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**FUEL EFFICIENCY &  
GREENHOUSE GAS REDUCTION  
STUDY AT  
CPMA POWER STATION FOR CROESUS MINING  
CENTRAL NORSEMAN OPERATION**

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## ***EXECUTIVE SUMMARY***

The FTC Combustion Catalysts, manufactured and marketed by Fuel Technology Pty Ltd, have proven in laboratory and field trials to reduce fuel consumption in the range **3%** to **8%** under comparable load conditions and to also substantially reduce carbon emissions.

Following meetings with Croesus Mining (Central Norseman) Mill Superintendent, John McBride, and Electrical Supervisor, Arthur Anderson, it was agreed that a fuel efficiency and greenhouse gas reduction emission study should be conducted at the CPMA power generation facility.

Two engineering standard test procedures were employed in the test program, namely:-

1. Specific Fuel Consumption tests (SFC)
2. Exhaust Emission Carbon Mass Balance tests AS2077-1982 (CMB)

The net efficiency gain (reduction in fuel consumption) measured by the SFC and CMB test methods was **3.5% and 4%** respectively. The mean efficiency gain of **3.75%** as measured by these Fuel Consumption tests translates to an annual reduction in CO<sub>2</sub> emissions of **1,412 tonnes**.

## *INTRODUCTION*

Baseline (untreated) fuel efficiency tests were conducted on four Cummins KTA 50 alternator sets, Nos 3, 4, 6 and 9 during the week commencing 21<sup>st</sup> April 2004 employing the SFC and CMB test procedures. Bosch Smoke Tests were also conducted in conjunction with CMB tests.

Fuel Technology Pty Ltd supplied, on loan, an air operated FTC catalyst metering system which was calibrated and commissioned following completion of the baseline tests. This unit injected catalyst into the fuel supply as fuel supplier pumped fuel into bulk storage tanks on site.

Treated tests were conducted during the week commencing 17<sup>th</sup> May 2004.

CMB tests for both untreated and FTC treated tests were conducted during mill maintenance shutdowns resulting in generators running at lower loads than normal. Also lower loads for treated CMB tests compared to baseline tests were experienced and calculations have been applied to allow for this factor.

## *TEST METHODS*

**The Specific Fuel Consumption (SFC)** test procedure employed in this efficiency study measures the absolute amount of fuel consumed against work performed by the engine over time at a constant load. From this raw data the engine's efficiency can be calculated.

This evaluation of FTC involves a series of back to back untreated (baseline) and treated fuel tests conducted approximately one month apart.

A calibrated MacNaught M-10 flow transducer was used to measure fuel supplied to the engine from which the net volume of fuel consumed over ten by ten-minute time intervals can be calculated.

The flow transducer is fitted with a thermocouple probe that enables measurement of fuel temperature at the transducer.

From the fuel temperature the density at that temperature is calculated. A sample of fuel was taken for analysis and the density determined at 15°C.

Volumetric fuel flows are corrected for density and temperature and reported in mass (kg) of fuel.

The power station's sophisticated instrument was used to accurately measure power output from each engine over successive ten minute intervals.

**The Carbon Mass Balance Measurement (CMB)** is a procedure whereby the mass of carbon in the exhaust is calculated as a measure of the fuel being burned. The elements measured in this test include the exhaust gas composition, its temperature and the gas flow rate calculated from the pressure and exhaust stack cross sectional area. Whilst this is an engineering standard test (AS2077-1982) in field testing we are unable to comply with the procedure in relation to employing a chassis dynamometer. However, in the case of power generation the alternator substitutes as a mechanism to apply a constant load.

## ***T*EST *R*ESULTS**

### **Specific Fuel Consumption**

A summary of the fuel efficiency results achieved in this test program is detailed in the following table.

The results are represented graphically in Graphs 1, 2, 3 and 4.

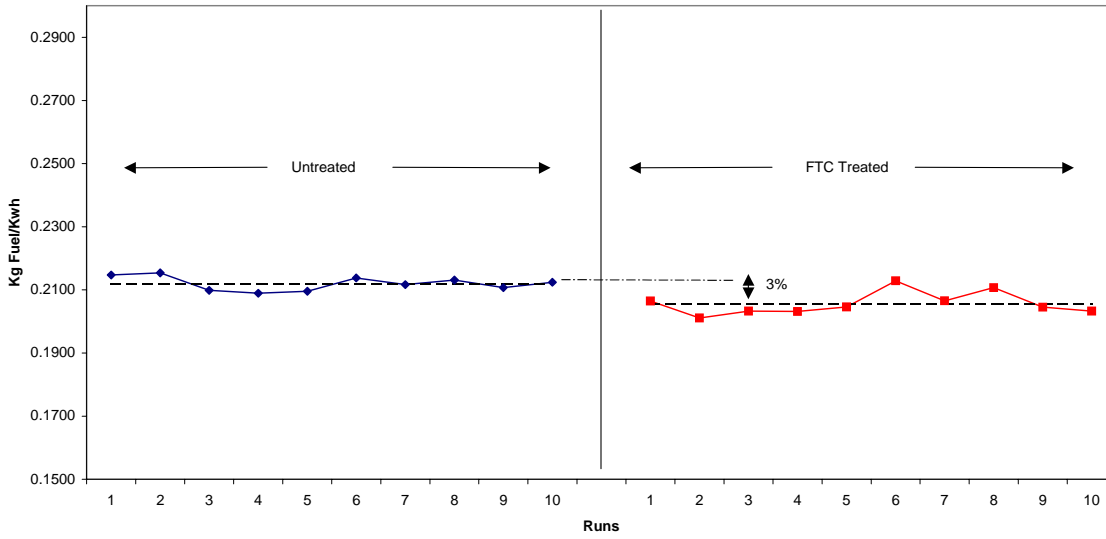
**TABLE 1**

### **Specific Fuel Consumption Test Results**

| Unit No.       | Baseline 21/4/04<br>Kg/kWh | Treated 19/5/04<br>Kg/kWh | Variation    |
|----------------|----------------------------|---------------------------|--------------|
| 3              | 0.2120                     | 0.2057                    | - 3.0%       |
| 4              | 0.2082                     | 0.1986                    | - 4.6%       |
| 6              | 0.2096                     | 0.2024                    | - 3.4%       |
| 9              | 0.2071                     | 0.2007                    | -3.1%        |
| <b>AVERAGE</b> | <b>0.2092</b>              | <b>0.2018</b>             | <b>-3.5%</b> |

