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Federal Agency Treatment of Uncertainty in Environmental Impact Statements Under the CEQ's Amended NEPA Regulation § 1502.22: Worst Case Analysis or Risk Threshold?

INTRODUCTION

Congress enacted the National Environmental Policy Act (NEPA) in 1969.1 Congress intended to institutionalize within the various federal agencies the interdisciplinary application of science to anticipate and to manage the prospective environmental impacts of major projects. Recognizing the disparate missions, budgets, and scientific capabilities of these agencies, Congress simultaneously created the Council on Environmental Quality (CEQ)2 to assist in implementing the broad NEPA mandate. As environmental science achieved greater sophistication during the 1970s,3 the CEQ came to recognize that the accuracy of a prediction of environmental impact depends on the reliability of the data underlying the estimate.4 In its first binding NEPA


(i) the environmental impact of the proposed action,
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
(iii) alternatives to the proposed action,
(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
(v) any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented.


2. NEPA created the Council on Environmental Quality (CEQ) to advise and monitor agencies preparing environmental impact statements (EISs). 42 U.S.C. §§ 4342, 4344 (1982).

3. For a general discussion of the development of interdisciplinary environmental science, see L. CALDWELL, supra note 1, at 98-103.

4. The statutory language of NEPA is silent on precisely how agencies should address data gaps and uncertainties in an EIS.

The CEQ's first binding NEPA regulations, 40 C.F.R. §§ 1500.1-1508.28 (1985), promulgated in 1978, addressed scientific uncertainty in environmental impact statements in the following subsections: § 1502.22, entitled "Incomplete or unavailable information," and including the original worst case analysis requirement; § 1502.23 on cost-benefit analysis; § 1502.24 on methodology and scientific accuracy; § 1502.14 describing alternatives that must be discussed in addition to the proposed action; § 1502.16, generally defining environmental consequences; and § 1502.9(c)(1)(ii), requiring supplements to EISs when the agency receives significant new information relevant to the proposed project under study.

"Effects" are defined in § 1508.8 to include both direct and indirect effects of the federal
regulations, issued in 1978, the CEQ thus required that environmental impact statements (EISs) affirmatively address deficiencies in the completeness and quality of the incorporated data, generally referred to as data gaps or uncertainties.\(^5\) In particular, the CEQ regulations originally mandated worst case analysis where relevant information on environmental effects was unavailable or uncertain. Worst case analysis required agencies to predict the worst possible environmental consequences of a proposed federal action in order to aid agency decision-making and to inform public debate.\(^6\)

After studying judicial interpretations of the 1978 data uncertainty regulation, the CEQ in 1986 amended the regulation, replacing worst case analysis with a "rule of reason" threshold. The new regulation requires discussion in an EIS of a potential environmental effect only upon demonstration through "credible scientific evidence" that it is reasonably foreseeable.\(^7\)

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5. The original data uncertainty provision stated:

Incomplete or unavailable information.

When an agency is evaluating significant adverse effects on the human environment in an environmental impact statement and there are gaps in relevant information or scientific uncertainty, the agency shall always make clear that such information is lacking or that uncertainty exists.

(a) If the information relevant to adverse impacts is essential to a reasoned choice among alternatives and is not known and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.

(b) If (1) the information relevant to adverse impacts is essential to a reasoned choice among alternatives and is not known and the overall costs of obtaining it are exorbitant or (2) the information relevant to adverse impacts is important to the decision and the means to obtain it are not known (e.g., the means for obtaining it are beyond the state of the art) the agency shall weigh the need for the action against the risk and severity of possible adverse impacts were the action to proceed in the face of uncertainty. If the agency proceeds, it shall include a worst case analysis and an indication of the probability or improbability of its occurrence.


6. See Question 20(b) of CEQ, Forty Most Asked Questions on the National Environmental Policy Act Regulations, 46 Fed. Reg. 18,026, 18,032 (1981). The response to question 20(b) states: "In addition to an analysis of a low probability/catastrophic impact event, the worst case analysis should also include a spectrum of events of higher probability but less drastic impact." Id. Thus, the worst case analysis should supplement the potential environmental consequences analyzed under § 1502.16.


Incomplete or unavailable information.

When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.

(a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.

(b) If the information relevant to reasonably foreseeable significant adverse impacts
This new approach envisions some threshold probability of occurrence of a specific environmental outcome below which the agency need not research, evaluate, or disclose its impact in an EIS. Nevertheless, some courts, particularly in the Ninth Circuit, have continued to demand inclusion of a worst case analysis in EISs containing incomplete or uncertain scientific data. These courts contend that the statutory language and the "common law" of NEPA mandate such analysis.

There are three major reasons for examining the treatment of data uncertainty in EISs. First, the completeness and accuracy of scientific data are substantively important. As awareness of the inadequacy or uncertainty of information concerning the effects of federal projects increases, agency treatment of low probability/catastrophic impact events attains practical, long-term environmental significance. Examples of potentially catastrophic impacts litigated under the NEPA data uncertainty regulation range from the interference with deer migration caused by secondary development at a proposed ski resort to the effects of supertanker oil spills in dredged harbors to the long-term carcinogenic risk from herbicide spraying or to the dangers of disposal of high-level nuclear wastes. In addition, the decision to disclose, cannot be obtained because the overall costs of obtaining it are exorbitant or the means to obtain it are not known, the agency shall include within the environmental impact statement: (1) A statement that such information is incomplete or unavailable; (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community. For the purposes of this section, "reasonably foreseeable" includes impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.

(c) The amended regulation will be applicable to all environmental impact statements for which a Notice of Intent (40 C.F.R. 1508.22) is published in the Federal Register on or after May 27, 1986. For environmental impact statements in progress, agencies may choose to comply with the requirements of either the original or amended regulation. 40 C.F.R. § 1502.22 (1987).

8. A risk threshold encompasses consideration of both the probability and the severity of an effect. In this Note the CEQ's amended regulation is termed a "probability threshold" since it restricts the agency's duty to discuss remote impacts, regardless of severity. See note 14 infra and accompanying text for a brief discussion and list of sources on risk assessment.

9. See Methow Valley Citizens Council v. Regional Forester, 833 F.2d 810, 817 n.11 (9th Cir. 1987); Oregon Natural Resources Council v. Marsh, 820 F.2d 1051, 1058 n.8, vacated & modified, 832 F.2d 1489, 1497 n.8 (9th Cir. 1987) (modifications not relevant to the discussion of worst case analysis); see also Part III.B.1 infra.


12. Southern Oregon Citizens Against Toxic Sprays, Inc. v. Clark, 720 F.2d 1475, 1477 (9th Cir. 1983), cert. denied, 469 U.S. 1028 (1984); Save Our Ecosystems v. Clark, 747 F.2d 1240, 1242 (9th Cir. 1984).

analyze, or even mitigate potentially severe, but unlikely, effects may determine the fate of a proposed project, either within an agency or externally in the political and legal arenas. Detailed examination of low probability/catastrophic impact events in an EIS may convince agency decisionmakers to abandon a proposed action (or to change the plan to minimize potential environmental damage), or it may ignite public and political sentiments against the project.

Second, agency treatment of data uncertainty in EISs is inextricably linked with risk assessment, an increasingly important frontier of science that arguably improves the rigor and rationality of policymaking. The refinement of analytical techniques (those recognizing the limited predictability of scientific information collected during the NEPA process) directly alters the relationship between economic, social, and technological policies and environmental goals.

Third, agency treatment of scientific data is interesting from an administrative law perspective. The EIS process involves a vague statute, two levels of administrative regulations (one set promulgated by the CEQ for generic application and one set by each federal agency), and judicial construction of the statute and regulations in fact-intensive, project-specific contexts.

While good reasons exist for investigating the treatment of data uncertainty in EISs, it is a confusing area for study. This confusion derives from the injection of risk assessment jargon into administrative law and policy. The former contemplates numerical expression; the latter encompasses broad notions of separation of powers, agency discretion, and limited judicial review. In addition, there is no straightforward, universal lexicon with which to characterize low probability/catastrophic impact events. The regulations and cases, recognizing that budgetary, technical, and time constraints prevent agency evaluation of every potential impact, use limiting words such as “significant,” “reasonably foreseeable,” “probable,” and “possible” without defining them precisely. Thus, courts, seeking a rough characteriza-


15. "Significantly" is defined by CEQ regulation 40 C.F.R. § 1508.27 (1987) to include con-
tion of an agency's duty to express and to analyze scientific uncertainty in EISs, distinguished early on between mandating discussion of "possible" and "probable" environmental impacts. Where courts make this qualitative distinction, they signify their willingness to expand or to limit, respectively, an agency's obligation to collect, evaluate, and present scientific information in EISs.

This Note traces the judicial and administrative treatment of uncertainty under NEPA and supports the CEQ's replacement of worst case analysis with a qualitative probability threshold. Part I discusses the development of reasonableness standards in NEPA common law to define agency obligations prior to promulgation of the worst case analysis regulation. Part II reviews the worst case analysis regulation and its judicial construction. Finally, Part III outlines the amended regulation, which replaces worst case analysis with a probability threshold employing the rule of reason to limit EIS discussion to environmental effects shown through credible scientific evidence to be reasonably foreseeable. This Part next discusses judicial responses to the CEQ amendment and suggests an interpretation of the new regulation that comports more closely with the amendment than that of the courts. The Note concludes that both the CEQ's intention and more effective use of the EIS process require major practical alterations in substantive EIS preparation which the amendment, by itself, is unlikely to generate.

I. NEPA "COMMON LAW" PRIOR TO WORST CASE ANALYSIS

Congress passed NEPA to force federal agencies to recognize and to consider the significant, and potentially permanent, impacts of federal projects on scarce environmental resources. Since the aesthetic and ecological costs of such federal activities as dam, highway, or power plant construction, herbicide spraying, sale of mineral leases, and leasing for resort development are difficult if not impossible to quantify, Congress refused to require formal, mathematical characterization of environmental risks. Rather, NEPA commands agencies to analyze these impacts, at least qualitatively, through either an examination of context in which the environmental effect occurs and the intensity or severity of the effect. The CEQ defined "reasonable foreseeability" in a draft explanation of worst case analysis.


Environmental assessment (EA) or an environmental impact statement (EIS), prior to undertaking a proposed activity.\(^8\)

The data collection and evaluation duties that courts may impose on agencies are constrained by almost twenty years of judicial and regulatory interpretation of NEPA. This history also illuminates the appropriate function of an EIS in the decisionmaking process and the proper treatment of scientific information and uncertainty within an EIS.

**A. Early Development of Agency Information Gathering Duties**

Early NEPA case law attempted to clarify the following three characteristics of the broad statutory language: (1) the procedural and substantive boundaries; (2) the purposes of NEPA and the identification of its beneficiaries; and (3) the role of the CEQ and the courts as arbiters of disputes concerning the form and content of EISs.\(^9\) Eventually, the judiciary defined concrete rights and obligations as comprising a “common law” of NEPA.\(^10\)

Although NEPA required each agency to establish its own environmental review process,\(^21\) nonuniform regulations and varying degrees of diligence among the agencies ultimately resulted in the judicial specification of minimum EIS procedures.\(^22\) In addition, under its obligation to assist agencies in interpreting and applying

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\(^10\) Justice Marshall, concurring in part in *Kleppe v. Sierra Club*, summarized the judicial definition of concrete NEPA rights and obligations as follows: "[T]his vaguely worded statute seems designed to serve as no more than a catalyst for development of a 'common law' of NEPA. To date, the courts have responded in just that manner and have created such a 'common law,' . . . Indeed, that development is the source of NEPA's success." 427 U.S. 390, 421 (1975).


NEPA, the CEQ published advisory guidelines for EIS preparation in the early 1970s. Since the CEQ had no authority at that time to promulgate binding EIS regulations, agencies and courts accorded these advisory guidelines varying weight. Thus, most agencies initially limited their data collection and disclosure activities to pro forma compliance, preferring to continue assessing project risks using their professional discretion, rather than subjecting the process to potentially expensive, time consuming, and intrusive public scrutiny.


The CEQ's 1976 study identified the key problem in implementing NEPA as "focusing the EIS analysis on the impacts and alternatives that are most relevant to decisionmakers and the public." CEQ, ENVIRONMENTAL IMPACT STATEMENTS: AN ANALYSIS OF SIX YEARS' EXPERIENCE BY SEVENTY FEDERAL AGENCIES 2, 25 (1976) [hereinafter ANALYSIS OF SIX YEARS' EXPERIENCE]. The CEQ failed to address directly the treatment of uncertainty in EISs, but the report did discuss problems with the depth of analysis. Ironically, the CEQ criticized agencies for the length and detail of EISs rather than for the conclusory coverage of unlikely impacts rejected in some courts. The CEQ blamed the failure of many EISs to inform decisionmakers and the public succinctly about project impacts and alternatives on a misconception that the EIS should be a comprehensive, highly technical, and scientific document; agencies' neglect to edit voluminous materials supplied by applicants or consultants; and recommendations from lawyers that in order to cover every possible contingency in case of suit, the EISs must expand the number of topics covered, their detail, and consequently their length.

Id. at 53. Dissatisfaction with the disparate agency diligence and performance of impact statements and inconsistent judicial interpretations led President Carter in 1977 to issue Executive Order 11,991, requiring the CEQ to promulgate binding regulations applicable to all federal agencies. See Note, Putting Bite in NEPA's Bark: New Council on Environmental Quality Regulations for the Preparation of Environmental Impact Statements, 13 MICH. J.L. REF. 367, 367-69 (1980) [hereinafter Note, Putting Bite in NEPA's Bark].


For a discussion of agency treatment of the nonbinding CEQ guidelines, see ANALYSIS OF SIX YEARS' EXPERIENCE, supra note 23, at 49-53; N. Orloff, supra note 22, at 40-43.

The issue of deference to CEQ's 1978 binding regulations was resolved when the Supreme Court in Andrus v. Sierra Club, 442 U.S. 347, 358 (1979), unanimously declared "CEQ's interpretation of NEPA is entitled to substantial deference."

