



# **Hot Bituminous Pavement QC&QA Projects Constructed in 1997 Under QPM 2 Specifications**

**Bud A. Brakey, P. E.**  
Colorado Department of Transportation  
Construction and Materials Branch  
4201 East Arkansas Avenue  
Denver, Colorado 80222

**Sixth Annual & Final Report**  
**May, 1998**

**Prepared in Cooperation with the**  
**U.S. Department of Transportation**  
**Federal Highway Administration**

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| 13. ABSTRACT (Maximum 200 words)<br><br>This report presents Tables and Figures which summarize the HBP Quality Level Analysis (QL) for QC&QA projects completed in 1997, the third season using the current specifications. The Quality Level (QL) for the elements (sieve analysis, asphalt content, and pavement density) and the item composites are summarized. While QL determines Pay Factor(PF), it is also used to rank contractors' performance. The item QL improved in 1997 over 1996. Incentive/disincentive payments were not sufficient to cause some contractors to improve their process control. Both, the better and poorer performing contractors show up with similar rankings from year to year. The QL specifications essentially are serving satisfactorily. This is the final report in this series.<br><br>Implementation: No significant changes are recommended for the HBP QC&QA program. |                                                             |                                                                      |                                                                      |  |
| 14. SUBJECT TERMS<br>Assurance, Quality, Level, Analysis, Statistics, Incentive                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                             |                                                                      | 15. NUMBER OF PAGES                                                  |  |
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**SIXTH ANNUAL  
CDOT REPORT FOR THE HBP QC/QA PROJECTS  
CONSTRUCTED IN 1997 UNDER QPM 2 SPECIFICATIONS**

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## **CDOT SIXTH ANNUAL REPORT FOR THE HBP QC&QA PROJECTS CONSTRUCTED IN 1997**

### **INTRODUCTION AND COMMENTS**

CDOT began QC&QA construction for hot bituminous pavement (HBP) in 1992 with the implementation of a three-year pilot program which was essentially completed in 1994 (several projects were held over and completed in 1995). The Pilot project computer software was designated QPM 1 and that designation is used herein to designate projects built under the Pilot specifications<sup>(1)</sup>.

In 1994 a revised and updated specification was written, designated as QPM 2<sup>(2)</sup>. It was used on a few projects completed in 1995 and essentially all HBP projects completed in 1996 and 1997. Reports have been made for 1992 through 1996<sup>(3-7)</sup>. These are available from the CDOT library, or from the Pavement Unit in the Central Laboratory. The 1995 construction report<sup>(6)</sup> contained summaries for both QPM 1 & 2.

By comparing the bid summaries and other available information in the Central laboratory, it appears only 35 to 40% of the projects completed in 1997 were reported. Because of this, consider the trends, quality levels, and other summary information herein as only showing trends. It approximately represents 1997 QC&QA

The general format and presentation of data in this Sixth Annual report are similar to that used in the other QC&QA reports. Information on the background, development, philosophy and rationale involved can be found in the previous reports and is not being repeated here. The total tons reported each year under each specification and the summarized data can be found in Tables 4 and 5. Also, relationships of yearly summaries to the 1991 historical base are defined in the tables and Figures 1 through 4.

### **DISCUSSION OF THE DATA**

#### ***Description of Tables and Figures.***

Table 1, comprising three pages, is a listing of each complete process (referred to in the column heading as Mix Design) summary. Each element (asphalt content, density and gradation) is listed, along with a composite calculation (Totals & Weighed Means) for the applicable columns. Tons, test "n" and the incentive or disincentive payments (I/DP) are totaled. Quality Level (QL) and pay factor (PF) are the averages of the element values weighted by their "W" factors (see previous reports and the QPM 2 specifications). Project summaries are listed numerically by subaccount number (SA) and mix design numbers. Table 1 is the summarized construction data for projects reported.

Element and mix design item summaries (composite) have been grouped separately in Table 2. The data is listed by SA. Each element is totaled and averaged (weighted by tons). The final grouping is the Item composite. It gives summaries for all projects reported for the 1997 season. Table 2 data, except the summary at the end of each group, is the same as in Table 1. It has been sorted differently, by element, and the composite data is listed separately.

Summary values from Table 2 have been transferred to Tables 3 and 3A. The composited item data for each process sorted in descending order by QL is in Table 3. Processes have been grouped by contractor in Table 3A and the groups sorted by QL, in descending order. Where there was more than one process per contractor, the total tons, and weighted PF and QL averages for the group are listed.

Summarized element and composite data, 1991 historical and QC&QA 1992 through 1997 are in Table 4. Included are the overall summaries for all QPM 1 and all QPM 2 projects. The tons and number of tests for each group are listed. Table 4 data is shown again in Table 5, but presented in a different mode. It groups the elements and composites together. In Table 5, data has been "normalized" by comparing each element for each year with the historical data, which is shown as a percentage of 1991.

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The "SD, % of '91" column is the only "% of 1991" column where less than 100% shows an improvement. A lower percentage means a smaller SD, a desirable condition. For the other columns, more than 100% is an improvement from 1991. The "All QPM 2 Composite" line shows a continued and significant improvement from 1991 base data. Figures 1 through 4 are plotted from data in Table 5.

A large amount of information is contained in Table 6. It tabulates the following data for each of the six QC&QA construction years (1992-1997) for the 28 participating contractors: (1) Quality Level, (2) percent of a given contractor's production that was in Red (i.e., QL less than 65), (3) the total tons for each contractor for the year, (4) the weighted averages for QPM 1 and 2 and (5) for all (QC&QA). Figures 5 through 10 show the table data graphically. Table 6A is an abbreviated version of the data for easier reading. Only summaries for QPM 1, QPM 2 and the totals for each contractor are given.

Figures 11- 16 are frequency histograms of 1996 and 1997 element test values. For asphalt content and the No. 8 sieve (usually the controlling sieve for the gradation element), the field test values for each process were adjusted to a common target value (average for the year). The Density test target was 94, the same for all processes, so no adjustment was necessary.

*Significance of Data and Comments*

Contractors' QL ranking, along with tonnage represented is of interest to many. A review of the 1993 - 1997 reports shows that, annually, most of the same contractors show up with similar QL rankings. The better performers repeat year after year, and likewise, so do the poor performers. Occasionally extenuating circumstances, such as experimental projects or other factors, shift the rankings. Apparently, the incentives and disincentives are not enough to persuade some contractors to produce at a higher level. Competition will not always guarantee the most efficient contractors will be the lowest bidders. Factors other than competition may be involved, such as location of the new project in relation to the bidder's home base or current project.

From Tables 4 and 5, the Asphalt % and Density QLs, have improved significantly in 1997 above 1996. Gradation QL is lower, reflecting the low "W" factor of 0.2. Still, the 1997 composite QL is higher than 1996. For most contractors there were significant improvements, but a few contractors with low QLs lowered the yearly average.

Figures 11 and 12, field test results for asphalt content, show consistent, good distribution in 1996 and 1997. Figures 13 and 14, for asphalt density, show the distribution for 1997 has improved above 1996. For the first time, the distribution at the lower limit of 92 is normal. In all previous years, the percentages just above 92 were higher than normal, and just below, less than normal. This condition shows a bias in sample selection (not purely random). Continued training in random sampling methods appears finally to be paying off. The 1997 No.8 sieve distribution histogram shows some improvement from 1996.

This will be the final report in this series on QC&QA for HBP. The program is continuing satisfactorily. Minor wording changes in the specification may be made as it is fine tuned. Computer software is continually being updated and improved. No major changes are recommended.

**REFERENCES**

1. Revisions of the Standard Specifications, Sections 105, Control of Work and 106, Control of Material; to be used with the 1992 Pilot Projects, by the Staff Materials Branch, CDOT, March, 1992. (QPM 1)
2. Revision of Sections 105 and 106, Quality of Hot Bituminous Pavement, April 25, 1995 (Reissued with minor editorial changes, March 7, 1996). CDOT, 4201 East Arkansas Avenue, Denver, CO 80222. (QPM 2)
3. HBP QA/QC Pilot Projects Construction in 1992, Interim Report. Report No. CDOT-DTD-R-93-14, by Bud A. Brakey, Colorado Department of Transportation, 4201 East Arkansas Avenue, Denver, CO 80222.
4. HBP QA/QC Pilot Projects Construction in 1993, Second Interim Report, by Bud A. Brakey, Colorado Department of Transportation, 4201 East Arkansas Avenue, Denver, CO 80222.
5. Hot Bituminous Pavement QC/QA Projects Constructed in 1994 and Summary of the 1992-1994 QC/QA Pilot Program, Final Report, June 1995, by Bud A. Brakey,
6. HBP QC&QA Projects Constructed in 1995 Under QPM 1 and QPM 2 Specifications, (1996 fourth annual report by Bud A Brakey, Colorado Department of Transportation, 4201 East Arkansas Avenue, Denver, CO 80222.), Report No. CDOT-R-96-9.
7. HBP QC&QA Projects Constructed in 1996 Under QPM 2 Specifications, (May 1997, fifth annual report by Bud A. Brakey, Colorado Department of Transportation, 4201 East Arkansas Avenue, Denver, CO 80222), Report No. CDOT-R-97-9.

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TABLES AND FIGURES COMPRISING 17 PAGES NUMBERED 5 - 21.

See the Table of Content at the beginning of this report.

**TABLE 1**  
**HOT BITUMINOUS PAVEMENT QC/QA DETAILS & SUMMARY BY PROJECT**  
**AND MIX DESIGN FOR 1997 CONSTRUCTION SEASON USING QPM 97W**

| PROJECT<br>LOCATION            | REG/<br>UNIT | SUBAC<br>NUMBER | MIX<br>DESIGN | ELE-<br>MENT | BID<br>\$/TON  | TONS<br>1000 | TEST<br>"n" | PROCESS<br>SD | MEAN<br>-TC     | QUAL<br>LEVL                   | PAY<br>FACT  | Incent/<br>Disinc\$ | Contr<br>Code | HBP<br>Agg |
|--------------------------------|--------------|-----------------|---------------|--------------|----------------|--------------|-------------|---------------|-----------------|--------------------------------|--------------|---------------------|---------------|------------|
|                                |              |                 | /PRCSS        |              |                |              |             |               | Gradation is #8 | Gradation is CONTROLLING Sieve |              |                     |               | Grad       |
| <b>HH 0702-193</b>             |              | 10093           | 60128         | <b>a</b>     |                |              |             |               |                 |                                |              |                     | E1            | StF        |
| Gypsum-Eagle                   | 3            | 10093           | 60128         | AC%          | \$24.85        | 5.03         | 5           | 0.20          | -0.10           | 83.7                           | 1.022        | \$812               | E1            | StF        |
| Gypsum-Eagle                   | 3            | 10093           | 60128         | Dn%          | \$24.85        | NA           | 0           | NA            | 0.00            | NA                             | 1.000        | \$0                 | E1            | StF        |
| Gypsum-Eagle                   | 3            | 10093           | 60128         | Grad         | \$24.85        | 5.03         | 3           | 1.20          | -0.70           | 71.5                           | 1.007        | \$168               | E1            | StF        |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>10093</b>    | <b>60128</b>  | <b>ITEM</b>  | <b>\$24.85</b> | <b>5.03</b>  | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>78.8</b>                    | <b>1.016</b> | <b>\$981</b>        | <b>E1</b>     | <b>StF</b> |
| <b>HH 0702-193</b>             |              | 10093           | 60128A        | <b>a</b>     |                |              |             |               |                 |                                |              |                     | E1            | StF        |
| Gypsum-Eagle                   | 3            | 10093           | 60128A        | AC%          | \$24.85        | 30.26        | 31          | 0.14          | -0.06           | 95.6                           | 1.048        | \$10,805            | E1            | StF        |
| Gypsum-Eagle                   | 3            | 10093           | 60128A        | Dn%          | \$24.85        | NA           | 0           | NA            | 0.00            | NA                             | 1.000        | \$0                 | E1            | StF        |
| Gypsum-Eagle                   | 3            | 10093           | 60128A        | Grad         | \$24.85        | 30.26        | 16          | 0.80          | -0.40           | 88.7                           | 1.018        | \$2,765             | E1            | StF        |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>10093</b>    | <b>60128A</b> | <b>ITEM</b>  | <b>\$24.85</b> | <b>30.26</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>92.8</b>                    | <b>1.036</b> | <b>\$13,570</b>     | <b>E1</b>     | <b>StF</b> |
| <b>STU M356-004</b>            |              | 10391           | R60072        | <b>a</b>     |                |              |             |               |                 |                                |              |                     | B3            | C          |
| 120th and Huron                | 6            | 10391           | R60072        | AC%          | \$35.00        | 3.50         | 3           | 0.14          | 0.07            | 100.0                          | 1.025        | \$919               | B3            | C          |
| 120th and Huron                | 6            | 10391           | R60072        | Dn%          | \$35.00        | 3.50         | 7           | 1.08          | -0.41           | 94.3                           | 1.035        | \$2,144             | B3            | C          |
| 120th and Huron                | 6            | 10391           | R60072        | Grad         | \$35.00        | 3.50         | 2           | NA            | 3.00            | NA                             | 1.000        | \$0                 | B3            | C          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>10391</b>    | <b>R60072</b> | <b>ITEM</b>  | <b>\$35.00</b> | <b>3.50</b>  | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>96.4</b>                    | <b>1.025</b> | <b>\$3,062</b>      | <b>B3</b>     | <b>C</b>   |
| <b>PLH 0503-047</b>            |              | 10934           | 109341        | <b>a</b>     |                |              |             |               |                 |                                |              |                     | A2            | C          |
| Parkdale - West                | 2            | 10934           | 109341        | AC%          | \$38.75        | 3.60         | 4           | 0.19          | -0.06           | 92.4                           | 1.030        | \$1,254             | A2            | C          |
| Parkdale - West                | 2            | 10934           | 109341        | Dn%          | \$38.75        | 3.60         | 8           | 1.09          | 0.54            | 91.8                           | 1.037        | \$2,603             | A2            | C          |
| Parkdale - West                | 2            | 10934           | 109341        | Grad         | \$38.75        | 3.60         | 2           | NA            | 3.00            | NA                             | 1.000        | \$0                 | A2            | C          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>10934</b>    | <b>109341</b> | <b>ITEM</b>  | <b>\$38.75</b> | <b>3.60</b>  | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>92.0</b>                    | <b>1.028</b> | <b>\$3,857</b>      | <b>A2</b>     | <b>C</b>   |
| <b>PLH 0503-047</b>            |              | 10934           | 109341        | <b>a</b>     |                |              |             |               |                 |                                |              |                     | A2            | C          |
| Parkdale - West                | 2            | 10934           | 109341        | AC%          | \$38.75        | 20.17        | 21          | 0.17          | -0.03           | 91.8                           | 1.029        | \$6,684             | A2            | C          |
| Parkdale - West                | 2            | 10934           | 109341        | Dn%          | \$38.75        | 20.17        | 41          | 0.88          | -0.08           | 98.1                           | 1.055        | \$21,497            | A2            | C          |
| Parkdale - West                | 2            | 10934           | 109341        | Grad         | \$38.75        | 20.17        | 11          | 3.00          | 6.20            | 92.5                           | 1.040        | \$6,244             | A2            | C          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>10934</b>    | <b>109341</b> | <b>ITEM</b>  | <b>\$38.75</b> | <b>20.17</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>95.1</b>                    | <b>1.044</b> | <b>\$34,425</b>     | <b>A2</b>     | <b>C</b>   |
| <b>Br 3851-010</b>             |              | 11233           | 88550         | <b>a</b>     |                |              |             |               |                 |                                |              |                     | A3            | CX         |
| Six Miles S of SH 40           | 1            | 11233           | 88550         | AC%          | \$45.00        | 1.89         | 2           | NA            | -0.06           | NA                             | 1.000        | \$0                 | A3            | CX         |
| Six Miles S of SH 40           | 1            | 11233           | 88550         | Dn%          | \$45.00        | 1.89         | 5           | 0.82          | -0.72           | 97.4                           | 1.030        | \$1,276             | A3            | CX         |
| Six Miles S of SH 40           | 1            | 11233           | 88550         | Grad         | \$45.00        | 1.89         | 2           | NA            | 3.00            | NA                             | 1.000        | \$0                 | A3            | CX         |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11233</b>    | <b>88550</b>  | <b>ITEM</b>  | <b>\$45.00</b> | <b>1.89</b>  | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>97.4</b>                    | <b>1.015</b> | <b>\$1,276</b>      | <b>A3</b>     | <b>CX</b>  |
| <b>MC 006A 024</b>             |              | 11338           | 81341         | <b>a</b>     |                |              |             |               |                 |                                |              |                     | E1            | CX         |
| US 6, Machine Patch            | 3            | 11338           | 81341         | AC%          | \$40.00        | 5.58         | 6           | 0.22          | -0.00           | 86.3                           | 1.024        | \$1,613             | E1            | CX         |
| US 6, Machine Patch            | 3            | 11338           | 81341         | Dn%          | \$40.00        | 5.58         | 12          | 1.15          | -1.14           | 76.8                           | 0.955        | (\$5,020)           | E1            | CX         |
| US 6, Machine Patch            | 3            | 11338           | 81341         | Grad         | \$40.00        | 5.58         | 3           | 2.50          | 2.70            | 66.7                           | 0.987        | (\$574)             | E1            | CX         |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11338</b>    | <b>81341</b>  | <b>ITEM</b>  | <b>\$40.00</b> | <b>5.58</b>  | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>77.6</b>                    | <b>0.982</b> | <b>(\$3,981)</b>    | <b>E1</b>     | <b>CX</b>  |
| <b>IM 0703-231</b>             |              | 11350           | 98056         | <b>a</b>     |                |              |             |               |                 |                                |              |                     | W2            | S          |
| Eisenhower Tunnel-West         | 1            | 11350           | 98056         | AC%          | \$25.00        | 83.15        | 84          | 0.17          | 0.01            | 92.6                           | 1.018        | \$10,948            | W2            | S          |
| Eisenhower Tunnel-West         | 1            | 11350           | 98056         | Dn%          | \$25.00        | 83.15        | 167         | 1.03          | 0.27            | 94.1                           | 1.025        | \$25,804            | W2            | S          |
| Eisenhower Tunnel-West         | 1            | 11350           | 98056         | Grad         | \$25.00        | 83.15        | 42          | 2.30          | 0.30            | 90.5                           | 1.010        | \$4,230             | W2            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11350</b>    | <b>98056</b>  | <b>ITEM</b>  | <b>\$25.00</b> | <b>83.15</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>92.9</b>                    | <b>1.020</b> | <b>\$40,981</b>     | <b>W2</b>     | <b>S</b>   |
| <b>IM 0252-292</b>             |              | 11365           | R6016         | <b>a</b>     |                |              |             |               |                 |                                |              |                     | K1            | C          |
| I 25, Colo Blvd-South          | 6            | 11365           | R6016         | AC%          | \$36.00        | 28.35        | 29          | 0.16          | -0.02           | 93.8                           | 1.037        | \$11,404            | K1            | C          |
| I 25, Colo Blvd-South          | 6            | 11365           | R6016         | Dn%          | \$36.00        | 28.35        | 57          | 1.17          | -0.66           | 86.4                           | 0.974        | (\$13,231)          | K1            | C          |
| I 25, Colo Blvd-South          | 6            | 11365           | R6016         | Grad         | \$36.00        | 28.35        | 15          | 1.80          | -0.40           | 91.8                           | 1.032        | \$6,607             | K1            | C          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11365</b>    | <b>R6016</b>  | <b>ITEM</b>  | <b>\$36.00</b> | <b>28.35</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>89.7</b>                    | <b>1.005</b> | <b>\$4,780</b>      | <b>K1</b>     | <b>C</b>   |
| <b>NH 0403-024</b>             |              | 11628           | 97811         | <b>a</b>     |                |              |             |               |                 |                                |              |                     | E1            | S          |
| Moffat Tunnel-Clear Creek      | 1            | 11628           | 97811         | AC%          | \$18.00        | 24.61        | 25          | 0.13          | -0.05           | 97.3                           | 1.050        | \$6,644             | E1            | S          |
| Moffat Tunnel-Clear Creek      | 1            | 11628           | 97811         | Dn%          | \$18.00        | 24.61        | 50          | 0.76          | -0.46           | 98.0                           | 1.055        | \$12,181            | E1            | S          |
| Moffat Tunnel-Clear Creek      | 1            | 11628           | 97811         | Grad         | \$18.00        | 24.61        | 13          | 2.30          | -0.10           | 93.2                           | 1.039        | \$3,482             | E1            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11628</b>    | <b>97811</b>  | <b>ITEM</b>  | <b>\$18.00</b> | <b>24.61</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>       | <b>96.8</b>                    | <b>1.050</b> | <b>\$22,308</b>     | <b>E1</b>     | <b>S</b>   |

