CRC Report No. 659

# 2010 CRC ALTITUDE HOT-FUEL-HANDLING PROGRAM

## Final Report

## January 2011

COORDINATING RESEARCH COUNCIL, INC.
3650 MANSELL ROAD·SUITE 140·ALPHARETTA, GA 30022

**The Coordinating Research Council, Inc. (CRC) is a non-profit corporation supported by the petroleum and automotive equipment industries. CRC operates through the committees made up of technical experts from industry and government who voluntarily participate. The four main areas of research within CRC are: air pollution (atmospheric and engineering studies); aviation fuels, lubricants, and equipment performance, heavy-duty vehicle fuels, lubricants, and equipment performance (e.g., diesel trucks); and light-duty vehicle fuels, lubricants, and equipment performance (e.g., passenger cars). CRC's function is to provide the mechanism for joint research conducted by the two industries that will help in determining the optimum combination of petroleum products and automotive equipment. CRC's work is limited to research that is mutually beneficial to the two industries involved, and all information is available to the public.**

**COORDINATING RESEARCH COUNCIL, INC.**
3650 MANSELL ROAD, SUITE 140
ALPHARETTA, GA30022
TEL: 678/795-0506 FAX: 678/795-0509
WWW.CRCAO.ORG

**CRC Report No. 659**

# 2010 CRC Altitude Hot-Fuel-Handling Program

(CRC Project No. CM-138-09-1)



Prepared by the

CRC Volatility Group

January 2011

CRC Performance Committee
of the
Coordinating Research Council

## Table of Contents

## **Table of Contents** *(Continued)*

### Tables and Figures



### Appendices

# ABSTRACT

The 2010 CRC Altitude Hot-Fuel-Handling Program was conducted at the Transportation Technology Center, Inc. (TTCI) in Pueblo, Colorado, June 28 through August 22, 2010. The objective of the program was to determine under hot ambient temperature conditions and at altitude the effect of fuel front-end volatility, the 50% evaporated distillation point (T50), and ethanol content on hot-fuel-handling performance in a large group of late model vehicles equipped with fuel injection. There were 20 late-model vehicles selected from a larger fleet of 60 2008 – 2010 vehicles. The test fuel design consisted of 13 test fuels with three levels of TVL20: 116, 124, and 133°F; three levels of 50% evaporated distillation points: 150, 170, and 200°F; and three levels of ethanol content: 0, 10, and 20 volume percent. An additional more volatile fuel with 15 volume percent ethanol from the 2009/2010 CRC/ASTM Hot-Fuel-Handling Program (CRC Report No. 658) was also tested in the program.

The TVL20 parameters (124°F to 116°F) of the original fuel set evaluated showed no statistically significant effect on total weighted demerits (TWDs). The addition of a more volatile fuel with TVL20 of 108°F and 15 volume percent ethanol resulted in a statistically significant increase in TWDs. T50 and the ethanol content had no statistically significant effect on TWD.

# I. INTRODUCTION

The CRC Volatility Group conducted a program in 2010 to determine the effect under hot ambient temperature conditions of fuel front-end volatility, 50% evaporated distillation point, and ethanol content on hot-fuel-handling driveability performance in a large group of late-model vehicles equipped with fuel-injection systems at 5,100 feet elevation. CRC had also conducted hot-fuel-handling programs in 1999, 2001, and 2006, one of which investigated 10 volume percent ethanol, and the other two of which investigated a range of ethanol concentrations.(1,2,3) Both the 1999 and 2001 programs were conducted under warm ambient temperatures nominally ranging from 80°F to 100°F at an altitude of approximately 1000 feet above sea level. The 2006 program expanded the range of ambient temperatures, incorporating test temperatures up to 120°F, as well as attempting to replicate some of the 2001 data in the 90s°F for a tie-back. The altitude of the 2006 program was 1,200 feet above sea level.

The results of the 2006 program were reported in CRC Report No. 648(3) and showed that fuels meeting ASTM D4814 Volatility Class C-3 requirements performed satisfactorily under Volatility Class A-1 ambient conditions. Even two fuels that were not part of the original program design meeting Class C-4 requirements and having 50% evaporated distillation points as low as 154°F performed well.

Consequently, the 2010 program was conducted at high altitude (5,100 feet above sea level) and under hot temperatures (nominally 95 - 105°F). The 2010 CRC Altitude Hot-Fuel-Handling Program was conducted at the Transportation Technology Center, Inc. (TTCI), a subsidiary of the Association of American Railroads, in Pueblo, Colorado, June 28 through August 22, 2006. The objective of the program was to determine under hot ambient temperature conditions and at altitude the effect of fuel front-end volatility, the 50% evaporated distillation point, and ethanol content on hot-fuel-handling performance in a large group of late model vehicles equipped with fuel injection. There were 20 late-model vehicles selected from a larger fleet of 60 2008 – 2010 vehicles. The test fuel design consisted of 13 test fuels with three levels of TVL20: 116, 124, and 133°F; three levels of 50% evaporated distillation points: 150, 170, and 200°F; and three levels of ethanol content: 0, 10, and 20 volume percent.

Members of the Data Analysis Panel and participants in the program are shown in Appendices A and B, respectively. Appendix C outlines the program as approved by the CRC Performance Committee. Also included in Appendix C are the recently developed draining and flushing procedures(4).

## II. CONCLUSIONS

The conclusions of the 2010 CRC Altitude Hot-Fuel-Handling Program are as follow:

- Individual vehicle performance appears consistent between fuels tested in this project with Total Weighted Demerits (TWDs) varying from 5 to 67.
- The vehicle average Least Squares Mean (LS mean) TWD across fuels ranged from 9.28 to 46.37 (mean 21.45) for fuels tested in this project.
- In the original test fuel set for normal summer fuel parameters; a change in TVL20 from 124°F to 116°F gave approximately 5 TWD difference, which is not statistically significant.
- A statistically significant effect of TVL20 was observed going from 124°F to 108°F with an increased LS mean TWD of approximately 10 after addition of a more volatile fuel of TVL20 at 108°F to give greater sensitivity to the analysis.
- No statistically significant effects on TWD were observed for the ethanol content (0 to 20 volume percent) or T50 (150°F to 200°F) experimental parameters.
- The results for TVL20 of 124°F at altitude were similar based on a comparison of a single fuel to previous vehicle performance observed at lower altitude testing as in CRC Report No. 648.
- Fuel weathering in vehicles increased with increasing fuel vapor pressure and with increasing in ambient temperature.

## III. TEST VEHICLES

It was planned to use approximately 20 late-model fuel-injected vehicles to evaluate the hot-fuel-handling driveability performance of the test fuels. The actual final test fleet of 20 vehicles was selected from a larger fleet of 60 vehicles. The 60 late-model rental vehicles were screened for fuel sensitivity by testing them first on their tank fuel and then testing them on the lowest TVL20 ethanol content blend with 10 volume percent ethanol (designated as Fuel 5). Ideally, those vehicles that showed few demerits on both fuels would have been returned to the rental agency, as would those vehicles showing high demerits on both fuels; however, the actual decisions on the final test vehicles took into account wide representation of makes and models, production volume, engine displacement size, mechanical condition, and fuel sensitivity.

The 60-vehicle fleet included one 2008, twenty-two 2009, and thirty-six 2010 vehicles, represented by General Motors, Ford, Chrysler, Honda, Kia, Volkswagen, Toyota, Subaru, Hyundai, Nissan, and Mazda. All 60 vehicles in the fleet were equipped with air conditioning and automatic transmissions. Engine displacements ranged from 1.5 to 5.7 liters. Of the 20 vehicles selected, three were flexible-fuel vehicles. The 20 vehicles in the final fleet are shown in Table 1, and a complete description of the 60-vehicle fleet is presented in Appendix D. Ideally, those vehicles that showed few demerits on both fuels would have been returned to the rental agency, as would those vehicles showing high demerits on both fuels. The actual decisions on the final test vehicles also took into account the need to select a wide representation of makes and models, production volume, engine displacement size, mechanical condition, and fuel sensitivity.

## IV. TEST FUELS

The test fuel matrix design consisted of thirteen test fuels with three levels of TVL20: 116, 124, and 133°F, three levels of 50% evaporated distillation points: 150, 170, and 200°F, and three levels of ethanol content: 0, 10, and 20 volume percent.

Average dry vapor pressure equivalent (DVPE), TVL20, distillation temperatures, ethanol content, and other property inspection results as determined by the supplier (Laboratory A) and Fuel Acceptance Panel Laboratories (B, C, and D) are shown in Table 2. Individual test results obtained by each inspecting laboratory are shown in Table E-1 of Appendix E. Additional inspections provided by the supplier laboratory and one of the panel laboratories are also shown in Table 2.

As vehicle testing began, poor weather conditions and lower than specified ambient temperatures were frequently encountered. As the program proceeded, it was apparent that not all of the test fuels were going to be evaluated during the scheduled time period. Because of limitations in the funding, personnel availability, length of the desired weather season, and the test site contract schedule, it was not possible to extend the test period. A statistician was asked to develop a priority list of fuels that would be followed until time ran out. Such a list would provide the best opportunity for a successful data analysis. It was observed that the level of Total Weighted Demerits with the design test fuel set was not very high. To possibly provide for more testing scale, Fuel 28, which was left over from the CRC 2009-2010 CRC/ASTM Hot-Fuel-Handling Program[4], was obtained and added to the altitude program. The properties of Fuel 28 are shown in Table 2. Only seven fuels were tested before time ran out. They were Fuels 2, 3, 5, 7, 9, 12, and 28.

Before testing was initiated on each new fuel, a sample was tested for DVPE to ensure it was the proper fuel. Samples were also sent to a contract laboratory for further testing. The results are shown in Table E-2 of Appendix E.

# V. TEST SITE

The test program was conducted at the Transportation Technology Center, Inc. (TTCI) in Pueblo, Colorado. The altitude of the test site within the TTCI campus is approximately 5,100 feet above sea level. A private road within the campus was closed off and used as the test track for vehicle driveability evaluations performed by two raters. A separate area close-by was closed off and used as the fueling and office area. One container which had been purchased by CRC for equipment storage and converted into a refrigerated fuel storage container in 2006 was used for fuel storage and fuel dispensing, and a second refrigerated storage unit was rented and used for fuel storage. This second storage unit also contained a small office area which was utilized as the Grabner fuel analysis room to obtain the DVPE readings. A small office trailer was also rented. Two roofless wooden sheds for hot-soaking a vehicle were used, each capable of holding two vehicles. One shed was set up at the east end of the test site, and the other shed was set up at the west end of the test site. The defueling/flushing/ refueling/sampling area was located close to the test track as were the fuel and vehicle storage, and the office trailer.

The program was conducted from June 28 through August 22, 2010. The week of June 28$^{th}$ was used to receive equipment, unpack, construct the soak sheds, prepare the test site, and prepare the vehicles for testing. The weeks of July 5$^{th}$ and 12$^{th}$ were used for vehicle screening for fuel sensitivity, and the core program was conducted July 19$^{th}$ through August 22$^{nd}$. The target ambient testing temperature range was 95°F - 105°F; however, actual test temperature range was 93°F - 109°F.

# VI. TEST PROGRAM

## A. Test Procedure

The test procedure used in this program is the same one used in the 2006 CRC Hot-Fuel-Handling Program. In this test procedure, after switching fuels, the test vehicle is warmed-up for 15 miles. This consists of a route where the vehicle is driven at 15 mph, 25 mph, 35 mph, 45 mph, and 55 mph on private or lightly travelled roads for a nominal half-hour schedule before bringing it to the soak sheds. The test vehicle is then parked in a soak shed for 20 minutes with the ignition off. The engine is then restarted after the 20-minute soak. Recording of data for calculation of total weighted demerits (TWDs) begins when the engine is restarted. The starting time, idle quality, and the occurrences of any stalls are recorded. The vehicle is accelerated at wide-open-throttle (WOT) to 35 mph. Driveability malfunctions, such as hesitation, surge, stumble, stall, or backfire, and their severity are recorded. The test vehicle is then returned and parked in a soak shed. The transmission is shifted into park and the engine is idled for 20 minutes. The idle quality is assessed, and if the engine stalls, the stall is recorded and an attempt to restart the engine is made immediately. If the engine continues to stall after three restarts, the test is aborted. At the end of the 20-minute idle test period, the transmission is shifted into drive, and the idle quality and any stalls are recorded. The vehicle is then slowly driven from the soak shed and accelerated at light-throttle to 35 mph. Driveability malfunctions and their severity are recorded. The vehicle is driven back to the soak shed and parked with the engine off for 20 minutes. The starting time is recorded, and idle quality and number of stalls are recorded. The vehicle is accelerated out of the soak shed at light-throttle to 35 mph. Driveability malfunctions and their severity are recorded. This concludes the testing sequence.

## B. Fueling and Sampling Procedures

All test fuel, prior to being used to supply the test vehicles, was stored in the 70°F refrigerated container for at least 24 hours prior to being opened. The fuel was delivered to the test vehicles through metered dispensing pumps installed inside the refrigerated container. The only portion of the fuel delivery system exposed to hot ambient temperatures was the fuel delivery hose. Samples were taken for vapor pressure tests from each drum when it was opened. The samples were analyzed using two Grabner DVPE instruments, one provided by General Motors and the other by BP. A sample of each test fuel was taken from a drum and sent to the contract laboratory for ASTM D5191 vapor pressure, ASTM D86 distillation, and ASTM D5599 oxygenate inspections. The results from these inspections are shown in Table E-2.

Each vehicle was tested on a hydrocarbon-only fuel immediately after being tested on an ethanol blend. A separate sample was collected from each vehicle while the hydrocarbon-only fuel was being drained, and this sample was shipped to the contract laboratory for ethanol analysis to determine fuel carryover and assess the current flushing procedure. The results of this fuel carryover analysis are presented in Table E-3.

After each test, the fuel from the vehicle tank was sampled through a valve on the fuel rail. Chilled one-quart cans were filled with the fuel. The samples were immediately placed in an insulated chest containing ice. The samples were then removed for evaluation from the ice chest, opened for air saturation as required by ASTM D5191 and then tested in one of the Grabner instruments. The inspection results for the end-of-test vehicle samples are shown in Table E-4.

## C. Test Plan

Initially, the plan was to test all thirteen fuels twice in all twenty selected vehicles. Unfortunately, this was not possible because of weather and temperature conditions. The weather pattern in Pueblo is such that July and early August provide the required temperatures to conduct this program, but this is also the rainy season. Most afternoons, a few hours after the temperatures allowed testing to begin, clouds would begin developing east of the mountain ranges. Testing would have to proceed with the on-site Program Manager’s attempts to predict one and one-half hours in advance whether there would be cloud cover and/or rain. Storms are a major threat on the plains, and it was necessary to secure and vacate the area before lightning, damaging hail, and heavy rain. Cloud cover also affects the sun-load on the engine, and testing must be aborted under frequent or continuous cloud cover. Again, this requires difficult predictions, because fuel quantities do not allow for many repeat tests. Another unforeseen difficulty created by the rainy season was that the moisture content of the air the morning after a rain would often keep the temperature from climbing to the predicted high for the day or the high would occur late into the day, which would reduce or preclude testing that day.

It was thus necessary to consult with the Leader of the Volatility Group and a statistician to determine the priority of the test fuels, and for the on-site Program Manager to ensure the priority of testing. Historically, the daily high temperatures decrease rapidly beginning near the middle of August. This, along with logistical factors discussed earlier in this report, allowed the test program to be extended a few days, but not enough to test all of the fuels.

## D. Data Worksheets

The data from the vehicle data sheets were summarized each day and entered into an Excel spreadsheet for each test. Information such as testing date, vehicle, fuel, and rater was given, and for each sequence of the test, start-of-test ambient temperature, and driveability malfunctions and their severity were recorded and entered into a computer summary sheet. A summary of the data is presented in Appendix F in Table F-1 for the test vehicles. A summary of the screening data are presented in Table F-2 for the non-selected vehicles only on Fuel 5.

# VII. DISCUSSION OF RESULTS

## A. Data Set Analysis

The final data set was analyzed using the SAS® System to calculate least square mean values for each vehicle and all vehicles, as well as for each fuel and all fuels. The initial model included fuel, vehicle, fuel x vehicle interactions, ambient temperature, vehicle x ambient temperature interactions, and rater. As is common with driveability data, the total weighted demerits (TWD) values were log transformed due to the wide range of vehicle/fuel TWDs (5 - 67). Log transforming the data leads to a data set that is more normally distributed and has approximately constant variance. The data were corrected using the rater and ambient temperature variables, but not the interaction terms. Each of the two raters tested each vehicle with each fuel and a rater correction was applied to the data (the raters were statistically significantly different from each other: 19.9 vs. 23.4 TWD, p-value = 0.00). Table 3 presents the least-squares mean corrected natural log TWD and mean TWD for each fuel across all vehicles. Table 4 presents the least-squares mean corrected natural log TWD for each fuel for each vehicle. The results were corrected to the 99°F average temperature. The regression analyses are on file at the CRC offices and are available upon request.

Figure 1 shows the Ln TWD least-squares mean for each fuel averaged across all the vehicles. A statistical significance for differences between fuels is shown in Table 5. Statistically significant differences have p-values of 0.05 or less. Differences with p-values of 0.10-0.06 are considered marginally statistically significant. Table 5 shows significant differences between Fuel 28 and all the other fuels. Fuel 9 is statistically different from Fuels 3, 7, and 12; and Fuel 2 is statistically different from Fuel 7. The Ln TWD least-squares mean data from Table 4 averaged across all fuels for each vehicle are shown graphically in Figure 2. Vehicle 18 has statistically significantly lower TWD than all other vehicles, except for Vehicle 56. Vehicle 25 has higher TWDs than all other vehicles, except for Vehicle 1.

## B. Ambient Temperature

The testing ambient temperatures ranged from 93°F to 109°F, versus the target temperature range of 95°F to 105°F for the designed program. Although the data were corrected to 99°F, the effect of ambient temperature was not significant.

## C. Fuel Property Effect Analysis

Using the TWD data from Table 3, regression analyses were initially undertaken against TVL20, 50% evaporated distillation point (T50), and ethanol content. The regression results are shown in Table 7. Regressing against three variables showed only TVL20 to be a significant property as indicated by the p-values in Table 7. For completeness, TVL20, T50, and ethanol content alone were also regressed and the results are shown in Table 7. Only TVL20 was a significant property. A similar DVPE-only regression was significant, but TVL20 had a better correlation. The Ln mean corrected TWD is plotted against TVL20 in Figure 3. The adjusted $R^2$ was 0.83.

The actual data points are shown in Figure 3. While the effect of changes in TVL20 on driveability are statistically significant, the increase in Ln TWD was small and changed from 2.9 at 124°F TVL20 to 3.4 at 108°F TVL20. The change in TWD would be from 18.7 to 29.9, a difference of approximately 10 TWD.

## D. 2006 CRC Program Comparison

The only fuel in this program that was similar to a fuel in the 2006 CRC Program[3] was Fuel 12 which was similar to Fuel X20. The Ln TWD LS mean for Fuel 12 was 2.97, and for X20 3.02. It was concluded from the 2006 Program that there was no statistically significant relationship between driveability and measured TVL20, DVPE, or ethanol content because the program provided too few driveability demerits to assess the effects of fuel properties.

## E. Rater Comparison

The same two driveability raters were used throughout the program. Each rater tested every vehicle and every test fuel in every vehicle. Table 8 shows the fuel average across all vehicles for each rater. The p-value for the difference for each fuel is shown, and on average Rater B reported higher mean Ln TWD than Rater A, which was significantly different (p=0.00). Table 9 shows the comparison for each vehicle across all fuels and the p-values for the difference. On average Rater B reported higher Ln TWD than Rater A, and the difference was statistically significant (p=0.00)

## F. Fuel Flushing Efficiency

To assess the flushing efficiency of the flushing procedure used to switch fuels, the ethanol content was determined for a hydrocarbon-only fuel following a 10 volume percent ethanol test run for each vehicle. The ethanol content inspection data are shown in Table E-3 of Appendix E. The average amount of ethanol across all vehicles was <0.17 volume percent. It ranged from <0.10 to 0.39 volume percent ethanol across the 20-vehicle fleet. Similar determinations in the 2006 CRC volatility program showed the average ethanol content to be 0.28 volume percent and ranged from 0.08 to 0.72 volume percent ethanol.

## G. Fuel Weathering

Fuel samples were obtained from each vehicle fuel tank at the end of each test run and analyzed on-site for DVPE. Drums were also tested on-site for vapor pressure. Taking the difference between the DVPE value from Table 2 and the end-of-test value for each vehicle provides the fuel vapor pressure weathering for each run. The final data set is shown in Table E-4. Figure 5 shows the average loss in vapor pressure across all fuels for each vehicle. Figure 6 shows the loss in vapor pressure for each fuel across all of the vehicles.

An SAS® System regression of the weathering data showed the significant fuel variables to be the initial fuel DVPE and the maximum ambient temperature (T) during a test. A conversion of the vapor pressure loss data into natural logarithms resulted in the best model. A linear model results in a DVPE increase when the temperature range is below the test program values. The resulting model for calculating loss directly in psi for all vehicles is as follows:

$$\text{Loss} = \text{EXP}(-4.90 + 0.243*\text{DVPE} + 0.0294*\text{T}) - 1$$

The $R^2$ for this regression equation is 0.848 with p-values for the DVPE and temperature slopes of $<0.001$. This equation is applicable within the vapor pressure range (9.5 to 13.0 psi) and temperatures from 93°F to 109°F assessed in this program. Figure 7 shows the average predicted loss in vapor pressure (weathering) as a function of the initial DVPE for two temperature conditions. The weathering increased as initial DVPE increased. Figure 8 shows the average predicted loss in vapor pressure as a function of the maximum ambient temperature for two fuel vapor pressures. The weathering increased with an increase in ambient temperature. Shown on both plots are the average properties for the seven test fuels. Looking at individual vehicles showed that DVPE was a significant variable for all vehicles. Ambient temperature was a significant variable for 10 vehicles. Ethanol content was a significant variable for two vehicles where it slightly reduced weathering (about 0.3 psi).

## ACKNOWLEDGEMENT

CRC would like to express appreciation to the Transportation Technology Center, Inc., a subsidiary of the Association of American Railroads, for their assistance with the conduct of this program. The CRC Volatility Group and the on-site participants most especially thank Mr. Gregg McBride of TTCI for all of his help. Without his oversight and assistance, this program would have been difficult to accomplish.

## REFERENCES


1. Coordinating Research Council, Inc., 1999 CRC Hot-Fuel-Handling Program, CRC Report No. 623, August 2000.

2. Coordinating Research Council, Inc., 2001 CRC Hot-Fuel-Handling Program, CRC Report No. 629, June 2002.

3. Coordinating Research Council, Inc., 2006 CRC Hot-Fuel-Handling Program, CRC Report No. 648, January 2007

4. Coordinating Research Council, Inc., 2009/2010 CRC/ASTM Hot-Fuel-Handling Program(For Classes D-4 and E-5 Gasoline), CRC Report No. 658, October 2010

5. ASTM International, ASTM D 4814 Specification for Automotive Spark-Ignition Engine Fuel, 2010 Annual Book of ASTM Standards.

6. Southwest Research Institute, A Vehicle Fuel Tank Flush Effectiveness Evaluation Program, August 2001.

**TABLES**

**AND**

**FIGURES**

**Table 1**
**Test Vehicles**
**2010 CRC 2010 Altitude Driveability Program**

| Year | Make | Model | Displacement | Mileage | VIN |
|---|---|---|---|---|---|
| 2010 | Chevrolet | Aveo | 1.6L I-4 | 7412 | KL1TD5DE9AB066094 |
| 2010 | Chevrolet | Cobalt | 2.2L I-4 | 13876 | 1G1AB5F53A7104658 |
| 2010 | Chevrolet | Tahoe | 5.3L V-8 FFV | 19554 | 1GNUKBE06AR119496 |
| 2009 | Chrylser | PT Cruiser | 2.4L I-4 | 26605 | 3A8FY48969T546484 |
| 2010 | Chrysler | Town & Country | 4.0L V-6 | 3964 | 2A4RR5DX9AR345496 |
| 2010 | Dodge | Ram Pickup | 4.7L V-8 FFV | 2820 | 1D7RV1GP4AS234459 |
| 2009 | Ford | Focus | 2.0L I-4 | 24430 | 1FAHP36N89W269124 |
| 2010 | Ford | Fusion | 2.5L I-4 | 11203 | 3FAHP0HAXAR253278 |
| 2010 | Ford | F150 | 5.4L V-8 FFV | 8787 | 1FTFW1EV3AFB34048 |
| 2009 | Honda | Accord | 2.4L I-4 | 26181 | IHGCP26329A119246 |
| 2009 | Hyundai | Accent | 1.6L I-4 | 18499 | KMHCN46C29U387479 |
| 2008 | Kia | Rio | 1.6L I-4 | 40207 | KNADE123486355727 |
| 2009 | Mazda | 3 | 2.0L I-4 | 28922 | JM1BK32F591257037 |
| 2009 | Nissan | Rouge | 2.5L I-4 | 36460 | JN8AS58V69W434661 |
| 2010 | Pontiac | Vibe | 2.4L I-4 | 12565 | 5Y2SP6E0XAZ415260 |
| 2010 | Subaru | Forester | 2.5L I-4 | 2972 | JF2SH6BC5AH794512 |
| 2009 | Toyota | Matrix | 1.8L I-4 | 42160 | 2T1KU4OE19C118108 |
| 2009 | Toyota | Yaris | 1.5L I-4 | 28571 | JTDJT903695257366 |
| 2009 | Toyota | Sienna | 3.5L V-6 | 28989 | 5TDZK23C09S287675 |
| 2010 | Volkswagen | Beetle | 2.5L I-5 | 13308 | 3VWPW3AG3AM008163 |

