APPENDIX L

Controlled Emission Inventory Development

APPENDIX L: CONTROLLED EMISSION INVENTORY DEVELOPMENT

INTRODUCTION

The 2001 emission inventories presented in Appendix E were modified to determine the effects of control measures, adopted as part of the PM_{10} State Implementation Plan (SIP), on significant sources. Although other control measures are in place for many of the emission categories, only those measures adopted as part of the SIP were used to develop the controlled inventories. Vehicular emissions were calculated using the MOBILE5b and Part5 models. These models take into account the federal programs for vehicle emission controls for both the annual and 24-hour inventories, although vehicular emissions are an insignificant source for the annual National Ambient Air Quality Standard (NAAQS).

The overall effectiveness of each of the control measures was determined for each of the source categories. Based upon the control effectiveness, reductions in the inventory were made and the proportional decrease in concentration calculated. Because the overall effectiveness of several control measures changed from 2001 to 2006, the 24-hour 2006 emission inventory and overall emission reduction is discussed as well.

OVERALL CONTROL MEASURE REDUCTIONS

Overall control measure reduction is the actual reduction that can be achieved when the control measure is properly applied to a specific activity or source. Overall reduction is the product of emission reduction, rule penetration, and rule effectiveness. Emission reduction is the quantity of PM_{10} that would not be emitted when the control measure is in place. It is calculated by dividing the emissions that occur after the control measure is applied by the emissions that occur before the control measure is applied. Rule penetration is the percentage of a source category that a particular rule will impact. For example, the unpaved road rule applies to roads with average daily trips of 150 vehicles or greater, not to all (100 percent) of the unpaved roads. Rule effectiveness is used to denote the rate of compliance with a rule. The U. S. EPA default value for rule effectiveness is 80 percent,[1] although areas also have the option to derive local category-specific rule effectiveness factors based the following criteria:

- the nature of the regulation;
- the nature of the compliance procedures;
- the performance of the source in maintaining compliance over time; and

[1] *Rule Effectiveness Guidance: Integration of Inventory, Compliance, and Assessment Applications,* (EPA 452/R-94-001) January 1994, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

- the performance of the implementing agency in assuring compliance.[2]

The ability to enforce a rule adequately is considered when estimating rule effectiveness. It is estimated that 15 additional enforcement staff members will be required to adequately enforce the new rules adopted as control measures for the PM_{10} SIP (see Chapter 4). The District Board of Health has committed to hiring this staff and efforts are underway to hire and train these personnel. It is anticipated that all additional staff members will be in place by January 1, 2002. Because not all new staff will be in place by January 1, 2001, rule effectiveness during 2001 has been lowered. The overall control measure reduction for 2001 has been calculated separately from 2006 when all staff members will be in place and rule effectiveness will be estimated at 80 percent.

An element of effective enforcement is the penalty cost associated with noncompliance. In reviewing the effectiveness of the Clark County AQR, staff compared the minimum penalties for dust violations contained in Section 9 of the AQR with those of other air regulatory agencies and found that Clark County's minimum penalties were among the highest in the nation. Clark County has emphasized stringent minimum penalties because fugitive dust violations typically do not reach sufficient magnitude to justify assessing fines at the top of the violation scale and because the limit on maximum penalties is set by the state.

Under Section 9 of the AQR, the minimum penalty for violating the requirements for limiting visible emissions is $2,000. The minimum penalty for not complying with other control measure provisions is $1,000. Minimum penalties for failing to comply with administrative requirements related to permit conditions is $500 and minimum penalties for failing to comply with other administrative requirements is $250.

Emission Reductions

Emission reductions are source category specific. Although a single control measure may control more than one source category (for example, the vacant land rule controls both wind erosion from vacant land and off-road racing), the emission reduction may be different. Therefore, emission reduction will be discussed based upon each significant source category.

[2] *Procedures for Estimating and Applying Rule Effectiveness In Post 1987 Base Year Inventories For Ozone and Carbon Monoxide State Implementation Plans,* 1989, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

Wind Erosion – Vacant Land, Construction, Unpaved Parking and Race Tracks

Emission reductions for unstable land are based upon the emission factors for a stabilized parcel having the same meteorology (See Appendix C). The emission factor for stabilized land is the average of the emission factors for parcels treated with seven different control measures including watering. The factor also accounted for disturbance of controlled parcels. This emission factor will be used because there is no way to predict which emission control measures a landowner may choose for his/her parcel, or the potential for vehicle traffic once the parcel has been stabilized. The mean emission factors for stabilized land were divided by the mean emission factor for unstable land by wind classification. The results of each of these ratios is less than 9 percent, or greater than a 91 percent reduction. As the reduction was greater than 91 percent in each case, 91 percent was used as a minimum reduction.

The 91 percent emission reduction will be used in the valley-wide inventories for unpaved parking lots. In several areas of the valley, impromptu lots are established adjacent to roadways to sell wares, including used cars. Inventorying these lots was not feasible, so these disturbed areas were inventoried as disturbed vacant land. The control measure for disturbed vacant land was applied to the valley-wide inventories. The requirements for disturbed vacant land will eliminate the establishment of these impromptu lots.

Construction Activities

Watering is the primary method used by the construction industry to stabilize disturbed portions of a site that is being actively worked or left for short periods of time. The Section 94 Handbook of Best Management Practices, used for the development of dust mitigation plans for dust permits under Section 94 of the Air Quality Regulations (AQR), requires the use of tackifiers and surfactants as well.

Several studies have been done to determine the effectiveness of watering on construction sites. As described above, stabilizers have at least 91 percent effectiveness on vacant disturbed land. This reduction will be used for soil not being actively disturbed on construction sites. In a 1988 EPA report[3], 50 percent control efficiency was given for using water. The report did not detail wind speeds, soil types, or which construction activities were tested. In a later report by Grelinger,[4] an equation was developed to predict a control efficiency based on wind speeds. Observations in a recent study by Fitz[5] confirmed the equation by Grelinger demonstrating a reduction percentage of 90 percent 13 meters per

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[3] *Control of Open Fugitive Sources* (EPA 450/3-88-008) September 1988, United States Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina.

[4] Grelinger, M. A; *Gap Filling PM_{10} Emission Factors for Selected Open Area Dust Sources*, (EPA-450/4-88/003), 1988.

[5] Fitz, D.R., Bumiller; *Evaluation of Watering to Control Dust in High Winds*, Journal of the Air & Waste Management Association **2000** 50, 570-577.

second, while the Grelinger equation predicted 83 percent. One reason the Fitz study achieved a greater control rate predicted by the equation was the water application rate of 1.4 gallons per hour per square yard. Given the lack of details in the EPA report, and because the Grelinger equation was independently verified by Fitz, the 83 percent reduction for construction activities appears to be the best substantiated estimate of emission reduction for construction activities. Although none of these studies included the use of tackifiers or surfactants, they did test the effectiveness of water that is included in the best management practices for construction activities adopted by Clark County. It is likely that the best management practices adopted by Clark County that include the use of tackifiers and surfactants, the effective application of water, and an overall strengthening of dust control requirements will produce a higher percentage of emission reductions. By averaging the 91 percent reduction for soil not being moved with the 83 percent reduction established by Grelinger for construction activities, an emission reduction percentage for construction activities of 87 percent was calculated. This is still a conservative estimate because the construction activities estimate does not include the added emission reduction benefit of tackifiers and surfactants.

One of the requirements of Section 94 of the Clark County Health District Air Quality Regulations is that dust permit holders must notify the Air Quality Division (AQD) within seven days when a construction project is completed. The permit holder must also inform the AQD in writing of the method used to stabilize the entire site. If sites are to be left inactive for 30 days or more, the AQD must be notified and a longer term form of stabilization is required. The site must be stabilized throughout the lapse in construction. Therefore, it is assumed inactive construction sites have the same emission factor as stabilized vacant land. This factor has been averaged into the overall emission reduction factor for construction activities.

