APPENDIX D

HUDSON RIVER PCB STATISTICS

Appendix D

The following statistical analysis was done to evaluate total PCB concentration data for Hudson River surface water samples collected at the boat launch from September 2005 to March 2011. The data were grouped into three time periods: pre-construction (PC), during construction (DC), and operational(OP). The pre-construction period is defined as September 2005 to August, 2007. The construction period is defined as September 2007 to May 2009 and the operational period is from May 2009 to March 2011. The method of analysis included tests for normality, analysis of variance, and non-parametric analyses to test equality of medians. The results of the analysis are attached.

The results indicate that total PCB concentration data for all three time periods are not normally distributed. Non-parametric analysis of median equality indicate that during construction, the median total PCB concentration was greater than median total PCB concentration during the preconstruction and operational time periods. In addition, the median total PCB concentration during the operational time period is comparable to the median total PCB concentration during the pre-construction time period.

5/20/2011 7:53:49 AM

```
Welcome to Minitab, press F1 for help.
```

Descriptive Statistics: Tot PCB by Period

Variable	Period	N	Mean	Median	TrMean	StDev
Tot PCB	DC	87	40.21	23.60	33.92	44.95
	OP	98	25.39	12.70	19.52	34.15
	PC	104	20.65	15.75	17.76	18.49

Variable	Period	SE Mean	Minimum	Maximum	Q1	Q3
Tot PCB	DC	4.82	9.34	302.00	15.70	40.70
	OP	3.45	7.14	229.00	8.73	24.80
	PC	1.81	9.34	128.00	9.34	23.05

```
Executing from file: C:\Program Files\MTBWIN\MACROS\Describe.MAC
```

Descriptive Statistics Graph: Tot PCB by Period

Descriptive Statistics Graph: Tot PCB by Period

Descriptive Statistics Graph: Tot PCB by Period

Descriptive Statistics: Tot PCB* by Period

Variable	Period	N	N*	Mean	Median	TrMean
Tot PCB*	DC	85	2	35.47	23.40	31.20
	OP	95	3	20.35	12.30	17.90
	PC	104	0	20.65	15.75	17.76

Variable	Period	StDev	SE Mean	Minimum	Maximum	Q1
Tot PCB*	DC	31.48	3.41	9.34	149.00	15.65
	OP	17.90	1.84	7.14	99.10	8.66
	PC	18.49	1.81	9.34	128.00	9.34

Variable	Period	Q3
Tot PCB*	DC	40.60
	OP	23.70
	PC	23.05

```
Executing from file: C:\Program Files\MTBWIN\MACROS\Describe.MAC
```

Descriptive Statistics Graph: Tot PCB* by Period

Descriptive Statistics Graph: Tot PCB* by Period

Descriptive Statistics Graph: Tot PCB* by Period

```
Macro is running ... please wait
```

Results for: Worksheet 1

Test for Equal Variances

```
Response    Tot PCB*
Factors     Period
ConfLvl     95.0000

Bonferroni confidence intervals for standard deviations

  Lower     Sigma     Upper     N  Factor Levels

 26.5407   31.4768   38.5021     85  DC
 15.2249   17.9009   21.6359     95  OP
 15.8342   18.4924   22.1470    104  PC


Bartlett's Test (normal distribution)


Test Statistic: 39.011
P-Value       :  0.000


Levene's Test (any continuous distribution)


Test Statistic: 5.543
P-Value       : 0.004
```

Test for Equal Variances: Tot PCB* vs Period

Kruskal-Wallis Test: Tot PCB* versus Period

```
  284 cases were used
    5 cases contained missing values
Kruskal-Wallis Test on Tot PCB*

Period      N    Median    Ave Rank         Z
DC         85     23.40       186.1      5.84
OP         95     12.30       116.4     -3.80
PC        104     15.75       130.7     -1.84
Overall   284                 142.5

H = 35.66  DF = 2  P = 0.000
H = 35.72  DF = 2  P = 0.000 (adjusted for ties)


Macro is running ... please wait
```

Results for: Worksheet 2

Test for Equal Variances

```
Response    Tot PCB*
Factors     Period
ConfLvl     95.0000

Bonferroni confidence intervals for standard deviations

  Lower     Sigma     Upper     N  Factor Levels

 15.3779   17.9009   21.3664     95  OP
 15.9869   18.4924   21.8849    104  PC
```

