The State of New Jersey **Department of Environmental Protection**

ESTIMATED VOC EMISSION REDUCTIONS AND ECONOMIC IMPACT ANALYSIS

FOR

PROPOSED AMENDMENTS TO ARCHITECTURAL COATINGS RULE

June 12, 2003

I. INTRODUCTION

The Department is proposing amendments to its architectural coating rules as discussed in the rule amendment proposal. This document provides additional details on the estimated volatile organic compound (VOC) emission reductions and the economic impact analysis for the rule amendments.

II. ESTIMATED VOC EMISSION REDUCTIONS

The OTC model rule is based on the State and Territorial Air Pollution Program

Administrators and Association of Local Air Pollution Control Officials (STAPPA/ ALAPCO)

model rule for paint, which in turn is based on the California Air Resources Board (CARB)

Suggested Control Measure (SCM) for Architectural Coatings, adopted June 22, 2000. The technical basis for the proposed VOC content limits lies within the framework that the CARB developed for its SCM. Significant technical documentation was developed as part of the CARB process.

Two related rules currently exist regarding consumer products in New Jersey, an existing New Jersey rule and a National rule adopted by the United States Environmental Protection Agency (USEPA) (40 CFR § \$ 59.401 to 59.413). The proposed rule is more stringent than the existing rules. The existing New Jersey rule became effective in January 1990 and regulates 30 coating categories. The National rule regulates 61 coating categories The National rule contains more coating categories than the existing New Jersey rule, however, this has little impact on the

emission reductions, because many of the additional categories are small market share categories.

The proposed rule regulates 55 coating categories. In most cases, these limits are more stringent than those in the existing New Jersey rule and the USEPA National rule. Some coating categories are the same as those in the existing rules and some are unique to the proposed rule.

In the New Jersey 1996 Emission Inventory, volatile organic compound (VOC) emissions from architectural coatings were estimated to be approximately 87 tons per day, on a typical summer day. These emissions are from the following four inventory categories: architectural surface coatings, traffic paints, high performance maintenance coatings, and other special purpose coatings. (The VOC emissions estimates for these categories are based on USEPA guidance, USEPA, EIIP, Volume III, Chapter 3, "Architectural Surface Coatings", November 1995.) These emissions represent approximately 9 percent of the total man-made VOC emissions in the inventory. For additional details on the derivation of these estimates see the "NJDEP State Implementation Plan Revision for the Attainment and Maintenance of the Ozone National Ambient Air Quality Standard, 1996 Actual Emission Inventory and Rate of Progress Plans for 2002, 2005 and 2007", dated March 31, 2001.

It is estimated that the proposed rule will achieve a 31 percent reduction of the architectural coatings VOC emissions inventory, beyond the existing New Jersey rule (and the USEPA National rule which is generally equivalent in emission reductions to the existing New Jersey rule). This data was calculated using a spreadsheet developed by the National Paints and Coatings Association (NPCA) for the USEPA during their regulation development process. It is

the same spreadsheet that the USEPA used to calculate their 20 percent reduction for their National rule. The spreadsheet utilizes estimated 1990 VOC emission data provided by an Industry Insights survey for NPCA. VOC emissions data is subdivided by each coating category in the survey and is broken down by solvent borne and waterborne coatings. The spreadsheet provides options for the constant gallons method or the constant solids method. The emission reductions for this rule were computed on a constant solids basis, assuming the coatings will be manufactured at the new limits. The proposed VOC limits were input into the spreadsheet and a reduction percentage from the 1990 base emissions was calculated. The reduction percentage was adjusted to account for the National rule emission reduction of 20 percent by using the following formula:

Percent Reduction from Proposed Rule, beyond National Rule =

(Percent Reduction from Proposed Rule from 1990 Base
Percent Reduction from National Rule from 1990 Base)/

((100 Percent - Percent Reduction from National Rule from 1990 Base) * 100Percent)

Where: Percent Reduction from National Rule from 1990 Base = 20 Percent

Percent Reduction from Proposed Rule from 1990 Base = 45 Percent

Percent Reduction from Proposed Rule, beyond National Rule =

(45 Percent-20 Percent)/((100 Percent-20 Percent)*100 Percent) =

31 Percent

As part of the regional effort to address the 1-hour ozone additional reduction requirements, the Ozone Transport Commission (OTC) commissioned a study to quantify the

emission reduction benefits of the six rules being prepared for use on a regional basis (Pechan Control Measure Development Support Analysis of Ozone Transport Commission Model Rules, February 5, 2001). As shown in the regional study, the architectural coatings rule is estimated to result in a reduction of VOC emissions of approximately 25 tons per day in New Jersey in 2005.