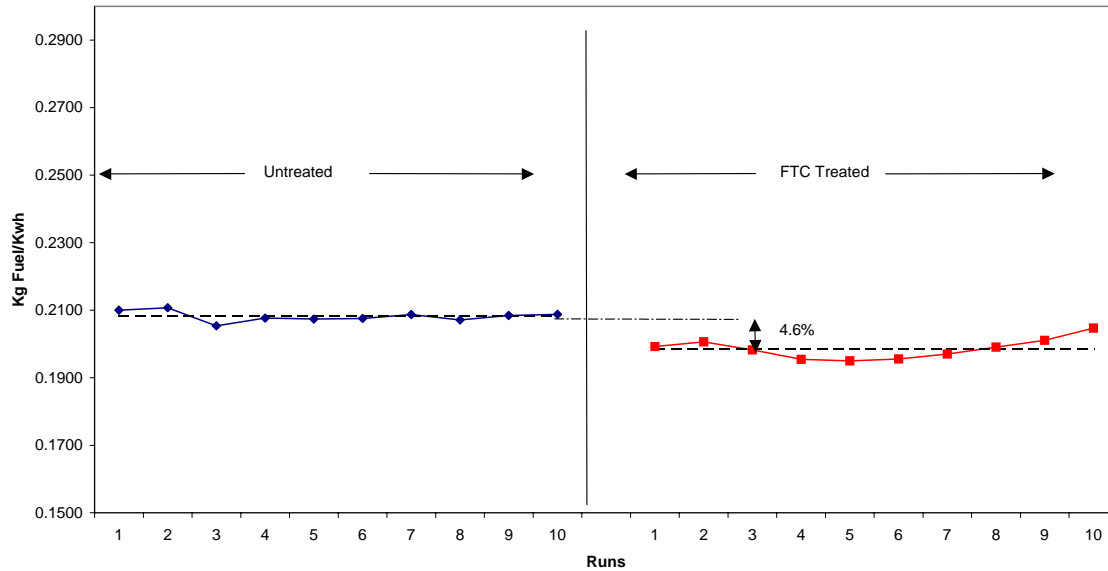
# GRAPH NO. 1

Central Norseman Gold Power Generation  
Cummins KTA 50 Genset # 3



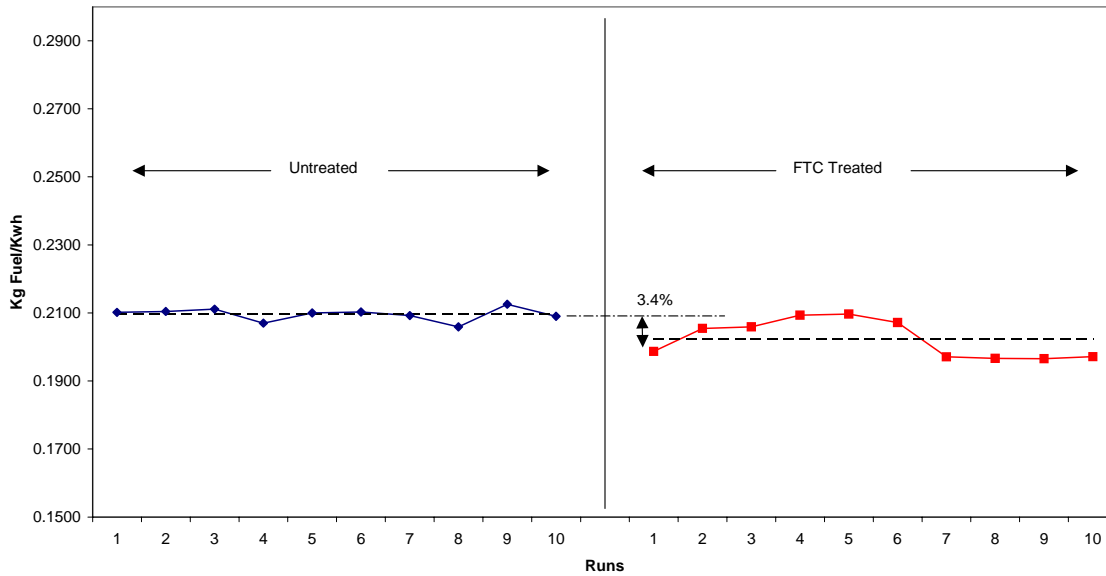
# GRAPH NO. 2

Central Norseman Gold Power Generation  
Cummins KTA 50 Genset # 4



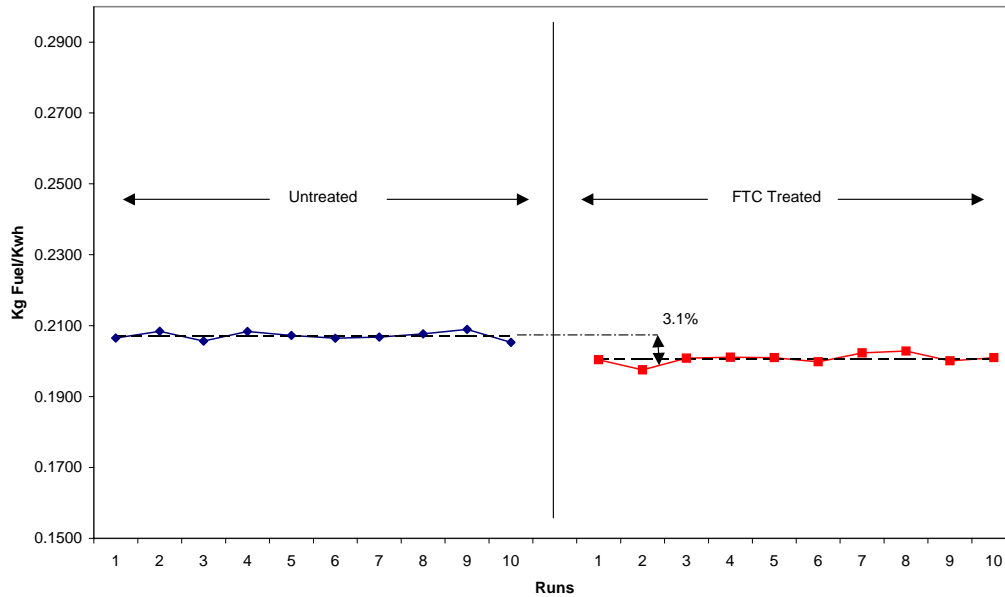
### GRAPH NO. 3

Central Norseman Gold Power Generation  
Cummins KTA 50 Genset # 6



### GRAPH NO. 4

Central Norseman Gold Power Generation  
Cummins KTA 50 Genset # 9



The net efficiency gain resulting from fuel treatment with the FTC-3 Catalyst is **3.5%**. The computer printouts of the results are contained in the *Appendix* as are the raw data sheets.



## Carbon Mass Balance

Table 2 provides results achieved in the CMB test program.

**TABLE 2**  
**Carbon Mass Balance Fuel Consumption Test Results.**  
**Grams per second flow of carbon**

| Unit No.           | Baseline 21/4/04<br>g/s | Treated 19/5/04<br>g/s | Variation    |
|--------------------|-------------------------|------------------------|--------------|
| 3                  | 30.473                  | 28.866                 | -5.3%        |
| 4                  | 33.576                  | 29.864                 | -11.1%       |
| 6                  | 30.522                  | 28.370                 | -7.1%        |
| 9                  | 31.051                  | 29.362                 | -5.4%        |
| <b>Average g/s</b> | <b>31.405</b>           | <b>29.115</b>          | <b>-7.3%</b> |

As the kW's produced during the treated tests were lower than that produced during untreated tests, results have been calculated as grams/second per kilowatt and shown in the following table.

| Unit No.           | Baseline 21/4/04<br>g/s per kW | Treated 19/5/04<br>g/s per kW | Variation  |
|--------------------|--------------------------------|-------------------------------|------------|
| 3                  | 0.0528                         | 0.0511                        | -3.2%      |
| 4                  | 0.0590                         | 0.0560                        | -5.1%      |
| 6                  | 0.0529                         | 0.0505                        | -4.5%      |
| 9                  | 0.0529                         | 0.0513                        | -3.0%      |
| <b>Average g/s</b> | <b>0.0544</b>                  | <b>0.0522</b>                 | <b>-4%</b> |

The CMB test procedure provides confirmation that addition of FTC-3 Catalyst to the fuel supply has resulted in a reduction in carbon flow (fuel consumption) of **4.0%**.

*The computer printouts of results and raw data sheets are contained in the Appendix.*

## Bosch Smoke Tests

A Bosch smoke test is also undertaken during conduct of the CMB tests and the results are shown in Table 3. Smoke emissions at this power generation facility are very low as are reflected in these Bosch smoke test results.

**TABLE 3**  
**Bosch Smoke Measurements**

| Unit No.       | Baseline 21/4/04 | Treated 19/5/04 | Variation   |
|----------------|------------------|-----------------|-------------|
| 3              | 0.3              | 0.3             | 0.0%        |
| 4              | 0.6              | 0.3             | -50%        |
| 6              | 0.3              | 0.2             | -33%        |
| 9              | 0.3              | 0.2             | -33%        |
| <b>Average</b> | <b>0.375</b>     | <b>0.250</b>    | <b>-33%</b> |

*The Bosch Scale reads from 0.1 (very clean) to 9.9 (very dirty).*

Although smoke emissions are very clean and the allocated Bosch numbers are very low, a reduction in smoke has been realised following FTC treatment of fuel. *The Bosch smoke patches are contained in the Appendix.*

## Greenhouse Gas Reduction

A gross reduction of **3.75%** of the current estimated annual fuel consumption of 14,000 KL translates to a **1,412 tonnes per annum reduction in CO<sub>2</sub> emissions**, based on the formula outlined in Worksheet 1 of the “Electricity Supply Business Greenhouse Change Workbook”. Our estimate is based on the following calculations:-

$$\begin{array}{rcl} & (14000 \text{ KL} \times 38.6 \times 74.9) \div 1000 & = 37,666 \text{ tonnes CO}_2 \text{ per annum} \\ - 3.75\% & (13,482 \text{ KL} \times 38.6 \times 74.9) \div 1000 & = 36,253 \text{ tonnes CO}_2 \text{ per annum} \end{array}$$

$$\begin{array}{l} \text{CO}_2 \text{ reduction by application FTC-3} \\ 37,666 - 36,253 = 1,412 \text{ tonnes} \end{array}$$

## CONCLUSION

These carefully controlled engineering standard test procedures conducted on Cummins KTA 50 generator sets Nos 3, 4, 6 and 9 provide clear evidence of reduced fuel consumption in the range **3.5% to 4%**.