**TABLE 1**  
**HOT BITUMINOUS PAVEMENT QC/QA DETAILS & SUMMARY BY PROJECT**  
**AND MIX DESIGN FOR 1997 CONSTRUCTION SEASON USING QPM 97W**

| PROJECT<br>LOCATION            | REG/<br>UNIT | SUBAC<br>NUMBR | MIX<br>DESIGN<br>/PRCSS | ELE-<br>MENT | BID<br>\$/TON  | TONS<br>1000 | TEST<br>"n" | PROCESS<br>SD | MEAN<br>-TC | QUAL<br>LEVL    | PAY<br>FACT  | Incent/<br>Disinc\$            | Contr<br>Code | HBP<br>Agg |
|--------------------------------|--------------|----------------|-------------------------|--------------|----------------|--------------|-------------|---------------|-------------|-----------------|--------------|--------------------------------|---------------|------------|
|                                |              |                |                         |              |                |              |             |               |             | Gradation is #8 |              | Gradation is CONTROLLING Sieve |               |            |
| <b>C 0911-003</b>              |              | 11706          | 603397                  | a            |                |              |             |               |             |                 |              |                                | H1            | S          |
| Copper Mountain-South          | 1            | 11706          | 603397                  | AC%          | \$24.04        | 19.22        | 20          | 0.10          | 0.10        | 98.1            | 1.050        | \$6,931                        | H1            | S          |
| Copper Mountain-South          | 1            | 11706          | 603397                  | Dn%          | \$24.04        | 19.22        | 39          | 0.89          | -0.64       | 93.8            | 1.034        | \$7,784                        | H1            | S          |
| Copper Mountain-South          | 1            | 11706          | 603397                  | Grad         | \$24.04        | 19.22        | 10          | 2.10          | 2.70        | 54.7            | 0.801        | (\$18,401)                     | H1            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11706</b>   | <b>603397</b>           | <b>ITEM</b>  | <b>\$24.04</b> | <b>19.22</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>   | <b>87.3</b>     | <b>0.992</b> | <b>(\$3,685)</b>               | <b>H1</b>     | <b>S</b>   |
| <b>IM 0252-303</b>             |              | 11765          | 98203                   | a            |                |              |             |               |             |                 |              |                                | S1            | C          |
| Tomaha Road North              | 1            | 11765          | 98203                   | AC%          | \$36.16        | 33.38        | 34          | 0.14          | 0.13        | 89.0            | 1.003        | \$1,198                        | S1            | C          |
| Tomaha Road North              | 1            | 11765          | 98203                   | Dn%          | \$36.16        | 33.38        | 67          | 0.83          | -0.49       | 96.6            | 1.050        | \$30,050                       | S1            | C          |
| Tomaha Road North              | 1            | 11765          | 98203                   | Grad         | \$36.16        | 33.38        | 17          | 3.30          | -0.50       | 75.9            | 0.934        | (\$16,008)                     | S1            | C          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11765</b>   | <b>98203</b>            | <b>ITEM</b>  | <b>\$36.16</b> | <b>33.38</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>   | <b>90.2</b>     | <b>1.013</b> | <b>\$15,241</b>                | <b>S1</b>     | <b>C</b>   |
| <b>NH 0243-053</b>             |              | 11773          | 102007                  | a            |                |              |             |               |             |                 |              |                                | K1            | S          |
| Bridge Remov, CRI&P RR         | 1            | 11773          | 102007                  | AC%          | \$58.10        | 3.77         | 8           | 0.12          | 0.11        | 95.0            | 1.040        | \$2,628                        | K1            | S          |
| Bridge Remov, CRI&P RR         | 1            | 11773          | 102007                  | Dn%          | \$58.10        | 3.77         | 8           | 0.94          | -0.58       | 94.8            | 1.040        | \$4,381                        | K1            | S          |
| Bridge Remov, CRI&P RR         | 1            | 11773          | 102007                  | Grad         | \$58.10        | 3.77         | 4           | 1.30          | -3.70       | 83.1            | 1.030        | \$1,302                        | K1            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11773</b>   | <b>102007</b>           | <b>ITEM</b>  | <b>\$58.10</b> | <b>3.77</b>  | <b>NA</b>   | <b>NA</b>     | <b>NA</b>   | <b>92.5</b>     | <b>1.038</b> | <b>\$8,312</b>                 | <b>K1</b>     | <b>S</b>   |
| <b>IM 0705-067</b>             |              | 11779          | 68220                   | a            |                |              |             |               |             |                 |              |                                | W2            | S          |
| Bethune East                   | 1            | 11779          | 68220                   | AC%          | \$35.00        | 26.75        | 27          | 0.14          | 0.03        | 96.8            | 1.055        | \$15,450                       | W2            | S          |
| Bethune East                   | 1            | 11779          | 68220                   | Dn%          | \$35.00        | 26.75        | 54          | 1.00          | -0.80       | 89.9            | 1.002        | \$1,088                        | W2            | S          |
| Bethune East                   | 1            | 11779          | 68220                   | Grad         | \$35.00        | 26.75        | 14          | 1.40          | -0.60       | 86.5            | 1.006        | \$1,090                        | W2            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11779</b>   | <b>68220</b>            | <b>ITEM</b>  | <b>\$35.00</b> | <b>26.75</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>   | <b>91.3</b>     | <b>1.019</b> | <b>\$17,627</b>                | <b>W2</b>     | <b>S</b>   |
| <b>C R200-056</b>              |              | 11786          | 90497                   | a            |                |              |             |               |             |                 |              |                                | G1            | S          |
| Lamar Area, Mach Patch         | 2            | 11786          | 90497                   | AC%          | \$30.30        | 13.81        | 14          | 0.21          | -0.01       | 86.0            | 1.003        | \$375                          | G1            | S          |
| Lamar Area, Mach Patch         | 2            | 11786          | 90497                   | Dn%          | \$30.30        | 13.81        | 28          | 0.54          | -0.38       | 99.9            | 1.055        | \$11,503                       | G1            | S          |
| Lamar Area, Mach Patch         | 2            | 11786          | 90497                   | Grad         | \$30.30        | 13.81        | 7           | 2.30          | 0.90        | 74.1            | 0.963        | (\$3,125)                      | G1            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11786</b>   | <b>90497</b>            | <b>ITEM</b>  | <b>\$30.30</b> | <b>13.81</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>   | <b>90.6</b>     | <b>1.021</b> | <b>\$8,753</b>                 | <b>G1</b>     | <b>S</b>   |
| <b>C R200-057</b>              |              | 11787          | 93626                   | a            |                |              |             |               |             |                 |              |                                | A2            | S          |
| Pueblo Area, Mach Patch        | 2            | 11787          | 93626                   | AC%          | \$32.70        | 10.24        | 11          | 0.18          | -0.03       | 91.1            | 1.032        | \$3,208                        | A2            | S          |
| Pueblo Area, Mach Patch        | 2            | 11787          | 93626                   | Dn%          | \$32.70        | 10.24        | 21          | 0.79          | -0.84       | 93.1            | 1.036        | \$6,038                        | A2            | S          |
| Pueblo Area, Mach Patch        | 2            | 11787          | 93626                   | Grad         | \$32.70        | 10.24        | 6           | 1.90          | 0.30        | 93.9            | 1.035        | \$2,344                        | A2            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11787</b>   | <b>93626</b>            | <b>ITEM</b>  | <b>\$32.70</b> | <b>10.24</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>   | <b>92.7</b>     | <b>1.035</b> | <b>\$11,591</b>                | <b>A2</b>     | <b>S</b>   |
| <b>CR 200-059</b>              |              | 11789          | 85577                   | a            |                |              |             |               |             |                 |              |                                | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789          | 85577                   | AC%          | \$36.50        | 4.00         | 4           | 0.18          | 0.17        | 73.6            | 0.995        | (\$201)                        | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789          | 85577                   | Dn%          | \$36.50        | 4.00         | 8           | 1.03          | -1.49       | 68.4            | 0.919        | (\$5,888)                      | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789          | 85577                   | Grad         | \$36.50        | 4.00         | 2           | NA            | 0.50        | NA              | 1.000        | \$0                            | A2            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11789</b>   | <b>85577</b>            | <b>ITEM</b>  | <b>\$36.50</b> | <b>4.00</b>  | <b>NA</b>   | <b>NA</b>     | <b>NA</b>   | <b>70.4</b>     | <b>0.958</b> | <b>(\$6,089)</b>               | <b>A2</b>     | <b>S</b>   |
| <b>CR 200-059</b>              |              | 11789          | 93626                   | a            |                |              |             |               |             |                 |              |                                | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789          | 93626                   | AC%          | \$36.50        | 6.00         | 6           | 0.26          | -0.10       | 72.5            | 0.962        | (\$2,506)                      | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789          | 93626                   | Dn%          | \$36.50        | 6.00         | 12          | 1.05          | -0.49       | 92.8            | 1.038        | \$4,174                        | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789          | 93626                   | Grad         | \$36.50        | 6.00         | 3           | 3.50          | -1.00       | 54.4            | 0.920        | (\$3,518)                      | A2            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11789</b>   | <b>93626</b>            | <b>ITEM</b>  | <b>\$36.50</b> | <b>6.00</b>  |             |               |             | <b>79.0</b>     | <b>0.992</b> | <b>(\$1,850)</b>               | <b>A2</b>     | <b>S</b>   |
| <b>CR 200-059</b>              |              | 11789          | 85577A1                 | a            |                |              |             |               |             |                 |              |                                | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789          | 85577A1                 | AC%          | \$36.50        | 6.85         | 9           | 0.21          | -0.14       | 75.9            | 0.750        | (\$32,568)                     | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789          | 85577A1                 | Dn%          | \$36.50        | 6.85         | 18          | 0.73          | -0.14       | 99.8            | 0.750        | (\$54,279)                     | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789          | 85577A1                 | Grad         | \$36.50        | 6.85         | 5           | 1.70          | 0.30        | 21.1            | 0.750        | (\$12,507)                     | A2            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11789</b>   | <b>85577A1</b>          | <b>ITEM</b>  | <b>\$36.50</b> | <b>6.85</b>  | <b>NA</b>   | <b>NA</b>     | <b>NA</b>   | <b>76.9</b>     | <b>0.750</b> | <b>(\$99,353)</b>              | <b>A2</b>     | <b>S</b>   |

**TABLE 1**  
**HOT BITUMINOUS PAVEMENT QC/QA DETAILS & SUMMARY BY PROJECT**  
**AND MIX DESIGN FOR 1997 CONSTRUCTION SEASON USING QPM 97W**

