EEM 1 Uncertainty/Sensitivity Analysis
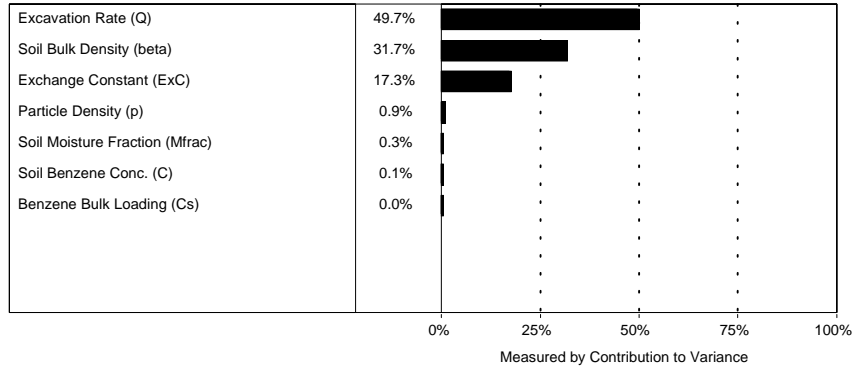
Simulation started on 9/27/96 at 12:06:54

Simulation stopped on 9/27/96 at 12:09:04
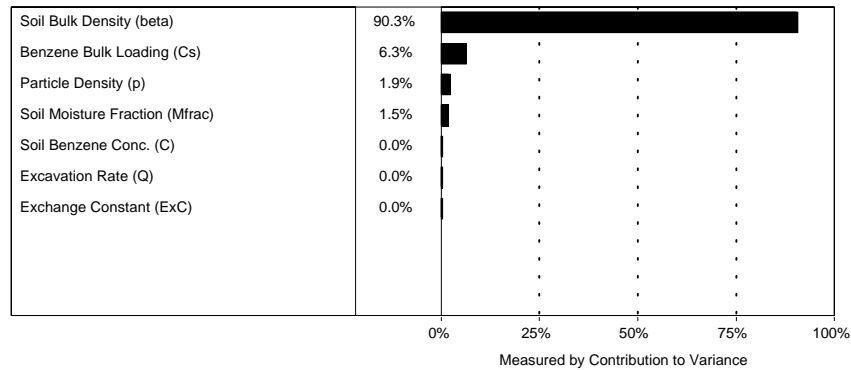
Sensitivity Chart

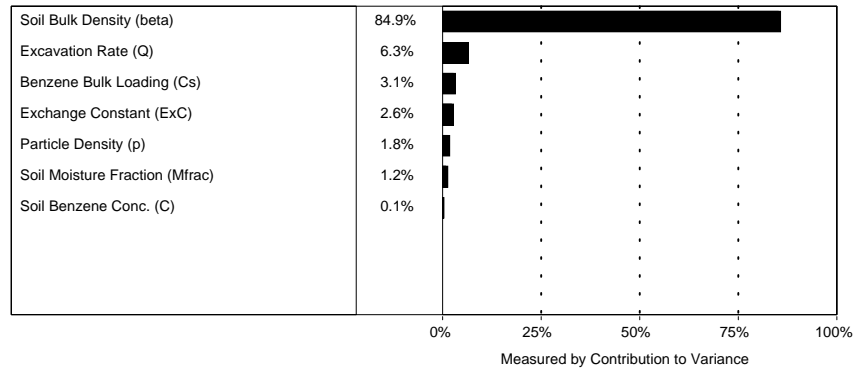### Target Forecast: EEM 1. ER (Pore Space)

Excavation Rate (Q)	49.7%
Soil Bulk Density (beta)	31.7%
Exchange Constant (ExC)	17.3%
Particle Density (p)	0.9%
Soil Moisture Fraction (Mfrac)	0.3%
Soil Benzene Conc. (C)	0.1%
Benzene Bulk Loading (Cs)	0.0%

Measured by Contribution to Variance

Sensitivity Chart

Target Forecast: EEM 1. ER (Diffusion)

Soil Bulk Density (beta)	90.3%
Benzene Bulk Loading (Cs)	6.3%
Particle Density (p)	1.9%
Soil Moisture Fraction (Mfrac)	1.5%
Soil Benzene Conc. (C)	0.0%
Excavation Rate (Q)	0.0%
Exchange Constant (ExC)	0.0%

Measured by Contribution to Variance

Sensitivity Chart

Target Forecast: EEM 1. ER (Total)