The correlation between the two test procedures is very good and provides strong confidence in the accuracy of the test procedures.

A fuel efficiency gain of **3.75%** as measured by the Specific Fuel Consumption test method, if applied to the total fuel currently consumed by the power generation plant, will result in a **1,412 tonnes per annum reduction in CO<sub>2</sub> emissions**.

**Additional to the fuel economy benefits measured and a reduction in greenhouse gas emissions due to a more complete combustion of the fuel a reduction over time in engine maintenance costs will also be realised.**

*Appendix “A”*

**Bosch Smoke Filter Patches**

*Appendix “B”*

**Carbon Balance Printouts**

**FUEL TECHNOLOGY PTY LTD**

**CARBON BALANCE RESULTS**

|             |                  |            |                  |
|-------------|------------------|------------|------------------|
| COMPANY :   | Croesus Mining   | LOCATION : | Central Norsemqn |
| EQUIPMENT : | Power generation | UNIT NR. : | 3                |
| ENG. TYPE : | Cummins          | MODEL :    | KTA 50           |
| RATING :    | 1 Mw             | FUEL :     |                  |

**BASELINE TEST** **DATE : 21/04/04**

|                 |       |            |            |
|-----------------|-------|------------|------------|
| ENG. HOURS :    | 32448 | ENG. RPM:  |            |
| AMB. TEMP (C) : | 23.1  | STACK(mm): | 300        |
| BAROMETRIC(mb): | 978   | LOAD:      | 569-585 Kw |

|                 | TEST 1   | TEST 2 | TEST 3 | TEST 4 | TEST 5 | AVERAGE | % ST.DEV |  |
|-----------------|----------|--------|--------|--------|--------|---------|----------|--|
| PRES DIFF (Pa): | 206      | 208    | 211    | 210    | 209    | 209     | 0.92     |  |
| EXHST TEMP (C): | 388.5    | 388.6  | 388.6  | 388.5  | 388.5  | 389     | 0.01     |  |
| HC (ppm) :      | 30       | 30     | 30     | 30     | 30     | 30.0    | 0.00     |  |
| CO (%) :        | 0.02     | 0.02   | 0.02   | 0.02   | 0.02   | 0.020   | 0.00     |  |
| CO2 (%) :       | 8.71     | 8.71   | 8.71   | 8.68   | 8.66   | 8.69    | 0.26     |  |
| O2 (%) :        | 9.93     | 9.89   | 10.01  | 9.95   | 9.93   | 9.94    | 0.44     |  |
| CARB FLOW(g/s): | 30.325   | 30.470 | 30.687 | 30.513 | 30.371 | 30.473  | 0.46     |  |
| REYNOLDS NR. :  | 4.98E+04 |        |        |        |        |         |          |  |

**TREATED TEST** **DATE : 19/04/2005**

|                 |      |            |            |
|-----------------|------|------------|------------|
| ENG. HOURS :    |      | ENG. RPM:  |            |
| AMB. TEMP (C) : | 18.8 | STACK(mm): | 300        |
| BAROMETRIC(mb): | 987  | LOAD:      | 560-570 Kw |

|                 | TEST 1   | TEST 2                        | TEST 3 | TEST 4 | TEST 5 | AVERAGE | % ST.DEV |  |
|-----------------|----------|-------------------------------|--------|--------|--------|---------|----------|--|
| PRES DIFF (Pa): | 198      | 199                           | 199    | 200    | 203    | 200     | 0.96     |  |
| EXHST TEMP (C): | 372.5    | 372.3                         | 372.3  | 372.3  | 372.4  | 372     | 0.02     |  |
| HC (ppm) :      | 20       | 20                            | 20     | 20     | 20     | 20.0    | 0.00     |  |
| CO (%) :        | 0.01     | 0.01                          | 0.01   | 0.01   | 0.01   | 0.010   | 0.00     |  |
| CO2 (%) :       | 8.29     | 8.29                          | 8.33   | 8.26   | 8.29   | 8.29    | 0.30     |  |
| O2 (%) :        | 10.55    | 10.54                         | 10.36  | 10.39  | 10.35  | 10.44   | 0.95     |  |
| CARB FLOW(g/s): | 28.724   | 28.801                        | 28.942 | 28.773 | 29.091 | 28.866  | 0.52     |  |
| REYNOLDS NR. :  | 4.95E+04 | TOTAL HOURS ON TREATED FUEL : |        |        |        | -32448  |          |  |

PERCENTAGE CHANGE IN FUEL CONSUMPTION ((TREATED-BASE)/BASE\*100) : **-5.3 %**

REMARKS:

**FUEL TECHNOLOGY PTY LTD**

**CARBON BALANCE RESULTS**

|             |                  |            |                  |
|-------------|------------------|------------|------------------|
| COMPANY :   | Croesus Mining   | LOCATION : | Central Norsemaq |
| EQUIPMENT : | Power generation | UNIT NR. : | 4                |
| ENG. TYPE : | Cummins          | MODEL :    | KTA 50           |
| RATING :    | 1 Mw             | FUEL :     |                  |

**BASELINE TEST** DATE : 21/04/04

|                 |       |            |            |
|-----------------|-------|------------|------------|
| ENG. HOURS :    | 32425 | ENG. RPM:  |            |
| AMB. TEMP (C) : | 21.4  | STACK(mm): | 300        |
| BAROMETRIC(mb): | 978   | LOAD:      | 568-570 Kw |

|                 | TEST 1   | TEST 2 | TEST 3 | TEST 4 | TEST 5 | AVERAGE | % ST.DEV |
|-----------------|----------|--------|--------|--------|--------|---------|----------|
| PRES DIFF (Pa): | 273      | 272    | 268    | 271    | 274    | 272     | 0.85     |
| EXHST TEMP (C): | 386.1    | 386.3  | 386.3  | 386.4  | 386.5  | 386     | 0.04     |
| HC (ppm) :      | 0        | 0      | 0      | 0      | 0      | 0.0     | #DIV/0!  |
| CO (%) :        | 0.02     | 0.02   | 0.02   | 0.02   | 0.02   | 0.020   | 0.00     |
| CO2 (%) :       | 8.43     | 8.40   | 8.39   | 8.40   | 8.39   | 8.40    | 0.20     |
| O2 (%) :        | 10.34    | 10.38  | 10.41  | 10.35  | 10.34  | 10.36   | 0.29     |
| CARB FLOW(g/s): | 33.780   | 33.593 | 33.305 | 33.530 | 33.673 | 33.576  | 0.53     |
| REYNOLDS NR. :  | 5.68E+04 |        |        |        |        |         |          |

**TREATED TEST** DATE : 19/05/2004

|                 |      |            |            |
|-----------------|------|------------|------------|
| ENG. HOURS :    | 18.5 | ENG. RPM:  |            |
| AMB. TEMP (C) : | 18.5 | STACK(mm): | 300        |
| BAROMETRIC(mb): | 987  | LOAD:      | 520-540 Kw |

|                 | TEST 1   | TEST 2 | TEST 3                        | TEST 4 | TEST 5 | AVERAGE | % ST.DEV |
|-----------------|----------|--------|-------------------------------|--------|--------|---------|----------|
| PRES DIFF (Pa): | 220      | 221    | 219                           | 217    | 222    | 220     | 0.88     |
| EXHST TEMP (C): | 353.7    | 353.8  | 353.9                         | 354.2  | 355.8  | 354     | 0.25     |
| HC (ppm) :      | 10       | 10     | 10                            | 10     | 10     | 10.0    | 0.00     |
| CO (%) :        | 0.01     | 0.01   | 0.01                          | 0.01   | 0.01   | 0.010   | 0.00     |
| CO2 (%) :       | 8.01     | 8.05   | 8.05                          | 8.10   | 8.14   | 8.07    | 0.63     |
| O2 (%) :        | 10.86    | 10.84  | 10.85                         | 10.86  | 10.84  | 10.85   | 0.09     |
| CARB FLOW(g/s): | 29.671   | 29.884 | 29.746                        | 29.785 | 30.235 | 29.864  | 0.74     |
| REYNOLDS NR. :  | 5.27E+04 |        |                               |        |        |         |          |
|                 |          |        | TOTAL HOURS ON TREATED FUEL : |        |        | -32425  |          |