| PROJECT<br>LOCATION            | REG/<br>UNIT | SUBAC<br>NUMBER | MIX<br>DESIGN  | ELE-<br>MENT | BID<br>\$/TON  | TONS<br>1000 | TEST<br>"n" | PROCESS<br>SD   | MEAN<br>-TC | QUAL<br>LEVL                   | PAY<br>FACT  | Incent/<br>Disinc\$ | Contr<br>Code | HBP<br>Agg |
|--------------------------------|--------------|-----------------|----------------|--------------|----------------|--------------|-------------|-----------------|-------------|--------------------------------|--------------|---------------------|---------------|------------|
|                                |              |                 | /PRCSS         |              |                |              |             | Gradation is #8 |             | Gradation is CONTROLLING Sieve |              |                     |               | Grad       |
| <b>CR 200-059</b>              |              | 11789           | 85577A2        | <b>a</b>     |                |              |             |                 |             |                                |              |                     | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789           | 85577A2        | AC%          | \$36.50        | 2.00         |             |                 | NA          | NA                             | 0.500        | (\$10,950)          | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789           | 85577A2        | Dn%          | \$36.50        | 2.00         |             |                 | NA          | NA                             | 0.500        | (\$18,250)          | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789           | 85577A2        | Grad         | \$36.50        | 2.00         | 1           | >2V             | NA          | NA                             | 0.500        | (\$7,300)           | A2            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11789</b>    | <b>85577A2</b> | <b>ITEM</b>  | <b>\$36.50</b> | <b>2.00</b>  | <b>NA</b>   | <b>NA</b>       | <b>NA</b>   | <b>NA</b>                      | <b>0.500</b> | <b>(\$36,500)</b>   | <b>A2</b>     | <b>S</b>   |
| <b>CR 200-059</b>              |              | 11789           | 93626A         | <b>a</b>     |                |              |             |                 |             |                                |              |                     | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789           | 93626A         | AC%          | \$36.50        | 14.88        | 15          | 0.18            | -0.09       | 88.0                           | 1.012        | \$2,030             | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789           | 93626A         | Dn%          | \$36.50        | 14.88        | 30          | 0.97            | 0.32        | 95.6                           | 1.048        | \$13,109            | A2            | S          |
| CO Spgs Area, Mach Patch       | 2            | 11789           | 93626A         | Grad         | \$36.50        | 14.88        | 8           | 2.40            | 2.90        | 57.7                           | 0.841        | (\$17,242)          | A2            | S          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>11789</b>    | <b>93626A</b>  | <b>ITEM</b>  | <b>\$36.50</b> | <b>14.88</b> | <b>NA</b>   | <b>NA</b>       | <b>NA</b>   | <b>85.8</b>                    | <b>0.996</b> | <b>(\$2,103)</b>    | <b>A2</b>     | <b>S</b>   |
| <b>FR(CX) 009-2 (009)</b>      |              | 88041           | 841001         | <b>a</b>     |                |              |             |                 |             |                                |              |                     | B5            | C          |
| 3 Mi N of Silverthorne-N       | 1            | 88041           | 841001         | AC%          | \$42.00        | 1.73         | 2           | NA              | 0.05        | NA                             | 1.000        | \$0                 | B5            | C          |
| 3 Mi N of Silverthorne-N       | 1            | 88041           | 841001         | Dn%          | \$42.00        | 1.73         | 4           | 0.88            | -0.60       | 100.0                          | 1.030        | \$1,089             | B5            | C          |
| 3 Mi N of Silverthorne-N       | 1            | 88041           | 841001         | Grad         | \$42.00        | 1.73         | 1           | NA              | -4.00       | NA                             | 1.000        | \$0                 | B5            | C          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>88041</b>    | <b>841001</b>  | <b>ITEM</b>  | <b>\$42.00</b> | <b>1.73</b>  | <b>NA</b>   | <b>NA</b>       | <b>NA</b>   | <b>100.0</b>                   | <b>1.015</b> | <b>\$1,089</b>      | <b>B5</b>     | <b>C</b>   |
| <b>FR(CX) 009-2 (009)</b>      |              | 88041           | 841002         | <b>a</b>     |                |              |             |                 |             |                                |              |                     | B5            | C          |
| 3 Mi N of Silverthorne-N       | 1            | 88041           | 841002         | AC%          | \$42.00        | 15.13        | 16          | 0.11            | 0.15        | 99.5                           | 1.050        | \$9,534             | B5            | C          |
| 3 Mi N of Silverthorne-N       | 1            | 88041           | 841002         | Dn%          | \$42.00        | 15.13        | 31          | 0.67            | 0.12        | 99.8                           | 1.050        | \$15,890            | B5            | C          |
| 3 Mi N of Silverthorne-N       | 1            | 88041           | 841002         | Grad         | \$42.00        | 15.13        | 8           | 1.40            | -1.20       | 100.0                          | 1.040        | \$5,085             | B5            | C          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>88041</b>    | <b>841002</b>  | <b>ITEM</b>  | <b>\$42.00</b> | <b>15.13</b> | <b>NA</b>   | <b>NA</b>       | <b>NA</b>   | <b>99.8</b>                    | <b>1.048</b> | <b>\$30,508</b>     | <b>B5</b>     | <b>C</b>   |
| <b>BRF 050-4 (17)</b>          |              | 91067           | 93048          | <b>a</b>     |                |              |             |                 |             |                                |              |                     | T1            | C          |
| SH 50 in Otero County          | 2            | 91067           | 93048          | AC%          | \$33.00        | 14.00        | 14          | 0.21            | 0.07        | 83.5                           | 0.991        | (\$1,249)           | T1            | C          |
| SH 50 in Otero County          | 2            | 91067           | 93048          | Dn%          | \$33.00        | 14.00        | 28          | 0.59            | -1.26       | 89.7                           | 1.016        | \$3,654             | T1            | C          |
| SH 50 in Otero County          | 2            | 91067           | 93048          | Grad         | \$33.00        | 14.00        | 7           | 2.30            | 4.00        | 76.7                           | 0.984        | (\$1,495)           | T1            | C          |
| <b>TOTALS &amp; WTED MEANS</b> |              | <b>91067</b>    | <b>93048</b>   | <b>ITEM</b>  | <b>\$33.00</b> | <b>14.00</b> | <b>NA</b>   | <b>NA</b>       | <b>NA</b>   | <b>85.2</b>                    | <b>1.002</b> | <b>\$911</b>        | <b>T1</b>     | <b>C</b>   |



**TABLE 2**  
**HOT BITUMINOUS PAVEMENT QC/QA DETAILS & SUMMARY BY PROJECT**  
**AND MIX DESIGN FOR 1997 CONSTRUCTION SEASON USING QPM 97W**

| PROJECT<br>LOCATION                   | REG/<br>UNIT | SUBAC<br>NUMBR | MIX<br>DESIGN<br>/PRCSS | ELE-<br>MENT | BID<br>\$/TON                  | TONS<br>1000  | TEST<br>"a" | PROCESS<br>SD | MN-TC         | QUAL<br>LEVL  | PAY<br>FACT  | Incent/<br>Disinc\$ | Contr<br>Code | HBP<br>Agg |
|---------------------------------------|--------------|----------------|-------------------------|--------------|--------------------------------|---------------|-------------|---------------|---------------|---------------|--------------|---------------------|---------------|------------|
| 120th and Huron                       | 6            | 10391          | R60072                  | Grad         | \$35.00                        | 3.50          | 2           | NA            | 3.00          | NA            | 1.000        | \$0                 | B3            | C          |
| Parkdale - West                       | 2            | 10934          | 109341                  | Grad         | \$38.75                        | 3.60          | 2           | NA            | 3.00          | NA            | 1.000        | \$0                 | A2            | C          |
| Parkdale - West                       | 2            | 10934          | 109342                  | Grad         | \$38.75                        | 20.17         | 11          | 3.00          | 6.20          | 92.5          | 1.040        | \$6,244             | A2            | C          |
| Six Miles S of SH 40                  | 1            | 11233          | 88550                   | Grad         | \$45.00                        | 1.89          | 2           | NA            | 3.00          | NA            | 1.000        | \$0                 | A3            | CX         |
| US 6, Machine Patch                   | 3            | 11338          | 81341                   | Grad         | \$40.00                        | 5.58          | 3           | 2.50          | 2.70          | 66.7          | 0.987        | (\$574)             | E1            | CX         |
| I 25, Colo Blvd-South                 | 6            | 11365          | R6016                   | Grad         | \$36.00                        | 28.35         | 15          | 1.80          | -0.40         | 91.8          | 1.032        | \$6,607             | K1            | C          |
| Tomaha Road North                     | 1            | 11765          | 98203                   | Grad         | \$36.16                        | 33.38         | 17          | 3.30          | -0.50         | 75.9          | 0.934        | (\$16,008)          | S1            | C          |
| 3 Mi N of Silverthorne-N              | 1            | 88041          | 841001                  | Grad         | \$42.00                        | 1.73          | 1           | NA            | -4.00         | NA            | 1.000        | \$0                 | B5            | C          |
| 3 Mi N of Silverthorne-N              | 1            | 88041          | 841002                  | Grad         | \$42.00                        | 15.13         | 8           | 1.40          | -1.20         | 100.0         | 1.040        | \$5,085             | B5            | C          |
| SH 50 in Otero County                 | 2            | 91067          | 93048                   | Grad         | \$33.00                        | 14.00         | 7           | 2.30          | 4.00          | 76.7          | 0.984        | (\$1,495)           | T1            | C          |
|                                       |              |                |                         |              |                                | 127.32        | 68          | 2.48          | 1.46          | 85.43         | 1.00         | (\$141)             |               |            |
| Eisenhower Tunnel-West                | 1            | 11350          | 98056                   | Grad         | \$25.00                        | 83.15         | 42          | 2.30          | 0.30          | 90.5          | 1.010        | \$4,230             | W2            | S          |
| Moffat Tunnel-Clear Creek             | 1            | 11628          | 97811                   | Grad         | \$18.00                        | 24.61         | 13          | 2.30          | -0.10         | 93.2          | 1.039        | \$3,482             | E1            | S          |
| Copper Mountain-South                 | 1            | 11706          | 603397                  | Grad         | \$24.04                        | 19.22         | 10          | 2.10          | 2.70          | 54.7          | 0.801        | (\$18,401)          | H1            | S          |
| Bridge Remov, CRI&P RR                | 1            | 11773          | 102007                  | Grad         | \$58.10                        | 3.77          | 4           | 1.30          | -3.70         | 83.1          | 1.030        | \$1,302             | K1            | S          |
| Bethune East                          | 1            | 11779          | 68220                   | Grad         | \$35.00                        | 26.75         | 14          | 1.40          | -0.60         | 86.5          | 1.006        | \$1,090             | W2            | S          |
| Lamar Area, Mach Patch                | 2            | 11786          | 90497                   | Grad         | \$30.30                        | 13.81         | 7           | 2.30          | 0.90          | 74.1          | 0.963        | (\$3,125)           | G1            | S          |
| Pueblo Area, Mach Patch               | 2            | 11787          | 93626                   | Grad         | \$32.70                        | 10.24         | 6           | 1.90          | 0.30          | 93.9          | 1.035        | \$2,344             | A2            | S          |
| CO Spgs Area, Mach Patch              | 2            | 11789          | 85577                   | Grad         | \$36.50                        | 4.00          | 2           | NA            | 0.50          | NA            | 1.000        | \$0                 | A2            | S          |
| CO Spgs Area, Mach Patch              | 2            | 11789          | 93626                   | Grad         | \$36.50                        | 6.00          | 3           | 3.50          | -1.00         | 54.4          | 0.920        | (\$3,518)           | A2            | S          |
| CO Spgs Area, Mach Patch              | 2            | 11789          | 85577A1                 | Grad         | \$36.50                        | 6.85          | 5           | 1.70          | 0.30          | 21.1          | 0.750        | (\$12,507)          | A2            | S          |
| CO Spgs Area, Mach Patch              | 2            | 11789          | 85577A2                 | Grad         | \$36.50                        | 2.00          | 1           | >2V           | NA            | NA            | 0.500        | (\$7,300)           | A2            | S          |
| CO Spgs Area, Mach Patch              | 2            | 11789          | 93626A                  | Grad         | \$36.50                        | 14.88         | 8           | 2.40          | 2.90          | 57.7          | 0.841        | (\$17,242)          | A2            | S          |
|                                       |              |                |                         |              |                                | 215.28        | 115         | 2.15          | 0.48          | 80.3          | 0.965        | (\$49,644)          |               |            |
| Gypsum-Eagle                          | 3            | 10093          | 60128                   | Grad         | \$24.85                        | 5.03          | 3           | 1.20          | -0.70         | 71.5          | 1.007        | \$168               | E1            | StF        |
| Gypsum-Eagle                          | 3            | 10093          | 60128A                  | Grad         | \$24.85                        | 30.26         | 16          | 0.80          | -0.40         | 88.7          | 1.018        | \$2,765             | E1            | StF        |
|                                       |              |                |                         |              |                                | 35.286        | 19          | 0.857         | -0.4428       | 86.249        | 1.01673      | \$2,934             |               |            |
| <b>All Grad Processes</b>             |              |                |                         |              | <b>\$31.09</b>                 | <b>377.89</b> | <b>202</b>  | <b>2.13</b>   | <b>0.676</b>  | <b>82.556</b> | <b>0.981</b> | <b>(\$46,851)</b>   | <b>0.68</b>   |            |
|                                       |              |                |                         |              | <b>Wt'd Avg Absolute Mn-TC</b> |               |             |               | <b>1.2499</b> |               |              |                     |               |            |
| STU M356-004                          | 6            | 10391          | R60072                  | ITEM         | \$35.00                        | 3.50          | NA          | NA            | NA            | 96.4          | 1.025        | \$3,062             | B3            | C          |
| PLH 0503-047                          | 2            | 10934          | 109341                  | ITEM         | \$38.75                        | 3.60          | NA          | NA            | NA            | 92.0          | 1.028        | \$3,857             | A2            | C          |
| PLH 0503-047                          | 2            | 10934          | 109342                  | ITEM         | \$38.75                        | 20.17         | NA          | NA            | NA            | 95.1          | 1.044        | \$34,425            | A2            | C          |
| IM 0252-292                           | 6            | 11365          | R6016                   | ITEM         | \$36.00                        | 28.35         | NA          | NA            | NA            | 89.7          | 1.005        | \$4,780             | K1            | C          |
| IM 0252-303                           | 1            | 11765          | 98203                   | ITEM         | \$36.16                        | 33.38         | NA          | NA            | NA            | 90.2          | 1.013        | \$15,241            | S1            | C          |
| FR(CX) 009-2 (009)                    | 1            | 88041          | 841001                  | ITEM         | \$42.00                        | 1.73          | NA          | NA            | NA            | 100.0         | 1.015        | \$1,089             | B5            | C          |
| FR(CX) 009-2 (009)                    | 1            | 88041          | 841002                  | ITEM         | \$42.00                        | 15.13         | NA          | NA            | NA            | 99.8          | 1.048        | \$30,508            | B5            | C          |
| BRF 050-4 (17)                        | 2            | 91067          | 93048                   | ITEM         | \$33.00                        | 14.00         | NA          | NA            | NA            | 85.2          | 1.002        | \$911               | T1            | C          |
| Br 3851-010                           | 1            | 11233          | 88550                   | ITEM         | \$45.00                        | 1.89          | NA          | NA            | NA            | 97.4          | 1.015        | \$1,276             | A3            | CX         |
| MC 006A 024                           | 3            | 11338          | 81341                   | ITEM         | \$40.00                        | 5.58          | NA          | NA            | NA            | 77.6          | 0.982        | (\$3,981)           | E1            | CX         |
|                                       |              |                |                         |              |                                | 127.32        | NA          | NA            | NA            | 91.4          | 3.968        | \$156,878           |               |            |
| IM 0703-231                           | 1            | 11350          | 98056                   | ITEM         | \$25.00                        | 83.15         | NA          | NA            | NA            | 92.9          | 1.020        | \$40,981            | W2            | S          |
| NH 0403-024                           | 1            | 11628          | 97811                   | ITEM         | \$18.00                        | 24.61         | NA          | NA            | NA            | 96.8          | 1.050        | \$22,308            | E1            | S          |
| C 0911-003                            | 1            | 11706          | 603397                  | ITEM         | \$24.04                        | 19.22         | NA          | NA            | NA            | 87.3          | 0.992        | (\$3,685)           | H1            | S          |
| NH 0243-053                           | 1            | 11773          | 102007                  | ITEM         | \$58.10                        | 3.77          | NA          | NA            | NA            | 92.5          | 1.038        | \$8,312             | K1            | S          |
| IM 0705-067                           | 1            | 11779          | 68220                   | ITEM         | \$35.00                        | 26.75         | NA          | NA            | NA            | 91.3          | 1.019        | \$17,627            | W2            | S          |
| C R200-056                            | 2            | 11786          | 90497                   | ITEM         | \$30.30                        | 13.81         | NA          | NA            | NA            | 90.6          | 1.021        | \$8,753             | G1            | S          |
| C R200-057                            | 2            | 11787          | 93626                   | ITEM         | \$32.70                        | 10.24         | NA          | NA            | NA            | 92.7          | 1.035        | \$11,591            | A2            | S          |
| CR 200-059                            | 2            | 11789          | 85577                   | ITEM         | \$36.50                        | 4.00          | NA          | NA            | NA            | 70.4          | 0.958        | (\$6,089)           | A2            | S          |
| CR 200-059                            | 2            | 11789          | 93626                   | ITEM         | \$36.50                        | 6.00          | NA          | NA            | NA            | 79.0          | 0.992        | (\$1,850)           | A2            | S          |
| CR 200-059                            | 2            | 11789          | 85577A1                 | ITEM         | \$36.50                        | 6.85          | NA          | NA            | NA            | 76.9          | 0.750        | (\$99,353)          | A2            | S          |
| CR 200-059                            | 2            | 11789          | 85577A2                 | ITEM         | \$36.50                        | 2.00          | NA          | NA            | NA            | NA            | 0.500        | (\$36,500)          | A2            | S          |
| CR 200-059                            | 2            | 11789          | 93626A                  | ITEM         | \$36.50                        | 14.88         | NA          | NA            | NA            | 85.8          | 0.996        | (\$2,103)           | A2            | S          |
|                                       |              |                |                         |              |                                | 215.28        | NA          | NA            | NA            | 89.8          | 0.996        | (\$40,008)          |               |            |
| HH 0702-193                           | 3            | 10093          | 60128                   | ITEM         | \$24.85                        | 5.03          | NA          | NA            | NA            | 78.8          | 1.016        | \$981               | E1            | StF        |
| HH 0702-193                           | 3            | 10093          | 60128A                  | ITEM         | \$24.85                        | 30.26         | NA          | NA            | NA            | 92.8          | 1.036        | \$13,570            | E1            | StF        |
|                                       |              |                |                         |              |                                | 35.286        | NA          | NA            | NA            | 90.842        | 1.03319      | \$14,551            |               |            |
| <b>All ITEM (Composite) Processes</b> |              |                |                         |              | <b>\$31.06</b>                 | <b>377.89</b> | <b>NA</b>   | <b>NA</b>     | <b>NA</b>     | <b>90.919</b> | <b>1.015</b> | <b>\$65,710</b>     |               |            |