Soil Bulk Density (beta)	84.9%
Excavation Rate (Q)	6.3%
Benzene Bulk Loading (Cs)	3.1%
Exchange Constant (ExC)	2.6%
Particle Density (p)	1.8%
Soil Moisture Fraction (Mfrac)	1.2%
Soil Benzene Conc. (C)	0.1%

Measured by Contribution to Variance

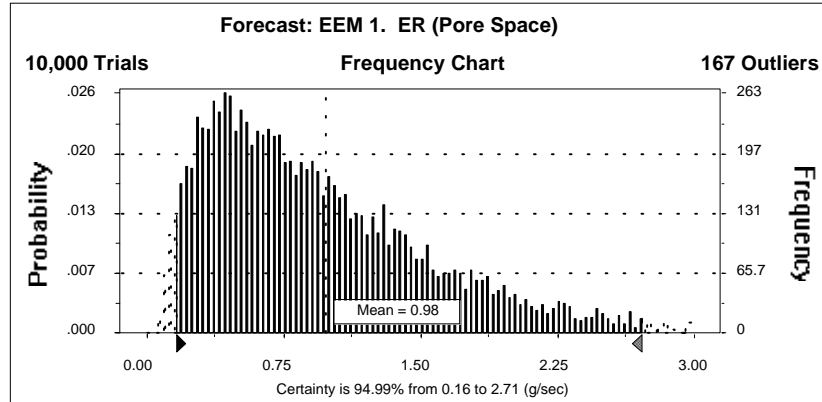**Forecast: EEM 1. ER (Pore Space)**   **Cell: B35**

Summary:
>   Certainty Level is 94.99%
>   Certainty Range is from 0.16 to 2.71 (g/sec)
>   Display Range is from 0.00 to 3.00 (g/sec)
>   Entire Range is from 0.07 to 4.48 (g/sec)
>   After 10,000 Trials, the Std. Error of the Mean is 0.01

Statistics:	Value
Trials	10000
Mean	0.98
Median	0.82
Mode	---
Standard Deviation	0.68
Variance	0.46
Skewness	1.35
Kurtosis	5.17
Coeff. of Variability	0.69
Range Minimum	0.07
Range Maximum	4.48
Range Width	4.41
Mean Std. Error	0.01

Forecast: EEM 1. ER (Pore Space)

10,000 Trials   **Frequency Chart**   **167 Outliers**

Mean = 0.98

Certainty is 94.99% from 0.16 to 2.71 (g/sec)

Percentiles:

Percentile	(g/sec)
0%	0.07
10%	0.29
20%	0.42
30%	0.54
40%	0.67
50%	0.82

Percentile	(g/sec)
60%	0.99
70%	1.20
80%	1.46
90%	1.90
100%	4.48

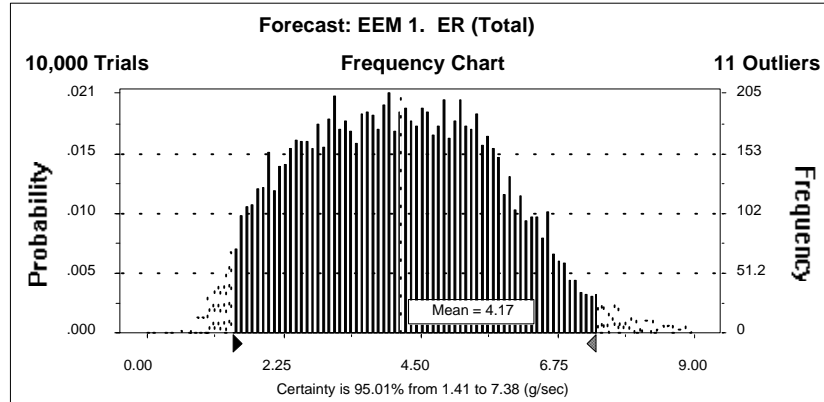End of Forecast

Forecast: EEM 1. ER (Total)   **Cell: B37**

Summary:
    Certainty Level is 95.01%
    Certainty Range is from 1.41 to 7.38 (g/sec)
    Display Range is from 0.00 to 9.00 (g/sec)
    Entire Range is from 0.59 to 10.30 (g/sec)
    After 10,000 Trials, the Std. Error of the Mean is 0.02

Statistics:	Value
Trials	10000
Mean	4.17
Median	4.13
Mode	---
Standard Deviation	1.62
Variance	2.62
Skewness	0.21
Kurtosis	2.46
Coeff. of Variability	0.39
Range Minimum	0.59
Range Maximum	10.30
Range Width	9.71
Mean Std. Error	0.02