PERCENTAGE CHANGE IN FUEL CONSUMPTION ((TREATED-BASE)/BASE\*100) : **-11.1 %**

REMARKS:

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**CARBON BALANCE RESULTS**

|             |                  |            |                  |
|-------------|------------------|------------|------------------|
| COMPANY :   | Croesus Mining   | LOCATION : | Central Norsemqn |
| EQUIPMENT : | Power generation | UNIT NR. : | 6                |
| ENG. TYPE : | Cummins          | MODEL :    | KTA 50           |
| RATING :    | 1 Mw             | FUEL :     |                  |

**BASELINE TEST** **DATE :** 21/04/04

|                 |       |            |         |
|-----------------|-------|------------|---------|
| ENG. HOURS :    | 32499 | ENG. RPM:  |         |
| AMB. TEMP (C) : | 20.9  | STACK(mm): | 300     |
| BAROMETRIC(mb): | 978   | LOAD:      | 580-574 |

|                 | TEST 1   | TEST 2 | TEST 3 | TEST 4 | TEST 5 | AVERAGE | % ST.DEV |
|-----------------|----------|--------|--------|--------|--------|---------|----------|
| PRES DIFF (Pa): | 228      | 227    | 227    | 224    | 229    | 227     | 0.82     |
| EXHST TEMP (C): | 373.3    | 373.5  | 373.7  | 373.7  | 373.9  | 374     | 0.06     |
| HC (ppm) :      | 0        | 0      | 0      | 0      | 0      | 0.0     | #DIV/0!  |
| CO (%) :        | 0.02     | 0.02   | 0.02   | 0.02   | 0.02   | 0.020   | 0.00     |
| CO2 (%) :       | 8.28     | 8.27   | 8.28   | 8.27   | 8.27   | 8.27    | 0.07     |
| O2 (%) :        | 10.64    | 10.63  | 10.60  | 10.63  | 10.61  | 10.62   | 0.15     |
| CARB FLOW(g/s): | 30.619   | 30.510 | 30.543 | 30.303 | 30.635 | 30.522  | 0.44     |
| REYNOLDS NR. :  | 5.25E+04 |        |        |        |        |         |          |

**TREATED TEST** **DATE :** 19/45/04

|                 |      |            |            |
|-----------------|------|------------|------------|
| ENG. HOURS :    | 18.3 | ENG. RPM:  |            |
| AMB. TEMP (C) : | 987  | STACK(mm): | 300        |
| BAROMETRIC(mb): |      | LOAD:      | 550-565 Kw |

|                 | TEST 1   | TEST 2 | TEST 3                        | TEST 4 | TEST 5 | AVERAGE | % ST.DEV |
|-----------------|----------|--------|-------------------------------|--------|--------|---------|----------|
| PRES DIFF (Pa): | 204      | 202    | 203                           | 200    | 197    | 201     | 1.38     |
| EXHST TEMP (C): | 368.5    | 368.4  | 368.3                         | 368.2  | 368.2  | 368     | 0.04     |
| HC (ppm) :      | 10       | 10     | 10                            | 10     | 10     | 10.0    | 0.00     |
| CO (%) :        | 0.01     | 0.01   | 0.01                          | 0.01   | 0.01   | 0.010   | 0.00     |
| CO2 (%) :       | 8.12     | 8.13   | 8.08                          | 8.11   | 8.07   | 8.10    | 0.32     |
| O2 (%) :        | 10.97    | 10.85  | 10.70                         | 10.72  | 10.79  | 10.81   | 1.01     |
| CARB FLOW(g/s): | 28.623   | 28.522 | 28.423                        | 28.318 | 27.966 | 28.370  | 0.89     |
| REYNOLDS NR. :  | 4.98E+04 |        |                               |        |        |         |          |
|                 |          |        | TOTAL HOURS ON TREATED FUEL : |        |        | -32499  |          |

PERCENTAGE CHANGE IN FUEL CONSUMPTION ((TREATED-BASE)/BASE\*100) : **-7.1 %**

REMARKS:



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**CARBON BALANCE RESULTS**

|             |                  |            |                  |
|-------------|------------------|------------|------------------|
| COMPANY :   | Croesus Mining   | LOCATION : | Central Norsemaq |
| EQUIPMENT : | Power generation | UNIT NR. : | 9                |
| ENG. TYPE : | Cummins          | MODEL :    | KTA 50           |
| RATING :    | 1 Mw             | FUEL :     |                  |

**BASELINE TEST** **DATE : 21/04/04**

|                 |       |            |            |
|-----------------|-------|------------|------------|
| ENG. HOURS :    | 32391 | ENG. RPM:  |            |
| AMB. TEMP (C) : | 20.8  | STACK(mm): | 300        |
| BAROMETRIC(mb): | 978   | LOAD:      | 590-582 Kw |

|                 | TEST 1   | TEST 2 | TEST 3 | TEST 4 | TEST 5 | AVERAGE | % ST.DEV |
|-----------------|----------|--------|--------|--------|--------|---------|----------|
| PRES DIFF (Pa): | 222      | 220    | 221    | 221    | 223    | 221     | 0.51     |
| EXHST TEMP (C): | 385.6    | 385.6  | 385.6  | 385.7  | 385.8  | 386     | 0.02     |
| HC (ppm) :      | 30       | 20     | 20     | 20     | 20     | 22.0    | 20.33    |
| CO (%) :        | 0.02     | 0.02   | 0.02   | 0.03   | 0.03   | 0.024   | 22.82    |
| CO2 (%) :       | 8.59     | 8.53   | 8.60   | 8.60   | 8.61   | 8.59    | 0.37     |
| O2 (%) :        | 10.30    | 10.28  | 10.29  | 10.30  | 10.35  | 10.30   | 0.26     |
| CARB FLOW(g/s): | 31.112   | 30.736 | 31.056 | 31.090 | 31.263 | 31.051  | 0.62     |
| REYNOLDS NR. :  | 5.13E+04 |        |        |        |        |         |          |

**TREATED TEST** **DATE : 19/05/2004**

|                 |      |            |            |
|-----------------|------|------------|------------|
| ENG. HOURS :    |      | ENG. RPM:  |            |
| AMB. TEMP (C) : | 18.3 | STACK(mm): | 300        |
| BAROMETRIC(mb): | 987  | LOAD:      | 565-580 Kw |

|                 | TEST 1   | TEST 2 | TEST 3                        | TEST 4 | TEST 5 | AVERAGE | % ST.DEV |
|-----------------|----------|--------|-------------------------------|--------|--------|---------|----------|
| PRES DIFF (Pa): | 213      | 212    | 211                           | 214    | 216    | 213     | 0.90     |
| EXHST TEMP (C): | 371      | 371.2  | 371.2                         | 371.4  | 371.6  | 371     | 0.06     |
| HC (ppm) :      | 0        | 0      | 0                             | 0      | 0      | 0.0     | #DIV/0!  |
| CO (%) :        | 0.01     | 0.01   | 0.01                          | 0.01   | 0.01   | 0.010   | 0.00     |
| CO2 (%) :       | 8.18     | 8.18   | 8.18                          | 8.15   | 8.16   | 8.17    | 0.17     |
| O2 (%) :        | 10.61    | 10.63  | 10.63                         | 10.58  | 10.58  | 10.61   | 0.24     |
| CARB FLOW(g/s): | 29.391   | 29.317 | 29.247                        | 29.344 | 29.512 | 29.362  | 0.34     |
| REYNOLDS NR. :  | 5.12E+04 |        |                               |        |        |         |          |
|                 |          |        | TOTAL HOURS ON TREATED FUEL : |        |        | -32391  |          |

PERCENTAGE CHANGE IN FUEL CONSUMPTION ((TREATED-BASE)/BASE\*100) : **-5.4 %**

REMARKS:

*Appendix “C”*

**Specific Fuel Consumption Printouts**

**SPECIFIC FUEL CONSUMPTION GENSET TRIAL**

Customer: Croesus Mining Central Norseman  
 Genset No: 3  
 Date: 21/04/2004

Engine Hrs 32448  
 Make & Model Cummins KTA 50  
 Amb; Temp; Start deg; C 32.8  
 Amb; Temp; Finish deg; C 30.3

|             |         |            |
|-------------|---------|------------|
| Fuel Sample | Density | Temp Deg C |
|             | 0.829   | 27         |
| Corrected   | 0.837   | 15         |

