Reserve Mining--The Standard of Proof Required to Enjoin an Environmental Hazard to the Public Health

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Note: Reserve Mining—The Standard of Proof Required to Enjoin an Environmental Hazard to the Public Health

A monstrous black silhouette set against the wilderness of the North Shore of Lake Superior, the Reserve Mining Company's taconite “beneficiating” plant stands as a grim reminder of man's ability to destroy natural beauty. Its smokestacks interminably belching white clouds as it daily emits 67,000 tons of taconite waste into the blue waters of the lake, the plant represents, in the words of the Court of Appeals for the Eighth Circuit, "a monumental environmental mistake." It also represents, however, the major source of employment, commercial prosperity, and tax revenue for several North Shore communities, as well as the primary source of iron ore for Reserve's parent companies, Armco and Republic Steel. The efforts of environmentalists to halt or modify Reserve's operation have thus met with both a valiant defense by the company and its dependents, and a considerable amount of judicial sympathy.

Since 1969, when official pollution enforcement activities began, the contest between Reserve and its opponents has surfaced

1. Reserve Mining Co. v. United States, 498 F.2d 1073, 1085 (8th Cir. 1974). Reserve mines low grade iron ore (taconite) on the Mesabi Iron Range in northern Minnesota and transports the raw ore to its "beneficiating" plant on the shore of Lake Superior at Silver Bay. There it extracts iron from the taconite by a process of grinding, crushing, and magnetic separation. The waste product, taconite "tailings" ranging in size from pebbles to microscopic particles, are flushed into Lake Superior with water drawn from the lake.

The operation began in 1955 and achieved its present magnitude in 1960. The tailings discharge was originally sanctioned by state and federal permits, which were granted after hearings on the obvious pollution questions had satisfied the agencies concerned that the discharge would create its own "high density current" that would carry the tailings directly to the bottom of the lake, to settle there forever. The comment of the court of appeals that the decision to allow Reserve to discharge its tailings into the lake had been an "environmental mistake" was based upon a district court finding that the tailings do not in fact all sink to the lake bottom, but disperse via currents over a considerable portion of the lake's western arm. United States v. Reserve Mining Co., 380 F. Supp. 11, 36-39 (D. Minn. 1974).

2. The plant supplies about 12 percent of the iron ore produced in the United States. Reserve Mining Co. v. Environmental Protection Agency, 514 F.2d 492, 536 (8th Cir. 1975).
in almost every available state and federal judicial or administrative forum. Only recently, with the final decision of the

3. Pollution enforcement proceedings against Reserve began in May of 1969, when the Secretary of the Interior, pursuant to his authority under the Federal Water Pollution Control Act, 33 U.S.C. § 1160(d) (1970) (FWPCA), convened a Lake Superior Enforcement Conference to consider the interstate pollution of Lake Superior. (The FWPCA is now administered by the Administrator of the Environmental Protection Agency, and the conference procedure has been replaced by the more streamlined enforcement procedures of the 1972 amendments. Id. § 1251 et seq. (Supp. II 1972). Reserve was the second and last case tried under the old FWPCA.) The governments of the United States, Minnesota, Michigan, and Wisconsin were represented at the Conference. In September of 1969 the Conference concluded that Reserve’s tailings discharge into the lake constituted pollution of interstate waters subject to abatement under the FWPCA, id. § 1160(g) (1970), and requested Reserve to come forward with a plan to modify the discharge. At that time the only pollution in question was that of the lake itself; the asbestos-related public health issue that has dominated the case recently had not yet been raised.

Meanwhile, just prior to the Conference, Minnesota’s Pollution Control Agency (MPCA) had adopted certain water quality standards applicable to Lake Superior and to Reserve’s discharges. This action was prompted by the FWPCA provision that unless a state established standards meeting the approval of the Secretary of the Interior, the Secretary would designate standards for the state. Id. § 1160(c). The Secretary approved Minnesota’s standards in November 1969, and Reserve appealed their adoption to the Minnesota District Court for Lake County, claiming that the standards were invalid or inapplicable to its operation. The state counterclaimed, alleging violation of the standards and seeking to enjoin Reserve from polluting the lake in violation of a Minnesota statutory definition of that pollution, MINN. STAT. § 115.01(5) (1969). After a seven week trial, the court concluded that Reserve was not polluting the lake, and that the water quality standards in question were either inapplicable or arbitrary and capricious as applied to Reserve. Reserve Mining Co. v. Minnesota Pollution Control Agency, 2 E.R.C. 1135, 1141 (Dist. Ct., Lake County, Minn. 1970). The court did find, however, that Reserve’s discharge might possibly be a source of lake pollution in the future, and thus ordered the parties to agree upon a plan to modify the discharge. Id. at 1144-45. (The court apparently had in mind “floculating,” or congealing, the tailings to ensure their descent to the lake bottom.) The MPCA appealed to the Minnesota Supreme Court, alleging that Reserve had failed to exhaust its administrative remedies, but the court held in Reserve’s favor. Reserve Mining Co. v. Minnesota Pollution Control Agency, 294 Minn. 300, 200 N.W.2d 142 (1972).

In January of 1971, immediately following the Lake County trial, Reserve submitted to the Lake Superior Enforcement Conference a plan for flocculating its tailings. The Conference rejected the plan, notified Reserve pursuant to the FWPCA, 33 U.S.C. § 1160(c) (5) (1970), that it was in violation of the Federal–State Water Quality Standards adopted by the MPCA and approved by the Secretary, and requested the United States Attorney General to bring suit against Reserve. See id. § 1160(g). Thus, in early 1972 the United States filed suit against Reserve in the Federal District Court for the District of Minnesota, and was soon joined by the states of Michigan and Wisconsin and a number of environmental
Court of Appeals for the Eighth Circuit,\textsuperscript{4} and an almost certainly final denial of relief by the United States Supreme Court,\textsuperscript{5} does a resolution of the matter appear to be in sight; the precise con-

organizations as plaintiff-intervenors. Several North Shore municipalities and civic organizations intervened in Reserve’s behalf. The Court agreed to join Minnesota as a plaintiff on Reserve’s motion, and eventually Reserve’s parent companies, Armco and Republic Steel, were joined as defendants, though not without a battle. See Armco Steel Corp. v. United States, 490 F.2d 688 (8th Cir. 1974).

In June of 1973, just prior to the commencement of trial, the plaintiffs announced their discovery that Reserve’s tailings discharge and air emissions contain substantial quantities of carcinogenic asbestos fibers, and that these fibers are found in dangerous quantities in the drinking water of Duluth and other North Shore communities and in the air of Silver Bay. Since that time the primary focus of the case has been this “health issue,” although the “pollution issues” (lake and air) were incidentally litigated.

The trial began on August 1, 1973, and proceeded until April 20, 1974, when the district court enjoined the operation of the plant, effective immediately, on the ground that its discharges were “endangering” the public health in violation of the FWPCA, 33 U.S.C. §§ 1160(g)(1), (2) (1970), and various other state and federal laws. United States v. Reserve Mining Co., 380 F. Supp. 11, 54–58 (D. Minn. 1974). Reserve appealed to the Court of Appeals for the Eighth Circuit, which granted a temporary stay two days later, and then, on June 4, a 70-day stay pending appeal. Reserve Mining Co. v. United States, 498 F.2d 1073, 1074–75 (8th Cir. 1974).

The basis for the stay was that Reserve had demonstrated a strong likelihood that it would succeed on the merits of its appeal on the health issue. Id. at 1076, 1084. The court also held, however, that the plaintiffs were likely to succeed on the pollution issues—which the district court had also determined adversely to Reserve—and thus conditioned its stay upon Reserve’s coming forth with a good faith plan to curtail its air emissions and to dispose of its tailings on land. Id. at 1084–85. Minnesota unsuccessfully appealed to the United States Supreme Court to vacate the stay. Minnesota v. Reserve Mining Co., 94 S. Ct. 3203 (1974).

Later that summer, the Court of Appeals for the Eighth Circuit extended the stay indefinitely until its decision on the merits, on the ground that the parties had made “significant progress” in reaching agreements as to an on-land disposal site. Reserve Mining Co. v. United States, No. 1291 (8th Cir., Aug. 28, 1974). (The court did not mention control of the air emissions. Apparently it considered them a less serious source of pollution.) Minnesota, now joined by the United States, again appealed to the United States Supreme Court to vacate the stay, and the Court over dissent again declined to do so. Minnesota v. Reserve Mining Co., 95 S. Ct. 287 (1974). The appeal on the merits was eventually heard by the Court of Appeals for the Eighth Circuit in December of 1974; the final decision in that appeal was rendered in March of the next year, Reserve Mining Co. v. Environmental Protection Agency, 514 F.2d 492 (8th Cir. 1975), and a final and unsuccessful petition for relief was taken to the Supreme Court. United States v. Reserve Mining Co., 95 S. Ct. 1441 (1975). It is the final decision of the court of appeals that is the focus of this Note.

\textsuperscript{4} Reserve Mining Co. v. Environmental Protection Agency, 514 F.2d 492 (8th Cir. 1975).

\textsuperscript{5} United States v. Reserve Mining Co., 95 S. Ct. 1441 (1975).
tours of the resolution, however, remain unclear. The essence of the final ruling by the court of appeals is that Reserve's air emissions and tailings discharge contain asbestiform fibers potentially injurious to the health of North Shore residents. Thus, the company must take prompt steps to curtail its air emissions, and must construct and convert to an "on-land" disposal system for its tailings as soon as it and the state can agree upon a site. If a site is not agreed upon within approximately one year, the plant must close; but even then, Reserve may continue operations one more year in order to allow its parent corporations time to find an alternate source of ore.

