540279

Generation of the LHS Samples for the CRA-2004 PA Baseline Calculations

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	Print	**Signature**	**Date**

WIPP:1.4.1.1:PA:QA-L:LHS Sampling PABC

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Introduction

The program LHS is use to sample the subjective distributions of parameters using a Latin Hypercube sampling design. PRELHS is run prior to LHS and is used to obtain from the WIPP database the data describing the distributions and to create an input file to LHS based on that data. The user specifies to PRELHS which parameters are to be sampled using their "material" and "property" identifiers. PRELHS performs limits error checking on the data extracted from the database. LHS can reorder sampled data to induce or restrict correlations among the parameters. This report documents the use of PRELHS Version 2.30 and LHS Version 2.42 to provide three sets of sampled data for use in the CRA-2004 Performance Assessment Baseline Calculation (CRA-2004 PABC) (Kanney and Leigh 2005). These three sets represent three replicates of one hundred samples for each of 75 variables. For the most part these variables are associated with model parameters. However, there are also 19 "placeholder" variables sampled. These placeholders are included to enable users to add additional parameters and run LHS while preserving the ability to regenerate the values previously sampled for the model parameters. This report discusses an analysis that was identified as a task associated with the CRA-2004 PABC subsequent to the publication of AP-122 (Kanney and Leigh 2005) and thus is a deviation from AP-122.

Run Control

The script EVAL_LHS.COM was used to execute PRELHS and LHS. This script processes an input file which lists the specific information required to run PRELHS and LHS. The details of run control are documented in Long and Kanney (2005). The script and its input files are stored in LIBCRA1BC_EVAL.

PRELHS Input Files

The three input files for PRELHS are listed in appendices I to III. Except for the title and random seed these three files are identical. Different random seeds are assigned in each input file to cause LHS to generate three unique sets of values. The corresponding output (transfer) files from PRELHS for the three replicates are listed in appendices IV to VI. The three transfer files are also identical except for titles and the random seed values. These files were inspected to verify that the data used to construct the distributions were properly extracted from the library.

LHS Output files

The LHS output files were examined for errors. The ranges of the sampled variables were compared to the range specified as input for the distribution or, in the case of a Student distribution, against the computed 0.01 and 0.99 percentiles of the distribution (Table 1). No significant spurious correlations were observed among the uncorrelated variables. The sampled data for those variables for which a correlation matrix was entered showed correlations that were close to those specified (Tables 2 and 3). Variable 53 is S_HALITE:PRMX_LOG (material:property) and variable 54 is S_HALITE:COMP_RCK. Variable 61 is CASTILER:PRMX_LOG and variable 54 is CASTILER:COMP_RCK (Appendix I).

Table 1. Confidence intervals based on Student's t distribution (α=0.01)

	S_MB139:PRMX_LOG	S_MB139:SAT_RBRN	S_MB139:PORE_DIS
Data	-1.9200E+01	7.7846E-03	4.9053E-01
Data	-1.9100E+01	6.8842E-02	5.5775E-01
Data	-2.1000E+01	6.9860E-02	6.5200E-01
Data	-1.8800E+01	7.2620E-02	6.5500E-01
Data	-1.8100E+01	1.0861E-01	6.6452E-01
Data	-1.7100E+01	1.7401E-01	8.4178E-01
Statistics			
SD	1.2983E+00	5.4908E-02	1.1892E-01
Mean	-1.8883E+01	8.3621E-02	6.4360E-01
SE	5.3004E-01	2.2416E-02	4.8550E-02
Lower .99 Conf. Limit	-2.1020E+01	-6.7610E-03	4.4784E-01
Upper .99 Conf. Limit	-1.6746E+01	1.7400E-01	8.3935E-01

Table 2. Correlation observed between variables 53 and 54. A value of -0.99 was specified.

	49	50	51	52	53
49	1				
50	-0.0156	1			
51	0.0547	-0.0943	1		
52	0.002	0.0001	-0.0712	1	
53	-0.0022	0.0287	-0.0094	-0.0376	1
54	0.0119	-0.0249	-0.0066	0.0222	-0.9863
55	0	0.0068	-0.0648	0.0543	-0.0046
56	-0.02	-0.0128	0.0865	-0.083	0.134

Table 3. Correlation observed between variables 61 and 62. A value of -0.75 was specified.

	61	62	63	64	65
61	1				
62	-0.7362	1			
63	0.0365	-0.0414	1		
64	-0.0292	0.063	0.0081	1	
65	-0.0314	0.0081	-0.0215	0.012	1
66	0.0068	0.0332	0.0397	0.0245	0.0352
67	-0.0116	0.0487	0.008	0.0088	0.0165
68	0.0156	-0.0164	0.0193	0.0568	0.0331

The sampled distributions were compared to the expected distributions and to the distributions of values sampled for the Compliance Recertification Application (CRA). Cumulative distribution functions (CDFs) for the sampled data were constructed by ordering the data from smallest to largest value and assigning the probability $i/100-0.005$ to the i^{th} ordered value, i.e. the midpoint of the interval containing the value based on order statistics (Appendix VIII, Figures 1 through 168). The differences between the CDFs of the sampled values and the CDFs of the expected distributions are

due to the differences between the estimated probability assigned to the values and the true probability associated with the data.

In most all cases the distributions used for the CRA-2004 PABC analysis were identical to those used in the CRA. There were seven parameters that were sampled in the CRA-2004 PABC but were not in the CRA LHS output file (Table 4). The four parameters having material SPALLMOD were sampled separately and used in DRSPALL. However, only fifty vectors of these parameters were sampled for the CRA. The variable WAS_AREA:BIOGENFC is used to capture the uncertainty in actually obtaining the gas generation rates under WIPP conditions as compared to the experimental conditions under which the measured rates were derived. The variables SOLMOD3:SOLVAR and SOLMOD4:SOLVAR are uncertainty factors for solubility based on new data and they replace twelve equivalent variables used in the CRA.

Table 4. Parameters sampled in the CRA-2004 PABC that were not sampled in the CRA.

Material	Property	Figures	Reference
SPALLMOD	REPIPERM	33, 89, 145	Lord, 2003
SPALLMOD	PARTDIAM	40, 96, 152	Hansen et al., 2003
SPALLMOD	REPIPOR	41, 97, 153	Hansen et al., 2003
SPALLMOD	TENSLSTR	42, 98, 154	Hansen et al., 2003
WAS_AREA	BIOGENFC	44, 100, 156	Nemer et al., 2005
SOLMOD3	SOLVAR	54, 110, 166	Xiong et al., 2005
SOLMOD4	SOLVAR	55, 111, 167	Xiong et al., 2005

In addition, there were three parameters for which the distributions were changed (Table 5).

Table 4. Parameters having distributions that changed since the CRA.

Material	Property	Figures	Reason for Change	Reference
WAS_AREA	GRATMICH	47, 103, 159	Updated microbial gas generation rates (humid conditions) based on additional experimental data	Nemer et al., 2005
WAS_AREA	GRATMICI	48, 104, 160	Updated microbial gas generation rates (inundated conditions) based on additional experimental data	Nemer et al., 2005
WAS_AREA	PROBDEG	49, 105, 161	EPA required that the probability of microbial degradation be changed from 0.5 to 1.0.	Nemer, 2005

The sampling methodology for the Student's t distribution was modified after the CRA and prior to the CRA-2004 PABC to enforce truncation at the 0.01 and 0.99 probability levels (Vugrin 2004, 2005). Previously the distributions were truncated at the minimum and maximum of the observed values used to construct the t distribution. Thus the range of sample values for t distributions from the CRA can be different than the range of values sampled for the CRA-2004 PABC (Figures 1, 3, 4, 57, 60, 61, 113, 115, and 116).

Summary and Conclusions

LHS was used to generate one hundred vectors of sampled parameter values for each of three replicates. A unique random number seed was assigned to each of the three replicates. The resulting sampled data had the expected correlation structure and the values fell within the expected ranges.

References

Hansen, F., T. W. Pfeifle and D. L. Lord. 2003. Parameter Justification Report for DRSPALL. Sandia National Laboratories. Carlsbad, NM. ERMS #531057

Kanney, J. F. and C. Leigh. 2005. Analysis Plan for the Post CRA PA Baseline Calculation. AP-122. Sandia National Laboratories. Carlsbad, NM. ERMS #539624

Long, J. J. and J. F. Kanney. 2005. Execution of Performance Assessment Codes for the CRA-2004 Performance Assessment Baseline Calculation. Sandia National Laboratories. Carlsbad, NM.

Lord, D. 2005. Memo: Justification for waste permeability range used in DRSPALL. Sandia National Laboratories. Carlsbad, NM. ERMS #531473

Nemer, M, J. Stein and W. Zelinski. 2005. Analysis Report for BRAGFLO Preliminary Modeling Results With New Gas Generation Rates Based Upon Recent Experimental Results. Sandia National Laboratories. Carlsbad, NM. ERMS #539437

Nemer, M. 2005, Memo to David Kessel re: Updated value of WAS_AREA PROBDEG. Sandia National Laboratories. Carlsbad, NM. ERMS #539441

Vugrin, E. 2004. Software Problem Report, LHS version 2.41. Sandia National Laboratories. Carlsbad, NM.ERMS# 538239

Vugrin, E. 2005. Change Control, Corrections to LHS version 2.41. Sandia National Laboratories. Carlsbad, NM.ERMS# 538375

Xiong, Y., Nowak, E. J. and L H. Brush. 2005. Updated Uncertainty Analysis of Actinide Solubilities For the Response to EPA Comment C-23-16, Rev. 1. Sandia National Laboratories. Carlsbad, NM. ERMS #539595

Appendix I. Input file to PRELHS for Replicate 1

```
! TITLE:          CRA-2004 PABC PRELHS (LHS1) Input File
! ANALYSIS PLAN: AP-122
! ANALYST:        Eric Vugrin
! CREATED:        April  2005
!
!  LHSCALC = CRA1BC REALIZATION 1
!=======================================================================
!
!  DESCRIPTION:
!
!  WIPP 2004 Compliance Recertification Application PA
!  Baseline Calculation, aka  (CRA1BC)
!
!  This input file to PRELHS is used to generate, as an output file, an LHS
!  input file containing all distribution information and execution options
!  required to create a sample for Replicate R1 for the WIPP 2004 CRA1BC
!
!  Changes from CRA1 analyses: 1) Parameters were reordered to group them by
!           the codes that use them.  The grouping is as follows:
!         CCDFGF, CUTTINGS_S, DRSPALL, PANEL, SECOTP2D, BRAGFLO
!           2) Some parameters were removed.  These include WAS_AREA:VOLSPALL,
!           S_MB139:SAT_RGAS, S_MB139:COMP_RCK, SPALLMOD:RNDSPALL, and 12
!           solubility parameters used by PANEL.
!           3) 2 solubility parameters were added for use by PANEL:
!           SOLMOD3:SOLVAR and SOLMOD4:SOLVAR
!           4) The parameter WAS_AREA:BIOGENFC was added for the
!           new gas rate calculations without methanogenisis.
!           5) The correlation was removed between S_MB139:COMP_RCK and
!           S_MB139:PRMX_LOG.
!========= No Comments Allowed between *ECHO and *ENDECHO ==============
!
*ECHOLHS
TITLE 2004 CRA PA Baseline Calculation, Replicate R1 Input File for the LHS Code
NOBS            100
RANDOM SEED     582592385
CORRELATION MATRIX
    2
    53   54 -0.99
    61   62 -0.75
OUTPUT CORR HIST DATA
*ENDECHO
!
!== PROPERTIES TO BE RETRIEVED FROM WIPP PA CALCULATION DATABASE ==
!
*RETRIEVE
!1    CCDFGF
      MATERIALS,  GLOBAL
      PROPERTIES, PBRINE
!2
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!3
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!4    CUTTINGS_S
      MATERIALS,  BOREHOLE
      PROPERTIES, DOMEGA
!5    CUTTINGS_S
      MATERIALS,  BOREHOLE
      PROPERTIES, TAUFAIL
!6
      MATERIALS,  REFCON
```

```
      PROPERTIES, LHSBLANK
!7
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!8    DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, REPIPERM
!9    DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, TENSLSTR
!10   DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, PARTDIAM
!11   DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, REPIPOR
!12
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!13
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!14
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!15   PANEL
        MATERIALS,       SOLMOD3
        PROPERTIES,      SOLVAR
!16   PANEL
        MATERIALS,       SOLMOD4
        PROPERTIES,      SOLVAR
!17   PANEL
      MATERIALS,  PHUMOX3
      PROPERTIES, PHUMCIM
!18   PANEL/SECOTP2D
      MATERIALS,  GLOBAL
      PROPERTIES, OXSTAT
!19
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!20
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!21
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!22
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!23   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, MINP_FAC
!24   SECOTP2D
      MATERIALS,  GLOBAL
      PROPERTIES, TRANSIDX
!25   SECOTP2D
      MATERIALS,  GLOBAL
      PROPERTIES, CLIMTIDX
!26   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, HMBLKLT
!27   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, APOROS
!28   SECOTP2D
```

```
      MATERIALS,  CULEBRA
      PROPERTIES, DPOROS
!29   SECOTP2D
      MATERIALS,  U+6
      PROPERTIES, MKD_U
!30   SECOTP2D
      MATERIALS,  U+4
      PROPERTIES, MKD_U
!31   SECOTP2D
      MATERIALS,  PU+3
      PROPERTIES, MKD_PU
!32   SECOTP2D
      MATERIALS,  PU+4
      PROPERTIES, MKD_PU
!33   SECOTP2D
      MATERIALS,  TH+4
      PROPERTIES, MKD_TH
!34   SECOTP2D
      MATERIALS,  AM+3
      PROPERTIES, MKD_AM
!35
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!36
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!37
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!38
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!39   BRAGFLO
      MATERIALS,  STEEL
      PROPERTIES, CORRMCO2
!40   BRAGFLO/PANEL
      MATERIALS,  WAS_AREA
      PROPERTIES, PROBDEG
!41   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, GRATMICI
!42   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, GRATMICH
!43   BRAGFLO
      MATERIALS,  CELLULS
      PROPERTIES, FBETA
!44   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, SAT_RGAS
!45   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, SAT_RBRN
!46   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, SAT_WICK
!47   BRAGFLO
      MATERIALS,  DRZ_PCS
      PROPERTIES, PRMX_LOG
!48   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, PRMX_LOG
!49   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, SAT_RGAS
```

```
!50   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, SAT_RBRN
!51   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, PORE_DIS
!52   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, POROSITY
!53   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, PRMX_LOG
!54   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, COMP_RCK
!55   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, PRMX_LOG
!56   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, RELP_MOD
!57   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, SAT_RBRN
!58   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, PORE_DIS
!59   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, PRESSURE
!60   BRAGFLO
      MATERIALS,  CASTILER
      PROPERTIES, PRESSURE
!61   BRAGFLO
      MATERIALS,  CASTILER
      PROPERTIES, PRMX_LOG
!62   BRAGFLO
      MATERIALS,  CASTILER
      PROPERTIES, COMP_RCK
!63   BRAGFLO
      MATERIALS,  BH_SAND
      PROPERTIES, PRMX_LOG
!64   BRAGFLO
      MATERIALS,  DRZ_1
      PROPERTIES, PRMX_LOG
!65   BRAGFLO
      MATERIALS,  CONC_PLG
      PROPERTIES, PRMX_LOG
!66   BRAGFLO
      MATERIALS,  SHFTU
      PROPERTIES, SAT_RBRN
!67   BRAGFLO
      MATERIALS,  SHFTU
      PROPERTIES, SAT_RGAS
!68   BRAGFLO
      MATERIALS,  SHFTU
      PROPERTIES, PRMX_LOG
!69   BRAGFLO
      MATERIALS,  SHFTL_T1
      PROPERTIES, PRMX_LOG
!70   BRAGFLO
      MATERIALS,  SHFTL_T2
      PROPERTIES, PRMX_LOG
!71   BRAGFLO
      MATERIALS,  WAS_AREA
```

```
      PROPERTIES, BIOGENFC
!72
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!73
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!74
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!75
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!
!=======================================================================
!
*END
```