F-Test (normal distribution)

Test Statistic: 0.937
P-Value : 0.750

Levene's Test (any continuous distribution)

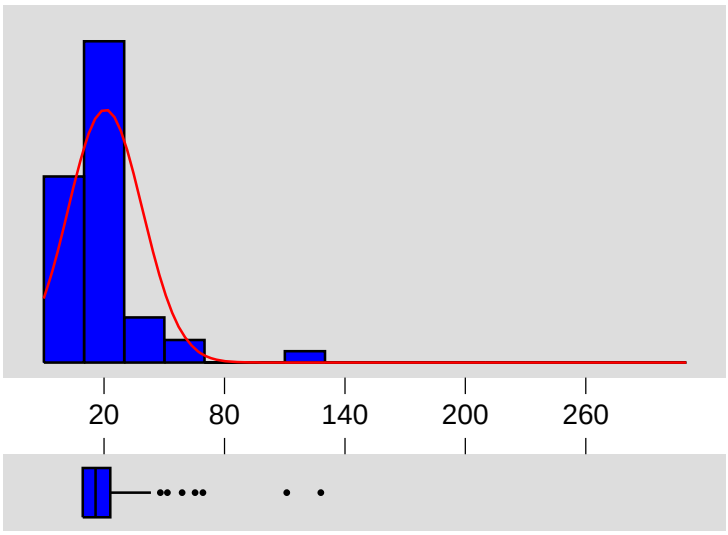
Test Statistic: 0.287
P-Value : 0.593

Test for Equal Variances: Tot PCB* vs Period

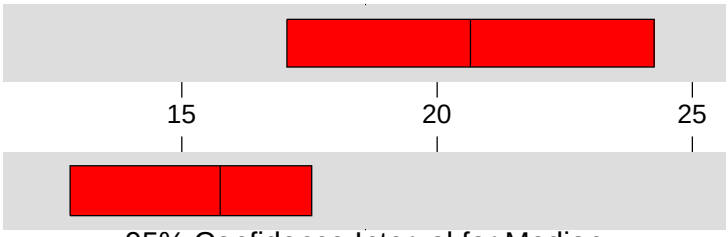
Mann-Whitney Test and CI: PC Total PCB*, OP Total PCB*

```
PC Total   N =  92     Median =      15.750
OP Total   N =  95     Median =      12.300
Point estimate for ETA1-ETA2 is       1.525
95.0 Percent CI for ETA1-ETA2 is (-0.611,2.541)
W = 9180.0
Test of ETA1 = ETA2  vs  ETA1 not = ETA2 is significant at 0.1509
The test is significant at 0.1504 (adjusted for ties)

Cannot reject at alpha = 0.05

Saving file as: C:\Projects\GeoTrans\GE Hudson Falls\TDCS\Phase 3 Report\Hudson R
iver Data Analysis\statistics\BOATLAUNCH_Sept_2005_to_Mar_2011.MPJ
* NOTE  * Existing file replaced.
```

Descriptive Statistics



95% Confidence Interval for Mu



95% Confidence Interval for Median

Variable: Tot PCB

Period: PC

Anderson-Darling Normality Test

A-Squared:	11.110
P-Value:	0.000

Mean	20.6546
StDev	18.4924
Variance	341.967
Skewness	3.54318
Kurtosis	15.7309
N	104

Minimum	9.340
1st Quartile	9.340
Median	15.750
3rd Quartile	23.050
Maximum	128.000