25. Taylor observed instances of pro forma compliance in the Forest Service. S. Taylor, supra note 17, at 197-99, 214-18, 223. "The general feeling within the agency was that the top leadership in the region was determined not to get into the position of providing the environmentalists with data that could then be used against the Forest Service." Id. at 214. See Controller General Report, supra note 22, at 1-4, 22, 42-45; Comment, NEPA Violations and Equitable Discretion, 64 OR. L. REV. 497, 507 (1986); Note, Putting Bite in NEPA's Bark, supra
Early NEPA plaintiffs frequently sought to enjoin federal actions by claiming violations of both their substantive right to an environmentally sound decision under section 10126 and the explicit procedural requirement in section 10227 of a “detailed statement” adequately considering environmental impacts in decisionmaking.28 The courts, however, were unwilling to read the statute and its legislative history as empowering judicial review of the underlying policy choices leading to the final decision on a federal action. Rather, they interpreted NEPA as an environmental full disclosure law.29 The stat-


For a prime example of a prodevelopment agency’s (Forest Service) pro forma compliance in a particular case, see California v. Bergland, 483 F. Supp. 465, 484-87 (E.D. Cal. 1980), aff’d in part sub nom. California v. Block, 690 F.2d 753 (9th Cir. 1982). In contrast, good-faith compliance was exhibited by the Department of Agriculture’s preparation of an EIS concerning a pesticide spraying program. See Oregon Environmental Council v. Kunzman, 817 F.2d 484 (9th Cir. 1987). The appellate court, approving the EIS against a readability challenge (40 C.F.R. § 1502.8 (1987)), praised the 134-page worst case analysis and the 43-page plain language summary, stating: “If the EIS is inadequate, it is not for lack of substantial effort on the part of its preparers.” 817 F.2d at 491.

26. Section 101 sets forth the legislative policy that stimulated enactment of NEPA. 42 U.S.C. § 4331 (1982). Subsection 101(a) states the policy of the federal government “to use all practicable means and measures . . . to create and maintain conditions under which man and nature can exist in productive harmony.” 42 U.S.C. § 4331(a) (1982). The next subsection then lists six goals that the government must pursue with “all practicable means, consistent with other essential considerations of national policy.” 42 U.S.C. § 4331(b) (1982). Plaintiffs have claimed a substantive right from the statement in subsection 101(c) recognizing “that each person should enjoy a healthful environment.” 42 U.S.C. § 4331(c) (1982).

27. The detailed statement mandated by subsection 102(2)(C), 42 U.S.C. § 4332(2)(C) (1982), provides the basis for stringent procedural EIS requirements established by the CEQ regulations or by NEPA common law.


29. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council (Vermont Yankee II), 435 U.S. 519, 558 (1978) (NEPA establishes “significant substantive goals for the nation, but its mandate to the agencies is essentially procedural, . . . to insure a fully informed and well-considered decision.” (citations omitted)). The case also renounces heightened procedural scrutiny not expressly mandated by NEPA, citing Kleppe v. Sierra Club, 427 U.S. 390, 405-06 (1976). 435 U.S. at 348. See also Calvert Cliffs’ Coordinating Comm. v. Atomic Energy Commn., 449 F.2d 1109, 1111 (D.C. Cir. 1971) (invalidating the AEC’s restriction on consideration of nonradiological environmental impacts and requiring strict compliance with the NEPA procedural mandate of “full consideration” of all environmental impacts). The court terms this review procedural, since it derives from NEPA § 102 rather than § 101. But see Gillham Dam, 470 F.2d 289, 297 (8th Cir. 1972), cert. denied., 412 U.S. 931 (1973) (upholding detailed review of Corps’ decision to proceed with construction of the Gillham Dam on the Cossatot River based on the substantive provisions of NEPA § 101).

Several cases interpret the substantive mandate of NEPA § 101 to permit judicial review of the agency’s decision on the merits, but only to determine whether “the actual balance of costs
ute served to inform, but not directly to constrain, an agency’s decision to proceed with a proposed project. Thus, historically, substantive NEPA claims have been largely unsuccessful.

Courts entertaining procedural challenges to the form and adequacy of an agency EIS nevertheless recognized two central purposes of NEPA’s “detailed statement” requirement — informing agency decisionmaking and alerting the public and Congress to environmental effects. Receipt of an EIS by these two groups furthers the consideration of environmental values in distinct, but equally important ways.

First, an EIS contributes essential (but previously ignored) environmental information to the internal agency debate on development

and benefits . . . was arbitrary or clearly gave insufficient weight to environmental values.” *Calvert Cliffs*, 449 F.2d at 1115. See also *Sierra Club v. Froehlke*, 486 F.2d 946, 952-53 (7th Cir. 1973); *Gillham Dam*, 470 F.2d at 297-99. These courts therefore apply two levels of review — inquiry into the agency’s procedurally adequate, good-faith consideration and balancing of environmental factors followed by examination of the result under the arbitrary and capricious standard. 470 F.2d at 300. *Calvert Cliffs*, 449 F.2d at 1115, foreshadowing the Supreme Court opinions in *Vermont Yankee II* and *Sierra Club v. Kleppe*, clearly anticipated that the procedural mandate would dominate the review process because of judicial unwillingness to scrutinize agency policy decisions and the difficult burden on plaintiffs to show that the decision is arbitrary and capricious.

This type of review really resembles the mainly procedural “hard look” doctrine, under which courts investigate the record to determine whether the agency has considered environmental effects in good faith, with the implication that if the agency has taken a hard look, it will not reach an arbitrary and capricious result. See *Holland*, supra note 19, at 764-67; *L. Caldwell*, supra note 1, at 93-94; *S. Taylor*, supra note 17, at 232.


31. See *Tennessee-Tombigbee Waterway*, 348 F. Supp. at 925 (“[Section] 101 vests in federal agencies broad discretion . . . to enhance the quality of man’s environment, and leaves with the decisionmakers, and not the courts, the question of whether a given project shall proceed.”); *Gillham Dam*, 325 F. Supp. at 755 (rejecting plaintiff’s claims to “safe, healthful, productive, and esthetically and culturally pleasing surroundings” under NEPA § 101(b)).

32. NEPA cases have traditionally identified two major purposes of NEPA, adopting a test similar to that applied in *Trout Unlimited v. Morton*:

(1) provid[ing] decision-makers with an environmental disclosure sufficiently detailed to aid in the substantive decision whether to proceed with the project in light of its environmental consequences, and (2) mak[ing] available to the public, information on the proposed project’s environmental impact and encourag[ing] public participation in the development of that information.

509 F.2d 1276, 1283 (9th Cir. 1974). See also *Baltimore Gas & Elec. Co. v. Natural Resources Defense Council (Vermont Yankee IV)*, 462 U.S. 87, 97 (1983) (Supreme Court cites “twin aims” of NEPA in agency consideration of environmental effects and informing the public that the agency is fulfilling its obligations.); *Calvert Cliffs’ Coordinating Comm. v. Atomic Energy Commn.*, 449 F.2d 1109 (D.C. Cir. 1971); *Scientists’ Inst. for Pub. Info. v. Atomic Energy Commn.*, 481 F.2d 1079 (D.C. Cir. 1973). *L. Caldwell*, supra note 1, at 93, cites three goals of NEPA — to force consideration of environmental impact, to provide for judicial review of agency actions, and to enhance public disclosure.

For a comprehensive statement of the purposes and problems of regulatory impact analysis, with a useful discussion of data uncertainty in that context and comparisons to NEPA’s environmental impact statement process, see McGarity, *Regulatory Analysis and Regulatory Reform*, 65 TEXAS L. REV. 1243, 1284-97 (1987).
policies. To improve prospective environmental planning — the substantive goal of NEPA — the agency must integrate information concerning environmental impacts along with more traditional economic and engineering data throughout the decisionmaking chain. To accomplish this, the agency must develop an organizational structure that allows frequent contact between environmental and mainstream planning personnel, creating a "cross-fertilization" process that will both influence specific project decisions and institutionalize environmental awareness generally. The receptiveness of agency management to NEPA in turn depends upon the practical value of the data compiled in an EIS as well as the perceived effect on administrative efficiency. To contribute to the agency decisionmaking process, EIS data must be accurate, relevant, and collected using scientifically accepted techniques. It also must enable consideration of realistic alternatives to the proposed action along with their potential impacts. Administrative efficiency encompasses factors such as the cost of the EIS, project delay, agency discretion in selecting impacts for analysis, and the finality of the agency's EIS process (or the relative inability of private entities to dispute the agency's EIS in court).

Second, although institutionalization of environmental awareness is the ultimate policy espoused by NEPA section 101, Congress in section 102 recognized the need for public scrutiny of formal agency documents to ensure adequate consideration of environmental effects by the agency. The EIS thus serves both as tangible evidence of agency

33. Trout Unlimited, 509 F.2d at 1283. Congress was particularly concerned that environmental issues would be neglected unless considered early in the decisionmaking process. 115 Cong. Rec. 40,420 (1969) (discussed in Tennessee-Tombigbee Waterway, 348 F. Supp. at 928 & n.18); see also Scientists' Inst., 481 F.2d at 1089-90 (demonstrating that as an agency delays computing and accounting for the environmental costs, project momentum and prior commitment of resources increasingly favor development); L. CALDWELL, supra note 1, at 14 (risk of misusing "knowledge of social significance" exists unless that knowledge is managed in an explicit, publicly accountable manner); Leventhal, Environmental Decisionmaking and the Role of the Courts, 122 U. Pa. L. Rev. 509, 515 (1974) (discussing integration of environmental values in agency policies).

34. See L. CALDWELL, supra note 1, at 17, 83. Caldwell identifies two problems in interdisciplinary planning — coordinating diverse scientific specialists, and accommodating incompatible political priorities that agencies have traditionally handled by ignoring some consequences. See S. TAYLOR, supra note 17, at 399 n.13. Taylor interviewed Forest Service personnel who believed that "they would have been — or 'should' be — gathering virtually the same kind of [environmental] information whether or not the EIS process required it."

35. Taylor questioned the veracity of the conventional complaint by agencies that the EIS process significantly reduces efficiency and increases costs. See note 37 infra.

36. See generally O'Hare, Improving the Use of Information in Environmental Decision Making, 1 ENVTL. IMPACT ASSESSMENT REV. 229 (1980); S. TAYLOR, supra note 17; P. BLACK, supra note 30; Holland, supra note 19, at 770.

37. Taylor found the evidence of costs added to federal projects by NEPA EIS requirements inconclusive. S. TAYLOR, supra note 17, at 164 n.2, 399 n.13 & App. E (discussing litigation costs of NEPA). Caldwell suggests that any measure of EIS burden on administrative efficiency consider the benefits of avoiding serious and long-term environmental damage by aborting marginal projects. L. CALDWELL, supra note 1, at 133-34, 140-41. See also Leventhal, supra note 33, at 519 (discussing costs of judicial review of NEPA).
compliance with NEPA as well as a means of involving the public more actively in the debate regarding proposed federal projects.38 Utility to the public, Congress, and outside entities39 requires logical presentation in an EIS of available data and agency evaluation methods, explanation of EIS assumptions and conclusions based on the data, and a response to public comments and criticisms of the EIS. Public disclosure of the agency's environmental impact analysis thus permits interested parties to discern the completeness, accuracy, fairness, and objectivity of the agency's presentation and evaluation of the scientific evidence.40

Enforcement of these two informative purposes fell to the judiciary shortly after the enactment of NEPA. In applying the ideals of NEPA to specific impact statements challenged for inadequacy, courts soon confronted the problem, neglected in the statute, of scientific data uncertainty.41

Courts quickly found that, contrary to congressional intent, an agency could circumvent meaningful environmental analysis by neglecting to address those impacts felt to be uncertain42 and by limiting the range of alternatives to the proposed action required to be considered under section 102(2)(C).43 Agency avoidance of NEPA obligations and claims of limited financial resources and manpower thus forced courts to establish detail-limiting rules. These rules set out, relying on a combination of probability and severity, the various potential impacts that an agency must cover in an EIS.44 Courts also

38. See L. CALDWELL, supra note 1, at 57, 72, 128. Caldwell states, "The desired outcome of this public involvement in administrative action [such as the EIS process] was a more sensitive and complex balancing of the values inherent in available alternatives" to the project. Id. at 72. See S. TAYLOR, supra note 17, at 70, 147 (agencies respond to variability of their projects in terms of political costs and benefits); see also Holland, supra note 19, at 770.

39. Outside entities chiefly consist of other federal or state agencies with jurisdiction over, or another interest in, a proposed project.

40. An EIS permits the public "to press for consideration of additional evidence or overlooked facts." L. CALDWELL, supra note 1, at 72. Science also improves in general as the number of areas of policy with open debate or information increases. Id. at 57. Furthermore, the position of internal agency environmental analysts, crucial to institutionalizing NEPA, is strengthened by outside, public scrutiny. S. TAYLOR, supra note 17, at 165-66, 258-59.


42. See COMPTROLLER GENERAL REPORT, supra note 22, at 1-3; Comment, NEPA Violations and Equitable Discretion, supra note 25, at 507; Note, SOCATS: Worst Case Analysis in the West, 6 PUB. LAND L. REV. 183, 187, 193 (1985).


44. Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council (Vermont Yankee II), 435 U.S. 519, 551 (1978), explains the detail-limiting interpretation of NEPA's procedural requirements as follows:
recognized that the length, accuracy, and complexity of the environmental analysis should vary depending on the project cost and dimensions and the remoteness of its dangers.\(^{45}\)

Thus, courts rapidly characterized NEPA as an essentially procedural, rather than substantive, statute. The procedural construction of NEPA implies less concern for the precision and quality of scientific data; nevertheless, in any case in which the potential environmental effects of a project are relevant, the courts' countervailing concern with agency avoidance of NEPA disclosure obligations through conclusory statements and pro forma compliance encourages courts to review agency treatment of uncertainty vigorously.

B. Development of the Probability Threshold

Early NEPA cases debated the extent of an agency's duty to research, evaluate, or disclose uncertainties or gaps in available information.\(^{46}\) In practice, courts defined this duty by determining what probability of occurrence should trigger consideration of a severe, albeit remote, environmental effect.

The level at which courts set this probability relates directly to their view of the proper scope of judicial review of an agency's EIS.\(^{47}\) The level varied depending on whether the court emphasized the literal language of NEPA section 102(2)(C),\(^{48}\) its broad purposes

To make an [EIS] something more than an exercise in frivolous boilerplate the concept of alternatives must be bounded by some notion of feasibility. . . . Time and resources are simply too limited to hold that an [EIS] fails because the agency failed to ferret out every possible alternative, regardless of how uncommon or unknown that alternative may have been at the time the project was approved.

According to Taylor:

The convertibility of analytical into political assets puts a heavy burden on the oversight arrangements for formulating and adjudicating the rules of analysis. Rules of analysis must be detailed and precise, requiring of the “judges” a deep knowledge of the standard methodologies employed in many diverse settings.

