Chapter 5: Estimates of Costs and Benefits

Synopsis

As discussed in previous chapters, under the current area-wide monitoring network, we have found no costs or benefits associated with attaining an NO_2 National Ambient Air Quality Standard (NAAQS) for the selected standard of 100 ppb, as our analysis projects no monitors in the existing network to have with maximum 1-hour design values as high as 80 ppb in 2020. Therefore, this Chapter does not include area-wide estimates.

In this RIA, we also adjusted the monitors in the existing area-wide network to approximate future near-roadway peaks in those counties. This analysis relies on current and future estimated air quality concentrations at area-wide monitors, making adjustments to future year projections using derived estimates of the relationship between future year area-wide air quality peaks and current near-roadway peaks. This additional analysis, which effectively extrapolates future year near-roadway air quality from projected area-wide concentrations, represents a screening level approximation with significant additional uncertainties. This Chapter also presents the benefits and costs of this screening level analysis to approximate future near-roadway conditions. We have found no costs or benefits associated with attaining a NAAQS for the selected standard of 100 ppb, as our analysis projects no monitors in the existing network after a near-roadway adjustment at this level in 2020.

It is important to reiterate that this analysis does not attempt to estimate attainment or nonattainment for any areas of the country other than those counties currently served by one of the 409 monitors in the current network. Chapter 2 explains that the current area-wide network is focused on community-wide ambient levels of NO_2, and not near-roadway levels, which may be significantly higher. In addition, this rule includes requirements for an NO_2 monitoring network that will include monitors near major roadways. We recognize that once a network of near-roadway monitors is put in place, more areas could find themselves exceeding the new hourly NO_2 NAAQS. However for this RIA, we lack sufficient data to predict which additional counties might exceed the new NAAQS after implementation of a near-roadway monitoring network. In our area-wide analysis, we projected current area-wide monitor values to future year monitor values directly, using future year CMAQ modeling outputs that take into account expected changes in emissions from 2006 to 2020. However regional scale models such as CMAQ do not provide a sufficient level of sub-grid detail to estimate near-road concentrations. (In addition, local-scale models such as AERMOD cannot model large regions with appropriate characterization of the near-road component of ambient air quality).

5.1 Benefits and Costs for Future Near-Roadway NO_2 Levels

Tables 5-1 and 5-2 present the counties in nonattainment, tons of NOx reduction, costs, and benefits for future near roadway levels using the near road gradient adjustment at discount rates of 3% and 7% respectively. The selected standard of 100 ppb is highlighted.

Table 5-1: Benefit Cost Comparison for Near Roadway Analysis (in millions of 2006$, 3% discount rate for Benefits only)

	Standard Level	# Counties in Nonattainment	Tons of NOx Reduction	Total Costs *	Total Benefits **	Net Benefits
30% Gradient	80 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
	100 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
	125 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
65% Gradient	80 ppb	1	680	$5.6 to $7.7	$3.5 to $8.6	-$4.1 to $3.0
	100 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
	125 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
100% Gradient	80 ppb	4	21,000	$67 to $130	$110 to $270	-$21 to $200
	100 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
	125 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6

* Total Cost estimates are shown as a range from $3,000/ton to $6,000/ton. Results include monitoring costs of $3.6m. Costs estimates were only available for a 3% discount rate. All estimates have been rounded to two significant figures.

**Total Benefit estimates are actually $PM_{2.5}$ co-benefits, shown as a range from Pope et al to Laden et al, at a 3% discount rate, using no-threshold functions, assuming NOx emission reductions from the mobile sector.

Table 5-2: Benefit Cost Comparison for Near Roadway Analysis (in millions of 2006$, 7% discount rate)

	Standard Level	# Counties in Nonattainment	Tons of NOx Reduction	Total Costs *	Total Benefits **	Net Benefits
30% Gradient	80 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
	100 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
	125 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
65% Gradient	80 ppb	1	680	$5.6 to $7.7	$3.2 to $7.8	-$4.5 to $2.1
	100 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
	125 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
100% Gradient	80 ppb	4	21,000	$67 to $130	$100 to $240	-$31 to $180
	100 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6
	125 ppb	0	0	$3.6 to $3.6	$0 to $0	-$3.6 to -$3.6

* Total Cost estimates are shown as a range from $3,000/ton to $6,000/ton. Results include monitoring costs of $3.6m. Costs estimates were only available for a 3% discount rate. All estimates have been rounded to two significant figures.

**Total Benefit estimates are actually $PM_{2.5}$ co-benefits, shown as a range from Pope et al to Laden et al, at a 3% discount rate, using no-threshold functions, assuming NOx emission reductions from the mobile sector.

5.2 Discussion of Uncertainties and Limitations

As with other NAAQS RIAs, it should be recognized that all estimates of future costs and benefits are not intended to be forecasts of the actual costs and benefits of implementing revised standards. Ultimately, states and urban areas will be responsible for developing and implementing emissions control programs to reach attainment of the NO_2 NAAQS, with the timing of attainment being determined by future decisions by states and EPA. Our estimates are intended to provide information on the general magnitude of the costs and benefits of alternative standards, rather than precise predictions of control measures, costs, or benefits. With these caveats, we expect that this analysis can provide a reasonable picture of the types of emissions controls that are currently available, the direct costs of those controls, the levels of emissions reductions that may be achieved with these controls, the air quality impact that can be expected to result from reducing emissions, and the public health benefits of reductions in ambient NO_2 levels, as well as coincident reductions in ambient fine particulates.

In the remainder of this section we re-state the most important limitations and uncertainties in the cost and benefit estimates related to the screening level near-roadway analysis.

- Due to the absence of a near-roadway monitoring network, this is a screening level analysis with several simplifying assumptions. It is provided to give a rough projection of the costs and benefits of attaining a revised NO2 standard based on a yet to be established monitoring network.
- This analysis does not take into account a large variety of localized conditions specific to individual monitors; instead, the analysis attempts to account for some local parameters by adjusting future design values based on average localized impacts near roads from onroad emissions.
- The process of adjusting from a specific 12 km CMAQ receptor to a near-road air quality estimate represents an uncertain approximation at the specific monitor level.
- This analysis is an approximation in that it derives future year (2020) peak air quality concentrations in specific locations by relying on CMAQ estimates that are averages over a 12 km grid square.

- This analysis cannot predict air quality in locations for which there is no current NO_2 monitor, or where current monitoring data is incomplete. There are 142 CBSAs for which we are proposing to add new near-road monitors. Of these, 73 either have no existing monitor in the CBSA, or have a monitor with data not complete enough to include in the near-roadway analysis. In these CBSAs, extrapolation to near-roadway levels is not possible.

- This analysis assumes area-wide monitors remain in the same location; however concentrations are adjusted to reflect near-roadway conditions.

- Because the emission reductions in this analysis are solely reductions from mobile sources, this analysis uses an estimated cost per ton for NOx emission reductions that is different from the estimated cost per ton for NOx emission reductions used in the main body of the RIA.

- This analysis omits certain unquantified effects due to lack of data, time and resources. These unquantified endpoints include NO_2 health effects, ozone co-benefits, ecosystem effects, and visibility.