J-U-B ENGINEERS, Inc.

N. W. Crossing Office Building, Suite 201
2810 West Clearwater Avenue
Kennewick, Washington 99336
Telephone: (509) 783-2144

Q-4
1.2

June 29, 1984

July 9 sampling results
Well 1 .01 mg/l
2 .03 mg/l
Control <.01 mg/l

phenol? resample

Mr. Larry Peterson
Washington State Dept.
of Ecology
E. 103 Indiana
Spokane, WA 99207

Re: Pasco Sanitary Landfill Groundwater Monitoring

Dear Mr. Peterson:

Groundwater monitoring was conducted for the sixth time in March 1984. Three additional parameters were added to the list of species analyzed over previous monitoring efforts. These three additional parameters were sodium, sulfate and total organic carbon. These parameters were measured because they would be additional indicators of potential groundwater contamination. The detailed results of the monitoring effort are provided in Attachment 1 and Attachment 2. Attachment 1 is a set of tables showing all measurements conducted over time at each of the individual monitoring well locations. Attachment 2 is the statistical analysis comparing the concentration of each of the parameters at the control well to concentrations of like parameters at down-gradient wells. The major conclusions relative to the 1984 work are as follows:

Jan 82
Apr 82
Sep 82
Dec 82
Mar 83
Mar 84

Iron is the only parameter present in concentrations in excess of the EPA maximum allowable concentrations. Average iron concentrations at the control well, well #1, #3 and #4 remain above the EPA maximum allowable concentration of 0.3 mg/l. It cannot be concluded that these iron concentrations are from the fill or waste disposal activities since iron concentrations are highest at the up-gradient control well. These concentrations are felt to be reflective of soil conditions in the area.

Iron and total dissolved solids were the only parameters found in significantly different concentrations at the down-gradient wells than at the up-gradient control well. Manganese concentrations were significantly lower at down-gradient wells #3 and #4 than manganese concentrations measured at the

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control well. Again, fill activities are not considered to be responsible for any alterations in the manganese concentrations. Fill activities may be responsible for a statistically higher concentration of total dissolved solids at well #4 than at the control well. While the concentration at this location is somewhat elevated the average concentration at well #4 (482 mg/l) is below the EPA allowable maximum concentration of 500 mg/l.

The phenol concentrations measured during this sampling were markedly higher at the control well, #1 and well #2 than had been observed on the five previous surveys. Concentrations at these wells were approximately 0.5 mg/l, while previous readings were all at least an order of magnitude lower. These wells are being resampled and the samples will be reanalyzed. We will inform you of these results.

If you have any questions concerning this information, please call me at 586-6471.

Sincerely,

John A. Zillich
Waste Management and
Environmental Specialist

JAZ:vl

Attachments

cc: Larry Kamberg, Benton-Franklin Health Dept.
Bob Boothe, Franklin County Planner

ATTACHMENT 1

GROUNDWATER QUALITY AT INDIVIDUAL MONITORING WELLS AT THE PASCO SANITARY LANDFILL

SITE: PASCO SANITARY LANDFILL
LOCATION: CONTROL WELL

DATE	Fe	Mn	Na	Cl	SO4	NO3	Phenol	TOX	TOC	pH	TDS	Sp Cond
JAN 82	0.49	0.04				5.22	<0.05	0.02		7.80	394	
APR 82		0.02				5.10	.0013	0.09		7.95	414	570
SEP 82	0.40	0.01				4.10	<0.0005	0.11		7.90	416	610
DEC 82	2.10	0.11				4.83	<0.001	0.06		7.80	454	555
MAR 83	0.39	0.01		26.00		5.37	.0025	<0.001		7.70	412	620
MAR 84	0.30	0.02	35.00	26.00	82.00	5.59	.45	0.03	2.40		420	600
AVERAGE	0.74	0.04	35.00	26.40	82.00	5.04	0.15	0.06	2.40	7.81	420	591
E.P.A. MAXIMUM ALLOWABLE CONC.	0.30	0.05	----	250.00	250.00	10.00	----	----	----	----	500	----
SUM	3.68	0.21	35.00	52.80	82.00	30.25	0.45	0.31	2.40	39.05	2520	2955
SUM OF SQ	5.05	0.01	1225	1394	6724	153.86	0.20	0.03	5.76	305.00	1060392.	1749425.
# OF OBS	5	6	1	2	1	6	3	5	1	5	6	5
MEAN	0.74	0.04	35.00	26.40	82.00	5.04	0.15	0.06	2.40	7.81	420	591
VARIANCE	0.59	0.00	ERROR	0.32	ERROR	0.27	0.07	0.00	ERROR	0.01	398	755
STD DEV	0.77	0.04	ERROR	0.57	ERROR	0.52	0.26	0.04	ERROR	0.07	20	27

SITE: PASCO SANITARY LANDFILL
LOCATION: WELL NUMBER 01

DATE	Fe	Mn	Na	Cl	SO4	NO3	Phenol	TOX	TOC	pH	TDS	Sp Cond
JAN 82	1.60	0.11				4.79	<0.05	0.01		7.80	396	
APR 82		0.01				5.15	.0022			7.85	422	570
SEP 82	0.16	0.01				4.76	.013			8.00	440	620
DEC 82	0.58	0.04				7.95	.002	0.05		8.10	440	515
MAR 83	0.19	<0.01		28.90		5.06	<0.001	0.09		7.60	412	620
MAR 84	0.10	0.01	35.00	27.70	82.00	5.32	.57	0.03	2.50		422	600
AVERAGE	0.53	0.04	35.00	28.30	82.00	5.51	0.15	0.05	2.50	7.87	422	585
E.P.A. MAXIMUM ALLOWABLE CONC.	0.30	0.05	----	250.00	250.00	10.00	----	----	----	----	500	----
SUM	2.63	0.18	35.00	56.60	82.00	33.03	0.59	0.18	2.50	39.35	2532	2925
SUM OF SQ	2.77	0.01	1225	1602	6724	189.23	0.33	0.01	6.25	309.83	1069928.	1718925.
# OF OBS	5	5	1	2	1	6	4	4	1	5	6	5
MEAN	0.53	0.04	35.00	28.30	82.00	5.51	0.15	0.05	2.50	7.87	422	585
VARIANCE	0.40	0.00	ERROR	0.72	ERROR	1.46	0.08	0.00	ERROR	0.04	285	1950
STD DEV	0.63	0.04	ERROR	0.85	ERROR	1.22	0.28	0.03	ERROR	0.19	17	44