II. ECONOMIC IMPACT ANALYSIS

General Approach/Data Sources/Assumptions

The analysis and discussion herein is based on the economic analyses performed by the California Air Resources Board (CARB) for their proposed architectural coatings suggested control measures (CARB SCM). The CARB economic analysis can be found in the CARB Staff Report for the Proposed Suggested Control Measure for Architectural Coatings, June 6, 2000. The CARB report may be downloaded from CARB's website at http://www.arb.ca.gov/coatings/arch/sreport/sreport.htm. The Department believes that architectural coating sales in California are comparable to those in the northeast, proportioned by population, for the purposes of conducting this economic analysis. In addition, many manufacturers market coatings nationally, and ten manufacturers account for approximately 75 to 80 percent of the sales volume nationally. In conducting their architectural coating survey CARB contacted 700 coating manufacturers (this includes manufacturers of coatings other than architectural coatings) nationwide requesting product and sales information. Furthermore, the OTC performed an architectural coating survey which indicated that coatings which are currently sold and are compliant with the proposed VOC limits exist in the northeast comparable to in California. The OTC architectural coatings survey can be found in a report prepared by E.H. Pechan and Associates titled "Control Measure Development Support Analysis of Ozone Transport Commission Model Rules" dated March 31, 2001.

Relying on CARB's analyses provides an overall conservative approach because the Department has assumed that manufacturers will incur all the non-recurring costs assumed by CARB for its analyses. This assumption is conservative because in reality for national

manufacturers some of the reformulation costs will only be incurred once to implement

California's regulation and will not need to be incurred again to comply with New Jersey

proposed amendments. In addition, manufacturer's will have to reformulate for the other states in
the northeast region adopting the OTC model rule.

The economic impact analysis accounts for a difference in the industrial maintenance coating limit between the CARB SCM and the New Jersey proposal. In the CARB SCM, the industrial maintenance coating limit of 340 grams per liter is offered as a variance option to the 250 grams per liter limit based on temperature conditions. In the OTC model rule and in the New Jersey proposal, the limit of 340 grams per liter was used as the only limit, based on temperature conditions in the northeast. The calculations presented in this analysis have been modified to account for the higher limit. At the request of the OTC workgroup, representatives from CARB re-calculated cost effectiveness and cost per gallon for the OTC model rule, the results of which are discussed below.

While the proposed table of VOC limits shows numerous product categories, CARB focused their cost impacts analysis on the 11 coating categories from which they are projecting emission reductions outside of the Southern California Air Quality Management District (SCAQMD). The SCAQMD was excluded from the analysis because the CARB SCM was based on the existing rules in the SCAQMD. The CARB SCM establishes VOC content limits for 47 categories (including subcategories) of architectural coatings. These coating categories are very similar to those in existing district rules in California. The CARB SCM lowers limits for only 11 of these 47 categories in California, relative to typical limits currently in effect in California.

These 11 categories account for about 80 percent of the total emissions from the categories in the proposed New Jersey rule. The 11 categories in the analysis are shown in Table 1.

CARB's analysis shows that for nearly all of the 47 coating categories, products are currently available that comply with the proposed limits. For the 11 categories for which they are proposing lower limits than the predominant limits in existing district rules, the complying product market shares range from 13 to 74 percent, with the exception of swimming pool repair and maintenance coatings. For this category, the CARB survey indicated no complying products, but CARB identified technologies that can be used by manufacturers to meet the proposed VOC limit.

A report prepared by E.H. Pechan Associates, Inc. (Pechan Control Measure Development Support Analysis of Ozone Transport Commission Model Rules, February 5, 2001), for the OTC model rule development effort, showed that for the 11 categories analyzed by CARB, the number of compliant products in New Jersey appears to be in the same range as the number of compliant products in California. The percentage of compliant products varies per category, but the results show that compliant products are present in the Ozone Transport Region to an extent comparable to that in California.