The remarkable aspects of this final ruling are that it essentially reverses the same court's earlier decision in the case, which had granted Reserve a stay of a district court injunction on the ground that a health threat had not been proved, and that it reaches the new result by gratuitously applying the liberal standard of proof that the stay opinion had chastised the district court for applying. In its stay opinion the appellate court had criticized the district court for going "one step beyond the evidence" in finding an enjoinable health threat. Nonetheless, it had agreed with the lower court that Reserve's discharges were polluting the air and water, and so had conditioned the stay upon Reserve's preparing to abate the discharges. Thus, in its final opinion the appellate court could easily have granted the relief it did simply by affirming the tentative holdings of its stay opinion. Instead, declining even to reach the pollution issues, the court adopted the more lenient standard of proof that the district

6. 514 F.2d at 500.
7. Id. at 538-39. The court intentionally did not set specific time limits for completion of either Reserve's "on-land" move or its air emissions curtailment. The former must begin within about a year; the latter immediately. Id. Since the opinion, Reserve has begun to install an air filtration system, which it is estimated will be complete in one to two years. A move to on-land disposal will probably take at least three years to complete after a site is finally agreed upon.
8. In order to sustain his burden of proof or persuasion as to an alleged fact, a party bearing that burden must establish the existence of that fact with a particular degree of certainty in the mind of the trier of fact. The "standard of proof," then, is a measure of the degree of certainty which will be required. (To be distinguished, of course, is the allocation of the burden, i.e., the determination of which party bears the risk of nonpersuasion.)
10. Id. See also note 3 supra.
court had applied and enjoined the discharges, though not immediately, as threats to public health.\textsuperscript{12} This about-face is the more interesting for the fact that during the interim between the two appellate court opinions a law review article\textsuperscript{13} and two Congressional bills concerning the burden of proof in environmental litigation\textsuperscript{14} had taken issue with the standard of proof applied in the stay opinion and had proposed the approach adopted in the final decision.

The court did not explicitly acknowledge that it was reversing itself. Instead, it explained that different standards of proof should apply to the same facts depending on whether the issue is the propriety of an \textit{immediate} injunction, as it was in the stay opinion, or the propriety of delayed relief, as in the final decision.\textsuperscript{15} This distinction, however, is untenable both in theory and in light of the language of the two opinions,\textsuperscript{16} and is best viewed as a face-saving artifice which will not be repeated. Whether the real reason for the court’s change of position on the health issue was the adverse criticism that greeted its stay opinion or simply a more thorough review of the voluminous evidence in the months that followed that rather hastily issued opinion\textsuperscript{17} can only be surmised.

The broader significance of the appellate court’s adoption of this more lenient standard of proof, which may best be termed the “risk-benefit” approach, is that it represents a novel judicial implementation of that standard in an environmental suit not involving the review of administrative agency action.\textsuperscript{18} For several years environmentalists have argued that traditional rules of proof are a major impediment to protecting man and his en-

\begin{enumerate}
\item Id. at 538-40.
\item S. 841, 94th Cong., 1st Sess. (1975); S. 776, 94th Cong., 1st Sess. (1975). These bills are discussed in text accompanying notes 136-47 \textit{infra}.
\item 514 F.2d at 507.
\item \textit{See} text accompanying notes 92-96 \textit{infra}.
\item \textit{See} note 3 \textit{supra}.
\item Several cases have upheld the use of risk-benefit principles by administrative agencies formulating regulations in areas where the types of harm the agency is authorized to prevent are difficult to prove by ordinary judicial standards. \textit{See}, e.g., South Terminal Corp. v. Environmental Protection Agency, 504 F.2d 646, 655 n.6 (1st Cir. 1974); Amoco Oil Co. v. Environmental Protection Agency, 501 F.2d 722, 740-41 (D.C. Cir. 1974); Industrial Union Dept., AFL-CIO v. Hodgson, 499 F.2d 467, 474 (D.C. Cir. 1974).
The problem, as they see it, is that the traditional rules fail to give proper weight to mere risks of harm—that is, to possible future harms that can be proved under ordinary standards only with great difficulty, but which are nonetheless serious enough to warrant preventive judicial intervention. Thus they have urged the courts not to rigidly require plaintiffs to demonstrate that the occurrence of harm is "more probable than not"—or whatever the prevailing standard prescribes—but rather to consider a variety of factors in determining the propriety of relief. The key factors suggested are the gravity of the harm should it occur, the degree of certainty that it will occur, and the benefits of allowing the allegedly harmful activity to occur. The theory is that if the risks of harm (the first two factors considered together) outweigh the benefits of the activity, relief should be granted whether or not the ordinary standard of proof has been met. Thus, the greater the gravity or the smaller the benefits, the less certain need be the harm.

19. Gelpe & Tarlock, supra note 13, at 412. See also note 22 infra.

20. The normal formulation of the standard of proof required in civil cases is a "preponderance of evidence." McCormick's Handbook of the Law of Evidence § 339 (2d ed. E. Cleary 1972); 9 J. Wigmore, Evidence § 2498 (3d ed. 1940). This phrase is potentially misleading, in that it implies that the matter to be measured is the evidence itself, whereas in fact the question is what degree of certainty the evidence must produce in the mind of the trier of fact. Therefore this Note will employ the synonymous phrases "more likely than not" and "more probable than not."

Some state courts have applied a standard of proof stricter than the "more probable than not" test in common-law nuisance suits to enjoin anticipated harm, e.g., Green v. Castle Concrete Co., 181 Colo. 309, 509 P.2d 588 (1973). See generally Note, Imminent Irreparable Injury: A Need for Reform, 45 S. Calif. L. Rev., 1025, 1027 (1972). Several federal cases also contain language suggesting that a stricter standard of proof is appropriate in suits for injunctions, but upon closer examination they reveal that the ordinary "more probable than not" standard was in fact applied. For example, in Caribbean Atlantic Airlines, Inc. v. International Ass'n of Machinists, 283 F. Supp. 601, 605 (D. Puerto Rico 1968), the court stated that the "plaintiff must present facts sufficient to show a necessity for and a clear right to such relief," but rejected plaintiff's proof of injury because it was not established by "a preponderance of the evidence" (emphasis added). See also Detroit News Pub. Ass'n v. Typographical Union Local 18, 471 F.2d 872 (6th Cir. 1972) (harm—loss of wages—must be clearly shown to be irreparable, but no indication of a higher than ordinary standard of proof).

21. See note 20 supra.

22. The leading attack on traditional rules of proof is Krier, Environmental Litigation and the Burden of Proof, in Law and the Environment 105 (J. Page & M. Baldwin eds. 1970). The author starts from the premise that because "resource consumers . . . can continue their
The final decision of the appellate court in Reserve is apparently a faithful implementation of this approach. Despite that appearance, however, the court's interpretation of the risk-benefit theory reflects two essential misconceptions which led conduct until sued," and resource preservers will therefore usually be plaintiffs charged with the burden of proof, our legal system is biased in favor of resource consumption. Id. at 107. He then points out that "judges traditionally have felt least restrained about law-making activity when they could operate through the medium of burden of proof," id. at 108, and suggests that, in suits to prevent environmental harm, once a plaintiff has made "a reasonable showing... that a proposed course of action poses a probable threat of significant environmental damage," judges should ease the plaintiff's burden by shifting to the defendant the burden of coming forward with evidence on the likelihood of harm from his activity and the feasibility of alternatives, id. at 115. Professor Krier cites Professor Joseph Sax's proposed Environmental Protection Act, then pending before the Michigan legislature, as incorporating this view. Id. Professor Sax's proposal has now become law in several states, including Minnesota. MINN. STAT. § 116B.01 et seq. (1974).

Professor Krier's article was followed by a law review note addressed to the more limited problem posed by the rule of some state jurisdictions that injunctions of threatened or anticipated nuisances must rest on proof that the harm is "practically certain" to occur in the immediate future. Note, supra note 20, at 1027. The author suggested that courts determine the weight to be accorded anticipated harm by reference to several factors:

- the (1) probability of occurrence of the harm,
- (2) magnitude and nature of the harm,
- (3) burden on the defendant and society if the injunction is granted,
- (4) necessary margin-of-safety, and
- (5) availability of alternatives to the defendant's proposed actions.

Id. at 1061. The third and fifth of these factors seem to be encompassed by the concept of the "benefits" in allowing a defendant's activity to continue, and the fourth could be considered an element of the first. Thus in the present consideration of the risk-benefit approach to the standard of proof, all of these factors are included.

The most recent article on the subject is Gelpe & Tarlock, supra note 13. The author's proposal is a more sophisticated version of the one presented in the Note just discussed:

Legislatures have sufficient discretion to base prohibitions on risks rather than proof of injury even if they do so relatively rarely. First, concepts of harm and injury must be redefined to include the risk of future adverse impact. Second, the factors relevant to a cost-benefit analysis must be defined to include risks of uncertain harm as a cost, and courts and agencies must be given the discretion to undertake a risk-benefit analysis as a justification for preventing or limiting an activity which poses only a risk of future adverse impact. Third, the burden of risk identification must in some instances be shifted to those whose activities threaten ecosystem stability.