FFV in Displacement Column Indicates Flexible-Fuel Vehicle

**Table 2**
**2010 CRC Altitude Volatility Program Fuel Inspections**

| **Fuel Description** | | | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Property** | **Method** | **Units** | **116/150/0** | **116/200/0** | **124/150/0** | **124/200/0** | **116/150/10** | **116/200/10** | **124/150/10** | **124/200/10** |
| T V/L=20 | ASTM D5188 | °F | 115.4 | 115.5 | 122.4 | 123.8 | 115.4 | 116.3 | 123.9 | 123.4 |
| DVPE | ASTM D5191 | psi | 11.4 | 12.2 | 10.2 | 10.6 | 11.4 | 11.7 | 9.5 | 10.3 |
| Gravity | ASTM D4052 | °API | 63.2 | 60.7 | 61.8 | 60.6 | 58.7 | 57.2 | 57.6 | 57.5 |
| Relative Density | | 60/60°F | 0.7269 | 0.7360 | 0.7319 | 0.7369 | 0.7439 | 0.7497 | 0.7481 | 0.7487 |
| Ethanol | ASTM D4815 | wt % | 0.0 | 0.0 | 0.0 | 0.0 | 10.8 | 10.7 | 10.6 | 10.4 |
| Ethanol | ASTM D4815 | vol % | 0.0 | 0.0 | 0.1 | 0.0 | 10.0 | 10.1 | 9.9 | 9.8 |
| FIA | ASTM D1319 | | | | | | | | | |
| Aromatics | | vol % | 20.9 | 31.5 | 20.8 | 28.0 | 22.9 | 27.5 | 24.0 | 27.7 |
| Olefins | | vol % | 2.0 | 2.1 | 3.7 | 2.9 | 2.3 | 2.3 | 1.9 | 3.9 |
| Saturates | | vol % | 77.1 | 66.3 | 78.7 | 69.1 | 64.7 | 59.8 | 64.3 | 58.6 |
| Distillation | ASTM D86 | | | | | | | | | |
| Initial Boiling Point | | °F | 86.6 | 77.3 | 91.3 | 82.3 | 88.5 | 84.5 | 97.1 | 90.2 |
| 5% Evaporated | | °F | 102.3 | 94.3 | 108.8 | 101.8 | 106.2 | 104.5 | 116.2 | 111.0 |
| 10% Evaporated | | °F | 108.6 | 105.0 | 115.0 | 111.7 | 113.7 | 115.3 | 122.3 | 121.1 |
| 20% Evaporated | | °F | 117.4 | 122.7 | 122.5 | 126.5 | 124.7 | 133.1 | 130.2 | 136.3 |
| 30% Evaporated | | °F | 125.9 | 144.0 | 129.6 | 143.5 | 134.2 | 148.2 | 136.7 | 147.9 |
| 40% Evaporated | | °F | 135.2 | 170.9 | 138.1 | 166.9 | 141.7 | 158.3 | 142.3 | 156.6 |
| 50% Evaporated | | °F | 147.8 | 199.7 | 149.5 | 197.1 | 149.4 | 197.5 | 149.5 | 203.4 |
| 60% Evaporated | | °F | 167.3 | 223.2 | 171.5 | 224.9 | 178.5 | 232.9 | 183.8 | 233.3 |
| 70% Evaporated | | °F | 204.6 | 239.9 | 213.9 | 245.4 | 221.5 | 249.1 | 218.6 | 252.4 |
| 80% Evaporated | | °F | 248.2 | 258.7 | 263.0 | 267.4 | 254.5 | 271.0 | 246.6 | 280.9 |
| 90% Evaporated | | °F | 286.6 | 295.5 | 307.1 | 305.4 | 295.0 | 314.7 | 282.5 | 320.9 |
| 95% Evaporated | | °F | 324.5 | 330.3 | 337.8 | 339.7 | 328.0 | 341.2 | 322.3 | 349.1 |
| End Point | | °F | 377.4 | 384.9 | 394.4 | 391.6 | 384.7 | 384.2 | 373.8 | 405.6 |
| Recovery | | vol % | 97.4 | 97.3 | 97.7 | 97.7 | 97.2 | 97.4 | 97.7 | 97.1 |
| Residue | | vol % | 0.9 | 0.9 | 1.0 | 1.0 | 1.1 | 1.0 | 1.0 | 32.9 |
| Loss | | vol % | 1.7 | 1.7 | 1.3 | 1.3 | 1.8 | 1.6 | 1.3 | 1.5 |
| Benzene | DHA | vol % | 0.4 | 0.62 | 0.3 | 0.6 | 0.5 | 0.3 | 0.5 | 0.5 |
| Ethanol | DHA | vol % | 0.0 | 0.0 | 0.00 | 0.00 | 10.50 | 10.36 | 10.4 | 10.4 |
| Hydrocarbon | DHA | vol % | 100.0 | 100.0 | 100.0 | 100.0 | 89.5 | 89.6 | 89.6 | 89.6 |
| Aromatics | DHA | vol % | 23.7 | 34.7 | 22.1 | 34.1 | 26.2 | 31.5 | 29.4 | 29.4 |
| Olefins | DHA | vol % | 1.7 | 1.72 | 2.7 | 3.5 | 1.9 | 2.0 | 3.5 | 3.5 |
| Saturates | DHA | vol % | 74.6 | 63.6 | 75.2 | 62.5 | 61.4 | 56.2 | 56.7 | 56.7 |

## Table 2 Continued
## 2010 CRC Altitude Volatility Program Fuel Inspections

| **Fuel Description** | | | **9** | **10** | **11** | **12** | **13** | **28** |
|---|---|---|---|---|---|---|---|---|
| **Property** | **Method** | **Units** | **116/150/20** | **116/170/20** | **124/150/20** | **124/170/20** | **133/200/0** | **109/150/15** |
| T V/L=20 | ASTM D5188 | °F | 115.0 | 115.4 | 123.5 | 123.7 | 134.1 | 108.4 |
| DVPE | ASTM D5191 | psi | 11.4 | 12.2 | 9.2 | 10.4 | 9.5 | 13.0 |
| Gravity | ASTM D4052 | °API | 57.8 | 55.2 | 56.1 | 58.6 | 61.6 | 66.9 |
| Relative Density | | 60/60°F | 0.7477 | 0.7578 | 0.7544 | 0.7445 | 0.7327 | 0.7132 |
| Ethanol | ASTM D4815 | wt % | 21.9 | 21.5 | 21.2 | 20.6 | 0.0 | 17.5 |
| Ethanol | ASTM D4815 | vol % | 20.3 | 20.3 | 20.3 | 19.5 | 0.0 | 15.5 |
| FIA | ASTM D1319 | | | | | | | |
| Aromatics | | vol % | 17.7 | 23.5 | 21.6 | 18.4 | 21.2 | 10.8 |
| Olefins | | vol % | 2.7 | 2.8 | 1.7 | 2.0 | 2.4 | 5.1 |
| Saturates | | vol % | 59.3 | 53.5 | 56.3 | 60.1 | 76.4 | 68.8 |
| Distillation | ASTM D86 | | | | | | | |
| Initial Boiling Point | | °F | 89.0 | 84.3 | 99.6 | 94.1 | 187.2 | 81.3 |
| 5% Evaporated | | °F | 106.8 | 103.8 | 117.0 | 115.4 | 112.9 | 98.2 |
| 10% Evaporated | | °F | 114.3 | 117.7 | 122.2 | 127.2 | 125.4 | 104.7 |
| 20% Evaporated | | °F | 123.4 | 141.3 | 128.7 | 145.3 | 145.9 | 114.6 |
| 30% Evaporated | | °F | 134.0 | 157.2 | 135.0 | 155.8 | 166.3 | 125.4 |
| 40% Evaporated | | °F | 141.5 | 164.0 | 141.8 | 161.1 | 185.1 | 137.6 |
| 50% Evaporated | | °F | 148.9 | 167.3 | 149.4 | 164.7 | 200.8 | 150.3 |
| 60% Evaporated | | °F | 157.6 | 183.9 | 157.9 | 172.3 | 213.7 | 159.9 |
| 70% Evaporated | | °F | 165.2 | 248.2 | 165.7 | 230.2 | 226.2 | 165.6 |
| 80% Evaporated | | °F | 239.6 | 269.0 | 237.2 | 246.8 | 244.0 | 250.1 |
| 90% Evaporated | | °F | 282.9 | 315.6 | 273.6 | 293.0 | 285.3 | 310.3 |
| 95% Evaporated | | °F | 321.5 | 338.1 | 312.4 | 328.9 | 324.2 | 344.8 |
| End Point | | °F | 379.2 | 379.3 | 368.2 | 375.3 | 382.1 | 393.3 |
| Recovery | | vol % | 97.6 | 97.2 | 98.1 | 96.8 | 97.8 | 97.3 |
| Residue | | vol % | 0.9 | 1.0 | 1.0 | 1.0 | 0.9 | 1.6 |
| Loss | | vol % | 1.5 | 1.8 | 0.9 | 2.2 | 1.3 | 1.2 |
| Benzene | DHA | vol % | 0.3 | 0.3 | 0.4 | 0.2 | 0.5 | 0.6 |
| Ethanol | DHA | vol % | 20.9 | 21.4 | 21.0 | 19.7 | 0.0 | 16.9 |
| Hydrocarbon | DHA | vol % | 79.1 | 78.6 | 79.0 | 80.3 | 100.0 | 83.1 |
| Aromatics | DHA | vol % | 20.5 | 29.2 | 22.4 | 22.2 | 24.3 | 10.9 |
| Olefins | DHA | vol % | 1.8 | 1.5 | 1.1 | 1.3 | 1.7 | 5.1 |
| Saturates | DHA | vol % | 56.9 | 48.0 | 55.5 | 56.8 | 74.1 | 67.1 |

## Table 2 Continued
## 2010 CRC Altitude Volatility Program Fuel Inspections

| Fuel Description | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Property** | **Method** | **Units** | **116/150/0** | **116/200/0** | **124/150/0** | **124/200/0** | **116/150/10** | **116/200/10** | **124/150/10** | **124/200/10** |
| Solvent Washed Gum | ASTM D381 | mg/100mL | 0.6 | <0.1 | 0.8 | 1.0 | 0.8 | 0.2 | 0.4 | 0.4 |
| Research ON | ASTM D2699 | ON | 95.0 | 90.6 | 95.0 | 90.3 | 95.4 | 93.0 | 95.0 | 95.4 |
| Motor ON | ASTM D2700 | ON | 85.5 | 83.3 | 85.3 | 83.7 | 85.5 | 84.5 | 85.0 | 85.4 |
| (R+M)/2 | Calc. | ON | 90.2 | 87 | 90.2 | 87 | 90.4 | 88.8 | 90.0 | 90.4 |

| Fuel Description | | | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|
| **Property** | **Method** | **Units** | **116/150/20** | **116/170/20** | **124/150/20** | **124/170/20** | **133/200/0** |
| Solvent Washed Gum | ASTM D381 | mg/100mL | <0.1 | <0.1 | 1.0 | 0.4 | 0.2 |
| Research ON | ASTM D2699 | ON | 100.0 | 96.5 | 101.0 | 99.3 | 92.2 |
| Motor ON | ASTM D2700 | ON | 86.7 | 86.5 | 87.4 | 88.6 | 85.0 |
| (R+M)/2 | Calc. | ON | 93.4 | 91.1 | 94.2 | 94.0 | 88.6 |

| Fuel Description | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Property** | **Method** | **Units** | **116/150/0** | **116/200/0** | **124/150/0** | **124/200/0** | **116/150/10** | **116/200/10** | **124/150/10** | **124/200/10** |
| Research ON | ASTM D2699 | ON | 95.1 | 91.5 | 94.8 | 91.4 | 95.9 | 93.0 | 95.2 | 96.0 |
| Motor ON | ASTM D2700 | ON | 86.0 | 84.1 | 85.9 | 84.1 | 86.1 | 88.7 | 85.1 | 86.1 |
| (R+M)/2 | Calc. | ON | 90.6 | 87.8 | 90.4 | 87.8 | 91.0 | 90.8 | 90.2 | 91.0 |

| Fuel Description | | | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|
| **Property** | **Method** | **Units** | **116/150/20** | **116/170/20** | **124/150/20** | **124/170/20** | **133/200/0** |
| Research ON | ASTM D2699 | ON | 100.0 | 97.8 | 100.6 | 99.6 | 92.3 |
| Motor ON | ASTM D2700 | ON | 87.1 | 85.7 | 87.7 | 88.5 | 85.9 |
| (R+M)/2 | Calc. | ON | 93.6 | 91.8 | 94.2 | 94.0 | 89.1 |

**Table 3**
**2010 CRC Altitude Driveability Program**
**Fuel Least-Squares Mean Natural Log and Mean TWD Values**

| Fuel | Description, Nominal TVL20/T50/ EtOH | Ln TWD LS Mean | TWD LS Mean |
|---|---|---|---|
| 2 | 116/200/0 | 3.09 | 22.01 |
| 3 | 124/150/0 | 2.93 | 18.79 |
| 5 | 116/150/10 | 3.01 | 20.23 |
| 7 | 124/150/10 | 2.87 | 17.71 |
| 9 | 116/150/20 | 3.18 | 24.14 |
| 12 | 124/170/20 | 2.97 | 19.48 |
| 28 | 109/150/15 | 3.40 | 30.04 |

**Table 4**
**2010 CRC Altitude Driveability Program**
**Least Square Mean Natural Log and Least Square Mean TWD Values**

| Fuel | 2 | 3 | 5 | 7 | 9 | 12 | 28 | | |
|---|---|---|---|---|---|---|---|---|---|
| Description | 116/200/0 | 124/150/0 | 116/150/10 | 124/150/10 | 116/150/20 | 124/170/20 | 109/150/15 | Ln TWD | TWD |
| Vehicle | Ln TWD | Ln TWD | Ln TWD | Ln TWD | Ln TWD | Ln TWD | Ln TWD | Mean | LS Mean |
| 1 | 3.66 | 3.64 | 3.52 | 3.22 | 3.83 | 3.12 | 3.99 | 3.57 | 35.46 |
| 4 | 2.81 | 3.04 | 3.14 | 2.59 | 2.57 | 2.90 | 2.94 | 2.85 | 17.37 |
| 9 | 3.43 | 3.33 | 3.13 | 3.34 | 3.13 | 3.42 | 3.64 | 3.35 | 28.37 |
| 14 | 3.36 | 3.08 | 3.07 | 3.06 | 3.51 | 3.08 | 3.72 | 3.27 | 26.27 |
| 15 | 3.22 | 2.98 | 3.46 | 3.15 | 3.37 | 3.14 | 3.45 | 3.25 | 25.85 |
| 16 | 2.95 | 2.70 | 2.84 | 2.81 | 3.00 | 2.88 | 2.89 | 2.87 | 17.60 |
| 18 | 2.59 | 1.88 | 2.55 | 1.85 | 2.68 | 1.77 | 2.28 | 2.23 | 9.28 |
| 19 | 3.09 | 3.33 | 2.90 | 2.53 | 3.28 | 3.15 | 3.13 | 3.06 | 21.28 |
| 21 | 3.38 | 3.29 | 3.06 | 2.84 | 3.26 | 3.51 | 3.43 | 3.25 | 25.86 |
| 25 | 3.81 | 3.85 | 3.49 | 3.67 | 3.82 | 4.05 | 4.17 | 3.84 | 46.37 |
| 28 | 2.77 | 3.16 | 3.19 | 3.01 | 3.46 | 2.88 | 3.58 | 3.15 | 23.35 |
| 29 | 2.98 | 2.75 | 2.59 | 3.10 | 3.10 | 3.04 | 3.54 | 3.01 | 20.36 |
| 30 | 3.12 | 2.59 | 3.21 | 2.98 | 3.29 | 2.60 | 3.99 | 3.11 | 22.48 |
| 44 | 3.34 | 3.01 | 3.02 | 3.26 | 3.42 | 2.89 | 3.70 | 3.23 | 25.39 |
| 45 | 3.03 | 2.22 | 2.85 | 2.52 | 2.74 | 2.72 | 3.33 | 2.77 | 16.03 |
| 48 | 2.69 | 2.80 | 2.88 | 2.50 | 2.64 | 3.05 | 3.20 | 2.82 | 16.84 |
| 50 | 3.55 | 3.32 | 3.39 | 3.06 | 3.54 | 3.41 | 3.53 | 3.40 | 30.02 |
| 51 | 2.76 | 2.39 | 2.45 | 2.45 | 2.95 | 2.42 | 3.33 | 2.68 | 14.55 |
| 55 | 2.97 | 3.02 | 2.65 | 3.04 | 3.18 | 3.22 | 3.70 | 3.11 | 22.47 |
| 56 | 2.25 | 2.41 | 2.60 | 2.51 | 2.95 | 2.14 | 2.51 | 2.48 | 11.95 |
| Ln TWD LS Mean | 3.09 | 2.94 | 3.00 | 2.88 | 3.19 | 2.97 | 3.40 | 3.07 | 21.45 |

## Table 5
## 2010 CRC Altitude Driveability Program
## Signfiicant Difference Between Fuels (p-values)

| Fuel | Ln TWD LS Mean | 2 | 3 | 5 | 7 | 9 | 12 | 28 |
|---|---|---|---|---|---|---|---|---|
| 2 | 3.0925 | | 0.373 | 0.915 | 0.052 | 0.883 | 0.631 | 0.001 |
| 3 | 2.9317 | 0.373 | | 0.967 | 0.985 | 0.011 | 0.999 | <.0001 |
| 5 | 3.0094 | 0.915 | 0.967 | | 0.591 | 0.286 | 0.998 | <.0001 |
| 7 | 2.8736 | 0.052 | 0.985 | 0.591 | | 0.001 | 0.848 | <.0001 |
| 9 | 3.1833 | 0.883 | 0.011 | 0.286 | 0.001 | | 0.045 | 0.041 |
| 12 | 2.9673 | 0.631 | 0.999 | 0.998 | 0.848 | 0.045 | | <.0001 |
| 28 | 3.4024 | 0.001 | <.0001 | <.0001 | <.0001 | 0.041 | <.0001 | |

### Table 6
### 2010 CRC Altitude Driveability Program
### Signficant Difference Between Vehicles (p-values)

| Vehicle | Ln TWD LS Mean | 1 | 4 | 9 | 14 | 15 | 16 | 18 | 19 | 21 | 25 | 28 | 29 | 30 | 44 | 45 | 48 | 50 | 51 | 55 | 56 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3.56 | | <.0001 | 0.957 | 0.632 | 0.541 | <.0001 | <.0001 | 0.007 | 0.558 | 0.768 | 0.084 | 0.002 | 0.040 | 0.463 | <.0001 | <.0001 | 0.999 | <.0001 | 0.0371 | <.0001 |
| 4 | 2.85 | <.0001 | | 0.011 | 0.084 | 0.119 | 1 | <.0001 | 0.981 | 0.115 | <.0001 | 0.632 | 0.999 | 0.825 | 0.167 | 1 | 1 | 0.002 | 0.997 | 0.830 | 0.195 |
| 9 | 3.34 | 0.957 | 0.011 | | 1 | 1 | 0.015 | <.0001 | 0.690 | 1 | 0.010 | 0.988 | 0.426 | 0.943 | 1 | 0.001 | 0.005 | 1 | <.0001 | 0.939 | <.0001 |
| 14 | 3.27 | 0.632 | 0.084 | 1 | | 1 | 0.107 | <.0001 | 0.972 | 1 | 0.001 | 1 | 0.859 | 1.000 | 1 | 0.012 | 0.043 | 1.000 | 0.0004 | 0.999 | <.0001 |
| 15 | 3.25 | 0.541 | 0.119 | 1 | 1 | | 0.151 | <.0001 | 0.987 | 1 | 0.0004 | 1 | 0.913 | 1.000 | 1 | 0.018 | 0.062 | 0.999 | 0.0007 | 1.000 | <.0001 |
| 16 | 2.86 | <.0001 | 1 | 0.015 | 0.107 | 0.151 | | <.0001 | 0.989 | 0.149 | <.0001 | 0.695 | 1.000 | 0.874 | 0.213 | 1 | 1 | 0.003 | 0.994 | 0.877 | 0.162 |
| 18 | 2.23 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | <.0001 | 0.002 | 0.0003 | <.0001 | 0.033 | <.0001 | 0.8717 |
| 19 | 3.06 | 0.007 | 0.981 | 0.690 | 0.972 | 0.987 | 0.989 | <.0001 | | 0.986 | <.0001 | 1 | 1 | 1 | 0.995 | 0.738 | 0.933 | 0.319 | 0.186 | 1 | 0.0006 |
| 21 | 3.25 | 0.558 | 0.115 | 1 | 1 | 1 | 0.149 | <.0001 | 0.986 | | 0.0005 | 1 | 0.908 | 1.000 | 1 | 0.016 | 0.059 | 0.999 | 0.0006 | 1.000 | <.0001 |
| 25 | 3.84 | 0.768 | <.0001 | 0.010 | 0.001 | 0.0004 | <.0001 | <.0001 | <.0001 | 0.001 | | <.0001 | <.0001 | <.0001 | 0.0003 | <.0001 | <.0001 | 0.056 | <.0001 | <.0001 | <.0001 |
| 28 | 3.15 | 0.084 | 0.632 | 0.988 | 1 | 1 | 0.695 | <.0001 | 1 | 1 | <.0001 | | 1.000 | 1 | 1 | 0.217 | 0.461 | 0.849 | 0.020 | 1 | <.0001 |
| 29 | 3.01 | 0.002 | 0.999 | 0.426 | 0.859 | 0.913 | 1.000 | <.0001 | 1 | 0.908 | <.0001 | 1.000 | | 1 | 0.951 | 0.921 | 0.992 | 0.140 | 0.391 | 1 | 0.003 |
| 30 | 3.12 | 0.040 | 0.825 | 0.943 | 1.000 | 1.000 | 0.874 | <.0001 | 1 | 1.000 | <.0001 | 1 | 1 | | 1 | 0.376 | 0.669 | 0.660 | 0.049 | 1 | <.0001 |
| 44 | 3.24 | 0.463 | 0.167 | 1 | 1 | 1 | 0.213 | <.0001 | 0.995 | 1 | 0.0003 | 1 | 0.951 | 1 | | 0.026 | 0.088 | 0.998 | 0.001 | 1 | <.0001 |
| 45 | 2.78 | <.0001 | 1 | 0.001 | 0.012 | 0.018 | 1 | 0.002 | 0.738 | 0.016 | <.0001 | 0.217 | 0.921 | 0.376 | 0.026 | | 1 | <.0001 | 1 | 0.385 | 0.619 |
| 48 | 2.83 | <.0001 | 1 | 0.005 | 0.043 | 0.062 | 1 | 0.0003 | 0.933 | 0.059 | <.0001 | 0.461 | 0.992 | 0.669 | 0.088 | 1 | | 0.0005 | 1.000 | 0.678 | 0.327 |
| 50 | 3.41 | 0.999 | 0.002 | 1 | 1.000 | 0.999 | 0.003 | <.0001 | 0.319 | 0.999 | 0.056 | 0.849 | 0.140 | 0.660 | 0.998 | <.0001 | 0.0005 | | <.0001 | 0.653 | <.0001 |
| 51 | 2.68 | <.0001 | 0.997 | <.0001 | 0.0004 | 0.001 | 0.994 | 0.033 | 0.186 | 0.001 | <.0001 | 0.020 | 0.391 | 0.049 | 0.001 | 1 | 1.000 | <.0001 | | 0.050 | 0.983 |
| 55 | 3.11 | 0.037 | 0.830 | 0.939 | 1.00 | 1.00 | 0.877 | <.0001 | 1 | 1.000 | <.0001 | 1 | 1 | 1 | 1 | 0.385 | 0.678 | 0.653 | 0.050 | | <.0001 |
| 56 | 2.48 | <.0001 | 0.195 | <.0001 | <.0001 | <.0001 | 0.162 | 0.872 | 0.001 | <.0001 | <.0001 | <.0001 | 0.0025 | <.0001 | <.0001 | 0.619 | 0.327 | <.0001 | 0.983 | <.0001 | |

**Table 7**
**2010 CRC Altitude Driveability Program Regression Models**

| Regression Variables | Adjusted $R^2$ | RMSE | Constant | T V/L=20 | | T50 | | Ethanol Content | | Vapor Pressure | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Coef. | p-value | Coef. | p-value | Coef. | p-value | Coef. | p-value |
| T V/L=20, T50, EtOH | 0.811 | 0.079 | 6.197 | -0.0278 | 0.0165 | 0.00058 | 0.780 | 0.0052 | 0.318 | - | - |
| T V/L=20 | 0.830 | 0.074 | 6.497 | -0.0291 | 0.0027 | - | - | - | - | - | - |
| T50 | -0.200 | 0.198 | 3.063 | - | - | 0.00002 | 0.996 | - | - | - | - |
| EtOH | -0.050 | 0.185 | 2.984 | - | - | - | - | 0.0076 | 0.436 | - | - |
| Vapor Pressure | 0.759 | 0.089 | 1.539 | - | - | - | - | - | - | 0.136 | 0.007 |

**Table 8**
**2010 CRC Altitude Driveability Program**
**Rater Difference for Fuels**

| Fuel | Rater A | Rater B | p-value of Difference |
|---|---|---|---|
| 2 | 2.95 | 3.23 | 0.01 |
| 3 | 2.85 | 3.02 | 0.10 |
| 5 | 2.88 | 3.12 | 0.02 |
| 7 | 2.93 | 2.83 | 0.34 |
| 9 | 3.10 | 3.27 | 0.09 |
| 12 | 2.99 | 2.96 | 0.78 |
| 28 | 3.21 | 3.60 | 0.00 |
| Average | 2.99 | 3.15 | 0.00 |

**Table 9**
**2010 CRC Altitude Driveability Program**
**Rater Difference for Vehicles**

| Vehicle | Rater A | Rater B | p-value of Difference |
|---|---|---|---|
| 1 | 3.58 | 3.56 | 0.89 |
| 4 | 2.65 | 3.06 | 0.02 |
| 9 | 3.31 | 3.38 | 0.65 |
| 14 | 3.23 | 3.30 | 0.67 |
| 15 | 3.18 | 3.32 | 0.42 |
| 16 | 2.66 | 3.07 | 0.02 |
| 18 | 1.98 | 2.48 | 0.00 |
| 19 | 2.82 | 3.30 | 0.01 |
| 21 | 3.23 | 3.27 | 0.83 |
| 25 | 3.73 | 3.94 | 0.22 |
| 28 | 3.08 | 3.22 | 0.41 |
| 29 | 3.00 | 3.03 | 0.87 |
| 30 | 2.94 | 3.29 | 0.04 |
| 44 | 3.42 | 3.05 | 0.03 |
| 45 | 2.52 | 3.03 | 0.00 |
| 48 | 2.60 | 3.05 | 0.01 |
| 50 | 3.30 | 3.50 | 0.24 |
| 51 | 2.72 | 2.64 | 0.62 |
| 55 | 3.19 | 3.04 | 0.39 |
| 56 | 2.58 | 2.38 | 0.24 |
| Average | 2.99 | 3.15 | 0.00 |