SITE: PASCO SANITARY LANDFILL
LOCATION: WELL NUMBER 2

DATE	Fe	Mn	Na	Cl	SO4	NO3	Phenol	TOX	TOC	pH	TDS	Sp Cond
JAN 82	0.61	0.07				4.12	.1	0.40		7.98	414	
APR 82		0.02				4.31	.0032	0.01		7.70	430	590
SEP 82	0.13	0.03				3.70	.0295	0.14		7.85	452	625
DEC 82	0.19	<0.01				4.25	.008	0.53		7.90	444	515
MAR 83	0.09	<0.01		26.40		5.06	<0.001	0.03		7.60	422	620
MAR 84	0.20	0.02	35.00	27.70	84.00	5.14	.45	0.04	2.40		416	600
AVERAGE	0.24	0.04	35.00	27.05	84.00	4.43	0.12	0.20	2.40	7.79	429.6667	590
E.P.A. MAXIMUM ALLOWABLE CONC.	0.30	0.05	----	250.00	250.00	10.00	----	----	----	----	500	----
SUM	1.21	0.14	35.00	54.10	84.00	26.56	0.59	1.20	2.40	38.95	2576	2950
SUM OF SQ	0.47	0.01	1225	1464	7056	119.33	0.21	0.52	6.76	303.49	1103876.	1748350.
# OF OBS	5	4	1	2	1	6	5	6	1	5	6	5
MEAN	0.24	0.04	35.00	27.05	84.00	4.43	0.12	0.20	2.40	7.79	429.6667	590
VARIANCE	0.04	0.00	ERROR	0.04	ERROR	0.32	0.04	0.04	ERROR	0.02	239	1963
STD DEV	0.21	0.02	ERROR	0.92	ERROR	0.56	0.19	0.24	ERROR	0.13	15	44

SITE: PASCO SANITARY LANDFILL
LOCATION: WELL NUMBER 3

DATE	Fe	Mn	Na	Cl	SO4	NO3	Phenol	TOX	TOC	pH	TDS	Sp Cond
JAN 82	0.35	<0.01				4.90	<0.05	0.00		7.95	394	
APR 82		<0.01				5.20	.0022			7.90	352	570
SEP 82	0.75	0.02				4.10	.0155	0.16		8.00	428	620
DEC 82	0.16	<0.01				4.50	<0.001	0.56		7.90	416	555
MAR 83	0.15	<0.01		25.60		5.10	.003	0.01		7.70	404	610
MAR 84	0.60	0.03	35.00	26.30	84.00	5.40	<0.01	0.03	3.20		406	590
AVERAGE	0.40	0.03	35.00	26.20	84.00	4.87	0.01	0.15	3.20	7.89	400	589
E.P.A. MAXIMUM ALLOWABLE CONC.	0.30	0.05	----	250.00	250.00	10.00	----	----	----	----	500	----
SUM	2.01	0.05	35.00	52.40	84.00	29.20	0.02	0.76	3.20	39.45	2400	2945
SUM OF SQ	1.09	0.00	1225	1374	7056	143.28	0.00	0.34	10.24	311.31	963432.0	1737525
# OF OBS	5	2	1	2	1	6	3	5	1	5	6	5
MEAN	0.40	0.03	35.00	26.20	84.00	4.87	0.01	0.15	3.20	7.89	400	589
VARIANCE	0.07	0.00	ERROR	0.72	ERROR	0.23	0.00	0.06	ERROR	0.01	486	738
STD DEV	0.27	0.01	ERROR	0.85	ERROR	0.48	0.01	0.24	ERROR	0.11	26	27

SITE: PASCO SANITARY LANDFILL
LOCATION: WELL NUMBER 4

DATE	Fe	Mn	Na	Cl	SO4	NO3	Phenol	TOX	TOC	pH	TDS	Sp Cond
JAN 82												
APR 82												
SEP 82						4.45	<0.001	0.05		7.00	478	555
DEC 82	0.70	0.02				4.60	.004	0.07		7.20	560	890
MAR 83	0.66	0.02		23.00		5.3		.012		7.8	440	600
JUN 83	<0.05	<0.01				4.99	<0.01	0.03	2.40		443	660
MAR 84	0.10	0.01	36.00	25.50	84.00	4.86	0.00	0.04	2.40	7.60	481.5	676.25
AVERAGE	0.49	0.02	36.00	26.75	84.00							
E.P.A. MAXIMUM ALLOWABLE CONC.	0.30	0.05	----	250.00	250.00	10.00	----	----	----	----	500	----
SUM	1.46	0.05	36.00	53.50	84.00	19.42	0.00	0.16	2.40	22.80	1926	2705
SUM OF SQ	0.94	0.00	1296.00	1434.25	7056.00	94.69	0.00	0.01	5.76	173.52	936388.0	1895725.
# OF OBS	3	3	1	2	1	4	1	4	1	3	4	4
MEAN	0.49	0.02	36.00	26.75	84.00	4.86	0.00	0.04	2.40	7.60	481.5	676.25
VARIANCE	0.11	0.00	ERROR	3.12	ERROR	0.14	ERROR	0.00	ERROR	0.12	3006	22156
STD DEV	0.34	0.01	ERROR	1.77	ERROR	0.37	ERROR	0.03	ERROR	0.35	55	149