Track Out

The emissions from track out onto paved roadways are directly related to the silt loading increase resulting from the deposited material. A number of measurements of silt loading on roadways within the Las Vegas Valley were taken before and after construction site egress points.[6] Several different track out control measures were being used at the construction sites, including gravel pads and wheel shakers. The silt loading increase from track out is a factor of 3.28 without any statistical variation based upon the control measure used. Using this factor to calculate the emission rate as described in Appendix B, the resulting emissions increase is 28 percent. It is assumed all track out will occur onto local roadways because construction egress points are placed along the roadways with the least amount of traffic. Also, the local roadways have the highest silt loading measurements, resulting in a higher track out silt loading and a conservative (higher) estimate of emissions from this category. Therefore, the

[6] *Silt Loading Measurements for Clark County Paved Roads*; submitted to Clark County Regional Transportation Commission by Dames & Moore, March 2000.

emission reduction that would take place by controlling track out has been estimated to be 28 percent for emission inventories.

Unpaved Road Dust

The emission factor for unpaved roads, assuming no controls, was calculated to be 3.27 pounds per Vehicle Mile Traveled (VMT) as presented in Appendix B. This emission rate assumes an average vehicle weight of 3 tons calculated from the vehicle fleet mix based on Department of Motor Vehicle registration information. It is also assumed vehicles will travel roughly at the same speed along each unpaved road. Using the average silt loading for local roads of 1.69 grams per square meter, the emission factor for paved roads is calculated to be 0.014 pounds per VMT. Paving a road would result in a 99.6 percent reduction in emissions. As described in Appendix B, none of the private roads inventoried have more than 50 vehicle trips per day and do not require control measures. The Public Works Departments from all the affected governmental agencies have decided to pave the unpaved roads with greater than 150 vehicle trips per day because their cost effectiveness analysis showed stabilization was not cost effective. Therefore, a 99 percent emission reduction was assumed for the category.

Paved Road Dust

Paved road dust reduction can be divided into two categories: reduction of silt loading on roadways with unimproved shoulders and reduction on roadways with improved shoulders. The Clark County governmental agencies' Public Works Departments have made a commitment to pave or stabilize unimproved shoulders. The details of this commitment are presented in Chapter 4. Based upon the silt loading measurements taken,[7] local and collector streets without improved shoulders but with a minimum 15-foot wide travel lane would have a silt loading of 24.7 g/m^2 compared with a silt loading of 1.69 g/m^2 or 0.86 g/m^2 respectively. There are some major and minor arterial roadways within the nonattainment area without paved shoulders but with gravel shoulders. The silt loading for roadways with gravel shoulders was 1.34 g/m^2 compared to 1.04 g/m^2 for minor arterial roadways and 0.49 g/m^2 for major arterial roadways. The overall percent increase in silt loading when compared to roadways with improved shoulders is 69 percent, but varies from 22 percent (minor arterial roadways) to 97 percent (collectors) depending on roadway classification. Due to the variability of the silt loading reduction, the reduction was calculated based upon roadway classification and a linear rollback was not applied. Table L-1 provides an example of how the reduction was calculated using the U. S. EPA emissions equation presented in Appendix B.

[7] Ibid.

Table L-1
Roadways with Unimproved Shoulders Emission Reduction Calculations

Roadway Classification	2006 Daily Vehicle Miles Traveled	Emission Factor (g/mile)		PM_{10} Emissions (tons/day)	
		Uncontrolled	Controlled	Uncontrolled	Controlled
Minor Arterial	1,324,585.64	5.63	4.77	8.22	6.96
Major Arterial	918,137.01	5.63	2.93	5.70	2.96
Collector	201,647.74	37.4	4.22	8.31	0.94
Local	381,589.05	37.4	6.57	15.73	2.76
Total	**2,825,959.4**			**37.96**	**13.63**

The percent reduction varies by roadway category from 15 percent to over 88 percent.

For roadways with improved shoulders, silt may be deposited by the following sources:

- Construction track out;
- Construction wind erosion;
- Paving transitions (unpaved lots, roads, and parking lots to paved roads);
- Spillage from trucks;
- Unpaved shoulders track on; and
- Vacant land wind erosion (including unpaved shoulders).

Construction track out and unpaved shoulder track on were measured directly and the contribution to silt loading on paved roads from these sources measured separately from the default silt loading values. The silt loading measurements for roadways within the Las Vegas Valley were not taken near paving transition points or when obvious signs of spillage were present.[8] Of the remaining four sources of silt on paved roadways, direct measurements have not been taken. From the location of the measurements and the activities surrounding the measurement locations, there is no justification to not assume the four remaining sources of silt are equal contributors to the silt loading found on the roadways. Therefore, it is assumed that each of the four sources: construction wind erosion, paving transitions, spillage, and vacant land wind erosion, each contribute 25 percent to the silt found on the paved roadways.

Wind erosion from construction sites and vacant land will be controlled from SIP-adopted control measures. The overall control reduction for wind erosion from construction sites is 36 percent in 2001 and 71 percent in 2006 (See Table L-2). The overall control reduction for wind erosion from vacant land is 36 percent in 2001 and 72 percent in 2006. Reducing 36 percent of 50 percent (25 percent from construction and 25 percent from vacant land) of the silt loading would lead

[8] ibid

to an overall reduction of 18 percent. Conservatively, Clark County has assumed a 15 percent reduction in silt loading from the control of wind erosion sources in 2001. Similarly, reducing 71 percent of 25 percent (construction reduction) and 72 percent of 25 percent (vacant land) would lead to an overall reduction of 36 percent. Again, Clark County has conservatively assumed a 30 percent reduction is silt loading from the control of wind erosion sources in 2006. The actual reduction will be measured by further silt loading studies committed to in Chapter 4 of the SIP.

Freeways and interstates are not always at grade or bordered by sound walls that would prevent the deposition from disturbed vacant land and construction activities. Vacant land and construction impacts on freeways and interstates is assumed to be minimal so no silt loading or corresponding emission reduction has been assumed for these roadway classifications. The equation relating silt loading to emission rate is not linear (See Appendix B) so the actual emissions reduced were based upon the roadway mix in each inventory.

Unpaved Parking – Vehicles

Emissions from unpaved parking lots were calculated in the micro-scale inventories using a silt content of 12 percent.[9] Section 92, adopted as a SIP measure by the Clark County Board of Health, defines an unpaved parking lot as stable if the measured silt content is 8 percent or less. Using the U. S. EPA approved algorithm for unpaved roads published in AP-42 and presented in Appendix B to calculate emissions, the emission reduction achieved by reducing the silt content from 12 percent (2.6 lb/VMT) to 8 percent (1.88 lb/VMT) is 28 percent.

If unpaved parking areas are paved rather than stabilized, Section 92 has a limit on silt loading of 100.7 g/m^2 (0.33 oz/ft^2). Using the AP-42 emission algorithm for paved surfaces, the resulting emission factor becomes 0.20 lb/VMT. This is a reduction of 92 percent or greater as the silt content is an EPA default factor. The average silt in native soils is 16 percent, so actual reductions may be greater.

Either method can be used to stabilize an unpaved parking lot. It is not known at this time which option will be used. It is more cost effective for larger, frequently used lots to be paved. It is reasonable to assume the areas with the largest emissions will achieve the greater emission control. Therefore, as a conservative estimate, the average of the two methods was used for the emission reduction. The average of 28 percent and 92 percent is 60 percent. This emission reduction was applied to the unpaved parking areas located in the Craig Road and Pittman micro-scale sites. Unpaved parking lots were not found in any of the other micro-scale areas.

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[9] *PM_{10} Emission Inventory of Sources Surrounding Five Ambient Monitoring Sites in the Las Vegas Valley*; submitted to Clark County Department of Comprehensive Planning by Dames & Moore, April, 2000.

Race Track – Vehicles
Section 90 of the AQR prohibits the use of motor vehicles on vacant land. Therefore, motorcycles and other recreational vehicles will not be allowed on vacant property. The emission reduction from this source would be 100 percent.