Appendix II. Input file to PRELHS for Replicate 2

```
! TITLE:         CRA-2004 PABC PRELHS (LHS1) Input File
! ANALYSIS PLAN: AP-122
! ANALYST:       Eric Vugrin
! CREATED:       April  2005
!
!  LHSCALC = CRA1BC REALIZATION 2
!=======================================================================
!
!  DESCRIPTION:
!
!  WIPP 2004 Compliance Recertification Application PA
!  Baseline Calculation, aka  (CRA1BC)
!
!  This input file to PRELHS is used to generate, as an output file, an LHS
!  input file containing all distribution information and execution options
!  required to create a sample for Replicate R2 for the WIPP 2004 CRA1BC
!
!  Changes from CRA1 analyses: 1) Parameters were reordered to group them by
!           the codes that use them.  The grouping is as follows:
!         CCDFGF, CUTTINGS_S, DRSPALL, PANEL, SECOTP2D, BRAGFLO
!           2) Some parameters were removed.  These include WAS_AREA:VOLSPALL,
!           S_MB139:SAT_RGAS, S_MB139:COMP_RCK, SPALLMOD:RNDSPALL, and 12
!           solubility parameters used by PANEL.
!           3) 2 solubility parameters were added for use by PANEL:
!           SOLMOD3:SOLVAR and SOLMOD4:SOLVAR
!           4) The parameter WAS_AREA:BIOGENFC was added for the
!           new gas rate calculations without methanogenisis.
!           5) The correlation was removed between S_MB139:COMP_RCK and
!           S_MB139:PRMX_LOG.
!========= No Comments Allowed between *ECHO and *ENDECHO ================
!
*ECHOLHS
TITLE 2004 CRA PA Baseline Calculation, Replicate R2 Input File for the LHS Code
NOBS            100
RANDOM SEED     168866235
CORRELATION MATRIX
    2
    53   54 -0.99
    61   62 -0.75
OUTPUT CORR HIST DATA
```

```
*ENDECHO
!
!== PROPERTIES TO BE RETRIEVED FROM WIPP PA CALCULATION DATABASE ==
!
*RETRIEVE
!1    CCDFGF
      MATERIALS,  GLOBAL
      PROPERTIES, PBRINE
!2
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!3
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!4    CUTTINGS_S
      MATERIALS,  BOREHOLE
      PROPERTIES, DOMEGA
!5    CUTTINGS_S
      MATERIALS,  BOREHOLE
      PROPERTIES, TAUFAIL
!6
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!7
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!8    DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, REPIPERM
!9    DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, TENSLSTR
!10   DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, PARTDIAM
!11   DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, REPIPOR
!12
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!13
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!14
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!15   PANEL
        MATERIALS,       SOLMOD3
        PROPERTIES,      SOLVAR
!16   PANEL
        MATERIALS,       SOLMOD4
        PROPERTIES,      SOLVAR
!17   PANEL
      MATERIALS,  PHUMOX3
      PROPERTIES, PHUMCIM
!18   PANEL/SECOTP2D
```

```
      MATERIALS,  GLOBAL
      PROPERTIES, OXSTAT
!19
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!20
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!21
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!22
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!23   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, MINP_FAC
!24   SECOTP2D
      MATERIALS,  GLOBAL
      PROPERTIES, TRANSIDX
!25   SECOTP2D
      MATERIALS,  GLOBAL
      PROPERTIES, CLIMTIDX
!26   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, HMBLKLT
!27   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, APOROS
!28   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, DPOROS
!29   SECOTP2D
      MATERIALS,  U+6
      PROPERTIES, MKD_U
!30   SECOTP2D
      MATERIALS,  U+4
      PROPERTIES, MKD_U
!31   SECOTP2D
      MATERIALS,  PU+3
      PROPERTIES, MKD_PU
!32   SECOTP2D
      MATERIALS,  PU+4
      PROPERTIES, MKD_PU
!33   SECOTP2D
      MATERIALS,  TH+4
      PROPERTIES, MKD_TH
!34   SECOTP2D
      MATERIALS,  AM+3
      PROPERTIES, MKD_AM
!35
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!36
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!37
```

```
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!38
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!39   BRAGFLO
      MATERIALS,  STEEL
      PROPERTIES, CORRMCO2
!40   BRAGFLO/PANEL
      MATERIALS,  WAS_AREA
      PROPERTIES, PROBDEG
!41   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, GRATMICI
!42   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, GRATMICH
!43   BRAGFLO
      MATERIALS,  CELLULS
      PROPERTIES, FBETA
!44   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, SAT_RGAS
!45   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, SAT_RBRN
!46   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, SAT_WICK
!47   BRAGFLO
      MATERIALS,  DRZ_PCS
      PROPERTIES, PRMX_LOG
!48   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, PRMX_LOG
!49   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, SAT_RGAS
!50   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, SAT_RBRN
!51   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, PORE_DIS
!52   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, POROSITY
!53   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, PRMX_LOG
!54   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, COMP_RCK
!55   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, PRMX_LOG
!56   BRAGFLO
```

```
      MATERIALS,  S_MB139
      PROPERTIES, RELP_MOD
!57   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, SAT_RBRN
!58   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, PORE_DIS
!59   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, PRESSURE
!60   BRAGFLO
      MATERIALS,  CASTILER
      PROPERTIES, PRESSURE
!61   BRAGFLO
      MATERIALS,  CASTILER
      PROPERTIES, PRMX_LOG
!62   BRAGFLO
      MATERIALS,  CASTILER
      PROPERTIES, COMP_RCK
!63   BRAGFLO
      MATERIALS,  BH_SAND
      PROPERTIES, PRMX_LOG
!64   BRAGFLO
      MATERIALS,  DRZ_1
      PROPERTIES, PRMX_LOG
!65   BRAGFLO
      MATERIALS,  CONC_PLG
      PROPERTIES, PRMX_LOG
!66   BRAGFLO
      MATERIALS,  SHFTU
      PROPERTIES, SAT_RBRN
!67   BRAGFLO
      MATERIALS,  SHFTU
      PROPERTIES, SAT_RGAS
!68   BRAGFLO
      MATERIALS,  SHFTU
      PROPERTIES, PRMX_LOG
!69   BRAGFLO
      MATERIALS,  SHFTL_T1
      PROPERTIES, PRMX_LOG
!70   BRAGFLO
      MATERIALS,  SHFTL_T2
      PROPERTIES, PRMX_LOG
!71   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, BIOGENFC
!72
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!73
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!74
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!75
```

```
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!
!=======================================================================
!
*END
```

Appendix III. Input file to PRELHS for Replicate 3

```
! TITLE:          CRA-2004 PABC PRELHS (LHS1) Input File
! ANALYSIS PLAN: AP-122
! ANALYST:        Eric Vugrin
! CREATED:        April  2005
!
!  LHSCALC = CRA1BC REALIZATION 3
!=======================================================================
!
!  DESCRIPTION:
!
!  WIPP 2004 Compliance Recertification Application PA
!  Baseline Calculation, aka  (CRA1BC)
!
!  This input file to PRELHS is used to generate, as an output file, an LHS
!  input file containing all distribution information and execution options
!  required to create a sample for Replicate R3 for the WIPP 2004 CRA1BC
!
!  Changes from CRA1 analyses: 1) Parameters were reordered to group them by
!           the codes that use them.  The grouping is as follows:
!         CCDFGF, CUTTINGS_S, DRSPALL, PANEL, SECOTP2D, BRAGFLO
!           2) Some parameters were removed.  These include WAS_AREA:VOLSPALL,
!           S_MB139:SAT_RGAS, S_MB139:COMP_RCK, SPALLMOD:RNDSPALL, and 12
!           solubility parameters used by PANEL.
!           3) 2 solubility parameters were added for use by PANEL:
!           SOLMOD3:SOLVAR and SOLMOD4:SOLVAR
!           4) The parameter WAS_AREA:BIOGENFC was added for the
!           new gas rate calculations without methanogenisis.
!           5) The correlation was removed between S_MB139:COMP_RCK and
!           S_MB139:PRMX_LOG.
!========= No Comments Allowed between *ECHO and *ENDECHO ===============
!
*ECHOLHS
TITLE 2004 CRA PA Baseline Calculation, Replicate R3 Input File for the LHS Code
NOBS            100
RANDOM SEED     292058223
CORRELATION MATRIX
    2
    53  54 -0.99
    61  62 -0.75
OUTPUT CORR HIST DATA
*ENDECHO
!
!== PROPERTIES TO BE RETRIEVED FROM WIPP PA CALCULATION DATABASE ==
!
*RETRIEVE
!1    CCDFGF
      MATERIALS,  GLOBAL
      PROPERTIES, PBRINE
!2
```

```
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!3
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!4    CUTTINGS_S
      MATERIALS,  BOREHOLE
      PROPERTIES, DOMEGA
!5    CUTTINGS_S
      MATERIALS,  BOREHOLE
      PROPERTIES, TAUFAIL
!6
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!7
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!8    DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, REPIPERM
!9    DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, TENSLSTR
!10   DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, PARTDIAM
!11   DRSPALL
      MATERIALS,  SPALLMOD
      PROPERTIES, REPIPOR
!12
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!13
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!14
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!15   PANEL
        MATERIALS,       SOLMOD3
        PROPERTIES,      SOLVAR
!16   PANEL
        MATERIALS,       SOLMOD4
        PROPERTIES,      SOLVAR
!17   PANEL
      MATERIALS,  PHUMOX3
      PROPERTIES, PHUMCIM
!18   PANEL/SECOTP2D
      MATERIALS,  GLOBAL
      PROPERTIES, OXSTAT
!19
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!20
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!21
```

```
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!22
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!23   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, MINP_FAC
!24   SECOTP2D
      MATERIALS,  GLOBAL
      PROPERTIES, TRANSIDX
!25   SECOTP2D
      MATERIALS,  GLOBAL
      PROPERTIES, CLIMTIDX
!26   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, HMBLKLT
!27   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, APOROS
!28   SECOTP2D
      MATERIALS,  CULEBRA
      PROPERTIES, DPOROS
!29   SECOTP2D
      MATERIALS,  U+6
      PROPERTIES, MKD_U
!30   SECOTP2D
      MATERIALS,  U+4
      PROPERTIES, MKD_U
!31   SECOTP2D
      MATERIALS,  PU+3
      PROPERTIES, MKD_PU
!32   SECOTP2D
      MATERIALS,  PU+4
      PROPERTIES, MKD_PU
!33   SECOTP2D
      MATERIALS,  TH+4
      PROPERTIES, MKD_TH
!34   SECOTP2D
      MATERIALS,  AM+3
      PROPERTIES, MKD_AM
!35
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!36
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!37
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!38
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!39   BRAGFLO
      MATERIALS,  STEEL
      PROPERTIES, CORRMCO2
!40   BRAGFLO/PANEL
```

```
      MATERIALS,  WAS_AREA
      PROPERTIES, PROBDEG
!41   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, GRATMICI
!42   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, GRATMICH
!43   BRAGFLO
      MATERIALS,  CELLULS
      PROPERTIES, FBETA
!44   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, SAT_RGAS
!45   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, SAT_RBRN
!46   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, SAT_WICK
!47   BRAGFLO
      MATERIALS,  DRZ_PCS
      PROPERTIES, PRMX_LOG
!48   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, PRMX_LOG
!49   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, SAT_RGAS
!50   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, SAT_RBRN
!51   BRAGFLO
      MATERIALS,  CONC_PCS
      PROPERTIES, PORE_DIS
!52   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, POROSITY
!53   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, PRMX_LOG
!54   BRAGFLO
      MATERIALS,  S_HALITE
      PROPERTIES, COMP_RCK
!55   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, PRMX_LOG
!56   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, RELP_MOD
!57   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, SAT_RBRN
!58   BRAGFLO
      MATERIALS,  S_MB139
      PROPERTIES, PORE_DIS
!59   BRAGFLO
```

```
      MATERIALS,  S_HALITE
      PROPERTIES, PRESSURE
!60   BRAGFLO
      MATERIALS,  CASTILER
      PROPERTIES, PRESSURE
!61   BRAGFLO
      MATERIALS,  CASTILER
      PROPERTIES, PRMX_LOG
!62   BRAGFLO
      MATERIALS,  CASTILER
      PROPERTIES, COMP_RCK
!63   BRAGFLO
      MATERIALS,  BH_SAND
      PROPERTIES, PRMX_LOG
!64   BRAGFLO
      MATERIALS,  DRZ_1
      PROPERTIES, PRMX_LOG
!65   BRAGFLO
      MATERIALS,  CONC_PLG
      PROPERTIES, PRMX_LOG
!66   BRAGFLO
      MATERIALS,  SHFTU
      PROPERTIES, SAT_RBRN
!67   BRAGFLO
      MATERIALS,  SHFTU
      PROPERTIES, SAT_RGAS
!68   BRAGFLO
      MATERIALS,  SHFTU
      PROPERTIES, PRMX_LOG
!69   BRAGFLO
      MATERIALS,  SHFTL_T1
      PROPERTIES, PRMX_LOG
!70   BRAGFLO
      MATERIALS,  SHFTL_T2
      PROPERTIES, PRMX_LOG
!71   BRAGFLO
      MATERIALS,  WAS_AREA
      PROPERTIES, BIOGENFC
!72
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!73
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!74
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!75
      MATERIALS,  REFCON
      PROPERTIES, LHSBLANK
!
!=============================================================================
!
*END
```