S. TAYLOR, supra note 17, at 317. See id. at 76-77, 83.

45. Scientists' Inst., 481 F.2d at 1092.

46. F. ANDERSON, supra note 43, at 214-17. Anderson identifies two court responses to data uncertainty: “Some find sufficient compliance with § 102(2)(C) when the statement simply points out the gaps in existing knowledge. Others make the completion of an agency research program a prerequisite to action.” Id. at 214.

47. Both the scope of judicial review of an agency's EIS and the implicit or express probability threshold established by courts determine an agency's obligation to disclose, research, and evaluate scientific uncertainty. The probability threshold and the scope of detail employed in judicial review of an EIS are inversely proportional. That is, as the court increases its scrutiny of the agency record, the level of probability of a potentially adverse environmental effect required to trigger the agency's duty to discuss the uncertainty surrounding the effect generally decreases. The ultimate lower boundary for the probability threshold is worst case analysis.

through a reasonableness veneer,\textsuperscript{49} or the more explicit, but nonbinding, CEQ guidelines.\textsuperscript{50} Courts in the first category set the threshold level very low. They justified this detailed review by the general language of section 102, which demands that an EIS discuss environmental impacts "to the fullest extent possible."\textsuperscript{51} Those in the second category set the level based upon a "rule of reason." The CEQ defines the "rule of reason" as "a judicial device to ensure that common sense and reason are not lost in the rubric of regulation."\textsuperscript{52} Finally some courts set the level of probability by applying the CEQ's nonbinding interim guidelines promulgated in the early 1970s. In these guidelines, the CEQ recommended that agencies screen environmental impacts with a qualitative probability threshold and assess only those having "any probable adverse environmental effects which cannot be avoided."\textsuperscript{53}

The court in \textit{Environmental Defense Fund v. Corps of Engineers of the United States Army (Gillham Dam)}, for example,\textsuperscript{54} based its detailed review of EIS information gaps on a literal reading of NEPA section 102(2)(C). In \textit{Gillham Dam}, the district court rejected a pro forma Corps of Engineers' EIS prepared prior to construction of a dam. The EIS failed to include some known or anticipated consequences, to discuss alternatives, and to consult with and include the comments and views of other federal and state agencies, as required by NEPA section 102(2)(C).\textsuperscript{55} The district court enjoined dam construction until the Corps of Engineers prepared a new EIS complying with NEPA, which occurred fifteen months later.\textsuperscript{56}

The district court in \textit{Gillham Dam} required disclosure of "all known possible environmental consequences of proposed agency action."\textsuperscript{57} Finding a failure to consider environmental effects "to the

\textsuperscript{49} \textit{Scientists' Inst.}, 481 F.2d at 1092.


\textsuperscript{51} 42 U.S.C. § 4332. Searching review based on the literal language of NEPA was particularly evident in \textit{Environmental Defense Fund v. Hardin}, 325 F. Supp. 1401, 1403 (D.D.C. 1971). In \textit{Hardin}, the district court interpreted § 102(2)(A) to require "the completion of an adequate research program [as] a prerequisite to agency action" when the likelihood of potential adverse impacts is uncertain. Courts continue to apply this research mandate, particularly in cases involving hazardous chemicals. \textit{See} \textit{Southern Oregon Citizens Against Toxic Sprays, Inc. v. Clark}, 720 F.2d 1475 (9th Cir. 1983), \textit{cert. denied}, 469 U.S. 1028 (1984); Merrell v. Block, companion case of \textit{Save Our Ecosystems v. Clark}, 747 F.2d 1240, 1243, 1248-49 (9th Cir. 1984).

\textsuperscript{52} 51 Fed. Reg. 15,621 (1986).


\textsuperscript{54} 325 F. Supp. at 749.

\textsuperscript{55} 325 F. Supp. at 758.

\textsuperscript{56} 342 F. Supp. 1211 (E.D. Ark.), aff'd., 470 F.2d 289 (8th Cir. 1972). Although this delay is long, the Gillham Dam project was commenced prior to the enactment of NEPA and was one of the Corps' early EIS attempts.

\textsuperscript{57} 325 F. Supp. at 759 (emphasis in original).
fullest extent possible,” the court emphasized that full disclosure demands more than a description of the agency’s analysis and conclusions. The EIS must contain the contentions and opinions of “experts, or concerned public or private organizations, or even ordinary lay citizens, . . . even if the responsible agency finds no merit in them whatsoever.”

The EIS must further reveal the agency’s response to these outside comments. The court faulted the Corps of Engineers' EIS for failure to consider comments of various experts, and for inadequate presentation and evaluation of competing scientific evidence, including potential injury to fish and wildlife. However, the court declined to require the agency to resolve scientific uncertainty through additional research. The court suggested that the Corps of Engineers could comply with NEPA by disclosing the lack of techniques for valuing qualitative environmental effects and by including and responding to the comments of outside agencies or individuals that present relevant areas for further research. With this disclosure of incompleteness or uncertainty in the database underlying the EIS, “decision makers can then determine whether [or not] to proceed without such a study . . . .”

Other courts considered the NEPA text too unwieldy to apply literally to agency actions, and chose to interpret NEPA through a “rule of reason.” The most thorough judicial explanation of the rule of reason under NEPA appears in Scientists’ Institute for Public Information v. Atomic Energy Commission. In this decision, the District of Columbia Circuit rejected the Gillham Dam position that mere acknowledgement of unavailable or incomplete information is sufficient for the agency to proceed in the face of uncertainty. Under the Scientists’ Institute interpretation of NEPA, in addition to disclosing gaps in knowledge, an agency must attempt to fill these gaps by predicting the adverse environmental effects of the proposed project that may result.

58. Gillham Dam, 325 F. Supp. at 759 (emphasis added). The court felt that including criticism in the EIS would enhance utility to the agency: “Then, if the decisionmakers choose to ignore such factors, they will be doing so with their eyes wide open.”

59. 325 F. Supp. at 759-62. The court also suggested that the Corps could assign values to “presently unquantified environmental amenities” to facilitate cost-benefit balancing of environmental considerations with economic and technical factors. 325 F. Supp. at 757.

60. 325 F. Supp. at 758, 760. Two explanations for requiring mere acknowledgement of uncertainty are unwillingness to constrain governmental actions in all cases involving scientific questions and the possibility that information may become available at a later stage of a multiphase project (particularly with respect to oil and gas exploration leases). See North Slope Borough v. Andrus, 642 F.2d 589 (D.C. Cir. 1980); Natural Resources Defense Council v. Callaway, 524 F.2d 79, 88 (2d Cir. 1975); Sierra Club v. Morton, 510 F.2d 813 (5th Cir. 1975); Note, Putting Bite in NEPA’s Bark, supra note 23, at 384-85.

61. 325 F. Supp. at 758, 760.

62. 325 F. Supp. at 760.

63. See note 15 supra and accompanying text.

64. 481 F.2d 1079 (D.C. Cir. 1973). Scientists’ Inst. required the AEC to draft an EIS for the entire breeder reactor program, in addition to statements covering individual facilities.
through various scenarios. "Reasonable forecasting and speculation is thus implicit in NEPA," and agencies cannot avoid NEPA obligations by denigrating estimation of the likelihood of all potential adverse effects as "crystal ball inquiry." However, the court applied the rule of reason to moderate agency prediction obligations under Gillham Dam by removing merely possible or unforeseeable effects from mandatory EIS consideration: a good faith effort . . . to describe the reasonably foreseeable environmental impact of the program will satisfy NEPA's implicit mandate for forecasting outcomes shrouded in uncertainty.

Even the Ninth Circuit, which typically demands the most rigorous compliance with NEPA by agencies, adopted a rule of reason standard. In Trout Unlimited v. Morton, plaintiffs challenged an EIS prepared by the Bureau of Reclamation for a proposed dam project. They claimed the EIS failed to address the environmental impact of secondary recreational development at the dam site. The Ninth Circuit upheld the adequacy of the EIS stating, "Many of these consequences while possible are improbable. A reasonably thorough discussion of the significant aspects of the probable environmental consequences is all that is required by an EIS."

To clarify the nebulous boundary between reasonable foreseeability and expensive and unenlightening conjecture or "crystal ball inquiry," a third group of courts chose to incorporate the detail-limiting CEQ guidelines directly into the rule of reason. In Environmental Defense Fund v. Corps of Engineers of the United States Army (Tennessee-Tombigbee Waterway), the district court adopted the CEQ's probability threshold. It interpreted the guidelines and the rule of reason to require that the EIS "discuss the significant aspects of the probable environmental impact" of the project. The court rejected the disclosure required in Gillham Dam of "all known possible environmental

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65. 481 F.2d at 1092 n.20 (AEC claims citing NEPA Hearings). This standard initially appears to impose more stringent obligations on agencies than does Gillham Dam; however, at the time of the Scientists' Inst. decision, courts were concerned primarily with lackluster agency efforts to comply with NEPA. 481 F.2d at 1092. See also Natural Resources Defense Council v. Morton, 458 F.2d 827, 837 (D.C. Cir. 1972) ("[NEPA] must be construed in the light of reason if it is not to demand what is, fairly speaking, not meaningfully possible . . . .").

66. 481 F.2d at 1092 (emphasis added).

67. 509 F.2d 1276 (9th Cir. 1974).

68. 509 F.2d at 1283. This precedent had been cited by recent Ninth Circuit decisions retaining the worst case analysis requirement despite the CEQ's replacement of that standard by a probability threshold. See Oregon Natural Resources Council v. Marsh, 832 F.2d 1489, 1492 (9th Cir. 1987); Oregon Environmental Council v. Kunzman, 817 F.2d 484, 492 (9th Cir. 1987).

69. See note 24 supra.

70. 348 F. Supp. 916 (N.D. Miss. 1972) (complaint by environmentalists seeking to enjoin Corps' construction of a navigable waterway based on inadequate EIS dismissed).

71. See Part III.A infra; see note 53 supra and accompanying text.

72. 348 F. Supp. at 933 (emphasis in original).
consequences”; instead, it excluded discussion of both insignificant impacts and remote effects of the proposed action.\textsuperscript{73}

The NEPA common law developed in \textit{Scientists' Institute, Trout Unlimited,} and \textit{Tennessee-Tombigbee Waterway} produced, by 1974, a qualitative probability threshold which, once exceeded for a particular adverse environmental effect, required discussion of that effect in an EIS. The CEQ and courts applying the rule of reason have generally accepted the \textit{Tennessee-Tombigbee Waterway} approach.\textsuperscript{74} Thus, NEPA common law permitted an agency to avoid discussing certain environmental effects of a proposed project, variously termed by courts as “remote,” “improbable,” or “not reasonably foreseeable.”\textsuperscript{75}

\textbf{C. Application of the Probability Threshold}

Courts generally agreed that an EIS could not address the entire spectrum of possible consequences of a proposed action.\textsuperscript{76} However, they continued to review proposed actions in which an agency selected certain environmental consequences for evaluation in an EIS and neglected others, often where the agency concluded superficially that no

\begin{footnotesize}
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\item \textsuperscript{73} The court included as examples of remote effects, “mere possibilities unlikely to occur as a result of the proposed activity.” 348 F. Supp. at 933. The \textit{Tennessee-Tombigbee Waterway} decision has been criticized for ignoring the benefits of identifying improbable risks with severe consequences. Anderson accused the court of “jump[ing] to the conclusion that only ‘probable’ effects need be discussed. . . . The weakness here lies in the failure to see that the magnitude of the risk must also be included. . . .” F. ANDERSON, supra note 43, at 214 n.146. The decision could also be explained by the Corps’ apparent good faith; the court was obviously impressed with the six-month interdisciplinary study by a team of specialists who consulted sixty individuals or agencies and circulated the draft EIS to about twenty state and federal agencies. 348 F. Supp. at 928-29.

For a general discussion of the important distinction between remote but insignificant effects and remote but catastrophic effects, see note 147 infra and accompanying text.

\item \textsuperscript{74} In formulating its frequently cited proposition that “[a]n EIS need not discuss remote and highly speculative consequences,” the Ninth Circuit in \textit{Trout Unlimited} v. Morton, 509 F.2d 1276, 1283 (9th Cir. 1974), cited \textit{Tennessee-Tombigbee Waterway} with approval. \textit{Trout Unlimited} upheld the adequacy of a dam project EIS against a claim that it ignored several possible, but unlikely, environmental consequences. The court agreed that coverage of recreational development concerns would have improved the EIS, but declined to demand their inclusion, concluding that a “reasonably thorough discussion of the significant aspects of the probable environmental consequences is all that is required.” 509 F.2d at 1283. \textit{See also} Environmental Defense Fund v. Hoffman, 566 F.2d 1060, 1067 (8th Cir. 1977) (upholding an EIS that failed to discuss secondary groundwater impacts of a flood control project as too remote and speculative under \textit{Trout Unlimited}).

\item \textsuperscript{75} Beyond this nebulous limit of remoteness and reasonable speculation, the agency essentially could ignore improbable environmental consequences in the EIS by simply assuming that the event, however severe, will not occur, neglecting data uncertainty, and refusing to evaluate in detail the magnitude or probability of the impact. Alternatively, the agency could expect decisionmakers to possess the sophistication necessary to anticipate the existence of certain low probability/catastrophic impact risks for which discussion in an EIS would provide little concrete, useful information.

\item \textsuperscript{76} Courts also recognize that an EIS cannot address the entire spectrum of alternatives to a proposed action. \textit{Vermont Yankee Nuclear Power Corp.} v. \textit{Natural Resources Defense Council (Vermont Yankee II)}, 435 U.S. 519, 551 (1978); \textit{California v. Bergland}, 483 F. Supp. 465, 488 (E.D. Cal. 1980); \textit{see S. Taylor, supra} note 17, at 76-77.
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significant risk existed for those impacts. Agencies learned from these decisions to avoid obvious procedural mistakes and to include scientific data and assumptions in their EISs to supplement often conclusory rejections of potential adverse environmental effects.

Meanwhile, the increasing length and complexity of impact statements after 1974 hindered plaintiffs and led to a decline in the number of NEPA lawsuits. To challenge successfully the adequacy of “five-pound” EISs and to enjoin a project, such plaintiffs were forced to suggest potential adverse effects to the agency during the drafting of the EIS, to marshal significant evidence on the probability and severity of those impacts, and to show that the agency had nonetheless ignored those impacts.