**UNTREATED**

| Run No  | Time Start | Period Mins | kWh Meter | kWh      | Avg Load kW | Fuel (Lt) In | Fuel (Lt) Out | Litres Consumed | Fuel (Lt) Per kWh | Fuel Temp (C) In | Fuel Temp (C) Out | Density In | Density Out | Fuel (kg) In | Fuel (kg) Out | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|---------|------------|-------------|-----------|----------|-------------|--------------|---------------|-----------------|-------------------|------------------|-------------------|------------|-------------|--------------|---------------|--------------------|-------------------|
| 1       | 5.15       |             | 10980158  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10980282  | 124.0    | 744         | 32.08        | 0.00          | 32.08           | 0.2587            | 25.6             |                   | 0.830      | 0.848       | 26.63        | 0.00          | 26.63              | 0.2147            |
| 2       | 5.25       |             | 10980282  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10980404  | 122.0    | 732         | 31.65        | 0.00          | 31.65           | 0.2594            | 25.2             |                   | 0.830      | 0.848       | 26.28        | 0.00          | 26.28              | 0.2154            |
| 3       | 5.35       |             | 10980404  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10980531  | 127.0    | 762         | 32.09        | 0.00          | 32.09           | 0.2527            | 24.7             |                   | 0.831      | 0.848       | 26.65        | 0.00          | 26.65              | 0.2099            |
| 4       | 5.45       |             | 10980531  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10980663  | 132.0    | 792         | 33.19        | 0.00          | 33.19           | 0.2514            | 24.4             |                   | 0.831      | 0.848       | 27.58        | 0.00          | 27.58              | 0.2089            |
| 5       | 5.55       |             | 10980663  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10980797  | 134.0    | 804         | 33.79        | 0.00          | 33.79           | 0.2522            | 24.2             |                   | 0.831      | 0.848       | 28.08        | 0.00          | 28.08              | 0.2095            |
| 6       | 6.05       |             | 10980797  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10980923  | 126.0    | 756         | 32.41        | 0.00          | 32.41           | 0.2572            | 24.0             |                   | 0.831      | 0.848       | 26.94        | 0.00          | 26.94              | 0.2138            |
| 7       | 6.15       |             | 10980923  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10981049  | 126.0    | 756         | 32.09        | 0.00          | 32.09           | 0.2547            | 23.9             |                   | 0.831      | 0.848       | 26.67        | 0.00          | 26.67              | 0.2117            |
| 8       | 6.25       |             | 10981049  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10981169  | 120.0    | 720         | 30.77        | 0.00          | 30.77           | 0.2564            | 23.9             |                   | 0.831      | 0.848       | 25.58        | 0.00          | 25.58              | 0.2131            |
| 9       | 6.35       |             | 10981169  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10981293  | 124.0    | 744         | 31.43        | 0.00          | 31.43           | 0.2535            | 23.7             |                   | 0.831      | 0.848       | 26.13        | 0.00          | 26.13              | 0.2107            |
| 10      | 6.45       |             | 10981293  |          |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|         |            | 10          | 10981416  | 123.0    | 738         | 31.43        | 0.00          | 31.43           | 0.2555            | 23.7             |                   | 0.831      | 0.848       | 26.13        | 0.00          | 26.13              | 0.2124            |
| Mean    |            |             |           | 126      | 755         |              |               | 32.09           | 0.2552            |                  |                   |            |             |              |               | 26.666             | 0.2120            |
| Std Dev |            |             |           | 4.341019 | 26.04611    |              |               | 0.8825          | 0.0028            |                  |                   |            |             |              |               | 0.7319             | 0.0022            |
| C.V     |            |             |           | 3.5%     | 3.5%        |              |               | 2.7%            | 1.1%              |                  |                   |            |             |              |               | 2.7%               | 1.1%              |

**SPECIFIC FUEL CONSUMPTION GENSET TRIAL**

Customer: Croesus Mining Central Norseman  
 Genset No: 3  
 Date: 18/05/2004

Amb; Temp; Start deg; C 20  
 Amb; Temp; Finish deg; C 22.8

|             |         |            |
|-------------|---------|------------|
| Fuel Sample | Density | Temp Deg C |
|             | 0.83    | 23.5       |
| Corrected   | 0.836   | 15         |

**TREATED**

| Run No | Time Start | Period Mins | kWh Meter | kWh    | Avg Load kW | Fuel (Lt) In | Fuel (Lt) Out | Litres Consumed | Fuel (Lt) Per kWh | Fuel Temp (C) In | Fuel Temp (C) Out | Density In | Density Out | Fuel (kg) In | Fuel (kg) Out | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|--------|------------|-------------|-----------|--------|-------------|--------------|---------------|-----------------|-------------------|------------------|-------------------|------------|-------------|--------------|---------------|--------------------|-------------------|
| 1      | 8.40       |             | 11352948  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11353058  | 110.00 | 660         | 27.19        |               | 27.19           | 0.2472            | 16.0             |                   | 0.835      | 0.847       | 22.71        | 0.00          | 22.71              | 0.2065            |
| 2      | 8.50       |             | 11353058  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11353168  | 110.00 | 660         | 26.49        |               | 26.49           | 0.2408            | 16.4             |                   | 0.835      | 0.847       | 22.12        | 0.00          | 22.12              | 0.2011            |
| 3      | 9.00       |             | 11353168  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11353279  | 111.00 | 666         | 27.03        |               | 27.03           | 0.2435            | 16.9             |                   | 0.835      | 0.847       | 22.56        | 0.00          | 22.56              | 0.2033            |
| 4      | 9.10       |             | 11353279  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11353390  | 111.00 | 666         | 27.03        |               | 27.03           | 0.2435            | 17.2             |                   | 0.834      | 0.847       | 22.55        | 0.00          | 22.55              | 0.2032            |
| 5      | 9.20       |             | 11353390  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11353502  | 112.00 | 672         | 27.47        |               | 27.47           | 0.2453            | 17.5             |                   | 0.834      | 0.847       | 22.92        | 0.00          | 22.92              | 0.2046            |
| 6      | 9.30       |             | 11353502  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11353612  | 110.00 | 660         | 28.08        |               | 28.08           | 0.2553            | 17.8             |                   | 0.834      | 0.847       | 23.42        | 0.00          | 23.42              | 0.2129            |
| 7      | 9.40       |             | 11353612  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11353722  | 110.00 | 660         | 27.25        |               | 27.25           | 0.2477            | 18.2             |                   | 0.834      | 0.847       | 22.72        | 0.00          | 22.72              | 0.2065            |
| 8      | 9.50       |             | 11353722  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11353832  | 110.00 | 660         | 27.81        |               | 27.81           | 0.2528            | 18.6             |                   | 0.834      | 0.847       | 23.18        | 0.00          | 23.18              | 0.2107            |
| 9      | 10.00      |             | 11353832  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11353943  | 111.00 | 666         | 27.25        |               | 27.25           | 0.2455            | 19.0             |                   | 0.833      | 0.847       | 22.70        | 0.00          | 22.70              | 0.2045            |
| 10     | 10.10      |             | 11353943  |        |             |              |               |                 |                   |                  |                   |            |             |              |               |                    |                   |
|        |            | 10          | 11354056  | 113.00 | 678         | 27.58        |               | 27.58           | 0.2441            | 19.5             |                   | 0.833      | 0.847       | 22.97        | 0.00          | 22.97              | 0.2033            |
| Mean   |            |             |           | 111    | 665         |              |               | 27.32           | 0.2466            |                  |                   |            |             |              |               | 22.785             | 0.2057            |

| % CHANGE:               |  | kWh     | Avg Load | Litres Consumed | Fuel (Lt) Per kWh | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|-------------------------|--|---------|----------|-----------------|-------------------|--------------------|-------------------|
| <b>Treated-Baseline</b> |  |         |          |                 |                   |                    |                   |
| <b>Baseline</b>         |  | -11.92% | -11.92%  | -14.88%         | -3.37%            | -14.55%            | <b>-3.0%</b>      |

**SPECIFIC FUEL CONSUMPTION GENSET TRIAL**

Customer: Croesus Mining Central Norseman  
 Genset No: 4  
 Date: 21/04/2004

Engine Hrs 32425  
 Make & Model Cummins KTA 50  
 Amb; Temp; Start deg; C 34.3  
 Amb; Temp; Finish deg; C 33.4

| Fuel Sample | Density | Temp Deg C |
|-------------|---------|------------|
|             | 0.829   | 27         |
| Corrected   | 0.837   | 15         |