ATTACHMENT 2

STATISTICAL ANALYSIS COMPARING CHEMICAL PARAMETERS
AT THE UP-GRADIENT CONTROL WELL
TO DOWN-GRADIENT WELLS AT THE
PASCO SANITARY LANDFILL

```
GROUP A =CONTROL  IRON                    |     null hypothesis is
          # Of Obs=      5.00             |     that group A = group B
          Variance=      0.59             |
          Mean    =      0.74             |reject (calc > table) ?    FALSE
                                          |reject (calc < table) ?    FALSE
GROUP B =WELL #1  IRON                    |
          # Of Obs=      5.00             |     if any "TRUE" values appear
          Variance=      0.40             |     then group A does NOT equal
          Mean    =      0.53             |     group B statistically
   ----------------------------------------
   pooled estimator =    0.50             |     if both conditions appear
   degree of freedom=    8.00             |     "FALSE",then you cannot
       t values from tables =      2.31   |     say that they are
       (two tailed t test)  =     -2.31   |     statistically different
       (1/n1)+(1/n2)=    0.40             |
   sqrt(1/n1)+(1/n2)=    0.63             |
   sqrt(pooled est.)=    0.70             |
   ----------------------------------------
        calculated "t" value =     0.47   |
   ----------------------------------------
```

```
GROUP A =CONTROL  IRON                    |     null hypothesis is
          # Of Obs=      5.00             |     that group A = group B
          Variance=      0.59             |
          Mean    =      0.74             |reject (calc > table) ?    FALSE
                                          |reject (calc < table) ?    FALSE
GROUP B =WELL #2  IRON                    |
          # Of Obs=      5.00             |     if any "TRUE" values appear
          Variance=      0.04             |     then group A does NOT equal
          Mean    =      0.24             |     group B statistically
   ----------------------------------------
   pooled estimator =    0.32             |     if both conditions appear
   degree of freedom=    8.00             |     "FALSE",then you cannot
       t values from tables =      2.31   |     say that they are
       (two tailed t test)  =     -2.31   |     statistically different
       (1/n1)+(1/n2)=    0.40             |
   sqrt(1/n1)+(1/n2)=    0.63             |
   sqrt(pooled est.)=    0.56             |
   ----------------------------------------
        calculated "t" value =     1.41   |
   ----------------------------------------
```

```
GROUP A =CONTROL  IRON                    |     null hypothesis is
          # Of Obs=      5.00             |     that group A = group B
          Variance=      0.59             |
          Mean    =      0.74             |reject (calc > table) ?    FALSE
                                          |reject (calc < table) ?    FALSE
GROUP B =WELL #3  IRON                    |
          # Of Obs=      5.00             |     if any "TRUE" values appear
          Variance=      0.07             |     then group A does NOT equal
          Mean    =      0.40             |     group B statistically
   ----------------------------------------
   pooled estimator =    0.33             |     if both conditions appear
   degree of freedom=    8.00             |     "FALSE",then you cannot
       t values from tables =      2.31   |     say that they are
       (two tailed t test)  =     -2.31   |     statistically different
       (1/n1)+(1/n2)=    0.40             |
   sqrt(1/n1)+(1/n2)=    0.63             |
   sqrt(pooled est.)=    0.57             |
   ----------------------------------------
        calculated "t" value =     0.94   |
   ----------------------------------------
```

```
GROUP A =CONTROL  IRON                    |     null hypothesis is
          # Of Obs=      5.00             |     that group A = group B
          Variance=      0.59             |
          Mean    =      0.74             |reject (calc > table) ?    FALSE
                                          |reject (calc < table) ?    FALSE
GROUP B =WELL #4  IRON                    |
          # Of Obs=      3.00             |     if any "TRUE" values appear
          Variance=      0.11             |     then group A does NOT equal
          Mean    =      0.49             |     group B statistically
   ----------------------------------------
   pooled estimator =    0.43             |     if both conditions appear
   degree of freedom=    6.00             |     "FALSE",then you cannot
       t values from tables =      2.45   |     say that they are
       (two tailed t test)  =     -2.45   |     statistically different
       (1/n1)+(1/n2)=    0.53             |
   sqrt(1/n1)+(1/n2)=    0.73             |
   sqrt(pooled est.)=    0.66             |
   ----------------------------------------
        calculated "t" value =     0.52   |
   ----------------------------------------
```

```
GROUP A =CONTROL  MANGANESE                  |     null hypothesis is
          # Of Obs=      6.00                 |     that group A = group B
          Variance=      0.00                 |
          Mean    =      0.04                 |reject (calc > table) ?    FALSE
                                              |reject (calc < table) ?    FALSE
GROUP B =WELL #1  MANGANESE                   |
          # Of Obs=      5.00                 |     if any "TRUE" values appear
          Variance=      0.00                 |     then group A does NOT equal
          Mean    =      0.04                 |     group B statistically
-----------------------------------------------
pooled estimator =      0.00                 |     if both conditions appear
degree of freedom=      9.00                 |     "FALSE",then you cannot
    t values from tables =        2.26       |     say that they are
    (two tailed t test)  =       -2.26       |     statistically different
    (1/n1)+(1/n2)=      0.37                 |
sqrt(1/n1)+(1/n2)=      0.61                 |
sqrt(pooled est.)=      0.01                 |
-----------------------------------------------
     calculated "t" value =       0.00       |
-----------------------------------------------
```

```
GROUP A =CONTROL  MANGANESE                  |     null hypothesis is
          # Of Obs=      6.00                 |     that group A = group B
          Variance=      0.00                 |
          Mean    =      0.04                 |reject (calc > table) ?    FALSE
                                              |reject (calc < table) ?    FALSE
GROUP B =WELL #2  MANGANESE                   |
          # Of Obs=      4.00                 |     if any "TRUE" values appear
          Variance=      0.00                 |     then group A does NOT equal
          Mean    =      0.04                 |     group B statistically
-----------------------------------------------
pooled estimator =      0.00                 |     if both conditions appear
degree of freedom=      8.00                 |     "FALSE",then you cannot
    t values from tables =        2.31       |     say that they are
    (two tailed t test)  =       -2.31       |     statistically different
    (1/n1)+(1/n2)=      0.42                 |
sqrt(1/n1)+(1/n2)=      0.65                 |
sqrt(pooled est.)=      0.01                 |
-----------------------------------------------
     calculated "t" value =       0.00       |