The cases vary widely on the sufficiency of plaintiffs’ claims that an agency made conclusory statements and glossed over uncertainties. In *Citizens Against Toxic Sprays, Inc. v. Bergland*, for example, plaintiffs successfully challenged a United States Forest Service EIS that discounted potentially severe human health effects from the spraying of phenoxy herbicides containing trace amounts of dioxin. The district court invalidated the EIS because the Forest Service failed to disclose and evaluate the uncertainty surrounding health risks of these herbicides, despite sufficient evidence demonstrating that this potential danger exceeded the probability threshold enunciated in *Scientists’ In-

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77. See, e.g., text accompanying notes 81-83 infra.

78. S. TAYLOR, supra note 17, at 187, 244-47. Public interest plaintiffs frequently focus on the inadequacy of scientific evidence supporting the agency’s EIS (or its decision that the project does not require an EIS) and the statutory limits on the agency’s duty to consider adverse effects of varying probabilities.

79. Taylor cites a 60% decline in NEPA lawsuits brought by environmental organizations and citizens between 1974 and 1979. S. TAYLOR, supra note 17, at 233. The highest number of annual EIS cases, 189, were filed in 1974. In 1983, 146 suits were filed challenging EISs, of which 21 (14%) resulted in injunctions. CEQ ENVTL. QUALITY ANN. REP. 522 (1984).

The EIS preparation costs and resulting project delays were downplayed by the CEQ. See ANALYSIS OF SIX YEARS’ EXPERIENCE, supra note 23, at 43-45; see also L. CALDWELL, supra note 1, at 21-22; CEQ ENVTL. QUALITY ANN. REP. (1978-84). Taylor strongly disputes the claim that NEPA litigation by antidevelopment forces had significantly delayed projects as of 1981, citing a litigation rate of 10% for all EISs and a temporary injunction rate of 11%, “down from double or triple this probability in the earliest years,” with the average delay at a little over six months. S. TAYLOR, supra note 17, at App. E, 351-61, 357.

80. Taylor observes that environmental plaintiffs must demonstrate that new techniques are available that would influence the decisionmaking outcome before an agency will be forced in litigation to improve its environmental analysis. Taylor quotes from *Environmental Defense Fund v. Costle*:

> [W]hen an information gap of this importance exists and there is not sufficient information . . . to permit even an educated guess as to the magnitude of the injury to the shellfish industry, we believe that NEPA requires the agency to take a harder look at this particular environmental problem since there is a credible basis for finding that the gap may now be filled.


stitute and Trout Unlimited. The EIS contained few references to the available scientific literature on the human health hazards of dioxin. It also effectively ignored existing evidence that the herbicides were both contaminated with dioxin and themselves linked to adverse health effects. Finally, the EIS failed to discuss seriously the Environmental Protection Agency’s (EPA’s) use restrictions on phenoxy herbicides pending resolution of health risk uncertainties.

In contrast, other courts have upheld EISs in which the agency glossed over or completely neglected admittedly severe consequences. In Carolina Environmental Study Group v. United States, the Atomic Energy Commission’s (AEC’s) EIS covering commercial nuclear reactor licensing merely noted that the consequences of the most dangerous type of accident (a Class 9 breach of reactor containment) were indeed severe, but that the probability of such an accident was extremely low due to redundant safety features and conservative plant design. The D.C. Circuit upheld the AEC’s abbreviated treatment of Class 9 breaches, stating:

There is a point at which the probability of an occurrence may be so low as to render it almost totally unworthy of consideration. Neither we, nor the A.E.C. on this record, would treat lightly the horrible consequences of a Class 9 accident. Recognition of the minimal probability of such an event is not equatable with nonrecognition of its consequences.

Citizens Against Toxic Sprays and Carolina Environmental Study Group illustrate the malleability of the probability threshold adopted prior to the 1978 binding CEQ regulations. The unpredictability of what courts would regard as an adequate disclosure of uncertainty in an EIS hindered agencies’ attempts to integrate environmental analysis into their decisionmaking processes.

II. THE CEQ’S 1978 REGULATION GOVERNING DATA UNCERTAINTY

In order to replace the independent agency regulations and CEQ recommendations with one authoritative source under NEPA, President Carter in 1977 ordered the CEQ to promulgate binding regulations applicable to all federal agencies. The 1978 CEQ regulations

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82. 428 F. Supp. at 926-27.
83. 428 F. Supp. at 925-33.
84. 510 F.2d 796 (D.C. Cir. 1975).
85. 510 F.2d at 799. Similarly, the Ninth Circuit in Warm Springs Dam Task Force v. Gribble, 621 F.2d 1017 (9th Cir. 1980), upheld an Army Corps of Engineers’ EIS which did not discuss the consequences of a total dam failure resulting from a major earthquake. The court considered the catastrophic effect of a dam break very remote and so obvious as not to warrant discussion in the EIS. 621 F.2d at 1026-27 (pertaining to an EIS drafted prior to the effective date of the CEQ’s 1978 binding regulations).
86. See S. TAYLOR, supra note 17, at 241; see also L. CALDWELL, supra note 1, at 122-51.
87. Although brief and general, the order elucidates the rationale for uniform EIS regulations:
established more than simply the form and procedures for the environmental impact statement and related documents. Among its streamlining provisions, the CEQ regulations forcefully addressed for the first time an increasingly controversial issue not mentioned in the statute itself — agency use and interpretation of uncertain scientific data.

The CEQ's 1978 regulation on uncertainty represented a major step toward integrating rational and effective environmental assessment into the decisionmaking process. The CEQ recognized that agencies frequently operate in time-pressured situations in which important information is expensive, unavailable, incomplete, or conflicting. The 1978 regulation identified the key components that make EISs useful to decisionmakers and the public — including disclosure of the existence of incomplete or uncertain data and evaluation of the proposed project in light of the uncertainty and risk surrounding environmental effects.

Under the 1978 CEQ regulation, the presence of scientific uncertainty in an agency investigation of significant adverse effects on the environment triggered subsection 1502.22 review. After an agency disclosed gaps in information, paragraph (a) then required the agency

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89. These provisions mandate scoping, which attempts to streamline the EIS process by defining discrete issues for analysis in the early stages of agency consideration of and public comment on the process. See CEQ, Scoping Guidelines Memo (Apr. 30, 1980). Such requirements effectively hinder environmental plaintiffs challenging EISs. Plaintiffs must follow and comment on agency activities from the outset of the EIS process in order to meet the Supreme Court's materiality threshold. The Court requires plaintiffs to "structure their participation so that it is meaningful, so that it alerts the agency to [their] positions and contentions . . . especially . . . when [they] are requesting the agency to embark upon an exploration of uncharted territory. . . ." Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council (Vermont Yankee IV), 462 U.S. 87, 99 n.12 (1983), even noted the pre-1978 CEQ guidelines in a case involving the NRC, suggesting that the CEQ's regulations be given some weight.
91. See note 90 supra.
92. Id.
93. 51 Fed. Reg. 15,618, 15,625 (Apr. 25, 1986). For the text of the amended data uncertainty regulation, see note 7 supra. This provision "requires . . . that an agency make clear that certain relevant information or scientific material is lacking or that uncertainty exists." Liebesman, supra note 19, at 50,048.
to obtain essential information through research, if the cost was not "exorbitant." For information either technically unobtainable or made practically so by exorbitant cost, paragraph (b) required the agency to evaluate the lack of information, balancing the benefits of the proposed project "against the risk and severity of possible adverse impacts were the action to proceed in the face of uncertainty."

These disclosure, research, and evaluation functions are related directly to requirements that had already become part of the NEPA common law. However, it was the final provision of the 1978 uncertainty regulation that attracted the most attention. Confronted with unavoidable uncertainty, "[i]f the agency proceeds, it shall include a worst case analysis and an indication of the probability or improbability of its occurrence."

A. The Worst Case Analysis Requirement

The Council on Environmental Quality selected worst case analysis as the original mechanism to address scientific uncertainty and incompleteness within an EIS. Such analysis employs conservative estimates to make up for insufficient knowledge about natural processes by overcompensating for unknown factors . . . [and] assum[ing] extreme rather than expected values for model parameters. The decisionmaker must decide whether the difference between those outcomes and the normal case could still be tolerated by individuals or populations of concern.

In the explanatory materials accompanying the 1978 NEPA regulations, the CEQ did not express the rationale for selecting worst case

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94. See note 90 supra.

95. Id. The risk-benefit evaluation of paragraph (b) was only required within the agency's overall "hard look" at the proposed project, not in the EIS itself.


98. Klapp, Need We Make Up for Not Knowing? Nuclear Submarine Disposal Offshore, 4 ENVTL. IMPACT ASSESSMENT REV. 137, 139 (1983). See also P. Black, supra note 30, at 50-51. Rather than focusing on maximum adverse impacts, best-estimate analyses "extrapolate from what is known to single numerical values that represent average expected amounts of variation in the natural processes under study." Klapp, supra, at 138.
analysis in subsection 1502.22 over other forms of risk assessment.\textsuperscript{99} And instead of promulgating detailed regulations, the CEQ relied on agency discretion and judicial review of the exercise of that discretion under section 10(e) of the Administrative Procedure Act — the arbitrary and capricious standard\textsuperscript{100} — to define the substance of worst case analysis. While worst case analysis may nonetheless be consistent with NEPA, neither NEPA's literal language\textsuperscript{101} nor the NEPA common law mandate it. Any type of analysis of environmental impact of a proposed action is essentially consistent with NEPA's broad

\textsuperscript{99} The explanation is found at 43 Fed. Reg. 55,978, 55,984 (1978). The CEQ apparently designed the worst case analysis regulation to insure agency evaluation of severe environmental impacts shrouded in uncertainty which, if disclosed to the public and to decisionmakers, would influence the agency's determination whether to proceed with the proposed action or one of its alternatives. See Yost, Don't Gut Worst Case Analysis, 13 ENVTL. L. REP. 10,394 (1983). The CEQ's statement accompanying the 1985 proposed revision of § 1502.22 argues that "[a]lthough nothing in the official regulatory record reveals the reason that the Council chose the 'worst case analysis' construct, . . . it was apparently created as a device to require agencies to complete the analysis in the EIS, rather than allowing agencies to disregard uncertainties as having no weight in the balancing process," 50 Fed. Reg. 32,236 (1985).

This purpose certainly comports with the disclosure and evaluation goals of the other provisions in § 1502.22. See notes 91-96 supra and accompanying text. The first CEQ comments on worst case analysis after the 1978 regulation suggest that verification of agency compliance was also an important aspect of the rule. One of the general conclusions of its 1980 study of 242 draft EISs and 88 records of decision since the effective date of the 1978 binding regulations (July 30, 1979) stated: "EISs rarely even address [§ 1502.22]. The need to address this and include a worst case analysis is especially critical for many new energy development projects where considerable important information is not available." CEQ, Talking Points on CEQ's Oversight of Agency Compliance with the NEPA Regulations (1980) (paper prepared by CEQ for interagency meetings), cited in Liebesman, supra note 19, at 50,049.

It is also consistent with the CEQ's most detailed explanation of worst case analysis, in which it interpreted NEPA to require that EISs "alert the public and Congress to all known possible environmental consequences of agency action." CEQ, Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations, supra note 6, at 18,032 (rescinded) (emphasis in original). This formulation indicates that the CEQ implicitly adopted NEPA common law from Gillham Dam. See notes 48-60 supra and accompanying text.

The CEQ merely stated that worst case analysis "received strong support from many commenters." In response to the "[s]everal commenters [who] expressed concern that this requirement would place undue emphasis on the possible occurrence [sic] of adverse environmental consequences regardless of how remote the possibility [sic] might be," CEQ drafted the regulation "to ensure that the improbability as well as the probability of adverse environmental consequences would be discussed" in the EIS. 43 Fed. Reg. 55,978, 55,984 (1978).

\textsuperscript{100} Administrative Procedure Act § 10(e), 5 U.S.C. § 706(2)(A) (1982). This provision requires judicial review of the EIS process, an informal, nonadjudicatory agency decision, under the arbitrary and capricious standard. This standard permits a reviewing court to set aside an agency's "action, findings, and conclusions found to be . . . arbitrary, capricious, an abuse of discretion, or otherwise in accordance with law." See Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council (Vermont Yankee II), 435 U.S. 519, 545-48 (1978); see also Wright, New Judicial Requisites for Informal Rulemaking: Implications for the Environmental Impact Statement Process, 29 ADMIN. L. REV. 59-60 (1977). Because an EIS is considered an informal rulemaking it is subject to APA § 553, which establishes notice and hearing procedures necessary to validate an EIS. For the proper scope of judicial review of an agency's finding of no significant impact, which permits the agency to avoid preparing an EIS, see Note, supra note 18.

\textsuperscript{101} Decisions applying the worst case analysis regulation admit, at least implicitly, that it is not mandated by NEPA's literal language. Sierra Club v. Sigler, 695 F.2d 957, 969 (5th Cir. 1983); see notes 12-13 supra and cases cited therein.
statutory language and legislative history. Thus, many supporters of worst case analysis concede, implicitly or explicitly, that the CEQ voluntarily originated the requirement. In contrast, several other commentators (and subsequent decisions) cite Sierra Club v. Sigler, the first major judicial interpretation of subsection 1502.22, for the incorrect statement that “[t]he worst case analysis regulation codifies prior NEPA case law.”

B. Judicial Interpretation of the Worst Case Analysis Regulation

As the courts began to issue opinions interpreting the requirements of worst case analysis, the CEQ reviewed the standard and solicited public comments in an attempt to make worst case analysis more efficient and useful to decisionmakers. And because these decisions

102. See Part I supra.

103. Comment, CEQ’s “Worst Case Analysis” Rule for EISs: “Reasonable” Speculation or Crystal Ball Inquiry?, 13 ENVTL. L. REP. 10,069, 10,071 (1983) (“[t]he worst case rule . . . added a major innovation”); Note, Putting Bite in NEPA’s Bark, supra note 23, at 386 (“By requiring worst case analysis, the [1978] guidelines have gone further than the authorities cited above,” including leading cases initiating NEPA common law such as Gillham Dam, Tennessee-Tombigbee Waterway, and Natural Resources Defense Council v. Morton); Comment, Vermont Yankee Revisited: High Court Upholds NRC’s S-3 Table for Second Time, 13 ENVTL. L. REP. 10,239, 10,243 (1983) [hereinafter Vermont Yankee Revisited] (The D.C. Circuit’s “conclusion runs awfully close to interfering with the agency’s substantive decision. . . . If one were to rewrite NEPA, it might be appropriate to require agencies to disclose and consider uncertainties in a way that parallels the magnitude of the risk involved. However, as NEPA stands now, it is hard to fault the [Supreme Court’s reversal.]”); Whitney, Demise of the Council on Environmental Quality “Worst” Case Analysis Regulation, 8 G.M.U. L. REV. 447, 456 (1986) (“[N]one of the cases relied upon by the [Sigler] court as providing a ‘common law’ basis for a requirement to perform worst case analysis even mention the concept . . . let alone find it legally required.”); Comment, Update: The NEPA Worst Case Analysis Regulation, 14 ENVTL. L. REP. 10,267, 10,269 [hereinafter Update] (1984) (“Some pre-regulation case law . . . suggested that if the uncertainty involved events that the agency had found unlikely to occur, it would not require worst case analysis.”).