**Figure 1**
**2010 CRC Altitude Driveability Program**
**LnTWD LSMean by Fuel**

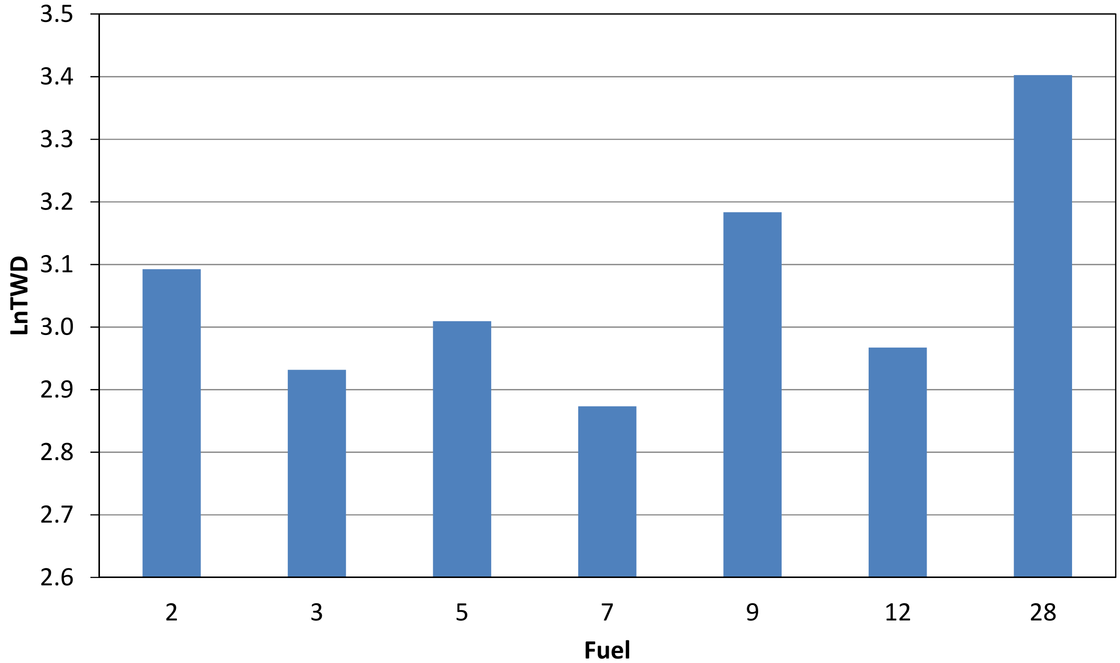
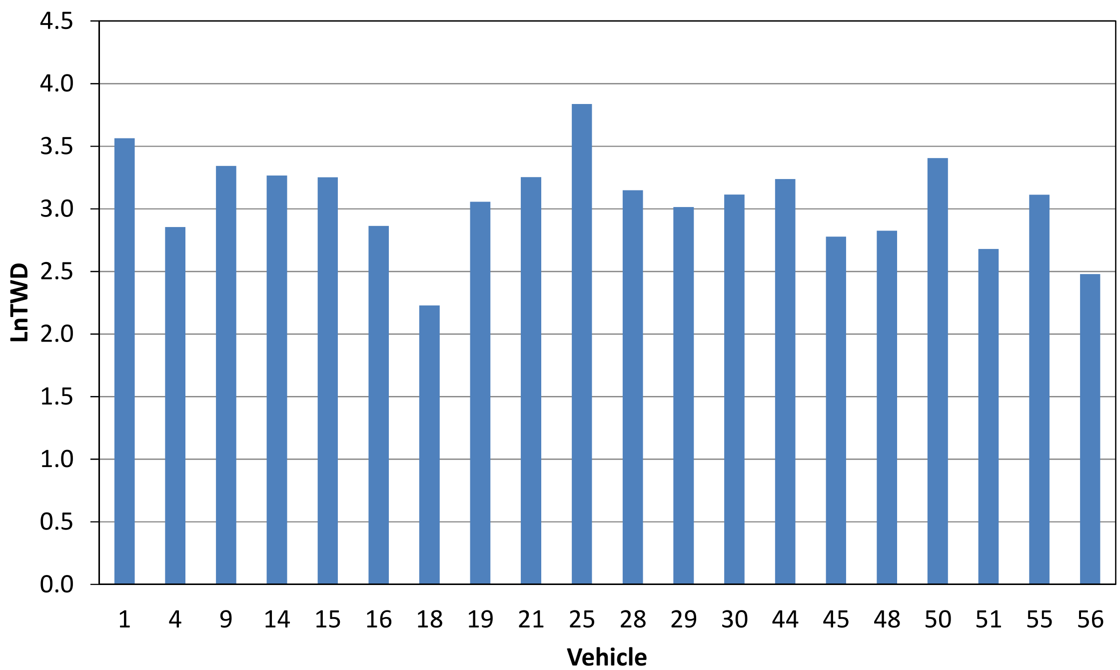
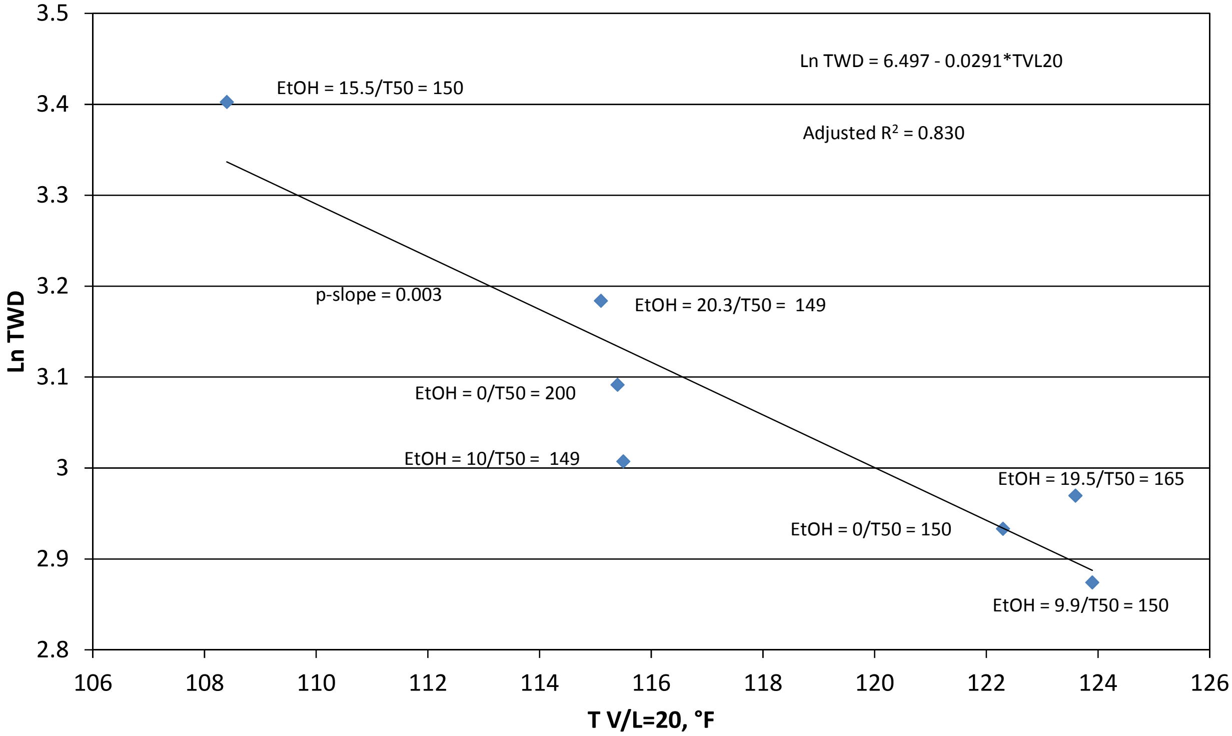



**Figure 2**
**2010 CRC Altitude Driveability Program**
**LnTWD LSMeans by Vehicle**



## Figure 3
## 2010 CRC Altitude Driveability Program
## Effect of T V/L=20 on Ln Total Weighted Demerits LS Mean




## Figure 4
## 2010 CRC Altitude Driveability Program
## Effect of Initial Vapor Pressure on Vapor Pressure Loss

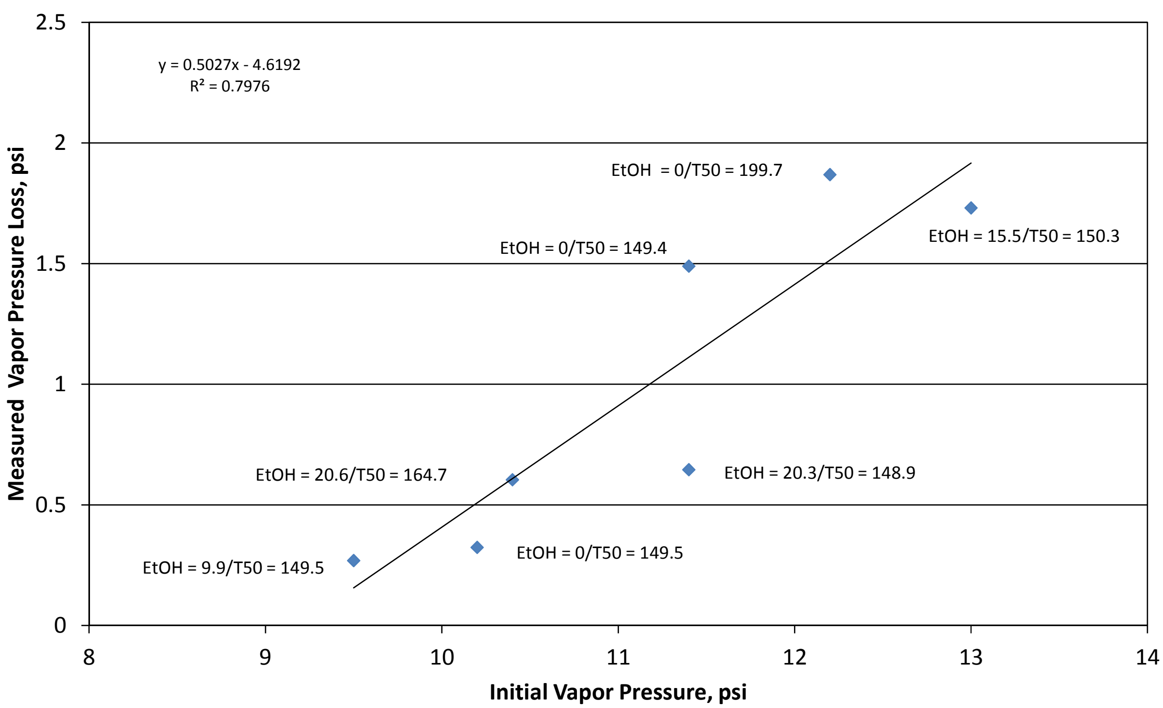


**Figure 5**
**2010 CRC Altitude Driveability Program**
**Vehicle Effect on Fuel Weathering**

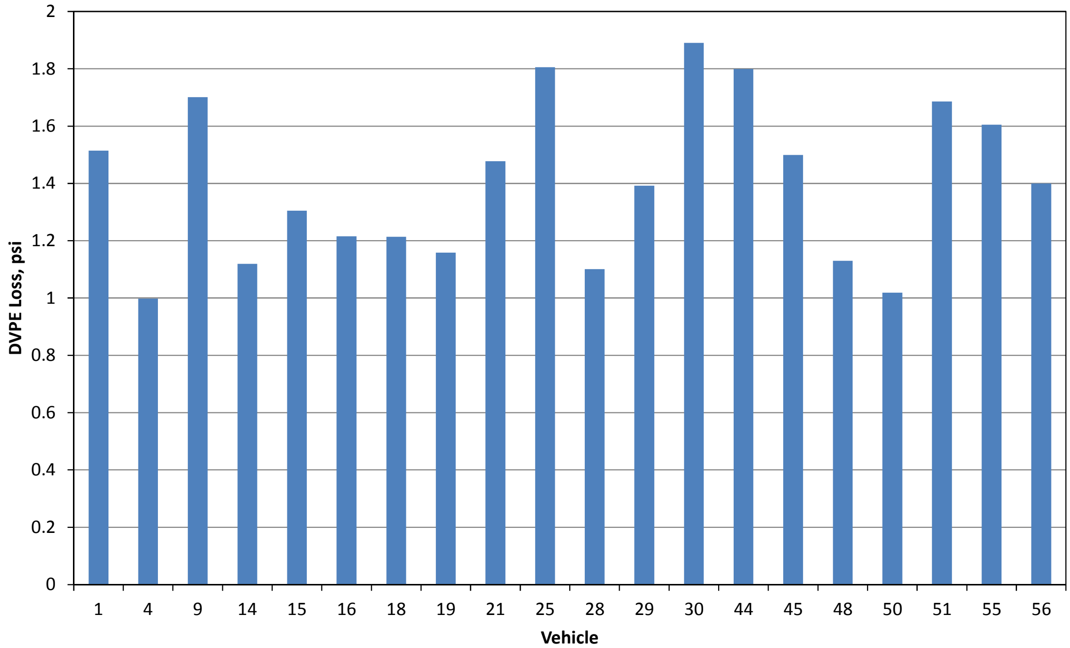



**Figure 6**
**2010 CRC Altitude Driveability Program**
**Fuel Effect on Fuel Weathering**

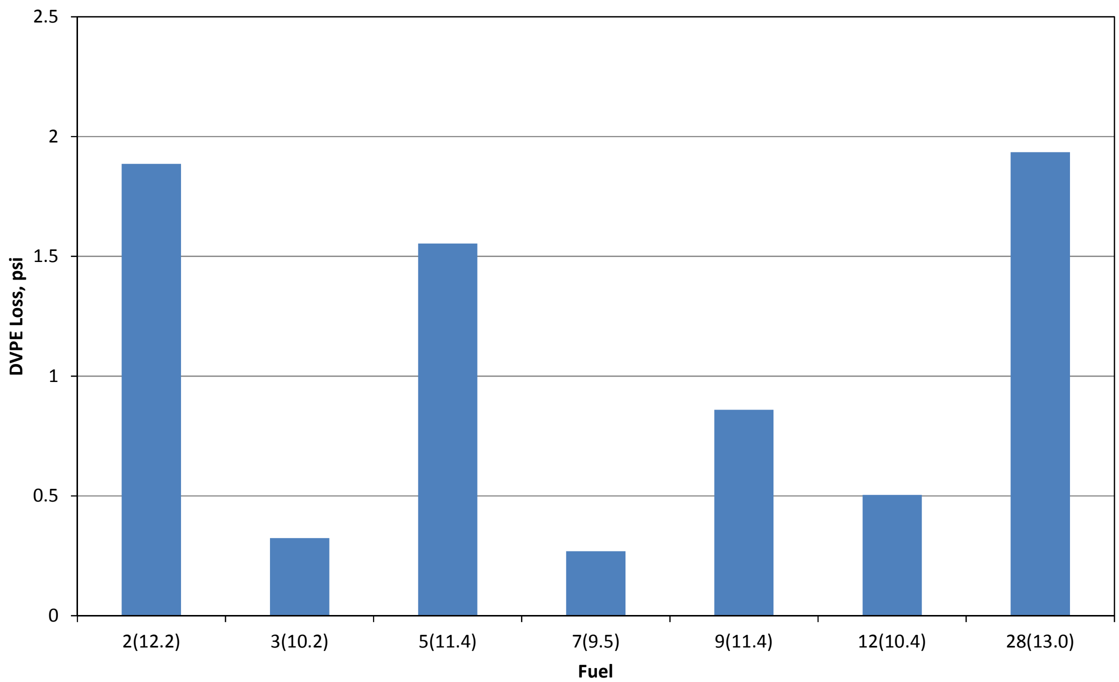


**Figure 7**
**2010 CRC Altitude Driveability Program**
**Effect of Initial Vapor Pressure on Weathering Loss**

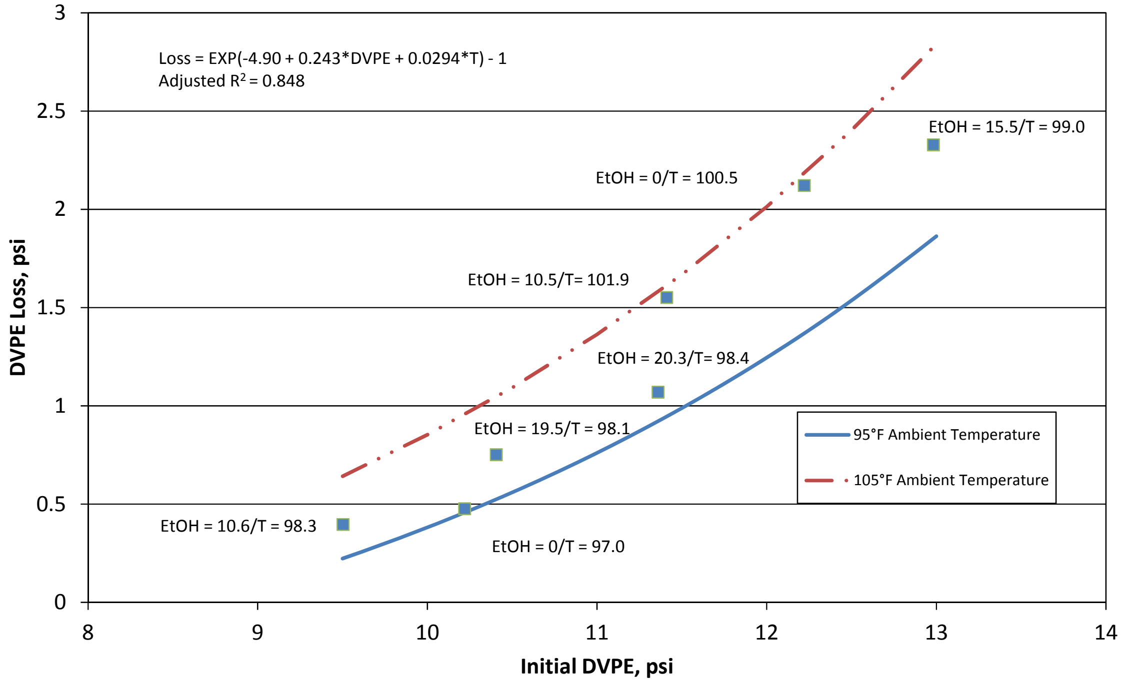
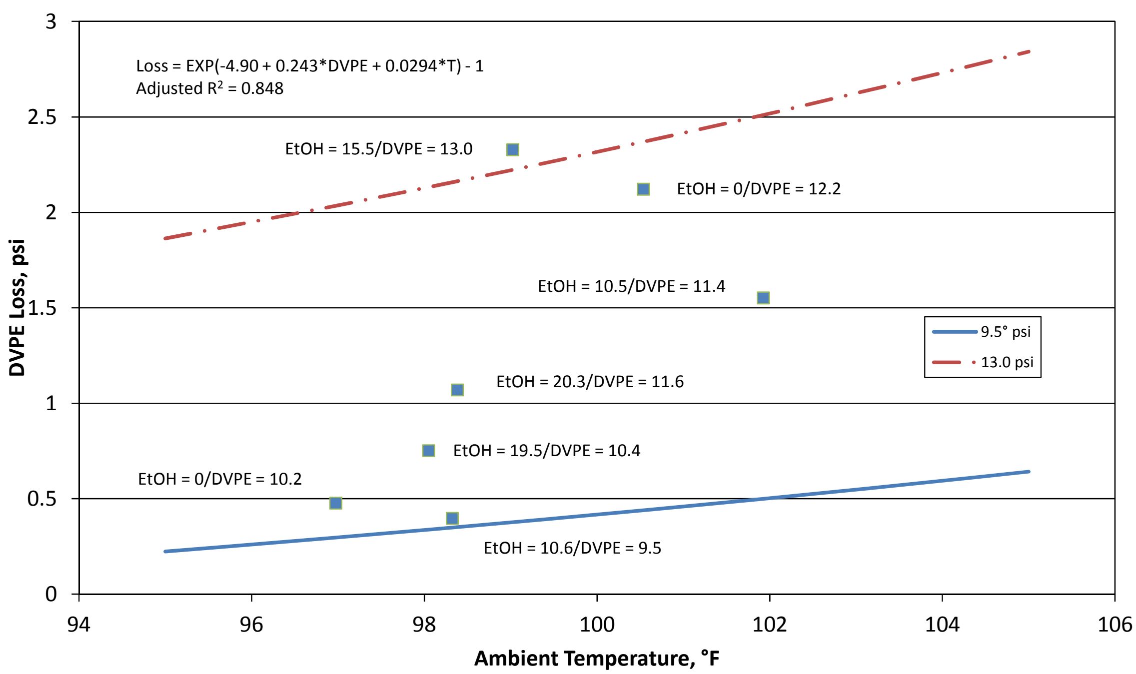



**Figure 8**
**2010 CRC Altitude Driveability Program**
**Effect of Ambient Temperature on Vapor Pressure on Weathering Loss**



## APPENDIX A

## MEMBERS OF THE

## 2010 CRC ALTITUDE HOT-FUEL-HANDLING PROGRAM

## DATA ANALYSIS PANEL

## Appendix A

### Members of the
### 2010 CRC Altitude Hot-Fuel-Handling Program
### Data Analysis Panel

| Name | Affiliation |
|---|---|
| Lew Gibbs, Leader | Chevron Products Company (Retired) |
| Bruce Alexander | BP Global Fuels Technology |
| King Eng | Shell Global Solutions |
| Beth Evans | Evans Research Consultants |
| Jeff Farenback-Brateman | ExxonMobil Research & Engineering |
| Pat Geng | General Motors Powertrain |
| Keith Knoll | National Renewable Fuels Laboratory |
| Jeff Jetter | Honda R&D Americas |
| Russ Lewis | Marathon Petroleum Company RAD |
| Kristy Moore | Renewable Fuels Association |

## APPENDIX B

## PARTICIPANTS IN THE

## 2010 CRC ALTITUDE HOT-FUEL-HANDLING PROGRAM

## ON-SITE AT PUEBLO, COLORADO

## Appendix B

## Participants in the 2010 CRC Altitude Program On-Site at Pueblo, Colorado

| Name | Affiliation |
|---|---|
| Harold “Archie” Archibald | Evans Research Consultants |
| Marcus Bishop | Consultant |
| Eric Brunnelle | ExxonMobil Research & Engineering |
| Jennifer Celeste | Sunoco |
| Tim Cushing | General Motors Powertrain |
| Kenny Davis | ConocoPhillips |
| Beth Evans | Evans Research Consultants |
| Pat Geng | General Motors Powertrain |
| Brian Giran | Sunoco |
| Hide Hanawa | Honda R&D Americas |
| Mark Hartman | Consultant |
| Carl Jewitt | Consultant |
| Vance Kopp | Suncor |
| Keith Knoll | National Renewable Energy Laboratory |
| Phil Krysinski | Consultant |
| Arline Most | Consultant |
| Bill Most | Consultant |
| Clive Pyburn | Consultant |
| Sheryl Rubin-Pitel | ExxonMobil Research & Engineering |
| Aron Saxon | National Renewable Energy Laboratory |
| Dave Sporleder | Shell Global Solutions (Canada) |
| Ron Stone | Consultant |
| Jan Tucker | Coordinating Research Council |
| Marie Valentine | Toyota Technical Center |
| Scott Walters | National Renewable Energy Laboratory |
| Doug Wilmot | Consultant |

# APPENDIX C

# 2010 CRC ALTITUDE HOT-FUEL-HANDLING PROGRAM

# 2009/2010 CRC HOT-FUEL-HANDLING PROGRAM

## Objective

Determine under hot ambient temperature conditions at altitude the effect of fuel front-end volatility, 50% evaporated distillation point, and ethanol content on hot-fuel-handling driveability performance in a large group of late model vehicles equipped with fuel injection systems.

## Deliverables

An assessment of hydrocarbon-only and various concentrations of ethanol blends under hot temperature ambient conditions at altitude will be undertaken. The fuel variables will be the front-end volatility parameter involving the temperature for a vapor-liquid ratio of 20 (TVL20), the 50% evaporated distillation point, and the ethanol content. The test procedure that was developed in the 2001 CRC Hot-Fuel-Handling Program (CRC Report No. 629) and used in the 2006 CRC Hot-Fuel-Handling Program (CRC Report No. 648) will be used in this study. A new correlation with performance may be developed if necessary.

## Introduction

In 2006, the CRC Volatility Group conducted a hot-fuel-handling driveability program investigating the effects of TVL20 and ethanol content (0, 5, 10, and 20 volume %) under hot ambient temperature conditions (110°F). The results reported in CRC Report No. 648 showed that fuels meeting ASTM D4814 Volatility Class C-3 requirements performed satisfactorily under Volatility Class A-1 ambient conditions. Even two fuels that were not part of the original program design meeting Class C-4 requirements and having 50% evaporated distillation points as low as 154°F performed well.

## Test Program

Vehicle hot-fuel-handling performance will be determined using the test procedure from the 2001 CRC volatility test program including the fuel flushing procedure. This program will be conducted in the summer of 2009.

## Test Fuels

The test fuel design will evaluate hydrocarbon-only fuel and two concentrations of ethanol blends (10 and 20 volume percent) at three TVL20 levels and two 50% evaporated distillation point levels. The fuel matrix is shown below.

| Fuel | TVL20, °F | T50, °F | EtOH, vol % | Est VP, psi |
|---|---|---|---|---|
| 1 | 116 | 150 | 0 | 11.3 |
| 2 | 116 | 200 | 0 | 13 |
| 3 | 124 | 150 | 0 | 10 |
| 4 | 124 | 200 | 0 | 11.5 |
| 5 | 116 | 150 | 10 | 11.2 |
| 6 | 116 | 200 | 10 | 13 |
| 7 | 124 | 150 | 10 | 9.5 |
| 8 | 124 | 200 | 10 | 11 |
| 9 | 116 | 150 | 20 | 11.4 |
| 10 | 116 | 170 | 20 | 12 |
| 11 | 124 | 150 | 20 | 9.7 |
| 12 | 124 | 170 | 20 | 10 |
| 13 | 133 | 200 | 0 | 9.7 |

The specifications for the 13 test fuels are shown in Table 1. The limits are designed around the TVL20/ethanol/T50 parameters. A Fuel Blending and Analysis Task Force will be formed to develop to assist in the analyses and approval of the test fuels.

**Test Vehicles**

Approximately 20 late model fuel injected equipped vehicles will be used in this test program to evaluate the hot-fuel-handling driveability performance of the test fuels. The late model vehicles will be selected from a total fleet of about 80 vehicles based on their response to the lowest TVL20 ethanol content blend with 10 vol % ethanol (Fuel 5). Those vehicles giving driveability problems will be further tested on the highest TVL20 hydrocarbon-only gasoline to verify sensitivity to fuel properties (Fuel 13). The late model vehicles will nominally cover 2007-2008 model years and will have stabilized mileages at over 6,000 odometer miles, and be in good mechanical condition with functional air conditioning systems.

**Test Procedure**

The Test Procedure used in the 2006 CRC volatility program will be used in this follow-up program. Each vehicle will be flushed with test fuel following the latest flushing procedure and filled to 40 percent of tank capacity. The most volatile fuel will be tested in each vehicle at increasing ambient temperatures until malfunctions are reported. If no problems are observed at the highest available temperature with the most volatile fuel, the vehicle will be parked and eliminated from the test fleet. If driveability problems are observed, lower volatility fuels will be tested at several ambient temperatures.

It is not planned to instrument the test vehicles as was done in 2001. On-site inspection of the test fuels to confirm they haven't weathered and to evaluate fuels after vehicle testing may be undertaken.

## Test Temperatures

The ambient test temperature will be a minimum of 95°F. It is desirable to conduct testing above 95°F, but below 105°F.

## Test Location

Because the ambient temperature conditions at the Renegade Raceways in Yakima, Washington are not reliably high enough for this program and because an altitude testing area is needed, the test program will be conducted at the Transportation Technology Center (TTCI) location near Pueblo, Colorado, which is at 5,100 feet elevation.

## Timing

The timing will be as follows:

The weeks of June 22 and June 29, 2009 (June 21 and June 28, 2010)* – 2 to 3 people will be required on-site to receive delivery of equipment, build soak sheds, etc. An additional 2-3 mechanics will be required on-site to prepare the vehicles for testing.

The weeks of July6 and July 13, 2009 (July 5 and July 12, 2010)* – 5 to 7 people will be required on-site for vehicle screening.

July 20 through August 15, 2009 (July 19 through August 14, 2010)* – the core test program with the 20 selected vehicles and 13 test fuels will be conducted.

It is planned that the data analysis and report-writing activities can be completed within about six-months following the completion of the testing portion of the program.

*The timing will depend on when funding is available.

## Personnel Requirements

The program will require 12 people on-site for each testing week for a total of 72 person-weeks. Mechanics and set-up people will be required for several weeks prior to the start of testing.

## Program Cost

The estimated cost for the test program is outlined below:

| Item | Cost |
|---|---|
| Vehicle Rental | |
| Test Fuel | |
| Freight to Move Test Equipment to/from Yakima | |
| TTCI Test Controller ($1,425 Daily Rate) | |
| Modifying TTCI Test Site to Accommodate CRC Testing | |
| Purchase of Second Container and Refrigeration Unit | |
| Material to Construct Soak Sheds | |
| Miscellaneous | |
| Contract Personnel | |
| Total | |

Optional Expense to Encourage Participation On-Site

CRC Participation Payment

Table 1
2009-2010 CRC Altitude Hot-Fuel Handling Program Test Fuel Specifications

| Property | Test Methods | Test Fuels | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| Ethanol, Vol % | D 4815 | 0 | 0 | 0 | 0 | 9.5-10.5 | 9.5-10.5 | 9.5-10.5 | 9.5-10.5 | 19.5-20.5 | 19.5-20.5 | 19.5-20.5 | 19.5-20.5 | 0 |
| TVL20. °F **Target** | D 5188 | 116 | 116 | 124 | 124 | 116 | 116 | 124 | 124 | 116 | 116 | 124 | 124 | 133 |
| DVPE, psi Estimated | | 11.3 | 13 | 10 | 11.5 | 11.2 | 13 | 9.5 | 11 | 11.4 | 12 | 9.7 | 10 | 9.7 |
| DVPE, psi | D 5191 | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report |
| 10% Evaporated, °F | D 86 | 105-125 | 95-115 | 115-135 | 105-125 | 105-125 | 95-115 | 115-135 | 105-125 | 105-125 | 100-120 | 115-135 | 115-135 | 115-135 |
| 50% Evaporated, °F | D 86 | 146-152 | 195-201 | 146-152 | 195-201 | 146-152 | 195-201 | 146-152 | 195-201 | 146-152 | 166-172 | 146-152 | 166-172 | 195-201 |
| 90% Evaporated, °F | D 86 | 270-350 | 270-350 | 270-350 | 270-350 | 270-350 | 270-350 | 270-350 | 270-350 | 270-350 | 270-350 | 270-350 | 270-350 | 270-350 |
| End Point, °F | D 86 | <437 | <437 | <437 | <437 | <437 | <437 | <437 | <437 | <437 | <437 | <437 | <437 | <437 |
| Aromatics, vol % | D 1319 | 15-35 | 15-35 | 15-35 | 15-35 | 13-32 | 13-32 | 13-32 | 13-32 | 12-28 | 12-28 | 12-28 | 12-28 | 15-35 |
| Olefins, vol % | D 1319 | 0-15 | 0-15 | 0-15 | 0-15 | 0-13 | 0-13 | 0-13 | 0-13 | 0-12 | 0-12 | 0-12 | 0-12 | 0-15 |
| Saturates, vol % | D 1319 | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report |
| Benzene, vol % | D 3606 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| MTBE, vol % | D 4815 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Lead, g/gal | D 3237 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Washed Gum, mg/100mL | D 381 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 | <2 |
| RON | D 2699 | >90 | >90 | >90 | >90 | >90 | >90 | >90 | >90 | >90 | >90 | >90 | >90 | >90 |
| MON | D 2700 | >80 | >80 | >80 | >80 | >80 | >80 | >80 | >80 | >80 | >80 | >80 | >80 | >80 |
| (R+M)/2 | Calculation | >87 | >87 | >87 | >87 | >87 | >87 | >87 | >87 | >87 | >87 | >87 | >87 | >87 |
| API Gravity | D 4052 | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report | Report |

All blends are to be made using refinery gasoline blending components.
Fuels are to contain all of the appropriate carbon numbers for each hydrocarbon type to represent commercial gasoline.
The most critical property is TVL20. The final blends shall be + 1°F and - 2°F from the target shown above.
Samples of handblends and of the final blends are to be sent to the Fuels Blending and Analysis Panel for inspection and approval.