Id. at 412. The article, published after the stay opinion but before the final decision by the appellate court in Reserve, specifically criticizes that court for its failure to apply a risk-benefit analysis in the former opinion. Id. at 380-81. The court, in its final opinion, cites the article approvingly—though not the pages criticizing the stay opinion. 514 F.2d at 538.

The risk-benefit approach, it will be noted, is analogous to the well-
the court to improperly delay relief. First, having concluded that abatement of the discharges was warranted by the health threat, the court refused to grant an immediate injunction on the ground that the "probabilities" of harm were low. Second, in distinguishing the "potential" health threat that it found in Reserve from the "imminent" danger that it thought would justify immediate relief, the court failed to realize that the threat from Reserve's discharges is indeed "imminent." Unless these errors are recognized, the effectiveness of the risk-benefit approach may be greatly diminished, as it was in Reserve, by judicial failure to appreciate the need for prompt relief from public health threats.

This Note will attempt to prevent such a result by explaining the court's two misconceptions. In the process it will contrast the court's two Reserve opinions in order to illustrate the radically different results that may be reached on the same set of facts by applying, alternatively, the risk-benefit approach and a more conservative standard of proof. Finally, the Note will question whether the proposed statutory implementation of the risk-benefit approach in environmental litigation is desirable, and, if so, whether it can be so formulated as to preclude the problems posed by the court's interpretation of that approach.

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known formula of Judge Learned Hand for determining whether the course of action followed by a tort defendant was reasonable:

[T]he owner's duty, as in similar situations, ... is a function of three variables: (1) The probability [of the event's occurrence]; (2) the gravity of the resulting injury ... ; (3) the burden of adequate precautions.

United States v. Carroll Towing Co., 159 F.2d 169, 173 (2d Cir. 1947). As the tort defendant is thought to have acted unreasonably if (3) outweighs (1) x (2), so a court could be said to act unreasonably in failing to enjoin possible harm where the risks outweigh the benefits.

23. 514 F.2d at 536.

24. Id. at 500, 528, 537. Some federal environmental statutes allow the immediate injunction of pollution posing an "imminent" danger to public health. The court distinguished the potential health threat in Reserve from such imminent dangers. See text accompanying notes 109-35 infra.

25. This Note will refer generally to the risk-benefit approach to the standard of proof in environmental litigation. For certain purposes, however, one must draw a distinction between suits involving an alleged threat to public health and those which are concerned only with the pollution of our natural environment. Theoretically, risk-benefit principles are equally applicable to both types of suit, and indeed the commentators, see note 22 supra, have not distinguished between them in proffering that approach to the standard of proof. The judiciary, however, will undoubtedly be more inclined to take account of mere risks of harm where the public health is at issue. Thus, the decision of the Court of Appeals for the Eighth Circuit to apply risk-benefit principles to the
I. FROM LEGISLATIVE POLICY JUDGMENT TO RISK-BENEFIT ANALYSIS

A rudimentary understanding of the factual issues raised by the health threat charges is essential to an appreciation of the significance of the appellate court's treatment of the standard of proof. The inhalation of asbestos fibers under certain circumstances is known to be extremely dangerous to man. A high incidence of deaths from cancer and asbestosis is consistently found among people who have worked in or lived near asbestos manufacturing plants, and even those who have merely lived in the homes of asbestos workers and been exposed to fibers brought home in the workers' clothing have died from the exposure.26 The period of inhalation need not be very lengthy;

health issue does not necessarily mean that the court would apply the same approach where only environmental pollution was at stake, although it is certainly good precedent for such an application.

On the other hand, the standard of proof has ceased to be a matter of much consequence in many suits involving ordinary environmental pollution, because specific statutory effluent limitations, air and water quality standards, and the like now define such pollution with precision. See, e.g., the enforcement provisions of the Clean Air Act, 42 U.S.C. § 1857c-8(b) (1970), and the Federal Water Pollution Control Act, 33 U.S.C. § 1319(b) (Supp. II 1972). A consideration of benefits will, of course, continue to be relevant to a determination of the "appropriate relief" to which those sections refer, but such a consideration has been generally applied in equity for decades. 7 J. MOORE, FEDERAL PRACTICE ¶ 65.18[3] nn.23-24 (2d ed. 1974).

Statutory definitions of pollution enjoinable as a threat to public health, however, continue to be couched in such general descriptive terms as "endangering" the public health, see note 24 supra and accompanying text, thus giving the courts much leeway in determining whether a violation has occurred. The bills inspired by the Reserve case, see text accompanying notes 109-35 infra, are simply attempts to ensure that the courts will apply risk-benefit principles in interpreting those definitions. The focus of this Note, then, will be upon the application of risk-benefit principles to the standard of proof in suits involving an alleged threat to public health; but the principles discussed are equally applicable to suits involving only pollution of air, land, or water.


In the last three months, three persons who were children at the time their relatives worked in the Paterson plant were found to have mesothelioma.

One of the three died of the disease in June at the age of 44. Her father had worked the late shift at the UNARCO plant for a year in the mid-1940's, and she took him a hot meal every evening, waiting outside the plant for her father to pick it up. Another patient was indirectly exposed to asbestos for just six months when she was four years old, and in the third case, the
deaths have been traced to exposures of only a few weeks or months. Despite the recorded cases, however, science has not yet been able to ascertain the dose-response relationship between exposure and disease, or the threshold level (if any) of exposure below which there is no danger of disease. Further complicating any attempt to predict accurately the effect of particular asbestos exposures are the facts that the tiny fibers are extremely difficult to count and that the symptoms of asbestos-induced diseases do not become manifest until at least 20 years after initial exposure.

In the Reserve case, the plaintiffs' health hazard claim was based on an assertion that the ore mined by the company contains "an asbestiform variety of the amphibole mineral cummingtonite-grunerite," and that the processing of the ore results in the discharge into air and water of mineral fibers substantially identical or identical to the fibers discharged by asbestos manufacturing plants. Plaintiffs contended that these fibers are present in dangerous quantities in the air of Silver Bay, Minnesota, where the plant is located, and in the drinking water of Duluth and other North Shore communities down current from Reserve. Reserve denied that the fibers in its discharges are identical to asbestos, that they reach municipal drinking supplies, that their ingestion can cause disease, and, even assuming the foregoing, that the fibers present in the air and water are sufficiently numerous to be a health problem. The federal district court, after a nine month trial, determined all these issues adversely to Reserve and closed the plant on the ground that it endangers the public health.

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27. Id. at 500.
28. Id. The dose-response relationship "quantifies the association between disease-producing levels of exposure and the incidence of disease."
29. Id.
30. Id. at 501.
A. The Stay Opinion

The appellate court, in ruling on Reserve's motion for a stay of the injunction pending an appeal on the merits—and thus on whether Reserve had made a strong showing that it was likely to succeed on the merits—held that, inasmuch as "any ill effects are simply beyond proof," the evidence did not support the district court's finding of a "demonstrable hazard" to the public health. In its view, the district court had violated judicial "rules of proof" and rendered an impermissible "legislative policy judgment" in determining to resolve "all uncertainties . . . in favor of health safety."

A brief summary of the stay opinion will illustrate exactly how the evidence had failed to establish a health hazard under the appellate court's "rules of proof." That court had tacitly adopted the findings of the trial court that Reserve's discharges did contain fibers identical to commercial asbestos and that the fibers were present in the air of Silver Bay and various municipal water supplies. Thus it considered only whether the circumstances of exposure constituted a health hazard. Because Reserve had been in operation for less than 20 years, direct proof of harm was of course impossible. Therefore, the court deter-

32. The court acknowledged the standard formulation of the appellant's burden on a motion for stay of an injunction pending appeal: he must make

(1) a strong showing that he is likely to succeed on the merits of the appeal; (2) a showing that, unless a stay is granted, he will suffer irreparable injury; (3) a showing that no substantial harm will come to other interested parties; and (4) a showing that a stay will do no harm to the public interest.

498 F.2d at 1076-77. See also Long v. Robinson, 432 F.2d 977, 979 (4th Cir. 1970). It concluded, however, that because of the "enormous economic impact" that closing the plant would have upon Reserve, its employees, and their communities, "our preliminary resolution of the health hazard question should control our action as to whether to grant or deny a stay." 498 F.2d at 1077. Thus the court addressed itself primarily to Reserve's likelihood of success on the health issue, although it also found that the plaintiffs were likely to succeed on the pollution issue and thus conditioned the stay on Reserve's presentation of plans to end its air and water pollution. See text accompanying note 10 supra.

33. 498 F.2d at 1083. The phrase "demonstrable hazard," or variations of it, appears frequently in the opinion. See id. at 1077, 1083, 1084. The court apparently treated this phrase as synonymous with the phrase "endangering" the public health contained in the relevant FWPCA provision, 33 U.S.C. § 1160(g) (1970), see note 24 supra, for it cited the district court's reluctance to assert the existence of a "health danger" as tacit support for its own conclusion that a "health hazard" had not been proved. 498 F.2d at 1083.

34. Id. at 1084.

35. Id.
mined that in order to prove their case plaintiffs would have to establish either that the fibers were present in quantities comparable to those present in the occupational setting of asbestos manufacturing plants, or that, though present in lesser quantities, those lesser quantities could be measured "with some precision" and shown to exceed a "known" threshold level. This formulation was biased in favor of Reserve. It ignored the fact that exposures less severe than those associated with occupational situations have proved fatal, and it demanded "precision" of measurement and a "known" threshold level where neither could be provided.