Rule Penetration

Rule penetration is based upon the fraction of the source category affected by the control measure. If each source within a source category emits at the same level, then the percent rule penetration and the percent of individual sources being affected by the rule are the same. If there is a difference in the emissions by each source within a source category, then the percent rule penetration is based upon emissions, not upon the population of the source. An example is the unpaved roads inventory. The emissions from a mile of unpaved roadway are based upon the number of vehicles that travel that road each day. For unpaved roads, 29 percent of the unpaved roads produce 72 percent of the emissions. Therefore a rule affecting 29 percent of the roads would have a rule penetration of 72 percent.

Discussed below is the rule penetration for each applicable source category. Rule penetration is not discussed for paved road dust on roads with improved shoulders as the emission reduction for paved road dust on these roadways is taken from the reduction of disturbed vacant land and construction sites, and not by a specific measure to remove silt from paved roads. The rule penetration for the rules pertaining to the sources that contribute to paved road dust on roadways with improved shoulders is discussed.

Wind Erosion – Vacant Land, Unpaved Parking and Race Tracks
Section 90 of the AQR requires vacant land lots 5,000 square feet and larger to be stabilized if they are found to be unstable using the test methods prescribed in the rule. The Clark County Assessor maintains a database of all parcels within the county regardless of size. The database also tracks if a parcel or a portion of the parcel is vacant. The Clark County Assessor's database was queried to determine the percentage of vacant land parcels less than 5,000 square feet. Less than one percent of vacant land within the Bureau of Land Management (BLM) disposal boundary was from parcels less than 5,000 square feet. Therefore the rule penetration for the vacant land rule was estimated at 99 percent.

Unpaved parking lots and racetracks were included in the inventory of vacant land acreage. Therefore, the rule penetration for these categories is 99 percent as well.

Construction - Activities, Wind Erosion and Track Out

Section 94 of the AQR applies to all construction sites. Construction sites one-quarter acre and larger require a dust control permit. The rule applies to construction activities, disturbed area stabilization, and track out. A review of construction activities permits that have been previously issued showed that sites less than one-quarter acre accounted for less than 1.5 percent of all construction permits. Therefore, the rule penetration was set conservatively at 98 percent for construction emission categories.

Unpaved Road Dust

Section 91 of the AQR became effective on January 1, 2001 and requires the stabilization of unpaved roads with Average Daily vehicle Trips (ADT) of 150 or greater. One-third of existing unpaved roads with ADT of 150 or greater are required to be stabilized by the owner or responsible agency every year for three years beginning in 2001, so that by December 1, 2003, all existing unpaved roads with ADT greater than or equal to 150 are stabilized. The inventory of unpaved roads presented in Appendix B assumes that all factors being equal (e.g., vehicle weight and vehicle speed), 66 percent of the emissions from unpaved roads are from roads with ADT of 150 or greater. Therefore the rule penetration of Section 91 is as follows:

2001	22 percent;
2002	44 percent; and
2003	66 percent.

For years beyond 2003, rule penetration will remain at 66 percent.

Paved Road Dust – Unimproved Shoulders

Unimproved shoulders are shoulders or medians with less than four feet of stabilized surface for each outside traffic lane. Section 93 of the AQR prohibits the building of roadways without unimproved shoulders and requires that existing roadways with unimproved shoulders be improved within 365 days of discovery. The emission inventory for the SIP includes roadways without improved shoulders that have been identified or "discovered." Therefore, rule penetration for these roadways was assumed to be 95 percent since it is a governmental responsibility to inventory the unimproved shoulders, funds are available, and all governmental entities have committed to paving the unimproved shoulders. The same rule penetration applies to all roadway categories, as the rule applies to all categories and the commitment for paving is for all roadway categories.

Unpaved Parking – Vehicles

The Clark County Air Quality Division moved forward with an unpaved parking lot rule that was approved and implemented by the Board of Health on June 22, 2000. This rule requires all unpaved parking lots regardless of size to be stabilized. Rule penetration is 100 percent for this rule.

Race Tracks – Vehicles
The vacant land rule applies to over 99 percent of the vacant land in the nonattainment area. Section 90 requires vacant land owners to prevent off-road vehicle use and stabilize the land. Based upon these factors, the rule penetration for race track vehicles is 99 percent.

Rule Effectiveness

Rule effectiveness is a measure of the rate of compliance with a rule. A standard default of 80 percent has been used for all rules as fully implemented unless noted below. This level of rule effectiveness is based upon the four criteria established by the U.S. EPA and previously described.

Wind Erosion – Vacant Land, Unpaved Parking and Race Tracks
Section 90 of the AQR is not an update of a previous control measure. The AQD has committed to hiring ten new enforcement department staff members to implement enforcement for this source category. This hiring process has begun and it is anticipated to be complete by December 31, 2001. Therefore, the 80 percent rule effectiveness will be in place by January 1, 2002.

The hiring process is anticipated to continue throughout 2001. As new staff is hired they will begin to augment the enforcement process. Therefore, rule effectiveness will be "ramping up" during 2001. For these reasons, a rule effectiveness of 40 percent was used as a default prior to 2002.

The AQD is prioritizing area inspections based on information from satellite imagery and air photos, previous observations by AQD enforcement staff, areas known to have problem soils, and complainants. Satellite imagery and air photos provide an overview of the degree of soil disturbance in different parts of the valley. This information is combined with the enforcement staff's knowledge of the valley and soil issues to prioritize areas for inspections. In addition, enforcement staff responds to complaints about dust from disturbed areas and unpaved parking lots as they occur.

Construction – Activities, Wind Erosion and Track Out
A similar increase in enforcement staff has been committed to by the AQD for construction. Currently, there are seven enforcement officers that inspect construction sites. The AQD has committed to hiring three additional enforcement officers to enforce the new Section 94 regulation. Clark County believes that ten enforcement officers are sufficient to adequately enforce Section 94 requirements. The hiring process has begun for these new officers has begun and it is anticipated to be complete by December 31, 2001. Due to the current 30 percent deficit in enforcement officers, the default rule effectiveness has reduced 24 percent (30 percent reduction of 80 percent) in 2001 to 56 percent due to the lack of sufficient enforcement.

The AQD enforcement program places an emphasis on prevention and education. The object of the program is to prevent emissions, not write tickets. To achieve this objective, enforcement staff has and is continuing to conduct educational workshops and dust control classes to educate industry on the necessity and means to comply with the AQR. The AQD has also published and distributed large numbers of a "Quick Look Book" summarizing the Section 94 AQR requirements in an easy to understand format. Enforcement officers are each assigned areas of responsibility. Complaints are inspected on a priority basis. Enforcement officers inspect construction sites within their assigned area on a routine basis. They also inspect non-permitted construction activities as they are encountered in the field.

Another criterion for rule effectiveness has not been fully met for construction activities. Section 94 does not have acceptable test methods for construction activities. Clark County has made a SIP commitment to conduct further studies to develop an acceptable test method. If the results of additional studies do not show an acceptable test method, the opacity method for unpaved roads will be presented to the governing board for adoption. Either through research and development or through the application of the opacity method for unpaved roads, an acceptable test method will be presented for adoption by 2003.

While acceptable test methods are being developed, Section 94 will still be enforced using 20 percent opacity and 100-yard plume standards (See Appendix G). Though these standards do not provide the full rule effectiveness as acceptable test methods, they do provide adequate rule effectiveness. It is estimated that these standards provide 80 percent of the effectiveness as acceptable test methods. Therefore, the default rule effectiveness has been reduced 16 percent (20 percent reduction of 80 percent) due to the lack of acceptable test methods.

The overall rule effectiveness for construction activities is 40 percent (80 percent minus 24 percent for reduced enforcement and 16 percent for acceptable test methods) in 2001, rising to 64 percent in 2002 (80 percent minus 16 percent for lack of acceptable test methods) in 2002. Rule effectiveness for construction sources reaches 80 percent by 2003 and remains at this level. Although the test methods only apply to construction activities, the same level of rule effectiveness was used for all three construction sources for simplification.