Appendix IV. PRELHS Output (Transfer) File for Replicate 1

```
TITLE SDB: PARAMETER_PROD     Calc: CRA1BC       Ver: 1.00     05/03/05 13:24:59
```

```
TITLE 2004 CRA PA Baseline Calculation, Replicate R1 Input File for the LHS Code
NOBS           100
RANDOM SEED    582592385
UNIFORM                 GLOBAL    PBRINE
    1.00000E-02    6.00000E-01
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
USER DISTRIBUTION  (CUMULATIVE)       BOREHOLE  DOMEGA
        10          SPECIFIED    CONTINUOUS
    4.20000E+00   0.15000
    6.30000E+00   0.50000
    8.40000E+00   0.15000
    1.05000E+01   0.10000
    1.26000E+01   0.05000
    1.47000E+01   0.02000
    1.68000E+01   0.01000
    1.88000E+01   0.01000
    2.09000E+01   0.01000
    2.30000E+01   0.00000
LOGUNIFORM              BOREHOLE  TAUFAIL
    5.00000E-02    7.70000E+01
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
LOGUNIFORM              SPALLMOD  REPIPERM
    2.40000E-14    2.40000E-12
UNIFORM                 SPALLMOD  TENSLSTR
    1.20000E+05    1.70000E+05
LOGUNIFORM              SPALLMOD  PARTDIAM
    1.00000E-03    1.00000E-01
UNIFORM                 SPALLMOD  REPIPOR
    3.50000E-01    6.60000E-01
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
USER DISTRIBUTION  (CUMULATIVE)       SOLMOD3   SOLVAR
        43          SPECIFIED    CONTINUOUS
   -3.15000E+00   0.00000
   -3.00000E+00   0.00412
   -2.85000E+00   0.00000
   -2.70000E+00   0.00000
   -2.55000E+00   0.00000
   -2.40000E+00   0.00000
   -2.25000E+00   0.00000
   -2.10000E+00   0.00000
   -1.95000E+00   0.00412
   -1.80000E+00   0.01646
   -1.65000E+00   0.00412
   -1.50000E+00   0.02469
   -1.35000E+00   0.03292
   -1.20000E+00   0.03292
   -1.05000E+00   0.02058
   -9.00000E-01   0.04527
   -7.50000E-01   0.04938
   -6.00000E-01   0.03292
   -4.50000E-01   0.07819
   -3.00000E-01   0.08230
   -1.50000E-01   0.09053
    0.00000E+00   0.06584
```

```
    1.50000E-01   0.06584
    3.00000E-01   0.07819
    4.50000E-01   0.02469
    6.00000E-01   0.04115
    7.50000E-01   0.03292
    9.00000E-01   0.02881
    1.05000E+00   0.02881
    1.20000E+00   0.04115
    1.35000E+00   0.02469
    1.50000E+00   0.00823
    1.65000E+00   0.00412
    1.80000E+00   0.01646
    1.95000E+00   0.00000
    2.10000E+00   0.00412
    2.25000E+00   0.00412
    2.40000E+00   0.00823
    2.55000E+00   0.00000
    2.70000E+00   0.00412
    2.85000E+00   0.00000
    3.00000E+00   0.00000
    3.15000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)        SOLMOD4    SOLVAR
        33          SPECIFIED     CONTINUOUS
   -2.10000E+00   0.00000
   -1.95000E+00   0.00000
   -1.80000E+00   0.02222
   -1.65000E+00   0.00000
   -1.50000E+00   0.00000
   -1.35000E+00   0.00000
   -1.20000E+00   0.00000
   -1.05000E+00   0.02222
   -9.00000E-01   0.04444
   -7.50000E-01   0.11111
   -6.00000E-01   0.20000
   -4.50000E-01   0.02222
   -3.00000E-01   0.00000
   -1.50000E-01   0.06667
    0.00000E+00   0.02222
    1.50000E-01   0.11111
    3.00000E-01   0.04444
    4.50000E-01   0.02222
    6.00000E-01   0.08889
    7.50000E-01   0.08889
    9.00000E-01   0.04444
    1.05000E+00   0.00000
    1.20000E+00   0.00000
    1.35000E+00   0.02222
    1.50000E+00   0.00000
    1.65000E+00   0.02222
    1.80000E+00   0.00000
    1.95000E+00   0.02222
    2.10000E+00   0.00000
    2.25000E+00   0.02222
    2.40000E+00   0.00000
    2.55000E+00   0.00000
    2.70000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)        PHUMOX3    PHUMCIM
        3           SPECIFIED     CONTINUOUS
    6.50000E-02   0.50000
    1.37000E+00   0.50000
    1.60000E+00   0.00000
UNIFORM                 GLOBAL     OXSTAT
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON     LHSBLANK
    0.00000E+00    1.00000E+00
```

```
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 CULEBRA   MINP_FAC
    1.00000E+00    1.00000E+03
UNIFORM                 GLOBAL    TRANSIDX
    0.00000E+00    1.00000E+00
USER DISTRIBUTION  (CUMULATIVE)       GLOBAL    CLIMTIDX
         4          SPECIFIED    CONTINUOUS
    1.00000E+00   0.75000
    1.25000E+00   0.00000
    1.50000E+00   0.25000
    2.25000E+00   0.00000
UNIFORM                 CULEBRA   HMBLKLT
    5.00000E-02    5.00000E-01
LOGUNIFORM              CULEBRA   APOROS
    1.00000E-04    1.00000E-02
USER DISTRIBUTION  (CUMULATIVE)       CULEBRA   DPOROS
         7          SPECIFIED    CONTINUOUS
    1.00000E-01   0.10000
    1.10000E-01   0.15000
    1.20000E-01   0.25000
    1.60000E-01   0.25000
    1.80000E-01   0.15000
    1.90000E-01   0.10000
    2.50000E-01   0.00000
LOGUNIFORM              U+6       MKD_U
    3.00000E-05    2.00000E-02
LOGUNIFORM              U+4       MKD_U
    7.00000E-01    1.00000E+01
LOGUNIFORM              PU+3      MKD_PU
    2.00000E-02    4.00000E-01
LOGUNIFORM              PU+4      MKD_PU
    7.00000E-01    1.00000E+01
LOGUNIFORM              TH+4      MKD_TH
    7.00000E-01    1.00000E+01
LOGUNIFORM              AM+3      MKD_AM
    2.00000E-02    4.00000E-01
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 STEEL     CORRMCO2
    0.00000E+00    3.17000E-14
USER DISTRIBUTION  (DELTA)            WAS_AREA  PROBDEG
         2          SPECIFIED    DISCRETE
    1.00000E+00   0.75000
    2.00000E+00   0.25000
UNIFORM                 WAS_AREA  GRATMICI
    3.08269E-11    5.56921E-10
UNIFORM                 WAS_AREA  GRATMICH
    0.00000E+00    1.02717E-09
UNIFORM                 CELLULS   FBETA
    0.00000E+00    1.00000E+00
UNIFORM                 WAS_AREA  SAT_RGAS
    0.00000E+00    1.50000E-01
UNIFORM                 WAS_AREA  SAT_RBRN
    0.00000E+00    5.52000E-01
```

```
UNIFORM                 WAS_AREA  SAT_WICK
    0.00000E+00    1.00000E+00
TRIANGULAR              DRZ_PCS   PRMX_LOG
   -2.06990E+01   -1.87496E+01   -1.70000E+01
TRIANGULAR              CONC_PCS  PRMX_LOG
   -2.06990E+01   -1.87496E+01   -1.70000E+01
UNIFORM                 CONC_PCS  SAT_RGAS
    0.00000E+00    4.00000E-01
USER DISTRIBUTION  (CUMULATIVE)       CONC_PCS  SAT_RBRN
         3          SPECIFIED    CONTINUOUS
    0.00000E+00   0.50000
    2.00000E-01   0.50000
    6.00000E-01   0.00000
USER DISTRIBUTION  (CUMULATIVE)       CONC_PCS  PORE_DIS
         3          SPECIFIED    CONTINUOUS
    1.10000E-01   0.50000
    9.40000E-01   0.50000
    8.10000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)       S_HALITE  POROSITY
         3          SPECIFIED    CONTINUOUS
    1.00000E-03   0.50000
    1.00000E-02   0.50000
    3.00000E-02   0.00000
UNIFORM                 S_HALITE  PRMX_LOG
   -2.40000E+01   -2.10000E+01
UNIFORM                 S_HALITE  COMP_RCK
    2.94000E-12    1.92000E-10
STUDENT                 S_MB139   PRMX_LOG
         6
 -2.10000E+01 -1.92000E+01 -1.91000E+01 -1.88000E+01 -1.81000E+01 -1.71000E+01
USER DISTRIBUTION  (DELTA)          S_MB139   RELP_MOD
         4          SPECIFIED    DISCRETE
    1.00000E+00   0.50000
    2.00000E+00   0.00000
    3.00000E+00   0.00000
    4.00000E+00   0.50000
STUDENT                 S_MB139   SAT_RBRN
         6
  7.78460E-03  6.88420E-02  6.98600E-02  7.26200E-02  1.08610E-01  1.74010E-01
STUDENT                 S_MB139   PORE_DIS
         6
  4.90530E-01  5.57750E-01  6.52000E-01  6.55000E-01  6.64520E-01  8.41780E-01
UNIFORM                 S_HALITE  PRESSURE
    1.10400E+07    1.38900E+07
TRIANGULAR              CASTILER  PRESSURE
    1.11000E+07    1.27000E+07    1.70000E+07
TRIANGULAR              CASTILER  PRMX_LOG
   -1.47000E+01   -1.18000E+01   -9.80000E+00
TRIANGULAR              CASTILER  COMP_RCK
    2.00000E-11    4.00000E-11    1.00000E-10
UNIFORM                 BH_SAND   PRMX_LOG
   -1.63000E+01   -1.10000E+01
UNIFORM                 DRZ_1     PRMX_LOG
   -1.94000E+01   -1.25000E+01
UNIFORM                 CONC_PLG  PRMX_LOG
   -1.90000E+01   -1.70000E+01
USER DISTRIBUTION  (CUMULATIVE)       SHFTU     SAT_RBRN
         3          SPECIFIED    CONTINUOUS
    0.00000E+00   0.50000
    2.00000E-01   0.50000
    6.00000E-01   0.00000
UNIFORM                 SHFTU     SAT_RGAS
    0.00000E+00    4.00000E-01
USER DISTRIBUTION  (CUMULATIVE)       SHFTU     PRMX_LOG
         9          SPECIFIED    CONTINUOUS
```

```
   -2.05000E+01    0.03000
   -2.00000E+01    0.08000
   -1.95000E+01    0.13000
   -1.90000E+01    0.19000
   -1.85000E+01    0.22000
   -1.80000E+01    0.24000
   -1.75000E+01    0.10000
   -1.70000E+01    0.01000
   -1.65000E+01    0.00000
USER DISTRIBUTION  (CUMULATIVE)        SHFTL_T1   PRMX_LOG
         8          SPECIFIED     CONTINUOUS
   -2.00000E+01    0.01000
   -1.95000E+01    0.09000
   -1.90000E+01    0.20700
   -1.85000E+01    0.33000
   -1.80000E+01    0.23600
   -1.75000E+01    0.12000
   -1.70000E+01    0.00700
   -1.65000E+01    0.00000
USER DISTRIBUTION  (CUMULATIVE)        SHFTL_T2   PRMX_LOG
        10          SPECIFIED     CONTINUOUS
   -2.25000E+01    0.02000
   -2.20000E+01    0.06000
   -2.15000E+01    0.09000
   -2.10000E+01    0.13500
   -2.05000E+01    0.22000
   -2.00000E+01    0.17500
   -1.95000E+01    0.16500
   -1.90000E+01    0.10000
   -1.85000E+01    0.03500
   -1.80000E+01    0.00000
UNIFORM                 WAS_AREA   BIOGENFC
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON     LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON     LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON     LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON     LHSBLANK
    0.00000E+00    1.00000E+00
CORRELATION MATRIX
    2
    53  54 -0.99
    61  62 -0.75
OUTPUT CORR HIST DATA
TITLE SDB: PARAMETER_PROD     Calc: CRA1BC       Ver: 1.00     05/03/05 13:24:59
```

Appendix V. PRELHS Output (Transfer) File for Replicate 2

```
TITLE SDB: PARAMETER_PROD     Calc: CRA1BC       Ver: 1.00     05/03/05 13:28:37
TITLE 2004 CRA PA Baseline Calculation, Replicate R2 Input File for the LHS Code
NOBS           100
RANDOM SEED    168866235
UNIFORM                 GLOBAL     PBRINE
    1.00000E-02    6.00000E-01
UNIFORM                 REFCON     LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON     LHSBLANK
    0.00000E+00    1.00000E+00
USER DISTRIBUTION  (CUMULATIVE)        BOREHOLE   DOMEGA
        10          SPECIFIED     CONTINUOUS
    4.20000E+00    0.15000
```

```
    6.30000E+00   0.50000
    8.40000E+00   0.15000
    1.05000E+01   0.10000
    1.26000E+01   0.05000
    1.47000E+01   0.02000
    1.68000E+01   0.01000
    1.88000E+01   0.01000
    2.09000E+01   0.01000
    2.30000E+01   0.00000
LOGUNIFORM              BOREHOLE  TAUFAIL
    5.00000E-02    7.70000E+01
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
LOGUNIFORM              SPALLMOD  REPIPERM
    2.40000E-14    2.40000E-12
UNIFORM                 SPALLMOD  TENSLSTR
    1.20000E+05    1.70000E+05
LOGUNIFORM              SPALLMOD  PARTDIAM
    1.00000E-03    1.00000E-01
UNIFORM                 SPALLMOD  REPIPOR
    3.50000E-01    6.60000E-01
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
USER DISTRIBUTION  (CUMULATIVE)       SOLMOD3   SOLVAR
        43          SPECIFIED    CONTINUOUS
   -3.15000E+00   0.00000
   -3.00000E+00   0.00412
   -2.85000E+00   0.00000
   -2.70000E+00   0.00000
   -2.55000E+00   0.00000
   -2.40000E+00   0.00000
   -2.25000E+00   0.00000
   -2.10000E+00   0.00000
   -1.95000E+00   0.00412
   -1.80000E+00   0.01646
   -1.65000E+00   0.00412
   -1.50000E+00   0.02469
   -1.35000E+00   0.03292
   -1.20000E+00   0.03292
   -1.05000E+00   0.02058
   -9.00000E-01   0.04527
   -7.50000E-01   0.04938
   -6.00000E-01   0.03292
   -4.50000E-01   0.07819
   -3.00000E-01   0.08230
   -1.50000E-01   0.09053
    0.00000E+00   0.06584
    1.50000E-01   0.06584
    3.00000E-01   0.07819
    4.50000E-01   0.02469
    6.00000E-01   0.04115
```

```
    7.50000E-01   0.03292
    9.00000E-01   0.02881
    1.05000E+00   0.02881
    1.20000E+00   0.04115
    1.35000E+00   0.02469
    1.50000E+00   0.00823
    1.65000E+00   0.00412
    1.80000E+00   0.01646
    1.95000E+00   0.00000
    2.10000E+00   0.00412
    2.25000E+00   0.00412
    2.40000E+00   0.00823
    2.55000E+00   0.00000
    2.70000E+00   0.00412
    2.85000E+00   0.00000
    3.00000E+00   0.00000
    3.15000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)        SOLMOD4    SOLVAR
       33           SPECIFIED     CONTINUOUS
   -2.10000E+00   0.00000
   -1.95000E+00   0.00000
   -1.80000E+00   0.02222
   -1.65000E+00   0.00000
   -1.50000E+00   0.00000
   -1.35000E+00   0.00000
   -1.20000E+00   0.00000
   -1.05000E+00   0.02222
   -9.00000E-01   0.04444
   -7.50000E-01   0.11111
   -6.00000E-01   0.20000
   -4.50000E-01   0.02222
   -3.00000E-01   0.00000
   -1.50000E-01   0.06667
    0.00000E+00   0.02222
    1.50000E-01   0.11111
    3.00000E-01   0.04444
    4.50000E-01   0.02222
    6.00000E-01   0.08889
    7.50000E-01   0.08889
    9.00000E-01   0.04444
    1.05000E+00   0.00000
    1.20000E+00   0.00000
    1.35000E+00   0.02222
    1.50000E+00   0.00000
    1.65000E+00   0.02222
    1.80000E+00   0.00000
    1.95000E+00   0.02222
    2.10000E+00   0.00000
    2.25000E+00   0.02222
    2.40000E+00   0.00000
    2.55000E+00   0.00000
    2.70000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)        PHUMOX3    PHUMCIM
        3           SPECIFIED     CONTINUOUS
    6.50000E-02   0.50000
    1.37000E+00   0.50000
    1.60000E+00   0.00000
```

```
UNIFORM                 GLOBAL    OXSTAT
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 CULEBRA   MINP_FAC
    1.00000E+00    1.00000E+03
UNIFORM                 GLOBAL    TRANSIDX
    0.00000E+00    1.00000E+00
USER DISTRIBUTION  (CUMULATIVE)       GLOBAL    CLIMTIDX
         4          SPECIFIED    CONTINUOUS
    1.00000E+00   0.75000
    1.25000E+00   0.00000
    1.50000E+00   0.25000
    2.25000E+00   0.00000
UNIFORM                 CULEBRA   HMBLKLT
    5.00000E-02    5.00000E-01
LOGUNIFORM              CULEBRA   APOROS
    1.00000E-04    1.00000E-02
USER DISTRIBUTION  (CUMULATIVE)       CULEBRA   DPOROS
         7          SPECIFIED    CONTINUOUS
    1.00000E-01   0.10000
    1.10000E-01   0.15000
    1.20000E-01   0.25000
    1.60000E-01   0.25000
    1.80000E-01   0.15000
    1.90000E-01   0.10000
    2.50000E-01   0.00000
LOGUNIFORM              U+6       MKD_U
    3.00000E-05    2.00000E-02
LOGUNIFORM              U+4       MKD_U
    7.00000E-01    1.00000E+01
LOGUNIFORM              PU+3      MKD_PU
    2.00000E-02    4.00000E-01
LOGUNIFORM              PU+4      MKD_PU
    7.00000E-01    1.00000E+01
LOGUNIFORM              TH+4      MKD_TH
    7.00000E-01    1.00000E+01
LOGUNIFORM              AM+3      MKD_AM
    2.00000E-02    4.00000E-01
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 STEEL     CORRMCO2
    0.00000E+00    3.17000E-14
USER DISTRIBUTION  (DELTA)            WAS_AREA  PROBDEG
         2          SPECIFIED    DISCRETE
```

```
    1.00000E+00    0.75000
    2.00000E+00    0.25000
UNIFORM                 WAS_AREA  GRATMICI
    3.08269E-11     5.56921E-10
UNIFORM                 WAS_AREA  GRATMICH
    0.00000E+00     1.02717E-09
UNIFORM                 CELLULS   FBETA
    0.00000E+00     1.00000E+00
UNIFORM                 WAS_AREA  SAT_RGAS
    0.00000E+00     1.50000E-01
UNIFORM                 WAS_AREA  SAT_RBRN
    0.00000E+00     5.52000E-01
UNIFORM                 WAS_AREA  SAT_WICK
    0.00000E+00     1.00000E+00
TRIANGULAR              DRZ_PCS   PRMX_LOG
   -2.06990E+01    -1.87496E+01   -1.70000E+01
TRIANGULAR              CONC_PCS  PRMX_LOG
   -2.06990E+01    -1.87496E+01   -1.70000E+01
UNIFORM                 CONC_PCS  SAT_RGAS
    0.00000E+00     4.00000E-01
USER DISTRIBUTION  (CUMULATIVE)       CONC_PCS  SAT_RBRN
         3           SPECIFIED    CONTINUOUS
    0.00000E+00    0.50000
    2.00000E-01    0.50000
    6.00000E-01    0.00000
USER DISTRIBUTION  (CUMULATIVE)       CONC_PCS  PORE_DIS
         3           SPECIFIED    CONTINUOUS
    1.10000E-01    0.50000
    9.40000E-01    0.50000
    8.10000E+00    0.00000
USER DISTRIBUTION  (CUMULATIVE)       S_HALITE  POROSITY
         3           SPECIFIED    CONTINUOUS
    1.00000E-03    0.50000
    1.00000E-02    0.50000
    3.00000E-02    0.00000
UNIFORM                 S_HALITE  PRMX_LOG
   -2.40000E+01    -2.10000E+01
UNIFORM                 S_HALITE  COMP_RCK
    2.94000E-12     1.92000E-10
STUDENT                 S_MB139   PRMX_LOG
         6
 -2.10000E+01 -1.92000E+01 -1.91000E+01 -1.88000E+01 -1.81000E+01 -1.71000E+01
USER DISTRIBUTION  (DELTA)          S_MB139   RELP_MOD
         4           SPECIFIED    DISCRETE
    1.00000E+00    0.50000
    2.00000E+00    0.00000
    3.00000E+00    0.00000
    4.00000E+00    0.50000
STUDENT                 S_MB139   SAT_RBRN
         6
  7.78460E-03  6.88420E-02  6.98600E-02  7.26200E-02  1.08610E-01  1.74010E-01
STUDENT                 S_MB139   PORE_DIS
         6
  4.90530E-01  5.57750E-01  6.52000E-01  6.55000E-01  6.64520E-01  8.41780E-01
UNIFORM                 S_HALITE  PRESSURE
    1.10400E+07     1.38900E+07
TRIANGULAR              CASTILER  PRESSURE
```

```
    1.11000E+07    1.27000E+07    1.70000E+07
TRIANGULAR              CASTILER  PRMX_LOG
   -1.47000E+01   -1.18000E+01   -9.80000E+00
TRIANGULAR              CASTILER  COMP_RCK
    2.00000E-11    4.00000E-11    1.00000E-10
UNIFORM                 BH_SAND   PRMX_LOG
   -1.63000E+01   -1.10000E+01
UNIFORM                 DRZ_1     PRMX_LOG
   -1.94000E+01   -1.25000E+01
UNIFORM                 CONC_PLG  PRMX_LOG
   -1.90000E+01   -1.70000E+01
USER DISTRIBUTION  (CUMULATIVE)       SHFTU     SAT_RBRN
         3          SPECIFIED    CONTINUOUS
    0.00000E+00   0.50000
    2.00000E-01   0.50000
    6.00000E-01   0.00000
UNIFORM                 SHFTU     SAT_RGAS
    0.00000E+00    4.00000E-01
USER DISTRIBUTION  (CUMULATIVE)       SHFTU     PRMX_LOG
         9          SPECIFIED    CONTINUOUS
   -2.05000E+01   0.03000
   -2.00000E+01   0.08000
   -1.95000E+01   0.13000
   -1.90000E+01   0.19000
   -1.85000E+01   0.22000
   -1.80000E+01   0.24000
   -1.75000E+01   0.10000
   -1.70000E+01   0.01000
   -1.65000E+01   0.00000
USER DISTRIBUTION  (CUMULATIVE)       SHFTL_T1  PRMX_LOG
         8          SPECIFIED    CONTINUOUS
   -2.00000E+01   0.01000
   -1.95000E+01   0.09000
   -1.90000E+01   0.20700
   -1.85000E+01   0.33000
   -1.80000E+01   0.23600
   -1.75000E+01   0.12000
   -1.70000E+01   0.00700
   -1.65000E+01   0.00000
USER DISTRIBUTION  (CUMULATIVE)       SHFTL_T2  PRMX_LOG
        10          SPECIFIED    CONTINUOUS
   -2.25000E+01   0.02000
   -2.20000E+01   0.06000
   -2.15000E+01   0.09000
   -2.10000E+01   0.13500
   -2.05000E+01   0.22000
   -2.00000E+01   0.17500
   -1.95000E+01   0.16500
   -1.90000E+01   0.10000
   -1.85000E+01   0.03500
   -1.80000E+01   0.00000
UNIFORM                 WAS_AREA  BIOGENFC
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
```

```
UNIFORM                  REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                  REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
CORRELATION MATRIX
    2
    53   54 -0.99
    61   62 -0.75
OUTPUT CORR HIST DATA
TITLE SDB: PARAMETER_PROD     Calc: CRA1BC       Ver: 1.00     05/03/05 13:28:37
```