Applying these requirements to the evidence, the court of appeals concluded that air counts at Silver Bay were far below occupational levels. It reached this result by comparing the fiber counts taken in that community by a court-appointed witness to the maximum levels permitted in asbestos factories under Occupational Safety and Health Act (OSHA) regulations, which it assumed to represent the occupational norm. As to whether some lower level of airborne fibers could be found with "some precision" to exceed a known threshold level, the court pointed out that all of the fiber counts, being subject to at least a nine-fold margin of error, were too imprecise to be "quantifiable," and that the threshold level was at any rate unknown. The

36. Id. at 1078-79.
37. See note 26 supra and accompanying text, discussing the evidence linking deaths to both occupational and "environmental" exposures.
38. 498 F.2d at 1078. Even assuming the propriety of the court's refusal to recognize the known dangers of environmental exposures, the significance of this comparison is suspect. The air counts chosen—those of the court-appointed witness, Dr. Taylor—were the lowest of the many counts considered by the trial court. Moreover, the trial court had rejected the Taylor counts as "biased" because taken in large part on rainy days, when fiber concentrations would naturally be low. 380 F. Supp. at 49. Indeed, Dr. Taylor himself recognized this bias. Brief for Plaintiff—Appellee—Appellant United States at 33, Reserve Mining Co. v. Environmental Protection Agency, 514 F.2d 492 (8th Cir. 1975) (citing the trial transcript). Moreover, the OSHA standard with which the court compared North Shore exposures, although it was upheld by the Court of Appeals for the District of Columbia in the Industrial Union Department, AFL-CIO v. Hodgson, 499 F.2d 467 (D.C. Cir. 1974), has been widely criticized as unsafe and is due to be reduced by 60 percent in 1976. Id. at 479. In fact, recent evidence has even cast doubt upon the validity of the study that was relied upon in adopting the 1976 standard. United States v. Reserve Mining Co., 380 F. Supp. 11, 44-45 (D. Minn. 1974). Furthermore, as the district court pointed out, asbestos workers are exposed only during working hours, whereas the residents of Silver Bay are exposed 24 hours a day.
39. Testimony at trial indicated, and both the district and the appel-
district court, on the other hand, had found the lack of a known threshold level to be a cause for alarm rather than a missing element of plaintiff's proof, and held that its absence rendered a precise quantification of the air counts unnecessary. Instead, that court found the broad ranges of fiber counts taken by witnesses for both sides and by experts appointed by the court to be generally comparable to levels found in the "environmental" setting of asbestos workers' homes.

As for the hazard allegedly created by ingestion of fibers, the appellate court relied primarily on the results of a study that had examined tissues from the bodies of deceased, long-time Duluth residents for the presence of asbestiform fibers. The court took the failure of the study to show significant fiber concentrations as indicating that the ingestion of fibers could not pose a health threat. The district court, on the other hand, had rejected that tissue study as methodologically unsound, and had late courts acknowledged, that counts subject to a nine-fold or greater margin of error could not be used quantitatively to give a figure one could rely on, but only qualitatively to indicate the presence of fibers. Reserve Mining Co. v. United States, 498 F.2d 1073, 1079 (8th Cir. 1974); United States v. Reserve Mining Co., 380 F. Supp. 11, 47-50 (D. Minn. 1974). Both courts, however, found certain counts quantifiable because of methodological safeguards. Thus the court of appeals explained in its final opinion that Dr. Taylor's air counts, see note 38 supra and accompanying text, were subject to quantitative use because they embodied the average of several readings. Reserve Mining Co. v. Environmental Protection Agency, 514 F.2d 492, 511 n.34 (8th Cir. 1975). Curiously, Dr. Taylor's counts were not likewise found to be quantifiable for the purpose of establishing a lower than occupational level of exposure with "some precision." That issue, however, was mooted by the court's requirement of a known threshold level.

The district court had found some of the water counts quantifiable on similar grounds, see note 47 infra and accompanying text, but this finding was ignored by the appellate court.


41. Id. The district court did not make this finding as explicit as it could have. It merely said the counts were comparable to those found "to have been associated with disease in other environmental situations." Id. The fact that the court was there referring to asbestos workers' homes may be deduced from the plaintiffs' brief. Joint Brief in Opposition to Motion for Stay at 18, 22, Reserve Mining Co. v. United States, 498 F.2d 1073 (8th Cir. 1974).

42. 498 F.2d at 1078-81.

43. 380 F. Supp. at 50-51. The district court had concluded that the tissue study deserved little weight because the amount of tissue studied "could possibly cover the surface of the blunt end of a straight pin," because the parts of the body studied were "not areas in which fibers had been found by other investigators," and because "this was the first attempt to look for fibers in a population that had only environmental exposure." Id. at 50.
found that ingestion of fibers could cause disease. It had based this finding on evidence that asbestos workers eventually ingested about one-half of the fibers they inhaled, that such fibers could pass through the stomach lining, and that asbestos workers contracted gastrointestinal cancer at a high rate. Indeed, a government expert had testified that ingestion could "probably" cause disease. The appellate court rejected this finding as based on "theoretical medical opinions" lacking "scientific or medical certainty" and insufficient to overcome the "direct evidence" of the tissue study. Thus the appellate court was able to ignore the district court's further finding that the fibers were present in dangerous quantities in the drinking water of North Shore communities.

On the basis of this analysis of the evidence the appellate court concluded that the discharges by Reserve can be characterized only as presenting an unquantifiable risk, i.e., a health risk which either may be negligible or may be significant, but with any significance as yet based on unknowns.

and that although Reserve's discharges represent a possible medical danger, they have not in this case been proven to amount to a health hazard. The discharges may or may not result in detrimental health effects, but, for the present, that is simply unknown.

The question then becomes, the court continued, "what manner of judicial cognizance may be taken of the unknown." "None," was the import of its answer. The district court's decision to go "beyond the evidence" and resolve "all uncertainties ... in favor of health safety" represented "a legislative policy judgment, not a judicial one." To support this proposition, the

44. Id. at 51-52.
45. Reserve Mining Co. v. Environmental Protection Agency, 514 F.2d 492, 516 n.47 (8th Cir. 1975).
46. Reserve Mining Co. v. United States, 498 F.2d 1073, 1082 (8th Cir. 1974).
47. In assessing the amount of fibers present in the drinking supplies the district court had acknowledged that any given count of fibers in air or water is subject to a ten-fold margin of error. 380 F. Supp. at 47-48. See note 39 supra and accompanying text. It found, however, that because "some laboratories were fairly constant in arriving at [water counts] consistent with the mean of all the laboratories," those counts were quantitatively valid and showed dangerous levels of fibers. 380 F. Supp. 48.
48. 498 F.2d at 1082.
49. Id. at 1083.
50. Id. at 1084.
51. Id.
court of appeals quoted the following passage from *Industrial Union Department, AFL-CIO v. Hodgson*,52 a case which had upheld the OSHA standards set by the Secretary of Labor for occupational exposure to asbestos:

>SOME of the questions involved in the promulgation of these standards are on the frontiers of scientific knowledge, and consequently as to them insufficient data is presently available to make a fully informed factual determination. Decision making must in that circumstance depend to a greater extent upon policy judgments and less upon purely factual analysis.53

The implication was that policy judgments by an administrative agency in this context are permissible, because its function is quasi-legislative, but that those of a court are not. Thus, the court stated:

>[A]lthough we are sympathetic to the uncertainties facing the residents of the North Shore, we are a court of law, governed by rules of proof, and unknowns may not be substituted for proof of a demonstrable hazard to the public health.54

It is interesting to note that the chief court-appointed witness, Dr. Arnold Brown—on whose testimony the court of appeals had relied for its findings as to the unquantifiability of the fiber counts and the significance of the tissue study55—had recommended that the plant be closed.56 Indeed, the district court had relied on Dr. Brown’s opinion in issuing the injunction.57 The appellate court rejected this recommendation as a “medical concern,” asserting that Dr. Brown was “essentially in agreement that the discharges here simply have not been proven to be a demonstrable hazard.”58 This statement and the appellate court’s acknowledgement that the discharges posed a “possible medical danger” imply that such medical concerns are to be placed in the same category as “legislative policy judgments.”

The above review should suggest that, although proof of a health danger to North Shore residents was problematical, the

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52. 499 F.2d 467 (D.C. Cir. 1974).
54. 498 F.2d at 1084 (emphasis added).
55. Dr. Brown had acknowledged that the tissue study failed to demonstrate fiber concentrations which were greater than normal. 498 F.2d at 1081. He had also indicated, however, that the study did not exonerate the tailings discharge as a possible cause of disease by ingestion of fibers. *Id.*
57. 380 F. Supp. at 51.
58. 498 F.2d at 1083.
59. See text accompanying note 49 supra.
rather wooden approach of the appellate court exhibited a lack of sensitivity to the plight of those residents, despite that court's protestation to the contrary. The degree to which the approach employed by the Court of Appeals for the Eighth Circuit in its final opinion departs from that taken in its stay opinion is remarkable. An explicit application of the risk-benefit concept of proof recently espoused by environmentalist commentators and congressmen replaced the rigid "rules of proof" and permitted the court, in effect, to make a "legislative policy judgment" to close the plant in order to implement the "reasonable medical concern" aroused by the evidence.