Unpaved Road Dust

Source categories where defaults are not being applied include categories where compliance with a rule is performed by a governmental agency. Governmental agency compliance occurs for unpaved roads and unimproved shoulders. Commitments have been made to pave the unpaved roads within the time frame required and funding has been procured. The road paving will be done as part of the local agency's capital improvement program. Unpaved road paving will be tracked using an extranet site accessible to the Clark County Health District Air Quality Division, the Clark County Department of Comprehensive Planning, and U.S. EPA. Using the U. S. EPA criteria for establishing rule effectiveness, the program was rated as follows:

- The nature of the regulation – the regulation was rated 100 percent as there was no ambiguity regarding which roads required stabilization, by when they were to be stabilized, what methods were appropriate for stabilization, and effective test methods that were included.

- The nature of the compliance procedures – paving of unpaved roads has a highest emission reduction rate of any unpaved road control estimated to be effective for up to 20 years. Funding for the paving has been secured. The compliance procedures were rated at 100 percent.

- The performance of the source in maintaining compliance over time – the Public Works Departments in Clark County track paved road performance and maintenance using a computer tracking system. The condition of paved roads are routinely checked and documented. As the roads are under the control of governmental agencies with written procedures and quality control plans, the performance of the source was rated at 100 percent.

- The performance of the implementing agency in assuring compliance – as the extranet web site will be in place and available to AQD and EPA; the compliance can be quickly verified by driving on the road; and AQD control officers will be able to daily confirm the status of each roadway, the performance of the implementing agencies was rated at 100 percent.

Recognizing that 100 percent rule effectiveness will be difficult to achieve in practice, the rule effectiveness for the unpaved roads has been determined to be 99 percent.

Paved Road Dust

Funding has been identified to improve unimproved shoulders and a plan is being developed to complete the work. The time frame for improving the shoulders has not been provided by the Public Works Departments of the governmental agencies within the nonattainment area though a SIP commitment has been made to complete the improvement of unpaved shoulders by December 31, 2006. Therefore, rule effectiveness for unpaved shoulders has been decreased to 50 percent for 2002 through 2005 and is being raised to 95 percent for 2006 as governmental agencies have made commitments to complete the work before the end of 2006. The same criteria that was described for unpaved roads was used. The rule effectiveness was downgraded slightly from the rule effectiveness for unpaved roads, as the unimproved shoulders will not be tracked via an extranet site. The unimproved shoulders program will be reviewed annually by Clark County and the rule effectiveness and emission inventories updated as appropriate. Public agencies and owners of roads subject to these requirements must submit annual reports to the AQD to assist in the tracking of the program to stabilize unimproved shoulders. The rule effectiveness is the same for all roadway categories, as the commitments apply to all roadways with unimproved shoulders regardless of category.

Rule effectiveness for silt reduction on paved roads with improved shoulders cannot be evaluated directly because the reduction will be realized by the control of disturbed vacant land and construction sites. Because the rule effectiveness in 2006 will be twice that in 2001 for the other sources being controlled, it is assumed that 15 percent of silt loading will be reduced in 2001 and 30 percent in 2006.

Control Reduction Results

Presented in Table L-2 are the overall control reductions for the affected source categories for 2001 and 2006. The overall control reductions were calculated by multiplying the emission reduction, rule penetration, and rule effectiveness percentages together. For paved road dust emission reductions, the percentage of silt loading reduction is presented in the column entitled Emission Reduction. The Overall Control Reduction shown in Table L-2 was not applied to these source categories, and emission reductions were calculated based upon specific silt loading reductions by roadway category.

Table L-2

Overall Control Reductions for 2001 and 2006 (Percent)

Source Category	Emission Reduction	Rule Penetration		Rule Effectiveness		Overall Control Reduction	
		2001	2006	2001	2006	2001	2006
Unstable Vacant Land	91	99	99	40	80	36	72
Construction							
Wind Erosion	91	98	98	40	80	36	71
Activities	87	98	98	40	80	34	68
Track Out	28	98	98	40	80	11	22
Unpaved Road Dust	99	22	66	99	99	22	65
Paved Road Dust							
Improved Shoulders	30[1]	-	-	-	-	N/A	N/A
Unimproved Shoulders	69[1]	95	95	N/A	95	N/A	N/A
Unpaved Parking							
Wind Erosion	91	99	99	40	80	36	72
Vehicles	60	100	100	40	80	24	48
Race Tracks							
Wind Erosion	91	99	99	40	80	36	72
Vehicles	100	99	99	40	80	40	79

[1]The percent emission reduction is presented as the percent silt loading reduction. Because there is not a linear relationship between silt loading and emission rates, the actual emission reductions will vary with the roadway mix in each inventory area.

2001 CONTROLLED ANNUAL INVENTORIES

The overall control reductions for 2001 were applied to the J. D. Smith annual and valley-wide annual 2001 inventories. The control reduction was applied to the J. D. Smith inventory first before being applied to the valley-wide annual. The J. D. Smith site is the only site that exceeds the annual NAAQS and the site where attainment must be demonstrated.

The overall control reduction was applied as a percentage to the uncontrolled inventory for all source categories except paved road dust, construction – wind erosion, and unpaved road dust. The reduction calculated in each of these source categories is described below for each inventory.

Paved Road Dust Control Reduction Calculations

The emission reduction of 15 percent for paved road dust is a reduction in silt loading. Because the equation for calculating emissions from silt loading is not a linear equation (see Appendix B), the corresponding emission reduction is not 15 percent. Silt loading also varies based upon roadway category. For this reason the emission reductions for paved road dust were calculated by reducing the silt loading by 15 percent in the micro-scale area surrounding the J. D. Smith site and the corresponding emissions reduction calculated. No silt loading or emission reduction was calculated for freeways. The emission reduction in the micro-scale area is presented in Table L-3. The overall emission reduction calculated for paved road dust within the micro-scale area in 2001 was ten percent.

Table L-3

Paved Road Dust PM_{10} Emission Reduction for the 2001 J. D. Smith Micro-Scale Inventory (tons/year)

Roadway Classification	2001 Annual Average Vehicle Miles Traveled	Emission Factor (g/mile)		PM_{10} Emissions (tons)	
		Uncontrolled	Controlled	Uncontrolled	Controlled
Collectors	264,806,595	4.22	3.79	1,231.8	1,106.3
Minor Arterial	508,063,628	4.77	4.29	2,671.4	2,402.6
Major Arterial	251,384,540	2.93	2.63	811.9	728.8
Freeway	182,419,757	0.37	0.37	73.6	73.6
Total				**4,788.7**	**4,311.3**

The controlled annual valley-wide inventory is based upon the attainment demonstration at the J. D. Smith micro-scale site. The controls used to demonstrate attainment within the J. D. Smith micro-area were applied to the valley-wide annual inventory without regard for additional controls that may have been applied to the valley-wide inventory. For example, there were no paved roads with unimproved shoulders inventoried in the J. D. Smith micro-scale area, so no reduction for this emission category was applied to the valley-wide inventory. Although a larger percentage emission reduction would occur on a valley-wide basis due to a different roadway mix (less percentage of VMT traveling on freeways where no silt reduction was estimated to occur), a ten percent reduction in paved road dust emissions was also applied to the annual inventory. This methodology was used to demonstrate that attainment could be achieved on a valley-wide basis using the lower of the percent reductions calculated.

Unimproved shoulders were not located within the micro-scale area and not included in the J. D. Smith inventory. Therefore, no reduction in emissions from improving shoulders was calculated in the valley-wide inventory.

Presented in Table L-4 are the paved road dust emission reductions for the valley-wide annual inventory based upon the actual reductions realized within the J. D. Smith micro-scale area. Paved road dust emissions from silt loading were reduced ten percent while increased silt loading from unimproved shoulders remained unchanged.

Table L-4

Paved Road Dust PM_{10} Emission Reduction for the 2001 Valley-Wide Annual Inventory

Source	Uncontrolled PM_{10} Emissions (tons)	Controlled PM_{10} Emissions (tons)
Paved Road Dust	41,115	37,004
Unimproved Shoulders	13,236	13,236
Total	**54,351**	**50,240**

Construction – Wind Erosion Control Reduction Calculations

Wind erosion emissions from construction sites were calculated assuming that a percentage of each construction site was already controlled under regulations already in place and not measures adopted as part of the SIP. The percent reduction calculated for the SIP-adopted measures would apply to those portions of the site not already being controlled. Therefore, the emission reduction was calculated on only a portion of the total wind erosion emissions.