Therefore, given the similarity regarding the proportion of emission reductions involved and the complying market share, the economic impact analysis presented is for these 11 categories. For the remaining categories with proposed limits stricter than the existing National and New Jersey rules, it is assumed that the cost effectiveness will be in the same range as the 11 categories presented based on the following:

- The CARB analysis shows that the proposed limits of the remaining categories are consistent with existing limits in California districts;
- The CARB analysis shows that compliant products exist for all of the proposed categories except swimming pool repair and maintenance;
- The limits in the CARB SCM have an effective date of two years prior to the effective date of the proposed New Jersey rule (one year for industrial maintenance coatings); this will allow time for reformulation to take place in California prior to the effective date of the New Jersey limits.

The cost analysis relies on various sources of information. For cost information specific to manufacturers in each coating category, it relied primarily on industry responses to the December 1999 CARB Economic Impacts Survey. It also relies on certain cost information and assumptions contained in the rulemaking records for the 1998 USEPA National Architectural Coatings Rule and the 1999 South Coast Air Quality Management District (SCAQMD) Rule 1113 adoptions.

To determine the cost impacts from changes in raw materials, CARB relied primarily on spot prices reported in Chemical Market Reporter (CMR, 2000) and aggregate ingredient prices reported in the 1997 US Economic Census for Standard Industrial Classification (SIC) 2851 (U.S. Census, 1999). In addition to conservatively using spot prices rather than lower contract prices, they also used the highest shown spot price in those situations when a price range was reported. For other ingredients not shown in these two sources, they used prices reported confidentially by individual coating manufacturers or in literature provided by known coatings experts (e.g., J.A. Gordon, Jr. and R.A. McNeill, A Condensed Comprehensive Course in Coatings Technology,

1992). In those infrequent cases where no price information was available for an ingredient, they applied a default value of \$1.50 per pound, which is higher than most of the ingredients used in the raw materials costs analysis, including the resin costs.

There were four main assumptions used in calculating total annual costs. Two assumptions are based on the rulemaking documentation used to support the 1998 USEPA National Architectural Coatings Rule, while a third is based on the rulemaking documentation for the 1999 SCAQMD amendment of Rule 1113 and comments received from industry representatives.

The first and most important assumption is that manufacturers will need to incur reformulation costs to meet the proposed limits for all their product lines. That is, manufacturers will have to "start from scratch" when determining how to comply with the proposed limits. In reality, however, this is unlikely to be the case because the proposed limits mirror all of the existing 2002 limits in SCAQMD Rule 1113 (except for swimming pool repair). Thus, the majority of manufacturers are likely to have already conducted research and development and have taken other steps necessary to meet the SCAQMD limits. Because of this assumption, the cost analysis may be conservative.

The second main assumption is the USEPA's assumption that, for a typical company, about one-third of its product lines are sufficiently similar enough to each other that no additional reformulation of that one-third is required to meet the limit. That is, once the manufacturer reformulates one of the products in the one-third group, it can transfer that technology to the

remaining products in the one-third group. The remaining two-thirds of the typical company's product lines are then assumed to require a separate and independent reformulation for each line within that group.

The third main assumption is that the actual costs to reformulate are likely to be 1/3 to 1/5 that of the reported costs. In its rulemaking docket, the USEPA stated that it started with a reformulation cost of \$250,000 per coating line, which it ultimately downgraded to \$87,000 per coating line based on comments received from industry. However, the USEPA then stated its belief that even the \$87,000 per coating line figure was probably higher than the true costs to reformulate by a factor of 3 to 5. When it used \$80,000 per reformulation in its recent Rule 1113 amendment, the SCAQMD also indicated that its estimate was probably higher than true costs. This was because the \$80,000 figure was reported for a coating category that was expected to be among the most difficult to reformulate. CARB's 1999 Economic Impacts Survey appears to confirm both statements.

Thus, the CARB 1999 Economic Impacts Survey and the fact that most manufacturers already have to reformulate to meet the SCAQMD limits provide a good foundation for applying a 1/3 multiplier against the reported reformulation costs.