Forecast: EEM 1. ER (Total)

10,000 Trials — **Frequency Chart** — **11 Outliers**

Mean = 4.17

Certainty is 95.01% from 1.41 to 7.38 (g/sec)

Percentiles:

Percentile	(g/sec)
0%	0.59
10%	2.03
20%	2.62
30%	3.15
40%	3.65
50%	4.13

Forecast: EEM 1. ER (Total) (cont'd)   **Cell: B37**

Percentile	(g/sec)
60%	4.62
70%	5.11
80%	5.61
90%	6.31
100%	10.30

End of Forecast
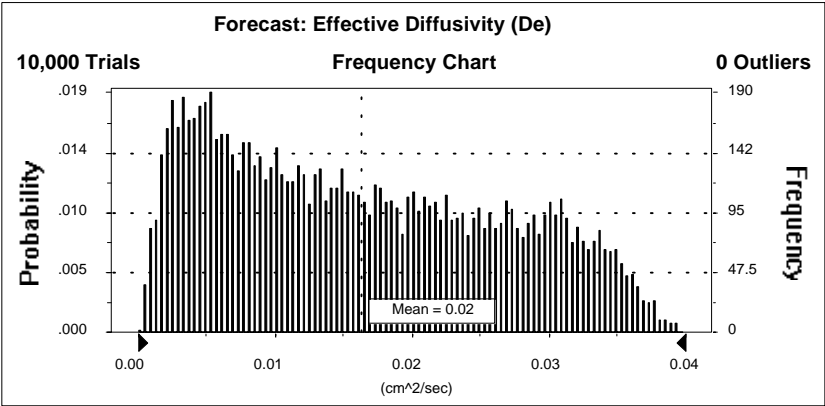
Forecast: Effective Diffusivity (De)   **Cell: B31**

Summary:
  Display Range is from 0.00 to 0.04 (cm^2/sec)
  Entire Range is from 0.00 to 0.04 (cm^2/sec)
  After 10,000 Trials, the Std. Error of the Mean is 0.00

Statistics:	Value
Trials	10000
Mean	0.02
Median	0.01
Mode	---
Standard Deviation	0.01
Variance	0.00
Skewness	0.32
Kurtosis	1.92
Coeff. of Variability	0.63
Range Minimum	0.00
Range Maximum	0.04
Range Width	0.04
Mean Std. Error	0.00

Forecast: Effective Diffusivity (De)

10,000 Trials   **Frequency Chart**   **0 Outliers**

Mean = 0.02

Percentiles:

Percentile	(cm^2/sec)
0%	0.00
10%	0.00
20%	0.01
30%	0.01
40%	0.01
50%	0.01
60%	0.02
70%	0.02

Percentile	(cm^2/sec)
80%	0.03
90%	0.03
100%	0.04

End of Forecast

Forecast: Air-Filled Porosity (Ea)   **Cell: B23**
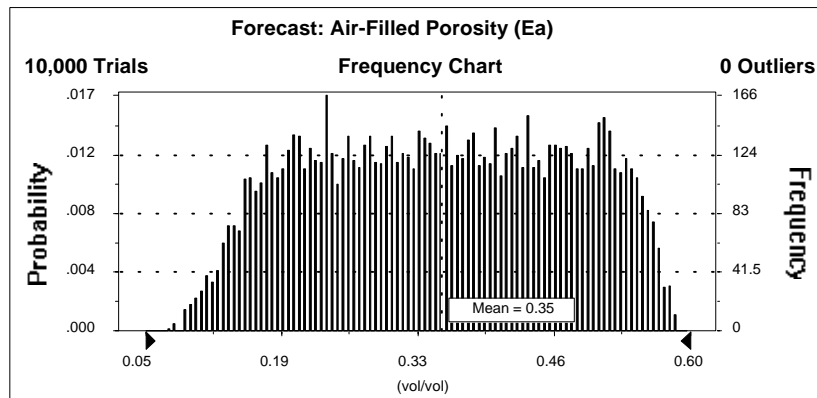
Summary:
  Display Range is from 0.05 to 0.60 (vol/vol)
  Entire Range is from 0.07 to 0.59 (vol/vol)
  After 10,000 Trials, the Std. Error of the Mean is 0.00