104. 695 F.2d 957, 969, 970 n.9 (5th Cir. 1983) (discussed infra).


106. As part of its oversight function, the CEQ solicited comments and held public hearings on its 1978 NEPA regulations in the early 1980s. This process resulted in publication in the summer of 1983 of a memorandum to agencies containing “Guidance Regarding NEPA Regula-
demonstrated that the courts were forcefully applying worst case analysis, federal development agencies and their private sector clients\(^{107}\) began to lobby the CEQ for amendment of subsection 1502.22.

Courts uniformly held the worst case analysis regulation consistent with NEPA, often characterizing it incorrectly as a continuation of NEPA common law.\(^{108}\) Opinions differ, however, concerning the appropriate scope of judicial review of worst case analysis and, more generally, of agency treatment of scientific uncertainty.\(^{109}\) Unfortunately, the Supreme Court has not directly addressed these issues. The courts of appeals reviewing worst case analyses — the District of Columbia, Fifth, and Ninth Circuits — have employed a detailed factual review of an agency's EIS in alleged furtherance of NEPA common law.\(^{110}\)

In the draft memorandum of August 11, 1983, the CEQ expressed concern that Question 20, supra note 6, provided insufficient guidance to agencies and that § 1502.22 "has been subject to a wide variety of conflicting interpretations by both federal agencies and reviewing courts." Id. at 36,486. In particular, the CEQ alleged "that the worst case analysis requirements are being read to require federal agencies to conduct such analyses for potential effects that may well be highly remote or unlikely." Id. at 36,487. The CEQ equated worst case analysis with the duty to provide information "essential to a reasoned choice among alternatives." It identified "reasonable foreseeability," derived from the definition of "effects" in § 1508.8, as an initial threshold for an impact to trigger worst case analysis. Thus, "speculative information or potential adverse impacts with an extremely low probability of occurrence could not be considered ‘essential to a reasoned choice among alternatives,’ as used in § 1502.22." Id.

In light of comments received on the draft guidance, the CEQ withdrew the memorandum to continue its examination of worst case analysis. 49 Fed. Reg. 4803 (Feb. 8, 1984). In December, 1984, the CEQ published an Advance Notice of Proposed Rulemaking covering § 1502.22 and requested comments on five questions related to the advisability of worst case analysis and techniques for improving agency treatment of scientific uncertainty. 49 Fed. Reg. 50,744 (Dec. 31, 1984). The CEQ published a proposed amendment to § 1502.22, which removed any reference to worst case analysis and expressly limited agency consideration to reasonably foreseeable impacts based upon "credible scientific support." 50 Fed. Reg. 32,234, 32,238 (Aug. 9, 1985).

107. Clients of federal agencies might include the regulated industry at issue, contractors, or lessees of federal lands.

108. See note 105 supra and accompanying text.

109. Both the scope of judicial review of agency worst case analyses and the legal justification for that review are central to the current debate between worst case analysis and a qualitative probability threshold triggering evaluation of low probability/catastrophic effects.

110. Opinions of these courts defining the source and binding nature of worst case analysis will, as direct precedent, determine whether courts may infer worst case analysis into the revised regulation through the NEPA common law. If these courts maintain that worst case analysis derives from preexisting NEPA common law (or from the statutory language itself), they could effectively ignore the CEQ's 1986 amendment of § 1502.22. The circuits diligently applying worst case analysis should concede that only § 1502.22, not the plain statutory language or prior judicial interpretations of NEPA, required its application. Indeed, since their own opinions effectively admit that worst case analysis derives from the CEQ, then in light of the CEQ's amended regulation, these courts should deliberately shift their EIS review away from remote or extreme
However, this detailed review appears incompatible with recent decisions of the Supreme Court and the Second Circuit favoring substantial deference to the agency preparing the EIS in cases concerning scientific uncertainty. 111

In *Sierra Club v. Sigler*, 112 the Fifth Circuit rejected a Corps of Engineers’ claim that worst case analysis exceeds the statutory minima of NEPA. The court applied worst case analysis to an EIS that the Corps of Engineers prepared prior to issuing construction permits for a deepwater port and oil terminal in Galveston Bay. The Sierra Club had proposed a catastrophic worst case based upon total oil cargo loss from a supertanker spill, which the Corps of Engineers declined to analyze. The trial court found the Sierra Club’s worst case too remote — mere “guesswork” based on “uninformed speculation and conjecture.” 113 The Fifth Circuit reversed, stating that the decisionmaker should consider the remoteness of the likelihood that the worst case would occur only in the course of approving or rejecting the proposed project. The court contended that NEPA demands “reasonable speculation” 114 and stated that “[a]ll parties agree that a total cargo loss could occur and could wreak catastrophic environmental damage in the Bay.” 115

The *Sigler* court’s most persuasive argument for worst case analysis was based on the explicit language of the CEQ’s 1978 regulation on uncertainty. 116 First, the court stated that the CEQ “regards the hypothetical consequences toward environmental effects meeting a reasonable probability threshold.

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111. Deference should be granted to an EIS only to the extent that the drafting agency possesses expertise in the area. See Leventhal, *supra* note 33, at 525.

112. 695 F.2d 957 (5th Cir. 1983).

113. Sierra Club v. Sigler, 532 F. Supp. 1222, 1230, 1233-34 (S.D. Tex. 1982), aff’d in part, 695 F.2d 957 (5th Cir. 1983). The Fifth Circuit identified the following three criteria for checking agency discretion in judicial review of an EIS: (1) good faith “hard look” at environmental consequences of the proposed action and its alternatives; (2) sufficiently detailed discussion of the five express procedural requirements of NEPA to inform interested parties, 42 U.S.C. § 4332(2)(C) (1982); and (3) adequate explanation of alternatives to permit the decisionmaker to make a reasoned choice among different courses of action. 695 F.2d at 965 (quoting *Isle of Hope Historical Assn. v. Corps of Engrs.*, 646 F.2d 215, 220 (5th Cir. 1981)); *see also Save Our Invaluable Land, Inc. v. Needham*, 542 F.2d 539 (10th Cir. 1976), *cert. denied*, 430 U.S. 945 (1977). The *Sigler* court’s listing of problems with the EIS suggests that it suspected bad faith assessment of environmental effects by the Corps.

114. 695 F.2d at 974 (citing *Scientists’ Inst. for Pub. Info. v. Atomic Energy Commn.*, 481 F.2d 1079, 1092 (D.C. Cir. 1973)).

115. 695 F.2d at 974 (emphasis in original). In one example of close scrutiny of the EIS and the trial record, the court suggested certain tidal data with which the Corps could supplement its state-of-the-art 24-hour dispersion model to improve its probability analysis. 695 F.2d at 974. Whitney contends that “[t]he effect of this [worst case analysis] was to substitute the court’s judgment for that of the agency and the district court that the oil spill analysis was legally sufficient and thereby to subject the agency’s decision to a more exacting and intrusive review than is permissible under NEPA.” Whitney, *supra* note 103, at 459.

116. However, this same reliance may be applied forcefully to suggest that courts defer analogously to the CEQ’s recent removal of the worst case analysis requirement. 51 Fed. Reg.
worst case analysis provision as very important and has resisted suggestions to weaken it." Sigler then noted that the CEQ's regulation and its interpretation bind agencies and courts. The court then reviewed leading NEPA case law prior to the issuance of the CEQ's binding regulations, concluding that "[t]he CEQ's worst case analysis regulation merely codifies these judicially created principles." However, the major cases to which the court referred support a rule of reason approach and only call in general terms for "full disclosure" and "reasonable speculation," not for worst case analysis. Thus,

In Andrus v. Sierra Club, 442 U.S. 347, 358 (1979), the Supreme Court held that the CEQ's regulations are binding on administrative agencies and entitled to substantial deference by the courts. See Liebesman, supra note 19, at 50,041; Note, SOCATS: Worst Case Analysis in the West, supra note 42, at 187 n.28.

117. Sigler, 695 F.2d at 971. This comment was based on the CEQ's explanation accompanying the 1978 regulation and the subsequent clarification in 1981. See Question 20, supra note 6. While the statement was accurate at the time the district court and the Fifth Circuit decided Sigler, it was later refuted by the CEQ's publication of the 1983 draft guidance on § 1502.22 and by the final amendment of that subsection in 1986, rescinding worst case analysis. See note 104 supra.

118. The CEQ's interpretation is binding unless it conflicts with the statutory language, legislative intent, or a Supreme Court decision on NEPA. Sigler, 605 F.2d at 972. For support, Sigler quoted from the Supreme Court's unanimous holding in Andrus v. Sierra Club, 442 U.S. at 358 (1978), that the CEQ is entitled to substantial deference even when it recently changed its interpretation of NEPA. Sigler, 695 F.2d at 972.

Similar reasoning may be used directly against any attempt by a court to continue to enforce worst case analysis explicitly against agency EISs covered by the amended uncertainty provision. The Supreme Court in Andrus v. Sierra Club also addressed and disposed of one administrative-law doctrine that could reduce the judicial deference to the amended CEQ regulation on uncertainty — the leniency deference to agency guidelines that "conflicted with earlier pronouncements of the agency." The Supreme Court introduced that lower level of deference in the course of rejecting a Title VII claim in General Electric v. Gilbert, 429 U.S. 125, 143 (1976). In Andrus v. Sierra Club the Court upheld the CEQ's changed interpretation of certain NEPA requirements during the drafting of the 1978 regulations. The Court explained its extension of substantial deference stating, "CEQ's reversal of interpretation occurred during the detailed and comprehensive process, ordered by the President, of transforming advisory guidelines into mandatory regulations applicable to all federal agencies." 442 U.S. at 358.

Sigler also cited the need for cautious review of precedent in environmental law (and all administrative law), since new regulations may overrule earlier judicial decisions. The court stated: "Therefore, the starting point for the legal analysis of this regulation is not precedent which precludes it, but the language of the regulation itself." Sigler, 695 F.2d at 973.


120. See notes 63-76 supra. The cases relied on by Sigler include: Scientists' Inst. for Pub. Info v. AEC, 481 F.2d 1079, 1092 (D.C. Cir. 1973); Carolina Environmental Study Group v. United States, 510 F.2d 796, 799 (D.C. Cir. 1975); and Sierra Club v. Morton, 510 F.2d 813, 827-28 (5th Cir. 1975). However, these cases also stress that NEPA "must be construed in the light of reason if it is not to demand what is, fairly speaking, not meaningfully possible." Scientists' Inst. for Pub. Info v. AEC, 481 F.2d 1079, 1092 (D.C. Cir. 1973).

In addition to case law, the court cited vague statements from the legislative history supporting broad environmental protection. In a footnote, the court identified "some support" for worst
none of the cited cases provide direct support for the view that CEQ's worst case regulation simply codifies preexisting NEPA common law.121

_Sigler_ extended prior applications of NEPA common law in two ways. First, the court demanded that the Corps of Engineers alter its oil spill model to incorporate suggestions of outside parties, instead of merely including their comments and opinions along with the agency's responses in the EIS as required in _Gillham Dam_.122 Second, the court

case analysis from legislative history "illustrat[ing] congressional awareness of man's limited understanding of the environmental consequences of his actions." 695 F.2d at 970 n.9. The court more accurately should have invoked these general statements for the proposition that the legislative history does not bar application of worst case analysis.

Examining the text of NEPA, it “perceived some language in NEPA which may be said to endorse generally the concept of worst case analysis” in 42 U.S.C. § 4331(b)(3) (responsibility of the federal government to avoid unintended consequences of using the environment) and in 42 U.S.C. § 4332(2)(C) (EIS to disclose all environmental impacts). The court conceded that because of the generality of NEPA, “its literal language does not require” such an analysis. 695 F.2d at 969. See _Mandelker, NEPA Law and Litigation_ § 10.17, 38 (1985).

121. See Whitney, _supra_ note 103, at 456-58; Brock, _Abolishing the Worst Case Analysis_, 2 NAT. RES. & ENVT. 22, 23-24 (Spring 1986). No other preregulation EIS cases were identified that identify any sort of nascent worst case analysis requirement under NEPA.

Arguably, had courts and agencies familiarized themselves with the worst case analysis regulation over time, it might have been implied into NEPA. See _Update, supra_ note 103, at 10,271 (“NEPA's uncertainty requirements are obscure, but are becoming clearer. . . . [T]he courts have framed the outlines of the worst case obligations. They will continue now to fill in the details . . . .”); _Rosenbaum, Amending CEQ’s Worst Case Analysis Rule: Towards Better Decisionmaking?,_ 15 ENVT. L. REP. 10,275, 10,277 (1985) (Worst case analysis “is becoming 'litigated out.' A new law holds only so many surprises; after a few novel court rulings, the bounds of the law emerge and compliance becomes easier, often routine. Compliance with the worst case rule was approaching this state.”); _see, e.g., Oregon Environmental Council v. Kunzman, 817 F.2d 484, 495-96 (9th Cir. 1987); Save Lake Washington v. Frank, 641 F.2d 1330, 1335 (9th Cir. 1981)._
required the Corps to demonstrate not only that its oil spill analysis provided agency decisionmakers with a “hard look” at potential environmental consequences, but also that its analysis was objectively, scientifically correct.\[123\]

The Ninth Circuit in *Southern Oregon Citizens Against Toxic Sprays, Inc. v. Clark*\[124\] and *Save Our Ecosystems v. Clark*\[125\] expanded on *Sigler’s* enunciation of worst case analysis in the context of EISs prepared by the Bureau of Land Management (BLM) for herbicide spraying projects. Both decisions rejected the traditional NEPA common law unwillingness to weigh conflicting scientific data. The court in *Southern Oregon Citizens* stated that the scientific uncertainty that existed concerning the carcinogenicity of the herbicides had to be explored in a worst case analysis, regardless of the BLM’s belief in the safety of its products.\[126\] Unlike *Sigler*, the *Southern Oregon Citizens* court did not recognize any limitations, characteristic of the rule of reason, on the remoteness or improbability of the proposed worst case or on the speculative nature of the data suggesting those catastrophic

the likelihood of which is not shown to be significantly increased by the carrying out of the project.” 695 F.2d at 975 (emphasis added). See *Scientific Uncertainty and NEPA*, supra note 41, at 110 & n.14; but see *Whitney*, supra note 103, at 459. 