95% Confidence Interval for Mu

17.058	24.251

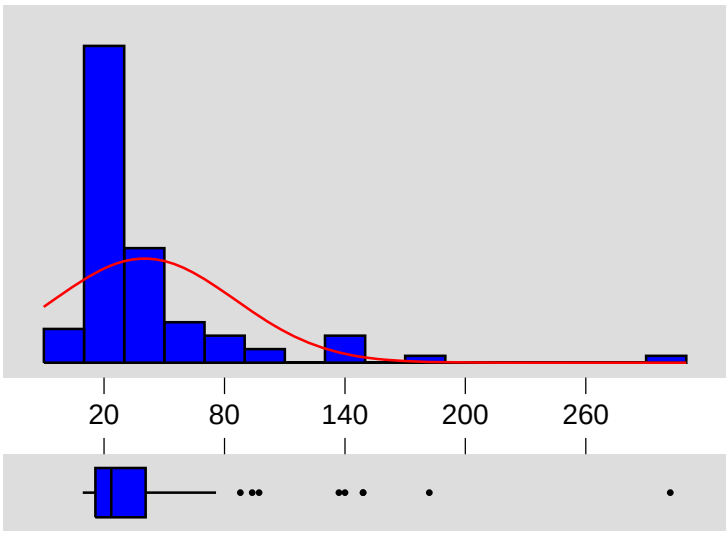
95% Confidence Interval for Sigma

16.275	21.414

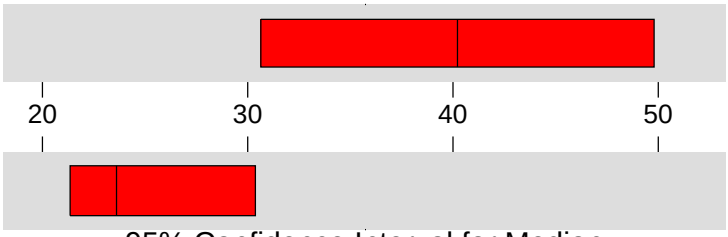
95% Confidence Interval for Median

12.811	17.544

Descriptive Statistics



95% Confidence Interval for Mu



95% Confidence Interval for Median

Variable: Tot PCB

Period: DC

Anderson-Darling Normality Test

A-Squared:	9.965
P-Value:	0.000

Mean	40.2149
StDev	44.9518
Variance	2020.66
Skewness	3.30286
Kurtosis	14.0366
N	87

Minimum	9.340
1st Quartile	15.700
Median	23.600
3rd Quartile	40.700
Maximum	302.000

95% Confidence Interval for Mu

30.634	49.795

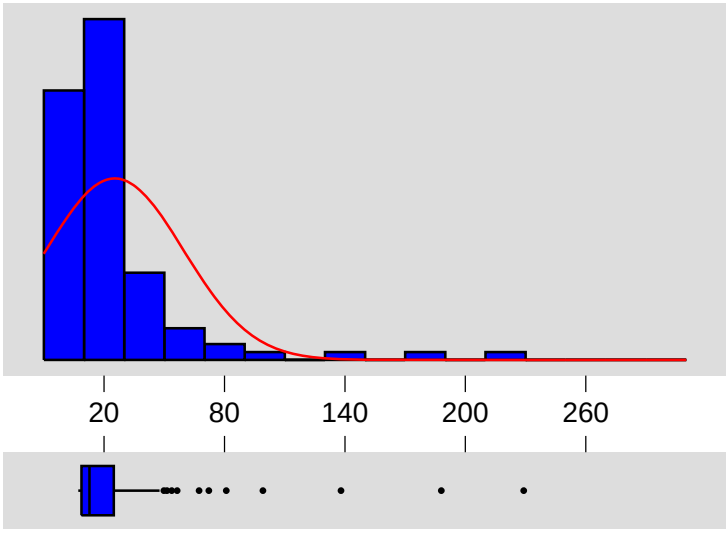
95% Confidence Interval for Sigma

39.121	52.840

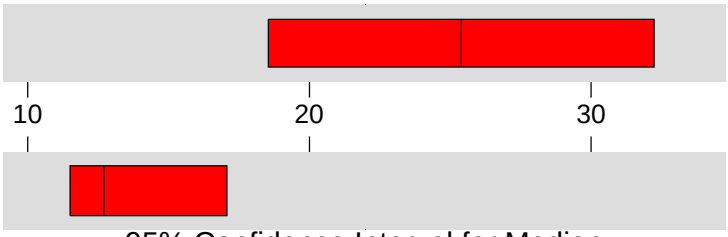
95% Confidence Interval for Median

21.343	30.367

Descriptive Statistics



95% Confidence Interval for Mu



95% Confidence Interval for Median

Variable: Tot PCB

Period: OP

Anderson-Darling Normality Test

A-Squared:	13.777
P-Value:	0.000

Mean	25.3900
StDev	34.1487
Variance	1166.14
Skewness	3.91553
Kurtosis	18.1365
N	98