Statistics:	Value
Trials	10000
Mean	0.35
Median	0.35
Mode	---
Standard Deviation	0.13
Variance	0.02
Skewness	-0.03
Kurtosis	1.88
Coeff. of Variability	0.37
Range Minimum	0.07
Range Maximum	0.59
Range Width	0.52
Mean Std. Error	0.00

Forecast: Air-Filled Porosity (Ea)

Percentiles:

Percentile	(vol/vol)
0%	0.07
10%	0.17
20%	0.22
30%	0.26
40%	0.31
50%	0.35
60%	0.39
70%	0.44

Percentile	(vol/vol)
80%	0.48
90%	0.52
100%	0.59

End of Forecast

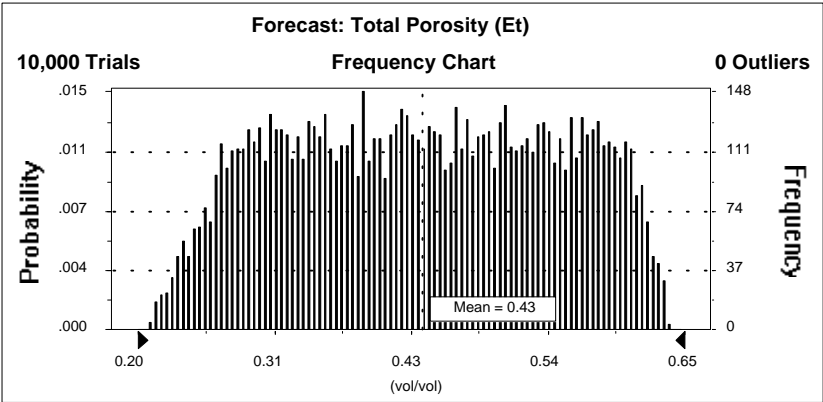**Forecast: Total Porosity (Et)**   **Cell: B24**

Summary:
Display Range is from 0.20 to 0.65 (vol/vol)
Entire Range is from 0.21 to 0.64 (vol/vol)
After 10,000 Trials, the Std. Error of the Mean is 0.00

Statistics:	Value
Trials	10000
Mean	0.43
Median	0.43
Mode	---
Standard Deviation	0.11
Variance	0.01
Skewness	-0.02
Kurtosis	1.86
Coeff. of Variability	0.25
Range Minimum	0.21
Range Maximum	0.64
Range Width	0.43
Mean Std. Error	0.00

Percentiles:

Percentile	(vol/vol)
0%	0.21
10%	0.28
20%	0.32
30%	0.36
40%	0.40
50%	0.43
60%	0.47
70%	0.51

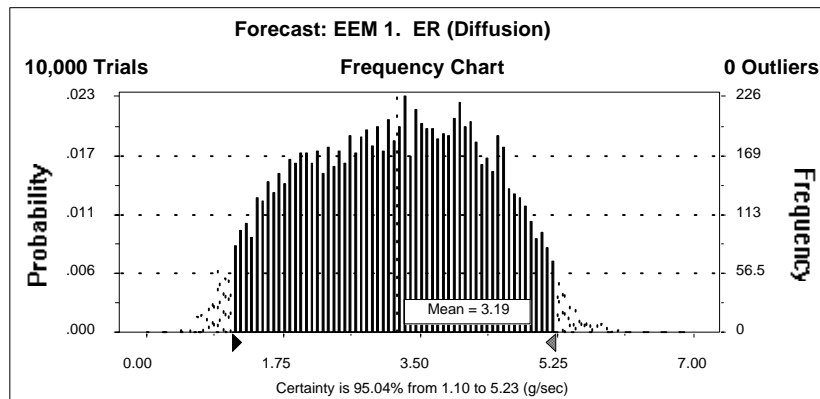| Percentile	(vol/vol)
80%	0.55
90%	0.58
100%	0.64

End of Forecast

Forecast: EEM 1. ER (Diffusion)   **Cell: B36**

Summary:
    Certainty Level is 95.04%
    Certainty Range is from 1.10 to 5.23 (g/sec)
    Display Range is from 0.00 to 7.00 (g/sec)
    Entire Range is from 0.47 to 6.64 (g/sec)
    After 10,000 Trials, the Std. Error of the Mean is 0.01

Statistics:	Value
Trials	10000
Mean	3.19
Median	3.22
Mode	---
Standard Deviation	1.16
Variance	1.35
Skewness	-0.04
Kurtosis	2.13
Coeff. of Variability	0.36
Range Minimum	0.47
Range Maximum	6.64
Range Width	6.17
Mean Std. Error	0.01