# FUELING AND DEFUELING PROCEDURE

## VEHICLE PREPARATION

Used test fuel from the vehicle is drained just before the fuel rail. The fuel line is disconnected at the OEM quick-disconnect to the fuel rail, and a Hansen fitting with hose is inserted between the fuel line and the fuel rail. During defueling, a tee is inserted between the two fittings, with one end of the tee leading to the "slop" fuel drum.

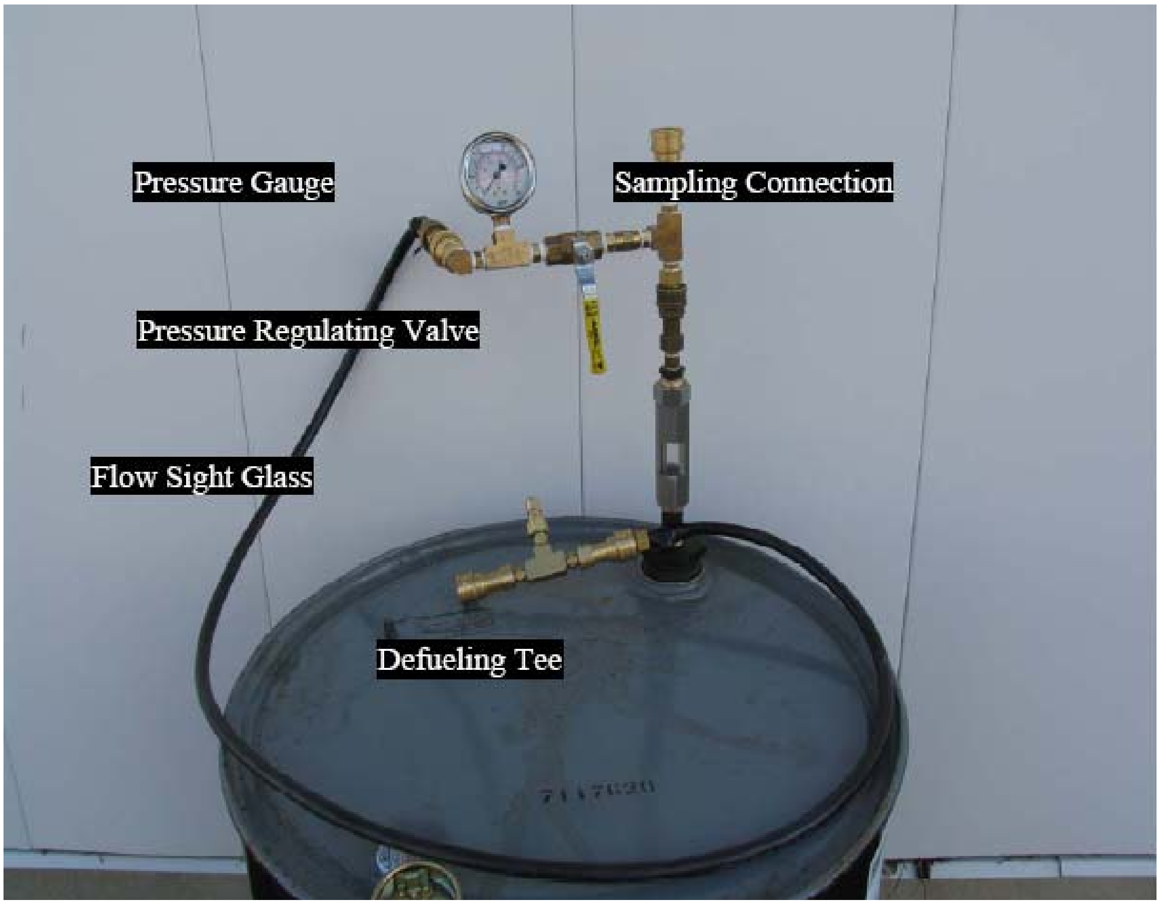
The next step in vehicle preparation is to install voltmeter leads to either the throttle-position-sensor (TPS) or the accelerator pedal, whichever is appropriate. The wires are routed into the passenger compartment of the vehicle to allow the rater to attach a voltmeter during testing. These wires should be long enough to allow either the rater or the observer to be able to read the voltmeter.

## DEFUELING PROCEDURE

The fuel is drained into a "slop" drum. This draining system is a closed system, and requires the vehicle engine to be running during the draining procedure. The large bung of the "slop" drum is removed and replaced with a bung that has a two-foot stainless steel tube welded through it. The top of the tube has a Swedgelock fitting on it which attaches to a Hansen coupler. Atop the coupler is an apparatus which has a pressure gauge, a regulating valve, and a sight glass, along with an extra Hansen fitting to obtain fuel samples. During defueling, this apparatus is connected to the vehicle's fuel line via the tee inserted as described above.

The small bung of the drum is removed and replaced by a bung with a float arrangement fabricated to indicate when the drum is full. This float arrangement has corks mounted on a rod on the underside of the small bung and a flag mounted on the same rod on the top-side of the small bung. As the fuel level in the drum rises, it pushes the corks up, which in turn pushes the flag up. This notifies the defueling personnel that the drum is full and must be changed.

Following is the procedure for draining and flushing the fuel system:




FUEL TANK FLUSHING PROCEDURE

***Precautionary notes:***

1. ***When draining the vehicle fuel tank, the vehicle engine is running, and the pressure to keep the engine running is regulated at the "slop" drum.***
2. ***Some vehicles require that the accelerator pedal be depressed to keep the engine running. An adjustable rod may be used to do this.***
3. ***Use a UL approved ground strap to ground defueling equipment to the fuel injector rail or fuel line fitting for all fuel draining.***

Flushing Procedure:

1. When a vehicle comes in from testing, the defueling apparatus is connected to the vehicle, and the engine is started so the fuel will flow. The flow to the “slop” drum is controlled by the regulating valve.

2. If a fuel sample is required, allow fuel to be drained for one minute through the draining apparatus on the “slop” drum before taking a fuel sample. Fuel from the vehicle should also be drained through the sampling line to ensure that the sample is not contaminated. A sample can then be taken from the sampling port on the draining apparatus.

3. Completely drain the vehicle’s fuel tank, at which time the engine will shut down.

4. Remove the fill cap, add four gallons of the next test fuel to the vehicle fuel tank, and replace the fill cap.

5. Start and idle the vehicle for a total of 2 minutes.

6. Completely drain the fuel tank through the draining apparatus, at which time the engine will shut down.

7. Remove the fill cap, add four gallons of the next test fuel to the vehicle fuel tank, and replace the fill cap.

8. Start and idle the vehicle for a total of 2 minutes. From approximately 15 seconds into the idle for a period of 30 seconds, rock the rear end of the vehicle from side to side. This task will require one person on each side of the vehicle.

9. Completely drain the fuel tank through the draining apparatus, at which time the engine will shut down.

10. When the vehicle is ready, remove the fill cap, add four or five gallons as required of the test fuel to the vehicle fuel tank, and replace the fill cap.

## FUELING PROCEDURE

The vehicles are fueled out of a 55-gallon drum of test fuel, using a portable dispensing pump. This dispensing pump has been fabricated by mounting the motor and gauge on a hand-truck. The dispensing pump is service station quality. The large bung of the drum is removed, and a steel pipe is inserted into the drum. The top of the pipe has the male side of the Hansen coupler on it and is connected to the female side of the coupler on the dispensing pump inlet hose. The small bung is loosened just enough to keep the drum from collapsing while fuel is being pumped out of it.

Ground straps are used throughout the fueling and defueling process to avoid static electricity.

# APPENDIX D

# LISTING OF SCREENED VEHICLES

**Table D-1**
**List of All Vehicles**

| Year | Make | Model | Displacement | Mileage | VIN |
|---|---|---|---|---|---|
| 2010 | Chevrolet | Aveo | 1.6L I-4 | 7412 | KL1TD5DE9AB066094 |
| 2010 | Chevrolet | Cobalt | 2.2L I-4 | 13876 | 1G1AB5F53A7104658 |
| 2010 | Chevrolet | Colorado | 3.7L I-6 | 17588 | 1GCJTCDE3A8100258 |
| 2010 | Chevrolet | HHR | 2.2L I-4 FFV | 15600 | 3GNBAADB2AS521536 |
| 2009 | Chevrolet | HHR | 2.2L I-4 FFV | 28261 | 3GNCA13B19S635660 |
| 2010 | Chevrolet | Impala | 3.5L V-6 FFV | 9993 | 2G1WB5EK7A1163268 |
| 2010 | Chevrolet | Impala | 3.5L V-6 FFV | 18362 | 2G1WA5EK4A1145975 |
| 2010 | Chevrolet | Silverado | 5.3L V-8 FFV | 16827 | 3GCRKSE34AG129596 |
| 2010 | Chevrolet | Suburban | 5.3L V-8 FFV | 9948 | 1GNUKHE34AR209442 |
| 2010 | Chevrolet | Tahoe | 5.3L V-8 FFV | 19554 | 1GNUKBE06AR119496 |
| 2009 | Chrysler | PT Cruiser | 2.4L I-4 | 26605 | 3A8FY48969T546484 |
| 2009 | Chrysler | Town&Country | 3.3L V-6 FFV | 35618 | 2A8HR44E59R549095 |
| 2010 | Chrysler | Town&Country | 4.0L V-6 | 3964 | 2A4RR5DX9AR345496 |
| 2010 | Chrysler | Town&Country | 4.0L V6 | 6834 | 2A4RR5DX7AR345495 |
| 2010 | Dodge | Avenger | 2.4L I-4 | 14444 | 1B3CC4FB4ANI35508 |
| 2010 | Dodge | Grand Caravan | 3.8L V-6 | 20458 | 2D4RN5D12AR179984 |
| 2010 | Dodge | Journey | 3.5L V-6 | 15245 | 3D4PH5FV8AT141381 |
| 2010 | Dodge | RAM PU | 4.7L V-8 FFV | 2820 | 1D7RV1GP4AS234459 |
| 2009 | Dodge | RAM PU | 5.7L V-8 | 21612 | 1D3HV18T29S802924 |
| 2010 | Ford | CargoVan | 4.6L V-8 FFV | 12083 | 1FTNE2EW8ADA31913 |
| 2009 | Ford | Escape | 3.0L V-6 | 31829 | 1FMCU93G49KB03692 |
| 2010 | Ford | Escape | 3.0L V-6 FFV | 12173 | 1FMCU9EG5AKC14043 |
| 2010 | Ford | Expedition | 5.4L V-8 FFV | 17935 | 1FMJU1G5XAEA88197 |
| 2010 | Ford | Explorer | 4.0L V-6 | 37782 | 1FMEU7DEXAUA11666 |
| 2010 | Ford | F-150 | 5.4L V-8 FFV | 8787 | 1FTFW1EV3AFB34048 |
| 2009 | Ford | Focus | 2.0L I-4 | 24430 | 1FAHP36N89W269124 |
| 2010 | Ford | Fusion | 2.5L I-4 | 11203 | 3FAHP0HAXAR253278 |
| 2010 | Ford | Taurus | 3.7L V-6 | 17123 | 1FAHP2FW1AG143043 |
| 2009 | Honda | Accord | 2.4L I-4 | 26181 | IHGCP26329A119246 |
| 2010 | Honda | Civic | 1.8L I-4 | 1061 | 19XFA1F50AE052771 |
| 2009 | Hummer | H3 | 3.7L I-6 | 28408 | 5GTEN13E598140816 |
| 2009 | Hyundai | Accent | 1.6L I-4 | 18499 | KMHCN46C29U387479 |
| 2010 | Hyundai | Elantra | 2.0LI-4 | 12951 | KMHDU4AD1AU851423 |
| 2010 | Hyundai | Sonata | 2.4L I-4 | 11292 | 5NPET4ACOAH656958 |
| 2010 | Jeep | Liberty | 3.7L V-6 | 11864 | 1J4PN2GK2AW132348 |
| 2010 | Jeep | Patriot 4x4 | 2.4L I-4 | 5444 | 1J4NF2GB2AD557794 |
| 2010 | Kia | Forte | 2.0L I-4 | 11852 | KNAFU4A29A5111606 |

FFV in Displacement Column Indicates Flexible-Fuel Vehicle

**Table D-1 Contined**
**List of All Vehicles**

| | | | | | |
|---|---|---|---|---|---|
| 2008 | Kia | Rio | 1.6L I-4 | 40207 | KNADE123486355727 |
| 2010 | Kia | Soul | 2.0L I-4 | 3884 | KNDJT2A29A7163343 |
| 2009 | Kia | Spectra | 2.0L I-4 | 23614 | KNAFE221195668335 |
| 2010 | Lincoln | TownCar | 4.6L V-8 FFV | 11179 | 2LNBL8CV8AX607140 |
| 2009 | Mazda | 3 | 2.0L I-4 | 28922 | JM1BK32F591257037 |
| 2010 | Mazda | 3 | 2.0L I-4 | 14026 | JM1BL1SF2A1265294 |
| 2010 | Mercury | Grand Marquis | 4.6L V-8 FFV | 5912 | 2MEBM7FV8AX625739 |
| 2009 | Nissan | Altima | 2.5L I-4 | 30987 | 1N4AL21E79C181245 |
| 2009 | Nissan | Pathfinder | 4.0L V-6 | 39989 | 5N1AR18B19C608543 |
| 2009 | Nissan | Rouge | 2.5 I-4 | 36460 | JN8AS58V69W434661 |
| 2009 | Nissan | Sentra | 2.0L I-4 | 23963 | AB61E09L670775 |
| 2010 | Pontiac | Vibe | 2.4L I-4 | 12565 | 5Y2SP6E0XAZ415260 |
| 2010 | Subaru | Forester | 2.5L I-4 | 2972 | JF2SH6BC5AH794512 |
| 2009 | Subaru | Impreza | 2.5L I-4 | 17550 | JF1GE61629H517181 |
| 2009 | Subaru | Outback | 2.5L I-4 | 16878 | JFIGH63679H824480 |
| 2010 | Toyota | Corolla | 1.8L I-4 | 10235 | 1NXBU4EE5AZ306061 |
| 2009 | Toyota | Matrix | 1.8L I-4 | 42160 | 2T1KU4OE19C118108 |
| 2009 | Toyota | Matrix | 1.8L I-4 | 26660 | 2T1KU40E89C176121 |
| 2009 | Toyota | Sienna | 3.5L V-6 | 42651 | 5TDZK23C49S244263 |
| 2009 | Toyota | Sienna | 3.5L V-6 | 28989 | 5TDZK23C09S287675 |
| 2009 | Toyota | Yaris | 1.5L I-4 | 28571 | JTDJT903695257366 |
| 2010 | Volkswagen | Beetle | 2.5L I-5 | 13308 | 3VWPW3AG3AM008163 |

FFV in Displacement Column Indicates Flexible-Fuel Vehicle

# APPENDIX E

# DETAILED FUEL INSPECTIONS, TEST FUEL DRUM INSPECTIONS, FLUSHING EFFICIENCY INSPECTIONS, AND ON-SITE VAPOR PRESSURE DETERMINATIONS

## Table E-1
## CRC 2010 Volatility Program Fuel Inspections

| Fuel Description | | | 1 | | | | | 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Property** | **Method** | **Units** | **116/150/0** | | | | | **116/200/0** | | | | |
| **Laboratory** | | | **A** | **B** | **C** | **D** | **Average** | **A** | **B** | **C** | **D** | **Average** |
| T V/L=20 | ASTM D5188 | °F | 115.3 | 114.8 | 115.6 | 115.3 | 115.3 | 115.0 | 115.1 | 116.9 | 114.5 | 115.4 |
| DVPE | ASTM D5191 | psi | 11.41 | 11.85 | 11.53 | 11.39 | 11.55 | 12.21 | 12.42 | 12.20 | 12.26 | 12.27 |
| Gravity | ASTM D4052 | °API | 63.3 | 63.2 | 62.9 | 63.3 | 63.2 | 60.9 | 61.0 | 60.3 | 61.0 | 60.8 |
| Relative Density | | 60/60°F | 0.7265 | 0.7266 | 0.7279 | 0.7263 | 0.7268 | 0.7353 | 0.7352 | 0.7377 | 0.7350 | 0.7358 |
| Ethanol | ASTM D4815 | wt % | 0 | <0.1 | - | | 0.0 | 0 | <0.1 | 0 | - | 0.00 |
| Ethanol | ASTM D4815 | vol % | 0 | 0 | 0 | 0.03 | 0.0 | 0.0 | 0 | 0 | 0.05 | 0.01 |
| FIA | ASTM D1319 | | | | | | | | | | | |
| Aromatics | | vol % | 17.6 | 24.4 | 24.1 | 20.9 | 21.7 | 30.8 | 35.4 | 32.9 | 30.9 | 32.5 |
| Olefins | | vol % | 1.3 | 2.0 | 2.8 | 1.9 | 2.0 | 2.1 | 2.1 | 2.4 | 1.9 | 2.1 |
| Saturates | | vol % | 81.1 | 73.5 | 73.1 | 77.17 | 76.2 | 67.1 | 62.5 | 64.7 | 67.15 | 65.4 |
| Distillation | ASTM D86 | | | | | | | | | | | |
| Initial Boiling Point | | °F | 87.1 | 81.3 | 88.4 | 84.2 | 85.3 | 79.9 | 72.4 | 77.9 | 74.1 | 76.1 |
| 5% Evaporated | | °F | 102.6 | 103.2 | 102.5 | 101.7 | 102.5 | 94.8 | 94.6 | 93.8 | 94.4 | 94.4 |
| 10% Evaporated | | °F | 108.5 | 108.9 | 109.2 | 108.2 | 108.7 | 104.5 | 105.4 | 105.1 | 105.4 | 105.1 |
| 20% Evaporated | | °F | 117.2 | 117.5 | 118.0 | 117.0 | 117.4 | 121.6 | 122.9 | 123.1 | 123.5 | 122.8 |
| 30% Evaporated | | °F | 125.2 | 126.3 | 126.5 | 125.9 | 126.0 | 142.5 | 145.2 | 144.4 | 145.2 | 144.3 |
| 40% Evaporated | | °F | 134.2 | 136.3 | 135.9 | 135.6 | 135.5 | 169.2 | 172.4 | 171.5 | 172.0 | 171.3 |
| 50% Evaporated | | °F | 146.1 | 149.4 | 148.6 | 148.7 | 148.2 | 198.1 | 201.4 | 200.2 | 200.9 | 200.2 |
| 60% Evaporated | | °F | 164.7 | 170.1 | 168.4 | 168.9 | 168.0 | 221.4 | 223.7 | 223.2 | 224.9 | 223.3 |
| 70% Evaporated | | °F | 202.8 | 208.9 | 205.5 | 205.4 | 205.7 | 238.5 | 240.4 | 240.3 | 240.8 | 240.0 |
| 80% Evaporated | | °F | 246.2 | 250.1 | 249.1 | 249.2 | 248.7 | 258.3 | 259.6 | 258.8 | 259.0 | 258.9 |
| 90% Evaporated | | °F | 287.2 | 289.9 | 287.1 | 285.5 | 287.4 | 295.7 | 297.5 | 296.5 | 294.3 | 296.0 |
| 95% Evaporated | | °F | 324.1 | 325.2 | 324.6 | 324.9 | 324.7 | 331.5 | 331.1 | 329.6 | 329.8 | 330.5 |
| End Point | | °F | 369.9 | 382.0 | 381.5 | 380.9 | 378.6 | 383.4 | 386.3 | 385.8 | 385.4 | 385.2 |
| Recovery | | vol % | 97.4 | 98.5 | 97 | 97.8 | 97.7 | 97.1 | 97.3 | 96.6 | 98.2 | 97.3 |
| Residue | | vol % | 1.0 | 1.0 | 1 | 0.8 | 1.0 | 0.9 | 1.0 | 1.1 | 0.8 | 1.0 |
| Loss | | vol % | 1.6 | 0.5 | 2 | 1.4 | 1.4 | 1.9 | 1.7 | 2.3 | 1.0 | 1.7 |
| Benzene | DHA | vol % | 0.44 | - | - | - | 0.44 | 0.61 | - | 0.62 | - | 0.62 |
| Ethanol | DHA | vol % | - | - | 0.00 | - | 0.00 | - | - | 0.00 | - | 0.00 |
| Hydrocarbon | DHA | vol % | - | - | 100.00 | - | 100.00 | - | - | 100.00 | - | 100.00 |
| Aromatics | DHA | vol % | - | - | 23.70 | - | 23.70 | - | - | 34.70 | - | 34.70 |
| Olefins | DHA | vol % | - | - | 1.70 | - | 1.70 | - | - | 1.72 | - | 1.72 |
| Saturates | DHA | vol % | - | - | 74.60 | - | 74.6 | - | - | 63.58 | - | 63.58 |

## Table E-1 Cont'd.
## CRC 2010 Volatility Program Fuel Inspections

| Fuel Description | | | 3 | | | | | 4 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Property | Method | Units | 124/150/0 | | | | | 124/200/0 | | | | |
| Laboratory | | | A | B | C | D | Average | A | B | C | D | Average |
| T V/L=20 | ASTM D5188 | °F | 122.1 | 121.8 | 122.2 | 122.9 | 122.3 | 123.4 | 123.2 | 125.2 | 122.7 | 123.63 |
| DVPE | ASTM D5191 | psi | 10.15 | 10.53 | 10.34 | 10.17 | 10.30 | 10.59 | 10.82 | 10.59 | 10.51 | 10.63 |
| Gravity | ASTM D4052 | °API | 61.9 | 61.89 | 61.8 | 61.8 | 61.8 | 60.7 | 60.7 | 60.3 | 60.7 | 60.6 |
| Relative Density | | 60/60°F | 0.7316 | 0.7317 | 0.7320 | 0.7319 | 0.7318 | 0.7362 | 0.7363 | 0.7377 | 0.7360 | 0.7366 |
| Ethanol | ASTM D4815 | wt % | - | <0.1 | 0 | - | 0.0 | - | <0.1 | 0 | - | 0.00 |
| Ethanol | ASTM D4815 | vol % | 0 | 0 | 0.0 | 0.2 | 0.1 | 0.0 | 0 | 0 | 0 | 0.00 |
| FIA | ASTM D1319 | | | | | | | | | | | |
| Aromatics | | vol % | 19.9 | 22.9 | 21.90 | 20.6 | 21.3 | 26.5 | 34.6 | 32 | 25.6 | 29.7 |
| Olefins | | vol % | 2.6 | 3.2 | 3.7 | 4.7 | 3.6 | 2.2 | 2.9 | 3.1 | 3.4 | 2.9 |
| Saturates | | vol % | 77.5 | 74.0 | 74.40 | 84.1 | 77.5 | 71.3 | 62.5 | 64.9 | 71 | 67.4 |
| Distillation | ASTM D86 | | | | | | | | | | | |
| Initial Boiling Point | | °F | 91.6 | 88.1 | 91.9 | 90.5 | 90.5 | 86.7 | 78.0 | 80.3 | 79.9 | 81.2 |
| 5% Evaporated | | °F | 109.8 | 109.2 | 108.7 | 107.9 | 108.9 | 103.1 | 102.2 | 101.6 | 100.8 | 101.9 |
| 10% Evaporated | | °F | 115.2 | 114.6 | 115.1 | 114.7 | 114.9 | 111.7 | 112.0 | 112.5 | 110.9 | 111.8 |
| 20% Evaporated | | °F | 122.0 | 122.5 | 122.8 | 122.8 | 122.5 | 126.0 | 126.7 | 127.8 | 125.8 | 126.6 |
| 30% Evaporated | | °F | 128.8 | 130.3 | 130.0 | 130.1 | 129.8 | 142.7 | 144.4 | 144.9 | 142.9 | 143.7 |
| 40% Evaporated | | °F | 136.9 | 139.3 | 138.4 | 139.1 | 138.4 | 166.3 | 168.5 | 168.4 | 166.0 | 167.3 |
| 50% Evaporated | | °F | 147.2 | 151.5 | 150.5 | 150.9 | 150.0 | 196.7 | 198.9 | 198.4 | 196.3 | 197.6 |
| 60% Evaporated | | °F | 170.4 | 173.1 | 171.8 | 172.4 | 171.9 | 224.1 | 225.7 | 225.7 | 225.0 | 225.1 |
| 70% Evaporated | | °F | 215,4 | 217.1 | 213.9 | 213.8 | 214.9 | 244.6 | 246.0 | 246.2 | 245.3 | 245.5 |
| 80% Evaporated | | °F | 261.7 | 264.4 | 263.6 | 263.7 | 263.4 | 267.3 | 268.4 | 267.5 | 267.3 | 267.6 |
| 90% Evaporated | | °F | 307.4 | 304.5 | 307.1 | 306.7 | 306.4 | 305.2 | 307.2 | 307.9 | 303.1 | 305.9 |
| 95% Evaporated | | °F | 338.4 | 342.1 | 339.9 | 335.0 | 338.9 | 341.2 | 340.8 | 339 | 338.9 | 340.0 |
| End Point | | °F | 388.8 | 394.6 | 393.1 | 401.2 | 394.4 | 390.9 | 396.7 | 391.4 | 392.6 | 392.9 |
| Recovery | | vol % | 98.0 | 98.2 | 97.4 | 97.8 | 97.9 | 97.3 | 97.8 | 97.6 | 98.1 | 97.7 |
| Residue | | vol % | 1.1 | 1.0 | 1 | 0.8 | 1.0 | 1.2 | 1.0 | 1 | 0.9 | 1.0 |
| Loss | | vol % | 0.9 | 0.8 | 1.6 | 1.4 | 1.2 | 1.5 | 1.2 | 1.4 | 1.0 | 1.3 |
| Benzene | DHA | vol % | 0.31 | - | 0.32 | - | 0.32 | 0.61 | - | 0.64 | - | 0.63 |
| Ethanol | DHA | vol % | - | - | 0.00 | - | 0.00 | - | - | 0.00 | - | 0.00 |
| Hydrocarbon | DHA | vol % | - | - | 100.00 | - | 100.00 | - | - | 100.00 | - | 100.00 |
| Aromatics | DHA | vol % | - | - | 22.11 | - | 22.11 | - | - | 34.06 | - | 34.06 |
| Olefins | DHA | vol % | - | - | 2.67 | - | 2.67 | - | - | 3.48 | - | 3.48 |
| Saturates | DHA | vol % | - | - | 75.22 | - | 75.2 | - | - | 62.46 | - | 62.46 |