Ironically, by focusing on the credible scientific evidence introduced by the Sierra Club, *Sigler* illustrates an interpretation of worst case analysis which essentially parallels the amended CEQ regulation discussed in Part III.A *infra*, which would presumably reach the same result.\[123\] 695 F.2d at 968. The traditional rule barring courts from deciding the merits of conflicting scientific issues underlying the legal dispute concerning adequacy of an EIS originated with *Committee for Nuclear Responsibility v. Seaborg*, 463 F.2d 783, 787 (D.C. Cir. 1971). The *Seaborg* court delineated its function as:

- only to assure that the statement sets forth the opposing scientific views, and does not take the arbitrary and impermissible approach of completely omitting from the [EIS] ... any reference whatever to the existence of responsible scientific opinions concerning possible adverse environmental effects.

463 F.2d at 787.

Although most courts still claim to adhere to this precedent, as their experience with technical environmental matters increases, courts have become more willing to question the scientific opinions of agencies. Thus, according to Davis, “how deeply the reviewing court will delve into the [administrative] record . . . seems more a function of that court’s predilections than of the applicable standard of review” found in the Administrative Procedure Act. Davis, *The “Shotgun Wedding” of Science and Law: Risk Assessment and Judicial Review*, 10 COLUM. J. ENVTL. L. 67, 92 (1985). See note 17 supra; see also *Baltimore Gas & Elec. Co. v. Natural Resources Defense Council (Vermont Yankee IV)*, 462 U.S. 87, 103 (1983) (discussed in text accompanying notes 133-42 *infra*); *Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council (Vermont Yankee II)*, 435 U.S. 519, 541-48 (1978). See also *Manygoats v. Kleppe*, 558 F.2d 556, 560 (10th Cir. 1977), in which three claimed impacts of proposed uranium mining permits arose from conflicting scientific evidence. The court “decline[d] to enter into this controversy of experts. It is enough that the problems were delineated with great care and informed the . . . decisionmaker, of environmental consequences.”

124. 720 F.2d 1475 (9th Cir. 1983), cert. denied, 469 U.S. 1028 (1984).
125. 747 F.2d 1240 (9th Cir. 1984). Both cases rely mainly on deference to the CEQ’s original § 1502.22 regulation; however, the *Southern Oregon Citizens* court cites *Sigler* for the claim that worst case analysis existed in the NEPA common law. See Note, *SOCATS: Worst Case Analysis in the West*, supra note 42, at 188-89; Note, *NEPA’s Worst Case Analysis Requirement: Cornerstone or Stumbling Block*, supra note 105, at 502.
126. 720 F.2d at 1479.
effects.\textsuperscript{127}

In \textit{Save Our Ecosystems}, the court added that "\textit{b}esides exposing the \textit{fact} of uncertainty, because of that uncertainty, a spectrum of possible events must be considered."\textsuperscript{128} Reviewing the scientific evidence, the court did not agree with the BLM's chief assumption in its worst case analysis that some threshold exposure exists at which human health is not impaired.\textsuperscript{129} The court concluded that a reasonable worst case scenario could include evaluation of the health impact of accidental massive exposure of a person applying the herbicide as the low probability/catastrophic consequence, with the spectrum of events including less severe effects of this exposure on wildlife and the environment in general.\textsuperscript{130}

\textbf{C. "Hard Look" Doctrine Applied to Data Uncertainty Issues Beyond the Scope of the Worst Case Analysis Regulation}

Paralleling the approach of the Fifth and Ninth Circuits to scientific uncertainty in EISs, the D.C. Circuit, in the third stage of the complex \textit{Vermont Yankee Nuclear Corp.} litigation,\textsuperscript{131} held that the Nuclear Regulatory Commission (NRC) violated NEPA by assigning no value to the environmental impact of long-term storage of radioactive wastes in its generic analysis of the environmental effects of the nuclear fuel cycle.\textsuperscript{132}


\textsuperscript{127} The court addressed cases cited by the BLM to support its claim of a probability threshold. For example, \textit{Trout Unlimited v. Morton}, 509 F.2d 1276 (9th Cir. 1974), was distinguished as being decided prior to the 1979 regulations and involving only "distantly connected" effects (second home development) concerning which no information gap existed "as to the improbability of the consequences." 720 F.2d at 1479.

\textsuperscript{128} 747 F.2d at 1244 (emphasis in original). The crucial scenario, which the BLM failed to address, was the most severe effect. The Ninth Circuit quoted the trial judge with approval: "Plainly, the worst result that can occur as a result of proceeding in the face of uncertainty as to whether a herbicide causes cancer is that it \textit{does} cause cancer." 747 F.2d at 1246 (emphasis in original). But the agency must also analyze a range of "worst" consequences. The court analogized this spectrum of events which the agency must evaluate under worst case analysis to the range of alternatives required by NEPA. 747 F.2d at 1245 n.7. \textit{See} 40 C.F.R. \textsection 1502.14 (1987); \textit{Update, supra} note 103, at 10,271.

\textsuperscript{129} 747 F.2d at 1245-46.

\textsuperscript{130} 747 F.2d at 1246 n.8.


\textsuperscript{132} The generic analysis restricted the disclosure and consideration of the environmental impact of nuclear waste in every individual power reactor licensing proceeding to a table of predetermined values. The table did not contain a value representing the effect of leakage of buried nuclear wastes over long time periods. \textit{Vermont Yankee III}, 685 F.2d at 469.
Defense Council (Vermont Yankee IV), however, the Supreme Court unanimously reversed. Although Vermont Yankee IV did not discuss worst case analysis or the CEQ's regulation explicitly, it did address the proper role of courts reviewing scientific uncertainty in EISs. The Court criticized detailed judicial review of EISs and other informal agency decisions to which the arbitrary and capricious standard applies. Precisely this disfavored type of review, which intrudes into the decisionmaking process instead of simply "ensur[ing] that the agency has adequately considered and disclosed the environmental impact of its actions," is characteristic of the Sigler, Southern Oregon Citizens, and Save Our Ecosystems interpretations of the worst case analysis regulation.

The Court reiterated that NEPA does not constrain the final decision whether to proceed with a proposed project. Nor does NEPA "require agencies to elevate environmental concerns over other appropriate considerations"; instead it demands a "hard look" by the agency at environmental effects before deciding whether to proceed. By characterizing NEPA as a procedural mandate, the Court restricted judicial review of an EIS to verifying the adequacy of consideration and disclosure of the project's environmental effects, and to ensuring that the final decision to proceed with the project is not arbitrary or capricious.

In this case, the Court found the NRC's decision to promulgate the generic data table was reached after a "hard look" at the scientific uncertainties and was neither arbitrary nor capricious. First, the Court noted that the no-risk assumption was made for the limited purpose of reactor licensing, not for waste disposal technology or siting. Second, the challenged assumption involved only one figure in a table of conservative estimates. Finally, the Court stated:

[A] reviewing court must remember that the [NRC] is making predictions, within its area of special expertise, at the frontiers of science. While examining this kind of scientific determination, as opposed to simple findings of fact, a reviewing court must generally be at its most deferential.

The Court, quoting its decision in Vermont Yankee II, clearly stated

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134. See note 100 supra.
135. 462 U.S. at 97-98.
138. 462 U.S. at 101-02.
139. 462 U.S. at 102-03.
140. 462 U.S. at 103.
that an administrative decision may be overruled only for procedural or substantive reasons expressed in the statute, "not simply because the court is unhappy with the result reached."142

The Second Circuit also indirectly disputed the inclusion in EISs of remote and speculative consequences through worst case analysis. In City of New York v. United States Department of Transportation,143 the court identified as a remoteness criterion the appearance of the term "significant" in NEPA. Thus, EIS preparation is not required unless the agency contemplates a major action "significantly affecting the quality of the human environment."144 In an environmental assessment (EA) of its regulations governing highway transportation of large quantities of radioactive materials, the Department of Transportation (DOT) had calculated a risk level of one catastrophic accident every 300 million years. The DOT determined that an environmental effect with such a low probability of occurrence, although catastrophic, would not have a "significant' impact on the human environment" and on that basis declined to prepare an EIS.145 The court upheld DOT's environmental assessment and its regulation in light of Vermont Yankee IV, since the EA indicated that the DOT had taken a "hard look" at the environmental consequences of its action.146

142. 435 U.S. at 558. Although commentary on the case expressed concern over NRC's decision not to introduce waste disposal uncertainty into individual plant licensing, it conceded that NEPA does not sanction the degree of interference with agency substantive decisionmaking inherent in the D.C. Circuit's approach in Vermont Yankee III. Vermont Yankee Revisited, supra note 103, at 10,243 ("NEPA . . . leaves agencies with considerable discretion on the weight to be given to the environmental factors, especially where they involve complex issues not easily understood even by the experts."); McGarity, Beyond the Hard Look: A New Standard for Judicial Review?, 2 NAT. RESOURCES & ENVT. 32, 33 (Fall 1986) (discussing the remaining flexibility under Vermont Yankee IV with which courts may ensure that agencies provide a "reasoned explanation for their rules").


Similarly, the only apparent limit on the worst case analysis required in Save Our Ecosystems v. Clark, 747 F.2d 1240 (9th Cir. 1984), is that the unavailable or uncertain information must be "significant" as defined in § 1508.27. Since that definition reflects both the intensity and the context of the environmental effect, however, the court implied with little discussion that the worst case analysis regulation avoids even this limitation by providing for discussion of the consequences of the worst case and its probability or improbability. 747 F.2d at 1244 n.5. See notes 126-28 supra.

The companion case to Save Our Ecosystems, Merrell v. Block, established a general duty of agencies to perform research where unavailable or uncertain data is significant and costs are not exorbitant, even if another federal agency is charged with such research (e.g., the EPA under FIFRA). See 747 F.2d at 1240, 1244, 1249; note 51 supra.

145. 715 F.2d at 747.

146. 715 F.2d at 751-52.
D. Criticism of Worst Case Analysis and Its Judicial Interpretation

Worst case analysis must be measured against the dual purposes of NEPA — informing agency decisionmakers and informing the public and other entities external to the agency. Worst case analysis served as an innovative measure of an agency's good faith compliance with NEPA and the CEQ's binding regulations. It facilitated this verification or watchdog function primarily by informing the public of low probability/catastrophic environmental effects with which they could gauge the adequacy of the agency's evaluation. However, as environmental analysis becomes truly integrated into the agency decisionmaking process, such a stringent review of agency compliance may cease to advance the purposes of NEPA. At this stage, agency decisionmakers would benefit from greater emphasis on the range of environmental effects more probable than the worst case. Furthermore, the EIS process could facilitate public consideration of environmental effects at all risk levels (including probable impacts or those certain to occur, as well as hypothetical low probability/catastrophic events), and the formulation of creative mitigation measures and project alternatives not considered by the agency, instead of emphasizing the worst case.

Proponents regard worst case analysis as an essential protection against improbable, but conceivable, environmental effects with severe or catastrophic consequences. However, the terminology of worst case analysis has been criticized for its perceived pessimism. Other criticism has addressed the negative implications of concentrating environmental analysis on a single extreme case — particularly the lack of objective criteria that define the worst case, the difficulty of legally evaluating it, the lack of useful data the worst case generates, and the possibility of constraining decisionmakers "to the point of foreclosing valuable agency action."

These critics may be correct that "worst case" is an unnecessarily negative term for the subsection 1502.22 investigation, and decisionmakers and courts should treat worst case analysis as defining

147. Yost, supra note 99, at 10,395. Yost, former general counsel of the CEQ, distinguishes between two types of remote effects — those of only tangential concern and others that are improbable but result in severe or catastrophic consequences. See also 49 Fed. Reg. 50,744 (1984) (to be codified at 40 C.F.R. § 1502) (proposed Dec. 31, 1984) (advance notice of proposed rulemaking).

148. P. Black, supra note 30, at 50. See CEQ, Comments Received, particularly answers to question 5 of the ANPR: "Is the term 'worst case' appropriate for this type of analysis? If so, how should it be defined? If not, what is the most appropriate term . . . and how should it be defined?" 49 Fed. Reg. 50,744 (1984) (to be codified at 40 C.F.R. § 1502) (proposed Dec. 31, 1984).

149. Note, Putting Bite Back in NEPA's Bark, supra note 23, at 386. See Whitney, supra note 103, at 471-72; Brock, supra note 121, at 24, 25, 64.
“the extreme upper bound of the calculated risk.” Indeed, the CEQ’s 1981 statement clarified its view that worst case analysis must “include a spectrum of events of higher probability but less drastic impact” than the low probability/catastrophic event postulated by the agency as the worst case.

Opponents of worst case analysis generally do not dispute its potential value as one type of information relevant to decisionmakers and to the public. Rather, they criticize overreliance on it by courts and the public. Identification of a more sophisticated standard that ensures agency compliance with NEPA and that brings useful, balanced, scientific information to the internal and external debate on agency policies is desirable.

Many appellate and trial courts interpreting worst case analysis have substantially exceeded the proper scope of judicial review under NEPA. The overriding theme of these cases, in contrast to earlier NEPA suits, is the judicial declaration of the specific worst case to be examined by the agency on remand, including the particular scientific models and studies to be applied and the research to be performed. Mandating the content of a particular EIS effectively compels an agency to adopt the court’s preferred scientific outcome in the worst case analysis. Absent the CEQ’s binding worst case analysis regulation as a legal justification, this type of stringent review would violate the Supreme Court’s “hard look” doctrine as elucidated in Vermont Yankee IV and its predecessors. Instead of engaging in detailed factual review of the record under the guise of identifying agency actions that are arbitrary, capricious, or an abuse of discretion, these courts should have concentrated on the procedural mandate of NEPA. This mandate certainly demands full disclosure of probable environmental

150. Objection to “Worst Cases” Aired at Chemical Session, PESTICIDE & TOXIC CHEM. NEWS, Sept. 24, 1986, at 7-8 (quoting address by attorney Don G. Scroggin, Jr.).