Table L-5

Construction – Wind Erosion PM_{10} Reductions for 2001 J. D. Smith and Annual Valley-Wide Inventories (tons)

Source	J. D. Smith		Annual Valley-wide	
	Uncontrolled	Controlled	Uncontrolled	Controlled
Stabilized Land	2.35	2.35	308.71	308.71
Unstable Land	107.41	68.74	19,537.98	12,504.3
Total	**109.76**	**71.10**	**19,846.68**	**12,813.01**

Unpaved Road Dust Control Reduction Calculation

No unpaved roads with greater than 150 vehicle trips per day were located within the J. D. Smith micro-scale inventory area so no reduction from this source category was calculated for the J. D. Smith annual inventory. As the valley-wide annual attainment is based upon the attainment at the J. D. Smith monitoring station and the controls implemented within this micro-scale area, no reduction in unpaved road dust was applied to the valley-wide annual inventory in 2001 for purposes of attainment demonstration. This is a conservative estimate, as rules regarding the paving of unpaved roads over 150 vehicle trips per day will be in place and enforced during 2001.

Summary of Controlled Annual Inventories

Controlled and uncontrolled J. D. Smith and valley-wide 2001 annual inventories are presented in Tables L-6 and L-7. As shown in the summaries, the same percentage reduction applied to the J. D. Smith annual inventory has been applied to the valley-wide inventory as well. Both inventories demonstrate attainment of the annual standard by December 31, 2001.

Table L-6

J. D. Smith 2001 Annual Micro-Scale Inventory

Source Category	2001 Uncontrolled Emissions (tons)	Relative Mass Contribution ($\mu g/m^3$)	Overall Reduction Percentage	2001 Controlled Emissions (tons)	Relative Mass Contribution After Controls ($\mu g/m^3$)
Vacant Land	213.4	1.46	-	139.3	0.95
Native Desert	2.1	0.01	-	2.1	0.01
Unstable	206.0	1.41	36	131.8	0.90
Stabilized	5.3	0.04	-	5.3	0.04
Construction	302.7	2.03	-	201.3	1.37
Wind Erosion	109.8	0.75	36	71.1	0.48
Construction Activities	186.6	1.27	34	123.2	0.84
Track Out	7.9	0.05	11	7.1	0.05
Unpaved Road Dust	1.8	0.01	-	1.8	0.01
Paved Road Dust	4,789	32.67	10	4,311	29.41
Vehicles	35.9	0.24	-	35.9	0.24
Stationary Sources	6.3	0.04	-	6.3	0.04
Background	-	16.5	-	-	16.5
Total	**5,350.7**	**53**	**-**	**4,695.5**	**48.5**

Table L-7

Valley-Wide 2001 Annual Inventory

Source Category	2001 Uncontrolled Emissions (tons)	Relative Mass Contribution ($\mu g/m^3$)	Overall Reduction Percentage	2001 Controlled Emissions (tons)	Relative Mass Contribution After Controls ($\mu g/m^3$)
Stationary Point Sources	1,201	0.26	-	1,201	0.26
Stationary Area Sources	86,269	19.10	-	62,976	13.47
Small Point Sources	184	0.04	-	184	0.04
Residential Firewood	89	0.02	-	89	0.02
Residential Natural Gas	79	0.02	-	79	0.02
Commercial Natural Gas	33	0.01	-	33	0.01
Industrial Natural Gas	14	0.00	-	14	0.00
NG – Carried by SWG	210	0.04	-	210	0.04
Structural / Vehicle / Wild Fires	20	0.00	-	20	0.00
Charbroiling / Meat Cooking	889	0.19	-	889	0.19
Disturbed Vacant Lands	33,100	7.08	36	21,184	4.53
Native Desert Fugitive Dust	9,520	2.04	-	9,520	2.04
Stabilized Vacant Lands Dust	3,640	0.78	-	3,640	0.78
Construction Activity Dust	23,109	4.94	34	15,252	3.26
Windblown Construction Dust	18,381	3.93	35	11,861	2.54
Nonroad Mobile Sources	867	0.19	-	867	0.19
Onroad Mobile Sources	79,491	16.96	-	73,638	15.75
Paved Road Dust (w/Track Out)[a]	55,005	11.77	8	50,822	10.87
Unpaved Road Dust	18,932	4.05	-	18,932	4.05
Highway Construction Activities	2,782	0.59	34	1,836	0.39
Highway Construction Dust	1,470	0.31	35	951	0.20
Vehicular Sulfate	489	0.10	-	489	0.10
Vehicular Tire Wear	100	0.02	-	100	0.02
Vehicular Brake Wear	163	0.03	-	163	0.03
Vehicular Exhaust	346	0.07	-	346	0.07
Background	-	16.5	-	-	15.75
Total	**170,625**	**53**	**-**	**138,683**	**46**

[a] Total paved road dust emissions include track out emissions of 654.67 tons uncontrolled and 582.81 tons controlled.

2001 AND 2006 CONTROLLED 24-HOUR INVENTORIES

Six inventories were prepared for 24-hour NAAQS attainment demonstration: five micro-scale inventories and one valley-wide inventory. The micro-scale inventories were prepared for the areas surrounding the five monitoring sites where the third highest concentrations measured exceed the 24-hour standard. The micro-scale sites are representative of the worst case conditions that could lead to a violation of the 24-hour standard. The valley-wide inventory was prepared to demonstrate the attainment for the entire nonattainment area. Because attainment could not be reached in 2001, a 2006 24-hour BLM disposal area inventory was prepared. The five micro-inventory sites are representative of the types of sources that lead to worst case 24-hour exceedances of the NAAQS. The overall control reductions were applied to the inventories though growth projections were not made to the micro-inventories.

Controlled 24-Hour Micro-Scale Inventories

The overall control reduction calculated for 2006 and described above was applied directly to the emissions calculated for each of the applicable source categories in the micro-scale areas except paved road dust. As previously described, the paved road dust emission reduction is based upon a reduction of silt loading. There is not a linear relationship between the reduction of silt loading and the reduction in emissions, and the calculated emission reduction varies by roadway type. Therefore, the emission reduction for paved road dust was calculated individually for each micro-scale area.

A linear relationship for emission reduction from wind erosion at construction sites has not been established. The report[10] prepared by an outside consultant detailing the micro-scale inventories does not detail the type of construction for each micro-scale area. However, as shown in the valley-wide inventories and the J. D. Smith inventory, the percentages do not vary greatly from the overall control reduction calculated (less than ten percent) and would not impact the attainment demonstration at any of the five micro-scale sites.

<u>Paved Road Dust Control Reduction Calculation</u>

The emission reduction of 30 percent for paved road dust is a reduction in silt loading. Because the equation for calculating emissions from silt loading is not a linear equation (see Appendix B), the corresponding emission reduction is not 30 percent. Silt loading also varies based upon roadway category. For this reason the emission reductions for paved road dust were calculated by reducing the silt loading by 30 percent in each of the micro-scale areas and the corresponding emissions reduction calculated. As it is anticipated that the control of construction sites and vacant land would have minimal impacts on freeways or interstates, no silt loading or corresponding emission reductions were calculated for these roadway classifications. The emission reductions in the micro-scale areas are presented in Table L-8.

[10] Ibid.