**UNTREATED**

| Run No  | Time Start | Period Mins | kWh Meter | kWh      | Avg Load kW | Fuel (Lt) |      | Litres Consumed | Fuel (Lt) Per kWh | Fuel Temp (C) |     | Density |       | Fuel (kg) |      | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|---------|------------|-------------|-----------|----------|-------------|-----------|------|-----------------|-------------------|---------------|-----|---------|-------|-----------|------|--------------------|-------------------|
|         |            |             |           |          |             | In        | Out  |                 |                   | In            | Out | In      | Out   | In        | Out  |                    |                   |
| 1       | 3.25       |             | 9846984   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9847115   | 131.00   | 786         | 33.24     | 0.00 | 33.24           | 0.2537            | 28.8          |     | 0.828   | 0.848 | 27.51     | 0.00 | 27.51              | 0.2100            |
| 2       | 3.35       |             | 9847115   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9847243   | 128.00   | 768         | 32.58     | 0.00 | 32.58           | 0.2545            | 28.6          |     | 0.828   | 0.848 | 26.97     | 0.00 | 26.97              | 0.2107            |
| 3       | 3.45       |             | 9847243   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9847373   | 130.00   | 780         | 32.25     | 0.00 | 32.25           | 0.2481            | 28.7          |     | 0.828   | 0.848 | 26.70     | 0.00 | 26.70              | 0.2054            |
| 4       | 3.55       |             | 9847373   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9847502   | 129.00   | 774         | 32.36     | 0.00 | 32.36           | 0.2509            | 28.6          |     | 0.828   | 0.848 | 26.79     | 0.00 | 26.79              | 0.2077            |
| 5       | 4.05       |             | 9847502   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9847631   | 129.00   | 774         | 32.31     | 0.00 | 32.31           | 0.2505            | 28.4          |     | 0.828   | 0.848 | 26.75     | 0.00 | 26.75              | 0.2074            |
| 6       | 4.15       |             | 9847631   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9847761   | 130.00   | 780         | 32.58     | 0.00 | 32.58           | 0.2506            | 28.2          |     | 0.828   | 0.848 | 26.98     | 0.00 | 26.98              | 0.2076            |
| 7       | 4.25       |             | 9847761   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9847891   | 130.00   | 780         | 32.75     | 0.00 | 32.75           | 0.2519            | 27.7          |     | 0.829   | 0.848 | 27.13     | 0.00 | 27.13              | 0.2087            |
| 8       | 4.35       |             | 9847891   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9848024   | 133.00   | 798         | 33.24     | 0.00 | 33.24           | 0.2499            | 27.6          |     | 0.829   | 0.848 | 27.54     | 0.00 | 27.54              | 0.2071            |
| 9       | 4.45       |             | 9848024   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9848156   | 132.00   | 792         | 33.19     | 0.00 | 33.19           | 0.2514            | 26.9          |     | 0.829   | 0.848 | 27.52     | 0.00 | 27.52              | 0.2085            |
| 10      | 4.55       |             | 9848156   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 9848287   | 131.00   | 786         | 32.97     | 0.00 | 32.97           | 0.2517            | 26.3          |     | 0.830   | 0.848 | 27.35     | 0.00 | 27.35              | 0.2088            |
|         |            |             |           |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            |             |           |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            |             |           |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            |             |           |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            |             |           |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            |             |           |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            |             |           |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            |             |           |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            |             |           |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
| Mean    |            |             |           | 130      | 782         |           |      | 32.75           | 0.2513            |               |     |         |       |           |      | 27.125             | 0.2082            |
| Std Dev |            |             |           | 1.494434 | 8.966605    |           |      | 0.3910          | 0.0018            |               |     |         |       |           |      | 0.3344             | 0.0015            |
| C.V     |            |             |           | 1.1%     | 1.1%        |           |      | 1.2%            | 0.7%              |               |     |         |       |           |      | 1.2%               | 0.7%              |

**SPECIFIC FUEL CONSUMPTION GENSET TRIAL**

Customer: Croesus Mining Central Norseman  
 Genset No: 4  
 Date: 18/05/2004

Amb; Temp; Start deg; C 25.5  
 Amb; Temp; Finish deg; C 25.5

| Fuel Sample | Density | Temp Deg C |
|-------------|---------|------------|
|             | 0.83    | 23.5       |
| Corrected   | 0.836   | 15         |

**TREATED**

| Run No | Time Start | Period Mins | kWh Meter | kWh    | Avg Load kW | Fuel (Lt) |     | Litres Consumed | Fuel (Lt) Per kWh | Fuel Temp |     | Density |       | Fuel (kg) |      | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|--------|------------|-------------|-----------|--------|-------------|-----------|-----|-----------------|-------------------|-----------|-----|---------|-------|-----------|------|--------------------|-------------------|
|        |            |             |           |        |             | In        | Out |                 |                   | In        | Out | In      | Out   | In        | Out  |                    |                   |
| 1      | 10.40      |             | 10245002  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10245128  | 126.00 | 756         | 30.16     |     | 30.16           | 0.2394            | 20.1      |     | 0.832   | 0.847 | 25.11     | 0.00 | 25.11              | 0.1992            |
| 2      | 10.50      |             | 10245128  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10245254  | 126.00 | 756         | 30.38     |     | 30.38           | 0.2411            | 20.3      |     | 0.832   | 0.847 | 25.28     | 0.00 | 25.28              | 0.2007            |
| 3      | 11.00      |             | 10245254  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10245379  | 125.00 | 750         | 29.78     |     | 29.78           | 0.2382            | 20.5      |     | 0.832   | 0.847 | 24.78     | 0.00 | 24.78              | 0.1982            |
| 4      | 11.10      |             | 10245379  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10245503  | 124.00 | 744         | 29.13     |     | 29.13           | 0.2349            | 20.7      |     | 0.832   | 0.847 | 24.24     | 0.00 | 24.24              | 0.1955            |
| 5      | 11.20      |             | 10245503  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10245627  | 124.00 | 744         | 29.07     |     | 29.07           | 0.2344            | 21.0      |     | 0.832   | 0.847 | 24.18     | 0.00 | 24.18              | 0.1950            |
| 6      | 11.30      |             | 10245627  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10245752  | 125.00 | 750         | 29.40     |     | 29.40           | 0.2352            | 21.3      |     | 0.832   | 0.847 | 24.45     | 0.00 | 24.45              | 0.1956            |
| 7      | 11.40      |             | 10245752  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10245876  | 124.00 | 744         | 29.39     |     | 29.39           | 0.2370            | 21.6      |     | 0.831   | 0.847 | 24.43     | 0.00 | 24.43              | 0.1970            |
| 8      | 11.50      |             | 10245876  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10245996  | 120.00 | 720         | 28.74     |     | 28.74           | 0.2395            | 21.9      |     | 0.831   | 0.847 | 23.89     | 0.00 | 23.89              | 0.1990            |
| 9      | 12.00      |             | 10245996  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10246117  | 121.00 | 726         | 29.28     |     | 29.28           | 0.2420            | 22.1      |     | 0.831   | 0.847 | 24.33     | 0.00 | 24.33              | 0.2011            |
| 10     | 12.10      |             | 10246117  |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 10246241  | 124.00 | 744         | 30.55     |     | 30.55           | 0.2464            | 22.3      |     | 0.831   | 0.847 | 25.38     | 0.00 | 25.38              | 0.2047            |
|        |            |             |           |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            |             |           |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            |             |           |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            |             |           |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            |             |           |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            |             |           |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            |             |           |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            |             |           |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
| Mean   |            |             |           | 124    | 743         |           |     | 29.59           | 0.2388            |           |     |         |       |           |      | 24.606             | 0.1986            |

| % CHANGE:               | kWh    | Avg Load | Litres Consumed | Fuel (Lt) Per kWh | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|-------------------------|--------|----------|-----------------|-------------------|--------------------|-------------------|
| <u>Treated-Baseline</u> |        |          |                 |                   |                    |                   |
| Baseline                | -4.91% | -4.91%   | -9.65%          | -4.98%            | -9.29%             | <b>-4.6%</b>      |

**SPECIFIC FUEL CONSUMPTION GENSET TRIAL**

Customer: Croesus Mining Central Norseman Engine Hrs 32499  
 Genset No: 6 Make & Model Cummins KTA 50  
 Date: 21/04/2004 Amb; Temp; Start deg: C  
 Amb; Temp; Finish deg: C

|             |         |            |
|-------------|---------|------------|
| Fuel Sample | Density | Temp Deg C |
|             | 0.829   | 27         |
| Corrected   | 0.837   | 15         |