By focusing their comments on the single, extreme case, however, critics neglect the range of consequences that must be addressed simultaneously under 40 C.F.R. § 1502.16 (1987). See Comment, supra note 41, at 110. This central EIS requirement mandates discussion of direct and indirect effects of the proposed action and its alternatives, as well as available mitigation measures. See note 15 supra. The scope of indirect effects under 40 C.F.R. § 1508.8(b) (1987) is limited by reasonable foreseeability. Question 18 of CEQ, supra note 6, at 18,031, requires the agency to attempt in good faith to explain indirect effects that are not known but are reasonably foreseeable, as well as identifying all known indirect effects. The agency cannot simply neglect “uncertain, but probable, effects”; rather, it must use informed judgment and “estimate future impacts on that basis.” Id.

151. CEQ, Question 20(b), supra note 6, at 18,032. The CEQ also states that “one of the federal government’s most important obligations is to present to the fullest extent possible the spectrum of consequences that may result from agency decisions.” Id.

152. See notes 44-45 & 112-15 supra and accompanying text.


effects, as contemplated in the statutory language and expressed in early NEPA case law and the CEQ regulation; however, NEPA does not obligate the agency to devote the time, budget, and technical expertise necessary for complete resolution of scientific disputes and uncertainty in an EIS.

Clarifying the procedures required when an agency confronts data uncertainty would permit courts to focus on the central issue in EIS review — whether the agency has addressed environmental impacts in good faith.155 By emphasizing NEPA's procedural mandate rather than engaging in a cloaked substantive review, the courts can avoid expensive and time-consuming study of potential “worst” consequences, however remote and speculative.

The CEQ, and even interventionist courts engaged in detailed factual review of the EIS and agency record, concede that worst case analysis is a proxy for useful, verifiable, good faith agency compliance with the procedural requirements of NEPA. The presence of a worst case analysis in an EIS provides at least some evidence that the drafting agency has disclosed and considered in the decisionmaking process uncertainty of consequences, alternatives, and their respective probabilities of occurrence.156

However, if the CEQ, courts, and agencies can harmonize the treatment of data uncertainty in EISs with the underlying NEPA goals of disclosure and consideration of environmental impacts in policymaking,157 the worst case analysis regulation (or a judicially created analog) will be unnecessary. The courts and agencies could focus on the pragmatic informative purposes of NEPA, rather than on a formal analysis requirement useful for litigation but ineffectual in actual decisionmaking.

III. THE CEQ'S AMENDED DATA UNCERTAINTY REGULATION AND THE ANTICIPATED RESPONSE

A. The Amended Regulation

In April 1986, the CEQ published its final amendment of section 1502.22, accompanied by a summary of written comments received on the proposed rule and the CEQ's responses to them.158 The CEQ

155. Both the opinion of the Supreme Court in Vermont Yankee IV and that of the Second Circuit in City of New York v. United States Dept. of Transp., 715 F.2d 732 (2d Cir. 1983), cert. denied, 465 U.S. 1055 (1984), as well as the amended § 1502.22, adopted this alternative formulation to determine whether an EIS meets the NEPA purposes of informing agency decisionmakers and the public.

156. For example, the DOT's quantitative EA impressed the Second Circuit in City of New York v. United States Dept. of Transp., 715 F.2d at 745-52. However, the Save Our Ecosystems court declined to uphold the BLM's assessment of herbicide carcinogenicity simply because it was labelled a “worst case analysis.” 747 F.2d at 1245-46.

157. See note 32 supra.

158. Because of the differences in the NEPA case law concerning remoteness limitations on
designed the amendment to provide "more accurate and relevant information" using requirements which "are more clearly articulated and manageable" than worst case analysis. The amendment purported to respond to the concern that EISs had overemphasized remote and speculative consequences.

The revised regulation requires the same disclosure of the existence of scientific uncertainty and collection of essential information when overall costs are not exorbitant as the original 1978 regulation. Now, however, these obligations are to apply only to "reasonably foreseeable" significant adverse impacts. More importantly, in a substantially altered paragraph (b), the CEQ deleted the worst case analysis requirement. It is replaced by a threshold of reasonably foreseeable impacts based on credible scientific evidence. Effects exceeding this threshold must be discussed in the EIS when the agency confronts data uncertainty that it can not afford to remedy through research. The CEQ explained the adoption of a probability threshold by emphasizing the drift of recent court decisions under worst case analysis, particularly in the Ninth Circuit, away from the rule of reason.

Paragraph (b) of revised section 1502.22 provides for a four-stage agency obligation, triggered when "information relevant to reasonably foreseeable significant adverse impacts" is unobtainable due to cost or

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The CEQ initially raised this concern in the 1983 draft guidance and addressed it directly in the August 1985 proposed rule.

Scroggin notes the potential for abuse of upper bound risk calculations by treating them as realistic risk projections. Conversely, Yost claims that the worst case analysis requirement did not cause an undue burden on agencies since only a small proportion of EISs involved § 1502.22. Yost, supra note 99, at 10,396. However, subsequent to Yost’s article, the Ninth Circuit applied worst case analysis to EAs also. Southern Oregon Citizens Against Toxic Sprays, Inc. v. Clark, 720 F.2d 1475, 1480-81 (9th Cir. 1983).


Although the agency may reject the proposed action at any time, NEPA is designed to inform decisionmakers of environmental consequences, not to require selection of the most desirable policy outcome from an environmental perspective. Strycker’s Bay Neighborhood Council v. Karlen, 444 U.S. 223, 227 (1980) (per curiam).
technical and scientific limitations. The agency must then: (1) disclose the existence of uncertainty; (2) state the relevance of the unavailable information to the impact; (3) summarize the relevant “existing credible scientific evidence;” and (4) evaluate these impacts using techniques of data collection and analysis “generally accepted in the scientific community.” In order to force the agency to consider significant impacts that may be objectively improbable, revised section 1502.22 defines “reasonably foreseeable” to include “impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason.”

The CEQ avoided defining precisely the broad terms concerning standards for the scientific evaluation of risk in the amended regulation. In its responses to comments received on the proposed amendment, the CEQ equated “credible scientific evidence” with “theoretical approaches or research methods generally accepted in the scientific community,” which in many cases “will include commonly accepted professional practices such as literature searches and peer review.” The preamble to the amended regulation expressly requires the agency to consider “responsible opposing views” — referring particularly to those opposed to the agency’s action — since the CEQ recognizes that “many times, particularly when dealing with questions of incomplete or unavailable information, there will be more than one point of view about potential environmental impacts which has scientific credibility.” Avoiding a formal definition of “credible scientific evidence” or a preferred method of evaluating uncertainty such as quantitative risk assessment, the CEQ was concerned that a narrow definition or methodology would obstruct the EIS process in some agencies, “given the wide variety of actions which potentially fall under the auspices of this regulation.”

Three important policies support the change in the CEQ’s data uncertainty regulation. First, the CEQ should continually seek clarity and logical presentation of information in EISs through its binding

165. 40 C.F.R. § 1502.22(b). See also 51 Fed. Reg. 15,621 (1986) (summarizing the requirements of subsection b).
166. 40 C.F.R. § 1502.22(b).
167. Id.
169. Id. at 15,623. Use of “responsible opposing views” terminology is consistent with 40 C.F.R. § 1502.9(b) (1987), and with preexisting NEPA case law. See Committee for Nuclear Responsibility v. Seaborg, 463 F.2d 783, 787 (D.C. Cir. 1971) (“Only responsible opposing views need be included and hence there is room for discretion on the part of the [agency] preparing the [EIS]; but there is no room for an assumption that [the agency’s] determination is conclusive.”) (emphasis in original); see also Environmental Defense Fund v. Costle, 439 F. Supp. 980, 997 (E.D.N.Y. 1977).
regulations. 171 Second, the CEQ should attempt to improve the utility of EISs for informing both the agency policymakers and the public. The amendment’s four-stage process of disclosure, explanation of relevance, summary of credible scientific evidence relating to the impact (both supporting the project and opposing it), and risk evaluation should focus discussion on the data more than on the emotive selection of a worst case scenario as in the original regulation. Third, the CEQ should participate with other agencies involved in extensive scientific analysis, notably the EPA, in promoting greater uniformity and rationality in federal risk assessment and risk management techniques. 172

B. Anticipated Agency and Court Responses to the Amended Regulation

The CEQ has promulgated a probability threshold to restrict, in theory, agency obligations to evaluate incomplete or conflicting scientific information in EISs. The utility of this threshold for relieving the agencies’ duty to consider remote and highly speculative consequences in EISs is, however, more apparent than real.

1. Judicial Interpretation of the Amended Data Uncertainty Regulation

Those courts predisposed to a detailed factual review of an EIS will likely rely on one of two rationales to retain the worst case analysis requirement despite its excision from the CEQ’s data uncertainty regulation. First, courts could directly repudiate the amended CEQ regulation, claiming incorrectly that worst case analysis is required explicitly by NEPA or implicitly by the common law gloss. Predictably, the Ninth Circuit has already adopted this approach, summarily rejecting the revisions with only cursory explanation in the footnotes to recent cases. 173 Second, courts could use the vague language of the

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171. The CEQ allowed the courts to apply worst case analysis for several years, and it spent substantial time considering measures to improve EIS risk assessment procedures. This grace period for worst case analysis was necessary in light of that regulation’s relationship to future activities of potential economic and environmental importance. Worst case analysis to date has primarily affected pesticide spraying, but one can readily imagine application of the data uncertainty regulation to new technologies including development of undersea mineral resources and hazardous and nuclear waste disposal. The increasing importance of agency treatment of scientific uncertainty suggests that the CEQ should act to clarify and to streamline the regulation after a reasonable grace period.

172. See note 14 supra.

173. Methow Valley Citizens Council v. Regional Forester, 833 F.2d 810, 817 n.11 (9th Cir. 1987); Oregon Natural Resources Council v. Marsh, 820 F.2d 1051, 1058 n.8 (9th Cir. 1987), vacated & modified, 832 F.2d 1489 (9th Cir. 1987) (modifications not pertinent).

One plausible rationale for rejecting the CEQ’s amended data uncertainty regulation could be the Ninth Circuit’s perception that the present CEQ is ineffectual. See CEQ Agenda Shows No Pending Proposals, No Upcoming Proposals in Next Six Months, in Current Developments, 17 ENVT. REP. (BNA) 1019 (1986).
Note — Treatment of Uncertainty in EISs

amended regulation effectively to retain the worst case analysis requirement without directly challenging the CEQ’s amendment. Both of these approaches, however, derive precedential support only from the bare, unsubstantiated, and incorrect statements in Sierra Club v. Sigler, Southern Oregon Citizens Against Toxic Sprays, Inc. v. Clark, and Save Our Ecosystems v. Clark that the worst case analysis requirement codified prior NEPA case law.¹⁷⁴

The Ninth Circuit in Oregon Natural Resources Council v. Marsh¹⁷⁵ and Methow Valley Citizens Council v. Regional Forester¹⁷⁶ summarily rejected the CEQ’s attempt to constrain judicial review of agency treatment of uncertainty through prior “rule of reason” case law and a probability threshold. In Oregon Natural Resources Council, plaintiffs challenged a Corps of Engineers’ EIS for failing to research the effects of a proposed dam on turbidity in a river, and for failing to perform worst case analyses covering turbidity and the survival of certain fish.¹⁷⁷ The Ninth Circuit rejected the Corps’ argument that worst case analysis was not required because of its rescission by the CEQ. In a footnote citing Save Our Ecosystems,¹⁷⁸ the court stated that “[t]he worst case regulation is a codification of prior NEPA case law... Thus, the rules embodied in the regulation remain in effect even though the regulation was rescinded.”¹⁷⁹ Although the Corps of Engineers had disclosed in its EIS the existence of uncertainty surrounding the evaluation of turbidity, the court found that “exposing uncertainty is not enough.”¹⁸⁰ The court required the Corps either to prepare a worst case analysis or to conduct additional research on the effect of river flow on turbidity. It also ordered the Corps, pursuant to subsection 1502.9, to analyze new information contained in two studies by state and federal agencies in an effort to determine if the presence of scientific uncertainty necessitated a worst case analysis.¹⁸¹ A separate opinion filed generally concurs with the retention of the worst case analysis requirement but scolds the majority for exceeding the court’s proper role in order “to decide whether the Corps’ analysis of the two studies was ‘correct’ scientifically.”¹⁸²

In Methow Valley Citizens Council, plaintiffs challenged the ade-

¹⁷⁴. See notes 105 & 116-21 supra and accompanying text; Sierra Club v. Sigler, 695 F.2d 957 (5th Cir. 1983); Southern Oregon Citizens Against Toxic Sprays, Inc. v. Clark, 720 F.2d 1475 (9th Cir. 1983), cert. denied, 469 U.S. 1028 (1984); Save Our Ecosystems v. Clark, 747 F.2d 1240 (9th Cir. 1984). See generally Part I.B supra.
¹⁷⁵. 832 F.2d 1489, 1497 n.8 (9th Cir. 1987).
¹⁷⁶. 833 F.2d 810, 817 n.11 (9th Cir. 1987).
¹⁷⁷. 832 F.2d at 1497 n.8.
¹⁷⁸. 747 F.2d 1240, 1244 (9th Cir. 1984).
¹⁷⁹. 832 F.2d at 1497 n.8.
¹⁸⁰. 832 F.2d at 1497.
¹⁸¹. 832 F.2d at 1496-97.
¹⁸². 832 F.2d at 1503 (Wallace, J., concurring in part and dissenting in part).
quacy of a United States Forest Service EIS concerning a proposal to grant a special use permit for development and operation of a ski resort in a remote area of a national forest.\textsuperscript{183} This area provided a winter range and migratory corridor for a substantial deer herd. The Forest Service’s witness testified that the agency lacked sufficient data on the potential effects of secondary development “reasonably certain to follow development of ski slopes” to support its conclusion in the EIS that as-yet unspecified mitigation measures would minimize any adverse impacts on the herd.\textsuperscript{184} The court correctly distinguished between requiring the agency to “foresee the unforeseeable” and demanding that it “evaluate the reasonably foreseeable significant effects which would be proximately caused by implementation of the proposed action,” including secondary development near ski resorts.\textsuperscript{185}

Although the Forest Service was in the process of conducting a detailed study of the deer herd, the court refused to approve the EIS until the study was finished. It insisted that if the study provided incomplete information, a worst case analysis was to be done.\textsuperscript{186} The court, citing Oregon Natural Resources Council, again affirmed the validity of the worst case analysis regulation, at least in the Ninth Circuit, despite its rescission by the CEQ.\textsuperscript{187} Finally, the court implied that it would generally require a worst case analysis where the agency neglected to evaluate the effectiveness of mitigation measures, emphasizing “the inherent limitation on a decisionmaker’s ability to make a reasoned decision as to the environmental impacts of a proposed action where information contained in an EIS is incomplete or inaccurate.”\textsuperscript{188}

Thus, Oregon Natural Resources Council and Methow Valley Citizens Council contend that prior NEPA case law established a worst case analysis requirement and demonstrate that Sigler, Southern Oregon Citizens, and Save Our Ecosystems have contrived precedential value for any court interested in deriving a similar obligation despite the excision of worst case analysis from subsection 1502.22.