-----------------------------------------------
```

```
GROUP A =CONTROL  MANGANESE                  |     null hypothesis is
          # Of Obs=      6.00                 |     that group A = group B
          Variance=      0.00                 |
          Mean    =      0.04                 |reject (calc > table) ?     TRUE
                                              |reject (calc < table) ?    FALSE
GROUP B =WELL #3  MANGANESE                   |
          # Of Obs=      2.00                 |     if any "TRUE" values appear
          Variance=      0.00                 |     then group A does NOT equal
          Mean    =      0.03                 |     group B statistically
-----------------------------------------------
pooled estimator =      0.00                 |     if both conditions appear
degree of freedom=      6.00                 |     "FALSE",then you cannot
    t values from tables =        2.45       |     say that they are
    (two tailed t test)  =       -2.45       |     statistically different
    (1/n1)+(1/n2)=      0.67                 |
sqrt(1/n1)+(1/n2)=      0.82                 |
sqrt(pooled est.)=      0.01                 |
-----------------------------------------------
     calculated "t" value =       2.45       |
-----------------------------------------------
```

```
GROUP A =CONTROL  MANGANESE                  |     null hypothesis is
          # Of Obs=      6.00                 |     that group A = group B
          Variance=      0.00                 |
          Mean    =      0.04                 |reject (calc > table) ?     TRUE
                                              |reject (calc < table) ?    FALSE
GROUP B =WELL #4  MANGANESE                   |
          # Of Obs=      3.00                 |     if any "TRUE" values appear
          Variance=      0.00                 |     then group A does NOT equal
          Mean    =      0.02                 |     group B statistically
-----------------------------------------------
pooled estimator =      0.00                 |     if both conditions appear
degree of freedom=      7.00                 |     "FALSE",then you cannot
    t values from tables =        2.37       |     say that they are
    (two tailed t test)  =       -2.37       |     statistically different
    (1/n1)+(1/n2)=      0.50                 |
sqrt(1/n1)+(1/n2)=      0.71                 |
sqrt(pooled est.)=      0.01                 |
-----------------------------------------------
     calculated "t" value =       4.73       |
-----------------------------------------------
```

```
GROUP A =CONTROL CHLORIDE                    null hypothesis is
          # Of Obs=      2.00                 that group A = group B
          Variance=      0.32
          Mean    =     26.40                reject (calc > table) ?    FALSE
                                             reject (calc < table) ?    FALSE
GROUP B =WELL # 1
          # Of Obs=      2.00                 if any "TRUE" values appear
          Variance=      0.72                 then group A does NOT equal
          Mean    =     28.30                 group B statistically
-----------------------------------------
pooled estimator =      0.52                 if both conditions appear
degree of freedom=      2.00                 "FALSE",then group B cannot
    t values from tables =       4.30        be judged to be statistically
    (two tailed t test)  =      -4.30        different from group A.
    (1/n1)+(1/n2)=      1.00
sqrt(1/n1)+(1/n2)=      1.00
sqrt(pooled est.)=      0.72
-----------------------------------------
     calculated "t" value =     -2.63
-----------------------------------------
```

```
GROUP A =CONTROL CHLORIDE                    null hypothesis is
          # Of Obs=      2.00                 that group A = group B
          Variance=      0.32
          Mean    =     26.40                reject (calc > table) ?    FALSE
                                             reject (calc < table) ?    FALSE
GROUP B =WELL # 2
          # Of Obs=      2.00                 if any "TRUE" values appear
          Variance=      0.84                 then group A does NOT equal
          Mean    =     27.05                 group B statistically
-----------------------------------------
pooled estimator =      0.58                 if both conditions appear
degree of freedom=      2.00                 "FALSE",then group B cannot
    t values from tables =       4.30        be judged to be statistically
    (two tailed t test)  =      -4.30        different from group A.
    (1/n1)+(1/n2)=      1.00
sqrt(1/n1)+(1/n2)=      1.00
sqrt(pooled est.)=      0.76
-----------------------------------------
     calculated "t" value =     -0.85
-----------------------------------------
```

```
GROUP A =CONTROL CHLORIDE                    null hypothesis is
          # Of Obs=      2.00                 that group A = group B
          Variance=      0.32
          Mean    =     26.40                reject (calc > table) ?    FALSE
                                             reject (calc < table) ?    FALSE
GROUP B =WELL # 3
          # Of Obs=      2.00                 if any "TRUE" values appear
          Variance=      0.72                 then group A does NOT equal
          Mean    =     26.20                 group B statistically
-----------------------------------------
pooled estimator =      0.52                 if both conditions appear
degree of freedom=      2.00                 "FALSE",then group B cannot
    t values from tables =       4.30        be judged to be statistically
    (two tailed t test)  =      -4.30        different from group A.
    (1/n1)+(1/n2)=      1.00
sqrt(1/n1)+(1/n2)=      1.00
sqrt(pooled est.)=      0.72
-----------------------------------------
     calculated "t" value =      0.28
-----------------------------------------
```

```
GROUP A =CONTROL CHLORIDE                    null hypothesis is
          # Of Obs=      2.00                 that group A = group B
          Variance=      0.32
          Mean    =     26.40                reject (calc > table) ?    FALSE
                                             reject (calc < table) ?    FALSE
GROUP B =WELL # 4
          # Of Obs=      2.00                 if any "TRUE" values appear
          Variance=      3.12                 then group A does NOT equal
          Mean    =     26.75                 group B statistically
-----------------------------------------
pooled estimator =      1.72                 if both conditions appear
degree of freedom=      2.00                 "FALSE",then group B cannot
    t values from tables =       4.30        be judged to be statistically
    (two tailed t test)  =      -4.30        different from group A.
    (1/n1)+(1/n2)=      1.00
sqrt(1/n1)+(1/n2)=      1.00
sqrt(pooled est.)=      1.31
-----------------------------------------
     calculated "t" value =     -0.27
-----------------------------------------
```

```
GROUP A =CONTROL  NITRATE                  |     null hypothesis is
          # Of Obs=      6.00               |     that group A = group B
          Variance=      0.27               |
          Mean    =      5.04               |reject (calc > table) ?    FALSE
                                            |reject (calc < table) ?    FALSE
GROUP B =WELL #1  NITRATE                   |
          # Of Obs=      6.00               |     if any "TRUE" values appear