The fourth main assumption is that the resin costs for complying coatings will increase by a certain level. Resin costs are the primary influence on raw materials cost for most coatings and, because there are a variety of resins with differing costs, resins have the most variable impact on raw materials cost. The resin portion of a coating typically represents about 20 percent to 50

percent or more of the total raw materials cost of a gallon of coating. With current ingredient prices as the baseline scenario, CARB conducted complete cost-effectiveness calculations at 10 percent, 20 percent, and 50 percent assumed increases in compliant resin costs. To be conservative, they use the 20 percent resin price increase assumption wherever they refer to the "average" cost-effectiveness of each limit and the overall cost-effectiveness. The 50 percent assumed resin price increase is intended as an extreme upper boundary for purposes of the sensitivity analysis.

Additional secondary assumptions include assuming a project horizon of 5 years and a discount rate of 10 percent throughout the project horizon.

Potential Business Impact

The amendments for architectural coatings would primarily impact manufacturers of architectural coatings (including any person who hires another person to manufacture a coating for them). In order to comply with the rule, manufacturers may have to reformulate some of their products to meet the rule requirements or refrain from selling them in New Jersey for use in New Jersey. Distributors and suppliers will need to ensure proper distribution of products to the appropriate states. Also potentially affected are businesses that supply ingredients and equipment to these manufacturers. Also potentially affected are painting contractors.

According to the 1998-1999 Rauch Guide to the US Paint Industry, there are approximately 40 architectural coating manufacturers located in New Jersey and approximately 26 of these manufacturers have 100 or less employees. According to the National Paint and Coatings

Association (NPCA) website (http://www.paint.org/index.htm) there are approximately 700 manufacturers, suppliers and distributors in the paint and coatings industry nationwide, with approximately \$16.6 billion in annual sales in 1998. Of that total sales, architectural coatings accounted for approximately 38 percent (\$6.3 billion) and special purpose coatings accounted for approximately 21 percent (\$3.5 billion). The remaining 41 percent is made up of original equipment manufacturer product coatings. According to the 1997 Economic Census for Paint and Coating Manufacturing, there are approximately 53,091 employees in the paint and coatings industry in the US. Of this total, approximately 2,207 are in New Jersey and approximately 1,193 are production workers.

In conducting their architectural coating survey CARB contacted 700 coating manufacturers (this includes manufacturers of coatings other than architectural coatings) nationwide requesting product and sales information. CARB received 340 responses with product information, and 25 responses included estimated cost impacts to comply with the CARB SCM. According to CARB, architectural coatings generated about \$7 billion in national sales in 1997, of which an estimated \$870 million was in California. The bulk of this sales volume was generated by a few companies; ten manufacturers account for approximately 75 to 80 percent of the volume. Adjusting CARB's estimates for population, architectural coatings are estimated to have generated approximately \$219 million in sales in New Jersey in 1997.

CARB estimated that the architectural coatings companies sold an estimated total of about 48.2 million gallons of paint and coatings in California outside the South Coast Air Quality

Management District (SCAQMD) in 1996. Adjusting CARB's estimate for population, approximately 29 million gallons of paint were sold in New Jersey in 1996.

The CARB business impacts analysis assumes the scenario in which all costs incurred to meet the proposal are absorbed by the manufacturers. First, total annual costs were calculated. Annual costs include annualized nonrecurring costs (e.g., total research and development, product and consumer testing, equipment purchases/modifications, one-time distributional/marketing changes, etc.) and annual recurring costs (e.g., increases or decreases in raw material costs, labeling, packaging, record keeping & reporting, etc.). The projected annual costs then became the inputs for determining the three main outputs of the economic analysis: the potential business impacts, the potential consumer impacts and the estimated cost-effectiveness.

Then projected annual costs were then divided by annual gallons of architectural coatings sold to result in a producer cost per gallon. The results of these calculations are shown in Table 1.