B. THE FINAL OPINION

Stating at the outset of its final opinion that the question before it was whether the evidence demonstrated any "legally cognizable" risk to public health, the court noted that

many of the issues in the case do not involve "historical" facts subject to the ordinary means of judicial resolution. Indeed, a number of the disputes involve conflicting theories and experimental results, about which it would be judicially presumptuous to offer conclusive findings.

It went on to quote the following statement from the Court of Appeals for the District of Columbia:

Where ... the [EPA] regulations turn on choices of policy, on an assessment of risks, or on predictions dealing with matters on the frontiers of scientific knowledge, we will demand adequate reasons and explanations, but not "findings" of the sort familiar from the world of adjudication.

The passage is virtually identical to the one that the court had quoted in its stay opinion when admonishing the district court for its "legislative policy judgment" to resolve "all uncertainties ... in favor of health safety." Like the earlier quotation, it is

60. See notes 11-24 supra and accompanying text.
61. 514 F.2d at 520. The Court of Appeals made no attempt to define precisely what "rules of proof" it did apply in the earlier decision. One can probably infer that the court applied the ordinary "more probable than not" standard, requiring that it must appear more likely than not that harm will result from the discharges. This is suggested by the court's insistence that an excessive rate of disease due to the discharge must be shown to be predictable, 498 F.2d at 1084, as well as by its requirement that plaintiffs show exposure comparable to occupational levels or exposures in excess of a known threshold level.
62. 514 F.2d at 507.
63. Id. at 507 n.20 (emphasis added).
65. 498 F.2d at 1084. See text accompanying note 53 supra.
drawn from a case involving judicial review of administrative agency decisionmaking. Thus, the court of appeals acknowledged that where the issues involved are on "the frontiers of scientific knowledge," judges need not bow out of the court room with an embarrassed expression of sympathy for the uncertainties faced by potential victims of pollution and an explanation that courts are governed by immutable "rules of proof." They may, like administrative agencies, make the necessary "policy" judgments.

The appellate court's reconsideration of the evidence in the Reserve case is an admirable implementation of this view. Turning first to the plant's discharges into the air, and examining the studies that have demonstrated the fatal effects of inhaling asbestos fibers, the court emphasized that exposures less severe than occupational levels have been implicated as the cause of death, especially by mesothelioma, and that "[i]t is significant that the witnesses generally agreed that no known safe level of exposure exists for mesothelioma." This approach differs significantly from the court's prior omission of any reference to the proven dangers of "environmental" exposures and its requirement that plaintiffs carry the burden of showing a known threshold level.

As for the question of what concentrations of fibers were present in the air of Silver Bay, the court again relied exclusively on the court-appointed witness. Instead of comparing his counts to the OSHA standard for occupational exposure, as it had in the stay opinion, the court of appeals this time noted that although the measurements could not be accepted as precise, they appeared to exceed by a statistically significant margin the levels found in St. Paul, the control city.

66. Cf. text accompanying note 54 supra.
67. Although the appellate court was reviewing the decision of a lower court, and thus acknowledged that the "clearly erroneous" standard of review applied, 514 F.2d at 507 n.20, it admitted that its review of the evidence under the risk-benefit approach was tantamount to a trial court's initial application of that standard of proof to the facts. Id. at 507 n.20.
68. Id. at 508.
69. Id. n.25 (emphasis added). The phrase "no known safe level" was apparently borrowed from the district court. 380 F. Supp. at 47.
70. See text accompanying note 36 supra.
71. See text accompanying note 38 supra.
72. 514 F.2d at 511.
The court's approach to the tailings discharge was similar. On the question whether ingestion could cause disease, the court again cited the negative results of the Duluth tissue study as evidence that it could not. But instead of treating this study as conclusive, as it had previously, the court went on to review the evidence in support of the lower court's conclusion that ingestion was dangerous. It found the animal studies designed to determine whether asbestos fibers could pass through the gastrointestinal wall "conflicting" but of "some support" for the proposition that ingestion could cause disease; and it found the theory that the excessive rate of gastrointestinal cancer among asbestos workers is due to ingestion of fibers originally inhaled to be "a tenable medical hypothesis." It even quoted the testimony of a government witness that ingestion was the "probable" cause of this excessive rate of disease. These were the pieces of evidence that it had previously rejected as "theoretical medical opinions" insufficient to overcome the "direct evidence" of the tissue study. On the issue of the level of exposure through ingestion, the court examined the evidence supporting the district court's finding that Duluth residents ingest quantities of fibers comparable to those found to cause gastrointestinal cancer among workers, and found it to be "weak" but worthy of consideration.

In preparing to draw its conclusions, the court reiterated that the questions involved lay "on the frontiers of scientific knowledge." The court's task in such a situation, like that of an administrative agency, was to consider both the "probabilities" and the "consequences" of the alleged harm. Where the consequences are "dire," the probability need not be high in order to justify precautionary relief. Thus,

[1]n assessing probabilities in this case, it cannot be said that the probability of harm is more likely than not. Moreover, the level of probability does not readily convert into a prediction of conse-

73. See text accompanying note 42 supra.
74. 514 F.2d at 515-16.
75. Id. at 516.
76. Id.
77. Reserve Mining Co. v. United States, 498 F.2d 1073, 1082 (8th Cir. 1974). See text accompanying note 46 supra.
79. 514 F.2d at 516-17.
80. Id. at 517.
81. Id. at 519.
82. Id. at 519-20.
83. Id. at 520.
On this record it cannot be forecast that the rates of cancer will increase from drinking Lake Superior water or breathing Silver Bay air. The best that can be said is that the existence of this asbestos contaminant in air and water gives rise to a reasonable medical concern for the public health. The public's exposure to asbestos fibers in air and water creates some health risk. Such a contaminant should be removed.84

The "medical concerns" which the court had rejected in its stay opinion thus became the ultimate basis of relief.85

This calculation of probabilities and consequences, however, was not sufficient, in the court's view, to determine the proper timing of relief. That question was resolved by a balancing of the hazards or risks thus determined against the benefits of allowing the discharges to continue.85 The court of appeals observed that the trial court had "considered many appropriate factors" in deciding to grant an immediate injunction,
such as a) the nature of the anticipated harm, b) the burden on Reserve and its employees from the issuance of the injunction, c) the financial ability of Reserve to convert to other methods of waste disposal, and d) a margin of safety for the public.86

Careful enough attention, however, had not been given to the "probabilities of harm."87 In the opinion of the appellate court, the probability of harm in the present case was not great enough to justify an immediate injunction when balanced against the severe economic problems to be expected from a shutdown of the plant:

A court is not powerless to act in these circumstances. But an immediate injunction cannot be justified in striking a balance between unpredictable health effects and the clearly predictable social and economic consequences that would follow the plant closing.88

As to just how long relief should be postponed, the court distinguished between the air and water discharges:

84. Id. In support of its determination that "such a contaminant should be removed," the court quoted a lengthy passage from the testimony of Dr. Brown to the effect that, although he could not scientifically predict that an excessive rate of disease would occur as a result of the discharge, he as a medical man would urge that it be stopped. Id. at 518-19. Ironically, this was the same testimony that the district court had quoted in support of its decision to enjoin the discharges. 380 F. Supp. at 51.
85. 514 F.2d at 535.
86. Id. at 536.
87. Id. The court borrowed all five of these factors from Note, Imminent Irreparable Injury: A Need for Reform, 45 S. CALIF. L. REV. 1025 (1972). See note 22 supra.
88. 514 F.2d at 536.
With respect to the water, these probabilities must be deemed low for they do not rest on a history of past health harm attributable to ingestion but on a medical theory implicating ... ingestion ... as a causative factor .... With respect to air, the assessment of the risk of harm rests on a higher degree of proof, a correlation between inhalation of asbestos dust and subsequent illness. 89

Reserve therefore must "promptly take all steps necessary" to reduce its air emissions so that the fiber count in Silver Bay does not exceed that of a control city such as St. Paul; 90 but has at least two years and perhaps several more, to end its water discharges. 91

The court of appeals attempted to justify the radical difference between the standards of proof applied in its two opinions on the ground that it was reviewing the propriety of an immediate injunction in the former opinion and of delayed relief in the latter. 92 This explanation will not withstand scrutiny, however. In the first place, such a distinction is theoretically untenable. The "rules of proof" applicable to a case do not alter as the immediacy of the relief sought changes. If "judicial cognizance" may be taken of slight and imperfectly proved risks in granting delayed relief, consideration of such risks must be equally appropriate where immediate relief is at issue. The difference between the two situations is one of relief, not proof of harm; or, in terms of the risk-benefit analysis that the court adopted, one of benefit, not of risk. 93

In the second place, such a distinction is belied by the language of the stay opinion. It contains no indication that the court was considering only the propriety of immediate injunctive relief. The court spoke of "the health issue" without qualification. At the outset it said:

89. Id.
90. Id. at 538-39. See note 7 supra.
91. Id. at 538. See note 7 supra.
92. The later opinion explained the earlier as follows:
[W]e forecast that Reserve would likely prevail on the merits of the health issue. We limited this forecast to the single issue before us whether Reserve's plant should be closed immediately because of a "substantial danger" [the district court's finding] to health. ... We reached no preliminary decision on whether the facts justified a less stringent abatement order.

[W]e adhere to our preliminary assessment that the evidence is insufficient to support the kind of demonstrable danger to the public health that would justify the immediate closing of Reserve's operations. We now address the basic question of whether the discharges pose any risk to public health and, if so, whether the risk is one which is legally cognizable.