**TABLE 3**  
**HOT BITUMINOUS PAVEMENT QC/QA DETAILS & SUMMARY BY PROJECT**  
**AND MIX DESIGN FOR 1997 CONSTRUCTION SEASON USING QPM 97W**

| PROJECT<br>LOCATION                                      | REG/<br>UNIT | SUBAC<br>NUMBER | MIX<br>DESIGN | ELE-<br>MENT | BID<br>\$/TON | TONS<br>1000 | TEST<br>"n" | PROCESS |       | QUAL<br>LEVL | PAY<br>FACT | Incent/<br>Disinc\$ | Contr<br>Code |
|----------------------------------------------------------|--------------|-----------------|---------------|--------------|---------------|--------------|-------------|---------|-------|--------------|-------------|---------------------|---------------|
|                                                          |              |                 | /PRCSS        |              |               |              |             | SD      | MN-TC | Graded is #8 |             | Graded is CONTROLLI |               |
| ITEM PROCESSES SORTED BY WEIGHTED AVERAGE QUALITY LEVELS |              |                 |               |              |               |              |             |         |       |              |             |                     |               |
| FR(CX) 009-2 (009)                                       | 1            | 88041           | 841001        | ITEM         | \$42.00       | 1.73         | NA          | NA      | NA    | 100.0        | 1.015       | \$1,089             | B5            |
| FR(CX) 009-2 (009)                                       | 1            | 88041           | 841002        | ITEM         | \$42.00       | 15.13        | NA          | NA      | NA    | 99.8         | 1.048       | \$30,508            | B5            |
| Br 3851-010                                              | 1            | 11233           | 88550         | ITEM         | \$45.00       | 1.89         | NA          | NA      | NA    | 97.4         | 1.015       | \$1,276             | A3            |
| NH 0403-024                                              | 1            | 11628           | 97811         | ITEM         | \$18.00       | 24.61        | NA          | NA      | NA    | 96.8         | 1.050       | \$22,308            | E1            |
| STU M356-004                                             | 6            | 10391           | R60072        | ITEM         | \$35.00       | 3.50         | NA          | NA      | NA    | 96.4         | 1.025       | \$3,062             | B3            |
| PLH 0503-047                                             | 2            | 10934           | 109342        | ITEM         | \$38.75       | 20.17        | NA          | NA      | NA    | 95.1         | 1.044       | \$34,425            | A2            |
| IM 0703-231                                              | 1            | 11350           | 98056         | ITEM         | \$25.00       | 83.15        | NA          | NA      | NA    | 92.9         | 1.020       | \$40,981            | W2            |
| HH 0702-193                                              | 3            | 10093           | 60128A        | ITEM         | \$24.85       | 30.26        | NA          | NA      | NA    | 92.8         | 1.036       | \$13,570            | E1            |
| C R200-057                                               | 2            | 11787           | 93626         | ITEM         | \$32.70       | 10.24        | NA          | NA      | NA    | 92.7         | 1.035       | \$11,591            | A2            |
| NH 0243-053                                              | 1            | 11773           | 102007        | ITEM         | \$58.10       | 3.77         | NA          | NA      | NA    | 92.5         | 1.038       | \$8,312             | K1            |
| PLH 0503-047                                             | 2            | 10934           | 109341        | ITEM         | \$38.75       | 3.60         | NA          | NA      | NA    | 92.0         | 1.028       | \$3,857             | A2            |
| IM 0705-067                                              | 1            | 11779           | 68220         | ITEM         | \$35.00       | 26.75        | NA          | NA      | NA    | 91.3         | 1.019       | \$17,627            | W2            |
| C R200-056                                               | 2            | 11786           | 90497         | ITEM         | \$30.30       | 13.81        | NA          | NA      | NA    | 90.6         | 1.021       | \$8,753             | G1            |
| IM 0252-303                                              | 1            | 11765           | 98203         | ITEM         | \$36.16       | 33.38        | NA          | NA      | NA    | 90.2         | 1.013       | \$15,241            | S1            |
| IM 0252-292                                              | 6            | 11365           | R6016         | ITEM         | \$36.00       | 28.35        | NA          | NA      | NA    | 89.7         | 1.005       | \$4,780             | K1            |
| C 0911-003                                               | 1            | 11706           | 603397        | ITEM         | \$24.04       | 19.22        | NA          | NA      | NA    | 87.3         | 0.992       | (\$3,685)           | H1            |
| CR 200-059                                               | 2            | 11789           | 93626A        | ITEM         | \$36.50       | 14.88        | NA          | NA      | NA    | 85.8         | 0.996       | (\$2,103)           | A2            |
| BRF 050-4 (17)                                           | 2            | 91067           | 93048         | ITEM         | \$33.00       | 14.00        | NA          | NA      | NA    | 85.2         | 1.002       | \$911               | T1            |
| CR 200-059                                               | 2            | 11789           | 93626         | ITEM         | \$36.50       | 6.00         | NA          | NA      | NA    | 79.0         | 0.992       | (\$1,850)           | A2            |
| HH 0702-193                                              | 3            | 10093           | 60128         | ITEM         | \$24.85       | 5.03         | NA          | NA      | NA    | 78.8         | 1.016       | \$981               | E1            |
| MC 006A 024                                              | 3            | 11338           | 81341         | ITEM         | \$40.00       | 5.58         | NA          | NA      | NA    | 77.6         | 0.982       | (\$3,981)           | E1            |
| CR 200-059                                               | 2            | 11789           | 85577A1       | ITEM         | \$36.50       | 6.85         | NA          | NA      | NA    | 76.9         | 0.750       | (\$99,353)          | A2            |
| CR 200-059                                               | 2            | 11789           | 85577         | ITEM         | \$36.50       | 4.00         | NA          | NA      | NA    | 70.4         | 0.958       | (\$6,089)           | A2            |
| CR 200-059                                               | 2            | 11789           | 85577A2       | ITEM         | \$36.50       | 2.00         | NA          | NA      | NA    | 0.0          | 0.500       | (\$36,500)          | A2            |
| 377.89                                                   |              |                 |               |              |               |              |             |         |       | 90.919       | 1.01472     | \$65,710            |               |

**TABLE 3A**  
**ITEM PROCESSES SORTED BY CONTRACTORS AND WEIGHTED AVERAGE QL**

|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
|--------------------|---|-------|---------|------|---------|-------|----|----|----|-------|-------|------------|----|
| FR(CX) 009-2 (009) | 1 | 88041 | 841001  | ITEM | \$42.00 | 1.73  | NA | NA | NA | 100.0 | 1.015 | \$1,089    | B5 |
| FR(CX) 009-2 (009) | 1 | 88041 | 841002  | ITEM | \$42.00 | 15.13 | NA | NA | NA | 99.8  | 1.048 | \$30,508   | B5 |
| 16.86              |   |       |         |      |         |       |    |    |    | 99.8  |       |            | B5 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| Br 3851-010        | 1 | 11233 | 88550   | ITEM | \$45.00 | 1.89  | NA | NA | NA | 97.4  | 1.015 | \$1,276    | A3 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| STU M356-004       | 6 | 10391 | R60072  | ITEM | \$35.00 | 3.50  | NA | NA | NA | 96.4  | 1.025 | \$3,062    | B3 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| IM 0703-231        | 1 | 11350 | 98056   | ITEM | \$25.00 | 83.15 | NA | NA | NA | 92.9  | 1.020 | \$40,981   | W2 |
| IM 0705-067        | 1 | 11779 | 68220   | ITEM | \$35.00 | 26.75 | NA | NA | NA | 91.3  | 1.019 | \$17,627   | W2 |
| 109.90             |   |       |         |      |         |       |    |    |    | 92.5  |       |            | W2 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| HH 0702-193        | 3 | 10093 | 60128   | ITEM | \$24.85 | 5.03  | NA | NA | NA | 78.8  | 1.016 | \$981      | E1 |
| HH 0702-193        | 3 | 10093 | 60128A  | ITEM | \$24.85 | 30.26 | NA | NA | NA | 92.8  | 1.036 | \$13,570   | E1 |
| MC 006A 024        | 3 | 11338 | 81341   | ITEM | \$40.00 | 5.58  | NA | NA | NA | 77.6  | 0.982 | (\$3,981)  | E1 |
| NH 0403-024        | 1 | 11628 | 97811   | ITEM | \$18.00 | 24.61 | NA | NA | NA | 96.8  | 1.050 | \$22,308   | E1 |
| 65.47              |   |       |         |      |         |       |    |    |    | 92.0  |       |            | E1 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| C R200-056         | 2 | 11786 | 90497   | ITEM | \$30.30 | 13.81 | NA | NA | NA | 90.6  | 1.021 | \$8,753    | G1 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| IM 0252-303        | 1 | 11765 | 98203   | ITEM | \$36.16 | 33.38 | NA | NA | NA | 90.2  | 1.013 | \$15,241   | S1 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| IM 0252-292        | 6 | 11365 | R6016   | ITEM | \$36.00 | 28.35 | NA | NA | NA | 89.7  | 1.005 | \$4,780    | K1 |
| NH 0243-053        | 1 | 11773 | 102007  | ITEM | \$58.10 | 3.77  | NA | NA | NA | 92.5  | 1.038 | \$8,312    | K1 |
| 32.12              |   |       |         |      |         |       |    |    |    | 90.0  |       |            | K1 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| PLH 0503-047       | 2 | 10934 | 109341  | ITEM | \$38.75 | 3.60  | NA | NA | NA | 92.0  | 1.028 | \$3,857    | A2 |
| PLH 0503-047       | 2 | 10934 | 109342  | ITEM | \$38.75 | 20.17 | NA | NA | NA | 95.1  | 1.044 | \$34,425   | A2 |
| C R200-057         | 2 | 11787 | 93626   | ITEM | \$32.70 | 10.24 | NA | NA | NA | 92.7  | 1.035 | \$11,591   | A2 |
| CR 200-059         | 2 | 11789 | 85577   | ITEM | \$36.50 | 4.00  | NA | NA | NA | 70.4  | 0.958 | (\$6,089)  | A2 |
| CR 200-059         | 2 | 11789 | 93626   | ITEM | \$36.50 | 6.00  | NA | NA | NA | 79.0  | 0.992 | (\$1,850)  | A2 |
| CR 200-059         | 2 | 11789 | 85577A1 | ITEM | \$36.50 | 6.85  | NA | NA | NA | 76.9  | 0.750 | (\$99,353) | A2 |
| CR 200-059         | 2 | 11789 | 93626A  | ITEM | \$36.50 | 14.88 | NA | NA | NA | 85.8  | 0.996 | (\$2,103)  | A2 |
| CR 200-059         | 2 | 11789 | 85577A2 | ITEM | \$36.50 | 2.00  | NA | NA | NA | NA    | 0.500 | (\$36,500) | A2 |
| 65.74              |   |       |         |      |         |       |    |    |    | 87.6  |       |            | A2 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| C 0911-003         | 1 | 11706 | 603397  | ITEM | \$24.04 | 19.22 | NA | NA | NA | 87.3  | 0.992 | (\$3,685)  | H1 |
|                    |   |       |         |      |         |       |    |    |    |       |       |            |    |
| BRF 050-4 (17)     | 2 | 91067 | 93048   | ITEM | \$33.00 | 14.00 | NA | NA | NA | 85.2  | 1.002 | \$911      | T1 |
| 377.89             |   |       |         |      |         |       |    |    |    | 90.9  | 1.01  | \$65,710   |    |

**TABLE 4**  
**HBP EVALUATION SUMMARIZED BY YEAR, 1991 HISTORICAL & 1992 - 1996 QC/QA**

| IDENTIFICATION<br>YEAR                                                                                                           | ELEMENT   | TONS<br>1000s | TESTS<br>"n" | STD<br>DEV | MEAN - TARGET |       | QPM 2<br>QUAL LEV | QPM 1<br>PAY FACT | QPM 2<br>PAY FACT |
|----------------------------------------------------------------------------------------------------------------------------------|-----------|---------------|--------------|------------|---------------|-------|-------------------|-------------------|-------------------|
|                                                                                                                                  |           |               |              |            | ABS           | ALGEB |                   |                   |                   |
| Composites are element values weighted by "V" if Element data are process averages weighted X tons. Gradation SD & Mean - Target |           |               |              |            |               |       |                   |                   |                   |
| 1991                                                                                                                             | Asphalt % | 2000          | 4027         | 0.18       | 0.07          |       | 87.0              | 1.005             | 1.000             |
| Historical                                                                                                                       | Density % | 900           | 1865         | 1.05       | 1.00          |       | 84.0              | 1.002             | 0.960             |
| Elements                                                                                                                         | Gradation | 2000          | 2317         | 2.59       | 1.82          |       | 85.7              | 1.005             | 0.989             |
| Composite                                                                                                                        | Item      | 2000          |              |            |               |       | 85.2              | 1.004             | 0.978             |
| 1992                                                                                                                             | Asphalt % | 282           | 214          | 0.14       | 0.06          |       | 96.3              | 1.039             | 1.042             |
| QPM 1                                                                                                                            | Density % | 282           | 570          | 1.00       | 0.71          |       | 88.9              | 1.018             | 0.990             |
| Elements                                                                                                                         | Gradation | 282           | 180          | 2.11       | 1.21          |       | 90.0              | 1.020             | 1.014             |
| Composite                                                                                                                        | Item      | 282           |              |            |               |       | 91.3              | 1.025             | 1.010             |
| 1993                                                                                                                             | Asphalt % | 482           | 837          | 0.15       | 0.04          |       | 93.2              | 1.032             | 1.028             |
| QPM1                                                                                                                             | Density % | 482           | 969          | 0.96       | 0.48          |       | 92.4              | 1.028             | 1.018             |
| Elements                                                                                                                         | Gradation | 482           | 309          | 2.31       | 1.53          |       | 88.8              | 1.016             | 1.010             |
| Composite                                                                                                                        | Item      | 482           |              |            |               |       | 91.9              | 1.027             | 1.019             |
| 1994                                                                                                                             | Asphalt % | 1496          | 1277         | 0.15       | 0.06          | 0.01  | 90.6              | 1.034             | 1.022             |
| QPM1                                                                                                                             | Density % | 1400          | 2812         | 0.96       | 0.57          | -0.47 | 90.3              | 1.023             | 1.007             |
| Elements                                                                                                                         | Gradation | 1496          | 1053         | 2.05       | 1.12          | -0.93 | 88.3              | 1.021             | 1.014             |
| Composite                                                                                                                        | Item      | 1496          |              |            |               |       | 90.0              | 1.026             | 1.013             |
| 1995                                                                                                                             | Asphalt % | 776           | 764          | 0.17       | 0.09          | 0.03  | 86.1              | 1.017             | 0.993             |
| QPM1                                                                                                                             | Density % | 757           | 1378         | 1.14       | 0.97          | -0.85 | 81.1              | 0.999             | 0.950             |
| Elements                                                                                                                         | Gradation | 776           | 547          | 2.10       | 1.18          | -0.18 | 88.9              | 1.017             | 1.015             |
| Composite                                                                                                                        | Item      | 776           |              |            |               |       | 84.2              | 1.008             | 0.976             |
| 1991 - 1995                                                                                                                      | Asphalt % | 3036          | 3092         | 0.15       | 0.07          | 0.02  | 90.4              | 1.030             | 1.017             |
| Summary of                                                                                                                       | Density % | 2921          | 5729         | 1.01       | 0.67          | -0.60 | 88.1              | 1.017             | 0.992             |
| QPM 1 Elements                                                                                                                   | Gradation | 3036          | 2089         | 2.11       | 1.21          | -0.67 | 88.7              | 1.019             | 1.014             |
| SUMMARY QPM1 COMPOSITES                                                                                                          |           | 3036          |              |            |               |       | 88.9              | 1.021             | 1.004             |
| 1995                                                                                                                             | Asphalt % | 328           | 342          | 0.18       | 0.05          | 0.02  | 88.7              | 1.014             | 1.000             |
| QPM 2                                                                                                                            | Density % | 314           | 625          | 0.99       | 0.46          | -0.38 | 91.7              | 1.023             | 1.017             |
| Elements                                                                                                                         | Gradation | 328           | 191          | 2.76       | 1.19          | 0.55  | 85.1              | 1.003             | 0.990             |
| Composite                                                                                                                        | Item      | 328           |              |            |               |       | 89.5              | 1.016             | 1.007             |
| 1996                                                                                                                             | Asphalt % | 830           | 847          | 0.16       | 0.07          | 0.02  | 89.8              | NA                | 1.008             |
| QPM 2                                                                                                                            | Density % | 830           | 1465         | 0.91       | 0.60          | -0.56 | 91.9              | NA                | 1.015             |
| Elements                                                                                                                         | Gradation | 830           | 438          | 1.98       | 1.53          | 0.15  | 89.6              | NA                | 1.012             |
| Composite                                                                                                                        | Item      | 830           |              |            |               |       | 90.8              | NA                | 1.012             |
| 1997                                                                                                                             | Asphalt % | 378           | 390          | 0.15       | 0.57          | 0.01  | 92.0              | NA                | 1.019             |
| QPM 2                                                                                                                            | Density % | 343           | 695          | 0.91       | 0.49          | -0.31 | 93.8              | NA                | 1.019             |
| Elements                                                                                                                         | Gradation | 378           | 202          | 2.13       | 1.30          | 0.68  | 82.6              | NA                | 1.015             |
| Composite                                                                                                                        | Item      | 378           |              |            |               |       | 91.0              | NA                | 1.018             |
| 1995 - 1997                                                                                                                      | Asphalt % | 1536          | 1579         | 0.16       | 0.19          | 0.02  | 90.1              | NA                | 1.009             |
| Summary of                                                                                                                       | Density % | 1487          | 2785         | 0.93       | 0.54          | -0.46 | 92.3              | NA                | 1.016             |
| QPM 2 Elements                                                                                                                   | Gradation | 1536          | 831          | 2.18       | 1.40          | 0.36  | 86.9              | NA                | 1.008             |
| SUMMARY QPM2 COMPOSITES                                                                                                          |           | 1536          |              |            |               |       | 90.6              | NA                | 1.012             |
| SUMMARY QC/QA PROJECTS                                                                                                           |           | 4572          |              |            |               |       | 89.5              | NA                | 1.007             |