          Variance=      1.48               |     then group A does NOT equal
          Mean    =      5.51               |     group B statistically
   ----------------------------------------
pooled estimator =       0.88               |     if both conditions appear
degree of freedom=      10.00               |     "FALSE",then you cannot
     t values from tables =        2.23     |     say that they are
     (two tailed t test)  =       -2.23     |     statistically different
     (1/n1)+(1/n2)=      0.33                |
sqrt(1/n1)+(1/n2)=       0.58               |
sqrt(pooled est.)=       0.94               |
   ----------------------------------------
      calculated "t" value =      -0.87     |
   ----------------------------------------
```

```
GROUP A =CONTROL  NITRATE                  |     null hypothesis is
          # Of Obs=      6.00               |     that group A = group B
          Variance=      0.27               |
          Mean    =      5.04               |reject (calc > table) ?    FALSE
                                            |reject (calc < table) ?    FALSE
GROUP B =WELL #2  NITRATE                   |
          # Of Obs=      6.00               |     if any "TRUE" values appear
          Variance=      0.32               |     then group A does NOT equal
          Mean    =      4.43               |     group B statistically
   ----------------------------------------
pooled estimator =       0.30               |     if both conditions appear
degree of freedom=      10.00               |     "FALSE",then you cannot
     t values from tables =        2.23     |     say that they are
     (two tailed t test)  =       -2.23     |     statistically different
     (1/n1)+(1/n2)=      0.33                |
sqrt(1/n1)+(1/n2)=       0.58               |
sqrt(pooled est.)=       0.54               |
   ----------------------------------------
      calculated "t" value =       1.95     |
   ----------------------------------------
```

```
GROUP A =CONTROL  NITRATE                  |     null hypothesis is
          # Of Obs=      6.00               |     that group A = group B
          Variance=      0.27               |
          Mean    =      5.04               |reject (calc > table) ?    FALSE
                                            |reject (calc < table) ?    FALSE
GROUP B =WELL #3  NITRATE                   |
          # Of Obs=      6.00               |     if any "TRUE" values appear
          Variance=      0.23               |     then group A does NOT equal
          Mean    =      4.87               |     group B statistically
   ----------------------------------------
pooled estimator =       0.25               |     if both conditions appear
degree of freedom=      10.00               |     "FALSE",then you cannot
     t values from tables =        2.23     |     say that they are
     (two tailed t test)  =       -2.23     |     statistically different
     (1/n1)+(1/n2)=      0.33                |
sqrt(1/n1)+(1/n2)=       0.58               |
sqrt(pooled est.)=       0.50               |
   ----------------------------------------
      calculated "t" value =       0.59     |
   ----------------------------------------
```

```
GROUP A =CONTROL  NITRATE                  |     null hypothesis is
          # Of Obs=      6.00               |     that group A = group B
          Variance=      0.27               |
          Mean    =      5.04               |reject (calc > table) ?    FALSE
                                            |reject (calc < table) ?    FALSE
GROUP B =WELL #4  NITRATE                   |
          # Of Obs=      4.00               |     if any "TRUE" values appear
          Variance=      0.14               |     then group A does NOT equal
          Mean    =      4.86               |     group B statistically
   ----------------------------------------
pooled estimator =       0.22               |     if both conditions appear
degree of freedom=       8.00               |     "FALSE",then you cannot
     t values from tables =        2.31     |     say that they are
     (two tailed t test)  =       -2.31     |     statistically different
     (1/n1)+(1/n2)=      0.42                |
sqrt(1/n1)+(1/n2)=       0.65               |
sqrt(pooled est.)=       0.47               |
   ----------------------------------------
      calculated "t" value =       0.59     |
   ----------------------------------------
```

```
GROUP A =CONTROL  PHENOL                  |     null hypothesis is
          # Of Obs=      3.00             |     that group A = group B
          Variance=      0.07             |
          Mean    =      0.15             |reject (calc > table) ?    FALSE
                                          |reject (calc < table) ?    FALSE
GROUP B =WELL #1  PHENOL                  |
          # Of Obs=      4.00             |     if any "TRUE" values appear
          Variance=      0.08             |     then group A does NOT equal
          Mean    =      0.15             |     group B statistically
  ----------------------------------------|
  pooled estimator =     0.08             |     if both conditions appear
  degree of freedom=     5.00             |     "FALSE",then you cannot
      t values from tables =       2.57   |     say that they are
      (two tailed t test)  =      -2.57   |     statistically different
      (1/n1)+(1/n2)=     0.50             |
  sqrt(1/n1)+(1/n2)=     0.74             |
  sqrt(pooled est.)=     0.28             |
  ----------------------------------------
       calculated "t" value =      0.00   |
  ----------------------------------------
```

```
GROUP A =CONTROL  PHENOL                  |     null hypothesis is
          # Of Obs=      3.00             |     that group A = group B
          Variance=      0.07             |
          Mean    =      0.15             |reject (calc > table) ?    FALSE
                                          |reject (calc < table) ?    FALSE
GROUP B =WELL #2  PHENOL                  |
          # Of Obs=      5.00             |     if any "TRUE" values appear
          Variance=      0.04             |     then group A does NOT equal
          Mean    =      0.12             |     group B statistically
  ----------------------------------------|
  pooled estimator =     0.05             |     if both conditions appear
  degree of freedom=     6.00             |     "FALSE",then you cannot
      t values from tables =       2.45   |     say that they are
      (two tailed t test)  =      -2.45   |     statistically different
      (1/n1)+(1/n2)=     0.53             |
  sqrt(1/n1)+(1/n2)=     0.73             |
  sqrt(pooled est.)=     0.22             |
  ----------------------------------------
       calculated "t" value =      0.18   |
  ----------------------------------------
```

```
GROUP A =CONTROL  PHENOL                  |     null hypothesis is
          # Of Obs=      3.00             |     that group A = group B
          Variance=      0.07             |
          Mean    =      0.15             |reject (calc > table) ?    FALSE
                                          |reject (calc < table) ?    FALSE
GROUP B =WELL #3  PHENOL                  |
          # Of Obs=      3.00             |     if any "TRUE" values appear
          Variance=      0.00             |     then group A does NOT equal
          Mean    =      0.01             |     group B statistically