## Table E-1 Cont'd.
## CRC 2010 Volatility Program Fuel Inspections

| Fuel Description | | | 5 | | | | | 6 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Property | Method | Units | 116/150/10 | | | | | 116/200/10 | | | | |
| Laboratory | | | A | B | C | D | Average | A | B | C | D | Average |
| T V/L=20 | ASTM D5188 | °F | 114.7 | 115.8 | 116.5 | 115.1 | 115.5 | 115.7 | 116.1 | 118.2 | 115.0 | 116.3 |
| DVPE | ASTM D5191 | psi | 11.43 | 11.66 | 11.44 | 11.30 | 11.46 | 11.70 | 11.97 | 11.56 | 11.74 | 11.74 |
| Gravity | ASTM D4052 | °API | 59.1 | 58.9 | 58.1 | 59.0 | 58.8 | 57.0 | 57.1 | 57.6 | 57.1 | 57.2 |
| Relative Density | | 60/60°F | 0.7426 | 0.7430 | 0.7463 | 0.7427 | 0.7436 | 0.7506 | 0.7503 | 0.7483 | 0.7501 | 0.7498 |
| Ethanol | ASTM D4815 | wt % | - | 10.8 | 10.8 | - | 10.8 | - | 10.57 | 10.7 | - | 10.64 |
| Ethanol | ASTM D4815 | vol % | 9.7 | 10.1 | 10.2 | 10.2 | 10.0 | 9.9 | 10.0 | 10.1 | 10.2 | 10.1 |
| FIA | ASTM D1319 | | | | | | | | | | | |
| Aromatics | | vol % | 19.60 | 27.9 | 26.2 | 23.0 | 24.2 | 26.4 | 31.7 | 28.2 | 27.9 | 28.6 |
| Olefins | | vol % | 2.25 | 2.3 | 2.8 | 2.0 | 2.3 | 1.9 | 2.4 | 2.8 | 2.3 | 2.3 |
| Saturates | | vol % | 68.50 | 60.0 | 60.8 | 64.8 | 63.5 | 61.1 | 55.7 | 58.89 | 59.56 | 58.8 |
| Distillation | ASTM D86 | | | | | | | | | | | |
| Initial Boiling Point | | °F | 91.2 | 82.8 | 92.1 | 85.8 | 86.6 | 88.0 | 80.1 | 83.2 | 82.3 | 83.4 |
| 5% Evaporated | | °F | 104.9 | 107.6 | 108.1 | 105.6 | 106.6 | 104.5 | 106.9 | 104.0 | 104.9 | 105.1 |
| 10% Evaporated | | °F | 112.1 | 115.1 | 115.6 | 113.4 | 114.1 | 114.3 | 117.7 | 116.0 | 115.5 | 115.9 |
| 20% Evaporated | | °F | 123.4 | 125.6 | 126.1 | 124.7 | 125.0 | 132.1 | 135.0 | 133.4 | 133.8 | 133.6 |
| 30% Evaporated | | °F | 133.3 | 135.1 | 135.1 | 134.1 | 134.4 | 147.4 | 149.3 | 147.9 | 149.2 | 148.5 |
| 40% Evaporated | | °F | 141.3 | 142.6 | 142.8 | 140.9 | 141.9 | 157.6 | 157.9 | 158.3 | 158.9 | 158.2 |
| 50% Evaporated | | °F | 148.1 | 148.9 | 150.7 | 149.4 | 149.3 | 197.8 | 200.3 | 198.3 | 196.5 | 198.2 |
| 60% Evaporated | | °F | 178.3 | 178.0 | 181.2 | 176.1 | 178.4 | 232.9 | 232.6 | 232.1 | 233.8 | 232.9 |
| 70% Evaporated | | °F | 221.5 | 224.1 | 223.6 | 219.5 | 222.2 | 248.4 | 249.1 | 249.6 | 249.2 | 249.1 |
| 80% Evaporated | | °F | 254.8 | 254.3 | 255.0 | 253.6 | 254.4 | 270.7 | 272.4 | 269.4 | 273.0 | 271.4 |
| 90% Evaporated | | °F | 295.5 | 289.0 | 295.1 | 294.4 | 293.5 | 315.1 | 315.3 | 313.3 | 315.8 | 314.9 |
| 95% Evaporated | | °F | 330.4 | 330.0 | 330.6 | 322.9 | 328.5 | 342.5 | 341.1 | 340.4 | 340.7 | 341.2 |
| End Point | | °F | 383.4 | 385.2 | 387.5 | 383.2 | 384.8 | 383.2 | 386.4 | 385 | 384.5 | 384.8 |
| Recovery | | vol % | 97.0 | 97.6 | 96.8 | 97.7 | 97.3 | 97.6 | 98.0 | 96.8 | 97.7 | 97.5 |
| Residue | | vol % | 1.2 | 1.0 | 1.1 | 0.9 | 1.1 | 1.0 | 1.0 | 1.1 | 1.0 | 1.0 |
| Loss | | vol % | 1.8 | 1.4 | 2.1 | 1.4 | 1.7 | 1.4 | 1.0 | 2.1 | 1.3 | 1.5 |
| Benzene | DHA | vol % | 0.51 | - | 0.51 | - | 0.51 | 0.34 | - | 0.27 | - | 0.31 |
| Ethanol | DHA | vol % | - | - | 10.50 | - | 10.50 | - | - | 10.36 | - | 10.36 |
| Hydrocarbon | DHA | vol % | - | - | 89.50 | - | 89.50 | - | - | 89.64 | - | 89.64 |
| Aromatics | DHA | vol % | - | - | 26.20 | - | 26.20 | - | - | 31.45 | - | 31.45 |
| Olefins | DHA | vol % | - | - | 1.90 | - | 1.90 | - | - | 1.98 | - | 1.98 |
| Saturates | DHA | vol % | - | - | 61.40 | - | 61.4 | - | - | 56.21 | - | 56.21 |

## Table E-1 Cont'd.
## CRC 2010 Volatility Program Fuel Inspections

| Fuel Description | | | 7 | | | | | 8 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Property | Method | Units | 124/150/10 | | | | | 124/200/10 | | | | |
| Laboratory | | | A | B | C | D | Average | A | B | C | D | Average |
| T V/L=20 | ASTM D5188 | °F | 123.4 | 124.1 | 124.5 | 123.7 | 123.9 | 122.1 | 123.3 | 124.6 | 123.4 | 123.4 |
| DVPE | ASTM D5191 | psi | 9.49 | 9.79 | 9.50 | 9.52 | 9.58 | 10.44 | 10.54 | 10.28 | 10.11 | 10.34 |
| Gravity | ASTM D4052 | °API | 57.7 | 57.8 | 57.5 | 57.7 | 57.7 | 57.7 | 57.6 | 57.4 | 57.4 | 57.5 |
| Relative Density | | 60/60°F | 0.7478 | 0.7475 | 0.7487 | 0.7478 | 0.7479 | 0.7480 | 0.7484 | 0.7491 | 0.7491 | 0.7486 |
| Ethanol | ASTM D4815 | wt % | - | 10.51 | 10.6 | - | 10.6 | - | 10.53 | 10.4 | - | 10.47 |
| Ethanol | ASTM D4815 | vol % | 9.6 | 9.9 | 10.0 | 9.97 | 9.9 | 9.8 | 9.9 | 9.8 | 9.8 | 9.84 |
| FIA | ASTM D1319 | | | | | | | | | | | |
| Aromatics | | vol % | 24.5 | 27.8 | 26.1 | 21.3 | 24.9 | 26.7 | 30.8 | 29.2 | 27.3 | 28.5 |
| Olefins | | vol % | 2.1 | 1.6 | 2.0 | 1.7 | 1.8 | 3.0 | 4.4 | 4.1 | 4.6 | 4.0 |
| Saturates | | vol % | 63.8 | 60.4 | 61.9 | 67.03 | 63.3 | 60.5 | 54.8 | 56.9 | 58.26 | 57.6 |
| Distillation | ASTM D86 | | | | | | | | | | | |
| Initial Boiling Point | | °F | 98.8 | 92.3 | 94.5 | 98 | 95.9 | 90.5 | 83.2 | 91.1 | 89.1 | 88.5 |
| 5% Evaporated | | °F | 116.6 | 117.6 | 115.1 | 116.8 | 116.5 | 109.0 | 114.3 | 112.2 | 111.8 | 111.8 |
| 10% Evaporated | | °F | 121.8 | 123.5 | 122.1 | 122.9 | 122.6 | 118.6 | 124.2 | 123.1 | 121.7 | 121.9 |
| 20% Evaporated | | °F | 130.3 | 130.9 | 129.8 | 130.5 | 130.4 | 134.4 | 138.2 | 137.3 | 137.3 | 136.8 |
| 30% Evaporated | | °F | 136.9 | 137.5 | 136.4 | 136.8 | 136.9 | 146.7 | 149.6 | 148.6 | 148.5 | 148.4 |
| 40% Evaporated | | °F | 142.2 | 143.2 | 142.5 | 142.2 | 142.5 | 155.2 | 156.4 | 158.6 | 156.1 | 156.6 |
| 50% Evaporated | | °F | 149.4 | 149.8 | 150.2 | 148.9 | 149.6 | 200.5 | 204.7 | 206.2 | 203.4 | 203.7 |
| 60% Evaporated | | °F | 185.9 | 184.4 | 182.7 | 182.9 | 184.0 | 232.0 | 234.7 | 234.6 | 233.3 | 233.7 |
| 70% Evaporated | | °F | 219.0 | 219.7 | 217.7 | 219.2 | 218.9 | 250.7 | 254.4 | 254.5 | 252.1 | 252.9 |
| 80% Evaporated | | °F | 247.5 | 247.5 | 246.8 | 245.4 | 246.8 | 280.2 | 282.5 | 281.5 | 281.1 | 281.3 |
| 90% Evaporated | | °F | 284.0 | 283.5 | 281.6 | 281.8 | 282.7 | 320.7 | 321.8 | 321.7 | 320.3 | 321.1 |
| 95% Evaporated | | °F | 325.4 | 321.0 | 320.8 | 320.7 | 322.0 | 349.5 | 352.3 | 351 | 346.7 | 349.9 |
| End Point | | °F | 367.3 | 374.2 | 374.3 | 379.8 | 373.9 | 397.9 | 406.1 | 405.1 | 413.9 | 405.8 |
| Recovery | | vol % | 98.3 | 98.4 | 96.9 | 97.8 | 97.9 | 97.2 | 98.0 | 96.5 | 97.5 | 97.3 |
| Residue | | vol % | 1.2 | 1.0 | 1 | 0.9 | 1.0 | 1.0 | 1.0 | 96.8 | 0.9 | 24.9 |
| Loss | | vol % | 0.5 | 0.6 | 2.1 | 1.3 | 1.1 | 1.8 | 1.0 | 1.1 | 1.6 | 1.4 |
| Benzene | DHA | vol % | 0.49 | - | 0.49 | - | 0.49 | 0.48 | - | 0.42 | - | 0.45 |
| Ethanol | DHA | vol % | - | - | 10.40 | - | 10.40 | - | - | 10.39 | - | 10.39 |
| Hydrocarbon | DHA | vol % | - | - | 89.60 | - | 89.60 | - | - | 89.61 | - | 89.61 |
| Aromatics | DHA | vol % | - | - | 29.40 | - | 29.40 | - | - | 29.42 | - | 29.42 |
| Olefins | DHA | vol % | - | - | 3.50 | - | 3.50 | - | - | 3.54 | - | 3.54 |
| Saturates | DHA | vol % | - | - | 56.70 | - | 56.7 | - | - | 56.65 | - | 56.65 |

## Table E-1 Cont'd.
## CRC 2010 Volatility Program Fuel Inspections

| Fuel Description | | | 9 | | | | | 10 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Property | Method | Units | 116/150/20 | | | | | 116/170/20 | | | | |
| Laboratory | | | A | B | C | D | Average | A | B | C | D | Average |
| T V/L=20 | ASTM D5188 | °F | 114.6 | 115.4 | 115.8 | 114.6 | 115.1 | 114.5 | 115.4 | 117.5 | 114.3 | 115.4 |
| DVPE | ASTM D5191 | psi | 11.40 | 11.62 | 11.30 | 11.38 | 11.43 | 12.30 | 12.36 | 12.15 | 12.22 | 12.26 |
| Gravity | ASTM D4052 | °API | 57.7 | 58.0 | 57.7 | 57.9 | 57.8 | 55.5 | 55.3 | 54.8 | 55.4 | 55.3 |
| Relative Density | | 60/60°F | 0.7479 | 0.7468 | 0.7479 | 0.7472 | 0.7474 | 0.7567 | 0.7574 | 0.7595 | 0.7572 | 0.7577 |
| Ethanol | ASTM D4815 | wt % | - | 21.42 | 21.9 | - | 21.7 | - | 21.75 | 21.5 | - | 21.63 |
| Ethanol | ASTM D4815 | vol % | 19.9 | 20.1 | 20.6 | 20.5 | 20.3 | 19.9 | 20.8 | 20.6 | 20.3 | 20.4 |
| FIA | ASTM D1319 | | | | | | | | | | | |
| Aromatics | | vol % | 15.1 | 21.6 | 19.8 | 18.1 | 18.6 | 21.2 | 29.0 | 23.5 | 25.7 | 24.9 |
| Olefins | | vol % | 2.3 | 2.1 | 3.2 | 2.7 | 2.6 | 2.0 | 2.0 | 4.6 | 1.7 | 2.6 |
| Saturates | | vol % | 62.7 | 55.2 | 56.4 | 58.7 | 58.3 | 56.9 | 48.1 | 51.3 | 52.3 | 52.2 |
| Distillation | ASTM D86 | | | | | | | | | | | |
| Initial Boiling Point | | °F | 91.2 | 86.0 | 87.2 | 88.6 | 88.3 | 86.5 | 78.7 | 85.6 | 80.9 | 82.9 |
| 5% Evaporated | | °F | 106.3 | 109.2 | 107.2 | 106.9 | 107.4 | 106.0 | 105.6 | 103.6 | 101.8 | 104.3 |
| 10% Evaporated | | °F | 113.4 | 116.3 | 115.2 | 114.4 | 114.8 | 118.0 | 119.5 | 118.7 | 116.3 | 118.1 |
| 20% Evaporated | | °F | 120.2 | 126.3 | 125.4 | 124.6 | 124.1 | 141.6 | 142.6 | 142.2 | 140.2 | 141.7 |
| 30% Evaporated | | °F | 132.8 | 135.2 | 135.4 | 133.9 | 134.3 | 157.1 | 157.9 | 157.7 | 156.7 | 157.4 |
| 40% Evaporated | | °F | 141.1 | 143.0 | 141.9 | 141.4 | 141.9 | 163.9 | 164.0 | 164.1 | 164.0 | 164.0 |
| 50% Evaporated | | °F | 147.7 | 150.8 | 149.6 | 149.4 | 149.4 | 166.8 | 167.6 | 168.1 | 167.1 | 167.4 |
| 60% Evaporated | | °F | 157.3 | 159.0 | 157.8 | 157.6 | 157.9 | 192.6 | 185.9 | 184.1 | 175.1 | 184.4 |
| 70% Evaporated | | °F | 165.6 | 165.8 | 165.2 | 164.7 | 165.3 | 248.0 | 248.5 | 248 | 248.5 | 248.3 |
| 80% Evaporated | | °F | 239.4 | 241.7 | 240.6 | 238.7 | 240.1 | 269.2 | 269.0 | 269.8 | 268.0 | 269.0 |
| 90% Evaporated | | °F | 283.1 | 286.6 | 283.7 | 281.9 | 283.8 | 317.5 | 315.9 | 316.6 | 312.8 | 315.7 |
| 95% Evaporated | | °F | 319.5 | 326.6 | 323.9 | 321.1 | 322.8 | 338.5 | 338.3 | 338.9 | 336.9 | 338.2 |
| End Point | | °F | 377.8 | 381.0 | 378.7 | 381.0 | 379.6 | 378.9 | 381.7 | 380.3 | 378.6 | 379.9 |
| Recovery | | vol % | 97.6 | 98.3 | 97.6 | 97.6 | 97.8 | 98.1 | 96.9 | 96.1 | 97.3 | 97.1 |
| Residue | | vol % | 0.9 | 1.0 | 1 | 0.9 | 1.0 | 1.0 | 1.1 | 1.1 | 0.9 | 1.0 |
| Loss | | vol % | 1.5 | 0.7 | 1.4 | 1.5 | 1.3 | 0.9 | 2.0 | 2.8 | 1.8 | 1.9 |
| Benzene | DHA | vol % | 0.32 | - | 0.25 | - | 0.29 | 0.31 | - | 0.22 | - | 0.27 |
| Ethanol | DHA | vol % | - | - | 20.89 | - | 20.89 | - | - | 21.36 | - | 21.36 |
| Hydrocarbon | DHA | vol % | - | - | 79.11 | - | 79.11 | - | - | 78.64 | - | 78.64 |
| Aromatics | DHA | vol % | - | - | 20.46 | - | 20.46 | - | - | 29.22 | - | 29.22 |
| Olefins | DHA | vol % | - | - | 1.78 | - | 1.78 | - | - | 1.47 | - | 1.47 |
| Saturates | DHA | vol % | - | - | 56.87 | - | 56.9 | - | - | 47.95 | - | 47.95 |

## Table E-1 Cont'd.
## CRC 2010 Volatility Program Fuel Inspections

| Fuel Description | | | 11 | | | | | 12 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Property | Method | Units | 124/150/20 | | | | | 124/170/20 | | | | |
| Laboratory | | | A | B | C | D | Average | A | B | C | D | Average |
| T V/L=20 | ASTM D5188 | °F | 123.1 | 124.1 | 124.0 | 123.4 | 123.7 | 123.5 | 123.4 | 125.6 | 121.9 | 123.6 |
| DVPE | ASTM D5191 | psi | 9.14 | 9.56 | 9.27 | 9.30 | 9.32 | 10.34 | 10.72 | 10.36 | 10.52 | 10.49 |
| Gravity | ASTM D4052 | °API | 56.1 | 56.2 | 56.0 | 56.1 | 56.1 | 58.7 | 58.7 | 58.3 | 58.7 | 58.6 |
| Relative Density | | 60/60°F | 0.7543 | 0.7540 | 0.7547 | 0.7542 | 0.7543 | 0.7440 | 0.7439 | 0.7455 | 0.7440 | 0.7443 |
| Ethanol | ASTM D4815 | wt % | - | 21.22 | 21.2 | - | 21.2 | - | 20.74 | 20.6 | - | 20.67 |
| Ethanol | ASTM D4815 | vol % | 20.5 | 20.2 | 20.2 | 20.2 | 20.2 | 20.1 | 19.4 | 19.3 | 19.1 | 19.5 |
| FIA | ASTM D1319 | | | | | | | | | | | |
| Aromatics | | vol % | 21.0 | 23.9 | 22.9 | 21.0 | 22.2 | 16.9 | 21.8 | 19.8 | 18.6 | 19.3 |
| Olefins | | vol % | 1.4 | 1.5 | 2.4 | 1.4 | 1.7 | 2.0 | 1.8 | 2.1 | 1.8 | 1.9 |
| Saturates | | vol % | 57.1 | 54.1 | 54.5 | 57.4 | 55.8 | 61.0 | 56.8 | 58.8 | 60.5 | 59.3 |
| Distillation | ASTM D86 | | | | | | | | | | | |
| Initial Boiling Point | | °F | 102.9 | 97.0 | 97 | 99.0 | 99.0 | 99.0 | 85.1 | 95.4 | 87.8 | 91.8 |
| 5% Evaporated | | °F | 118.0 | 117.3 | 117.3 | 115.8 | 117.1 | 117.0 | 119.2 | 115.9 | 113.2 | 116.3 |
| 10% Evaporated | | °F | 122.2 | 122.5 | 122.5 | 121.8 | 122.3 | 127.4 | 131.2 | 128.5 | 125.7 | 128.2 |
| 20% Evaporated | | °F | 129.2 | 129.1 | 128.7 | 128.3 | 128.8 | 144.9 | 147.5 | 146.0 | 145.1 | 145.9 |
| 30% Evaporated | | °F | 135.1 | 135.3 | 135.1 | 134.9 | 135.1 | 155.3 | 157.1 | 156.3 | 155.7 | 156.1 |
| 40% Evaporated | | °F | 142.0 | 142.2 | 142.0 | 141.4 | 141.9 | 160.9 | 161.5 | 161.5 | 160.8 | 161.2 |
| 50% Evaporated | | °F | 149.2 | 150.2 | 149.5 | 149.5 | 149.6 | 164.3 | 164.6 | 165.3 | 164.4 | 164.7 |
| 60% Evaporated | | °F | 157.6 | 158.6 | 158.1 | 158 | 158.1 | 171.3 | 178.4 | 175.3 | 170.4 | 173.9 |
| 70% Evaporated | | °F | 165.7 | 166.2 | 165.9 | 165.5 | 165.8 | 229.3 | 232.6 | 231.7 | 229.6 | 230.8 |
| 80% Evaporated | | °F | 237.7 | 237.8 | 238.4 | 235.4 | 237.3 | 245.5 | 249.7 | 248.5 | 246.3 | 247.5 |
| 90% Evaporated | | °F | 273.9 | 276.4 | 273.5 | 273.3 | 274.3 | 292.5 | 296.0 | 295.1 | 291.4 | 293.8 |
| 95% Evaporated | | °F | 315.3 | 316.5 | 315.2 | 306.7 | 313.4 | 328.3 | 332.2 | 331.3 | 327.0 | 329.7 |
| End Point | | °F | 359.6 | 371.5 | 372.5 | 372.5 | 369.0 | 375.3 | 378.1 | 376.7 | 373.8 | 376.0 |
| Recovery | | vol % | 98.4 | 98.0 | 98 | 98.0 | 98.1 | 97.1 | 97.9 | 96.3 | 97.0 | 97.1 |
| Residue | | vol % | 1.3 | 1.0 | 1 | 0.7 | 1.0 | 1.0 | 1.0 | 1.1 | 0.8 | 1.0 |
| Loss | | vol % | 0.3 | 1.0 | 1 | 1.3 | 0.9 | 1.9 | 1.1 | 2.6 | 2.2 | 2.0 |
| Benzene | DHA | vol % | 0.48 | - | 0.41 | - | 0.45 | 0.29 | - | 0.20 | - | 0.25 |
| Ethanol | DHA | vol % | - | - | 21.04 | - | 21.04 | - | - | 19.66 | - | 19.66 |
| Hydrocarbon | DHA | vol % | - | - | 78.96 | - | 78.96 | - | - | 80.34 | - | 80.34 |
| Aromatics | DHA | vol % | - | - | 22.37 | - | 22.37 | - | - | 22.22 | - | 22.22 |
| Olefins | DHA | vol % | - | - | 1.14 | - | 1.14 | - | - | 1.34 | - | 1.34 |
| Saturates | DHA | vol % | - | - | 55.45 | - | 55.5 | - | - | 56.78 | - | 56.78 |

# Table E-1 Cont'd.
# CRC 2010 Volatility Program Fuel Inspections

| Fuel Description | | | 13 | | | | |
|---|---|---|---|---|---|---|---|
| Property | Method | Units | 133/200/0 | | | | |
| Laboratory | | | A | B | C | D | Average |
| T V/L=20 | ASTM D5188 | °F | 133.4 | 130.8 | 135.0 | 132.9 | 133.0 |
| DVPE | ASTM D5191 | psi | 9.46 | 9.99 | 9.47 | 9.43 | 9.59 |
| Gravity | ASTM D4052 | °API | 61.67 | 61.73 | 61.4 | 61.8 | 61.7 |
| Relative Density | | 60/60°F | 0.7325 | 0.7323 | 0.7335 | 0.7320 | 0.7326 |
| Ethanol | ASTM D4815 | wt % | 0 | <0.1 | 0 | - | 0.0 |
| Ethanol | ASTM D4815 | vol % | 0 | 0 | 0 | 0 | 0 |
| FIA | ASTM D1319 | | | | | | |
| Aromatics | | vol % | 19.0 | 25.1 | 23.3 | 21.3 | 22.2 |
| Olefins | | vol % | 2.1 | 2.0 | 2.6 | 2.6 | 2.3 |
| Saturates | | vol % | 78.9 | 72.8 | 74.1 | 76.1 | 75.5 |
| Distillation | ASTM D86 | | | | | | |
| Initial Boiling Point | | °F | 93.4 | 82.6 | 384.4 | 83.8 | 161.1 |
| 5% Evaporated | | °F | 115.7 | 113.6 | 112.8 | 110.3 | 113.1 |
| 10% Evaporated | | °F | 126.7 | 126.8 | 126.5 | 123.1 | 125.8 |
| 20% Evaporated | | °F | 146.1 | 147.2 | 147.2 | 144.4 | 146.2 |
| 30% Evaporated | | °F | 165.9 | 168.1 | 167.6 | 165.3 | 166.7 |
| 40% Evaporated | | °F | 184.6 | 186.8 | 186.2 | 184.5 | 185.5 |
| 50% Evaporated | | °F | 200.1 | 202.2 | 201.8 | 200.6 | 201.2 |
| 60% Evaporated | | °F | 212.9 | 215.1 | 214.9 | 213.3 | 214.1 |
| 70% Evaporated | | °F | 225.0 | 227.4 | 227.4 | 226.1 | 226.5 |
| 80% Evaporated | | °F | 242.6 | 244.8 | 245.7 | 243.7 | 244.2 |
| 90% Evaporated | | °F | 285.6 | 287.2 | 286.9 | 283.4 | 285.8 |
| 95% Evaporated | | °F | 325.6 | 322.5 | 325.7 | 321.3 | 323.8 |
| End Point | | °F | 380.3 | 382.1 | 384.4 | 381.6 | 382.1 |
| Recovery | | vol % | 97.9 | 98.0 | 97.7 | 97.8 | 97.9 |
| Residue | | vol % | 0.9 | 1.0 | 1 | 0.9 | 1.0 |
| Loss | | vol % | 1.2 | 1.0 | 1.3 | 1.3 | 1.2 |
| Benzene | DHA | vol % | 0.45 | - | 0.46 | - | 0.46 |
| Ethanol | DHA | vol % | - | - | 0.00 | - | 0.00 |
| Hydrocarbon | DHA | vol % | - | - | 100.0 | - | 100.0 |
| Aromatics | DHA | vol % | - | - | 24.3 | - | 24.3 |
| Olefins | DHA | vol % | - | - | 1.7 | - | 1.7 |
| Saturates | DHA | vol % | - | - | 74.1 | - | 74.1 |