TABLE 5

**QC/QA HBP EVALUATION, SUMMARY BY ELEMENT AND YEARLY COMPOSITES**  
**1992 - 1996 Average Values (Weighted by Tons) Related to 1991 Historical**

| Year &<br>Identity                                                                 | Element or<br>Composite | Standard Deviation |          | Avg Abs Mean-Tol Lim |          | QPM 2 Quality Level                        |          | QPM 2 Pay Factor |          |
|------------------------------------------------------------------------------------|-------------------------|--------------------|----------|----------------------|----------|--------------------------------------------|----------|------------------|----------|
|                                                                                    |                         | Value              | % of '91 | Value                | % of '91 | Value                                      | % of '91 | Value            | % of '91 |
| '91 Historical                                                                     | Asphalt %               | 0.18               | 100.0    | 0.23                 | 100.0    | 87.0                                       | 100.0    | 1.000            | 100.0    |
| '92 QPM1                                                                           | Asphalt %               | 0.14               | 77.8     | 0.24                 | 104.3    | 96.3                                       | 110.7    | 1.042            | 104.2    |
| '93 QPM1                                                                           | Asphalt %               | 0.15               | 83.3     | 0.26                 | 113.0    | 93.2                                       | 107.1    | 1.028            | 102.8    |
| '94 QPM1                                                                           | Asphalt %               | 0.15               | 83.3     | 0.24                 | 106.1    | 90.6                                       | 104.1    | 1.022            | 102.2    |
| '95 QPM1                                                                           | Asphalt %               | 0.17               | 96.1     | 0.21                 | 90.0     | 86.1                                       | 99.0     | 0.993            | 99.3     |
| All QPM1                                                                           | Asphalt %               | 0.15               | 86.1     | 0.24                 | 102.9    | 90.40                                      | 103.9    | 1.017            | 101.7    |
| '95 QPM2                                                                           | Asphalt %               | 0.18               | 99.4     | 0.25                 | 107.0    | 88.6                                       | 101.8    | 1.000            | 100.0    |
| '96 QPM2                                                                           | Asphalt %               | 0.16               | 91.1     | 0.23                 | 100.0    | 89.8                                       | 103.2    | 1.008            | 100.8    |
| '97 QPM2                                                                           | Asphalt %               | 0.15               | 83.3     | 0.24                 | 105.8    | 92.0                                       | 105.7    | 1.019            | 101.9    |
| All QPM2                                                                           | Asphalt %               | 0.16               | 91.1     | 0.24                 | 102.9    | 90.05                                      | 103.5    | 1.009            | 100.9    |
|                                                                                    |                         |                    |          |                      |          |                                            |          |                  |          |
| '91 Hist.                                                                          | Density %               | 1.05               | 100.0    | 1.00                 | 100.0    | 84.0                                       | 100.0    | 0.960            | 100.0    |
| '92 QPM1                                                                           | Density %               | 1.00               | 95.2     | 1.29                 | 129.0    | 88.9                                       | 105.8    | 0.990            | 103.1    |
| '93 QPM1                                                                           | Density %               | 0.96               | 91.4     | 1.52                 | 152.0    | 92.4                                       | 110.0    | 1.018            | 106.0    |
| '94 QPM1                                                                           | Density %               | 0.96               | 91.4     | 1.43                 | 143.0    | 90.3                                       | 107.5    | 1.007            | 104.9    |
| '95 QPM1                                                                           | Density %               | 1.14               | 108.9    | 1.03                 | 102.8    | 81.1                                       | 96.5     | 0.949            | 98.9     |
| All QPM1                                                                           | Density %               | 1.01               | 96.2     | 1.33                 | 132.9    | 88.17                                      | 105.0    | 0.992            | 103.4    |
| '95 QPM2                                                                           | Density %               | 0.99               | 94.3     | 1.54                 | 153.6    | 91.7                                       | 109.2    | 1.017            | 105.9    |
| '96 QPM2                                                                           | Density %               | 0.91               | 86.8     | 1.40                 | 140.1    | 91.9                                       | 109.5    | 1.015            | 105.7    |
| '97 QPM2                                                                           | Density %               | 0.91               | 86.7     | 1.51                 | 151.2    | 93.8                                       | 111.6    | 1.019            | 106.1    |
| All QPM2                                                                           | Density %               | 0.93               | 88.4     | 1.46                 | 145.5    | 92.29                                      | 109.9    | 1.016            | 105.9    |
|                                                                                    |                         |                    |          |                      |          |                                            |          |                  |          |
| Based on the NO. 8 Sieve                                                           |                         |                    |          |                      |          | Based on Gradation (QPM Controlling Sieve) |          |                  |          |
| '91 Hist.                                                                          | Gradation               | 2.59               | 100.0    | 3.18                 | 100.0    | 85.7                                       | 100.0    | 0.989            | 100.0    |
| '92 QPM1                                                                           | Gradation               | 2.11               | 81.5     | 3.79                 | 119.2    | 90.0                                       | 105.0    | 1.014            | 102.5    |
| '93 QPM1                                                                           | Gradation               | 2.31               | 89.2     | 3.47                 | 109.1    | 88.8                                       | 103.6    | 1.010            | 102.1    |
| '94 QPM1                                                                           | Gradation               | 2.05               | 79.2     | 3.88                 | 122.0    | 88.3                                       | 103.0    | 1.014            | 102.5    |
| '95 QPM1                                                                           | Gradation               | 2.10               | 81.1     | 3.84                 | 120.6    | 88.9                                       | 103.7    | 1.016            | 102.8    |
| All QPM1                                                                           | Gradation               | 2.11               | 81.5     | 3.80                 | 119.3    | 88.69                                      | 103.5    | 1.014            | 102.5    |
| '95 QPM2                                                                           | Gradation               | 2.76               | 106.6    | 3.81                 | 119.7    | 85.1                                       | 99.3     | 0.990            | 100.1    |
| '96 QPM2                                                                           | Gradation               | 1.98               | 76.6     | 3.47                 | 109.0    | 89.6                                       | 104.5    | 1.012            | 102.3    |
| '97 QPM2                                                                           | Gradation               | 2.13               | 82.2     | 3.70                 | 116.3    | 82.6                                       | 96.3     | 0.981            | 99.2     |
| All QPM2                                                                           | Gradation               | 2.19               | 84.6     | 3.59                 | 112.8    | 87.37                                      | 101.9    | 1.002            | 101.3    |
|                                                                                    |                         |                    |          |                      |          |                                            |          |                  |          |
| Values Below Are Composites of Above Values, i.e. Elements Weighted by "W" Factors |                         |                    |          |                      |          |                                            |          |                  |          |
| 91 Hist.                                                                           | Composite               | ---                | 100.0    | ---                  | 100.0    | 85.2                                       | 100.0    | 0.978            | 100.0    |
| 92 QPM1                                                                            | Composite               | ---                | 87.2     | ---                  | 119.6    | 91.3                                       | 107.1    | 1.010            | 103.3    |
| 93 QPM1                                                                            | Composite               | ---                | 88.6     | ---                  | 131.7    | 91.9                                       | 107.9    | 1.019            | 104.3    |
| 94 QPM1                                                                            | Composite               | ---                | 86.5     | ---                  | 127.7    | 90.0                                       | 105.6    | 1.013            | 103.6    |
| 95 QPM1                                                                            | Composite               | ---                | 99.5     | ---                  | 102.5    | 84.2                                       | 98.7     | 0.976            | 99.8     |
| All QPM1                                                                           | Composite               | ---                | 90.2     | ---                  | 121.2    | 88.9                                       | 104.4    | 1.004            | 102.7    |
| 95 QPM2                                                                            | Composite               | ---                | 98.3     | ---                  | 132.8    | 89.5                                       | 105.0    | 1.007            | 103.0    |
| 96 QPM2                                                                            | Composite               | ---                | 86.0     | ---                  | 121.9    | 90.8                                       | 106.6    | 1.012            | 103.6    |
| 97 QPM2                                                                            | Composite               | ---                | 84.8     | ---                  | 130.6    | 91.0                                       | 106.8    | 1.015            | 103.5    |
| All QPM2                                                                           | Composite               | ---                | 88.4     | ---                  | 126.2    | 90.6                                       | 106.4    | 1.011            | 103.5    |
| All QC&QA                                                                          | Composite               | ---                | 89.6     | ---                  | 122.9    | 89.5                                       | 105.0    | 1.007            | 103.0    |



**TABLE 6A**  
**ABBREVIATED HBP QC/QA SUMMARY BY CONTRACTORS**  
**FOR 1992 TO 1997 QUALITY LEVEL AND PERCENT RED**

| CONTR              | AVG ALL QPM 1 |      | AVG ALL QPM 2 |                 | AVG ALL QC/QA   |      | TONS BY QPM 1 or 2 |           | ALL QC/QA |       |
|--------------------|---------------|------|---------------|-----------------|-----------------|------|--------------------|-----------|-----------|-------|
| CODE               | QL            | RD % | QL            | RD %            | QL              | RD % | All QPM 1          | All QPM 2 | TONS      | % Tot |
| W2                 | 92.3          | 3.4  | 92.8          | 1.9             | 92.5            | 2.7  | 474.4              | 382.0     | 856.4     | 18.7  |
| E1                 | 91.7          | 1.5  | 93.0          | 0.5             | 92.2            | 1.1  | 190.3              | 123.2     | 313.5     | 6.9   |
| H1                 | 91.7          | 2.0  | 92.6          | 2.2             | 92.1            | 2.1  | 174.2              | 144.5     | 318.7     | 7.0   |
| C4                 | 91.3          | 3.7  | 91.9          | 0.9             | 91.5            | 3.1  | 453.0              | 107.6     | 560.6     | 12.3  |
| A1                 | 92.3          | 2.6  | 88.4          | 4.0             | 91.1            | 3.0  | 277.9              | 110.6     | 388.5     | 8.5   |
| B1                 | 90.7          | 4.0  | 87.3          | 3.0             | 89.1            | 3.5  | 136.1              | 112.0     | 248.1     | 5.4   |
| A2                 | 72.5          | 17.0 | 84.1          | 7.1             | 79.5            | 11.1 | 100.1              | 149.7     | 249.8     | 5.5   |
| >5% of             | 90.7          | 3.8  | 90.6          | 2.7             | 90.7            | 3.3  | 1806.0             | 1129.6    | 2935.6    | 64.2  |
| Total              |               |      |               |                 | % of Total Tons |      | 39.5               | 24.7      | 64.2      |       |
| R1                 | 91.6          | 6.9  | 95.5          | 2.2             | 93.2            | 4.9  | 72.5               | 51.3      | 123.8     | 2.7   |
| C1                 | 93.2          | 0.5  | 0.0           | 0.0             | 93.2            | 0.5  | 132.0              | 0.0       | 132.0     | 2.9   |
| B4                 | 90.3          | 3.7  | 0.0           | 0.0             | 90.3            | 3.7  | 52.7               | 0.0       | 52.7      | 1.2   |
| S1                 | 89.6          | 4.5  | 91.0          | 3.0             | 90.1            | 4.0  | 77.5               | 42.7      | 120.2     | 2.6   |
| C3                 | 90.0          | 1.4  | 0.0           | 0.0             | 90.0            | 1.4  | 59.6               | 0.0       | 59.6      | 1.3   |
| K1                 | 90.8          | 2.6  | 87.6          | 1.3             | 89.0            | 1.9  | 91.7               | 114.9     | 206.6     | 4.5   |
| G1                 | 88.5          | 2.2  | 91.3          | 0.0             | 88.9            | 1.9  | 108.5              | 16.8      | 125.3     | 2.7   |
| P1                 | 88.2          | 6.4  | 0.0           | 0.0             | 88.2            | 6.4  | 186.6              | 0.0       | 186.6     | 4.1   |
| B2                 | 86.7          | 6.3  | 96.3          | 0.0             | 87.9            | 5.5  | 90.3               | 13.3      | 103.6     | 2.3   |
| U1                 | 86.7          | 7.4  | 91.2          | 1.6             | 87.8            | 6.0  | 57.3               | 18.6      | 75.9      | 1.7   |
| C2                 | 82.0          | 8.2  | 91.6          | 1.2             | 86.5            | 4.9  | 28.8               | 25.0      | 53.8      | 1.2   |
| W1                 | 85.9          | 10.3 | 0.0           | 0.0             | 85.9            | 10.3 | 66.7               | 0.0       | 66.7      | 1.5   |
| N1                 | 69.9          | 28.6 | 88.8          | 0.8             | 77.5            | 17.3 | 55.3               | 37.6      | 92.9      | 2.0   |
| B3                 | 72.7          | 34.9 | 89.2          | 5.8             | 76.8            | 27.7 | 45.8               | 15.0      | 60.8      | 1.3   |
| A4                 | 61.9          | 13.8 | 0.0           | 0.0             | 61.9            | 13.8 | 66.0               | 0.0       | 66.0      | 1.4   |
| <5 %, >1%          | 86.1          | 7.5  | 90.5          | 1.7             | 87.1            | 6.2  | 1191.3             | 335.2     | 1526.5    | 33.4  |
| Total              |               |      |               |                 | % of Total Tons |      | 26.1               | 7.3       | 33.4      |       |
| B5                 | 0.0           | 0.0  | 99.8          | 0.0             | 99.8            | 0.0  | 0.0                | 16.9      | 16.9      | 0.4   |
| A3                 | 91.4          | 0.2  | 97.4          | 0.0             | 92.7            | 0.2  | 6.9                | 1.9       | 8.8       | 0.2   |
| D1                 | 91.3          | 7.0  | 0.0           | 0.0             | 91.3            | 7.0  | 23.0               | 0.0       | 23.0      | 0.5   |
| H2                 | 88.8          | 0.2  | 0.0           | 0.0             | 88.8            | 0.2  | 8.8                | 0.0       | 8.8       | 0.2   |
| T1                 | 0.0           | 0.0  | 85.2          | 0.0             | 85.2            | 0.0  | 0.0                | 14.0      | 14.0      | 0.3   |
| K2                 | 0.0           | 0.0  | 83.7          | 5.4             | 83.7            | 5.4  | 0.0                | 37.9      | 37.9      | 0.8   |
| <1% of             | 90.7          | 4.2  | 88.2          | 2.9             | 89.1            | 3.4  | 38.7               | 70.7      | 109.4     | 2.4   |
| Total              |               |      |               |                 | % of Total Tons |      | 0.8                | 1.5       | 2.4       |       |
| All 28 Contractors | 88.9          | 5.2  | 90.6          | 2.5             | 89.4            | 4.2  | 3036.0             | 1535.5    | 4571.5    | 100.0 |
|                    |               |      |               | % of Total Tons |                 | 66.4 | 33.6               | 100.0     |           |       |

Notes: All Averages are weighted by tons. The Table is divided into three categories, (1) contractors producing 5% or more of total QC/QA tons, (2) those producing less than 5% and more than 1%, and (3) those producing less than 1%.