Minimum	7.140
1st Quartile	8.728
Median	12.700
3rd Quartile	24.800
Maximum	229.000

95% Confidence Interval for Mu

18.544	32.236

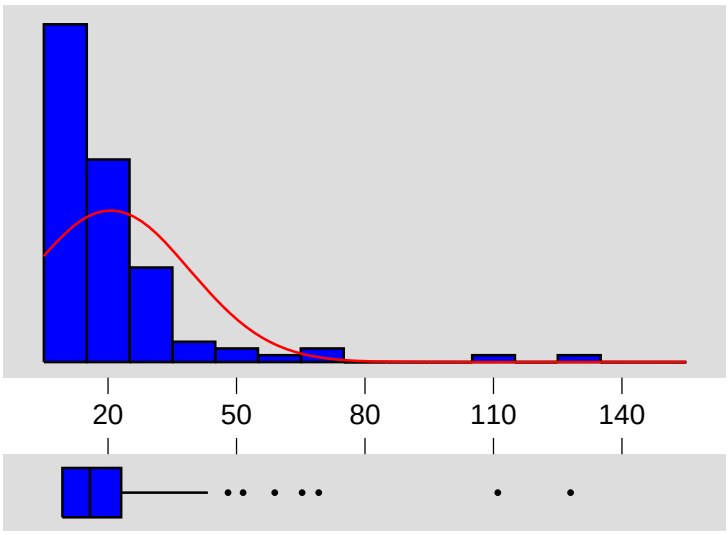
95% Confidence Interval for Sigma

29.945	39.735

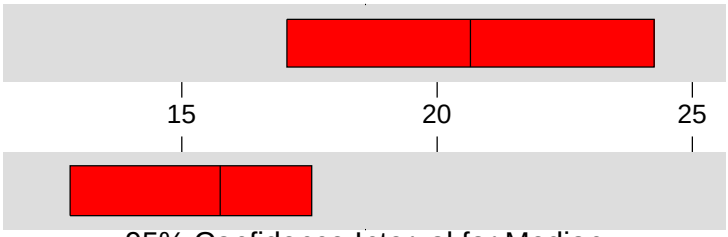
95% Confidence Interval for Median

11.500	17.068

Descriptive Statistics



95% Confidence Interval for Mu



95% Confidence Interval for Median

Variable: Tot PCB*

Period: PC

Anderson-Darling Normality Test

A-Squared:	11.110
P-Value:	0.000

Mean	20.6546
StDev	18.4924
Variance	341.967
Skewness	3.54318
Kurtosis	15.7309
N	104

Minimum	9.340
1st Quartile	9.340
Median	15.750
3rd Quartile	23.050
Maximum	128.000