**Table E-2**
**Test Fuel Drum Inspections**

| Fuel | | 2 | 3 | 5 | 7 | 9 | 12 | 28 |
|---|---|---|---|---|---|---|---|---|
| Description: | Units | 116/200/0 | 124/150/0 | 116/150/10 | 124/150/10 | 116/150/20 | 124/170/20 | 109/150/15 |
| DVPE, D5191 | psi | 12.27 | 10.34 | 11.27 | 9.44 | 11.51 | 10.7 | 12.74 |
| FIA, D1319 | | | | | | | | |
| Aromatics | vol % | 33.1 | 23.3 | 28.1 | 30.7 | 26.4 | 24.8 | 14.2 |
| Olefins | vol % | 2.8 | 3 | 2.9 | 2.1 | 2.9 | 2.2 | 6.9 |
| Saturate | vol % | 64.1 | 73.7 | 69 | 67.2 | 70.7 | 73 | 78.9 |
| API Gravity, D4052 | API @ 60°F | 60.9 | 61.9 | 59 | 57.9 | 58.1 | 59.1 | 67.2 |
| Specific Gravity @ 60°F | | 0.7353 | 0.7316 | 0.7426 | 0.7472 | 0.7462 | 0.7423 | 0.7121 |
| Density, @ 15°C | g/liter | 735 | 731.3 | 742.2 | 746.9 | 745.8 | 742 | 711.9 |
| T V/L=20 | °F | 117 | 122.6 | 116.8 | 126.2 | 116.3 | 125.6 | 108.8 |
| Oxygenate, D5599 | | | | | | | | |
| Ethanol | wt % | <0.1 | 0.32 | 10.92 | 10.50 | 19.63 | 20.61 | 16.14 |
| Total $O_2$ | wt % | 0.02 | 0.11 | 3.79 | 3.65 | 6.81 | 7.15 | 5.6 |
| Distillation, D86 | | | | | | | | |
| Initial Boiling Pt | °F | 80.6 | 90.1 | 88 | 95.8 | 91.1 | 88.4 | 82.4 |
| Evaporation 5% | °F | 95.5 | 105.5 | 106.2 | 116.1 | 106.1 | 112.5 | 97.8 |
| Evaporation 10% | °F | 104.5 | 112.3 | 113.7 | 122.2 | 113.1 | 126.2 | 105 |
| Evaporation 15% | °F | 112.5 | 117 | 119.4 | 126.5 | 118.9 | 136.5 | 109.7 |
| Evaporation 20% | °F | 120.7 | 120.9 | 124.6 | 130.2 | 123.9 | 145 | 114.5 |
| Evaporation 30% | °F | 142.2 | 128.7 | 134.1 | 136.8 | 133.2 | 155.9 | 125.3 |
| Evaporation 40% | °F | 168.7 | 138.1 | 142.3 | 142.9 | 142.1 | 161.4 | 137.2 |
| Evaporation 50% | °F | 198.6 | 150.1 | 148 | 149.3 | 149.7 | 165 | 149.5 |
| Evaporation 60% | °F | 222.6 | 171.2 | 174.4 | 184.3 | 157.5 | 173.3 | 159.3 |
| Evaporation 70% | °F | 240 | 211.7 | 222.4 | 219.5 | 164.8 | 229.8 | 164.8 |
| Evaporation 80% | °F | 258.2 | 261.2 | 254.5 | 247.6 | 236.9 | 246.2 | 248.5 |
| Evaporation 90% | °F | 294.7 | 302.1 | 294.4 | 282 | 283.7 | 289.5 | 309.7 |
| Evaporation 95% | °F | 327.9 | 334.1 | 331 | 322.2 | 322.2 | 326.7 | 344.5 |
| Final Boiling Pt. | °F | 382.7 | 387.6 | 383 | 368.4 | 375.1 | 367.4 | 396.1 |
| Recovered | vol % | 97.5 | 97.3 | 97.8 | 98.3 | 97.6 | 97.2 | 97.8 |
| Residue | vol % | 0.8 | 0.8 | 0.9 | 1 | 0.7 | 1 | 0.8 |
| Loss | vol % | 1.7 | 1.9 | 1.3 | 0.7 | 1.7 | 1.8 | 1.4 |

**Table E-3**
**Assement of Flushing Procedure**

| Vehicle | 1 | 4 | 9 | 14 | 15 |
|---|---|---|---|---|---|
| Relative Density @ 60°F | 0.7482 | 0.7430 | 0.7448 | 0.7442 | 0.7437 |
| Ethanol, wt % | 0.252 | 0.274 | <0.1 | 0.316 | <0.1 |
| Ethanol, vol % | 0.238 | 0.256 | <0.1 | 0.296 | <0.1 |
| Total $O_2$, wt % | 0.09 | 0.1 | 0.02 | 0.11 | 0.03 |

| Vehicle | 16 | 18 | 19 | 21 | 25 |
|---|---|---|---|---|---|
| Relative Density @ 60°F | 0.7465 | 0.7462 | 0.7456 | 0.7483 | 0.7437 |
| Ethanol, wt % | 0.152 | 0.179 | 0.101 | <0.1 | <0.1 |
| Ethanol, vol % | 0.143 | 0.168 | 0.095 | <0.1 | <0.1 |
| Total $O_2$, wt % | 0.05 | 0.06 | 0.03 | 0.02 | 0.03 |

| Vehicle | 28 | 29 | 30 | 44 | 45 |
|---|---|---|---|---|---|
| Relative Density @ 60°F | 0.7425 | 0.7496 | 0.7459 | 0.7457 | 0.7487 |
| Ethanol, wt % | <0.1 | <0.1 | 0.188 | 0.419 | 0.125 |
| Ethanol, vol % | <0.1 | <0.1 | 0.176 | 0.394 | 0.118 |
| Total $O_2$, wt % | 0.02 | 0.02 | 0.07 | 0.15 | 0.04 |

| Vehicle | 48 | 50 | 51 | 55 | 56 |
|---|---|---|---|---|---|
| Relative Density @ 60°F | 0.7444 | 0.7451 | 0.7473 | 0.744 | 0.7454 |
| Ethanol, wt % | <0.1 | 0.104 | <0.1 | 0.362 | 0.339 |
| Ethanol, vol % | <0.1 | 0.098 | <0.1 | 0.339 | 0.319 |
| Total $O_2$, wt % | 0.02 | 0.04 | 0.03 | 0.13 | 0.12 |

**Table E-4**

**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| **Date / Time** | **GM / BP** | **Analysis** | **Analysis** | **Vehicle** | **Fuel** | **EOT** | **Initial** | **Loss** |
| 7/16/2010 | BP | 11:05 | 7/17/2010 | 25 | 5 | 10.23 | 11.4 | 1.2 |
| 7/16/2010 | GM | 11:07 | 7/17/2010 | 55 | 5 | 10.21 | 11.4 | 1.2 |
| 7/16/2010 | BP | 11:21 | 7/17/2010 | 19 | 5 | 9.89 | 11.4 | 1.5 |
| 7/16/2010 | GM | 11:22 | 7/17/2010 | 1 | 5 | 9.36 | 11.4 | 2.0 |
| 7/17/10 - 12:03 | GM | 12:33 | 7/17/2010 | 15 | 5 | 10.04 | 11.4 | 1.4 |
| 7/17/10 - 12:10 | BP | 12:41 | 7/17/2010 | 48 | 5 | 10.2 | 11.4 | 1.2 |
| 7/17/10 - 12:15 | GM | 12:46 | 7/17/2010 | 21 | 5 | 9.25 | 11.4 | 2.1 |
| 7/17/10 - 12:20 | BP | 12:53 | 7/17/2010 | 44 | 5 | 10.04 | 11.4 | 1.4 |
| 7/17/10 - 13:06 | GM | 13:37 | 7/17/2010 | 28 | 5 | 10.01 | 11.4 | 1.4 |
| 7/17/10 - 13:10 | BP | 13:40 | 7/17/2010 | 29 | 5 | 9.73 | 11.4 | 1.7 |
| 7/17/10 - 13:22 | GM | 13:53 | 7/17/2010 | 4 | 5 | 9.57 | 11.4 | 1.8 |
| 7/17/10 - 13:26 | BP | 13:56 | 7/17/2010 | 14 | 5 | 9.53 | 11.4 | 1.9 |
| 7/17/10 - 14:10 | GM | 14:39 | 7/17/2010 | 16 | 5 | 9.43 | 11.4 | 2.0 |
| 7/17/10 - 14:12 | BP | 14:43 | 7/17/2010 | 45 | 5 | 9.14 | 11.4 | 2.3 |
| 7/17/10 - 14:25 | GM | 14:58 | 7/17/2010 | 50 | 5 | 10.25 | 11.4 | 1.1 |
| 7/17/10 - 14:29 | BP | 15:00 | 7/17/2010 | 30 | 5 | 9.76 | 11.4 | 1.6 |
| 7/17/10 - 15:12 | GM | 15:42 | 7/17/2010 | 51 | 5 | 9.21 | 11.4 | 2.2 |
| 7/17/10 - 15:15 | BP | 15:45 | 7/17/2010 | 18 | 5 | 9.54 | 11.4 | 1.9 |
| 7/17/10 - 15:29 | GM | 15:59 | 7/17/2010 | 9 | 5 | 10.09 | 11.4 | 1.3 |
| 7/18/10 - 12:25 | BP | 13:10 | 7/18/2010 | 55 | 5 | 10.79 | 11.4 | 0.6 |
| 7/18/10 - 12:25 | GM | 13:11 | 7/18/2010 | 50 | 5 | 10.59 | 11.4 | 0.8 |
| 7/18/10 - 12:28 | BP | 13:22 | 7/18/2010 | 25 | 5 | 10.47 | 11.4 | 0.9 |
| 7/18/10 - 12:32 | GM | 13:24 | 7/18/2010 | 9 | 5 | 10.43 | 11.4 | 1.0 |
| 7/18/10 - 13:27 | BP | 14:01 | 7/18/2010 | 45 | 5 | 9.65 | 11.4 | 1.7 |
| 7/18/10 - 13:27 | GM | 14:02 | 7/18/2010 | 21 | 5 | 9.69 | 11.4 | 1.7 |
| 7/18/10 - 13:35 | BP | 14:13 | 7/18/2010 | 18 | 5 | 9.78 | 11.4 | 1.6 |
| 7/18/10 - 13:39 | GM | 14:15 | 7/18/2010 | 14 | 5 | 9.51 | 11.4 | 1.9 |
| 7/18/10 - 14:28 | GM | 10:38 | 7/19/2010 | 51 | 5 | 9.53 | 11.4 | 1.9 |
| 7/18/10 - 14:32 | BP | 10:40 | 7/19/2010 | 28 | 5 | 9.99 | 11.4 | 1.4 |
| 7/18/10 - 14:38 | GM | 10:51 | 7/19/2010 | 48 | 5 | 10.04 | 11.4 | 1.4 |
| 7/18/10 - 14:40 | BP | 10:54 | 7/19/2010 | 19 | 5 | 10.08 | 11.4 | 1.3 |
| 7/18/10 - 14:45 | GM | 11:05 | 7/19/2010 | 1 | 5 | 9.17 | 11.4 | 2.2 |
| 7/18/10 - 14:48 | BP | 11:06 | 7/19/2010 | 4 | 5 | 10.15 | 11.4 | 1.2 |
| 7/18/10 - ? | GM | 11:16 | 7/19/2010 | 30 | 5 | 9.95 | 11.4 | 1.4 |
| 7/18/10 - ? | BP | 11:22 | 7/19/2010 | 16 | 5 | 9.67 | 11.4 | 1.7 |

**Table E-4 Continued**
**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| Date / Time | GM / BP | Analysis | Analysis | Vehicle | Fuel | EOT | Initial | Loss |
| 7/19/10 - 13:08 | GM | 13.44 | 7/19/2010 | 44 | 5 | 9.66 | 11.4 | 1.7 |
| 7/19/10 - 13:12 | BP | 13:45 | 7/19/2010 | 29 | 5 | 9.49 | 11.4 | 1.9 |
| 7/19/10 - 13:21 | BP | 13:57 | 7/19/2010 | 15 | 5 | 9.94 | 11.4 | 1.5 |
| 7/19/10 - 14:09 | GM | 7:52 | 7/20/2010 | 50 | 2 | 10.30 | 12.2 | 1.9 |
| 7/19/10 - 14:25 | BP | 7:54 | 7/20/2010 | 25 | 2 | 10.49 | 12.2 | 1.7 |
| 7/19/10 - 15:00 | GM | 8:06 | 7/20/2010 | 9 | 2 | 10.08 | 12.2 | 2.1 |
| 7/19/10 - 15:05 | BP | 8:08 | 7/20/2010 | 55 | 2 | 10.59 | 12.2 | 1.6 |
| 7/19/10 - 15:14 | GM | 9:21 | 7/20/2010 | 45 | 2 | 9.63 | 12.2 | 2.6 |
| 7/19/10 - 15:18 | BP | 9:23 | 7/20/2010 | 21 | 2 | 9.69 | 12.2 | 2.5 |
| 7/19/10 - 15:22 | BP | 9:12 | 7/20/2010 | 18 | 2 | 10.17 | 12.2 | 2.1 |
| 7/19/10 - 15:29 | GM | 9:11 | 7/20/2010 | 14 | 2 | 10.70 | 12.2 | 1.5 |
| 7/22/10 - 12:32 | GM | 13:07 | 7/22/2010 | 51 | 2 | 9.63 | 12.2 | 2.6 |
| 7/22/10 - 12:37 | BP | 13:08 | 7/22/2010 | 48 | 5 | 10.20 | 11.4 | 1.2 |
| 7/22/10 - 12:46 | GM | 13:20 | 7/22/2010 | 28 | 2 | 10.50 | 12.2 | 1.7 |
| 7/22/10 - 12:52 | BP | 13:21 | 7/22/2010 | 1 | 2 | 9.94 | 12.2 | 2.3 |
| 7/22/10 - 13:34 | GM | 14:05 | 7/22/2010 | 29 | 2 | 9.21 | 12.2 | 3.0 |
| 7/22/10 - 13:49 | GM | 14:26 | 7/22/2010 | 15 | 2 | 10.11 | 12.2 | 2.1 |
| 7/22/10 - 13:55 | BP | 14.27 | 7/22/2010 | 44 | 2 | 10.34 | 12.2 | 1.9 |
| 7/22/10 - 14:13 | GM | 14:46 | 7/22/2010 | Drum 1 | 2 | 12.21 | 12.2 | 0.0 |
| 7/22/10 - 14:20 | BP | 14:50 | 7/22/2010 | Drum 2 | 2 | 12.28 | 12.2 | -0.1 |
| 7/22/10 - 14:40 | GM | 10:33 | 7/23/2010 | 30 | 2 | 9.98 | 12.2 | 2.2 |
| 7/22/10 - 14:44 | BP | 10:34 | 7/23/2010 | 19 | 2 | 10.05 | 12.2 | 2.2 |
| 7/22/10 - 14:56 | GM | 10:52 | 7/23/2010 | 4 | 2 | 10.81 | 12.2 | 1.4 |
| 7/22/10 - 15:00 | BP | 10:53 | 7/23/2010 | 16 | 2 | 9.99 | 12.2 | 2.2 |
| 7/26/10 - 13:06 | GM | 14:43 | 7/26/2010 | Drum 1 | 5 | 11.59 | 12.2 | 0.6 |
| 7/26/10 - 14:15 | BP | 14:44 | 7/26/2010 | Drum 3 | 2 | 12.23 | 12.2 | 0.0 |
| 7/26/10 - 14:27 | GM | 14:54 | 7/26/2010 | 9 | 2 | 10.50 | 12.2 | 1.7 |
| 7/26/10 - 14:27 | BP | 14:55 | 7/26/2010 | 45 | 2 | 9.63 | 12.2 | 2.6 |
| 7/26/10 - 14:42 | GM | 15:16 | 7/26/2010 | 18 | 2 | 9.83 | 12.2 | 2.4 |
| 7/26/10 - 14:42 | BP | 15:16 | 7/26/2010 | 14 | 2 | 10.34 | 12.2 | 1.9 |
| 7/26/10 - 15:12 | GM | 15:46 | 7/26/2010 | Drum 4 | 2 | 12.11 | 12.2 | 0.1 |
| 7/26/10 - 15:20 | BP | 15:51 | 7/26/2010 | 56 | 5 | 9.59 | 11.4 | 1.8 |
| 7/26/10 - 15:32 | GM | 16:03 | 7/26/2010 | 21 | 2 | 9.18 | 12.2 | 3.0 |

**Table E-4 Continued**

**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| Date / Time | GM / BP | Analysis | Analysis | Vehicle | Fuel | EOT | Initial | Loss |
| 7/26/10 - 15:42 | BP | 16:18 | 7/26/2010 | 50 | 2 | 10.43 | 12.2 | 1.8 |
| 7/26/10 - 15:45 | GM | 16:20 | 7/26/2010 | 25 | 2 | 9.76 | 12.2 | 2.5 |
| 7/26/10 - 16:17 | GM | 16:54 | 7/26/2010 | Drum 5 | 2 | 12.26 | 12.2 | 0.0 |
| 7/26/10 - 16:39 | BP | 17:09 | 7/26/2010 | 55 | 2 | 10.52 | 12.2 | 1.7 |
| 7/26/10 - 16:41 | GM | 17:12 | 7/26/2010 | 4 | 2 | 10.07 | 12.2 | 2.2 |
| 7/26/10 - 16:56 | BP | 17:52 | 7/26/2010 | 1 | 2 | 9.44 | 12.2 | 2.8 |
| 7/26/10 - 17:05 | GM | 17:52 | 7/26/2010 | 15 | 2 | 9.54 | 12.2 | 2.7 |
| 7/26/10 - 17:40 | BP | 18:23 | 7/26/2010 | 28 | 2 | 9.96 | 12.2 | 2.3 |
| 7/26/10 - 17:46 | GM | 18:24 | 7/26/2010 | 16 | 2 | 9.86 | 12.2 | 2.4 |
| 7/26/10 - 17:47 | BP | 18:30 | 7/26/2010 | 15 | 2 | 9.87 | 12.2 | 2.4 |
| 7/26/10 - 17:58 | GM | 18:40 | 7/26/2010 | 19 | 2 | 10.57 | 12.2 | 1.7 |
| 7/26/10 - 18:00 | BP | 18:41 | 7/26/2010 | 29 | 2 | 9.91 | 12.2 | 2.3 |
| 7/26/10 - 18:45 | GM | 9:17 | 7/27/2010 | 48 | 2 | 10.47 | 12.2 | 1.8 |
| 7/26/10 - 18:48 | BP | 9:18 | 7/27/2010 | 56 | 5 | 10.41 | 11.4 | 1.0 |
| 7/26/10 - 18:57 | GM | 9:46 | 7/27/2010 | 30 | 2 | 10.59 | 12.2 | 1.6 |
| 7/26/10 - 18:59 | BP | 9:47 | 7/27/2010 | 44 | 2 | 11.14 | 12.2 | 1.1 |
| 7/27/10 - 10:02 | GM | 10:52 | 7/27/2010 | Drum 6 | 2 | 12.40 | 12.2 | -0.2 |
| 7/27/10 - 10:02 | BP | 10:53 | 7/27/2010 | Drum 1 | 7 | 9.91 | 9.5 | -0.4 |
| 7/27/10 - 12:02 | GM | 12:35 | 7/27/2010 | Drum 2 | 7 | 9.65 | 9.5 | -0.1 |
| 7/27/10 - 12:10 | GM | 13:44 | 7/27/2010 | 51 | 2 | 9.57 | 12.2 | 2.7 |
| 7/27/10 - 12:33 | BP | 13:45 | 7/27/2010 | 48 | 2 | 10.46 | 12.2 | 1.8 |
| 7/27/10 - 13:02 | GM | 13:56 | 7/27/2010 | Drum 3 | 7 | 9.60 | 9.5 | -0.1 |
| 7/27/10 - 13:25 | BP | 13:57 | 7/27/2010 | 56 | 2 | 10.24 | 12.2 | 2.0 |
| 7/27/10 - 13:30 | GM | 14:13 | 7/27/2010 | 45 | 7 | 8.75 | 9.5 | 0.8 |
| 7/27/10 - 13:42 | BP | 14:14 | 7/27/2010 | 44 | 7 | 8.88 | 9.5 | 0.6 |
| 7/27/10 - 13:48 | GM | 14:27 | 7/27/2010 | Drum 4 | 7 | 9.51 | 9.5 | 0.0 |
| 7/27/10 - 13:48 | BP | 14:28 | 7/27/2010 | 30 | 7 | 8.79 | 9.5 | 0.7 |
| 7/27/10 - 14:23 | GM | 15:14 | 7/27/2010 | Drum 5 | 7 | 9.57 | 9.5 | -0.1 |
| 7/27/10 - 14:29 | BP | 15:15 | 7/27/2010 | 28 | 7 | 8.85 | 9.5 | 0.7 |
| 7/27/10 - 14:32 | GM | 15:27 | 7/27/2010 | 9 | 7 | 8.89 | 9.5 | 0.6 |
| 7/27/10 - 14:47 | BP | 15:28 | 7/27/2010 | 29 | 7 | 8.82 | 9.5 | 0.7 |
| 7/27/10 - 14:47 | GM | 15:48 | 7/27/2010 | 15 | 7 | 8.67 | 9.5 | 0.8 |
| 7/27/10 - 15:36 | GM | 16:10 | 7/27/2010 | 21 | 7 | 8.72 | 9.5 | 0.8 |
| 7/27/10 - 15:39 | BP | 16:11 | 7/27/2010 | 56 | 2 | 9.09 | 12.2 | 3.1 |
| 7/27/10 - 15:46 | GM | 16:24 | 7/27/2010 | 19 | 7 | 9.01 | 9.5 | 0.5 |

**Table E-4 Continued**

**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| **Date / Time** | **GM / BP** | **Analysis** | **Analysis** | **Vehicle** | **Fuel** | **EOT** | **Initial** | **Loss** |
| 7/27/10 - 15:49 | BP | 16:25 | 7/27/2010 | 16 | 7 | 9.11 | 9.5 | 0.4 |
| 7/27/10 - 16:36 | GM | 9:39 | 7/28/2010 | 1 | 7 | 8.82 | 9.5 | 0.7 |
| 7/27/10 - 16:41 | BP | 9:40 | 7/28/2010 | 4 | 7 | 9.33 | 9.5 | 0.2 |
| 7/27/10 - 16:45 | GM | 10:04 | 7/28/2010 | 50 | 7 | 9.41 | 9.5 | 0.1 |
| 7/27/10 - 16:50 | BP | 10:05 | 7/28/2010 | 25 | 7 | 9.34 | 9.5 | 0.2 |
| 7/28/10 - 10:36 | GM | 12:43 | 7/28/2010 | Drum 6 | 7 | 9.62 | 9.5 | -0.1 |
| 7/28/10 - 11:23 | BP | 12:44 | 7/28/2010 | Drum 7 | 7 | 9.72 | 9.5 | -0.2 |
| 7/28/10 - 12:20 | GM | 12:55 | 7/28/2010 | 14 | 7 | 9.67 | 9.5 | -0.2 |
| 7/28/10 - 12:25 | BP | 12:56 | 7/28/2010 | 18 | 7 | 9.15 | 9.5 | 0.4 |
| 7/28/10 - 12:28 | GM | 13:20 | 7/28/2010 | 55 | 7 | 9.47 | 9.5 | 0.0 |
| 7/28/10 - 12:38 | BP | 13:20 | 7/28/2010 | 56 | 7 | 9.33 | 9.5 | 0.2 |
| 7/28/10 - 13:18 | GM | 9:02 | 7/29/2010 | 51 | 7 | 9.20 | 9.5 | 0.3 |
| 7/28/10 - 13:22 | BP | 9:03 | 7/29/2010 | 48 | 7 | 9.33 | 9.5 | 0.2 |
| 7/28/10 - 13:31 | GM | 9:20 | 7/29/2010 | 4 | 7 | 9.51 | 9.5 | 0.0 |
| 7/28/10 - 13:35 | BP | 9:21 | 7/29/2010 | 1 | 7 | 9.30 | 9.5 | 0.2 |
| 7/29/10 - 9:56 | GM | 11:39 | 7/29/2010 | Drum 8 | 7 | 9.69 | 9.5 | -0.2 |
| 7/29/10 - 10:40 | BP | 11:40 | 7/29/2010 | Drum 9 | 7 | 9.67 | 9.5 | -0.2 |
| 7/29/10 - 11:01 | GM | 11:58 | 7/29/2010 | Drum 10 | 7 | 9.65 | 9.5 | -0.1 |
| 7/29/10 - 12:02 | GM | 12:47 | 7/29/2010 | 15 | 7 | 9.25 | 9.5 | 0.3 |
| 7/29/10 - 12:04 | BP | 12:48 | 7/29/2010 | 25 | 7 | 9.40 | 9.5 | 0.1 |
| 7/29/10 - 12:17 | GM | 13:14 | 7/29/2010 | 16 | 7 | 9.28 | 9.5 | 0.2 |
| 7/29/10 - 12:17 | BP | 13:15 | 7/29/2010 | 9 | 7 | 9.38 | 9.5 | 0.1 |
| 7/29/10 - 13:09 | GM | 13:42 | 7/29/2010 | 19 | 7 | 9.12 | 9.5 | 0.4 |
| 7/29/10 - 13:09 | BP | 13:43 | 7/29/2010 | Drum 11 | 7 | 9.65 | 9.5 | -0.1 |
| 7/29/10 - 13:11 | GM | 14:02 | 7/29/2010 | 28 | 7 | 9.15 | 9.5 | 0.4 |
| 7/29/10 - 13:11 | BP | 14:05 | 7/29/2010 | Drum 12 | 7 | 9.66 | 9.5 | -0.2 |
| 7/29/10 - 13:20 | GM | 14:15 | 7/29/2010 | 29 | 7 | 9.17 | 9.5 | 0.3 |
| 7/29/10 - 13:24 | BP | 14:16 | 7/29/2010 | 14 | 7 | 9.15 | 9.5 | 0.4 |
| 7/29/10 - 14:04 | GM | 14:37 | 7/29/2010 | Drum 2 | 3 | 10.53 | 10.2 | -0.3 |
| 7/29/10 - 14:19 | GM | 14:53 | 7/29/2010 | 21 | 7 | 9.02 | 9.5 | 0.5 |
| 7/29/10 - 14:19 | BP | 14:54 | 7/29/2010 | 48 | 7 | 9.09 | 9.5 | 0.4 |
| 7/29/10 - 14:35 | GM | 15:07 | 7/29/2010 | 30 | 7 | 9.05 | 9.5 | 0.5 |
| 7/29/10 - 14.35 | BP | 15:08 | 7/29/2010 | 18 | 7 | 8.95 | 9.5 | 0.6 |
| 7/29/10 - 15:00 | GM | 15:30 | 7/29/2010 | Drum 1 | 3 | 10.44 | 10.2 | -0.2 |
| 7/29/10 - 15:20 | GM | 16:03 | 7/29/2010 | Drum 4 | 3 | 10.40 | 10.2 | -0.2 |