Forecast: EEM 1. ER (Diffusion)

10,000 Trials   **Frequency Chart**   **0 Outliers**

Mean = 3.19

Certainty is 95.04% from 1.10 to 5.23 (g/sec)

Percentiles:

Percentile	(g/sec)
0%	0.47
10%	1.59
20%	2.05
30%	2.46
40%	2.85
50%	3.22

Forecast: EEM 1. ER (Diffusion) (cont'd)   **Cell: B36**

Percentile	(g/sec)
60%	3.57
70%	3.94
80%	4.28
90%	4.72
100%	6.64

End of Forecast

Assumptions

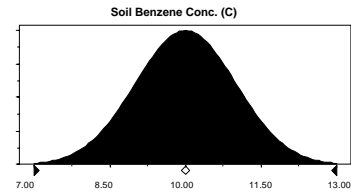### Assumption: Soil Benzene Conc. (C)   Cell: C5

Normal distribution with parameters:
    Mean   10.00
    Standard Dev.   1.00

Selected range is from -Infinity to +Infinity
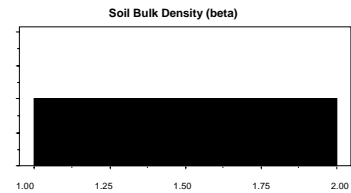Mean value in simulation was 10.00

Soil Benzene Conc. (C)

7.00   8.50   10.00   11.50   13.00

Assumption: Soil Bulk Density (beta)   Cell: C6

Uniform distribution with parameters:
    Minimum   1.00
    Maximum   2.00

Mean value in simulation was 1.50

Soil Bulk Density (beta)

1.00   1.25   1.50   1.75   2.00

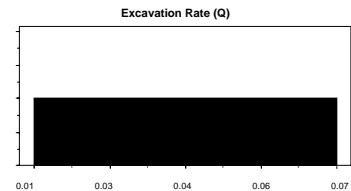### Assumption: Excavation Rate (Q)   Cell: C8

Uniform distribution with parameters:
    Minimum   0.01
    Maximum   0.07

Mean value in simulation was 0.04

Excavation Rate (Q)

0.01   0.03   0.04   0.06   0.07

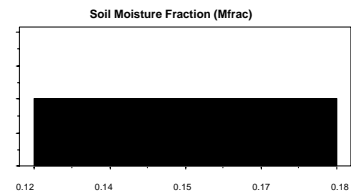### Assumption: Soil Moisture Fraction (Mfrac)   Cell: C9

Uniform distribution with parameters:
    Minimum   0.12
    Maximum   0.18

Mean value in simulation was 0.15

Soil Moisture Fraction (Mfrac)

0.12   0.14   0.15   0.17   0.18

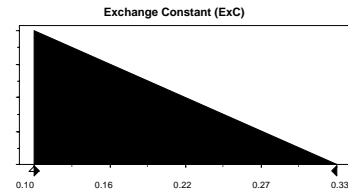**Assumption: Exchange Constant (ExC)**   **Cell: B25**

    Triangular distribution with parameters:
       Minimum   0.10
       Likeliest   0.10
       Maximum   0.33

Exchange Constant (ExC)

0.10   0.16   0.22   0.27   0.33

    Selected range is from 0.10 to 0.33
    Mean value in simulation was 0.18

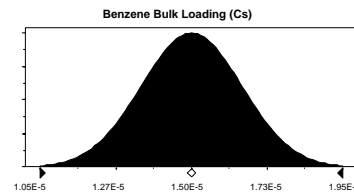**Assumption: Benzene Bulk Loading (Cs)**   **Cell: B27**

    Normal distribution with parameters:
       Mean   1.50E-05
       Standard Dev.   1.50E-06

Benzene Bulk Loading (Cs)

1.05E-5   1.27E-5   1.50E-5   1.73E-5   1.95E-5

    Selected range is from -Infinity to +Infinity
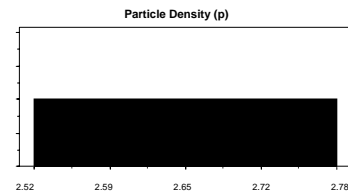   Mean value in simulation was 1.50E-5

Assumption: Particle Density (p)   **Cell: B32**

    Uniform distribution with parameters:
       Minimum   2.52
       Maximum   2.78

Particle Density (p)

2.52   2.59   2.65   2.72   2.78

    Mean value in simulation was 2.65

End of Assumptions