95% Confidence Interval for Mu

17.058	24.251

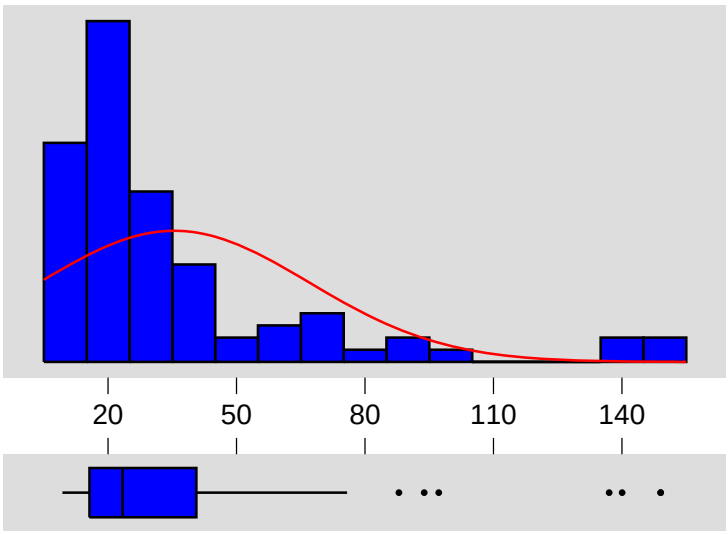
95% Confidence Interval for Sigma

16.275	21.414

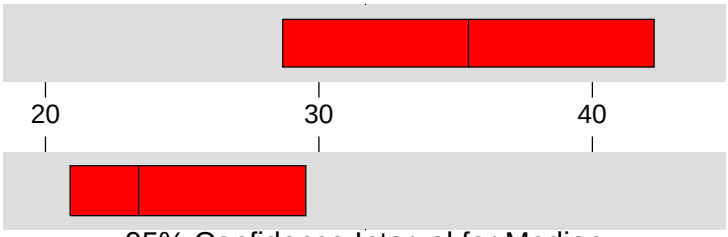
95% Confidence Interval for Median

12.811	17.544

Descriptive Statistics



95% Confidence Interval for Mu



95% Confidence Interval for Median

Variable: Tot PCB*

Period: DC

Anderson-Darling Normality Test

A-Squared:	7.482
P-Value:	0.000

Mean	35.4671
StDev	31.4768
Variance	990.791
Skewness	2.19354
Kurtosis	4.82089
N	85

Minimum	9.340
1st Quartile	15.650
Median	23.400
3rd Quartile	40.600
Maximum	149.000

95% Confidence Interval for Mu

28.678	42.256

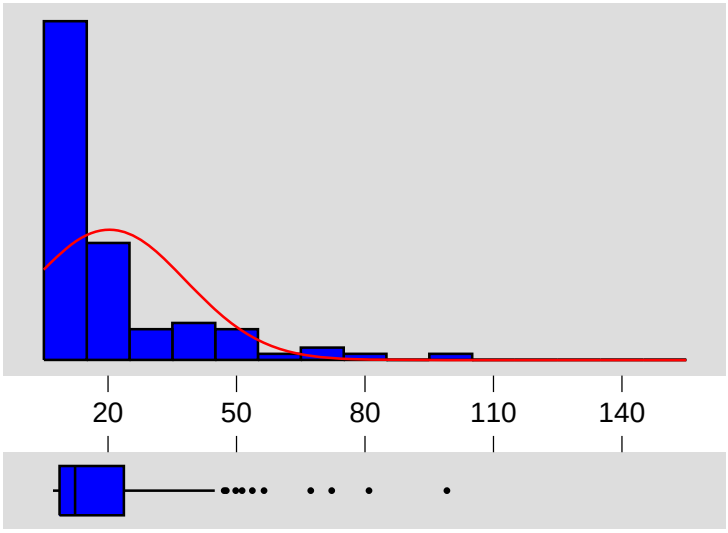
95% Confidence Interval for Sigma

27.352	37.077

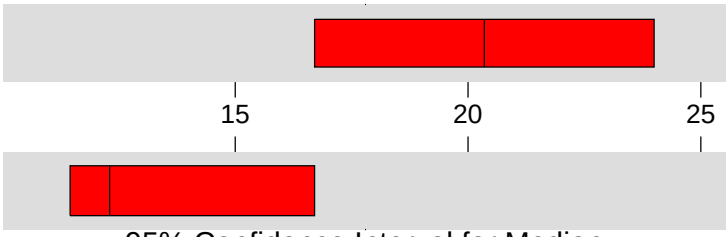
95% Confidence Interval for Median

20.897	29.514

Descriptive Statistics



95% Confidence Interval for Mu



95% Confidence Interval for Median

Variable: Tot PCB*

Period: OP

Anderson-Darling Normality Test

A-Squared:	8.591
P-Value:	0.000

Mean	20.3497
StDev	17.9009
Variance	320.443
Skewness	2.11196
Kurtosis	4.82540
N	95

Minimum	7.1400
1st Quartile	8.6600
Median	12.3000
3rd Quartile	23.7000
Maximum	99.1000