For those courts unwilling directly to counteract the CEQ’s replacement of worst case analysis with a probability threshold, the generality of the phrases “reasonably foreseeable impacts,” “credible scientific evidence,” and “theoretical approaches or research methods generally accepted” permits courts considerable latitude in construction.

Organizations intent on delaying or defeating an agency’s action

\textsuperscript{183} 833 F.2d at 812 (9th Cir. 1987).
\textsuperscript{184} 833 F.2d at 817.
\textsuperscript{185} 833 F.2d at 816-17.
\textsuperscript{186} 833 F.2d at 818.
\textsuperscript{187} 833 F.2d at 817 n.11.
\textsuperscript{188} 833 F.2d at 818 n.12.
frequently can marshal "credible scientific evidence" to support virtually any low probability/catastrophic impact imaginable. Like its predecessor, the amended regulation is explicitly (and appropriately) biased to encourage analysis of low probability, but severe, environmental effects that are particularly susceptible to data uncertainty. For example, revised subsection 1502.22 would effectively mandate a worst case analysis in the Ninth Circuit herbicide cases, *Southern Oregon Citizens* and *Save Our Ecosystems*, which present uncertain, yet scientifically credible, risks of carcinogenicity. The district and appellate courts at least implied in those cases that a potential increased risk of cancer from exposure to BLM herbicides is a "reasonably foreseeable significant adverse impact" which should be considered in an EIS, despite its relatively low probability.

Thus, the Ninth Circuit could have reached the same result in *Oregon Natural Resources Council* and *Methow Valley Citizens Council* by applying the probability threshold. In *Oregon Natural Resources Council*, the trial court identified two studies that provided credible scientific information on the effect of the proposed dam on turbidity and fish survival. In *Methow Valley Citizens Council*, the Forest Service's performance of a comprehensive study on the deer herd migrating through the proposed site of a ski resort presented credible scientific evidence from within the agency sufficient to require detailed evaluation of the effects of reasonably foreseeable secondary development.

Worst case analysis appeared limitless in its consideration of "remote and highly speculative consequences." Agencies could thus argue plausibly for a separate remoteness threshold under either the "significant adverse impact" label triggering EIS preparation or the "information essential [or important] to a reasoned choice among alternatives" language of the original subsection 1502.22. Conversely, the amended regulation establishes *apparent* boundaries for uncertain consequences and probabilities under the labels "credible scientific evidence" and "reasonably foreseeable," respectively. Such apparent limits potentially foreclose other existing remoteness restrictions. For example, in *New York City v. United States Department*
of Transportation, the DOT's detailed risk estimate in its EA of one catastrophic accident (entailing a major radioactive release) every 300 million years was supported by credible evidence collected with a generally accepted theoretical approach (quantitative risk assessment). It identified a very low probability event that a court could term "reasonably foreseeable." Thus, the amended data uncertainty regulation could be interpreted to require DOT to analyze this remote risk in an EIS.\footnote{195}

Five factors strongly support a court's application of the CEQ's amended data uncertainty regulation in lieu of worst case analysis. First, the amended subsection 1502.22 incorporates language qualifying and restricting the agency's duty to disclose, research, and evaluate scientific uncertainty, to which some courts undoubtedly will respond favorably. Second, the probability threshold of "reasonably foreseeable impacts based on credible scientific evidence" forces plaintiffs challenging EISs to produce more than simply a hypothetical adverse environmental effect.\footnote{196} This threshold equips courts with a standard for separating instances where the agency truly has taken a hard look at environmental consequences — as shown by its summary and evaluation of the scientific evidence on the issue of uncertainty — from those where the EIS is facially adequate but deficient in its discussion of responsible scientific views. Third, the amended regulation subtly shifts the emphasis from the hypothesized remote effects to the remoteness of reasonably foreseeable effects.\footnote{197} This shift may impair the plaintiffs' ability to demonstrate that the agency has failed to evaluate a particular environmental effect. Fourth, the structure of the amended regulation also equips courts inclined to defer to an agency's EIS with a more logical presentation and, presumably, a more rational evaluation of credible scientific information than those derived through worst case analysis.\footnote{198} This deference to the preparing agency's expertise comports with the limited scope of judicial review of agency treatment of scientific issues, as expressed by the Supreme Court in \textit{Vermont Yankee IV}.\footnote{199} Fifth, courts frequently defer to the

\footnotesize{\textit{\textsuperscript{195}} A potential counterargument to this point is that § 1502.22 only applies to projects requiring an EIS. However, faced with the express requirement in amended § 1502.22 to consider low probability/catastrophic impacts, it is doubtful that courts would permit a finding of no significant impact in \textit{City of New York v. United States Dept. of Transp.}, 715 F.2d 732, 745 (2d Cir. 1983).}

\footnotesize{\textit{\textsuperscript{196}} But see note 194 supra.}

\footnotesize{\textit{\textsuperscript{197}} See note 201 infra and accompanying text.}

\footnotesize{\textit{\textsuperscript{198}} See text following note 201 infra.}

\footnotesize{\textit{\textsuperscript{199}} 462 U.S. 87, 103 (1983); Kleppe v. Sierra Club, 427 U.S. 390, 413-14 (1976). See notes 133-42 supra and accompanying text.}
CEQ's regulations. 200

While federal actions involving remote but catastrophic effects may continue to require evaluation analogous to worst case analysis, other projects with more probable acute effects may escape analysis under the amended subsection 1502.22. This could occur because of the difference in emphasis between worst case analysis and evaluation based on a probability threshold requiring proof of reasonable foreseeability through credible scientific evidence. While worst case analysis focuses first on exposing the potential types of consequences of a federal action and then on determining their likelihood, the "credible scientific evidence" threshold concentrates on the uncertain probability of a known or reasonably foreseeable consequence. 201 The plaintiff challenging the agency's refusal to discuss an uncertain but postulated consequence in an EIS will face a greater burden under the amended regulation than under its predecessor. Instead of being required to show merely hypothetical consequences as with worst case analysis, the plaintiff under the amended regulation must prove with credible scientific evidence that the suggested impacts neglected by the agency meet the probability threshold of reasonable foreseeability. In addition, the plaintiff will find the agency's summary of existing credible scientific evidence more difficult to dispute. 202

For example, the amended regulation may still mandate evaluation of the supertanker total cargo oil spill postulated as a worst case by the Sierra Club in Sigler. 203 To prevail before a court under the revised regulation, however, the Sierra Club would have to produce credible scientific evidence showing that this catastrophic scenario is reasonably foreseeable. The Sierra Club would also have to challenge meaningfully the Corps of Engineers' summary and evaluation of credible scientific evidence presented in the EIS. Provided with a logical presentation of the agency's information, a court is more likely to defer to the agency's determination of what constitutes credible scientific evidence. Thus the court may uphold the agency's EIS because the addition of the new hypothetical consequence (i.e., a total cargo loss)

200. See notes 87-90 supra and accompanying text.

201. Worst case analysis initially emphasizes the determination of categories of environmental effects, regardless of their probabilities of occurrence. The likelihood (or remoteness) of a particular catastrophic impact is calculated secondarily, almost as an afterthought. Under a risk threshold regime, however, emphasis shifts from the invention of potential environmental consequences to the probability of those outcomes. This difference would be much more pronounced had the CEQ (or individual agencies) promulgated a quantitative probability threshold. For example, such a rule might state that the agency need not evaluate a hypothesized environmental effect, such as a dam failure, with an estimated probability of occurrence below one event in five hundred thousand years. However, even a qualitative threshold requiring credible scientific evidence concentrates analysis on the probability of a known or reasonably foreseeable consequence.

202. See notes 78-80 supra and accompanying text. See S. Taylor, supra note 17, at 84-85 (discussing the burden of proof on environmental plaintiffs).

203. Sierra Club v. Sigler, 695 F.2d 957 (5th Cir. 1983).
would not substantially alter the agency's evaluation of the evidence taken as a whole, particularly when the agency has diligently studied less catastrophic, but related, outcomes such as a partial cargo loss.

2. Suggested Interpretation of the Amended Data
   Uncertainty Regulation

Courts should shift their analysis away from simply asking whether the plaintiff seeking to enjoin a federal project can raise either conjectural alternatives to the project or speculative environmental consequences that the agency has failed to discuss in its EIS. The plaintiff should be required to present credible scientific evidence either excluded from the agency's summary of scientific information representing the majority and responsible opposing views, or neglected in the agency's evaluation of the data.204

The court must review this record under the arbitrary and capricious standard,205 deferring where appropriate to the agency's technical expertise. The court should remember that one fundamental purpose of NEPA is to force agency decisionmakers to give environmental effects a "hard look" before acting. NEPA was not enacted to ensure that environmental consequences control the ultimate decision taken, nor to dictate an emphasis on environmental concerns in the internal decisionmaking process to the exclusion of other considerations.206

The court may disagree with the agency's scientific conclusions derived from evaluation of the data under amended subsection 1502.22 or with the agency's final decision to proceed with the project after completion of the NEPA process. Nevertheless, the logical presentation of scientific data and conclusions required by the amended regulation should compel judicial acceptance of an EIS by demonstrating that the agency has taken the requisite "hard look" and thus complied in good faith with NEPA. The court should neither substitute its own opinion of the proper weight agency decisionmakers should attach to environmental considerations for that of the agency nor adjudicate the merits of the parties' conflicting scientific contentions.207

However, if plaintiffs can produce credible evidence of low probability/catastrophic impact events that the agency's EIS inexplicably ignored, the court should enjoin the proposed action until the agency complies fully with amended subsection 1502.22.208 Plaintiffs

205. See Leventhal, supra note 33, at 511-15.
206. See Kleppe v. Sierra Club, 427 U.S. 390 (1976); Trout Unlimited v. Morton, 509 F.2d 1276, 1282 (9th Cir. 1974).
208. See Save Our Ecosystems v. Clark, 747 F.2d 1240 (9th Cir. 1984); Southern Oregon Citizens Against Toxic Sprays v. Clark, 720 F.2d 1475 (9th Cir. 1983), cert. denied, 469 U.S.
can collect such evidence through literature searches or through generally accepted scientific modeling or research techniques. In the cases discussed above, arising under both the original worst case analysis requirement and the amended probability threshold regulation — those involving herbicide spraying, transport of radioactive materials, and development of a ski resort\textsuperscript{209} — the adverse environmental effects hypothesized by plaintiffs would surpass the threshold requiring discussion of them in the EIS. These plaintiffs would exceed the probability threshold because they could successfully generate credible scientific evidence suggesting that the agencies neglected reasonably foreseeable environmental effects.

Agencies should recognize that the amended CEQ regulation merely rescinds worst case analysis as an express requirement when an agency addresses scientific uncertainty, and adds a threshold based on credible scientific evidence of the reasonable foreseeability of an adverse environmental effect. In addition to low probability/catastrophic consequences, which the CEQ anticipates will continue to be addressed in EISs under amended subsection 1502.22, agencies must consider all environmental risks supported by credible evidence — whether observed in the field, identified under laboratory conditions, or suggested by other credible techniques. In order to follow the amended CEQ regulation consistently, each agency should establish a fixed procedure for collecting, evaluating, and updating information relevant to the resolution of disputed scientific issues, frequently affecting the agency's actions, that currently suffer from uncertain or incomplete data. Ideally, the agency will integrate this procedure with its other risk management functions to form a coherent policy governing the treatment of scientific uncertainty.

**CONCLUSION**

In its recent revision of the data uncertainty regulation codified at section 1502.22, the CEQ clearly intended to rescind the prior duty of agencies to consider remote and conjectural consequences of major projects, a duty that had come to characterize worst case analysis. The CEQ envisioned replacing worst case analysis with a probability threshold, derived from the rule of reason of early NEPA common law, which triggers the agency's duty to address a potential adverse environmental effect only when credible scientific evidence demonstrates that the hypothesized impact is reasonably foreseeable.

Although some courts have rejected the CEQ's amended regulation, their opinions lack precedential foundation. Neither the statutory language nor prior NEPA common law support retention of the


\textsuperscript{209} See Parts II.B, II.C & III.A supra and cases cited therein.
worst case analysis requirement. Other courts should avoid reviving worst case analysis because of (1) the contrived "common law" ration­
ale for overruling the CEQ; (2) the Supreme Court's emphasis in Ver­
mont Yankee IV on limiting the scope of judicial review of agency decisions in the face of uncertainty; and (3) NEPA's procedural mandate of a "hard look" at environmental effects by the agency, rather than a substantive requirement of an environmentally nondetrimental decision to the exclusion of other important social, economic, and technological considerations.

To fulfill their statutory obligations to the public and Congress, agencies must research, evaluate, summarize, and disclose scientific evidence relevant to improving the quality of uncertain or incomplete data. Judicial enforcement of the amended regulation should emphasize the identification and rejection of an agency's pro forma compliance with NEPA. An EIS merely presenting a conclusory discussion of uncertainty, without a meaningful statement of the relevance of the incomplete data and a summary and evaluation of credible scientific evidence bearing on that issue, is unacceptable. When an agency fails in this regard, the court should order the reevaluation of each of the project's environmental consequences attaining the CEQ's probability threshold of reasonable foreseeability through credible scientific evidence.

The courts' adherence to the probability threshold expressed in the CEQ's recent amendment of section 1502.22 and in early NEPA common law thus ultimately depends on the willingness of agencies to address scientific uncertainty clearly, logically, and completely in the EIS.

— Charles F. Weiss