  ----------------------------------------|
  pooled estimator =     0.04             |     if both conditions appear
  degree of freedom=     4.00             |     "FALSE",then you cannot
      t values from tables =       2.78   |     say that they are
      (two tailed t test)  =      -2.78   |     statistically different
      (1/n1)+(1/n2)=     0.67             |
  sqrt(1/n1)+(1/n2)=     0.82             |
  sqrt(pooled est.)=     0.19             |
  ----------------------------------------
       calculated "t" value =      0.91   |
  ----------------------------------------
```

```
GROUP A =CONTROL  PHENOL                  |     null hypothesis is
          # Of Obs=      3.00             |     that group A = group B
          Variance=      0.07             |
          Mean    =      0.15             |reject (calc > table) ?       NA
                                          |reject (calc < table) ?       NA
GROUP B =WELL #4  PHENOL                  |
          # Of Obs=      1.00             |     if any "TRUE" values appear
          Variance=        NA             |     then group A does NOT equal
          Mean    =        NA             |     group B statistically
  ----------------------------------------|
  pooled estimator =       NA             |     if both conditions appear
  degree of freedom=     2.00             |     "FALSE",then you cannot
      t values from tables =       4.30   |     say that they are
      (two tailed t test)  =      -4.30   |     statistically different
      (1/n1)+(1/n2)=     1.33             |
  sqrt(1/n1)+(1/n2)=     1.15             |
  sqrt(pooled est.)=       NA             |
  ----------------------------------------
       calculated "t" value =        NA   |
  ----------------------------------------
```

```
GROUP A =CONTROL  TOX                          |     null hypothesis is
          # Of Obs=      5.00                  |     that group A = group B
          Variance=      0.00                  |
          Mean    =      0.06                  |reject (calc > table) ?    FALSE
                                               |reject (calc < table) ?    FALSE
GROUP B =WELL #1  TOX                          |
          # Of Obs=      4.00                  |     if any "TRUE" values appear
          Variance=      0.00                  |     then group A does NOT equal
          Mean    =      0.05                  |     group B statistically
-----------------------------------------------
pooled estimator =       0.00                  |     if both conditions appear
degree of freedom=       7.00                  |     "FALSE",then you cannot
    t values from tables =        2.37         |     say that they are
    (two tailed t test)  =       -2.37         |     statistically different
    (1/n1)+(1/n2)=       0.45                  |
sqrt(1/n1)+(1/n2)=       0.67                  |
sqrt(pooled est.)=       0.03                  |
-----------------------------------------------
     calculated "t" value =       0.47         |
-----------------------------------------------
```

```
GROUP A =CONTROL  TOX                          |     null hypothesis is
          # Of Obs=      5.00                  |     that group A = group B
          Variance=      0.00                  |
          Mean    =      0.06                  |reject (calc > table) ?    FALSE
                                               |reject (calc < table) ?    FALSE
GROUP B =WELL #2  TOX                          |
          # Of Obs=      4.00                  |     if any "TRUE" values appear
          Variance=      0.06                  |     then group A does NOT equal
          Mean    =      0.20                  |     group B statistically
-----------------------------------------------
pooled estimator =       0.03                  |     if both conditions appear
degree of freedom=       9.00                  |     "FALSE",then you cannot
    t values from tables =        2.26         |     say that they are
    (two tailed t test)  =       -2.26         |     statistically different
    (1/n1)+(1/n2)=       0.37                  |
sqrt(1/n1)+(1/n2)=       0.61                  |
sqrt(pooled est.)=       0.18                  |
-----------------------------------------------
     calculated "t" value =      -1.26         |
-----------------------------------------------
```

```
GROUP A =CONTROL  TOX                          |     null hypothesis is
          # Of Obs=      5.00                  |     that group A = group B
          Variance=      0.00                  |
          Mean    =      0.06                  |reject (calc > table) ?    FALSE
                                               |reject (calc < table) ?    FALSE
GROUP B =WELL #3  TOX                          |
          # Of Obs=      5.00                  |     if any "TRUE" values appear
          Variance=      0.06                  |     then group A does NOT equal
          Mean    =      0.15                  |     group B statistically
-----------------------------------------------
pooled estimator =       0.03                  |     if both conditions appear
degree of freedom=       8.00                  |     "FALSE",then you cannot
    t values from tables =        2.31         |     say that they are
    (two tailed t test)  =       -2.31         |     statistically different
    (1/n1)+(1/n2)=       0.40                  |
sqrt(1/n1)+(1/n2)=       0.63                  |
sqrt(pooled est.)=       0.17                  |
-----------------------------------------------
     calculated "t" value =      -0.81         |
-----------------------------------------------
```

```
GROUP A =CONTROL  TOX                          |     null hypothesis is
          # Of Obs=      5.00                  |     that group A = group B
          Variance=      0.00                  |
          Mean    =      0.06                  |reject (calc > table) ?    FALSE
                                               |reject (calc < table) ?    FALSE
GROUP B =WELL #4  TOX                          |
          # Of Obs=      4.00                  |     if any "TRUE" values appear
          Variance=      0.00                  |     then group A does NOT equal
          Mean    =      0.04                  |     group B statistically
-----------------------------------------------
pooled estimator =       0.00                  |     if both conditions appear
degree of freedom=       7.00                  |     "FALSE",then you cannot
    t values from tables =        2.37         |     say that they are
    (two tailed t test)  =       -2.37         |     statistically different
    (1/n1)+(1/n2)=       0.45                  |
sqrt(1/n1)+(1/n2)=       0.67                  |
sqrt(pooled est.)=       0.03                  |
-----------------------------------------------
     calculated "t" value =       0.94         |
-----------------------------------------------
```

```
GROUP A =CONTROL pH                          |     null hypothesis is
          # Of Obs=      5.00                |     that group A = group B
          Variance=      0.01                |
          Mean    =      7.81                |reject (calc > table) ?    FALSE
                                             |reject (calc < table) ?    FALSE
GROUP B =WELL # 1 pH                         |
          # Of Obs=      5.00                |     if any "TRUE" values appear