Id. at 506-07.
93. See text accompanying note 104 infra.
We conclude that Reserve appears likely to succeed on the merits of its appeal on the health issue. We proceed now to trace the outlines of the testimony supporting this view.94

The court also spoke in absolute terms when it indicated that "judicial cognizance" could not be taken of the unknown, and that the district court had made an impermissible "legislative policy judgment."95 A statement made by one of the judges at a hearing held some months after the stay opinion supports this reading:

You [counsel for the United States] don't seem to accept the fact that the Court pretty carefully considered that health issue once and made a preliminary determination for the purpose of the stay; that neither an immediate nor a long-range health hazard had been proven.96

It must be concluded, therefore, that the decision of the appellate court to apply risk-benefit principles in its final decision represents a tacit reversal of its earlier rejection of such an approach. If the court again faces the issue, it should recognize this reversal explicitly and determine the propriety of either immediate or delayed relief on common risk-benefit grounds. Any decision to delay relief could then be based on the legitimate ground that benefits outweighed risks only with regard to immediate relief, rather than on an indefensible use of varying standards of proof.

II. PROBABILITIES AND THE IMMEDIACY OF RELIEF

The application of the risk-benefit approach in the final opinion of the court of appeals is, for the most part, a faithful adoption of the proposals of environmentalist commentators and current congressional bills.97 There remains an incongruity between the facts of the Reserve case and the relief granted by the court, however, which suggests that either the proposals or the court's application of them is faulty. The theory behind the postponement of the relief granted in the final opinion was that the evidence before the court was not sufficiently probative to allow a prediction that harm would occur; rather, the evidence merely

94. Reserve Mining Co. v. United States, 498 F.2d 1073, 1078 (8th Cir. 1974).
95. See text accompanying notes 50-54 supra.
97. See notes 14, 19-22 supra and accompanying text.
reflected a "reasonable medical theory" or "hypothesis." Emply the risk-benefit formula of balancing probabilities and consequences against benefits, the court treated this lack of probative weight as equivalent to a low probability of harm. Such a low probability could not justify an immediate injunction, it concluded, where there was some benefit in allowing the allegedly harmful activity to continue.

The court's reasoning on this point was incorrect in two respects: first, the concept of probability, as the term is normally understood, has no relation to the probative weight of the evidence presented in the Reserve case; and second, the relative sufficiency of the evidence should not have controlled the timing of relief. In order to explain these flaws in the court's logic, it is necessary to distinguish two types of statements as to the probability that an event will occur—objective and subjective.

A statement of objective or statistical probability actually describes the likelihood that an event will occur and results from the action of random or apparently random factors. For instance, the weather and some genetic events occur randomly; other events appear to occur randomly because, though they may be due to constant factors, those factors are so complex that human beings cannot discern their operation. In both instances a probability statement such as "if X occurs then there is a 57 percent chance that Y will occur" has an objective meaning upon which human beings can reasonably plan a course of action. To illustrate, suppose a group of people are each given the chance to play a game of Russian roulette in which each must announce at the outset how many times he will pull the trigger of a six-chambered revolver aimed at his head and containing one bullet; for each round safely completed, the player will receive $1,000,000. In deciding how many rounds to play,

98. Reserve Mining Co. v. Environmental Protection Agency, 514 F.2d 492, 536 (8th Cir. 1975).
99. Id. See text accompanying note 89 supra.
101. Id.
102. Since the player will not be allowed to spin the cylinder between rounds, the objective probability of losing each round considered separately will be the number of times the trigger will be pulled in that round (one) divided by the number of unfired chambers remaining. Thus, the probability of losing the first round will be one in six, the second one in five, etc. At the outset, however, the player can calculate his overall chance of losing by dividing the total number of times he will commit himself to pull the trigger by the total number of chambers
each must balance the steadily increasing probability of losing against the value to him of the incremental $1,000,000 which he will receive for each additional successful attempt. Some may wish to play one round, some more than one, and some none. The answers will depend on the relative values each places on life and money, considered in light of the objective probability of losing. The point is that where the probability of a harmful event's occurrence may indeed be estimated objectively, one may sensibly base a decision as to whether and for how long to risk its occurrence upon that estimate, in light of other relevant factors.

Subjective statements of probability, on the other hand, do not really refer to probabilities at all. Rather, they state a degree of human certainty about the occurrence of an event which, although it is already objectively certain to take place or not and depends neither on random nor on apparently random factors, cannot be foreknown because of the imperfection of human knowledge. It is this type of probability statement that is generally inherent in the determination of a court or jury that a standard of proof has been met. It will state, for instance, that the occurrence of an event is "more probable than not"; but by "probable" it refers to a subjective state of certainty. When the trier of fact becomes sufficiently certain he determines, in effect, that for legal purposes the event has occurred or will occur. Thus, it does not matter whether he is actually more certain than the law requires him to be—for example, 95 percent instead of 51 percent. Judicial relief is equally justified in either case.103

The probabilities upon which the Court of Appeals for the Eighth Circuit based its decision to postpone relief were purely subjective. It agreed with the determination of the district court that lethal asbestiform fibers continually reach the air and water supplies of North Shore communities in significant quantities. The court was only uncertain as to whether the fibers were sufficiently plentiful to cause disease and whether ingestion could cause disease, and these doubts were based solely upon imperfect human information. As far as nature is concerned, it is perfectly certain either that the fibers discharged by Reserve are sufficient to kill, and are in the process of killing, North Shore residents, or that they are not. Thus, once the court of appeals had de-

103. The use of percentages in this context is really quite inappropriate, but serves to suggest degrees of conviction.
terminated that the proof was sufficient to justify relief on the assumption that the first of these alternatives was true, the degree of that proof should have had no bearing on the immediacy of relief. In deciding that the benefits of allowing the plant to continue operating were outweighed by the gravity of the harm in light of the subjective certainty of its occurrence, and thus that the discharges should cease, the court had determined that the alleged harm should be treated as a fact, and the relative degree of certainty therefore became irrelevant. Under these circumstances the postponement of relief simply aggravates the harm by subjecting North Shore residents to new or continued exposures.

This is not to say that a decision to postpone relief could not have been validly based upon a calculation that the benefits of allowing the discharges to continue for a limited period outweighed the risks of additional harm created by such a continued exposure, while in the long run the risks of such a continued exposure would outweigh the benefits. Such a determination could have been based upon a prediction that the detrimental economic impact of an immediate injunction would be more severe than that of a shutdown following a transition period. But where the lives of thousands are at stake, it is unlikely that a court would find those lives outweighed by the increase in economic benefits between immediate and postponed relief; and indeed, the Court of Appeals for the Eighth Circuit did not so find. Rather it based the postponement of relief, including the difference in the timing of relief from the air and water discharges, solely upon its analysis of the "probabilities" of harm.104

Thus, ironically, after having set out to render a final decision in the Reserve case under principles it had previously described as forbidden by judicial "rules of proof,"105 the court of appeals based that decision upon a violation of another rule of proof—namely, that a party who has proved facts sufficient to merit an injunction is entitled to that remedy without delay, unless the balance of conveniences or some other equitable consideration weighs in favor of the defendant.106 The result is that the potential victims of Reserve's discharges must wait as long

105. Reserve Mining Co. v. United States, 498 F.2d 1073, 1084 (8th Cir. 1974).
as several more years for relief—unless in the meantime plaintiffs' "reasonable medical theory" proves to be true and North Shore residents begin to die from exposure to asbestiform particles.

III. IMMINENT HAZARDS AND THE IMMEDIACY OF RELIEF

The second misconception underlying the appellate court's interpretation of the risk-benefit approach also concerns the timing of relief. Several times in its final opinion the court pointedly contrasted the sort of "potential threat to the public health" that it found in Reserve with an "imminent" hazard or danger to the public health. Its purpose was to distinguish hazards that justify immediate relief from those that permit relief to be delayed. Only an imminent hazard would require immediate relief, and Reserve's discharges did not present one.

The court apparently drew this imminent hazard or danger concept from formulations of enjoinable pollution found in several federal environmental and health statutes. Both the Clean Air Act and the amended version of the Federal Water Pollution Control Act (FWPCA), for instance, employ the phrase "imminent and substantial endangerment" to define pollution against which the Administrator may seek an immediate injunction rather than resort to the acts' ordinary, more dilatory enforcement procedures. Inasmuch as neither of these provisions has received authoritative judicial or administrative construction, the court's assumption that the quoted language would not allow relief in a situation like that involved in Reserve becomes important. Moreover, an appreciation of the sense in which these statutes use the term "imminent" would perhaps have led the court to grant immediate relief from the imminent health threat which Reserve's discharges do indeed create.