Table L-8

2006 Controlled Paved Road Dust Emissions for Micro-Scale Inventories

Location	Roadway Classification	Vehicle Miles Traveled	Uncontrolled Silt Loading (g/m^2)	Controlled Silt Loading (g/m^2)	Controlled Emission Factor (g/mile)	Controlled Paved Road Dust Emissions (tons/day)
Craig Road	Collectors	454,208	0.86	0.602	3.34	
	Minor Arterial	215,445	1.04	0.728	3.78	
	Freeway	326,880	0.02	0.02	0.366	
Total						**2.71**
East Flamingo	Collectors	220,013	0.86	0.602	3.34	
	Minor Arterial	225,788	1.04	0.728	3.78	
	Major Arterial	859,016	0.49	0.343	2.32	
Total						**3.95**
Green Valley	Local	173,345	1.7	1.19	5.21	
	Collectors	76,766	0.86	0.602	3.34	
	Minor Arterial	263,052	1.04	0.728	3.78	
	Major Arterial	187,000	0.49	0.343	2.32	
Total						**2.85**
J. D. Smith	Collectors	536,555	0.86	0.602	3.34	
	Minor Arterial	1,223,017	1.04	0.728	3.78	
	Major Arterial	637,846	0.49	0.343	2.32	
	Freeway	351,900	0.02	0.02	0.366	
Total						**8.85**
Pittman	Collectors	406,036	0.86	0.602	3.34	
	Minor Arterial	167,781	1.04	0.728	3.78	
	Freeway	79,743	0.02	0.02	0.366	
Total						**2.23**

Summary of Controlled Micro-Scale Inventories

The uncontrolled and controlled 2006 micro-scale inventories for each of the five monitoring sites not in attainment of the 24-hour NAAQS are presented in Tables L-9 through L-13. As shown in the inventories, the overall control reduction as calculated above was applied to all source categories except paved road dust. The overall percent reduction for paved road dust varies for each area. Each of the inventories demonstrates attainment of the 24-hour standard for the representative worst case conditions by December 31, 2006.

Table L-9

Craig Road 2006 24-Hour Micro-Scale Inventory

Source Category	2006 Uncontrolled Emissions (tons)	Relative Mass Contribution ($\mu g/m^3$)	Overall Reduction Percentage	2006 Controlled Emissions (tons)	Relative Mass Contribution After Controls ($\mu g/m^3$)
Vacant Land	4.82	69.74	65	1.71	24.74
Native Desert	-	-	-	-	-
Unstable	4.32	62.51	72	1.21	17.50
Stabilized	0.5	7.23	-	0.50	7.23
Construction	3.43	49.63	70	1.03	14.90
Wind Erosion	2.72	39.36	71	0.79	11.41
Construction Activities	0.68	9.84	68	0.22	3.15
Track Out	0.03	0.43	22	0.02	0.34
Unpaved Road Dust	0.14	2.03	-	0.14	2.03
Paved Road Dust	3.98	57.59	32	2.71	39.21
Unpaved Parking	0.514	7.44	72	0.14	2.10
Wind Erosion	0.51	7.38	72	0.14	2.07
Vehicles	0.004	0.06	48	0.00	0.03
Race Tracks	2.43	35.16	74	0.63	9.12
Wind Erosion	1.71	24.74	72	0.48	6.93
Vehicles	0.72	10.42	79	0.15	2.19
Vehicles	0.1	1.45	-	0.1	6.93
Stationary Sources	0.24	3.47	-	0.24	2.19
Background	-	27.5	-	-	27.5
Total	**15.65**	**254**		**6.74**	**124.5**

Table L-10

East Flamingo 2006 24-Hour Micro-Scale Inventory

Source Category	2006 Uncontrolled Emissions (tons)	Relative Mass Contribution (μg/m³)	Overall Reduction Percentage	2006 Controlled Emissions (tons)	Relative Mass Contribution After Controls (μg/m³)
Vacant Land	2.912	36.70	66	0.98	12.38
Native Desert	0.141	1.78	-	0.14	1.78
Unstable	2.68	33.77	72	0.75	9.46
Stabilized	0.091	1.15	-	0.09	1.15
Construction	3.92	49.40	70	1.17	14.69
Wind Erosion	3.56	44.87	71	1.03	13.01
Construction Activities	0.32	4.03	68	0.10	1.29
Track Out	0.04	0.50	22	0.03	0.39
Unpaved Road Dust	0.01	0.13	-	0.01	0.13
Paved Road Dust	4.96	62.51	20	3.95	49.78
Vehicles	0.13	1.64	-	0.13	1.64
Stationary Sources	0.01	0.13	-	0.01	0.13
Background	-	38.5	-	-	38.5
Total	**11.94**	**189**		**6.26**	**117**

Table L-11

Green Valley 2006 24-Hour Micro-Scale Inventory

Source Category	2006 Uncontrolled Emissions (tons)	Relative Mass Contribution ($\mu g/m^3$)	Overall Reduction Percentage	2006 Controlled Emissions (tons)	Relative Mass Contribution After Controls ($\mu g/m^3$)
Vacant Land	7.33	57.09	72	2.08	16.21
Native Desert	-	-	-	-	-
Unstable	7.29	56.78	72	2.04	15.90
Stabilized	0.04	0.31	-	0.04	0.31
Construction	21.19	165.03	70	6.25	48.68
Wind Erosion	18.3	142.52	71	5.31	41.33
Construction Activities	2.85	22.20	68	0.91	7.10
Track Out	0.04	0.31	22	0.03	0.24
Unpaved Road Dust	0.017	0.13	-	0.02	0.13
Paved Road Dust	3.54	27.57	19	2.85	22.20
Race Tracks	1.26	9.81	73	0.34	2.65
Wind Erosion	1.08	8.41	72	0.30	2.36
Vehicles	0.18	1.40	79	0.04	0.29
Vehicles	0.07	0.55	-	0.07	0.55
Stationary Sources	0.17	1.32	-	0.17	1.32
Background	-	19.5	-	-	19.5
Total	**33.58**	**281**		**11.78**	**111**

Table L-12

J. D. Smith 2006 24-Hour Micro-Scale Inventory

Source Category	2006 Uncontrolled Emissions (tons)	Relative Mass Contribution ($\mu g/m^3$)	Overall Reduction Percentage	2006 Controlled Emissions (tons)	Relative Mass Contribution After Controls ($\mu g/m^3$)
Vacant Land	10.08	63.06	67	3.31	20.72
Native Desert	0.63	3.94	-	0.63	3.94
Unstable	9.4	58.81	72	2.63	16.47
Stabilized	0.05	0.31	-	0.05	0.31
Construction	5.52	34.53	70	1.65	10.29
Wind Erosion	5.1	31.91	71	1.48	9.25
Construction Activities	0.35	2.19	68	0.11	0.70
Track Out	0.07	0.44	22	0.05	0.34
Unpaved Road Dust	0.004	0.03	-	0.00	0.03
Paved Road Dust	11.63	72.76	24	8.85	55.36
Vehicles	0.26	1.63	-	0.26	1.63
Stationary Sources	0.08	0.50	-	0.08	0.50
Background	-	45.5	-	-	45.5
Total	**27.57**	**218**		**14.15**	**134**

Table L-13

Pittman 2006 24-Hour Micro-Scale Inventory

Source Category	2006 Uncontrolled Emissions (tons)	Relative Mass Contribution ($\mu g/m^3$)	Overall Reduction Percentage	2006 Controlled Emissions (tons)	Relative Mass Contribution After Controls ($\mu g/m^3$)
Vacant Land	13.16	134.48	71	3.87	39.57
Native Desert	-	-	-	-	-
Unstable	12.9	131.83	72	3.61	36.91
Stabilized	0.26	2.66	-	0.26	2.66
Construction	1.32	13.49	70	0.39	4.02
Wind Erosion	1.12	11.45	71	0.32	3.32
Construction Activities	0.19	1.94	68	0.06	0.62
Track Out	0.01	0.10	22	0.01	0.08
Unpaved Road Dust	0.66	6.74	-	0.66	6.74
Paved Road Dust	2.92	29.84	24	2.23	22.79
Unpaved Parking	1.14	11.65	71	0.33	3.34
Wind Erosion	1.11	11.34	72	0.31	3.18
Vehicles	0.03	0.31	48	0.02	0.16
Vehicles	0.06	0.61	-	0.06	0.61
Stationary Sources	0.36	3.68	-	0.36	3.68
Background	-	38.5	-	-	38.5
Total	**19.62**	**239**		**7.91**	**119**

Controlled Valley-Wide Inventory

The 2001 and 2006 valley-wide 24-hour inventories are based upon annual BLM disposal area inventories for 2001 and 2006. This was done because several of the emission factors and growth factors are based upon annual emissions. The annual inventories were calculated using applicable growth factors and control factors. The 24-hour emission inventories were then calculated by dividing by 365 to represent the design day for all applicable categories. Source categories that include wind data in the calculations were not scaled from the annual inventory. These categories include fugitive dust from vacant land and construction wind erosion. The relationship between the annual and 24-hour inventories is described in Appendix B, and the 2001 and 2006 projections of the base year inventory are described in Appendix E.