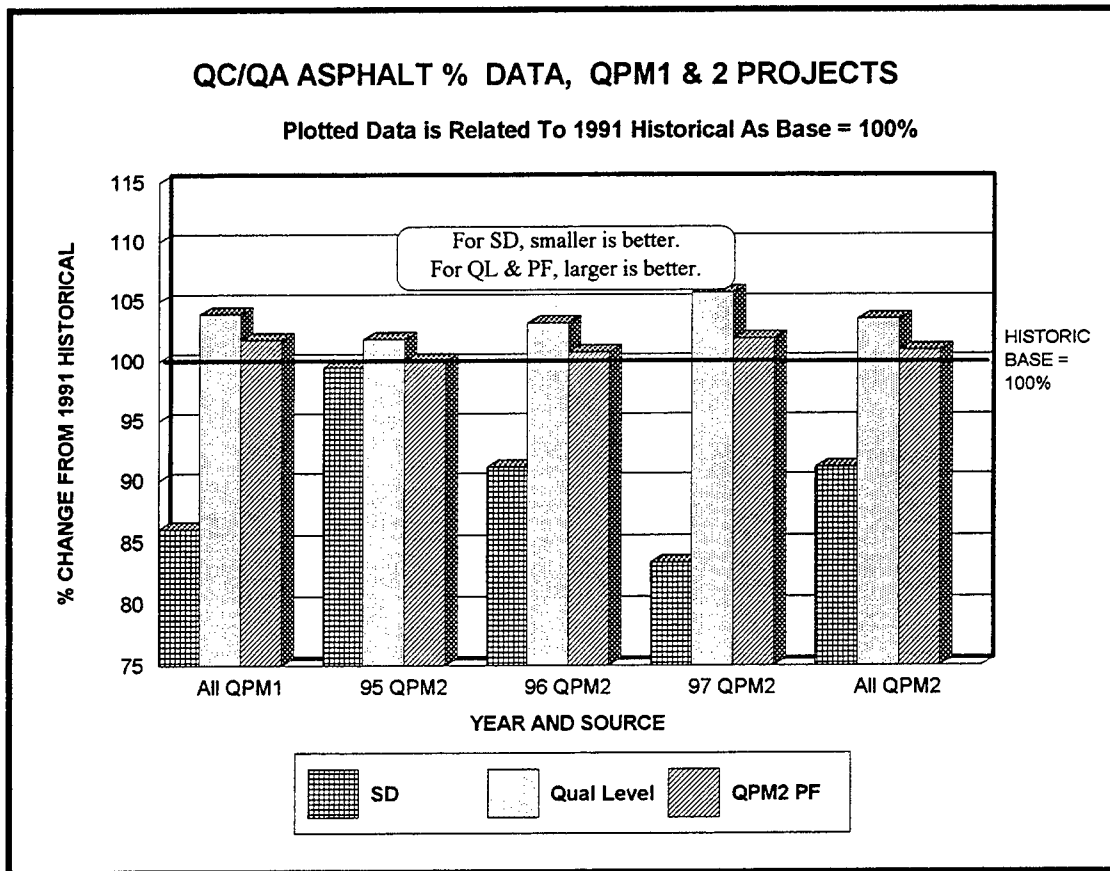


Figure 1

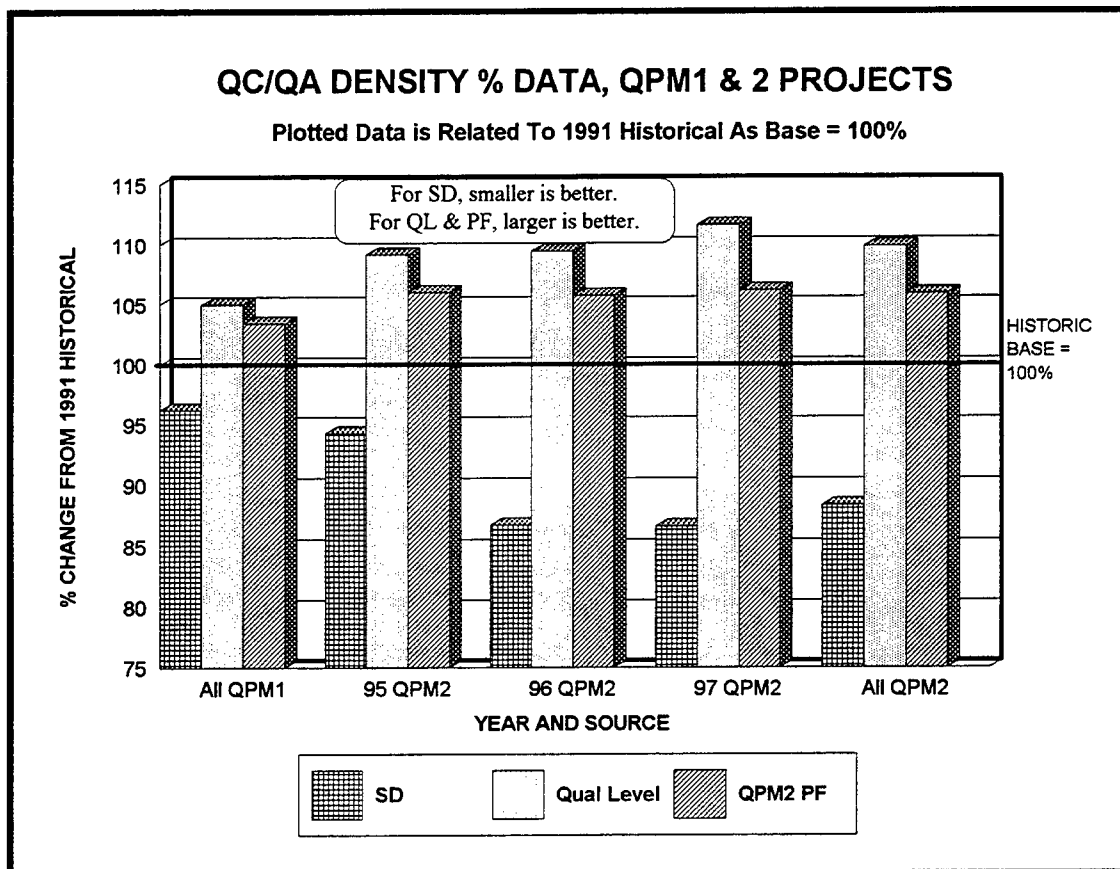


Figure 2

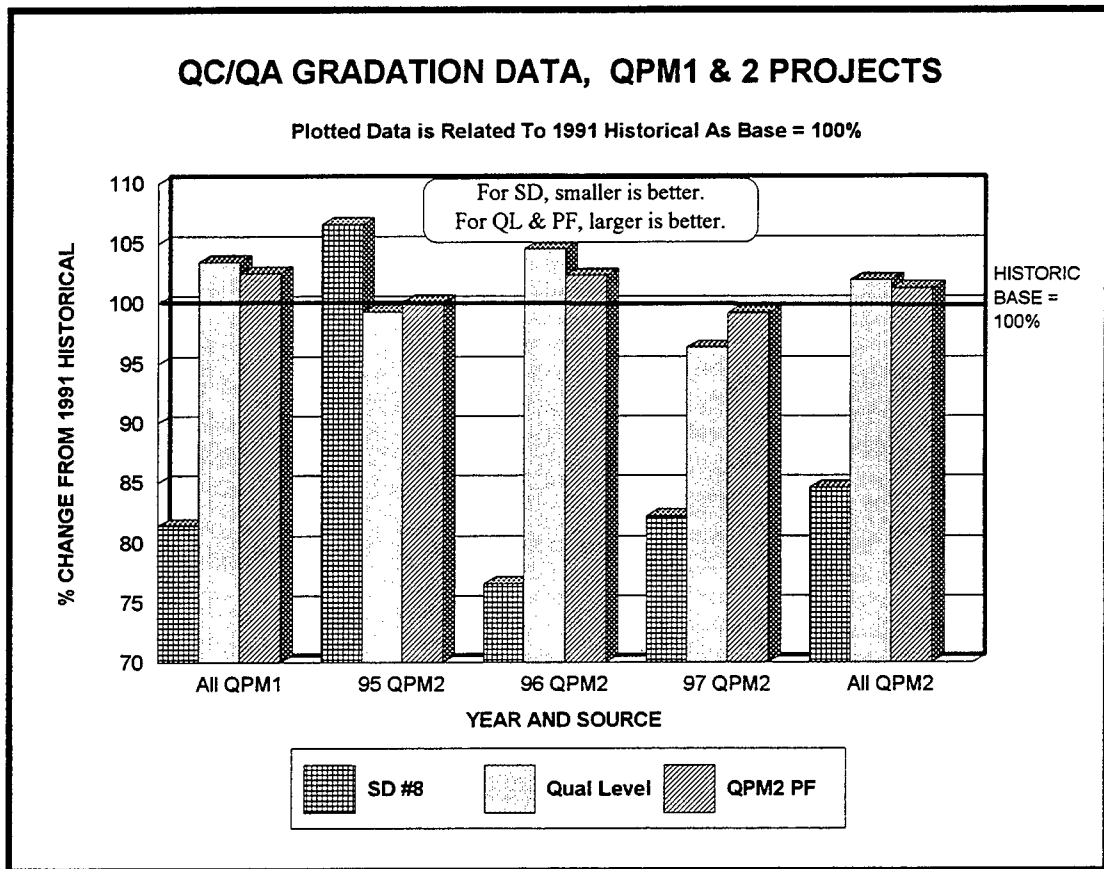


Figure 3

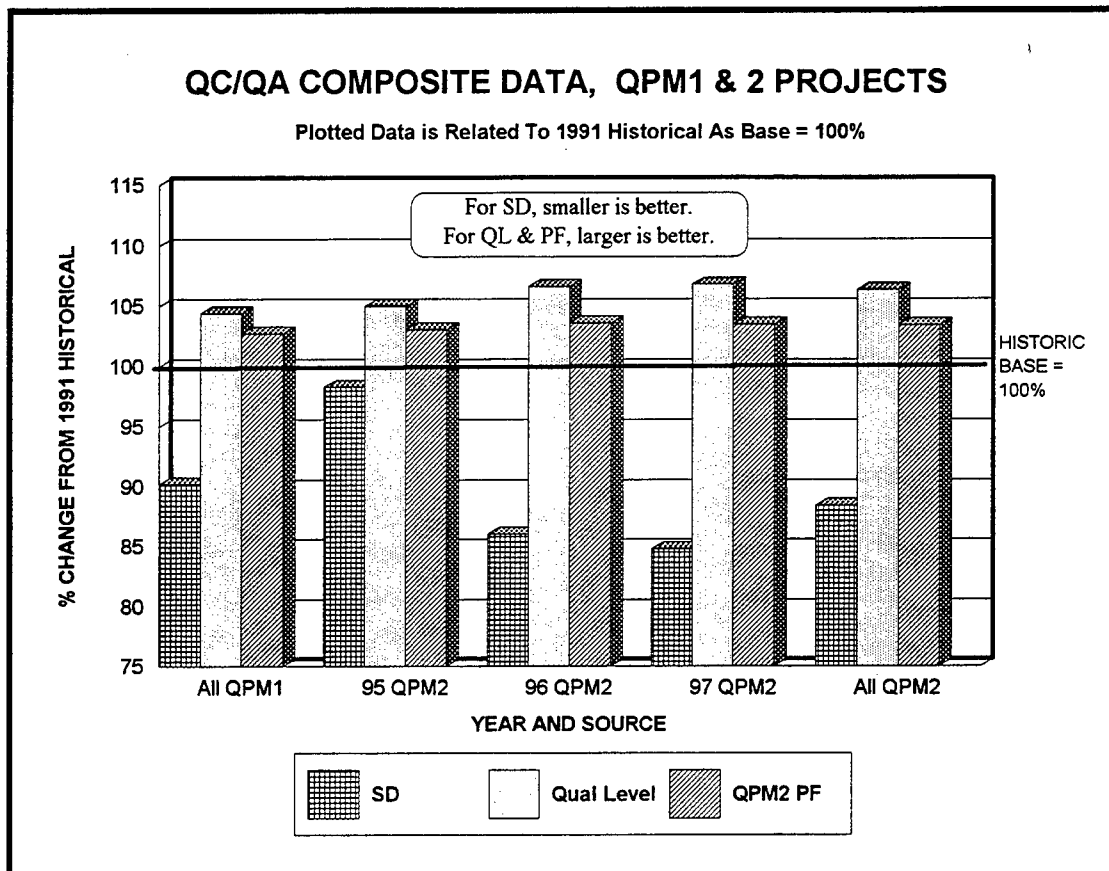


Figure 4

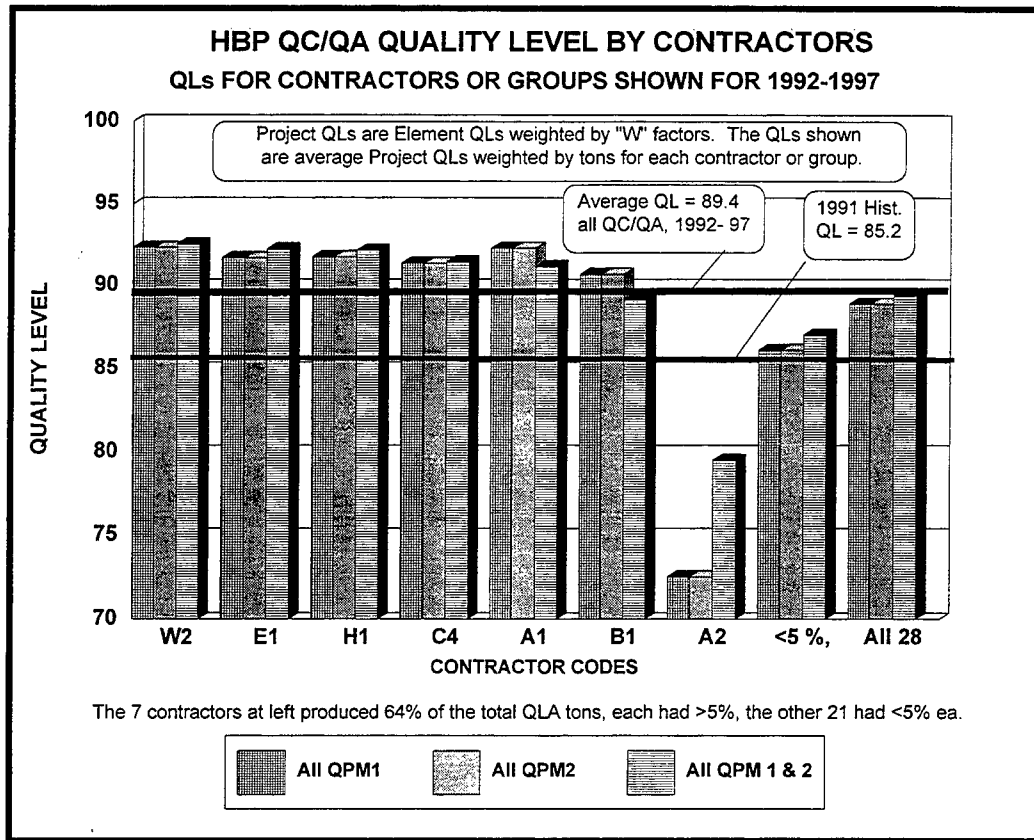


Figure 5

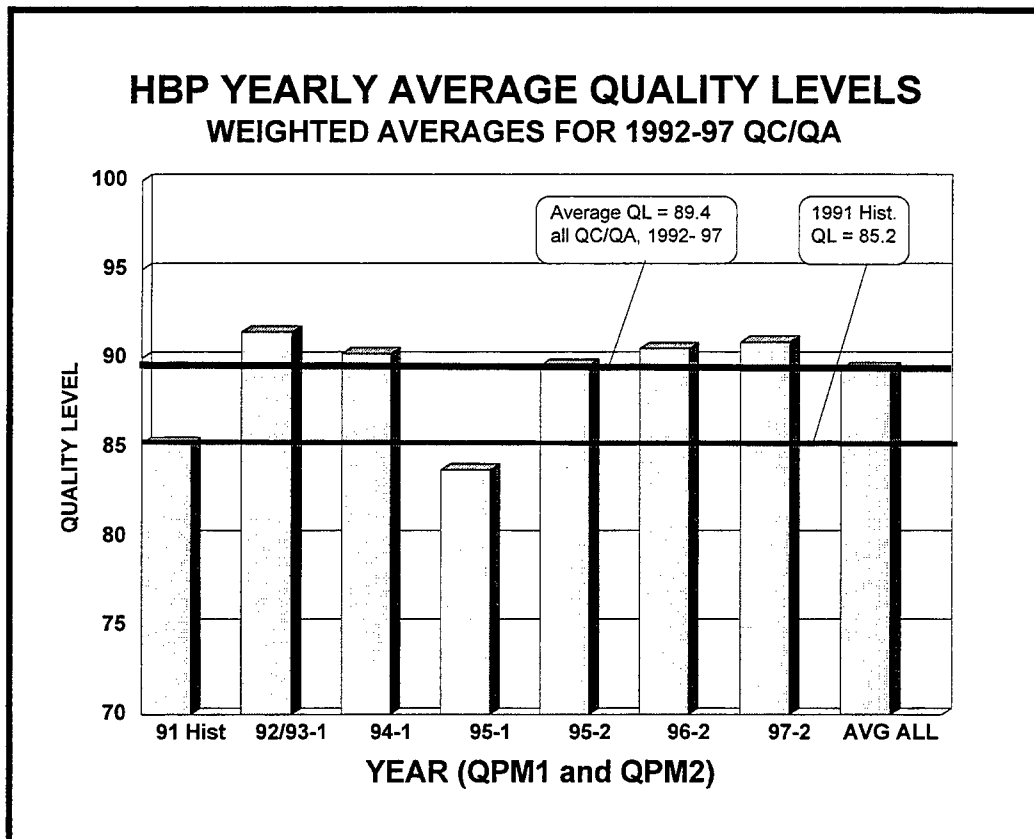


Figure 6

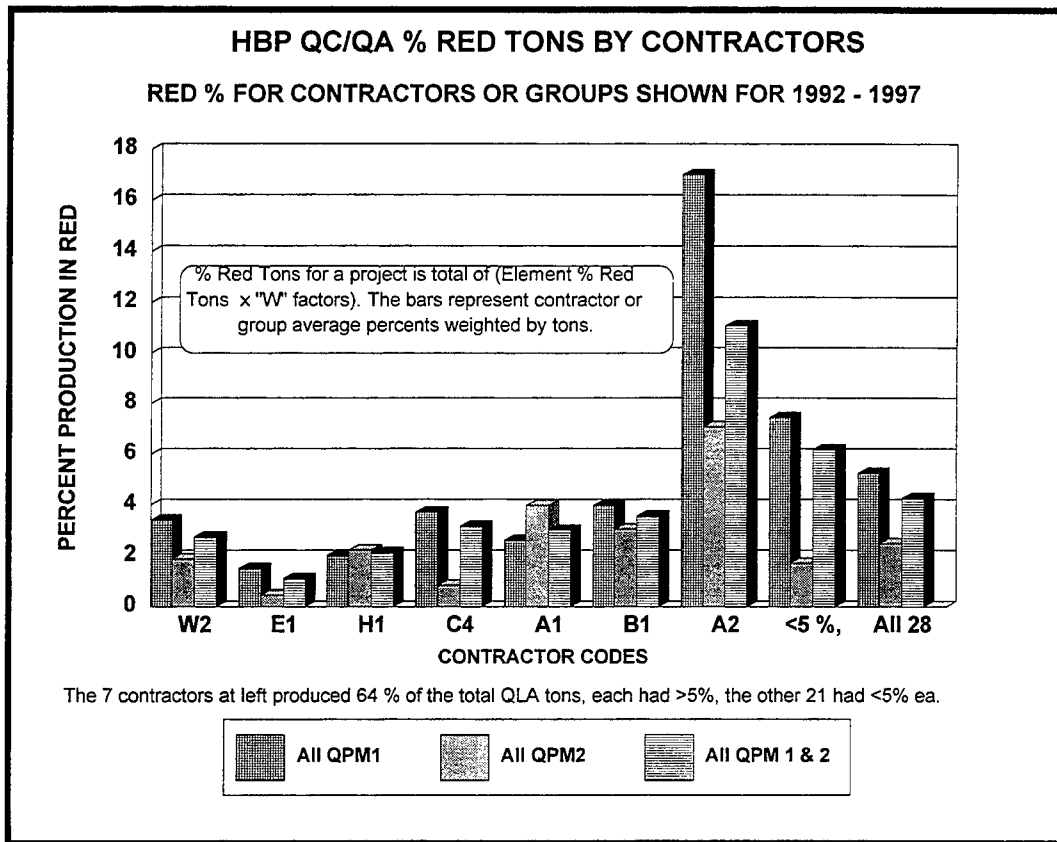


Figure 7

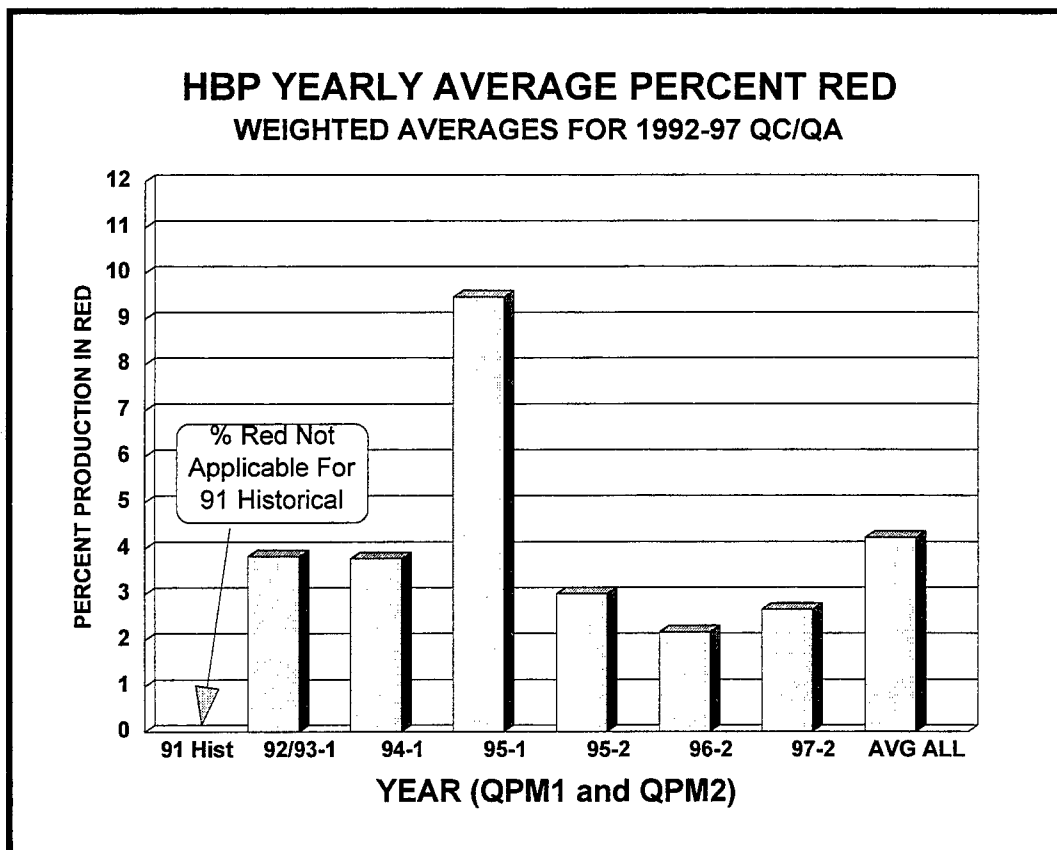


Figure 8

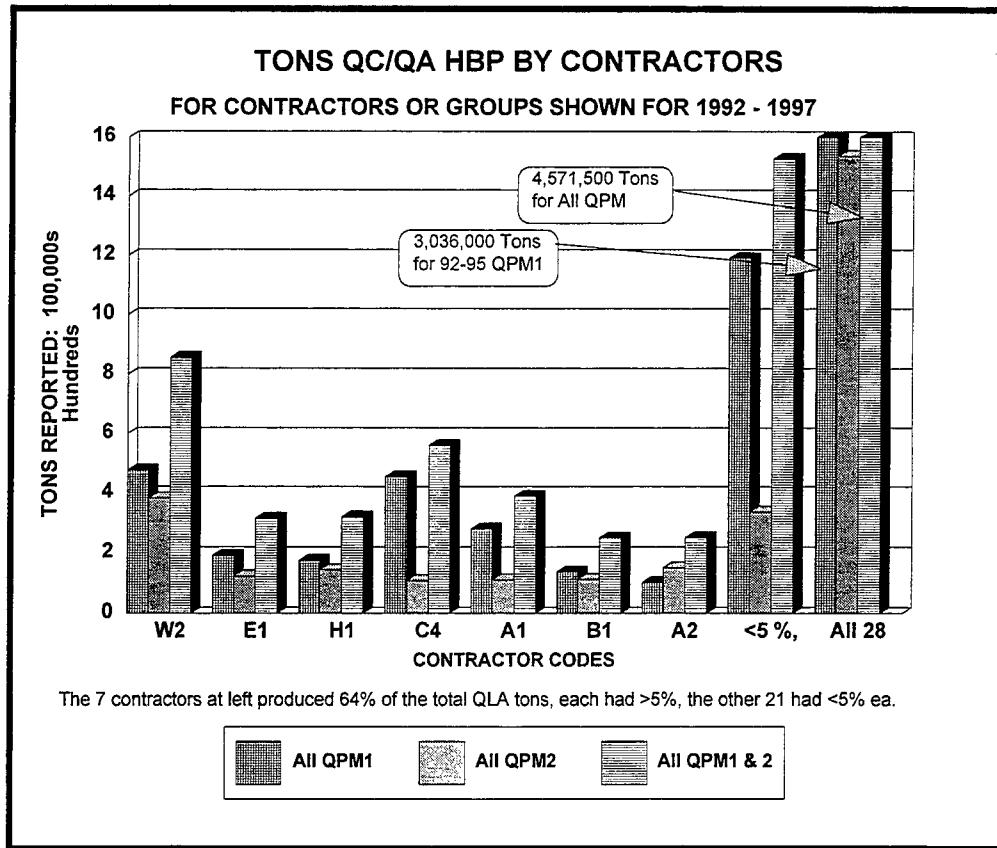


Figure 9

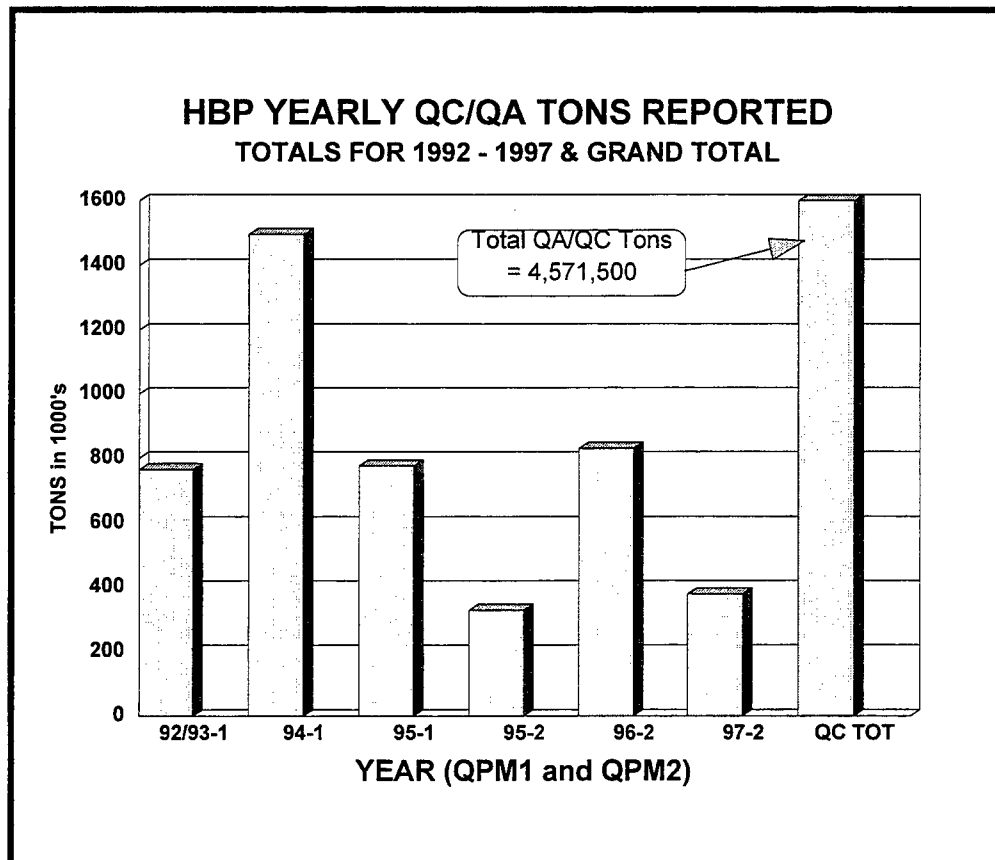


Figure 10

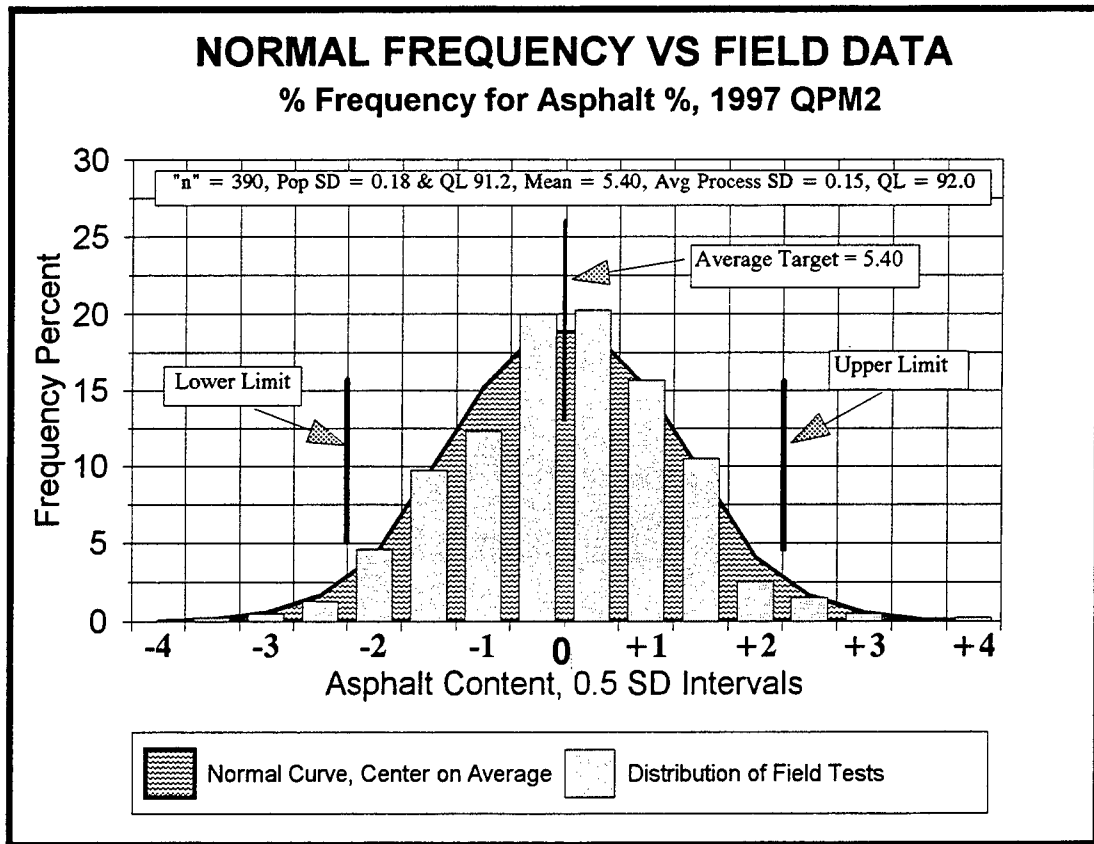


Figure 11

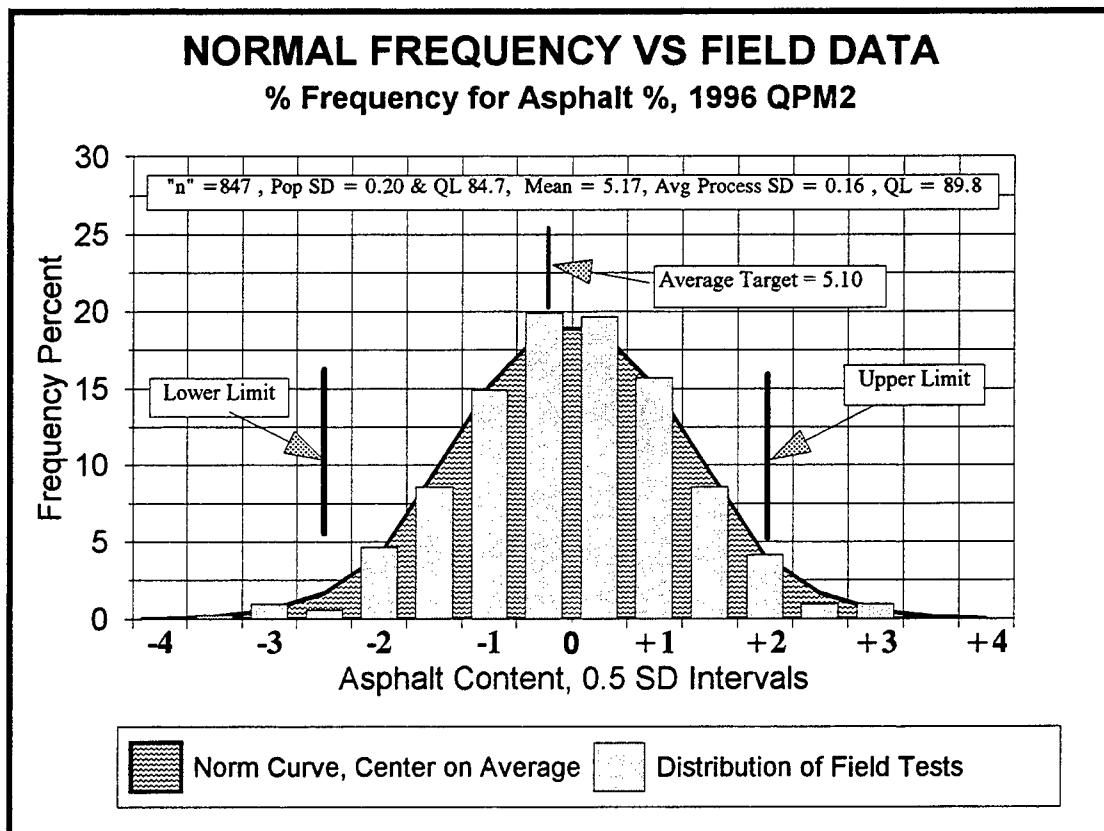


Figure 12

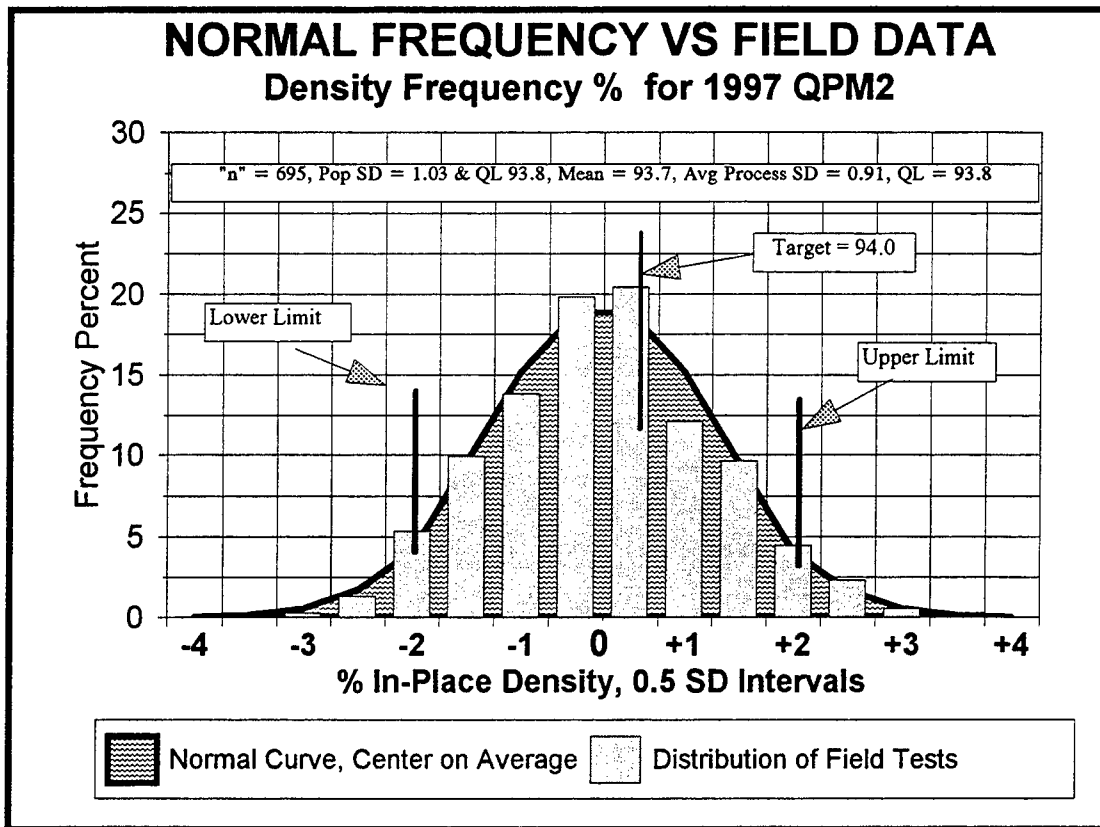


Figure 13

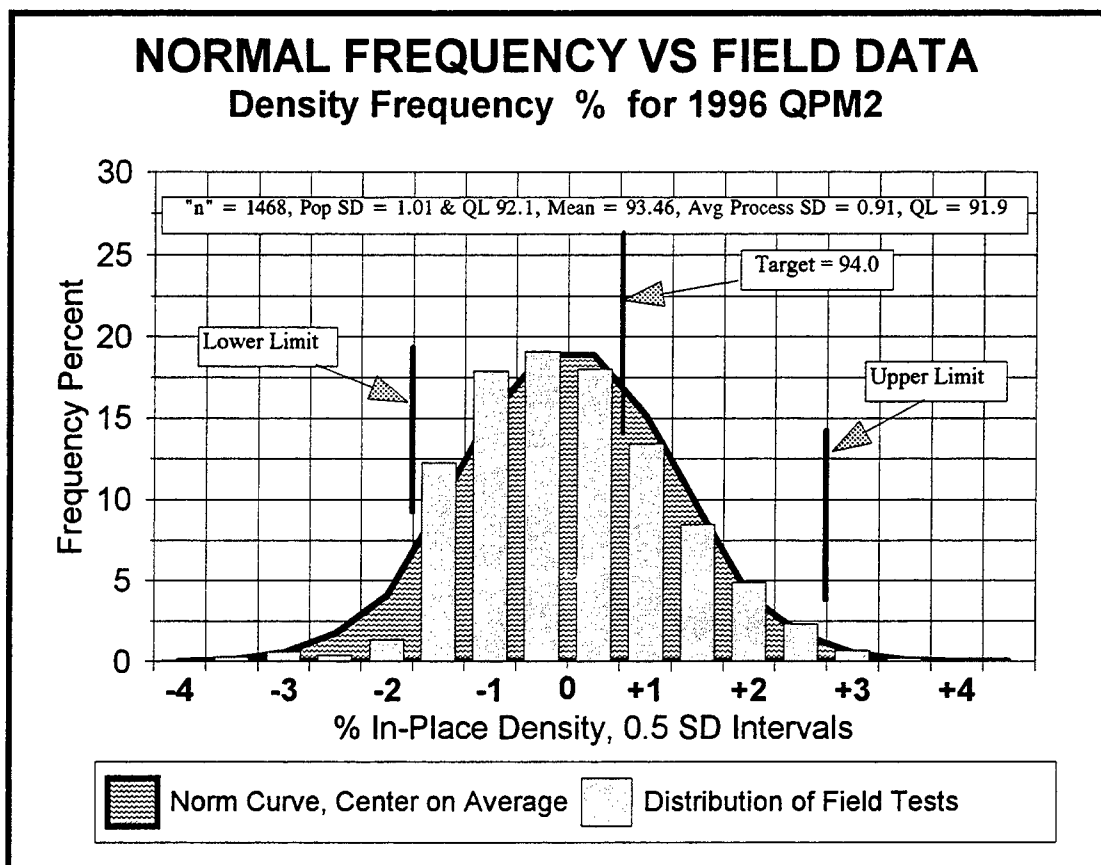


Figure 14

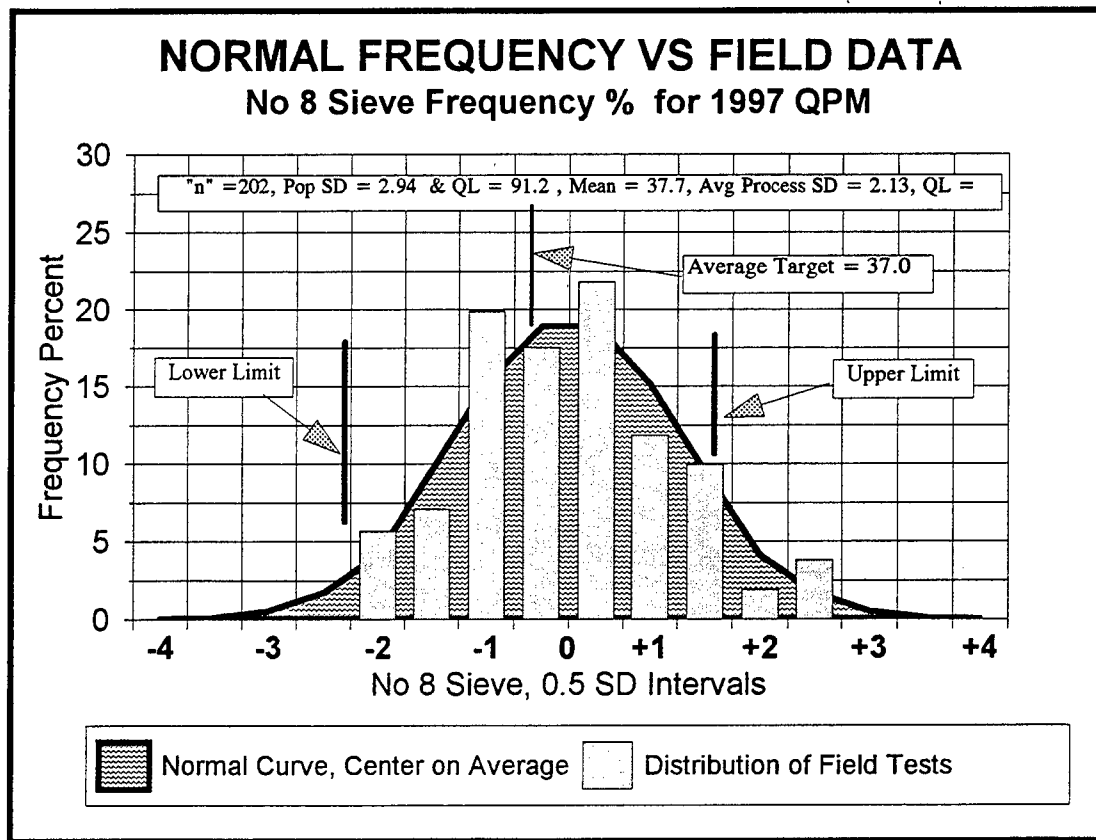


Figure 15

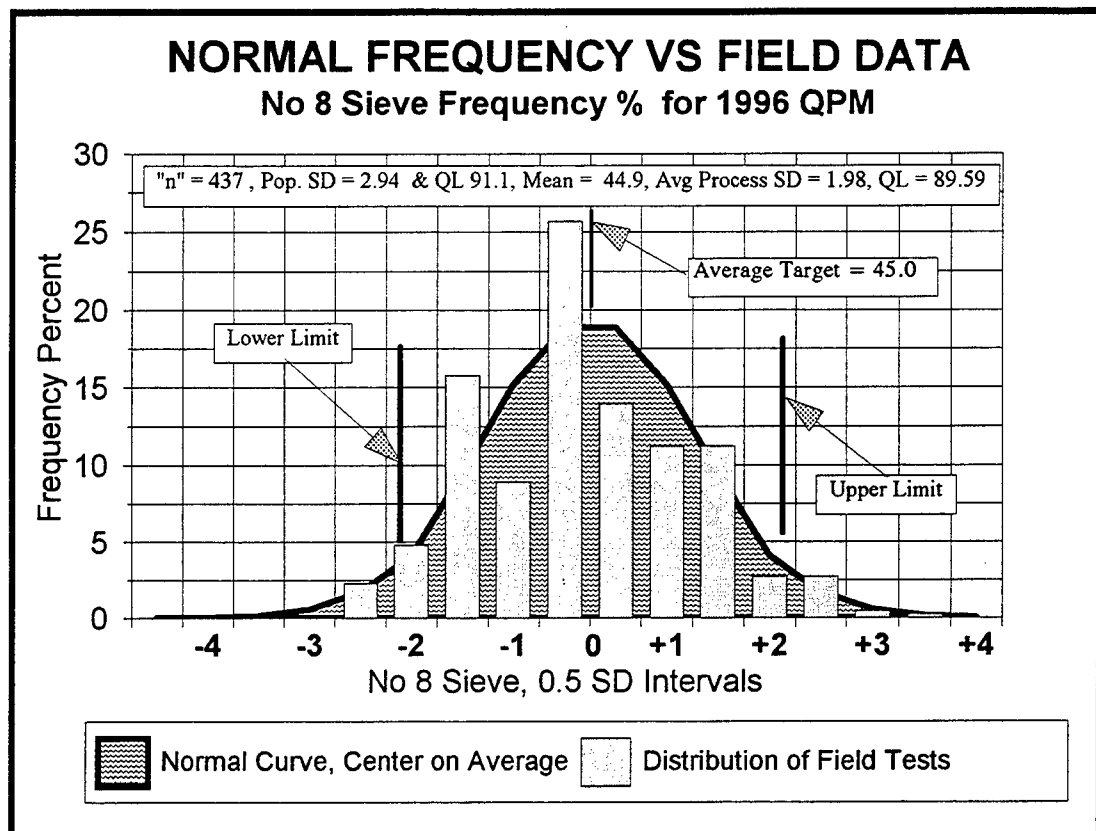


Figure 16

- 98-1 I-76 Truck Study
- 98-2 HBP Pilot Void Acceptance Projects in Region 2 in 1997
- 98-3 1997 Hot Bituminous Pavement QC for Day Pilot Project with Void Acceptance
- 98-4 Hot Bituminous Pavement QC & QA Project Constructed in 1997 Under QPM2 Specification

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- 96-1 Long-Term Performance Tests of Soil-Geosynthetic Composites
- 96-2 Efficiency of Sediment Basins: Analysis of the Sediment Basins Constructed as Part of the Straight Creek Erosion Control Project.
- 96-3 The Role of Facing Connection Strength in Mechanically Stabilized Backfill Walls
- 96-4 Revegetation of MSB Slopes
- 96-5 Roadside Vegetation Management
- 96-6 Evaluation of Slope Stabilization Methods (US-40 Berthod Pass) (Construction Report)
- 96-7 SMA (Stone Matrix Asphalt) Colfax Avenue Viaduct
- 96-8 Determinating Asphalt Cement Content Using the NCAT Asphalt Content Oven