Appendix VI. PRELHS Output (Transfer) File for Replicate 3

```
TITLE SDB: PARAMETER_PROD     Calc: CRA1BC       Ver: 1.00     05/03/05 13:29:49
TITLE 2004 CRA PA Baseline Calculation, Replicate R3 Input File for the LHS Code
NOBS           100
RANDOM SEED    292058223
UNIFORM                  GLOBAL    PBRINE
    1.00000E-02    6.00000E-01
UNIFORM                  REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                  REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
USER DISTRIBUTION  (CUMULATIVE)       BOREHOLE  DOMEGA
        10          SPECIFIED    CONTINUOUS
    4.20000E+00   0.15000
    6.30000E+00   0.50000
    8.40000E+00   0.15000
    1.05000E+01   0.10000
    1.26000E+01   0.05000
    1.47000E+01   0.02000
    1.68000E+01   0.01000
    1.88000E+01   0.01000
    2.09000E+01   0.01000
    2.30000E+01   0.00000
LOGUNIFORM               BOREHOLE  TAUFAIL
    5.00000E-02    7.70000E+01
UNIFORM                  REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                  REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
LOGUNIFORM               SPALLMOD  REPIPERM
    2.40000E-14    2.40000E-12
UNIFORM                  SPALLMOD  TENSLSTR
    1.20000E+05    1.70000E+05
LOGUNIFORM               SPALLMOD  PARTDIAM
    1.00000E-03    1.00000E-01
UNIFORM                  SPALLMOD  REPIPOR
    3.50000E-01    6.60000E-01
UNIFORM                  REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                  REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                  REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
USER DISTRIBUTION  (CUMULATIVE)       SOLMOD3   SOLVAR
        43          SPECIFIED    CONTINUOUS
```

```
   -3.15000E+00   0.00000
   -3.00000E+00   0.00412
   -2.85000E+00   0.00000
   -2.70000E+00   0.00000
   -2.55000E+00   0.00000
   -2.40000E+00   0.00000
   -2.25000E+00   0.00000
   -2.10000E+00   0.00000
   -1.95000E+00   0.00412
   -1.80000E+00   0.01646
   -1.65000E+00   0.00412
   -1.50000E+00   0.02469
   -1.35000E+00   0.03292
   -1.20000E+00   0.03292
   -1.05000E+00   0.02058
   -9.00000E-01   0.04527
   -7.50000E-01   0.04938
   -6.00000E-01   0.03292
   -4.50000E-01   0.07819
   -3.00000E-01   0.08230
   -1.50000E-01   0.09053
    0.00000E+00   0.06584
    1.50000E-01   0.06584
    3.00000E-01   0.07819
    4.50000E-01   0.02469
    6.00000E-01   0.04115
    7.50000E-01   0.03292
    9.00000E-01   0.02881
    1.05000E+00   0.02881
    1.20000E+00   0.04115
    1.35000E+00   0.02469
    1.50000E+00   0.00823
    1.65000E+00   0.00412
    1.80000E+00   0.01646
    1.95000E+00   0.00000
    2.10000E+00   0.00412
    2.25000E+00   0.00412
    2.40000E+00   0.00823
    2.55000E+00   0.00000
    2.70000E+00   0.00412
    2.85000E+00   0.00000
    3.00000E+00   0.00000
    3.15000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)        SOLMOD4    SOLVAR
        33          SPECIFIED    CONTINUOUS
   -2.10000E+00   0.00000
   -1.95000E+00   0.00000
   -1.80000E+00   0.02222
   -1.65000E+00   0.00000
   -1.50000E+00   0.00000
   -1.35000E+00   0.00000
   -1.20000E+00   0.00000
   -1.05000E+00   0.02222
   -9.00000E-01   0.04444
   -7.50000E-01   0.11111
   -6.00000E-01   0.20000
   -4.50000E-01   0.02222
```

```
   -3.00000E-01   0.00000
   -1.50000E-01   0.06667
    0.00000E+00   0.02222
    1.50000E-01   0.11111
    3.00000E-01   0.04444
    4.50000E-01   0.02222
    6.00000E-01   0.08889
    7.50000E-01   0.08889
    9.00000E-01   0.04444
    1.05000E+00   0.00000
    1.20000E+00   0.00000
    1.35000E+00   0.02222
    1.50000E+00   0.00000
    1.65000E+00   0.02222
    1.80000E+00   0.00000
    1.95000E+00   0.02222
    2.10000E+00   0.00000
    2.25000E+00   0.02222
    2.40000E+00   0.00000
    2.55000E+00   0.00000
    2.70000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)       PHUMOX3    PHUMCIM
         3          SPECIFIED    CONTINUOUS
    6.50000E-02   0.50000
    1.37000E+00   0.50000
    1.60000E+00   0.00000
UNIFORM                GLOBAL    OXSTAT
    0.00000E+00    1.00000E+00
UNIFORM                REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                CULEBRA   MINP_FAC
    1.00000E+00    1.00000E+03
UNIFORM                GLOBAL    TRANSIDX
    0.00000E+00    1.00000E+00
USER DISTRIBUTION  (CUMULATIVE)       GLOBAL    CLIMTIDX
         4          SPECIFIED    CONTINUOUS
    1.00000E+00   0.75000
    1.25000E+00   0.00000
    1.50000E+00   0.25000
    2.25000E+00   0.00000
UNIFORM                CULEBRA   HMBLKLT
    5.00000E-02    5.00000E-01
LOGUNIFORM             CULEBRA   APOROS
    1.00000E-04    1.00000E-02
USER DISTRIBUTION  (CUMULATIVE)       CULEBRA   DPOROS
         7          SPECIFIED    CONTINUOUS
    1.00000E-01   0.10000
    1.10000E-01   0.15000
    1.20000E-01   0.25000
    1.60000E-01   0.25000
    1.80000E-01   0.15000
```

```
    1.90000E-01   0.10000
    2.50000E-01   0.00000
LOGUNIFORM              U+6       MKD_U
    3.00000E-05    2.00000E-02
LOGUNIFORM              U+4       MKD_U
    7.00000E-01    1.00000E+01
LOGUNIFORM              PU+3      MKD_PU
    2.00000E-02    4.00000E-01
LOGUNIFORM              PU+4      MKD_PU
    7.00000E-01    1.00000E+01
LOGUNIFORM              TH+4      MKD_TH
    7.00000E-01    1.00000E+01
LOGUNIFORM              AM+3      MKD_AM
    2.00000E-02    4.00000E-01
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 STEEL     CORRMCO2
    0.00000E+00    3.17000E-14
USER DISTRIBUTION  (DELTA)           WAS_AREA  PROBDEG
         2          SPECIFIED    DISCRETE
    1.00000E+00   0.75000
    2.00000E+00   0.25000
UNIFORM                 WAS_AREA  GRATMICI
    3.08269E-11    5.56921E-10
UNIFORM                 WAS_AREA  GRATMICH
    0.00000E+00    1.02717E-09
UNIFORM                 CELLULS   FBETA
    0.00000E+00    1.00000E+00
UNIFORM                 WAS_AREA  SAT_RGAS
    0.00000E+00    1.50000E-01
UNIFORM                 WAS_AREA  SAT_RBRN
    0.00000E+00    5.52000E-01
UNIFORM                 WAS_AREA  SAT_WICK
    0.00000E+00    1.00000E+00
TRIANGULAR              DRZ_PCS   PRMX_LOG
   -2.06990E+01   -1.87496E+01   -1.70000E+01
TRIANGULAR              CONC_PCS  PRMX_LOG
   -2.06990E+01   -1.87496E+01   -1.70000E+01
UNIFORM                 CONC_PCS  SAT_RGAS
    0.00000E+00    4.00000E-01
USER DISTRIBUTION  (CUMULATIVE)      CONC_PCS  SAT_RBRN
         3          SPECIFIED    CONTINUOUS
    0.00000E+00   0.50000
    2.00000E-01   0.50000
    6.00000E-01   0.00000
USER DISTRIBUTION  (CUMULATIVE)      CONC_PCS  PORE_DIS
         3          SPECIFIED    CONTINUOUS
    1.10000E-01   0.50000
    9.40000E-01   0.50000
    8.10000E+00   0.00000
USER DISTRIBUTION  (CUMULATIVE)      S_HALITE  POROSITY
```

```
         3           SPECIFIED    CONTINUOUS
    1.00000E-03    0.50000
    1.00000E-02    0.50000
    3.00000E-02    0.00000
UNIFORM                 S_HALITE  PRMX_LOG
   -2.40000E+01    -2.10000E+01
UNIFORM                 S_HALITE  COMP_RCK
    2.94000E-12     1.92000E-10
STUDENT                 S_MB139   PRMX_LOG
         6
 -2.10000E+01 -1.92000E+01 -1.91000E+01 -1.88000E+01 -1.81000E+01 -1.71000E+01
USER DISTRIBUTION  (DELTA)          S_MB139   RELP_MOD
         4           SPECIFIED    DISCRETE
    1.00000E+00    0.50000
    2.00000E+00    0.00000
    3.00000E+00    0.00000
    4.00000E+00    0.50000
STUDENT                 S_MB139   SAT_RBRN
         6
  7.78460E-03  6.88420E-02  6.98600E-02  7.26200E-02  1.08610E-01  1.74010E-01
STUDENT                 S_MB139   PORE_DIS
         6
  4.90530E-01  5.57750E-01  6.52000E-01  6.55000E-01  6.64520E-01  8.41780E-01
UNIFORM                 S_HALITE  PRESSURE
    1.10400E+07     1.38900E+07
TRIANGULAR              CASTILER  PRESSURE
    1.11000E+07     1.27000E+07    1.70000E+07
TRIANGULAR              CASTILER  PRMX_LOG
   -1.47000E+01    -1.18000E+01   -9.80000E+00
TRIANGULAR              CASTILER  COMP_RCK
    2.00000E-11     4.00000E-11    1.00000E-10
UNIFORM                 BH_SAND   PRMX_LOG
   -1.63000E+01    -1.10000E+01
UNIFORM                 DRZ_1     PRMX_LOG
   -1.94000E+01    -1.25000E+01
UNIFORM                 CONC_PLG  PRMX_LOG
   -1.90000E+01    -1.70000E+01
USER DISTRIBUTION  (CUMULATIVE)       SHFTU     SAT_RBRN
         3           SPECIFIED    CONTINUOUS
    0.00000E+00    0.50000
    2.00000E-01    0.50000
    6.00000E-01    0.00000
UNIFORM                 SHFTU     SAT_RGAS
    0.00000E+00     4.00000E-01
USER DISTRIBUTION  (CUMULATIVE)       SHFTU     PRMX_LOG
         9           SPECIFIED    CONTINUOUS
   -2.05000E+01    0.03000
   -2.00000E+01    0.08000
   -1.95000E+01    0.13000
   -1.90000E+01    0.19000
   -1.85000E+01    0.22000
   -1.80000E+01    0.24000
   -1.75000E+01    0.10000
   -1.70000E+01    0.01000
   -1.65000E+01    0.00000
USER DISTRIBUTION  (CUMULATIVE)       SHFTL_T1  PRMX_LOG
         8           SPECIFIED    CONTINUOUS
```

```
   -2.00000E+01   0.01000
   -1.95000E+01   0.09000
   -1.90000E+01   0.20700
   -1.85000E+01   0.33000
   -1.80000E+01   0.23600
   -1.75000E+01   0.12000
   -1.70000E+01   0.00700
   -1.65000E+01   0.00000
USER DISTRIBUTION  (CUMULATIVE)        SHFTL_T2  PRMX_LOG
        10          SPECIFIED    CONTINUOUS
   -2.25000E+01   0.02000
   -2.20000E+01   0.06000
   -2.15000E+01   0.09000
   -2.10000E+01   0.13500
   -2.05000E+01   0.22000
   -2.00000E+01   0.17500
   -1.95000E+01   0.16500
   -1.90000E+01   0.10000
   -1.85000E+01   0.03500
   -1.80000E+01   0.00000
UNIFORM                 WAS_AREA  BIOGENFC
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
UNIFORM                 REFCON    LHSBLANK
    0.00000E+00    1.00000E+00
CORRELATION MATRIX
    2
    53  54 -0.99
    61  62 -0.75
OUTPUT CORR HIST DATA
TITLE SDB: PARAMETER_PROD     Calc: CRA1BC       Ver: 1.00     05/03/05 13:29:49
```