**UNTREATED**

| Run No  | Time Start | Period Mins | kWh Meter | kWh      | Avg Load kW | Fuel (Lt) |      | Litres Consumed | Fuel (Lt) Per kWh | Fuel Temp (C) |     | Density |       | Fuel (kg) |      | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|---------|------------|-------------|-----------|----------|-------------|-----------|------|-----------------|-------------------|---------------|-----|---------|-------|-----------|------|--------------------|-------------------|
|         |            |             |           |          |             | In        | Out  |                 |                   | In            | Out | In      | Out   | In        | Out  |                    |                   |
| 1       | 1.30       |             | 4302574   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4302699   | 125.00   | 750         | 31.75     | 0.00 | 31.75           | 0.2540            | 29.2          |     | 0.828   | 0.848 | 26.27     | 0.00 | 26.27              | 0.2102            |
| 2       | 1.40       |             | 4302699   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4302823   | 124.00   | 744         | 31.54     | 0.00 | 31.54           | 0.2544            | 29.4          |     | 0.827   | 0.848 | 26.09     | 0.00 | 26.09              | 0.2104            |
| 3       | 1.50       |             | 4302823   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4302947   | 124.00   | 744         | 31.65     | 0.00 | 31.65           | 0.2552            | 29.7          |     | 0.827   | 0.848 | 26.18     | 0.00 | 26.18              | 0.2111            |
| 4       | 2.00       |             | 4302947   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4303073   | 126.00   | 756         | 31.54     | 0.00 | 31.54           | 0.2503            | 29.9          |     | 0.827   | 0.848 | 26.08     | 0.00 | 26.08              | 0.2070            |
| 5       | 2.10       |             | 4303073   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4303197   | 124.00   | 744         | 31.48     | 0.00 | 31.48           | 0.2539            | 29.4          |     | 0.827   | 0.848 | 26.04     | 0.00 | 26.04              | 0.2100            |
| 6       | 2.20       |             | 4303197   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4303317   | 120.00   | 720         | 30.50     | 0.00 | 30.50           | 0.2542            | 29.3          |     | 0.827   | 0.848 | 25.24     | 0.00 | 25.24              | 0.2103            |
| 7       | 2.30       |             | 4303317   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4303440   | 123.00   | 738         | 31.10     | 0.00 | 31.10           | 0.2528            | 29.0          |     | 0.828   | 0.848 | 25.74     | 0.00 | 25.74              | 0.2093            |
| 8       | 2.40       |             | 4303440   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4303564   | 124.00   | 744         | 30.87     | 0.00 | 30.87           | 0.2490            | 29.5          |     | 0.827   | 0.848 | 25.54     | 0.00 | 25.54              | 0.2059            |
| 9       | 2.50       |             | 4303564   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4303687   | 123.00   | 738         | 31.60     | 0.00 | 31.60           | 0.2569            | 29.3          |     | 0.827   | 0.848 | 26.15     | 0.00 | 26.15              | 0.2126            |
| 10      | 3.00       |             | 4303687   |          |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4303811   | 124.00   | 744         | 31.32     | 0.00 | 31.32           | 0.2526            | 29.0          |     | 0.828   | 0.848 | 25.92     | 0.00 | 25.92              | 0.2090            |
| Mean    |            |             |           | 124      | 742         |           |      | 31.34           | 0.2533            |               |     |         |       |           |      | 25.925             | 0.2096            |
| Std Dev |            |             |           | 1.567021 | 9.402127    |           |      | 0.3966          | 0.0023            |               |     |         |       |           |      | 0.3271             | 0.0019            |
| C.V     |            |             |           | 1.3%     | 1.3%        |           |      | 1.3%            | 0.9%              |               |     |         |       |           |      | 1.3%               | 0.9%              |

**SPECIFIC FUEL CONSUMPTION GENSET TRIAL**

Customer: Croesus Mining Central Norseman Engine Hrs 32499  
 Genset No: 6 Make & Model Cummins KTA 50  
 Date: 18/05/2004 Amb; Temp; Start deg: C 25.6  
 Amb; Temp; Finish deg: C 24.6

|             |         |            |
|-------------|---------|------------|
| Fuel Sample | Density | Temp Deg C |
|             | 0.83    | 23.5       |
| Corrected   | 0.836   | 15         |

**TREATED**

| Run No  | Time Start | Period Mins | kWh Meter | kWh      | Avg Load kW | Fuel (Lt) |     | Litres Consumed | Fuel (Lt) Per kWh | Fuel Temp (C) |     | Density |       | Fuel (kg) |      | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|---------|------------|-------------|-----------|----------|-------------|-----------|-----|-----------------|-------------------|---------------|-----|---------|-------|-----------|------|--------------------|-------------------|
|         |            |             |           |          |             | In        | Out |                 |                   | In            | Out | In      | Out   | In        | Out  |                    |                   |
| 1       |            |             | 4670134   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4670252   | 118.00   | 708         | 28.24     |     | 28.24           | 0.2393            | 23.1          |     | 0.830   | 0.847 | 23.45     | 0.00 | 23.45              | 0.1987            |
| 2       |            |             | 4670252   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4670365   | 113.00   | 678         | 27.96     |     | 27.96           | 0.2474            | 23.0          |     | 0.830   | 0.847 | 23.22     | 0.00 | 23.22              | 0.2054            |
| 3       |            |             | 4670365   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4670478   | 113.00   | 678         | 28.03     |     | 28.03           | 0.2481            | 23.3          |     | 0.830   | 0.847 | 23.27     | 0.00 | 23.27              | 0.2059            |
| 4       |            |             | 4670478   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4670586   | 108.00   | 648         | 27.25     |     | 27.25           | 0.2523            | 23.9          |     | 0.830   | 0.847 | 22.61     | 0.00 | 22.61              | 0.2093            |
| 5       |            |             | 4670586   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4670692   | 106.00   | 636         | 26.76     |     | 26.76           | 0.2525            | 22.7          |     | 0.831   | 0.847 | 22.23     | 0.00 | 22.23              | 0.2097            |
| 6       |            |             | 4670692   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4670799   | 107.00   | 642         | 26.68     |     | 26.68           | 0.2493            | 22.0          |     | 0.831   | 0.847 | 22.17     | 0.00 | 22.17              | 0.2072            |
| 7       |            |             | 4670799   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4670911   | 112.00   | 672         | 26.56     |     | 26.56           | 0.2371            | 21.8          |     | 0.831   | 0.847 | 22.08     | 0.00 | 22.08              | 0.1971            |
| 8       |            |             | 4670911   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4671020   | 109.00   | 654         | 25.82     |     | 25.82           | 0.2369            | 23.2          |     | 0.830   | 0.847 | 21.44     | 0.00 | 21.44              | 0.1967            |
| 9       |            |             | 4671020   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4671131   | 111.00   | 666         | 26.27     |     | 26.27           | 0.2367            | 22.8          |     | 0.831   | 0.847 | 21.82     | 0.00 | 21.82              | 0.1966            |
| 10      |            |             | 4671131   |          |             |           |     |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 4671243   | 112.00   | 672         | 26.59     |     | 26.59           | 0.2374            | 22.9          |     | 0.830   | 0.847 | 22.08     | 0.00 | 22.08              | 0.1971            |
| Mean    |            |             |           | 111      | 665         |           |     | 27.02           | 0.2437            |               |     |         |       |           |      | 22.435             | 0.2024            |
| Std Dev |            |             |           | 3.541814 | 21.25088    |           |     | 0.8183          | 0.0068            |               |     |         |       |           |      | 0.6754             | 0.0056            |

| % CHANGE: | kWh              |          | Avg Load |  | Litres Consumed |        | Fuel (Lt) Per kWh |  | Fuel (kg) Consumed |       | Fuel (kg) Per kWh |  |
|-----------|------------------|----------|----------|--|-----------------|--------|-------------------|--|--------------------|-------|-------------------|--|
|           | Treated-Baseline | Baseline |          |  |                 |        |                   |  |                    |       |                   |  |
|           | -10.35%          | -10.35%  |          |  | -13.78%         | -3.80% |                   |  | -13.46%            | -3.4% |                   |  |