          Variance=      0.04                |     then group A does NOT equal
          Mean    =      7.87                |     group B statistically
-----------------------------------------------
pooled estimator =       0.03                |     if both conditions appear
degree of freedom=       8.00                |     "FALSE",then group B cannot
    t values from tables =        2.31       |     be judged to be statistically
    (two tailed t test)  =       -2.31       |     different from group A.
    (1/n1)+(1/n2)=       0.40                |
sqrt(1/n1)+(1/n2)=       0.63                |
sqrt(pooled est.)=       0.16                |
-----------------------------------------------
     calculated "t" value =      -0.60       |
-----------------------------------------------
```

```
GROUP A =CONTROL pH                          |     null hypothesis is
          # Of Obs=      5.00                |     that group A = group B
          Variance=      0.01                |
          Mean    =      7.81                |reject (calc > table) ?    FALSE
                                             |reject (calc < table) ?    FALSE
GROUP B =WELL # 2 pH                         |
          # Of Obs=      5.00                |     if any "TRUE" values appear
          Variance=      0.02                |     then group A does NOT equal
          Mean    =      7.79                |     group B statistically
-----------------------------------------------
pooled estimator =       0.02                |     if both conditions appear
degree of freedom=       8.00                |     "FALSE",then group B cannot
    t values from tables =        2.31       |     be judged to be statistically
    (two tailed t test)  =       -2.31       |     different from group A.
    (1/n1)+(1/n2)=       0.40                |
sqrt(1/n1)+(1/n2)=       0.63                |
sqrt(pooled est.)=       0.12                |
-----------------------------------------------
     calculated "t" value =       0.26       |
-----------------------------------------------
```

```
GROUP A =CONTROL pH                          |     null hypothesis is
          # Of Obs=      5.00                |     that group A = group B
          Variance=      0.01                |
          Mean    =      7.81                |reject (calc > table) ?    FALSE
                                             |reject (calc < table) ?    FALSE
GROUP B =WELL # 3 pH                         |
          # Of Obs=      5.00                |     if any "TRUE" values appear
          Variance=      0.01                |     then group A does NOT equal
          Mean    =      7.09                |     group B statistically
-----------------------------------------------
pooled estimator =       0.01                |     if both conditions appear
degree of freedom=       8.00                |     "FALSE",then group B cannot
    t values from tables =        2.31       |     be judged to be statistically
    (two tailed t test)  =       -2.31       |     different from group A.
    (1/n1)+(1/n2)=       0.40                |
sqrt(1/n1)+(1/n2)=       0.63                |
sqrt(pooled est.)=       0.10                |
-----------------------------------------------
     calculated "t" value =      -1.26       |
-----------------------------------------------
```

```
GROUP A =CONTROL pH                          |     null hypothesis is
          # Of Obs=      5.00                |     that group A = group B
          Variance=      0.01                |
          Mean    =      7.81                |reject (calc > table) ?    FALSE
                                             |reject (calc < table) ?    FALSE
GROUP B =WELL # 4 pH                         |
          # Of Obs=      3.00                |     if any "TRUE" values appear
          Variance=      0.12                |     then group A does NOT equal
          Mean    =      7.60                |     group B statistically
-----------------------------------------------
pooled estimator =       0.05                |     if both conditions appear
degree of freedom=       6.00                |     "FALSE",then group B cannot
    t values from tables =        2.45       |     be judged to be statistically
    (two tailed t test)  =       -2.45       |     different from group A.
    (1/n1)+(1/n2)=       0.53                |
sqrt(1/n1)+(1/n2)=       0.73                |
sqrt(pooled est.)=       0.22                |
-----------------------------------------------
     calculated "t" value =       1.33       |
-----------------------------------------------
```

```
GROUP A =CONTROL  TDS                          |     null hypothesis is
          # Of Obs=      6.00                  |     that group A = group B
          Variance=    398.00                  |
          Mean    =    420.00                  |reject (calc > table) ?    FALSE
                                               |reject (calc < table) ?    FALSE
GROUP B =WELL #1  TDS                          |
          # Of Obs=      6.00                  |     if any "TRUE" values appear
          Variance=    285.00                  |     then group A does NOT equal
          Mean    =    422.00                  |     group B statistically
-----------------------------------------------
pooled estimator =    341.50                  |     if both conditions appear
degree of freedom=     10.00                  |     "FALSE",then you cannot
    t values from tables =       2.23          |     say that they are
    (two tailed t test)  =      -2.23          |     statistically different
    (1/n1)+(1/n2)=      0.33                   |
sqrt(1/n1)+(1/n2)=      0.58                   |
sqrt(pooled est.)=     18.48                   |
-----------------------------------------------
     calculated "t" value =     -0.19          |
-----------------------------------------------
```

```
GROUP A =CONTROL  TDS                          |     null hypothesis is
          # Of Obs=      6.00                  |     that group A = group B
          Variance=    398.00                  |
          Mean    =    420.00                  |reject (calc > table) ?    FALSE
                                               |reject (calc < table) ?    FALSE
GROUP B =WELL #2  TDS                          |
          # Of Obs=      6.00                  |     if any "TRUE" values appear
          Variance=    239.00                  |     then group A does NOT equal
          Mean    =    430.00                  |     group B statistically
-----------------------------------------------
pooled estimator =    318.50                  |     if both conditions appear
degree of freedom=     10.00                  |     "FALSE",then you cannot
    t values from tables =       2.23          |     say that they are
    (two tailed t test)  =      -2.23          |     statistically different
    (1/n1)+(1/n2)=      0.33                   |
sqrt(1/n1)+(1/n2)=      0.58                   |
sqrt(pooled est.)=     17.85                   |
-----------------------------------------------
     calculated "t" value =     -0.97          |
-----------------------------------------------
```

```
GROUP A =CONTROL  TDS                          |     null hypothesis is
          # Of Obs=      6.00                  |     that group A = group B
          Variance=    398.00                  |
          Mean    =    420.00                  |reject (calc > table) ?    FALSE