Appendix VII. Ranges of Sampled Parameters

Material Property	Parameter / *Replicate*	*Minimum*	*Maximum*	*Mean*
AM+3				
MKD_AM	*CMKDAM*			
	1	2.01E-02	3.98E-01	1.27E-01
	2	2.05E-02	3.92E-01	1.27E-01
	3	2.06E-02	3.95E-01	1.27E-01
BH_SAND				
PRMX_LOG	*BHPERM*			
	1	-1.63E+01	-1.10E+01	-1.36E+01
	2	-1.63E+01	-1.10E+01	-1.36E+01
	3	-1.63E+01	-1.10E+01	-1.36E+01
BOREHOLE				
DOMEGA	*DOMEGA*			
	1	4.34E+00	2.16E+01	8.63E+00
	2	4.27E+00	2.27E+01	8.62E+00
	3	4.27E+00	2.30E+01	8.64E+00
TAUFAIL	*WTAUFAI*			
	1	5.00E-02	7.67E+01	1.05E+01
	2	5.10E-02	7.22E+01	1.04E+01
	3	5.12E-02	7.50E+01	1.05E+01
CASTILER				
COMP_RCK	*BPCOMP*			
	1	2.07E-11	9.36E-11	5.33E-11
	2	2.28E-11	9.48E-11	5.33E-11
	3	2.14E-11	9.49E-11	5.33E-11
PRESSURE	*BPINTPRS*			
	1	1.12E+07	1.65E+07	1.36E+07
	2	1.14E+07	1.67E+07	1.36E+07
	3	1.14E+07	1.69E+07	1.36E+07
PRMX_LOG	*BPPRM*			
	1	-1.45E+01	-9.94E+00	-1.21E+01

Material Property	Parameter / *Replicate*	*Minimum*	*Maximum*	*Mean*
	2	-1.45E+01	-1.01E+01	-1.21E+01
	3	-1.44E+01	-9.89E+00	-1.21E+01
CELLULS				
FBETA	*WFBETCEL*			
	1	1.03E-03	1.00E+00	5.00E-01
	2	9.13E-03	9.92E-01	5.00E-01
	3	1.65E-03	9.98E-01	5.00E-01
CONC_PCS				
PORE_DIS	*CONBCEXP*			
	1	1.20E-01	8.06E+00	2.52E+00
	2	1.10E-01	8.02E+00	2.52E+00
	3	1.26E-01	8.06E+00	2.52E+00
SAT_RBRN	*CONBRSAT*			
	1	1.96E-03	5.95E-01	2.50E-01
	2	6.93E-04	5.95E-01	2.50E-01
	3	2.91E-03	5.94E-01	2.50E-01
SAT_RGAS	*CONGSSAT*			
	1	9.61E-04	3.98E-01	2.00E-01
	2	2.78E-03	3.99E-01	2.00E-01
	3	5.95E-04	3.99E-01	2.00E-01
PRMX_LOG	*CONPRM*			
	1	-2.05E+01	-1.72E+01	-1.88E+01
	2	-2.07E+01	-1.72E+01	-1.88E+01
	3	-2.05E+01	-1.72E+01	-1.88E+01
CONC_PLG				
PRMX_LOG	*PLGPRM*			
	1	-1.90E+01	-1.70E+01	-1.80E+01
	2	-1.90E+01	-1.70E+01	-1.80E+01
	3	-1.90E+01	-1.70E+01	-1.80E+01
CULEBRA				
APOROS	*CFRACPOR*			
	1	1.01E-04	9.82E-03	2.14E-03
	2	1.02E-04	9.58E-03	2.15E-03

Material Property	Parameter	*Replicate*	*Minimum*	*Maximum*	*Mean*
		3	1.01E-04	9.70E-03	2.14E-03
HMBLKLT	*CFRACSP*				
		1	5.26E-02	4.99E-01	2.75E-01
		2	5.39E-02	4.96E-01	2.75E-01
		3	5.41E-02	4.96E-01	2.75E-01
DPOROS	*CMTRXPOR*				
		1	1.00E-01	2.46E-01	1.55E-01
		2	1.00E-01	2.48E-01	1.55E-01
		3	1.00E-01	2.49E-01	1.55E-01
MINP_FAC	*CTRANSFM*				
		1	1.02E+00	9.95E+02	5.01E+02
		2	5.56E+00	9.96E+02	5.01E+02
		3	4.34E+00	9.92E+02	5.00E+02
DRZ_1					
PRMX_LOG	*DRZPRM*				
		1	-1.94E+01	-1.25E+01	-1.59E+01
		2	-1.94E+01	-1.26E+01	-1.60E+01
		3	-1.93E+01	-1.26E+01	-1.59E+01
DRZ_PCS					
PRMX_LOG	*DRZPCPRM*				
		1	-2.05E+01	-1.72E+01	-1.88E+01
		2	-2.06E+01	-1.72E+01	-1.88E+01
		3	-2.06E+01	-1.72E+01	-1.88E+01
GLOBAL					
PBRINE	*BPPROB*				
		1	1.53E-02	5.98E-01	3.05E-01
		2	1.36E-02	5.97E-01	3.05E-01
		3	1.41E-02	5.95E-01	3.05E-01
CLIMTIDX	*CCLIMSF*				
		1	1.00E+00	2.23E+00	1.31E+00
		2	1.00E+00	2.25E+00	1.31E+00
		3	1.00E+00	2.24E+00	1.31E+00
TRANSIDX	*CTRAN*				

Material Property	Parameter	*Replicate*	*Minimum*	*Maximum*	*Mean*
		1	7.95E-03	9.98E-01	5.00E-01
		2	6.83E-03	9.92E-01	5.00E-01
		3	6.61E-03	9.92E-01	5.00E-01
OXSTAT	*WOXSTAT*				
		1	4.38E-03	9.95E-01	5.00E-01
		2	7.89E-03	9.92E-01	5.01E-01
		3	8.11E-04	9.94E-01	5.00E-01
PHUMOX3					
PHUMCIM	*WPHUMO*				
		1	8.48E-02	1.60E+00	1.10E+00
		2	7.88E-02	1.60E+00	1.10E+00
		3	9.04E-02	1.60E+00	1.10E+00
PU+3					
MKD_PU	*CMKDPU*				
		1	2.00E-02	3.97E-01	1.27E-01
		2	2.02E-02	3.97E-01	1.27E-01
		3	2.01E-02	4.00E-01	1.27E-01
PU+4					
MKD_PU	*CMKDPU*				
		1	7.07E-01	9.92E+00	3.50E+00
		2	7.08E-01	9.88E+00	3.50E+00
		3	7.14E-01	9.90E+00	3.50E+00
S_HALITE					
COMP_RCK	*HALCROCK*				
		1	3.77E-12	1.92E-10	9.75E-11
		2	3.20E-12	1.90E-10	9.75E-11
		3	3.46E-12	1.91E-10	9.74E-11
POROSITY	*HALPOR*				
		1	1.13E-03	2.96E-02	1.27E-02
		2	1.05E-03	2.96E-02	1.27E-02
		3	1.11E-03	2.98E-02	1.28E-02
PRMX_LOG	*HALPRM*				
		1	-2.40E+01	-2.10E+01	-2.25E+01

Material Property	Parameter	Replicate	Minimum	Maximum	Mean
		2	-2.40E+01	-2.10E+01	-2.25E+01
		3	-2.40E+01	-2.10E+01	-2.25E+01
PRESSURE	SALPRES				
		1	1.11E+07	1.39E+07	1.25E+07
		2	1.11E+07	1.39E+07	1.25E+07
		3	1.11E+07	1.39E+07	1.25E+07
S_MB139					
PORE_DIS	ANHBCEXP				
		1	4.99E-01	8.02E-01	6.44E-01
		2	5.00E-01	7.99E-01	6.44E-01
		3	5.03E-01	7.95E-01	6.44E-01
RELP_MOD	ANHBCVGP				
		1	1.00E+00	4.00E+00	2.50E+00
		2	1.00E+00	4.00E+00	2.50E+00
		3	1.00E+00	4.00E+00	2.50E+00
PRMX_LOG	ANHPRM				
		1	-2.04E+01	-1.71E+01	-1.89E+01
		2	-2.07E+01	-1.72E+01	-1.89E+01
		3	-2.04E+01	-1.73E+01	-1.89E+01
SAT_RBRN	ANRBRSA				
		1	1.50E-02	1.57E-01	8.36E-02
		2	2.13E-02	1.57E-01	8.38E-02
		3	2.14E-02	1.46E-01	8.38E-02
SHFTL_T1					
PRMX_LOG	SHLPRM2				
		1	-2.00E+01	-1.69E+01	-1.82E+01
		2	-1.99E+01	-1.70E+01	-1.82E+01
		3	-1.96E+01	-1.70E+01	-1.82E+01
SHFTL_T2					
PRMX_LOG	SHLPRM3				
		1	-2.24E+01	-1.80E+01	-2.01E+01
		2	-2.23E+01	-1.81E+01	-2.01E+01
		3	-2.23E+01	-1.80E+01	-2.01E+01

Material Property	Parameter	*Replicate*	*Minimum*	*Maximum*	*Mean*
SHFTU					
PRMX_LOG	*SHUPRM*				
		1	-2.05E+01	-1.69E+01	-1.84E+01
		2	-2.04E+01	-1.68E+01	-1.84E+01
		3	-2.04E+01	-1.66E+01	-1.84E+01
SAT_RBRN	*SHURBRN*				
		1	1.79E-03	6.00E-01	2.50E-01
		2	2.76E-03	5.97E-01	2.50E-01
		3	9.67E-04	5.93E-01	2.50E-01
SAT_RGAS	*SHURGAS*				
		1	9.09E-04	3.98E-01	2.00E-01
		2	2.05E-03	3.98E-01	2.00E-01
		3	2.70E-03	3.98E-01	2.00E-01
SOLMOD3					
SOLVAR	*WSOLVAR*				
		1	-2.87E+00	2.53E+00	2.77E-02
		2	-1.80E+00	2.76E+00	4.25E-02
		3	-2.97E+00	2.47E+00	2.58E-02
SOLMOD4					
SOLVAR	*WSOLVAR*				
		1	-1.75E+00	2.36E+00	1.05E-01
		2	-1.76E+00	2.35E+00	1.11E-01
		3	-1.76E+00	2.40E+00	1.07E-01
SPALLMOD					
REPIPERM	*REPIPER*				
		1	2.42E-14	2.32E-12	5.15E-13
		2	2.49E-14	2.37E-12	5.15E-13
		3	2.45E-14	2.40E-12	5.16E-13
PARTDIAM	*SPLPTDIA*				
		1	1.01E-03	9.65E-02	2.15E-02
		2	1.00E-03	9.76E-02	2.16E-02
		3	1.04E-03	9.82E-02	2.16E-02
REPIPOR	*SPLRPOR*				

Material / Property	Parameter / *Replicate*	*Minimum*	*Maximum*	*Mean*
	1	3.51E-01	6.58E-01	5.05E-01
	2	3.51E-01	6.58E-01	5.05E-01
	3	3.52E-01	6.58E-01	5.05E-01
TENSLSTR	*TENSLSTR*			
	1	1.21E+05	1.70E+05	1.45E+05
	2	1.20E+05	1.70E+05	1.45E+05
	3	1.20E+05	1.70E+05	1.45E+05
STEEL				
CORRMCO2	*WGRCOR*			
	1	2.16E-16	3.16E-14	1.58E-14
	2	2.37E-16	3.14E-14	1.59E-14
	3	5.60E-17	3.15E-14	1.59E-14
TH+4				
MKD_TH	*CMKDTH*			
	1	7.08E-01	9.92E+00	3.50E+00
	2	7.09E-01	9.94E+00	3.50E+00
	3	7.09E-01	9.93E+00	3.50E+00
U+4				
MKD_U	*CMKDU4*			
	1	7.16E-01	9.84E+00	3.50E+00
	2	7.08E-01	9.93E+00	3.50E+00
	3	7.03E-01	9.97E+00	3.50E+00
U+6				
MKD_U	*CMKDU6*			
	1	3.14E-05	1.97E-02	3.07E-03
	2	3.11E-05	1.99E-02	3.08E-03
	3	3.07E-05	1.88E-02	3.07E-03
WAS_AREA				
SAT_WICK	*WASTWIC*			
	1	3.06E-03	9.92E-01	5.00E-01
	2	2.32E-03	9.99E-01	5.00E-01
	3	4.40E-03	9.93E-01	5.00E-01
BIOGENFC	*WBIOGENF*			

Material Property	Parameter	*Replicate*	*Minimum*	*Maximum*	*Mean*
		1	2.82E-03	9.97E-01	5.01E-01
		2	1.81E-03	9.97E-01	5.00E-01
		3	2.65E-04	9.99E-01	5.00E-01
GRATMICH	*WGRMICH*				
		1	5.57E-12	1.02E-09	5.13E-10
		2	2.65E-12	1.02E-09	5.14E-10
		3	6.73E-13	1.03E-09	5.14E-10
GRATMICI	*WGRMICI*				
		1	3.26E-11	5.55E-10	2.94E-10
		2	3.40E-11	5.53E-10	2.94E-10
		3	3.15E-11	5.52E-10	2.94E-10
PROBDEG	*WMICDFLG*				
		1	1.00E+00	2.00E+00	1.25E+00
		2	1.00E+00	2.00E+00	1.25E+00
		3	1.00E+00	2.00E+00	1.25E+00
SAT_RBRN	*WRBRNSAT*				
		1	2.71E-03	5.51E-01	2.76E-01
		2	6.63E-04	5.47E-01	2.76E-01
		3	3.97E-03	5.48E-01	2.76E-01
SAT_RGAS	*WRGSSAT*				
		1	7.72E-04	1.48E-01	7.50E-02
		2	6.34E-04	1.50E-01	7.50E-02
		3	7.07E-04	1.49E-01	7.51E-02

Appendix VIII. Cumulative Distribution Functions (CDFs) of Sampled Parameters from the CRA-2004 PABC and the CRA.

Figure 1. Observed and Expected CDFs for S_MB139:PORE_DIS Student Distribution

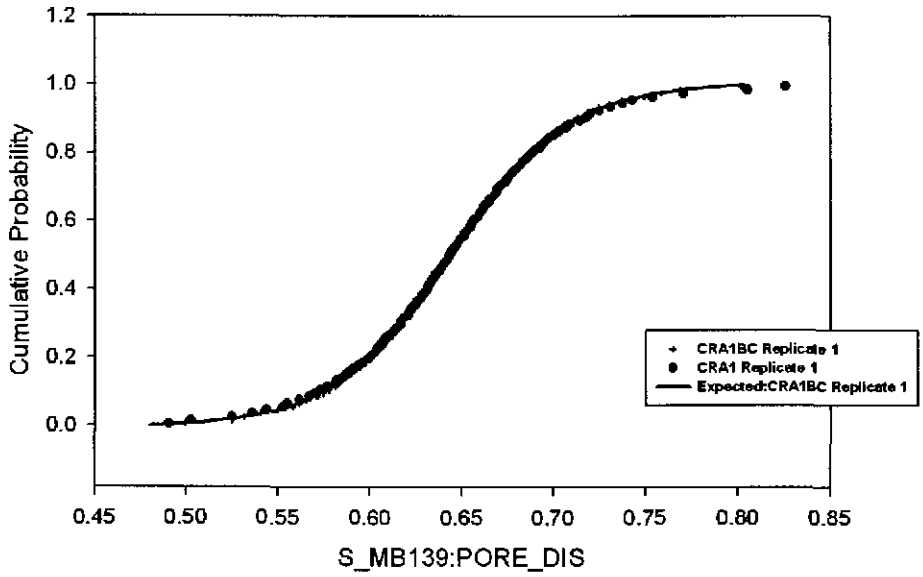

Figure 2. Observed and Expected CDFs for S_MB139:RELP_MOD User Discrete (Delta) Distribution