The court's various references to imminent dangers and hazards reveal a definition containing two elements. First, the anticipated harm must be temporally immediate:

107. See note 7 supra and accompanying text.
108. Reserve Mining Co. v. Environmental Protection Agency, 514 F.2d 492, 538 (8th Cir. 1975).
109. Id. at 500, 515, 528, 537.
110. Clean Air Act, 42 U.S.C. § 1857h-1 (1970); FWPCA, 33 U.S.C. § 1364 (Supp. II 1972). The provisions are identical. Several other federal statutes also use the concept of an "imminent hazard" to the public health to define activities subject to immediate restraint. These are discussed in text accompanying notes 118-27 infra.
No harm to the public health has been shown to have occurred to this date and the danger to health is not imminent. . . . No reason exists which requires that Reserve terminate its operations at once. 111

The tissue study, showing no evidence of present disease, therefore indicated to the court "that no emergency or imminent hazard to health exists." 112

Second, imminent hazards involve greater risks of harm than do situations involving danger that is not imminent:

The term "endangering," as used by Congress in § 1160(g)(1), connotes a lesser risk of harm than the phrase "imminent and substantial endangerment to the health of persons" as used by Congress in the 1972 amendments to the FWPCA. 33 U.S.C. § 1364 (Supp. II 1972). 113

By "risk" of harm, the court meant the "probability," or subjective certainty, that harm will occur. In other words, proof of harm must meet a higher standard under the "imminent" test than under the "endangering" provision applicable to Reserve's water discharge. 114 Thus, presumably, the court would interpret the "imminent and substantial endangerment" provision of the present FWPCA and the Clean Air Act, and similar provisions of other statutes, 115 as requiring proof of a high risk of immediate harm, and would therefore hold those provisions inapplicable to the "potential threat to the public health" involved in Reserve. 116

111. 514 F.2d at 500.
112. Id. at 515.
113. Id. at 528.
114. The identity of risk, probability, and proof of harm in the court's vocabulary can be deduced from other portions of its opinion. For example: "These concepts of potential harm, whether they be assessed as 'probabilities and consequences' or 'risk and harm' necessarily must apply . . . [where] proof with certainty is impossible." Id. at 520.
115. See note 110 supra.
116. 514 F.2d at 500, 528. The court held that the then applicable FWPCA provision authorizing a court to enjoin water pollution "endangering" the public health, 33 U.S.C. § 1160(g) (1970) [which has now been superseded by the "imminent and substantial endangerment" provision of the current FWPCA, 33 U.S.C. § 1364 (Supp. II 1972)], encompassed the risk-benefit approach, and particularly that it allowed a grant of relief against "potential harm to the public health." 514 F.2d at 519-20.

In support of this interpretation of the term "endangering," the court cited the dissenting opinion of Judge Wright in Ethyl Corp. v. Environmental Protection Agency, 7 E.R.C. 1353 (D.C. Cir. 1975), a case involving the similar statutory phrase, "will endanger the public health." Clean Air Act, 42 U.S.C. § 1857f-6c(c) (1) (A) (1970). Judge Wright read "danger" as meaning "risk of harm," 7 E.R.C. at 1385-90, which terms appear to be his equivalents, respectively, of the Reserve court's "probabilities" and "consequences." 514 F.2d at 520. Ironically, the approach to the standard of proof taken by the two-man majority in Ethyl is com-
Both aspects of the court's definition of the "imminent" danger concept are inappropriate in the context of the Reserve case, and more generally do not represent a justifiable interpretation of the FWPCA and Clean Air Act provisions. The first aspect—that immediate relief is justified only by immediate harm—is refuted by logic; by the language of the Clean Air Act, the FWPCA, and similar provisions in other statutes; and by official interpretations of those latter statutes. Logically, it is senseless to tie the immediacy of relief to the imminence of harm, because in many cases harm occurring far in the future will be attributable to present events. That is the situation in Reserve and in many other cases involving the unknown effects of carcinogens presently being introduced into the environment. Only by enjoining the present cause can the ultimate effect be prevented.

The various statutes themselves also support the interpretation that immediate relief is not dependent upon a showing of immediate harm, since they refer to dangers or hazards that are imminent, not to imminent harms. The imminently dangerous situation is the present occurrence of events which, unless stopped, will create harm either now or in the future.

Although the relevant language of neither the FWPCA nor the Clean Air Act has been officially construed, the courts, agencies, and Congress have consistently rejected the view of the Reserve court when called upon to interpret analogous provisions of other statutes. For example, the three institutions have cooperated in developing an interpretation of the provision in the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) that allows the Secretary of Agriculture to suspend the registrable to the rigid stance taken by the Reserve court in its stay opinion. The Ethyl court stated, for instance, that

"[f]or the dissent to argue that the Administrator can dispense with proof of actual harm, i.e., what has occurred in the past, and can nevertheless somehow determine potential harm, is to grant the plainest license for the wildest speculation. We have always thought scientific conclusions, above all, demanded proof by events recorded and observed."

7 E.R.C. at 1357. The full Court of Appeals for the District of Columbia has decided to rehear the case en banc, at which time adoption of Judge Wright's approach seems both likely and deserved.

tration of a pesticide immediately if he determines that such action is necessary to prevent an "imminent hazard" to the public health.\footnote{118} The first opportunity to interpret that phrase fell to the Court of Appeals for the Seventh Circuit,\footnote{119} which found mention in the legislative history of FIFRA that its procedures were generally modeled after similar "imminent hazard" provisions in the Food, Drug, and Cosmetic Act.\footnote{120} Thus, the court determined that the legislative history of the latter statute could be used in the interpretation of the former. That history, the court said,

reflected that an imminent hazard to the public health would exist when ... a drug was so unsafe as to create a public health situation "which must be corrected immediately."\footnote{121}

This definition avoids the pitfall of reading "imminent" with reference to the harm itself, relating it instead to the hazardous situation faced by potential victims of the harmful substance.

The next step in the interpretation of FIFRA was taken by the Secretary of Agriculture. When the provision was again presented for judicial review, the reviewing court approved as consistent with the statutory language and purpose the Secretary's conclusion that

the most important element of an "imminent hazard to the public" is a serious threat to public health, [and] that a hazard may be "imminent" even if its impact will not be apparent for many years ... .\footnote{122}

The final step in the process of interpreting this provision was taken by Congress. Tacitly approving the judicial and administrative developments, it amended the original statutory language\footnote{123} by adding a provision that defines an imminent hazard as a situation wherein continued use of a pesticide "would be likely to result in unreasonable adverse effects on the environment ... ."\footnote{124} An "unreasonable adverse effect on the environment" is further defined as "any unreasonable risk to man or
the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide."

Similar “imminent hazard” provisions contained in the Food, Drug and Cosmetic Act and in the Hazardous Substances Act have received virtually identical administrative interpretation. The single regulation promulgating that interpretation contains the particularly illuminating statement that “[t]he ‘imminent hazard’ may be declared at any point in the chain of events which may ultimately result in harm to the public health.”

In light of these developments it seems unlikely—contrary to the assumption made by the Court of Appeals for the Eighth Circuit—that Congress intended the “imminent and substantial endangerment” provision of the FWPCA and Clean Air Act to be interpreted as requiring imminent harm. Verbally, it is not significantly different from the “imminent hazard” formula of FIFRA and the other statutes. Moreover, all of the “imminent” provisions previously discussed fulfill the same function: granting relief where the ordinary enforcement procedures of the particular statutes would be too slow. A requirement that immediate harm be shown would therefore frustrate both the language and the intent of the statutes.

The second element contained within the appellate court’s definition of the “imminent” danger concept is the assertion that the phrase “imminent and substantial endangerment” “connotes” a higher degree of risk, or proof of harm, than does the “endangering” the public health language of the former FWPCA. This contention likewise cannot withstand scrutiny. In the first place, it is implausible as a matter of plain English: “imminent” cannot support the requirement of a higher degree of proof, because it refers only to a temporal element—whether that be the timing of the harm or of the hazard. Nor can “substantial,” which merely embodies a cautionary instruction to the Administrator not to act on de minimis or imagined risks. That leaves “endangerment,” which corresponds to “endangering” in the old FWPCA. Thus, a comparison of the present and former language of the FWPCA on this point reveals no reason to believe that Congress, in changing that statute, meant to change the degree of risk required for immediate relief.

125. Id. § 136(bb).
126. See note 117 supra.
127. 21 C.F.R. § 3.73 (1974).
128. See note 110 supra. The legislative history of both acts is silent as to the meaning of the phrase.
Nor can support for the view of the appellate court in Reserve be found in precedent. Official interpretations of the various “imminent hazard” provisions\(^{130}\) have found them to require that the decisionmaker apply the same principles of risk-benefit analysis that were ultimately found appropriate in Reserve under the “endangering” provision; those interpretations have not suggested that any higher degree of proof is required by the addition of “imminent.” In this regard, the history of the FIFRA provision again serves as an example. In Environmental Defense Fund. v. Ruckelshaus,\(^{131}\) the Court of Appeals for the District of Columbia noted, upon remanding the case to the Administrator of the Environmental Protection Agency for an explanation of his refusal to suspend DDT immediately as an imminent hazard, that a court must consider “both the magnitude of the anticipated harm, and the likelihood that it will occur.”\(^{132}\) The implication was that the requisite degree of likelihood that an imminent hazard will occur is not fixed at a particular level, but will vary with the magnitude of the harm. Congress, in its subsequent statutory definition of the “imminent hazard” phrase,\(^{133}\) sanctioned and elaborated upon this approach. Its definition explicitly sets forth the principles of risk-benefit analysis.\(^{134}\)

This recognition that risk-benefit principles are appropriate under a provision requiring that the hazard or danger be “imminent”\(^{135}\) refutes the assumption of the Reserve court that such a provision nonetheless requires a greater degree of risk than does simple “endangering.” The essence of the risk-benefit balancing process is that its standard of proof is flexible, varying

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130. See notes 117–27 supra and accompanying text.
131. 439 F.2d 584 (D.C. Cir. 1971).
132. Id. at 595.
133. See text accompanying notes 123–25 supra.
134. See 7 U.S.C. §§ 136(l), (bb) (Supp. II 1972). The term “risk” as used in this statutory definition is the equivalent of the terms “probabilities” and “consequences” as used by the Reserve court as well as of the “likelihood” and “magnitude” of harm referred to in Ruckelshaus.
135. The aforementioned administrative interpretation of the “imminent hazard” provisions of the Hazardous Substances Act and the Food, Drug, and Cosmetics Act, see note 127 supra, also envisions a risk-benefit approach:

In exercising his judgment on whether an “imminent hazard” exists, the Commissioner will consider the number of injuries anticipated and the nature, severity, and duration of the anticipated injury.