**Table E-4 Continued**

**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| Date / Time | GM / BP | Analysis | Analysis | Vehicle | Fuel | EOT | Initial | Loss |
| 7/29/10 - 15:24 | BP | 16:03 | 7/29/2010 | 51 | 7 | 8.59 | 9.5 | 0.9 |
| 7/29/10 - 15:24 | GM | 16:14 | 7/29/2010 | 56 | 7 | 8.86 | 9.5 | 0.6 |
| 7/29/10 - 15:39 | BP | 16:15 | 7/29/2010 | 44 | 7 | 9.12 | 9.5 | 0.4 |
| 7/29/10 - 15:39 | GM | 16:29 | 7/29/2010 | 45 | 7 | 9.12 | 9.5 | 0.4 |
| 7/29/10 - 16:23 | GM | 16:57 | 7/29/2010 | 55 | 7 | 9.12 | 9.5 | 0.4 |
| 7/29/10 - 16:26 | BP | 16:58 | 7/29/2010 | 50 | 7 | 9.14 | 9.5 | 0.4 |
| 7/29/10 - 16:42 | GM | 17:30 | 7/29/2010 | 14 | 3 | 9.73 | 10.2 | 0.5 |
| 7/29/10 - 16:43 | BP | 17:30 | 7/29/2010 | 29 | 3 | 9.69 | 10.2 | 0.5 |
| 7/29/10 - 17:28 | GM | 10:04 | 7/30/2010 | 21 | 3 | 9.86 | 10.2 | 0.4 |
| 7/29/10 - 17:28 | BP | 10:05 | 7/30/2010 | 30 | 3 | 9.46 | 10.2 | 0.8 |
| 7/29/10 - 17:37 | GM | 10:53 | 7/30/2010 | 48 | 3 | 9.82 | 10.2 | 0.4 |
| 7/29/10 - 17:41 | BP | 10:54 | 7/30/2010 | 18 | 3 | 9.89 | 10.2 | 0.3 |
| 7/30/10 - 11:46 | GM | 10:01 | 8/2/2010 | 3 | 3 | 10.36 | 10.2 | -0.1 |
| 7/30/10 - 13:28 | BP | 10:02 | 8/2/2010 | 51 | 3 | 9.36 | 10.2 | 0.9 |
| 7/30/10 - 13:33 | GM | 10:19 | 8/2/2010 | 45 | 3 | 9.57 | 10.2 | 0.7 |
| 7/30/10 - 13:41 | BP | 10:19 | 8/2/2010 | 56 | 3 | 10.5 | 10.2 | -0.3 |
| 7/30/10 - 13:41 | GM | 10:45 | 8/2/2010 | 44 | 3 | 10.01 | 10.2 | 0.2 |
| 8/02/10 - 11:07 | GM | 12:30 | 8/2/2010 | Drum 5 | 3 | 10.4 | 10.2 | -0.2 |
| 8/02/10 - 11:07 | BP | 12:32 | 8/2/2010 | Drum 6 | 3 | 10.37 | 10.2 | -0.1 |
| 8/02/10 - 12:28 | GM | 13:03 | 8/2/2010 | Drum 8 | 3 | 10.4 | 10.2 | -0.2 |
| 8/02/10 - 12:31 | BP | 13:04 | 8/2/2010 | 55 | 3 | 10.07 | 10.2 | 0.2 |
| 8/02/10 - 12:31 | GM | 13:15 | 8/2/2010 | 50 | 3 | 9.65 | 10.2 | 0.6 |
| 8/02/10 - 12:34 | BP | 13:16 | 8/2/2010 | 19 | 3 | 9.82 | 10.2 | 0.4 |
| 8/02/10 - 12:35 | GM | 13:30 | 8/2/2010 | 28 | 3 | 9.56 | 10.2 | 0.7 |
| 8/02/10 - 13:14 | BP | 13:53 | 8/2/2010 | Drum 7 | 3 | 10.4 | 10.2 | -0.2 |
| 8/02/10 - 13:27 | GM | 13:57 | 8/2/2010 | 16 | 3 | 9.66 | 10.2 | 0.6 |
| 8/02/10 - 13:27 | BP | 14:06 | 8/2/2010 | 4 | 3 | 9.82 | 10.2 | 0.4 |
| 8/02/10 - 13:35 | GM | 14:09 | 8/2/2010 | 9 | 3 | 9.88 | 10.2 | 0.3 |
| 8/02/10 - 13:38 | BP | 14:16 | 8/2/2010 | 25 | 3 | 9.76 | 10.2 | 0.5 |
| 8/02/10 - 14:34 | GM | 10:07 | 8/3/2010 | 1 | 3 | 9.83 | 10.2 | 0.4 |
| 8/02/10 - 14:37 | BP | 10:07 | 8/3/2010 | 15 | 3 | 9.56 | 10.2 | 0.7 |
| 8/02/10 - 14:39 | GM | 10:25 | 8/3/2010 | 14 | 3 | 9.83 | 10.2 | 0.4 |
| 8/02/10 - 14:41 | BP | 10:26 | 8/3/2010 | 21 | 3 | 9.5 | 10.2 | 0.7 |
| 8/03/10 - 12:04 | GM | 13:00 | 8/3/2010 | Drum 9 | 3 | 10.41 | 10.2 | -0.2 |
| 8/03/10 - 12:04 | BP | 13:00 | 8/3/2010 | Drum 10 | 3 | 10.41 | 10.2 | -0.2 |

**Table E-4 Continued**

**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| Date / Time | GM / BP | Analysis | Analysis | Vehicle | Fuel | EOT | Initial | Loss |
| 8/03/10 - 13:18 | GM | 14:10 | 8/3/2010 | 18 | 3 | 9.6 | 10.2 | 0.6 |
| 8/03/10 - 13:20 | BP | 14:11 | 8/3/2010 | 29 | 3 | 9.73 | 10.2 | 0.5 |
| 8/03/10 - 13:40 | GM | 14:31 | 8/3/2010 | Drum 12 | 3 | 10.37 | 10.2 | -0.1 |
| 8/03/10 - 13:40 | BP | 14:32 | 8/3/2010 | 30 | 3 | 9.78 | 10.2 | 0.4 |
| 8/03/10 - 13:40 | GM | 14:47 | 8/3/2010 | 19 | 3 | 9.3 | 10.2 | 0.9 |
| 8/03/10 - 14:10 | BP | 14:48 | 8/3/2010 | Drum 11 | 3 | 10.36 | 10.2 | -0.1 |
| 8/03/10 - 14:23 | GM | 15:04 | 8/3/2010 | 15 | 3 | 9.65 | 10.2 | 0.6 |
| 8/03/10 - 14:26 | BP | 15:04 | 8/3/2010 | 1 | 3 | 9.57 | 10.2 | 0.7 |
| 8/03/10 - 14:36 | GM | 15:14 | 8/3/2010 | 28 | 3 | 9.8 | 10.2 | 0.4 |
| 8/03/10 - 14:36 | BP | 15:15 | 8/3/2010 | 4 | 3 | 9.66 | 10.2 | 0.6 |
| 8/03/10 - 15:25 | GM | 16:14 | 8/3/2010 | 45 | 3 | 9.67 | 10.2 | 0.6 |
| 8/03/10 - 15:27 | BP | 16:14 | 8/3/2010 | 25 | 3 | 9.85 | 10.2 | 0.4 |
| 8/03/10 - 15:38 | GM | 16:24 | 8/3/2010 | 16 | 3 | 9.65 | 10.2 | 0.6 |
| 8/03/10 - 15:39 | BP | 16:25 | 8/3/2010 | 9 | 3 | 10.01 | 10.2 | 0.2 |
| 8/03/10 - 16:27 | GM | 10:20 | 8/6/2010 | 48 | 3 | 9.49 | 10.2 | 0.7 |
| 8/03/10 - 16:27 | BP | 10:20 | 8/6/2010 | 51 | 3 | 9.43 | 10.2 | 0.8 |
| 8/03/10 - 16:38 | GM | 10:48 | 8/6/2010 | 50 | 3 | 10.07 | 10.2 | 0.2 |
| 8/03/10 - 16:38 | BP | 10:49 | 8/6/2010 | 44 | 3 | 10.08 | 10.2 | 0.1 |
| 8/06/10 - 12:00 | GM | 12:55 | 8/7/2010 | Drum 1 | 28 | 13.1 | 13.0 | -0.1 |
| 8/07/10 - 11:24 | BP | 12:55 | 8/7/2010 | Drum 2 | 28 | 13.04 | 13.0 | 0.0 |
| 8/07/10 - 12:02 | GM | 13:06 | 8/7/2010 | Drum 3 | 28 | 13.02 | 13.0 | 0.0 |
| 8/07/10 - 12:53 | GM | 13:52 | 8/7/2010 | 56 | 3 | 9.66 | 10.2 | 0.6 |
| 8/07/10 - 12:57 | BP | 13:53 | 8/7/2010 | 55 | 3 | 9.94 | 10.2 | 0.3 |
| 8/07/10 - 13:04 | GM | 14:03 | 8/7/2010 | 50 | 28 | 11.33 | 13.0 | 1.7 |
| 8/07/10 - 13:07 | BP | 14:05 | 8/7/2010 | 51 | 28 | 10.44 | 13.0 | 2.5 |
| 8/07/10 - 13:31 | GM | 12:34 | 8/7/2010 | Drum 6 | 28 | 13 | 13.0 | 0.0 |
| 8/07/10 - 13:57 | BP | 14:35 | 8/7/2010 | 16 | 28 | 10.83 | 13.0 | 2.2 |
| 8/07/10 - 14:02 | GM | 14:45 | 8/7/2010 | 25 | 28 | 11:05 | 13.0 | 12.5 |
| 8/07/10 - 14:09 | BP | 14:46 | 8/7/2010 | 44 | 28 | 11.31 | 13.0 | 1.7 |
| 8/07/10 - 14:12 | GM | 15:12 | 8/7/2010 | 48 | 28 | 10.88 | 13.0 | 2.1 |
| 8/07/10 - 14:12 | BP | 15:13 | 8/7/2010 | Drum 4 | 28 | 13 | 13.0 | 0.0 |
| 8/07/10 - 14:59 | GM | 15:32 | 8/7/2010 | Drum 7 | 28 | 12.97 | 13.0 | 0.0 |
| 8/07/10 - 15:03 | BP | 15:53 | 8/7/2010 | 4 | 28 | 11.14 | 13.0 | 1.8 |
| 8/07/10 - 15:13 | GM | 16:04 | 8/7/2010 | 9 | 28 | 11.17 | 13.0 | 1.8 |
| 8/07/10 - 15:16 | BP | 16:07 | 8/7/2010 | 28 | 28 | 10.94 | 13.0 | 2.0 |

**Table E-4 Continued**
**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| Date / Time | GM / BP | Analysis | Analysis | Vehicle | Fuel | EOT | Initial | Loss |
| 8/07/10 - 15:19 | GM | 16:22 | 8/7/2010 | 45 | 28 | 10.2 | 13.0 | 2.8 |
| 8/07/10 - 16:10 | GM | 16:41 | 8/7/2010 | 19 | 28 | 10.73 | 13.0 | 2.3 |
| 8/07/10 - 16:10 | BP | 16:41 | 8/7/2010 | 15 | 28 | 10.72 | 13.0 | 2.3 |
| 8/07/10 - 16.19 | GM | 10:26 | 8/8/2010 | 56 | 28 | 10.17 | 13.0 | 2.8 |
| 8/07/10 - 16:21 | BP | 10:26 | 8/8/2010 | 55 | 28 | 11.43 | 13.0 | 1.6 |
| 8/08/10 - 14:29 | GM | 11:08 | 8/11/2010 | 1 | 28 | 10.57 | 13.0 | 2.4 |
| 8/08/10 - 14:51 | BP | 11:08 | 8/11/2010 | 18 | 28 | 11.01 | 13.0 | 2.0 |
| 8/08/10 - 15:02 | GM | 12:32 | 8/11/2010 | 29 | 28 | 10.81 | 13.0 | 2.2 |
| 8/08/10 - 15:02 | BP | 12:32 | 8/11/2010 | 30 | 28 | 11.07 | 13.0 | 1.9 |
| 8/11/10 - 11:37 | GM | 13:09 | 8/11/2010 | Drum 8 | 28 | 13.01 | 13.0 | 0.0 |
| 8/11/10 - 12:41 | BP | 13:12 | 8/11/2010 | Drum 5 | 28 | 13 | 13.0 | 0.0 |
| 8/11/10 - 13:20 | GM | 14:25 | 8/11/2010 | 4 | 28 | 11.24 | 13.0 | 1.7 |
| 8/11/10 - 13:20 | BP | 14:25 | 8/11/2010 | 9 | 28 | 11.53 | 13.0 | 1.5 |
| 8/11/10 - 14:13 | GM | 14:49 | 8/11/2010 | 1 | 28 | 10.69 | 13.0 | 2.3 |
| 8/11/10 - 14:13 | BP | 14:50 | 8/11/2010 | 16 | 28 | 10.75 | 13.0 | 2.2 |
| 8/11/10 - 14:23 | GM | 14:54 | 8/11/2010 | 18 | 28 | 10.73 | 13.0 | 2.3 |
| 8/11/10 - 14:25 | BP | 14:59 | 8/11/2010 | 15 | 28 | 10.89 | 13.0 | 2.1 |
| 8/11/10 - 14:49 | GM | 15:28 | 8/11/2010 | 21 | 28 | 10.88 | 13.0 | 2.1 |
| 8/11/10 - 14:49 | BP | 15:28 | 8/11/2010 | 14 | 28 | 11.34 | 13.0 | 1.6 |
| 8/11/10 - 15:17 | GM | 16:08 | 8/11/2010 | 25 | 28 | 11.05 | 13.0 | 1.9 |
| 8/11/10 - 15:20 | BP | 16:08 | 8/11/2010 | 19 | 28 | 10.76 | 13.0 | 2.2 |
| 8/11/10 - 15:26 | GM | 16:26 | 8/11/2010 | 28 | 28 | 10.98 | 13.0 | 2.0 |
| 8/11/10 - 15;29 | BP | 16:27 | 8/11/2010 | 29 | 28 | 10.34 | 13.0 | 2.6 |
| 8/11/10 - 16:09 | GM | 17:00 | 8/11/2010 | Drum 1 | 9 | 11.66 | 11.4 | -0.3 |
| 8/11/10 - 16:24 | BP | 17:00 | 8/11/2010 | 21 | 28 | 10.6 | 13.0 | 2.4 |
| 8/11/10 - 16:24 | GM | 10:55 | 8/12/2010 | 30 | 28 | 10.99 | 13.0 | 2.0 |
| 8/11/10 - 16:32 | BP | 10:55 | 8/12/2010 | 44 | 28 | 11.31 | 13.0 | 1.7 |
| 8/11/10 - 16:35 | GM | 11:10 | 8/12/2010 | 14 | 28 | 11.01 | 13.0 | 2.0 |
| 8/11/10 - 17:21 | BP | 11:10 | 8/12/2010 | 48 | 28 | 11.15 | 13.0 | 1.8 |
| 8/11/10 - 17:27 | GM | 11:25 | 8/12/2010 | 45 | 28 | 10.56 | 13.0 | 2.4 |
| 8/11/10 - 17:33 | BP | 11:25 | 8/12/2010 | 51 | 28 | 10.75 | 13.0 | 2.2 |
| 8/11/10 - 17:36 | GM | 11:43 | 8/12/2010 | 50 | 28 | 11.4 | 13.0 | 1.6 |
| 8/12/10 - 11:15 | BP | 11:45 | 8/12/2010 | Drum 2 | 9 | 11.53 | 11.4 | -0.2 |
| 8/12/10 - 11:46 | GM | 12:32 | 8/12/2010 | Drum 4 | 9 | 11.63 | 11.4 | -0.3 |
| 8/12/10 - 12:44 | GM | 13:43 | 8/12/2010 | 55 | 28 | 11.37 | 13.0 | 1.6 |

**Table E-4 Continued**

**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| **Date / Time** | **GM / BP** | **Analysis** | **Analysis** | **Vehicle** | **Fuel** | **EOT** | **Initial** | **Loss** |
| 8/12/10 - 12:47 | BP | 13:43 | 8/12/2010 | 56 | 28 | 10.65 | 13.0 | 2.3 |
| 8/12/10 - 12:56 | GM | 14:11 | 8/12/2010 | 29 | 9 | 9.63 | 11.4 | 1.7 |
| 8/12/10 - 12:56 | BP | 14:11 | 8/12/2010 | Drum 3 | 9 | 11.7 | 11.4 | -0.3 |
| 8/12/10 - 12:57 | GM | 14:24 | 8/12/2010 | 28 | 9 | 10.28 | 11.4 | 1.1 |
| 8/12/10 - 13:48 | BP | 14:24 | 8/12/2010 | 51 | 9 | 9.8 | 11.4 | 1.6 |
| 8/12/10 - 13:51 | GM | 14:57 | 8/12/2010 | 45 | 9 | 10.07 | 11.4 | 1.3 |
| 8/12/10 - 14:22 | BP | 14:57 | 8/12/2010 | 50 | 9 | 10.04 | 11.4 | 1.3 |
| 8/12/10 - 14:22 | GM | 11:02 | 8/13/2010 | 14 | 9 | 10.18 | 11.4 | 1.2 |
| 8/12/10 - 14:33 | BP | 11:02 | 8/13/2010 | Drum 5 | 9 | 11.75 | 11.4 | -0.4 |
| 8/12/10 - 14:41 | GM | 11:17 | 8/13/2010 | Drum 6 | 9 | 11.65 | 11.4 | -0.3 |
| 8/12/10 - 14:54 | BP | 11:17 | 8/13/2010 | 44 | 9 | 10.63 | 11.4 | 0.7 |
| 8/12/10 - 14:54 | GM | 11:34 | 8/13/2010 | 48 | 9 | 10.33 | 11.4 | 1.0 |
| 8/12/10 - 15:03 | BP | 11:34 | 8/13/2010 | 30 | 9 | 10.53 | 11.4 | 0.8 |
| 8/12/10 - 15:06 | GM | 11:47 | 8/13/2010 | 21 | 9 | 9.96 | 11.4 | 1.4 |
| 8/13/10 - 14:36 | GM | 15:17 | 8/13/2010 | Drum 7 | 9 | 11.49 | 11.4 | -0.1 |
| 8/13/10 - 14:36 | BP | 15:17 | 8/13/2010 | Drum 8 | 9 | 11.68 | 11.4 | -0.3 |
| 8/13/10 - 14:38 | GM | 15:31 | 8/13/2010 | 16 | 9 | 10.49 | 11.4 | 0.9 |
| 8/13/10 - 14:38 | BP | 15:31 | 8/13/2010 | 18 | 9 | 10.4 | 11.4 | 1.0 |
| 8/13/10 - 14:48 | GM | 15:46 | 8/13/2010 | 19 | 9 | 10.78 | 11.4 | 0.6 |
| 8/13/10 - 14:50 | BP | 15.47 | 8/13/2010 | 1 | 9 | 9.99 | 11.4 | 1.4 |
| 8/13/10 - 15:41 | GM | 16:25 | 8/13/2010 | 25 | 9 | 10.62 | 11.4 | 0.7 |
| 8/13/10 - 15:44 | BP | 16:25 | 8/13/2010 | 15 | 9 | 10.6 | 11.4 | 0.8 |
| 8/13/10 - 15:51 | GM | 16:38 | 8/13/2010 | 55 | 9 | 10.85 | 11.4 | 0.5 |
| 8/13/10 - 15:54 | BP | 16:39 | 8/13/2010 | 56 | 9 | 9.96 | 11.4 | 1.4 |
| 8/13/10 - 16:20 | GM | 16:50 | 8/13/2010 | Drum 10 | 9 | 11.65 | 11.4 | -0.3 |
| 8/13/10 - 16:47 | GM | 17:25 | 8/13/2010 | 4 | 9 | 10.78 | 11.4 | 0.6 |
| 8/13/10 - 16:47 | BP | 17:25 | 8/13/2010 | 9 | 9 | 10.92 | 11.4 | 0.4 |
| 8/13/10 - 17:00 | GM | 17:40 | 8/13/2010 | 14 | 9 | 10.25 | 11.4 | 1.1 |
| 8/13/10 - 17:00 | BP | 17:40 | 8/13/2010 | 21 | 9 | 10.3 | 11.4 | 1.1 |
| 8/13/10 - 17:44 | GM | 11:10 | 8/18/2010 | 29 | 9 | 10.85 | 11.4 | 0.5 |
| 8/13/10 - 17:47 | BP | 11:10 | 8/18/2010 | 28 | 9 | 11.01 | 11.4 | 0.4 |
| 8/13/10 - 17:56 | GM | 11:21 | 8/18/2010 | 16 | 9 | 11.05 | 11.4 | 0.3 |
| 8/13/10 - 17:59 | BP | 11:21 | 8/18/2010 | 18 | 9 | 10.94 | 11.4 | 0.4 |
| 8/18/10 - 10:57 | GM | 11:36 | 8/18/2010 | Drum 9 | 9 | 10.23 | 11.4 | 1.1 |
| 8/18/10 - 12:00 | GM | 12:55 | 8/18/2010 | Drum 12 | 9 | 11.57 | 11.4 | -0.2 |

**Table E-4 Continued**

**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| Date / Time | GM / BP | Analysis | Analysis | Vehicle | Fuel | EOT | Initial | Loss |
| 8/18/10 - 12:56 | GM | 13:43 | 8/18/2010 | Drum 11 | 9 | 11.49 | 11.4 | -0.1 |
| 8/18/10 - 13:06 | BP | 13:43 | 8/18/2010 | 44 | 9 | 10.25 | 11.4 | 1.1 |
| 8/18/10 - 13:06 | GM | 14:14 | 8/18/2010 | 48 | 9 | 10.05 | 11.4 | 1.3 |
| 8/18/10 - 13:15 | BP | 14:14 | 8/18/2010 | 30 | 9 | 10.15 | 11.4 | 1.2 |
| 8/18/10 - 13:15 | GM | 14:26 | 8/18/2010 | 25 | 9 | 10.2 | 11.4 | 1.2 |
| 8/18/10 - 13:59 | BP | 14:29 | 8/18/2010 | Drum 1 | 12 | 10.92 | 10.4 | -0.5 |
| 8/18/10 - 14:11 | GM | 15:01 | 8/18/2010 | 45 | 9 | 10.31 | 11.4 | 1.1 |
| 8/18/10 - 14:11 | BP | 15:01 | 8/18/2010 | 50 | 9 | 9.75 | 11.4 | 1.6 |
| 8/18/10 - 14:18 | GM | 15:15 | 8/18/2010 | 55 | 9 | 10.63 | 11.4 | 0.7 |
| 8/18/10 - 14:21 | BP | 15:15 | 8/18/2010 | 51 | 9 | 9.27 | 11.4 | 2.1 |
| 8/18/10 - 14:58 | GM | 15:47 | 8/18/2010 | Drum 2 | 12 | 10.82 | 10.4 | -0.4 |
| 8/18/10 - 15:11 | BP | 15:47 | 8/18/2010 | 19 | 9 | 9.94 | 11.4 | 1.4 |
| 8/18/10 - 15:13 | GM | 15:58 | 8/18/2010 | 56 | 9 | 9.53 | 11.4 | 1.8 |
| 8/18/10 - 15:24 | BP | 15:58 | 8/18/2010 | 1 | 9 | 9.25 | 11.4 | 2.1 |
| 8/18/10 - 15:24 | GM | 16:16 | 8/18/2010 | 9 | 9 | 10.21 | 11.4 | 1.2 |
| 8/18/10 - 16:15 | GM | 16:55 | 8/18/2010 | 15 | 9 | 10.14 | 11.4 | 1.2 |
| 8/18/10 - 16:18 | BP | 16:55 | 8/18/2010 | 4 | 9 | 10.4 | 11.4 | 1.0 |
| 8/18/10 - 16:24 | GM | 17:16 | 8/18/2010 | 25 | 12 | 9.73 | 10.4 | 0.7 |
| 8/18/10 - 16:28 | BP | 17:16 | 8/18/2010 | 30 | 12 | 9.37 | 10.4 | 1.0 |
| 8/18/10 - 17:20 | GM | 10:35 | 8/20/2010 | 44 | 12 | 9.76 | 10.4 | 0.6 |
| 8/18/10 - 17:21 | BP | 10:35 | 8/20/2010 | 51 | 12 | 8.82 | 10.4 | 1.6 |
| 8/18/10 - 17:26 | GM | 11:00 | 8/20/2010 | 50 | 12 | 9.85 | 10.4 | 0.6 |
| 8/18/10 - 17:28 | BP | 11:00 | 8/20/2010 | 55 | 12 | 10.01 | 10.4 | 0.4 |
| 8/20/10 - 10:15 | GM | 11:35 | 8/20/2010 | Drum 3 | 12 | 10.81 | 10.4 | -0.4 |
| 8/20/10 - 10:33 | BP | 11:35 | 8/20/2010 | Drum 4 | 12 | 10.85 | 10.4 | -0.4 |
| 8/21/10 - 12:35 | GM | 13:42 | 8/21/2010 | Drum 5 | 12 | 10.7 | 10.4 | -0.3 |
| 8/21/10 - 13:21 | BP | 13:42 | 8/21/2010 | Drum 6 | 12 | 10.67 | 10.4 | -0.3 |
| 8/21/10 - 13:29 | GM | 13:58 | 8/21/2010 | 4 | 12 | 9.96 | 10.4 | 0.4 |
| 8/21/10 - 13:29 | BP | 13:58 | 8/21/2010 | 15 | 12 | 9.89 | 10.4 | 0.5 |
| 8/21/10 - 13:39 | GM | 14:05 | 8/21/2010 | 9 | 12 | 10.24 | 10.4 | 0.2 |
| 8/21/10 - 13:39 | BP | 14:05 | 8/21/2010 | 56 | 12 | 9.47 | 10.4 | 0.9 |
| 8/21/10 - 14:13 | GM | 14:51 | 8/21/2010 | Drum 7 | 12 | 10.6 | 10.4 | -0.2 |
| 8/21/10 - 14:31 | BP | 14:51 | 8/21/2010 | 45 | 12 | 9.8 | 10.4 | 0.6 |
| 8/21/10 - 14:33 | GM | 15:52 | 8/21/2010 | 1 | 12 | 9.3 | 10.4 | 1.1 |
| 8/21/10 - 14:41 | BP | 15:52 | 8/21/2010 | 19 | 12 | 9.7 | 10.4 | 0.7 |

**Table E-4 Continued**

**End of Test Vapor Pressures**

| Sample in Ice | Grabner | Time of | Date of | | | DVPE, psi | | |
|---|---|---|---|---|---|---|---|---|
| Date / Time | GM / BP | Analysis | Analysis | Vehicle | Fuel | EOT | Initial | Loss |
| 8/21/10 - 14:45 | GM | 16:03 | 8/21/2010 | 48 | 12 | 9.7 | 10.4 | 0.7 |
| 8/21/10 - 15:32 | BP | 16:03 | 8/21/2010 | 28 | 12 | 9.88 | 10.4 | 0.5 |
| 8/21/10 - 15:38 | GM | 16:14 | 8/21/2010 | 16 | 12 | 9.69 | 10.4 | 0.7 |
| 8/21/10 - 15:38 | BP | 16:14 | 8/21/2010 | Drum 8 | 12 | 10.66 | 10.4 | -0.3 |
| 8/21/10 - 15:50 | GM | 16:57 | 8/21/2010 | 21 | 12 | 9.5 | 10.4 | 0.9 |
| 8/21/10 - 15:50 | BP | 16:57 | 8/21/2010 | 14 | 12 | 9.75 | 10.4 | 0.7 |
| 8/21/10 - 16:42 | GM | 17:16 | 8/21/2010 | 29 | 12 | 9.7 | 10.4 | 0.7 |
| 8/21/10 - 16:42 | BP | 17:16 | 8/21/2010 | 18 | 12 | 9.66 | 10.4 | 0.7 |
| 8/21/10 - 16:53 | GM | 17:27 | 8/21/2010 | 4 | 12 | 9.78 | 10.4 | 0.6 |
| 8/21/10 - 16:53 | BP | 17:27 | 8/21/2010 | 9 | 12 | 10.09 | 10.4 | 0.3 |
| 8/21/10 - 16:56 | GM | 9:00 | 8/22/2010 | Drum 9 | 12 | 10.69 | 10.4 | -0.3 |
| 8/21/10 - 17:40 | BP | 9:00 | 8/22/2010 | 19 | 12 | 10.23 | 10.4 | 0.2 |
| 8/21/10 - 17:42 | GM | 9:13 | 8/22/2010 | 1 | 12 | 9.76 | 10.4 | 0.6 |
| 8/21/10 - 17:52 | BP | 9:13 | 8/22/2010 | 30 | 12 | 9.98 | 10.4 | 0.4 |
| 8/21/10 - 17:52 | GM | 8:38 | 8/22/2010 | 15 | 12 | 9.96 | 10.4 | 0.4 |
| 8/22/10 - 11:16 | GM | 11:48 | 8/22/2010 | Drum 10 | 12 | 10.54 | 10.4 | -0.1 |
| 8/22/10 - 11:16 | BP | 11:48 | 8/22/2010 | Drum 11 | 12 | 10.85 | 10.4 | -0.4 |
| 8/22/10 - 12:28 | GM | 13:01 | 8/22/2010 | 21 | 12 | 9.36 | 10.4 | 1.0 |
| 8/22/10 - 12:28 | BP | 13:01 | 8/22/2010 | 14 | 12 | 9.54 | 10.4 | 0.9 |
| 8/22/10 - 12:34 | GM | 13:42 | 8/22/2010 | 28 | 12 | 9.88 | 10.4 | 0.5 |
| 8/22/10 - 12;34 | BP | 13:42 | 8/22/2010 | 16 | 12 | 9.72 | 10.4 | 0.7 |
| 8/22/10 - 13:27 | GM | 14:27 | 8/22/2010 | 29 | 12 | 9.63 | 10.4 | 0.8 |
| 8/22/10 - 13:27 | BP | 14:27 | 8/22/2010 | 18 | 12 | 9.56 | 10.4 | 0.8 |
| 8/22/10 - 13:27 | GM | 14:30 | 8/22/2010 | Drum 12 | 12 | 10.62 | 10.4 | -0.2 |
| 8/22/10 - 13:41 | BP | 14:38 | 8/22/2010 | 25 | 12 | 9.56 | 10.4 | 0.8 |
| 8/22/10 - 13:41 | GM | 14:50 | 8/22/2010 | 51 | 12 | 8.99 | 10.4 | 1.4 |
| 8/22/10 - 14:32 | GM | 15:17 | 8/22/2010 | 48 | 12 | 9.44 | 10.4 | 1.0 |
| 8/22/10 - 14:32 | BP | 15:17 | 8/22/2010 | 45 | 12 | 9.11 | 10.4 | 1.3 |
| 8/22/10 - 14:43 | GM | 15:29 | 8/22/2010 | 44 | 12 | 9.31 | 10.4 | 1.1 |
| 8/22/10 - 14:43 | BP | 15:29 | 8/22/2010 | 55 | 12 | 9.67 | 10.4 | 0.7 |
| 8/22/10 - 15:00 | GM | 11:00 | 8/23/2010 | 56 | 12 | 9.14 | 10.4 | 1.3 |
| 8/22/10 - 15:00 | BP | 11:00 | 8/23/2010 | 50 | 12 | 9.73 | 10.4 | 0.7 |