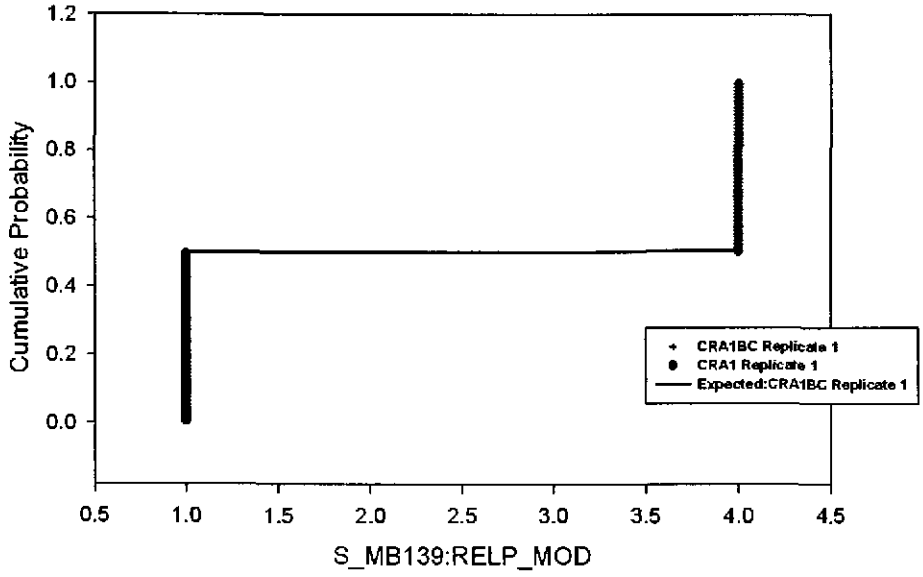

Figure 3. Observed and Expected CDFs for S_MB139:PRMX_LOG Student Distribution

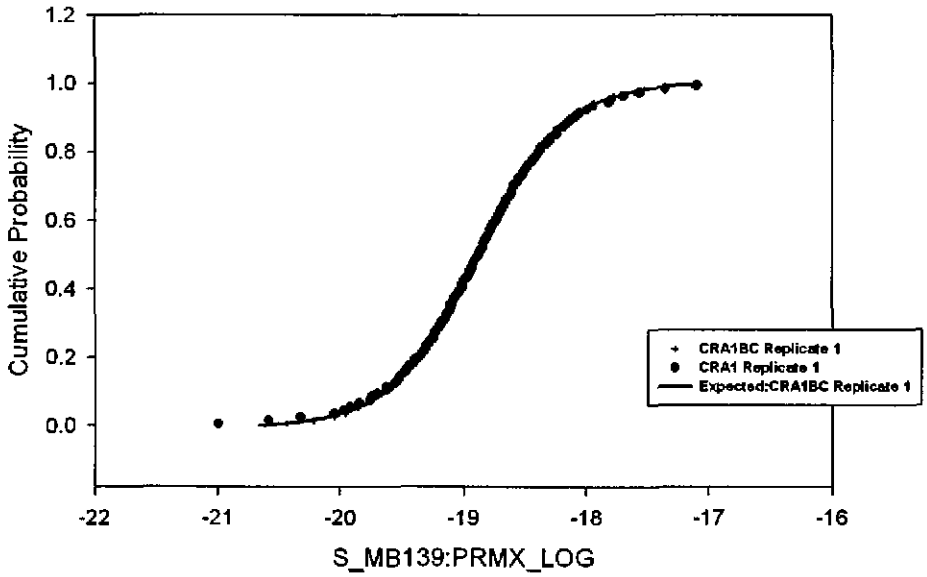

Figure 4. Observed and Expected CDFs for S_MB139:SAT_RBRN Student Distribution

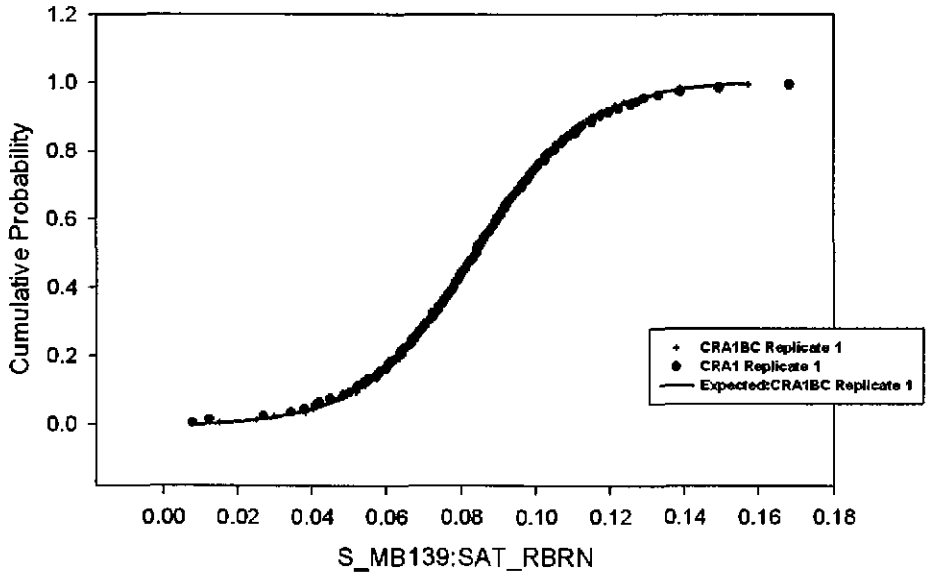

Figure 5. Observed and Expected CDFs for BH_SAND:PRMX_LOG
Uniform Distribution

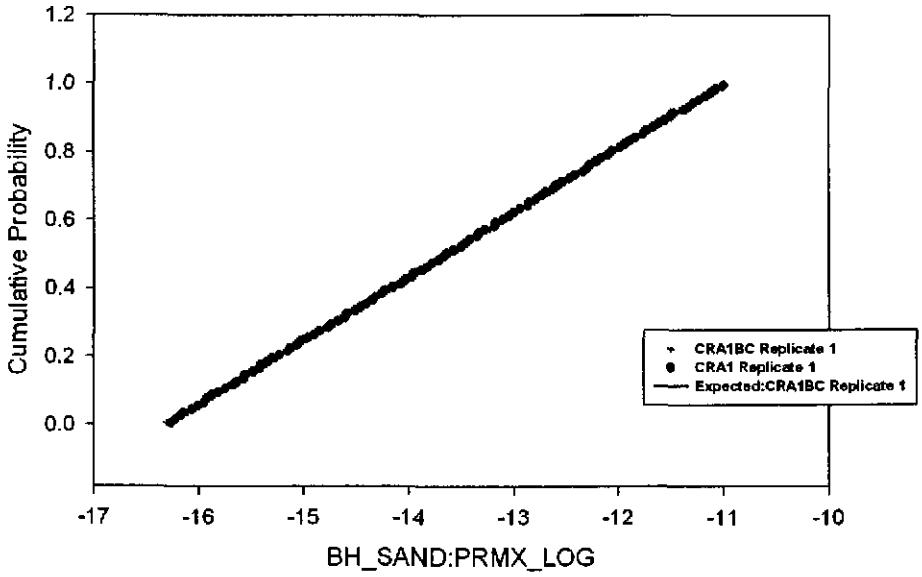

Figure 6. Observed and Expected CDFs for CASTILER:COMP_RCK
Triangular Distribution

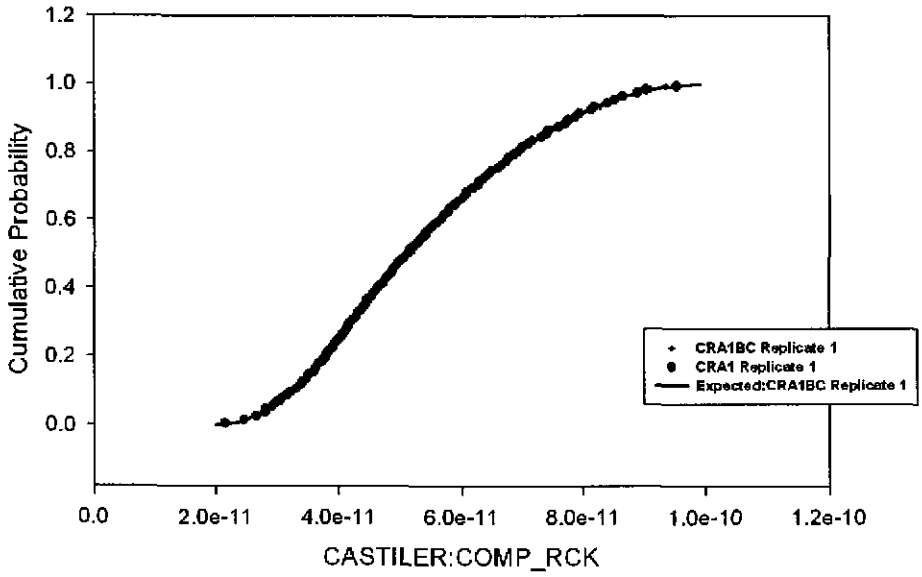

Figure 7. Observed and Expected CDFs for CASTILER:PRESSURE Triangular Distribution

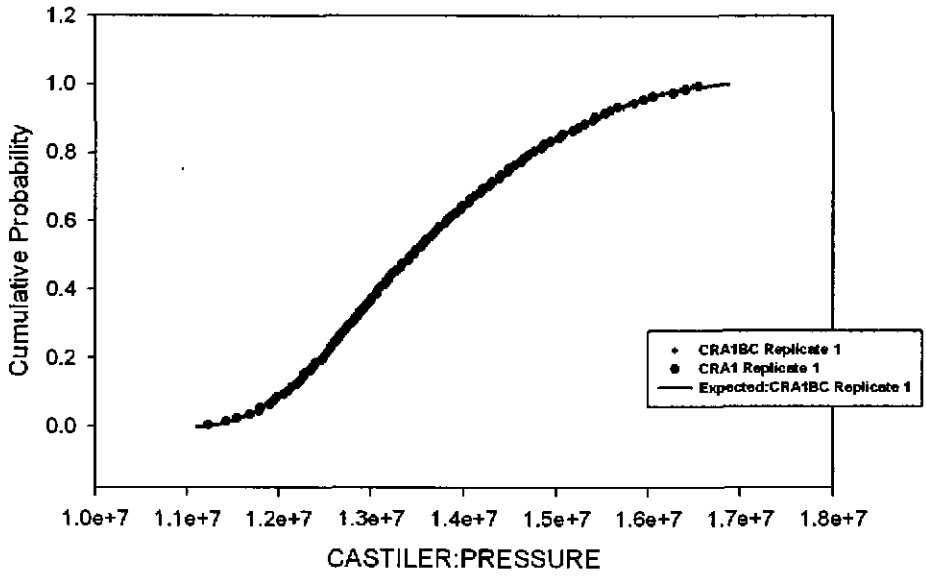

Figure 8. Observed and Expected CDFs for CASTILER:PRMX_LOG Triangular Distribution

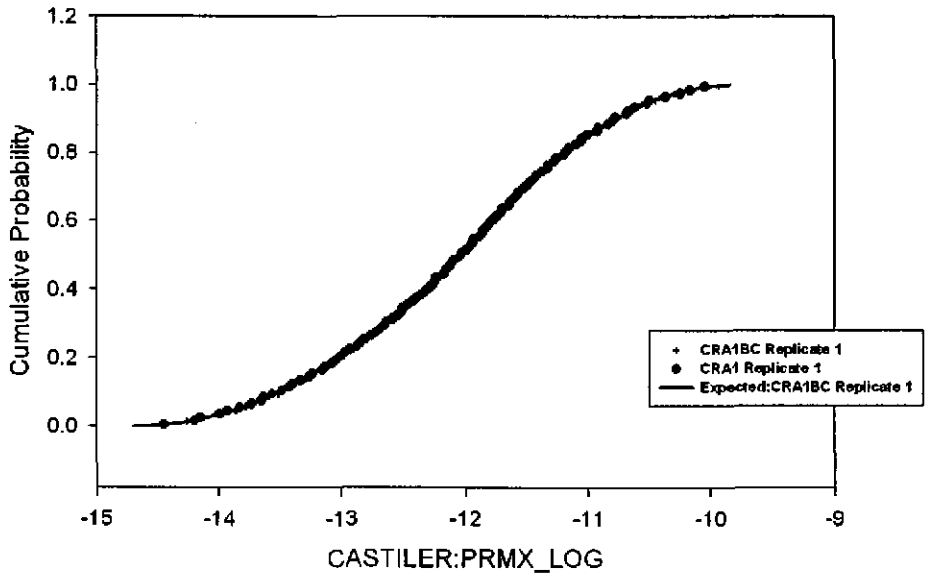

Figure 9. Observed and Expected CDFs for GLOBAL:PBRINE
Uniform Distribution

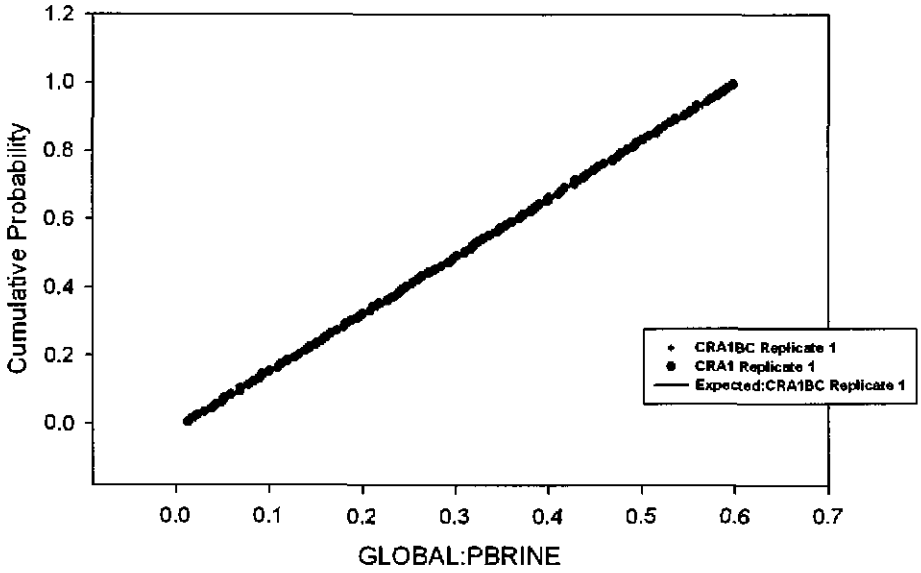

Figure 10. Observed and Expected CDFs for GLOBAL:CLIMTIDX
User Continuous Distribution