The overall control reduction was applied to all applicable source categories except paved road dust, including unimproved shoulders, construction wind erosion, and unpaved roads. The paved road dust emission reduction is not linear as previously described. The reduction for control of wind erosion at construction sites only applies to the portion of the site not previously controlled, and the portion of a site that is controlled varies based upon the type of construction being completed. Therefore, a linear relationship does not exist and the overall reduction was calculated directly for the valley-wide inventories. Similarly, the controls for unpaved roads only applied to those roads with over 150 vehicle trips per day and not to the entire category. Therefore, the reduction was calculated based upon only roads with greater than 150 vehicle trips and not the entire source category.

Paved Road Dust Control Reduction Calculation

Roadways with Improved Shoulders: The emission reductions of 15 percent in 2001 and 30 percent for 2006 for paved road dust is a reduction in silt loading. Because the equation for calculating emissions from silt loading is not a linear equation (see Appendix B), the corresponding emission reductions are not 15 and 30 percent respectively. Silt loading also varies based upon roadway category. For this reason the emission reductions for paved road dust were calculated by reducing the silt loading by 15 percent in 2001 and 30 percent in 2006 in each roadway classification and the corresponding emissions reduction calculated. As it is anticipated that the control of construction sites and vacant land would have minimal impacts on freeways or interstates, no silt loading or corresponding emission reductions were calculated for these roadway classifications. For roadway classifications not characterized in the silt loading study,[11] the silt loading for the roadway classification with the same average vehicle speed was applied. The emission reduction for the 2001 and 2006 24-hour valley-wide inventories are presented in Tables L-14 and L-15. The overall emission reduction calculated for paved road dust for the BLM disposal area was ten percent in 2001 and 20 percent in 2006.

[11] Op Cit.

Table L-14

Paved Road Dust PM_{10} Emission Reduction for the 2001 24-Hour Valley-Wide Inventory

Roadway Classification	2001 Daily Vehicle Miles Traveled[a]	Emission Factor (g/mile)		PM_{10} Emissions (tons)	
		Uncontrolled	Controlled	Uncontrolled	Controlled
Ext. Connector	904,077.5	2.93	2.63	2.91	2.62
Freeway Ramps	106,055.7	4.22	3.79	0.49	0.44
Minor Arterial	11,688,430	4.77	4.29	55.31	49.74
Major Arterial	2,749,688	2.93	2.63	6.61	5.94
Ramps	346,873	4.22	3.79	1.61	1.45
Interstate	5,012,399	0.37	0.37	2.02	2.02
Freeway	2,091,923	0.37	0.37	0.84	0.84
Expressway	-	2.93	2.63	-	-
Collector	4,979,581	4.22	3.79	22.05	19.81
Local	3,073,666	6.57	5.89	19.66	17.62
Intrazonal Trips	74,402.1	6.57	5.89	0.54	0.48
Public Transit	79,880	6.57	5.89	0.58	0.52
Total	**31,106,976**			**112.62**	**101.48**

[a] The daily vehicle miles traveled presented in Table L-14 are the total number of miles modeled by RTC. The number of miles used for calculating paved road dust emissions for roads with improved shoulders is the total VMT minus the vehicle miles traveled on roadways without improved shoulders. The daily vehicle miles used to calculate the emissions presented in this table are the same except as follows: Minor Arterial – 10,519,198; Major Arterial – 2,047,384; Collector – 4,741,037; and Local – 2,714,371.

Table L-15

Paved Road Dust PM_{10} Emission Reduction for the 2006 24-Hour Valley-Wide Inventory

Roadway Classification	2006 Daily Vehicle Miles Traveled[a]	Emission Factor (g/mile)		PM_{10} Emissions (tons)	
		Uncontrolled	Controlled	Uncontrolled	Controlled
Ext. Connector	1,027,600	2.93	2.32	3.32	2.63
Freeway Ramps	152,222.4	4.22	3.34	0.71	0.56
Minor Arterial	13,241,455	4.77	3.78	62.66	49.65
Major Arterial	3,594,725	2.93	2.32	8.64	6.85
Ramps	487,962.3	4.22	3.34	2.27	1.80
Interstate	6,188,899	0.37	0.37	2.50	2.50
Freeway	3,311,378	0.37	0.37	1.34	1.34
Expressway	-	2.93	2.32	-	-
Collector	4,209,380	4.22	3.34	18.64	14.76
Local	3,264,388	6.57	5.21	20.88	16.56
Intrazonal Trips	80,072.6	6.57	5.21	0.58	0.46
Public Transit	144,780	6.57	5.21	1.05	0.83
Total	**35,702,862**			**122.58**	**97.92**

[a] The daily vehicle miles traveled presented in Table L-15 are the total number of miles modeled by RTC. The number of miles used for calculating paved road dust emissions for roads with improved shoulders is the total VMT minus the vehicle miles traveled on roadways without improved shoulders. The daily vehicle miles used to calculate the emissions presented in this table are the same except as follows: Minor Arterial – 11,916,869; Major Arterial – 2,676,588; Collector – 4,007,732; and Local – 2,882,799.

Roadways with Unimproved Shoulders: As noted in the footnote for Tables L-14 and L-15, there are four roadway categories for roadways without improved shoulders. The silt loading for roadways without improved shoulders is 1.34 g/m^2 for major and minor arterials and 24.7 g/m^2 for collectors and local roadways. Emission reductions vary based upon the roadway category. Improvements to roadway shoulders are not anticipated to begin until 2002. No reductions from this category were calculated for the 2001 24-hour BLM disposal area emission inventory.

Rule effectiveness and rule penetration were estimated at 95 percent. Therefore, 90 percent of roadways that currently do not have improved shoulders would have improved shoulders in 2006. The total paved road dust emissions from this category would be calculated with 90 percent of the daily VMT traveling on roadways with improvements and ten percent traveling on roadways without improved shoulders. The emissions from roadways with unimproved shoulders are presented in Table L-16.

Table L-16

Roadways with Unimproved Shoulders Emissions for the 2006 Valley-Wide 24-Hour Inventory

Roadway Classification	2006 Daily Vehicle Miles Traveled	Emission Factor (g/mile)		PM_{10} Emissions (tons)	
		Uncontrolled	Controlled	Uncontrolled	Controlled
Minor Arterial	1,324,585.64	5.63	4.77	8.22	6.96
Major Arterial	918,137.01	5.63	2.93	5.70	2.96
Collector	201,647.74	37.4	4.22	8.31	0.94
Local	381,589.05	37.4	6.57	15.73	2.76
Total	**2,825,959.4**			**37.96**	**13.63**
Total Emissions = 0.9(13.63 tons) + 0.1(37.96 tons) = 16.04					

Construction – Wind Erosion Control Reduction Calculations: Wind erosion emissions from construction sites were calculated assuming a percentage of each construction site was already controlled under RACM controls already in place and not measures adopted as part of the SIP. The percent reduction calculated for the SIP-adopted BACM measures would apply to those portions of the site not already being controlled. Therefore, the emission reduction was calculated on only a portion of the total wind erosion emissions. Rule effectiveness is projected to increase from 40 percent in 2001 to 80 percent before 2006. Therefore, the overall control reduction increases from 36 percent in 2001 to 71 percent in 2006. The control reduction for construction wind erosion is presented in Tables L-17 and L-18.

