

market prices, as described in section VIII.B.2(a). Measured as potential for changes in traded volumes, such as increases in imports and decreases in exports, EPA estimates that increases in imports and decreases in exports will each total less than 1 percent compared to baseline (pre-regulation) levels in each of the commodity sectors. Based on these results, EPA believes that any quantity and price changes resulting from the final rule will not significantly alter the competitiveness of U.S. export markets for meat, dairy foods, and poultry products.

### C. Cost-Benefit and Cost-Effectiveness Analyses

#### 1. Cost-Benefit Analysis

This section presents a comparison of the costs and benefits attributable to the final rule. As Table 8.4 shows, the

economic value of the environmental benefits EPA is able to monetize (*i.e.*, evaluate in dollar terms) is comparable to the estimated costs of the rule. As discussed in section VII, EPA estimates that the monetized benefits of the final rule range from \$204 million to \$355 million annually. Monetized benefit categories are primarily in the areas of improved surface water quality (measured in terms of enhanced recreational value), reduced nitrates in private wells, reduced shellfish bed closures from pathogen contamination, and reduced fish kills from episodic events. As discussed in Section VII of this preamble, EPA also identified a number of benefits categories that could not be monetized. These benefits are described in more detail in Section VII of this preamble and in the *Benefits Analysis* and other supporting

documentation provided in the administrative record.

This compares to EPA's estimate of the total social costs of the final regulations of about \$335 million annually. These costs cover compliance costs to all CAFOs (Large, Medium, and Small), and administrative costs to States and federal governments. Costs to all CAFOs are estimated at \$326 million per year (pre-tax, \$2001). EPA estimates the administrative cost to State and federal governments to implement this rule is \$9 million per year. There may be additional social costs that have not been monetized. For a detailed discussion of these costs, see the *Technical Development Document* and the *Economic Analysis*. A comparison of the total costs and benefits for other regulatory options considered and analyzed by EPA can be found in the *Economic Analysis*.

TABLE 8.4.—TOTAL ANNUAL MONETIZED SOCIAL COSTS AND BENEFITS

[Millions of 2001 dollars]

Category	Large CAFOs	All CAFOs
Social Costs:		
Industry Compliance Costs (pre-tax) .....	\$298	\$352
State/Federal Administrative Costs .....	6	9
Total .....	304	360
Benefits (Total for all CAFOs) .....	\$204 to \$355	(**)

\*\*Benefits analysis does not reflect monetized benefits for Medium CAFOs. May not add due to rounding. See Table 7.1 for information on benefit categories that EPA was not able to monetize.

#### 2. Cost-Effectiveness Analysis

As part of the process of developing effluent limitations guidelines and standards, EPA typically conducts a cost-effectiveness (C-E) analysis to compare the efficiencies of regulatory options for removing pollutants. This analysis defines cost-effectiveness as the incremental annualized cost of a regulatory control option per incremental pound of pollutant removed annually by that option.

The American Society of Agricultural Engineers reports that the constituents present in livestock and poultry manure include boron, cadmium, calcium, chlorine, copper, iron, lead, magnesium, manganese, molybdenum, nickel, potassium, sodium, sulfur, zinc, nitrogen and phosphorus species, TSS, and pathogens. Of these pollutants, EPA's standard C-E analysis is suitable to analyze only the removals of metals and metallic compounds. EPA's standard C-E analysis does not adequately address removals of nutrients, TSS, and pathogens. To account for the estimated removal of nutrients and sediments under the final

rule, the Agency developed an alternative approach to evaluate the pollutant removal effectiveness for nutrients and sediment relative to the cost of these pollutant removals.

The C-E analysis conducted for this rule evaluates the cost-effectiveness of removing select non-conventional and conventional pollutants, including nitrogen, phosphorus, and sediments. For this analysis, sediments are used as a proxy for TSS. This analysis compares the estimated compliance cost per pound of pollutant removed to a recognized benchmark, such as EPA's benchmark for conventional pollutants or other criteria for existing treatment, as reported in available cost-effectiveness studies. The research in this area has mostly been conducted at municipal facilities, including publicly owned treatment works (POTWs) and wastewater treatment plants (WWTPs). Additional information is available based on the effectiveness of various nonpoint source controls and BMPs and other pollutant control technologies that are commonly used to control runoff from agricultural lands. A summary of

this literature is provided in the *Economic Analysis*. Benchmark estimates were used to evaluate the efficiency of the final rule in removing a range of pollutants. This approach also allowed for an assessment of the types of management practices that will be implemented to comply with the final regulations.

For this analysis, EPA estimated average cost-effectiveness values that reflect the increment between no revisions to the current regulations and the final regulatory requirements promulgated today. All costs are expressed in pre-tax 2001 dollars. Estimated compliance costs used to calculate the cost-effectiveness of the final regulations include total estimated costs to CAFOs and costs to the permitting authority.

EPA estimates an average cost-effectiveness of nutrient removal at about \$3 per pound of nitrogen removed (pre-tax, 2001 dollars). For phosphorus removal, removal costs are estimated at about \$7 per pound of phosphorus removed. For nitrogen, EPA used a cost-effectiveness benchmark established by