# APPENDIX F

# VEHICLE TOTAL WEIGHTED DEMERIT SUMMARY

**Table F-1**
**Vehicle Total Weighted Demerit Summary**

| Vehicle | Fuel | Rater | Date | TWD | Max Amb Temp, °F |
|---|---|---|---|---|---|
| 1 | 2 | A | 26-Jul-10 | 35 | 99 |
| 1 | 2 | B | 22-Jul-10 | 44 | 99 |
| 1 | 3 | A | 02-Aug-10 | 32 | 97 |
| 1 | 3 | B | 3-Aug-10 | 50 | 95 |
| 1 | 5 | A | 16-Jul-10 | 49 | 102 |
| 1 | 5 | B | 18-Jul-10 | 22 | 100 |
| 1 | 7 | A | 27-Jul-10 | 17.5 | 99 |
| 1 | 7 | B | 28-Jul-10 | 38 | 95 |
| 1 | 9 | A | 18-Aug-10 | 44 | 100 |
| 1 | 9 | B | 13-Aug-10 | 50 | 96 |
| 1 | 12 | A | 21-Aug-10 | 41 | 95 |
| 1 | 12 | B | 21-Aug-10 | 14 | 97 |
| 1 | 28 | A | 8-Aug-10 | 49 | 97 |
| 1 | 28 | B | 11-Aug-10 | 66 | 95 |
| 4 | 2 | A | 22-Jul-10 | 18 | 100 |
| 4 | 2 | B | 26-Jul-10 | 15 | 100 |
| 4 | 3 | A | 02-Aug-10 | 20 | 96 |
| 4 | 3 | B | 3-Aug-10 | 24 | 96 |
| 4 | 5 | A | 18-Jul-10 | 17 | 99 |
| 4 | 5 | B | 17-Jul-10 | 29 | 104 |
| 4 | 7 | A | 28-Jul-10 | 9 | 97 |
| 4 | 7 | B | 27-Jul-10 | 20 | 100 |
| 4 | 9 | A | 18-Aug-10 | 11 | 101 |
| 4 | 9 | B | 13-Aug-10 | 15.5 | 97 |
| 4 | 12 | A | 21-Aug-10 | 15 | 97 |
| 4 | 12 | B | 21-Aug-10 | 24 | 95 |
| 4 | 28 | A | 11-Aug-10 | 14 | 96 |
| 4 | 28 | B | 7-Aug-10 | 25.5 | 102 |
| 9 | 2 | A | 19-Jul-10 | 26 | 103 |
| 9 | 2 | B | 26-Jul-10 | 36 | 98 |
| 9 | 3 | A | 02-Aug-10 | 26 | 96 |
| 9 | 3 | B | 3-Aug-10 | 32 | 98 |
| 9 | 5 | A | 17-Jul-10 | 13 | 105 |
| 9 | 5 | B | 18-Jul-10 | 37 | 98 |
| 9 | 7 | A | 27-Jul-10 | 31.5 | 99 |
| 9 | 7 | B | 29-Jul-10 | 27 | 95 |
| 9 | 9 | A | 13-Aug-10 | 30 | 95 |
| 9 | 9 | B | 18-Aug-10 | 18 | 101 |
| 9 | 12 | A | 21-Aug-10 | 37 | 95 |
| 9 | 12 | B | 21-Aug-10 | 27.5 | 98 |
| 9 | 28 | A | 7-Aug-10 | 38 | 99 |
| 9 | 28 | B | 11-Aug-10 | 40 | 96 |

**Table F-1 Continued**
**Vehicle Total Weighted Demerit Summary**

| | | | | | |
|---|---|---|---|---|---|
| 14 | 2 | A | 26-Jul-10 | 26 | 97 |
| 14 | 2 | B | 19-Jul-10 | 29 | 107 |
| 14 | 3 | A | 2-Aug-10 | 22 | 96 |
| 14 | 3 | B | 29-Jul-10 | 21 | 103 |
| 14 | 5 | A | 17-Jul-10 | 22 | 103 |
| 14 | 5 | B | 18-Jul-10 | 20 | 99 |
| 14 | 7 | A | 28-Jul-10 | 26 | 97 |
| 14 | 7 | B | 29-Jul-10 | 19 | 96 |
| 14 | 9 | A | 12-Aug-10 | 30.5 | 100 |
| 14 | 9 | B | 13-Aug-10 | 37.5 | 97 |
| 14 | 12 | A | 21-Aug-10 | 22 | 96 |
| 14 | 12 | B | 22-Aug-10 | 24 | 95 |
| 14 | 28 | A | 11-Aug-10 | 32.5 | 100 |
| 14 | 28 | B | 11-Aug-10 | 54.5 | 95 |
| 15 | 2 | A | 22-Jul-10 | 26 | 100 |
| 15 | 2 | B | 26-Jul-10 | 23 | 101 |
| 15 | 3 | A | 3-Aug-10 | 17 | 95 |
| 15 | 3 | B | 02-Aug-10 | 24 | 100 |
| 15 | 5 | A | 17-Jul-10 | 27 | 102 |
| 15 | 5 | B | 19-Jul-10 | 34 | 103 |
| 15 | 7 | A | 27-Jul-10 | 29 | 99 |
| 15 | 7 | B | 29-Jul-10 | 20 | 95 |
| 15 | 9 | A | 13-Aug-10 | 28 | 96 |
| 15 | 9 | B | 18-Aug-10 | 29.5 | 103 |
| 15 | 12 | A | 21-Aug-10 | 24 | 95 |
| 15 | 12 | B | 21-Aug-10 | 24.5 | 97 |
| 15 | 28 | A | 7-Aug-10 | 22 | 101 |
| 15 | 28 | B | 11-Aug-10 | 44.5 | 98 |
| 16 | 2 | A | 26-Jul-10 | 17 | 99 |
| 16 | 2 | B | 22-Jul-10 | 21 | 102 |
| 16 | 3 | A | 3-Aug-10 | 16 | 96 |
| 16 | 3 | B | 02-Aug-10 | 16 | 95 |
| 16 | 5 | A | 17-Jul-10 | 12 | 104 |
| 16 | 5 | B | 18-Jul-10 | 22 | 101 |
| 16 | 7 | A | 29-Jul-10 | 16.5 | 95 |
| 16 | 7 | B | 27-Jul-10 | 17.5 | 100 |
| 16 | 9 | A | 13-Aug-10 | 15.5 | 93 |
| 16 | 9 | B | 13-Aug-10 | 30.5 | 95 |
| 16 | 12 | A | 21-Aug-10 | 15 | 96 |
| 16 | 12 | B | 22-Aug-10 | 23 | 96 |
| 16 | 28 | A | 11-Aug-10 | 12.5 | 96 |
| 16 | 28 | B | 7-Aug-10 | 27 | 100 |

**Table F-1 Continued**
**Vehicle Total Weighted Demerit Summary**

| | | | | | |
|---|---|---|---|---|---|
| 18 | 2 | A | 19-Jul-10 | 6 | 105 |
| 18 | 2 | B | 26-Jul-10 | 27 | 99 |
| 18 | 3 | A | 3-Aug-10 | 6 | 95 |
| 18 | 3 | B | 29-Jul-10 | 7 | 104 |
| 18 | 5 | A | 18-Jul-10 | 10 | 100 |
| 18 | 5 | B | 17-Jul-10 | 15 | 109 |
| 18 | 7 | A | 28-Jul-10 | 5.5 | 96 |
| 18 | 7 | B | 29-Jul-10 | 7.5 | 101 |
| 18 | 9 | A | 13-Aug-10 | 12 | 95 |
| 18 | 9 | B | 13-Aug-10 | 20 | 95 |
| 18 | 12 | A | 21-Aug-10 | 8 | 96 |
| 18 | 12 | B | 22-Aug-10 | 4.5 | 99 |
| 18 | 28 | A | 11-Aug-10 | 6.5 | 97 |
| 18 | 28 | B | 8-Aug-10 | 15.5 | 98 |
| 19 | 2 | A | 26-Jul-10 | 23 | 99 |
| 19 | 2 | B | 22-Jul-10 | 19 | 105 |
| 19 | 3 | A | 02-Aug-10 | 26 | 95 |
| 19 | 3 | B | 3-Aug-10 | 34 | 95 |
| 19 | 5 | A | 16-Jul-10 | 12 | 104 |
| 19 | 5 | B | 18-Jul-10 | 25 | 100 |
| 19 | 7 | A | 27-Jul-10 | 8 | 100 |
| 19 | 7 | B | 29-Jul-10 | 20.5 | 96 |
| 19 | 9 | A | 13-Aug-10 | 26 | 95 |
| 19 | 9 | B | 18-Aug-10 | 27.5 | 102 |
| 19 | 12 | A | 21-Aug-10 | 15 | 95 |
| 19 | 12 | B | 21-Aug-10 | 40 | 97 |
| 19 | 28 | A | 11-Aug-10 | 19 | 97 |
| 19 | 28 | B | 7-Aug-10 | 27 | 102 |
| 21 | 2 | A | 19-Jul-10 | 35 | 104 |
| 21 | 2 | B | 26-Jul-10 | 23 | 100 |
| 21 | 3 | A | 29-Jul-10 | 26 | 101 |
| 21 | 3 | B | 2-Aug-10 | 28 | 97 |
| 21 | 5 | A | 17-Jul-10 | 20 | 102 |
| 21 | 5 | B | 18-Jul-10 | 22 | 98 |
| 21 | 7 | A | 27-Jul-10 | 18.5 | 100 |
| 21 | 7 | B | 29-Jul-10 | 15.5 | 100 |
| 21 | 9 | A | 13-Aug-10 | 24 | 95 |
| 21 | 9 | B | 12-Aug-10 | 28.5 | 102 |
| 21 | 12 | A | 22-Aug-10 | 41 | 98 |
| 21 | 12 | B | 21-Aug-10 | 28 | 98 |
| 21 | 28 | A | 11-Aug-10 | 20 | 95 |
| 21 | 28 | B | 11-Aug-10 | 49 | 101 |

**Table F-1 Continued**
**Vehicle Total Weighted Demerit Summary**

| | | | | | |
|---|---|---|---|---|---|
| 25 | 2 | B | 26-Jul-10 | 55 | 100 |
| 25 | 3 | A | 3-Aug-10 | 46 | 96 |
| 25 | 3 | B | 02-Aug-10 | 54 | 95 |
| 25 | 5 | A | 18-Jul-10 | 34 | 100 |
| 25 | 5 | B | 16-Jul-10 | 29 | 106 |
| 25 | 7 | A | 29-Jul-10 | 37 | 95 |
| 25 | 7 | B | 27-Jul-10 | 43.5 | 100 |
| 25 | 9 | A | 18-Aug-10 | 37.5 | 98 |
| 25 | 9 | B | 13-Aug-10 | 57 | 98 |
| 25 | 12 | A | 18-Aug-10 | 49 | 100 |
| 25 | 12 | B | 22-Aug-10 | 66.5 | 99 |
| 25 | 28 | A | 7-Aug-10 | 62.5 | 99 |
| 25 | 28 | B | 11-Aug-10 | 66 | 100 |
| 28 | 2 | A | 22-Jul-10 | 13 | 97 |
| 28 | 2 | B | 26-Jul-10 | 20 | 100 |
| 29 | 2 | A | 22-Jul-10 | 15 | 100 |
| 28 | 3 | A | 3-Aug-10 | 21 | 96 |
| 28 | 3 | B | 02-Aug-10 | 30 | 95 |
| 28 | 5 | A | 18-Jul-10 | 21 | 100 |
| 28 | 5 | B | 17-Jul-10 | 26 | 104 |
| 28 | 7 | A | 29-Jul-10 | 17.5 | 96 |
| 28 | 7 | B | 27-Jul-10 | 24.5 | 100 |
| 28 | 9 | A | 12-Aug-10 | 36 | 100 |
| 28 | 9 | B | 13-Aug-10 | 29.5 | 95 |
| 28 | 12 | A | 22-Aug-10 | 25 | 98 |
| 28 | 12 | B | 21-Aug-10 | 13 | 99 |
| 28 | 28 | A | 11-Aug-10 | 29 | 99 |
| 28 | 28 | B | 7-Aug-10 | 43 | 101 |
| 29 | 2 | B | 26-Jul-10 | 25 | 101 |
| 29 | 3 | A | 29-Jul-10 | 16 | 100 |
| 29 | 3 | B | 3-Aug-10 | 16 | 95 |
| 29 | 5 | A | 17-Jul-10 | 16 | 103 |
| 29 | 5 | B | 19-Jul-10 | 10 | 104 |
| 29 | 7 | A | 29-Jul-10 | 18 | 96 |
| 29 | 7 | B | 27-Jul-10 | 28.5 | 100 |
| 29 | 9 | A | 13-Aug-10 | 24 | 94 |
| 29 | 9 | B | 12-Aug-10 | 22 | 100 |
| 29 | 12 | A | 22-Aug-10 | 34 | 98 |
| 29 | 12 | B | 21-Aug-10 | 13 | 99 |
| 29 | 28 | A | 8-Aug-10 | 26 | 97 |
| 29 | 28 | B | 11-Aug-10 | 46 | 100 |

**Table F-1 Continued**
**Vehicle Total Weighted Demerit Summary**

| | | | | | |
|---|---|---|---|---|---|
| 30 | 2 | A | 22-Jul-10 | 18 | 100 |
| 30 | 2 | B | 26-Jul-10 | 29 | 100 |
| 30 | 3 | A | 3-Aug-10 | 15 | 95 |
| 30 | 3 | B | 29-Jul-10 | 13 | 102 |
| 30 | 5 | A | 18-Jul-10 | 25 | 100 |
| 30 | 5 | B | 18-Jul-10 | 22 | 107 |
| 30 | 7 | A | 29-Jul-10 | 22 | 99 |
| 30 | 7 | B | 27-Jul-10 | 17.5 | 99 |
| 30 | 9 | A | 12-Aug-10 | 17.5 | 100 |
| 30 | 9 | B | 18-Aug-10 | 41.5 | 98 |
| 30 | 12 | A | 21-Aug-10 | 7 | 96 |
| 30 | 12 | B | 18-Aug-10 | 26 | 102 |
| 30 | 28 | A | 11-Aug-10 | 52 | 100 |
| 30 | 28 | B | 8-Aug-10 | 56.5 | 98 |
| 44 | 2 | A | 26-Jul-10 | 24 | 98 |
| 44 | 2 | B | 22-Jul-10 | 33 | 101 |
| 44 | 3 | A | 3-Aug-10 | 28 | 97 |
| 44 | 3 | B | 30-Jul-10 | 16 | 95 |
| 44 | 5 | A | 19-Jul-10 | 18 | 103 |
| 44 | 5 | B | 17-Jul-10 | 22 | 101 |
| 44 | 7 | A | 27-Jul-10 | 46 | 99 |
| 44 | 7 | B | 29-Jul-10 | 14 | 102 |
| 44 | 9 | A | 12-Aug-10 | 45 | 100 |
| 44 | 9 | B | 18-Aug-10 | 20.5 | 99 |
| 44 | 12 | A | 18-Aug-10 | 23 | 100 |
| 44 | 12 | B | 22-Aug-10 | 13.5 | 101 |
| 44 | 28 | A | 7-Aug-10 | 41 | 100 |
| 44 | 28 | B | 11-Aug-10 | 38.5 | 101 |
| 45 | 2 | A | 26-Jul-10 | 16 | 97 |
| 45 | 2 | B | 19-Jul-10 | 25 | 107 |
| 45 | 3 | A | 30-Jul-10 | 6 | 95 |
| 45 | 3 | B | 3-Aug-10 | 15 | 99 |
| 45 | 5 | A | 18-Jul-10 | 13 | 100 |
| 45 | 5 | B | 17-Jul-10 | 20 | 107 |
| 45 | 7 | A | 29-Jul-10 | 12 | 100 |
| 45 | 7 | B | 27-Jul-10 | 13 | 98 |
| 45 | 9 | A | 12-Aug-10 | 11 | 100 |
| 45 | 9 | B | 18-Aug-10 | 21.5 | 99 |
| 45 | 12 | A | 22-Aug-10 | 11 | 100 |
| 45 | 12 | B | 21-Aug-10 | 22 | 97 |
| 45 | 28 | A | 7-Aug-10 | 25 | 100 |
| 45 | 28 | B | 11-Aug-10 | 30 | 101 |

**Table F-1 Continued**
**Vehicle Total Weighted Demerit Summary**

| | | | | | |
|---|---|---|---|---|---|
| 48 | 2 | A | 26-Jul-10 | 8 | 99 |
| 48 | 2 | B | 27-Jul-10 | 27 | 99 |
| 48 | 3 | A | 29-Jul-10 | 12 | 101 |
| 48 | 3 | B | 3-Aug-10 | 22 | 99 |
| 48 | 5 | A | 18-Jul-10 | 18 | 99 |
| 48 | 5 | B | 17-Jul-10 | 17 | 102 |
| 48 | 7 | A | 29-Jul-10 | 14.5 | 99 |
| 48 | 7 | B | 28-Jul-10 | 10.5 | 98 |
| 48 | 9 | A | 18-Aug-10 | 9 | 98 |
| 48 | 9 | B | 12-Aug-10 | 21 | 102 |
| 48 | 12 | A | 21-Aug-10 | 18 | 96 |
| 48 | 12 | B | 22-Aug-10 | 25 | 102 |
| 48 | 28 | A | 11-Aug-10 | 20 | 100 |
| 48 | 28 | B | 7-Aug-10 | 29 | 100 |
| 50 | 2 | A | 26-Jul-10 | 31 | 98 |
| 50 | 2 | B | 19-Jul-10 | 36 | 106 |
| 50 | 3 | A | 02-Aug-10 | 22 | 96 |
| 50 | 3 | B | 3-Aug-10 | 36 | 101 |
| 50 | 5 | A | 17-Jul-10 | 22 | 104 |
| 50 | 5 | B | 18-Jul-10 | 38 | 98 |
| 50 | 7 | A | 27-Jul-10 | 27 | 100 |
| 50 | 7 | B | 29-Jul-10 | 16 | 102 |
| 50 | 9 | A | 18-Aug-10 | 36 | 99 |
| 50 | 9 | B | 12-Aug-10 | 32 | 101 |
| 50 | 12 | A | 18-Aug-10 | 26 | 100 |
| 50 | 12 | B | 22-Aug-10 | 34 | 101 |
| 50 | 28 | A | 7-Aug-10 | 29 | 96 |
| 50 | 28 | B | 11-Aug-10 | 40 | 102 |
| 51 | 2 | A | 22-Jul-10 | 17 | 97 |
| 51 | 2 | B | 27-Jul-10 | 16 | 98 |
| 51 | 3 | A | 3-Aug-10 | 10 | 96 |
| 51 | 3 | B | 30-Jul-10 | 13 | 96 |
| 51 | 5 | A | 17-Jul-10 | 10 | 105 |
| 51 | 5 | B | 18-Jul-10 | 12 | 100 |
| 51 | 7 | A | 28-Jul-10 | 14.5 | 98 |
| 51 | 7 | B | 29-Jul-10 | 9 | 102 |
| 51 | 9 | A | 18-Aug-10 | 18 | 100 |
| 51 | 9 | B | 12-Aug-10 | 19 | 102 |
| 51 | 12 | A | 22-Aug-10 | 17 | 99 |
| 51 | 12 | B | 18-Aug-10 | 7 | 103 |
| 51 | 28 | A | 11-Aug-10 | 24 | 100 |
| 51 | 28 | B | 7-Aug-10 | 33.5 | 96 |

**Table F-1 Continued**
**Vehicle Total Weighted Demerit Summary**

| | | | | | |
|---|---|---|---|---|---|
| 55 | 2 | A | 26-Jul-10 | 23 | 98 |
| 55 | 2 | B | 19-Jul-10 | 15 | 106 |
| 55 | 3 | A | 7-Aug-10 | 25 | 95 |
| 55 | 3 | B | 02-Aug-10 | 19 | 95 |
| 55 | 5 | A | 18-Jul-10 | 11 | 100 |
| 55 | 5 | B | 16-Jul-10 | 16 | 106 |
| 55 | 7 | A | 29-Jul-10 | 25.5 | 100 |
| 55 | 7 | B | 28-Jul-10 | 18 | 95 |
| 55 | 9 | A | 13-Aug-10 | 23 | 95 |
| 55 | 9 | B | 18-Aug-10 | 27 | 99 |
| 55 | 12 | A | 22-Aug-10 | 33 | 100 |
| 55 | 12 | B | 18-Aug-10 | 18 | 102 |
| 55 | 28 | A | 7-Aug-10 | 42.5 | 101 |
| 55 | 28 | B | 12-Aug-10 | 37 | 100 |
| 56 | 2 | A | 27-Jul-10 | 9 | 98 |
| 56 | 2 | B | 27-Jul-10 | 10 | 100 |
| 56 | 3 | A | 30-Jul-10 | 14 | 95 |
| 56 | 3 | B | 7-Aug-10 | 10 | 95 |
| 56 | 5 | A | 26-Jul-10 | 10 | 98 |
| 56 | 5 | B | 26-Jul-10 | 18 | 100 |
| 56 | 7 | A | 29-Jul-10 | 32 | 100 |
| 56 | 7 | B | 28-Jul-10 | 5 | 95 |
| 56 | 9 | A | 18-Aug-10 | 22 | 101 |
| 56 | 9 | B | 13-Aug-10 | 16.5 | 97 |
| 56 | 12 | A | 22-Aug-10 | 8 | 100 |
| 56 | 12 | B | 21-Aug-10 | 10 | 95 |
| 56 | 28 | A | 12-Aug-10 | 10 | 101 |
| 56 | 28 | B | 7-Aug-10 | 13.5 | 104 |

Table F-2
Vehicle Screening Total Weighted Demerit Summary on Fuel 5

| Vehicle | Fuel | Rater | Date | TWD | max amb T |
|---|---|---|---|---|---|
| 1 | 5 | A | 14-Jul-10 | 32 | 103 |
| 2 | 5 | A | 16-Jul-10 | 7 | 104 |
| 3 | 5 | B | 13-Jul-10 | 14.5 | 103 |
| 4 | 5 | B | 15-Jul-10 | 10.5 | 92 |
| 5 | 5 | B | 12-Jul-10 | 15 | 97 |
| 6 | 5 | A | 16-Jul-10 | 10 | 103 |
| 7 | 5 | A | 16-Jul-10 | 19 | 103 |
| 8 | 5 | A | 15-Jul-10 | 24 | 96 |
| 9 | 5 | B | 16-Jul-10 | 29.5 | 106 |
| 10 | 5 | B | 15-Jul-10 | 8.5 | 100 |
| 11 | 5 | B | 14-Jul-10 | 10 | 104 |
| 12 | 5 | A | 15-Jul-10 | 15 | 97 |
| 13 | 5 | A | 15-Jul-10 | 13.5 | 96 |
| 14 | 5 | A | 14-Jul-10 | 28.5 | 102 |
| 15 | 5 | A | 12-Jul-10 | 21 | 93 |
| 16 | 5 | A | 13-Jul-10 | 25 | 102 |
| 17 | 5 | B | 15-Jul-10 | 12.5 | 100 |
| 18 | 5 | B | 14-Jul-10 | 14.5 | 105 |
| 19 | 5 | A | 13-Jul-10 | 24.5 | 103 |
| 20 | 5 | B | 12-Jul-10 | 12.5 | 99 |
| 21 | 5 | B | 15-Jul-10 | 27.5 | 97 |
| 22 | 5 | B | 12-Jul-10 | 16.5 | 98 |
| 23 | 5 | A | 12-Jul-10 | 7.5 | 97 |
| 24 | 5 | B | 16-Jul-10 | 11 | 100 |
| 25 | 5 | B | 13-Jul-10 | 34 | 104 |
| 26 | 5 | A | 14-Jul-10 | 15 | 103 |
| 27 | 5 | B | 13-Jul-10 | 8 | 102 |
| 28 | 5 | B | 14-Jul-10 | 20 | 104 |
| 29 | 5 | A | 13-Jul-10 | 20 | 104 |
| 30 | 5 | B | 13-Jul-10 | 26.5 | 104 |
| 31 | 5 | A | 12-Jul-10 | 12 | 95 |
| 32 | 5 | B | 13-Jul-10 | 10 | 102 |
| 33 | 5 | A | 13-Jul-10 | 7 | 103 |
| 34 | 5 | A | 13-Jul-10 | 6 | 104 |
| 35 | 5 | B | 13-Jul-10 | 19.5 | 104 |
| 36 | 5 | B | 12-Jul-10 | 11 | 99 |
| 37 | 5 | B | 15-Jul-10 | 2 | 96 |
| 38 | 5 | B | 12-Jul-10 | 24 | 100 |
| 39 | 5 | B | 12-Jul-10 | 8 | 95 |
| 40 | 5 | B | 13-Jul-10 | 9 | 103 |

Table F-2 Continued

Vehicle Screening Total Weighted Demerit Summary on Fuel 5

| | | | | | |
|---|---|---|---|---|---|
| 41 | 5 | B | 15-Jul-10 | 8 | 99 |
| 42 | 5 | B | 15-Jul-10 | 17 | 99 |
| 43 | 5 | A | 15-Jul-10 | 22.5 | 97 |
| 44 | 5 | B | 16-Jul-10 | 25.5 | 100 |
| 45 | 5 | B | 13-Jul-10 | 21 | 104 |
| 46 | 5 | A | 15-Jul-10 | 14 | 96 |
| 47 | 5 | A | 15-Jul-10 | 23 | 93 |
| 48 | 5 | A | 13-Jul-10 | 19 | 102 |
| 49 | 5 | A | 13-Jul-10 | 16 | 103 |
| 50 | 5 | B | 15-Jul-10 | 26 | 93 |
| 51 | 5 | B | 16-Jul-10 | 20 | 105 |
| 52 | 5 | A | 16-Jul-10 | 12 | 102 |
| 53 | 5 | A | 15-Jul-10 | 10 | 94 |
| 54 | 5 | A | 12-Jul-10 | 10 | 96 |
| 55 | 5 | A | 14-Jul-10 | 24.5 | 103 |
| 57 | 5 | A | 15-Jul-10 | 6 | 96 |
| 58 | 5 | A | 12-Jul-10 | 11 | 96 |
| 59 | 5 | A | 13-Jul-10 | 18 | 104 |
| 60 | 5 | A | 12-Jul-10 | 24 | 97 |