- 96-9 HBP QC & QA Projects Constructed in 1995 Under QPM1 and QPM2 Specifications
- 96-10 Long-Term Performance of Accelerated Rigid Pavements, Project CXMP 13-006-07
- 96-11 Determining the Degree of Aggregate Degradation After Using the NCAT Asphalt Content Oven
- 96-12 Evaluation of Rumble Treatments on Asphalt Shoulders
  
- 97-1 Avalanche Forecasting Methods, Highway 550
- 97-2 Ground Access Assessment of North American Airport Locations
- 97-3 Special Polymer Modified Asphalt Cement (Final Report)
- 97-4 Avalanche Detection Using Atmospheric Infrasound
- 97-5 Keway Curb (Final Report)
- 97-6 IAUAC - (Interim Report)
- 97-7 Evaluation of Design-Build Practice in Colorado (Pre-Construction Report)
- 97-8 HBP Pilot Void Acceptance Projects Completed in 1993-1996 (Interim Report)
- 97-9 QC & QA Projects Constructed in 1996 Under QPM2 Specifications (Fifth Annual Report)
- 97-10 Loading Test of GRS Bridge Pier and Abutment in Denver, CO
- 97-11 Faulted Pavements at Bridge Abutments

- 95-1 SMA (Stone Matrix Asphalts) Flexible Pavement
- 95-2 PCCP Texturing Methods
- 95-3 Keyway Curb (Construction Report)
- 95-4 EPS, Flow Fill and Structure Fill for Bridge Abutment Backfill
- 95-5 Environmentally Sensitive Sanding and Deicing Practices
- 95-6 Reference Energy Mean Emission Levels for Noise Prediction in Colorado
- 95-7 Investigation of the Low Temperature Thermal Cracking in Hot Mix Asphalt
- 95-8 Factors Which Affect the Inter-Laboratory Repeatability of the Bulk Specific Gravity of Samples Compacted Using the Texas Gyratory Compactor
- 95-9 Resilient Modulus of Granular Soils with Fine Contents
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- 95-11 Dynamic Traffic Modelling of the I-25/HOV Corridor
- 95-12 Using Ground Tire Rubber in Hot Mix Asphalt Pavements