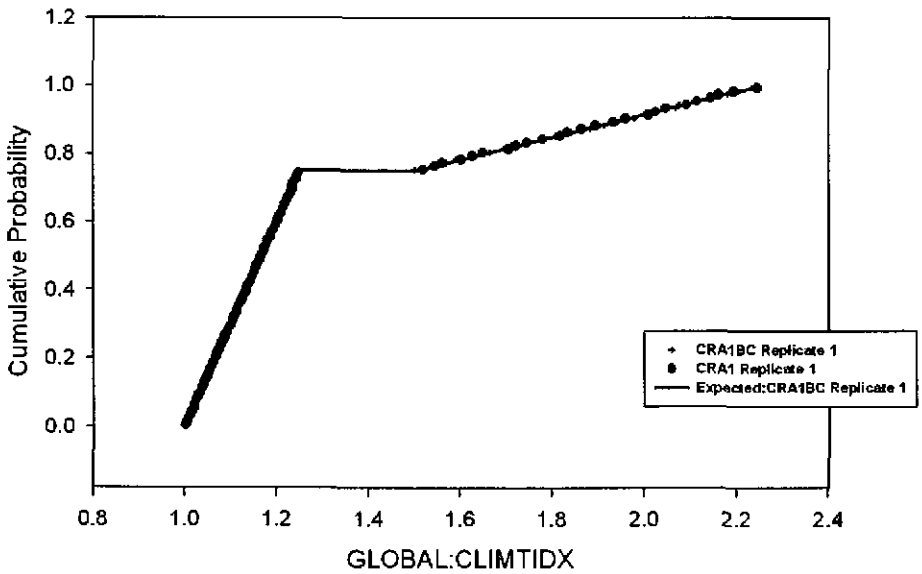

Figure 11. Observed and Expected CDFs for CULEBRA:APOROS Loguniform Distribution

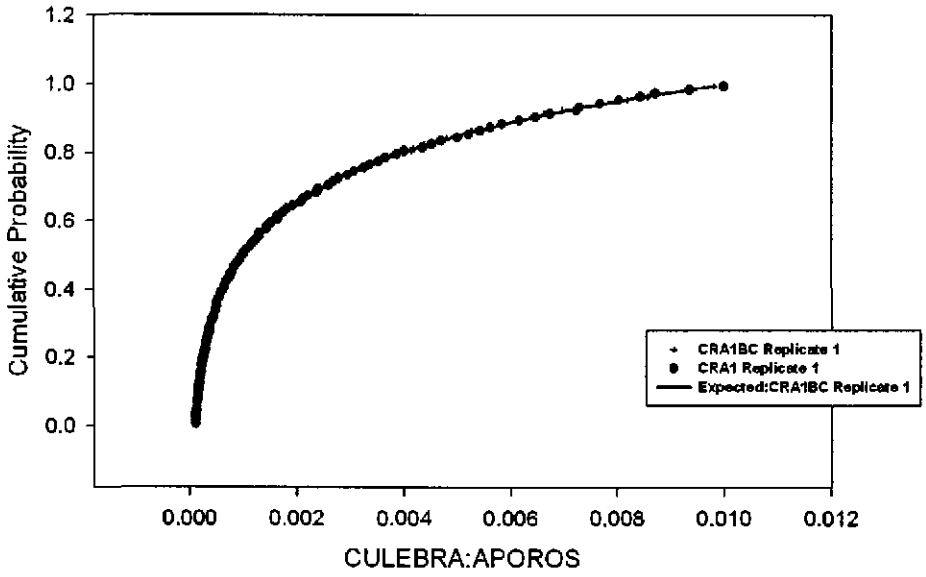

Figure 12. Observed and Expected CDFs for CULEBRA:HMBLKLT Uniform Distribution

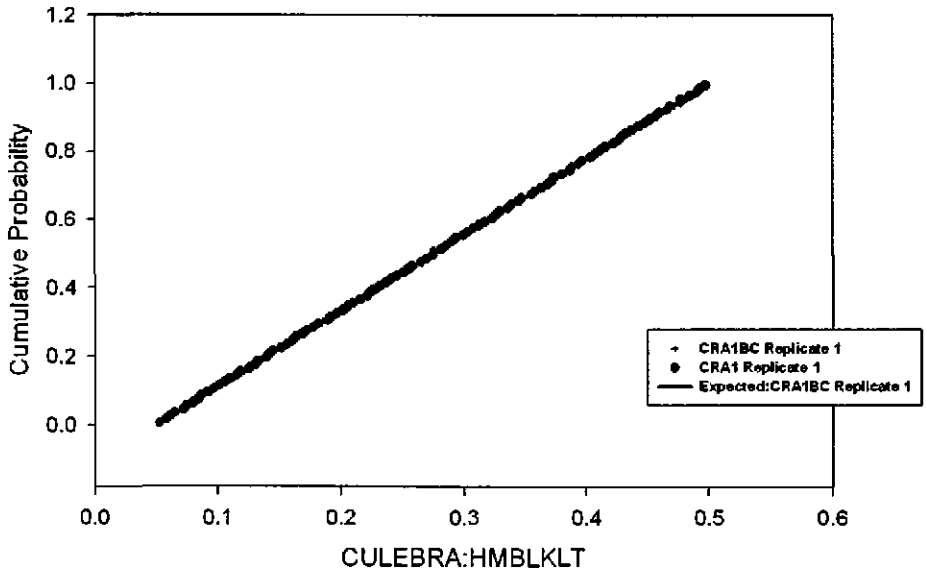

Figure 13. Observed and Expected CDFs for AM+3:MKD_AM Loguniform Distribution

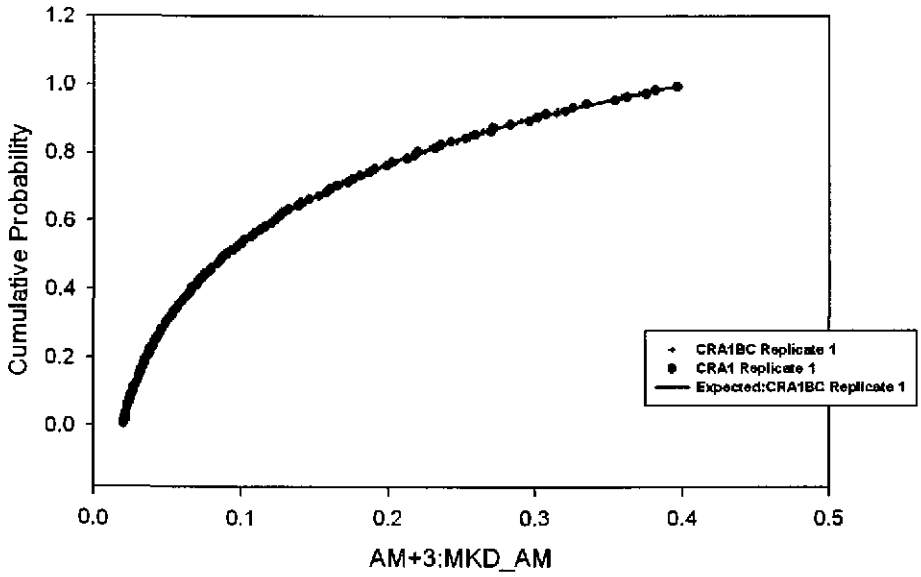

Figure 14. Observed and Expected CDFs for PU+3:MKD_PU Loguniform Distribution

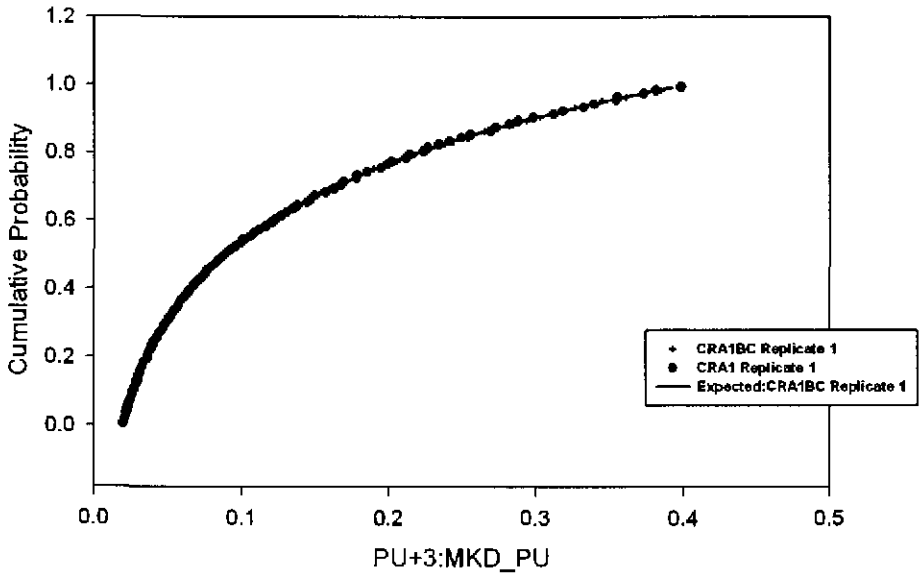

Figure 15. Observed and Expected CDFs for PU+4:MKD_PU Loguniform Distribution

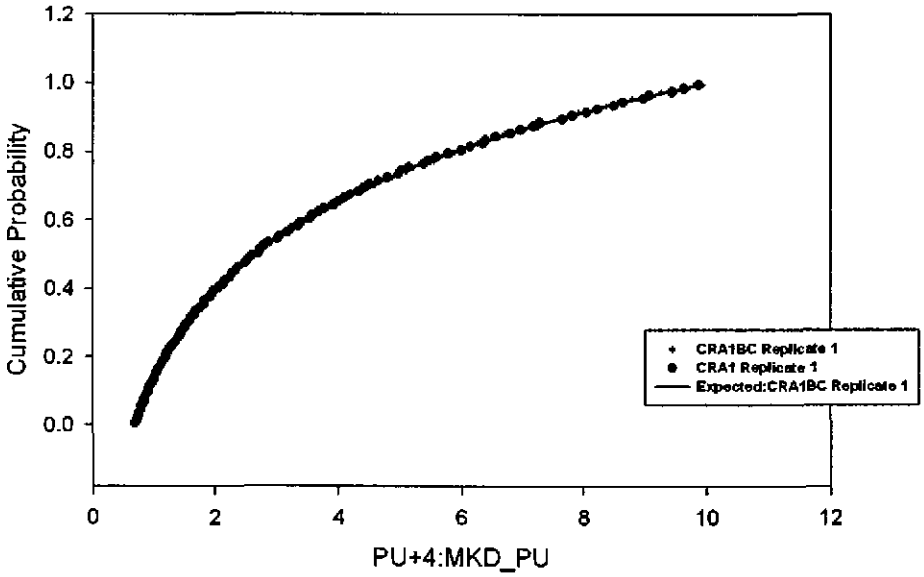

Figure 16. Observed and Expected CDFs for TH+4:MKD_TH Loguniform Distribution

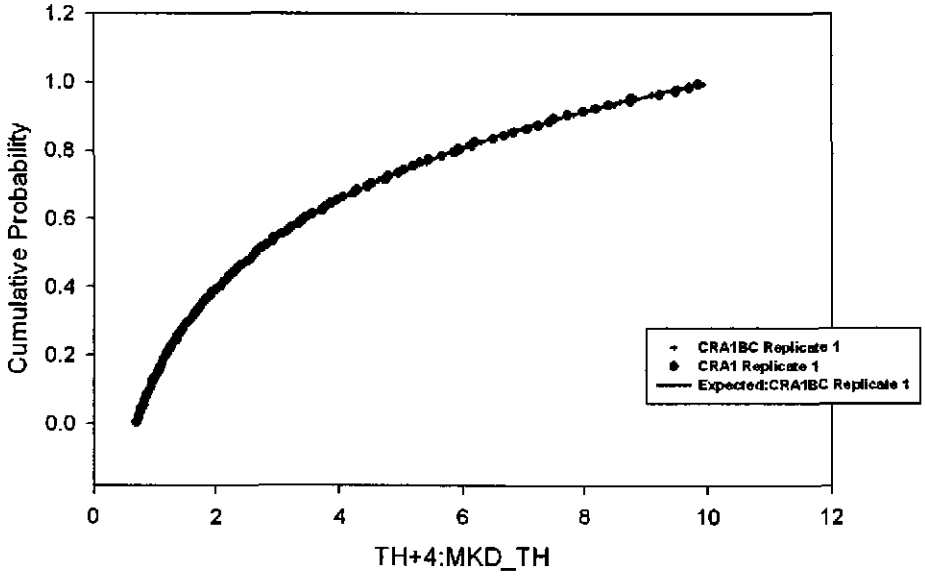

Figure 17. Observed and Expected CDFs for U+4:MKD_U Loguniform Distribution

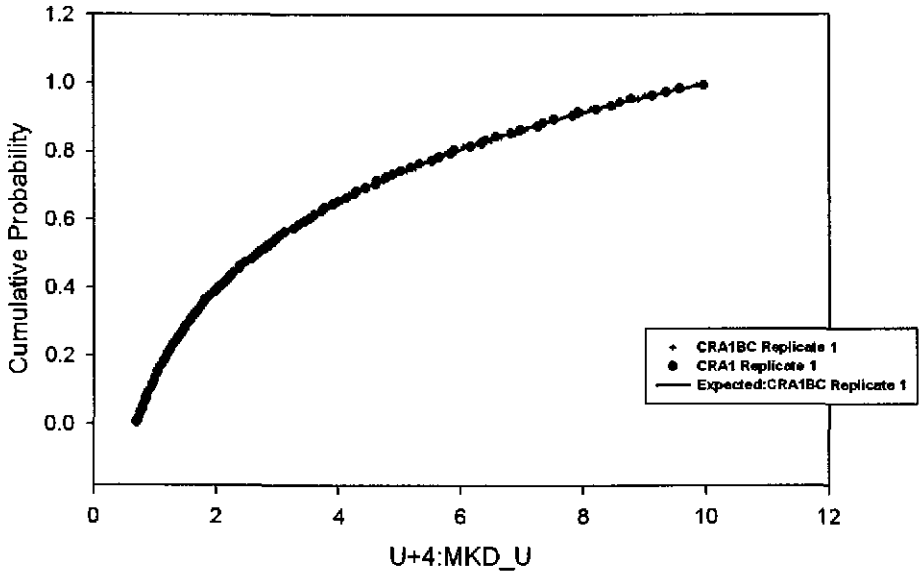

Figure 18. Observed and Expected CDFs for U+6:MKD_U Loguniform Distribution

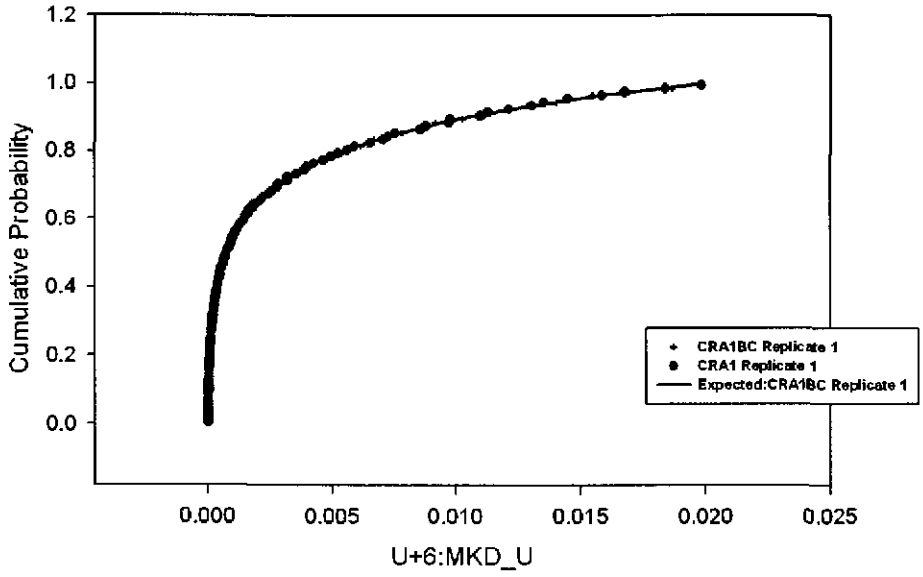

Figure 19. Observed and Expected CDFs for CULEBRA:DPOROS User Continuous Distribution

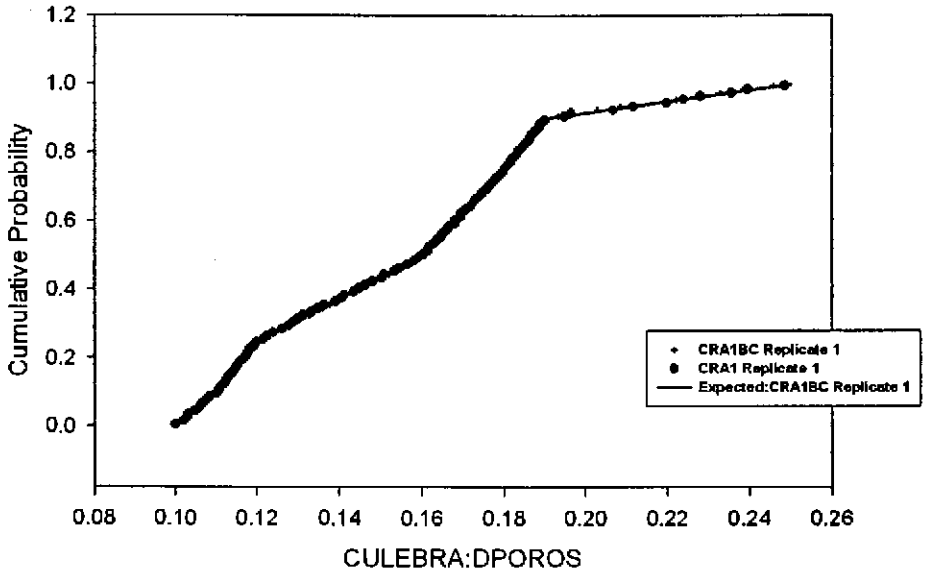

Figure 20. Observed and Expected CDFs for CONC_PCS:PORE_DIS User Continuous Distribution

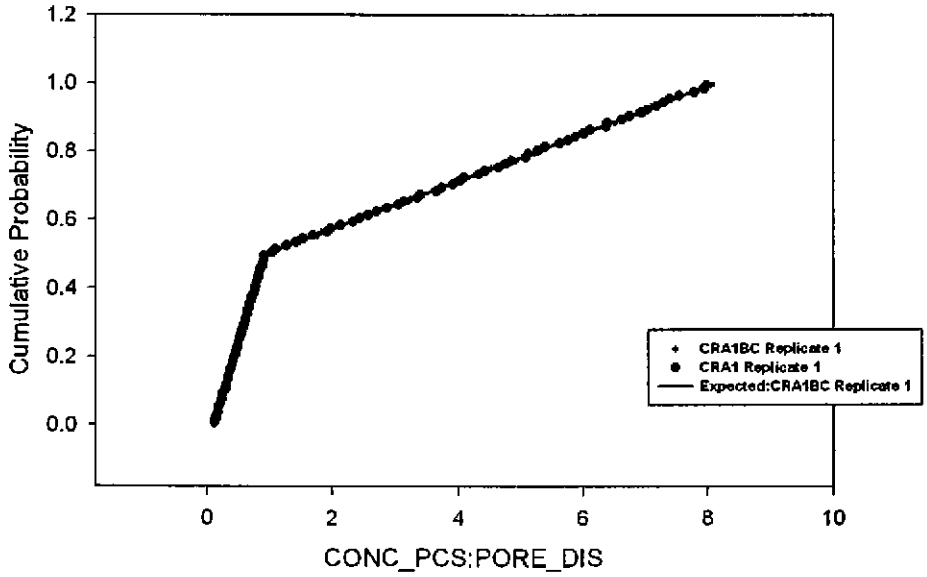

Figure 21. Observed and Expected CDFs for CONC_PCS:SAT_RBRN User Continuous Distribution