Table 1: Estimated Producer Cost Per-Gallon for Architectural Coatings

Based on Proposed Amendments to NJAC 7:27- 23 1,2

Coating Category	Estimated Producer Cost Per Gallon ³
	(dollars per gallon)
Flats	(\$0.04)
Industrial Maintenance	\$4.19
Lacquer	\$4.00
Multicolor	\$2.74
Non-flat (low & medium-gloss)	\$0.93
Primers, Sealers, Undercoaters (PSU)	\$4.78
Quick Dry Enamel	\$6.02
Quick Dry PSU	(\$0.35)
Stains	\$1.70
Swimming Pool Repair	\$2.65
WaterProofing Sealers	(\$0.40)
OVERALL RESULTS	\$1.02 4

Notes:

- 1. Table source: CARB Staff Report for the Proposed Suggested Control Measure for Architectural Coatings, June 6, 2000. The table has been modified by CARB for the OTC model rule (and New Jersey rule) to account for a limit of 340 g/l for industrial maintenance.
- 2. Values in "()" are negative (indicates potential cost savings).
- 3. Producer cost per gallon assuming total annual costs were spread out over total annual non-compliant gallons.
- 4. Overall cost per gallon equals total annual costs divided by total non-SCAQMD, noncompliant gallons.

Then CARB conducted a three year average return on equity (ROE) analysis on three sample businesses of different sizes, small, medium and large. ROE is calculated by dividing the net profit by the net worth. Compliance cost was estimated for each business in the analysis and adjusted for Federal and State taxes. The adjusted cost was then subtracted from net profit data. The analysis found that the estimated overall change in ROE ranges from negligible to a decline in ROE of about 2 percent, with an average change in ROE of about 1 percent. A decrease of 10 percent in ROE is used by CARB as a threshold to indicate a potentially significant impact on profitability. According to CARB this threshold is consistent with the thresholds used by the

USEPA and others (CARB Staff Report, June 6, 2000). Therefore, the CARB economic analysis concluded that most manufacturers of architectural coatings would be able to absorb the cost of the proposed amendments with no significant adverse economic impacts.

In addition, the estimated changes to ROE may be conservative for the following reasons. First, annualized costs of compliance were estimated using, in part, the current prices of raw materials. Raw material prices usually tend to fall as higher demand for these materials induces economy of scale production in the long run. Second, affected businesses may not absorb the costs of compliance, they may pass some or all of the costs on to consumers.

Companies that supply raw materials for existing noncompliant paints and coatings may experience a decline in demand for their products. On the other hand, those companies which supply resins, solvents, other chemicals and equipment for use in reformulating architectural coatings could potentially benefit from the proposed amendments as they experience an increase in demand for their products.

Distributors will need to ensure proper distribution of products to the appropriate states.

The Department does not anticipate any significant adverse economic impacts for distributors.

Persons who apply coatings for compensation, or painting contractors, must not purchase coatings from another state which has VOC content limits that exceed the proposed New Jersey VOC limits, and then apply them in New Jersey. In addition, they must follow the thinning instructions on the label, so as not to exceed the proposed VOC limits, and must keep containers

closed when not in use. The Department does not anticipate any significant adverse economic impacts for painting contractors. Potential additional costs of the coatings used by contractors would be similar to the potential additional costs a consumer would experience as discussed below in "Potential Consumer Impact". As discussed below, the estimated potential average cost per gallon increase is \$4.08 per gallon of coating, retail. In addition, the potential consumer impact analysis concluded that prices for general use flat and non-flat paints (eggshell, satin, semi-gloss, gloss), which account for about 60 percent of the sales volume of architectural coatings, are not expected to change significantly as a result of the proposed amendments.

Potential Consumer Impact

An estimated cost per gallon of coating that the manufacturers and retailers may pass on to the consumers by raising the price of coatings that need to be reformulated is discussed below. However, this estimate is conservative because the manufacturers may absorb some or all of the costs of compliance.

As shown in Table 1, the estimated producer (manufacturer) cost increase per gallon, based on the proposed New Jersey amendments, ranges from no cost to \$6.02 per reformulated gallon, with an average of about \$1.02 per gallon. Based on an assumed multiplier of four (i.e., the distributor doubles the purchase price from the manufacturer, and the retailer doubles the purchase price from the distributor), this translates to approximately a \$4.08 per gallon retail price increase, on average. With an average retail price ranging from about \$18.50 to about \$50 per gallon of noncompliant coating, the estimated average potential cost increase would equate to an 8 percent to 22 percent retail price increase for reformulated coatings.

It was estimated by CARB that the majority of retail price increases, if any, would occur in the industrial maintenance and other commercial coating applications. However, the impact of the industrial maintenance coating limit will be less in New Jersey than in California due to the higher proposed VOC limit.