                                               |reject (calc < table) ?    FALSE
GROUP B =WELL #3  TDS                          |
          # Of Obs=      6.00                  |     if any "TRUE" values appear
          Variance=    686.00                  |     then group A does NOT equal
          Mean    =    400.00                  |     group B statistically
-----------------------------------------------
pooled estimator =    542.00                  |     if both conditions appear
degree of freedom=     10.00                  |     "FALSE",then you cannot
    t values from tables =       2.23          |     say that they are
    (two tailed t test)  =      -2.23          |     statistically different
    (1/n1)+(1/n2)=      0.33                   |
sqrt(1/n1)+(1/n2)=      0.58                   |
sqrt(pooled est.)=     23.28                   |
-----------------------------------------------
     calculated "t" value =      1.49          |
-----------------------------------------------
```

```
GROUP A =CONTROL  TDS                          |     null hypothesis is
          # Of Obs=      6.00                  |     that group A = group B
          Variance=    398.00                  |
          Mean    =    420.00                  |reject (calc > table) ?    FALSE
                                               |reject (calc < table) ?     TRUE
GROUP B =WELL #4  TDS                          |
          # Of Obs=      4.00                  |     if any "TRUE" values appear
          Variance=   3006.00                  |     then group A does NOT equal
          Mean    =    481.50                  |     group B statistically
-----------------------------------------------
pooled estimator =   1376.00                  |     if both conditions appear
degree of freedom=      8.00                  |     "FALSE",then you cannot
    t values from tables =       2.31          |     say that they are
    (two tailed t test)  =      -2.31          |     statistically different
    (1/n1)+(1/n2)=      0.42                   |
sqrt(1/n1)+(1/n2)=      0.65                   |
sqrt(pooled est.)=     37.09                   |
-----------------------------------------------
     calculated "t" value =     -2.57          |
-----------------------------------------------
```

```
GROUP A =CONTROL  SPEC COND                  |     null hypothesis is
          # Of Obs=      5.00                 |     that group A = group B
          Variance=    755.00                 |
          Mean    =    591.00                 |reject (calc > table) ?    FALSE
                                              |reject (calc < table) ?    FALSE
GROUP B =WELL #1  SPEC COND                   |
          # Of Obs=      5.00                 |     if any "TRUE" values appear
          Variance=   1950.00                 |     then group A does NOT equal
          Mean    =    585.00                 |     group B statistically
-----------------------------------------------
pooled estimator =   1352.50                  |     if both conditions appear
degree of freedom=      8.00                  |     "FALSE",then you cannot
    t values from tables =       2.31         |     say that they are
    (two tailed t test)  =      -2.31         |     statistically different
    (1/n1)+(1/n2)=      0.40                  |
sqrt(1/n1)+(1/n2)=      0.63                  |
sqrt(pooled est.)=     36.78                  |
-----------------------------------------------
     calculated "t" value =      0.26         |
-----------------------------------------------
```

```
GROUP A =CONTROL  SPEC COND                  |     null hypothesis is
          # Of Obs=      5.00                 |     that group A = group B
          Variance=    755.00                 |
          Mean    =    591.00                 |reject (calc > table) ?    FALSE
                                              |reject (calc < table) ?    FALSE
GROUP B =WELL #2  SPEC COND                   |
          # Of Obs=      5.00                 |     if any "TRUE" values appear
          Variance=   1963.00                 |     then group A does NOT equal
          Mean    =    590.00                 |     group B statistically
-----------------------------------------------
pooled estimator =   1359.00                  |     if both conditions appear
degree of freedom=      8.00                  |     "FALSE",then you cannot
    t values from tables =       2.31         |     say that they are
    (two tailed t test)  =      -2.31         |     statistically different
    (1/n1)+(1/n2)=      0.40                  |
sqrt(1/n1)+(1/n2)=      0.63                  |
sqrt(pooled est.)=     36.86                  |
-----------------------------------------------
     calculated "t" value =      0.04         |
-----------------------------------------------
```

```
GROUP A =CONTROL  SPEC COND                  |     null hypothesis is
          # Of Obs=      5.00                 |     that group A = group B
          Variance=    755.00                 |
          Mean    =    591.00                 |reject (calc > table) ?    FALSE
                                              |reject (calc < table) ?    FALSE
GROUP B =WELL #3  SPEC COND                   |
          # Of Obs=      5.00                 |     if any "TRUE" values appear
          Variance=    730.00                 |     then group A does NOT equal
          Mean    =    589.00                 |     group B statistically
-----------------------------------------------
pooled estimator =    742.50                  |     if both conditions appear
degree of freedom=      8.00                  |     "FALSE",then you cannot
    t values from tables =       2.31         |     say that they are
    (two tailed t test)  =      -2.31         |     statistically different
    (1/n1)+(1/n2)=      0.40                  |
sqrt(1/n1)+(1/n2)=      0.63                  |
sqrt(pooled est.)=     27.25                  |
-----------------------------------------------
     calculated "t" value =      0.12         |
-----------------------------------------------
```

```
GROUP A =CONTROL  SPEC COND                  |     null hypothesis is
          # Of Obs=      5.00                 |     that group A = group B
          Variance=    755.00                 |
          Mean    =    591.00                 |reject (calc > table) ?    FALSE
                                              |reject (calc < table) ?    FALSE
GROUP B =WELL #4  SPEC COND                   |
          # Of Obs=      4.00                 |     if any "TRUE" values appear
          Variance=  22156.00                 |     then group A does NOT equal
          Mean    =    676.25                 |     group B statistically
-----------------------------------------------
pooled estimator =   9926.86                  |     if both conditions appear
degree of freedom=      7.00                  |     "FALSE",then you cannot
    t values from tables =       2.37         |     say that they are
    (two tailed t test)  =      -2.37         |     statistically different
    (1/n1)+(1/n2)=      0.45                  |
sqrt(1/n1)+(1/n2)=      0.67                  |
sqrt(pooled est.)=     99.63                  |
-----------------------------------------------
     calculated "t" value =     -1.28         |
-----------------------------------------------
```