- 95-13 Research Status Report
- 95-14 A Documentation of Hot Mix Asphalt Overlays on I-25 in 1994
- 95-15 EPS, Flowfill, and Structure Fill for Bridge Abutment Backfill
- 95-16 Concrete Deck Behavior in a Four-Span Prestressed Girder Bridge: Final Report
- 95-17 Avalanche Hazard Index For Colorado Highways
- 95-18 Widened Slab Study

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- 94-1 Comparison of the Hamburg Wheel-Tracking Device and the Environmental Conditioning System to Pavements of Known Stripping Performance
- 1-94 Design and Construction of Simple, Easy, and Low Cost Retaining Walls
- 94-2 Demonstration of a Volumetric Acceptance Program for Hot Mix Asphalt in Colorado
- 2-94 The Deep Patch Technique for Landslide Repair
- 94-3 Comparison of Test Results from Laboratory and Field Compacted Samples
- 3-94 Independent Facing Panels for Mechanically Stabilized Earth Walls
- 94-4 Alternative Deicing Chemicals Research
- 94-5 Large stone Hot Mix Asphalt Pavements
- 94-6 Implementation of a Fine Aggregate Angularity Test
- 94-7 Influence of Refining Processes and Crude Oil Sources Used in Colorado on Results from the Hamburg Wheel-Tracking Device
- 94-8 A Case Study of concrete Deck Behavior in a Four-Span Prestressed Girder Bridge: Correlation of Field Test Numerical Results
- 94-9 Influence of Compaction Temperature and Anti-Stripping Treatment on the Results from the Hamburg Wheel-Tracking Device
- 94-10 Denver Metropolitan Area Asphalt Pavement Mix Design Recommendation
- 94-11 Short-Term Aging of Hot Mix Asphalt
- 94-12 Dynamic Measurements or Penetrometers for Determination of Foundation Design
- 94-13 High-Capacity Flexpost Rockfall Fences
- 94-14 Preliminary Procedure to Predict Bridge Scour in Bedrock (Interim Report)