95% Confidence Interval for Mu

16.7031	23.9963

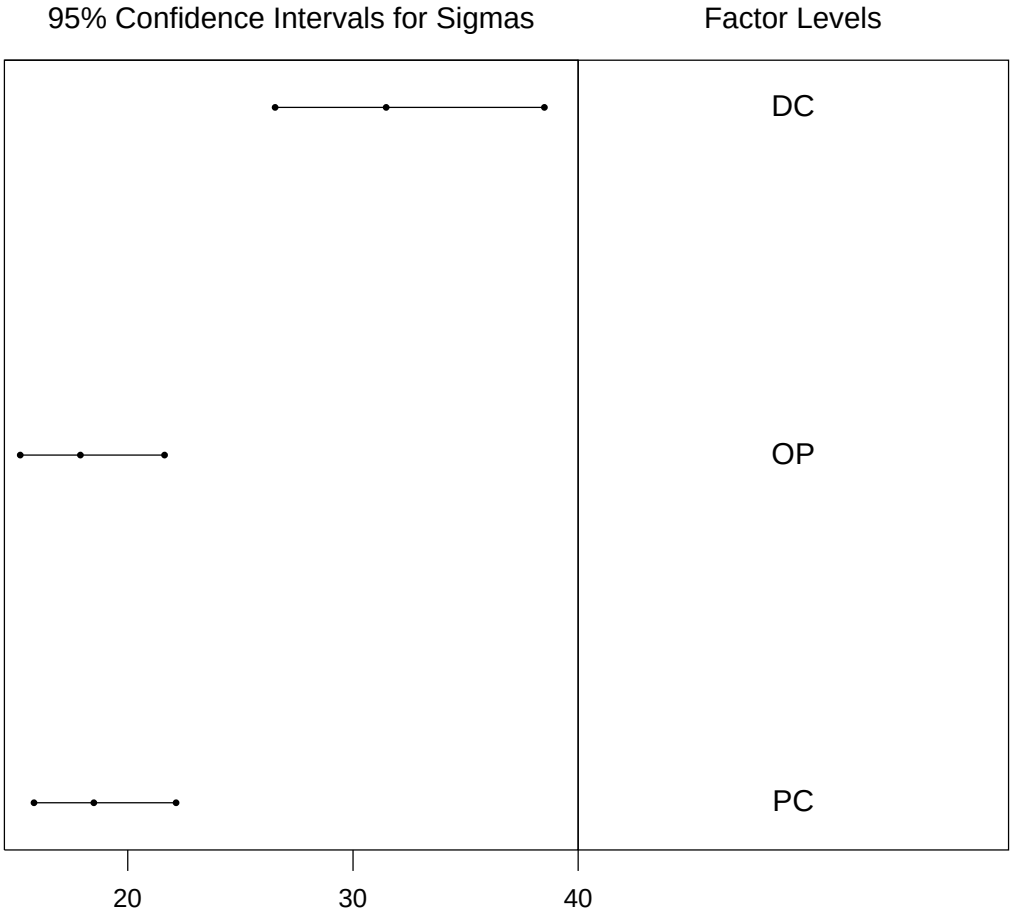
95% Confidence Interval for Sigma

15.6672	20.8834

95% Confidence Interval for Median

11.4499	16.7003

Hudson River Total PCB - Boat Launch



Bartlett's Test

Test Statistic: 39.011

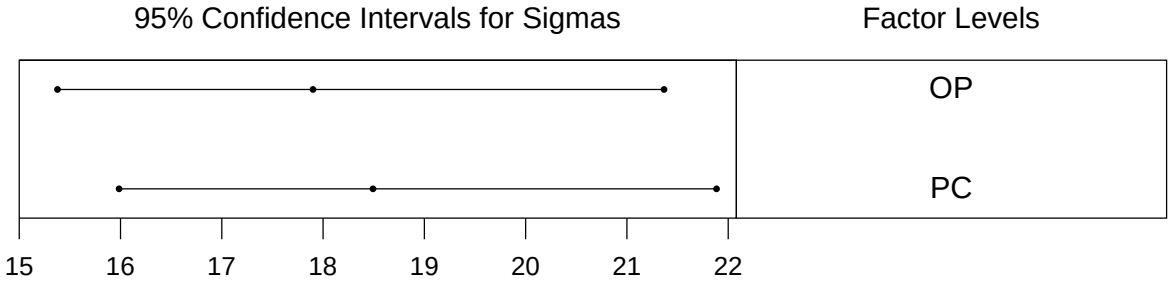
P-Value : 0.000

Levene's Test

Test Statistic: 5.543

P-Value : 0.004

Hudson River Total PCB - Boat Launch



F-Test
Test Statistic: 0.937
P-Value : 0.750

Levene's Test
Test Statistic: 0.287
P-Value : 0.593