21 C.F.R. § 3.73(b) (1974). The flexible likelihood or certainty standard is encompassed by the definition of an “imminent hazard” as a “significant threat” that must be “corrected immediately to prevent injury.” Id.
according to the weight of the other factors in the equation. The issue under all the statutory provisions that have been discussed is simply whether permitting the challenged activity to continue is "reasonable" upon a consideration of all the factors. The only distinction added by the word "imminent" is that the need for relief from the activity must be immediate. On the other hand, the use of the term "endangering," without more, encompasses both such a situation and one where an analysis of benefits renders only a deferred remedy appropriate.

The interpretation of the imminence concept advanced in Reserve, then, reflects both a misunderstanding of the statutes in which it is used and a failure to appreciate the significance of the public health danger in that case. Even assuming the tissue study demonstrates that asbestiform fibers have not yet accumulated in significant quantities in the tissues of Duluth residents, and even assuming it cannot be "predicted" that the residents of Silver Bay will soon begin to die, the hazards involved are imminent, and delay will only aggravate whatever harm may occur.

IV. A STATUTORY FORMULATION OF RISK-BENEFIT ANALYSIS

The stay opinion of the appellate court in Reserve has achieved the distinction of prompting introduction of federal legislation to overrule the standard of proof applied in that decision. A bill initiated by Senators Hart of Michigan and Nelson of Wisconsin shortly after the stay opinion would, in essence, make the risk-benefit approach applicable to all suits brought for the purpose of enjoining health threats pursuant to any statute administered by the Environmental Protection Agency (EPA). Although the bill couches its proposal in procedural

136. Reserve Mining Co. v. United States, 498 F.2d 1073 (8th Cir. 1974).
137. The bill exempts suits for review of federal administrative actions. S. 841, 94th Cong., 1st Sess. § 3 (1975).
138. Id. The proposal was originally introduced in August 1974. S. 1104, 93d Cong., 2d Sess. §§ 401-05, Amend. 1814 (1974).

That the bill was indeed inspired by the stay opinion in the Reserve case was made clear by its authors. Hearing on S. 1104 Amend. 1814 Before the Subcomm. on the Environment of the Senate Comm. on Commerce, 93d Cong., 2d Sess., ser. 126, at 1 (1974). The bill responded, they said, to the statement of the Court of Appeals for the Eighth Circuit that the district court's decision to resolve "all uncertainties . . . in favor of health safety" was a "legislative policy judgment, not a judicial one." 120 Cong. Rec. S. 15185 (daily ed. Aug. 19, 1974), quoting Reserve Mining
language—purporting to shift the burden of proof to the defendant once the plaintiff has raised a rebuttable presumption of an enjoinable health threat by introducing evidence that demonstrates a "reasonable risk" of a health threat—its effect is substantive. It would ensure that the degree of certainty with which harm must be shown in order to enjoin a health threat is flexible rather than fixed, varying with the gravity of the alleged harm and with the benefits of the defendant's activity. The device of a rebuttable presumption that shifts the burden of proof is merely a statement of what ordinarily occurs once a plaintiff has proved his case sufficiently to allow a directed verdict on his behalf; the defendant then bears the burden of rebutting the plaintiff's proof or succeeding on an affirmative defense.

The authors of the bill have expressed uncertainty as to whether it would change existing law. In introducing the proposal to the Subcommittee on Environment of the Senate Commerce Committee, Senator Hart stated:

In rejecting the policy of the eighth circuit's panel, and in proposing a new law to deal with the situation, I intend to take Co. v. United States, 498 F.2d 1073, 1084 (8th Cir. 1974).
As the FWPCA, 33 U.S.C. § 1251 et seq. (Supp. II 1972), and the Clean Air Act, 42 U.S.C. § 1857 et seq. (1970), are both administered by the EPA, the provisions in those statutes that allow the Administrator to seek an immediate injunction against pollution creating an "imminent and substantial endangerment" to the public health, 33 U.S.C. § 1364 (Supp. II 1972), 42 U.S.C. § 1857h-1 (1970), would fall within the bill's language. The language of those existing statutes should be interpreted to require the approach set forth by the bill. See text accompanying notes 128-35 supra.

Senators Hart and Nelson have also introduced another bill on the same topic. Simpler than, but similar in purpose to S. 841, it provides that in any action brought under any statute administered by the EPA, where a risk to public health is alleged and established, the failure by the party requesting such relief to prove that demonstrable harm to health now exists or will result, shall not, in and of itself, constitute a permissible basis to deny such relief.

S. 776, 94th Cong., 1st Sess., Amend. 21 (1975). The phrase "demonstrable harm to the public health" reflects the "demonstrable health hazard" requirement of the stay opinion, see note 33 supra, which the authors took to mean that actual harm must be proved. Hearing on S. 1104 Amend. 1814 Before the Subcomm. on the Environment of the Senate Comm. on Commerce, 93d Cong., 2d Sess., ser. 126, at 1 (1974). There should be no need for this measure after the final opinion of the court of appeals in Reserve, but caution perhaps justifies its passage.

139. S. 841, 94th Cong., 1st Sess. § 3 (1975).
140. Defendant can rebut the presumption by proving "that in fact no public health threat exists or that the risk of any such threat is negligible," id. § 4(A), or that the "physical and economic" benefits of his activity outweigh "all" of its costs, "including any possible threat to the public health," id. § 4(B).
no position on whether the Reserve decision is authorized by existing law.

It is my feeling that if that decision is consistent with the law, as it now exists, the law should be changed as promptly as possible. If on the other hand, the decision constitutes a misinterpretation of existing law, I would recommend that the law be clarified so that such misinterpretations will not continue.\textsuperscript{141} 

Inasmuch as the bill covers only suits brought for injunctive relief pursuant to statutes administered by the EPA, and since Reserve is the first health threat case to be brought under one of those statutes, the question whether it changes existing law is somewhat hypothetical. Moreover, with the Reserve court's recent rejection of the approach taken in the stay opinion against which the bill is directed, it now seems clear that existing law—the final Reserve opinion—does encompass the bill's approach to proof of a health hazard. Thus the final decision of the appellate court in Reserve stands as a precedent for the very proposition that Senators Hart and Nelson desire to write into law, and so vitiates the urgency of their proposal.

Nonetheless, the desirability of the Hart-Nelson bill is quite clear. Incorporating as it does a precautionary approach to cases like Reserve, it can do no harm, and may inspire a court not otherwise so inclined to reach the result required by an appropriate concern for human lives. That the measure would not necessarily ensure such a result, however, is illustrated, ironically, by the final Reserve opinion. Perhaps prompted by the bill, perhaps by a thorough review of the voluminous evidence, the court applied the bill's principles to find a health threat; but, having done so, it granted a remedy only slightly more satisfactory than the relief it had granted in the stay decision after denying the existence of a health threat and instead finding an ultimate injunction warranted on the pollution issues.\textsuperscript{142} It is hoped that a repetition of the court's mistaken denial of immediate relief will be precluded by recognition of the misconceptions on which it was based.\textsuperscript{143} Other courts, however, might have reached the same decision to delay relief by finding that the economic benefits of continued operation temporarily outweighed


\textsuperscript{142} See text accompanying note 10 \textit{infra}. On the other hand, the risk-benefit approach was at least responsible for the change in the court's position on the health issue, and would therefore have had a greater impact in the absence of the pollution issues.

\textsuperscript{143} See text accompanying notes 97-135 \textit{supra}. 

the need for relief. In certain cases such a result could be appropriate, but where the public health is at stake those cases should be rare.\textsuperscript{144} Cases where the economic benefits of releasing substances deleterious to human health into the environment outweigh any relief should be even rarer.

The question remains, then, whether any statutory formulation could ensure the result that a "reasonable medical concern" should dictate in Reserve and similar cases. One solution would be legislation identical to that proposed but without provision for rebutting the presumption. This suggestion has been rejected even by leading proponents of the risk-benefit approach, however, as "an irrational curtailment of resource use."\textsuperscript{145} Assuming society shares that view, any feasible solution must allow the court to balance risks and benefits; this, given the difficulty of measuring and comparing those factors, would necessarily give the court a certain amount of discretion in the result.\textsuperscript{146} The ultimate solution, then, must lie with the judges. When they are prepared to translate their sympathies for the "uncertainties"\textsuperscript{147} faced by potential human victims of pollution into effective relief, the proper result will be reached with or without a statute.

\textsuperscript{144} See text accompanying note 104 supra.
\textsuperscript{145} Gelpe & Tarlock, supra note 100, at 416.
\textsuperscript{146} All of the previously discussed proposals advanced by environmentalist commentators, see note 22 supra, grant the court such discretion.
\textsuperscript{147} Reserve Mining Co. v. United States, 498 F.2d 1073, 1084 (8th Cir. 1974).