For ordinary household consumers, the projected impacts would most likely be less than the impacts discussed above. This is because household consumers primarily buy flat and non-flat coatings (such as household wall paint). General use flat and non-flat (eggshell, satin, semi-gloss, gloss) coatings account for about 60 percent of the sales volume of architectural coatings. The analysis projected no price increase for flat paints and a maximum potential price increase of \$3.72 for non-flat paints. Prices for flat and non-flat paints are not expected to change significantly as a result of the proposed amendments. The reformulation of these categories of coatings do not impose a significant technical challenge to the paint and coating manufacturers as shown by the number of products that currently exist in the market that comply with the proposed VOC limits. In addition, consumers who do not wish to purchase the reformulated coatings may still be able to buy coatings that currently exist in the market that comply with the proposed VOC limits. The competition from these existing compliant coatings will likely constrain any price increases for the reformulated coatings. Thus, for most household consumers who purchase coatings such as flat and non-flat wall paint, the proposed amendments should not have a significant impact on the prices such consumers encounter.

According to the CARB analysis, currently, there are no noticeable differences between the market prices for compliant and noncompliant products in California. Given the availability of

good substitute products, it appears unlikely that affected businesses will pass on the cost increases to consumers, at least in the short run. In the long run, however, if businesses are unable to bring down their costs of doing business, they may pass their cost increases on to consumers.

Cost Effectiveness

The cost-effectiveness of a proposed limit is generally defined as the ratio of total dollars to be spent to comply with the limit (as an annual cost) to the mass reduction of the pollutant(s) to be achieved by complying with that limit (in annual pounds or tons). The cost-effectiveness is presented to show the proposal's cost-efficiency in reducing a pound of VOC.

As shown in Table 2, the estimated cost effectiveness of the proposed amendments for each product category ranges from no cost (net savings) to approximately \$7.65 per pound of VOC reduced, with an average for all of the categories analyzed of \$2.79 per pound of VOC reduced or \$5,580 per ton of VOC reduced.

Table 2: Estimated Cost-Effectiveness for Architectural Coatings Based on Proposed Amendments to NJAC 7:27- 23 ^{1, 2}		
Coating Category	Estimated Cost-Effectiveness ³ (dollars per pound VOC reduced)	
Flats	(\$0.30)	
Industrial Maintenance	\$6.07	
Lacquer	\$1.59	
Multicolor	\$2.83	
Non-flat (low & medium-gloss)	\$4.37	
Primers, Sealers, Undercoaters (PSU)	\$7.65	
Quick Dry Enamel	\$3.97	

Quick Dry PSU	(\$0.25)
Stains	\$2.14
Swimming Pool Repair	\$0.83
WaterProofing Sealers	(\$0.50)
OVERALL RESULTS	\$2.79 4

Notes:

- 1. Table source: CARB Staff Report for the Proposed Suggested Control Measure for Architectural Coatings, June 6, 2000. The table has been modified by CARB for the OTC model rule (and New Jersey rule) to account for a limit of 340 g/l for industrial maintenance.
- 2. Values in "()" are negative (indicates potential cost savings).
- 3. Using 20 percent resin price increase assumption
- 4. Total annual costs divided by total annual emission reductions

The cost-effectiveness estimates in Table 2 assume a 20 percent increase in resin prices. CARB also calculated cost effectiveness with three other assumed resin prices which are 1.) baseline or existing price, 2.) a 10 percent increase and 3.) a 50 percent increase. The CARB cost-effectiveness results ranged from \$2.72 per pound of VOC reduced at baseline conditions to \$3.88 per pound of VOC reduced with a 50 percent increase in resin price. These cost-effectiveness results are conservative for New Jersey and would be expected to be slightly lower for these proposed amendments due to the higher limit for industrial maintenance coatings in these amendments.

Cost to the Department

Additional Department resources may be needed to implement the proposed amendments.

Resources will be needed to organize the date code information submitted to the Department by the manufacturers and to continue to evaluate CARB research and technology reviews.

Resources will also be needed to enforce the rule.

Additional information regarding the economic impact analysis can be found in the CARB Staff Report for the Proposed Suggested Control Measure for Architectural Coatings, June 6, 2000. The CARB report may be downloaded from CARB's website at http://www.arb.ca.gov/coatings/arch/sreport/sreport.htm.