**SPECIFIC FUEL CONSUMPTION GENSSET TRIAL**

Customer: Croesus Mining Central Norseman  
 Genset No: 9  
 Date: 21/04/2004

Engine Hrs 32391  
 Make & Model Cummins KTA 50  
 Amb; Temp; Start deg; C 21.8  
 Amb; Temp; Finish deg; C

| Fuel Sample | Density | Temp Deg C |
|-------------|---------|------------|
|             | 0.829   | 27         |
| Corrected   | 0.837   | 15         |

**UNTREATED**

| Run No  | Time Start | Period Mins | kWh Meter | kWh     | Avg Load kW | Fuel (Lt) |      | Litres Consumed | Fuel (Lt) Per kWh | Fuel Temp (C) |     | Density |       | Fuel (kg) |      | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|---------|------------|-------------|-----------|---------|-------------|-----------|------|-----------------|-------------------|---------------|-----|---------|-------|-----------|------|--------------------|-------------------|
|         |            |             |           |         |             | In        | Out  |                 |                   | In            | Out | In      | Out   | In        | Out  |                    |                   |
| 1       | 10.55      |             | 1366708   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1366840   | 132.00  | 792         | 32.80     | 0.00 | 32.80           | 0.2485            | 24.0          |     | 0.831   | 0.848 | 27.26     | 0.00 | 27.26              | 0.2065            |
| 2       | 11.05      |             | 1366840   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1366969   | 129.00  | 774         | 32.36     | 0.00 | 32.36           | 0.2509            | 24.4          |     | 0.831   | 0.848 | 26.89     | 0.00 | 26.89              | 0.2084            |
| 3       | 11.15      |             | 1366969   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1367101   | 132.00  | 792         | 32.69     | 0.00 | 32.69           | 0.2477            | 25.1          |     | 0.830   | 0.848 | 27.15     | 0.00 | 27.15              | 0.2056            |
| 4       | 11.25      |             | 1367101   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1367233   | 132.00  | 792         | 33.13     | 0.00 | 33.13           | 0.2510            | 25.3          |     | 0.830   | 0.848 | 27.50     | 0.00 | 27.50              | 0.2084            |
| 5       | 11.35      |             | 1367233   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1367364   | 131.00  | 786         | 32.70     | 0.00 | 32.70           | 0.2496            | 25.2          |     | 0.830   | 0.848 | 27.15     | 0.00 | 27.15              | 0.2073            |
| 6       | 11.45      |             | 1367364   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1367497   | 133.00  | 798         | 33.07     | 0.00 | 33.07           | 0.2486            | 25.2          |     | 0.830   | 0.848 | 27.46     | 0.00 | 27.46              | 0.2065            |
| 7       | 11.55      |             | 1367497   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1367630   | 133.00  | 798         | 33.14     | 0.00 | 33.14           | 0.2492            | 25.9          |     | 0.830   | 0.848 | 27.50     | 0.00 | 27.50              | 0.2068            |
| 8       | 12.05      |             | 1367630   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1367766   | 136.00  | 816         | 34.06     | 0.00 | 34.06           | 0.2504            | 26.5          |     | 0.829   | 0.848 | 28.25     | 0.00 | 28.25              | 0.2077            |
| 9       | 12.15      |             | 1367766   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1367899   | 133.00  | 798         | 33.52     | 0.00 | 33.52           | 0.2520            | 26.7          |     | 0.829   | 0.848 | 27.79     | 0.00 | 27.79              | 0.2090            |
| 10      | 12.25      |             | 1367899   |         |             |           |      |                 |                   |               |     |         |       |           |      |                    |                   |
|         |            | 10          | 1368031   | 132.00  | 792         | 32.68     | 0.00 | 32.68           | 0.2476            | 26.8          |     | 0.829   | 0.848 | 27.10     | 0.00 | 27.10              | 0.2053            |
| Mean    |            |             |           | 132     | 794         |           |      | 33.02           | 0.2495            |               |     |         |       |           |      | 27.405             | 0.2071            |
| Std Dev |            |             |           | 66.5294 | 10.60189    |           |      | 0.4912          | 0.0015            |               |     |         |       |           |      | 0.3945             | 0.0012            |
| C.V     |            |             |           | 50.3%   | 1.3%        |           |      | 1.5%            | 0.6%              |               |     |         |       |           |      | 1.4%               | 0.6%              |

**SPECIFIC FUEL CONSUMPTION GENSSET TRIAL**

Customer: Croesus Mining Central Norseman  
 Genset No: 9  
 Date: 18/05/2004

Amb; Temp; Start deg; C 21.4  
 Amb; Temp; Finish deg; C 20

| Fuel Sample | Density | Temp Deg C |
|-------------|---------|------------|
|             | 0.83    | 23.5       |
| Corrected   | 0.836   | 15         |

**TREATED**

| Run No | Time Start | Period Mins | kWh Meter | kWh    | Avg Load kW | Fuel (Lt) |     | Litres Consumed | Fuel (Lt) Per kWh | Fuel Temp |     | Density |       | Fuel (kg) |      | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|--------|------------|-------------|-----------|--------|-------------|-----------|-----|-----------------|-------------------|-----------|-----|---------|-------|-----------|------|--------------------|-------------------|
|        |            |             |           |        |             | In        | Out |                 |                   | In        | Out | In      | Out   | In        | Out  |                    |                   |
| 1      |            |             | 1733959   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1734074   | 115.00 | 690         | 27.74     |     | 27.74           | 0.2412            | 22.4      |     | 0.831   | 0.847 | 23.05     | 0.00 | 23.05              | 0.2004            |
| 2      |            |             | 1734074   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1734188   | 114.00 | 684         | 27.09     |     | 27.09           | 0.2376            | 21.8      |     | 0.831   | 0.847 | 22.52     | 0.00 | 22.52              | 0.1975            |
| 3      |            |             | 1734188   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1734299   | 111.00 | 666         | 26.81     |     | 26.81           | 0.2415            | 21.4      |     | 0.832   | 0.847 | 22.29     | 0.00 | 22.29              | 0.2008            |
| 4      |            |             | 1734299   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1734409   | 110.00 | 660         | 26.60     |     | 26.60           | 0.2418            | 21.1      |     | 0.832   | 0.847 | 22.12     | 0.00 | 22.12              | 0.2011            |
| 5      |            |             | 1734409   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1734517   | 108.00 | 648         | 26.10     |     | 26.10           | 0.2417            | 20.9      |     | 0.832   | 0.847 | 21.71     | 0.00 | 21.71              | 0.2010            |
| 6      |            |             | 1734517   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1734630   | 113.00 | 678         | 27.14     |     | 27.14           | 0.2402            | 20.6      |     | 0.832   | 0.847 | 22.58     | 0.00 | 22.58              | 0.1998            |
| 7      |            |             | 1734630   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1734743   | 113.00 | 678         | 27.47     |     | 27.47           | 0.2431            | 20.3      |     | 0.832   | 0.847 | 22.86     | 0.00 | 22.86              | 0.2023            |
| 8      |            |             | 1734743   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1734859   | 116.00 | 696         | 28.30     |     | 28.30           | 0.2440            | 21.4      |     | 0.832   | 0.847 | 23.53     | 0.00 | 23.53              | 0.2029            |
| 9      |            |             | 1734859   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1734968   | 109.00 | 654         | 26.21     |     | 26.21           | 0.2405            | 20.3      |     | 0.832   | 0.847 | 21.81     | 0.00 | 21.81              | 0.2001            |
| 10     |            |             | 1734968   |        |             |           |     |                 |                   |           |     |         |       |           |      |                    |                   |
|        |            | 10          | 1735074   | 106.00 | 636         | 25.60     |     | 25.60           | 0.2415            | 20.4      |     | 0.832   | 0.847 | 21.30     | 0.00 | 21.30              | 0.2010            |
| Mean   |            |             |           | 112    | 669         |           |     | 26.91           | 0.2413            |           |     |         |       |           |      | 22.378             | 0.2007            |

| % CHANGE:       | kWh | Avg Load | Litres Consumed | Fuel (Lt) Per kWh | Fuel (kg) Consumed | Fuel (kg) Per kWh |
|-----------------|-----|----------|-----------------|-------------------|--------------------|-------------------|
|                 |     |          |                 |                   |                    |                   |
| <b>Baseline</b> |     |          |                 |                   |                    |                   |

*Appendix “D”*

**Specific Fuel Consumption Data Sheets**

*Appendix “E”*

**Carbon Balance Data Sheets**