Table L-17

Construction – Wind Erosion PM_{10} Reductions for the 2001 24-Hour Valley-Wide Inventory (tons)

Source	Number of Acres	24-Hour Valley-Wide	
		Uncontrolled	Controlled
Stabilized Land	6,297	2.37	2.37
Unstable Land	16,394	149.36	95.59
Total	**22,691**	**151.73**	**97.96**

Table L-18

Construction – Wind Erosion PM_{10} Reductions for the 2006 24-Hour Valley-Wide Inventory (tons)

Source	Number of Acres	24-hour Valley-Wide	
		Uncontrolled	Controlled
Stabilized Land	4,048	1.52	1.52
Unstable Land	10,539	96.02	27.85
Total	**14,587**	**97.54**	**29.37**

Unpaved Roads Control Reductions: Unpaved roads with Average Daily Trips (ADT) are required to be controlled. Governmental agencies have made SIP commitments and obtained funding to pave all unpaved roads with ADT 150 or above. Rule effectiveness and emission reductions are 99 percent. Therefore, by 2006, 98 percent of the emissions from roads with 150 ADT or greater will eliminated while none of the emissions from unpaved roads under 150 ADT will be reduced by SIP-imposed requirements.

The rule requires one-third of unpaved roads greater than 150 ADT be paved each year beginning in 2001. The emissions from unpaved roads with greater than 150 ADT is 66 percent of all unpaved road emissions (see rule penetration). Dividing 66 percent by one-third, the number of greater-than-150 ADT roads paved in 2001, 22 percent of the emissions from greater-than-150 ADT unpaved roads will be controlled. Because all of the roads over 150 ADT will be paved by 2006, the control reduction jumps to 65 percent in 2006.

To project growth to 2001 and 2006, the annual unpaved road emissions were increased by the same factor as local roadway ADT was increased between 1998 and 2001, or 1998 and 2006 as appropriate (See Appendix E). Then 98 percent emission reductions were calculated from the higher ADT roads anticipated to be paved that year. These calculations and the resulting unpaved road dust emissions are presented in Tables L-19 and L-20.

Table L-19

Unpaved Roads PM_{10} Reductions for the 2001 24-Hour Valley-Wide Inventory (tons)

ADT	1998 Emissions (tons)	1998 to 2001 Local Road Growth Factor	2001 Uncontrolled Emissions (tons)	2001 Controlled Emissions (tons)	24-hour Emissions (tons)
150 and Greater	9,905	1.26	12,480	8,403	23.02
Less Than 150	5,119	1.26	6,450	6,450	17.67
Total	**15,025**		**18,930**	**14,853**	**40.69**

Table L-20

Unpaved Roads PM_{10} Reductions for the 2006 24-Hour Valley-Wide Inventory (tons)

ADT	1998 Emissions (tons)	1998 to 2006 Local Road Growth Factor	2006 Uncontrolled Emissions (tons)	2006 Controlled Emissions (tons)	24-hour Emissions (tons)
150 and Greater	9,905	1.339	13,262.8	264	0.72
Less Than 150	5,119	1.339	6,854.3	6,854	18.78
Total	**15,025**		**20,117**	**7,118**	**19.50**

Summary of Controlled 2001 and 2006 24-Hour Valley-Wide Inventories

The uncontrolled and controlled 2001 and 2006 valley-wide 24-hour inventories are presented in Tables L-21 and L-22. As shown in the inventories, the overall control reductions as calculated above were applied to all source categories except paved road dust, construction wind erosion, and unpaved road dust. The overall percent reduction for paved road dust reduction including track out is about eight percent in 2001 and 29 percent in 2006. The inventory demonstrates attainment of the 24-hour standard for the BLM disposal area in 2006.

Table L-21

Valley-Wide 2001 24-Hour Inventory

Source Category	2001 Uncontrolled Emissions (tons)	Relative Mass Contribution ($\mu g/m^3$)	Overall Reduction Percentage	2001 Controlled Emissions (tons)	Relative Mass Contribution After Controls ($\mu g/m^3$)
Stationary Point Sources	3.29	1.24	-	3.29	1.24
Stationary Area Sources	489.72	184.04	33	327.27	122.99
Small Point Sources	0.50	0.19	-	0.50	0.19
Residential Firewood	0.96	0.36	-	0.96	0.36
Residential Natural Gas	0.22	0.08	-	0.22	0.08
Commercial Natural Gas	0.09	0.03	-	0.09	0.03
Industrial Natural Gas	0.04	0.01	-	0.04	0.01
NG – Carried by SWG	0.58	0.22	-	0.58	0.22
Structural / Vehicle / Wild Fires	0.06	0.02	-	0.06	0.02
Charbroiling / Meat Cooking	2.44	0.92	-	2.44	0.92
Disturbed Vacant Lands	253.00	95.08	36	161.92	60.85
Native Desert Fugitive Dust	0.00	0.00	-	0.00	0.00
Stabilized Vacant Lands Dust	28.00	10.52	-	28.00	10.52
Construction Activity Dust	63.31	23.79	34	41.79	15.70
Windblown Construction Dust	140.53	52.81	35	90.69	34.08
Nonroad Mobile Sources	2.38	0.89	-	2.38	0.89
Onroad Mobile Sources	224.40	84.33	27	195.35	73.41
Paved Road Dust (w/Track Out)[a]	150.70	56.63	8	139.35	52.37
Unpaved Road Dust	51.87	19.49	22	40.69	15.29
Highway Construction Activities	7.62	2.86	34	5.03	1.89
Highway Construction Dust	11.20	4.21	35	7.27	2.73
Vehicular Sulfate	1.34	0.50	-	1.34	0.50
Vehicular Tire Wear	0.27	0.10	-	0.27	0.10
Vehicular Brake Wear	0.45	0.17	-	0.45	0.17
Vehicular Exhaust	0.95	0.36	-	0.95	0.36
Background		10.5	-	-	10.5
Total	**719.78**	**281**		**528.29**	**209.04**

[a] Total paved road dust emissions include track out emissions of 1.79 tons uncontrolled and 1.60 tons controlled.

Table L-22

Valley-Wide 2006 24-Hour Inventory

Source Category	2006 Uncontrolled Emissions (tons)	Relative Mass Contribution ($\mu g/m^3$)	Overall Reduction Percentage	2006 Controlled Emissions (tons)	Relative Mass Contribution After Controls ($\mu g/m^3$)
Stationary Point Sources	3.29	2.25	-	3.29	2.25
Stationary Area Sources	156.91	107.53	67	52.00	35.77
Small Point Sources	0.50	0.35	-	0.50	0.35
Residential Firewood	1.12	0.77	-	1.12	0.77
Residential Natural Gas	0.25	0.17	-	0.25	0.17
Commercial Natural Gas	0.09	0.06	-	0.09	0.06
Industrial Natural Gas	0.04	0.03	-	0.04	0.03
NG – Carried by SWG	0.58	0.39	-	0.58	0.39
Structural / Vehicle / Wild Fires	0.07	0.04	-	0.07	0.04
Charbroiling / Meat Cooking	2.84	1.94	-	2.84	1.94
Disturbed Vacant Lands	19.30	13.23	72	5.40	3.70
Native Desert Fugitive Dust	0.00	0.00	-	0.00	0.00
Stabilized Vacant Lands Dust	1.09	0.75	-	1.09	0.75
Construction Activity Dust	40.70	27.89	68	13.02	8.93
Windblown Construction Dust	90.34	61.91	70	27.20	18.64
Nonroad Mobile Sources	2.36	1.62	-	2.36	1.62
Onroad Mobile Sources	232.16	159.10	39	141.40	96.90
Paved Road Dust (w/Track Out)[a]	161.70	110.81	29	114.86	78.71
Unpaved Road Dust	55.11	37.77	64	19.50	13.36
Highway Construction Activities	4.90	3.36	68	1.57	1.07
Highway Construction Dust	7.20	4.93	69	2.22	1.52
Vehicular Sulfate	1.52	1.04	-	1.52	1.04
Vehicular Tire Wear	0.32	0.22	-	0.32	0.22
Vehicular Brake Wear	0.51	0.35	-	0.51	0.35
Vehicular Exhaust	0.91	0.62	-	0.91	0.62
Background	-	10.5	-	-	10.5
Total	**394.72**	**281**		**199.25**	**147**

[a] Total paved road dust emissions include track out emissions of 1.15 tons uncontrolled and 0.9 tons controlled.