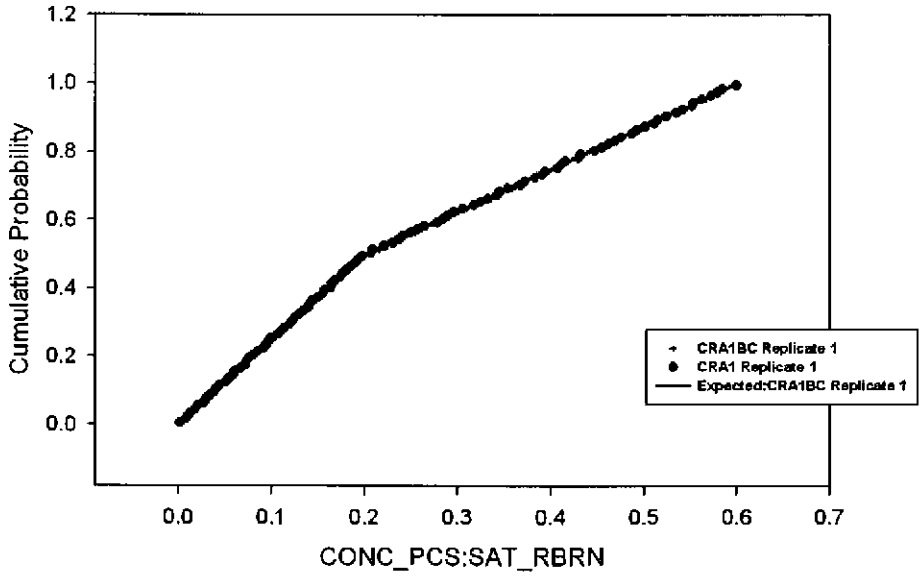

Figure 22. Observed and Expected CDFs for CONC_PCS:SAT_RGAS Uniform Distribution

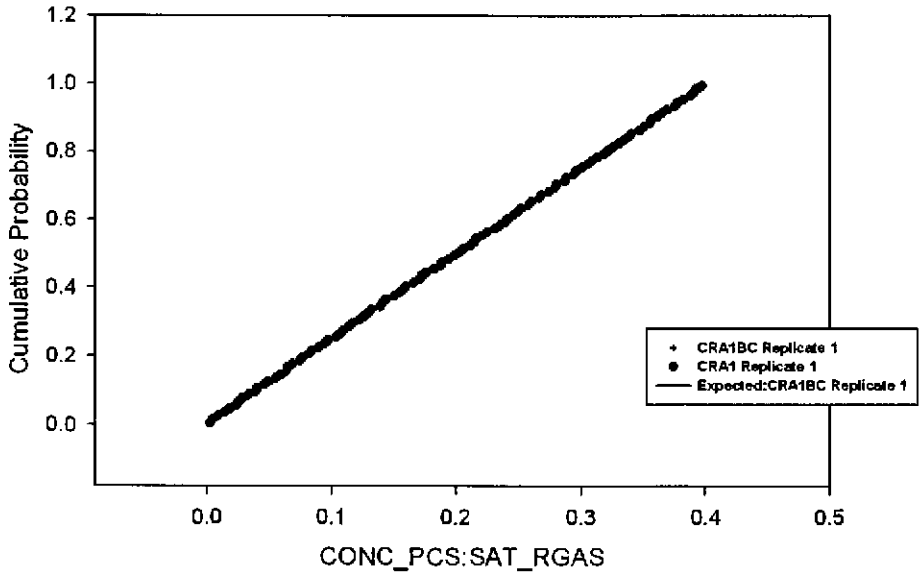

Figure 23. Observed and Expected CDFs for CONC_PCS:PRMX_LOG
Triangular Distribution

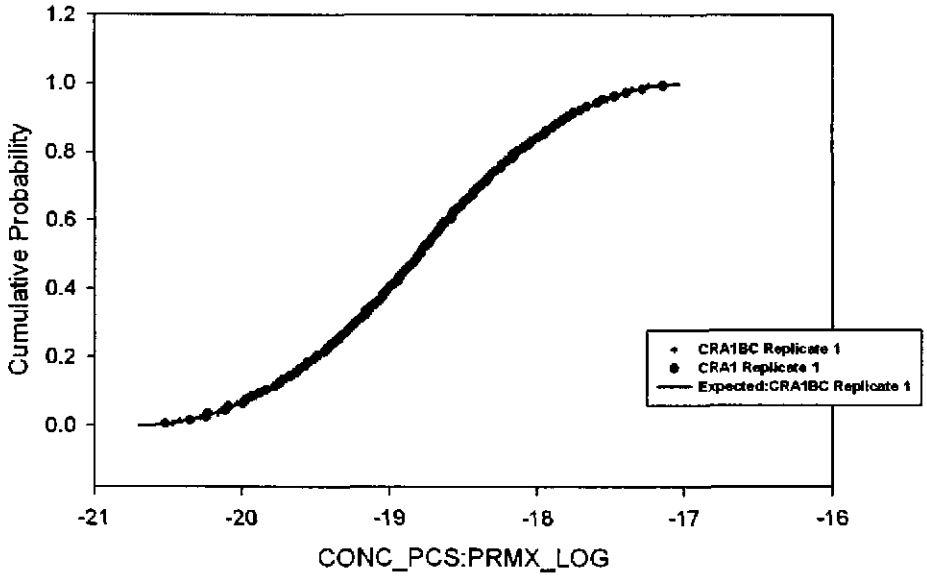

Figure 24. Observed and Expected CDFs for GLOBAL:TRANSIDX
Uniform Distribution

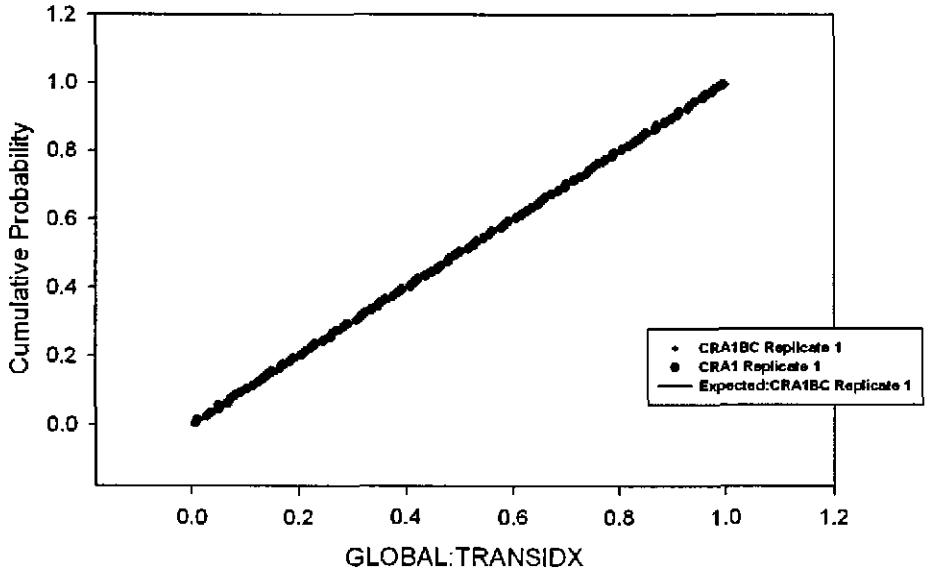

Figure 25. Observed and Expected CDFs for CULEBRA:MINP_FAC
Uniform Distribution

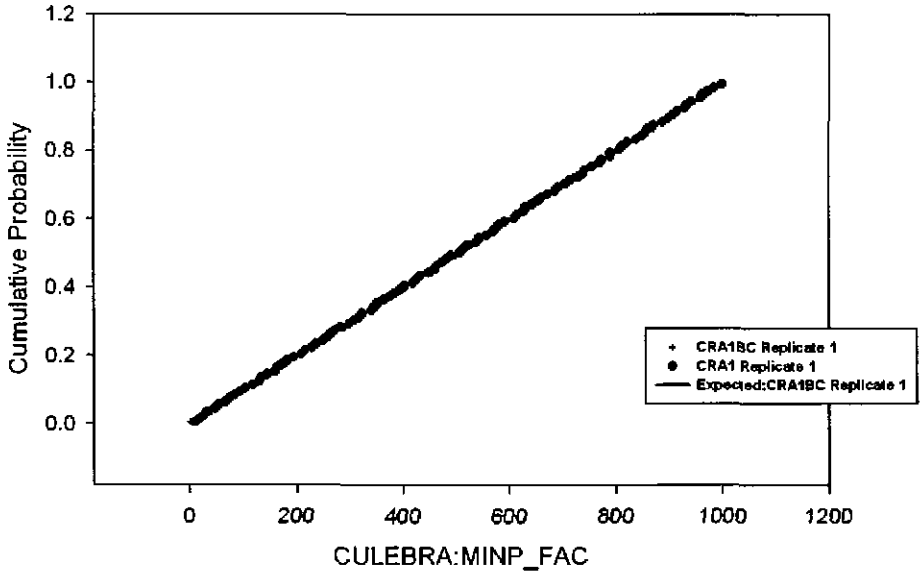

Figure 26. Observed and Expected CDFs for BOREHOLE:DOMEGA
User Continuous Distribution

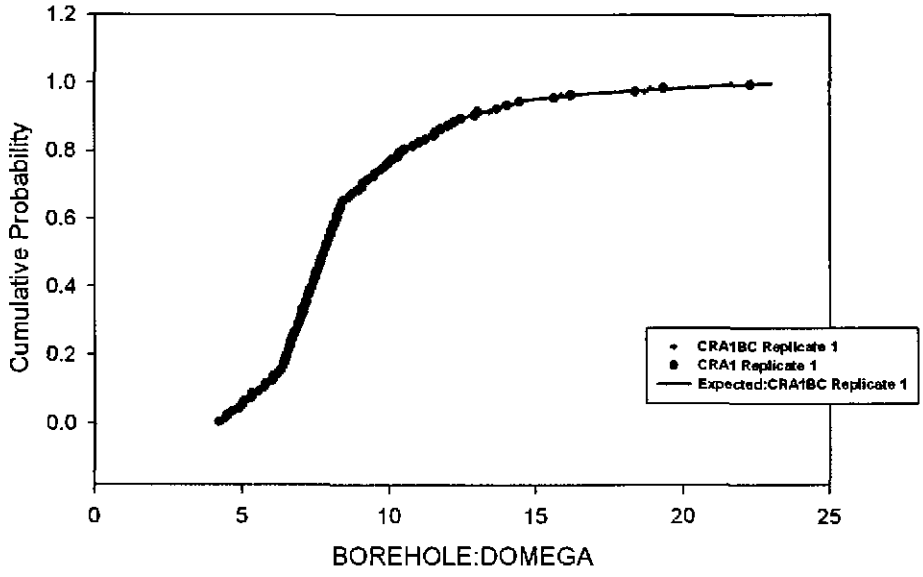

Figure 27. Observed and Expected CDFs for DRZ_PCS:PRMX_LOG Triangular Distribution

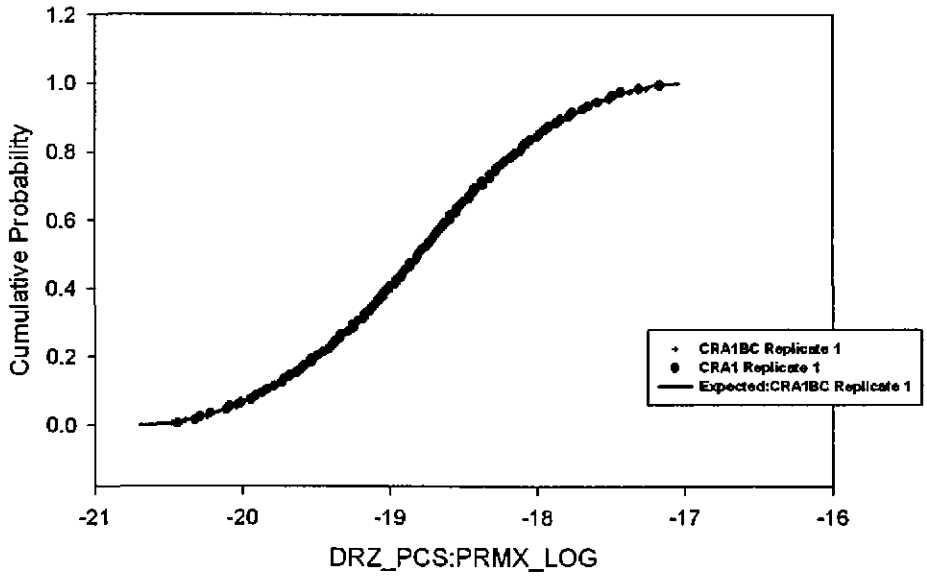

Figure 28. Observed and Expected CDFs for DRZ_1:PRMX_LOG Uniform Distribution

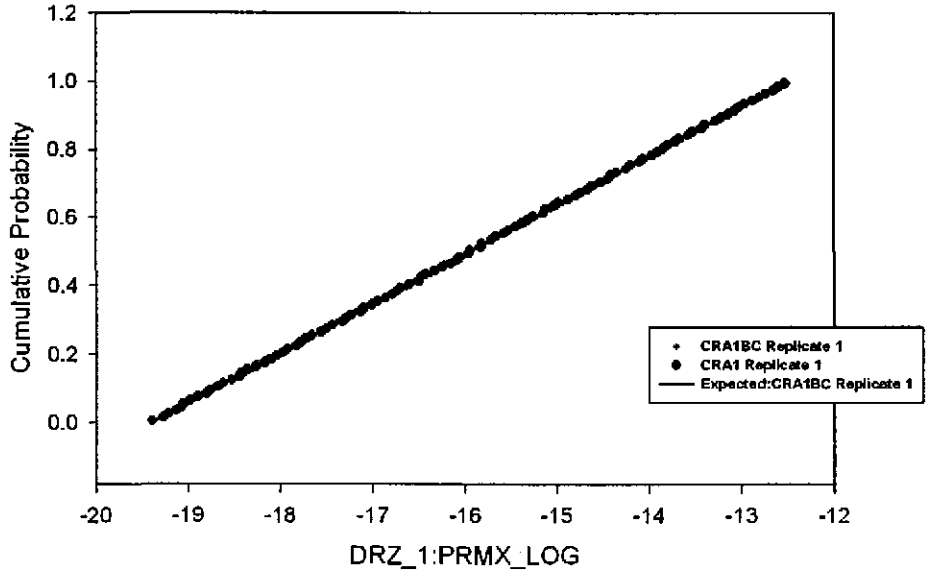

Figure 29. Observed and Expected CDFs for S_HALITE:COMP_RCK Uniform Distribution

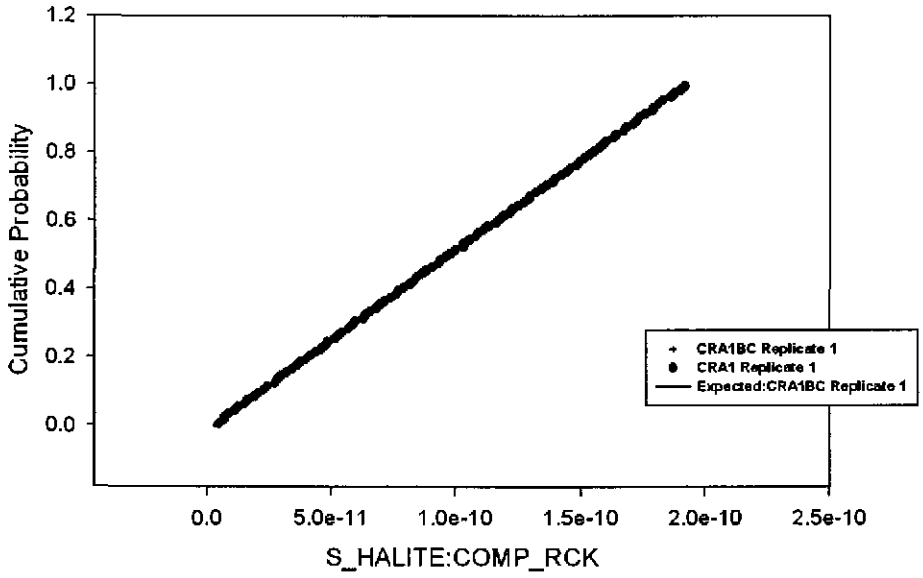

Figure 30. Observed and Expected CDFs for S_HALITE:POROSITY User Continuous Distribution

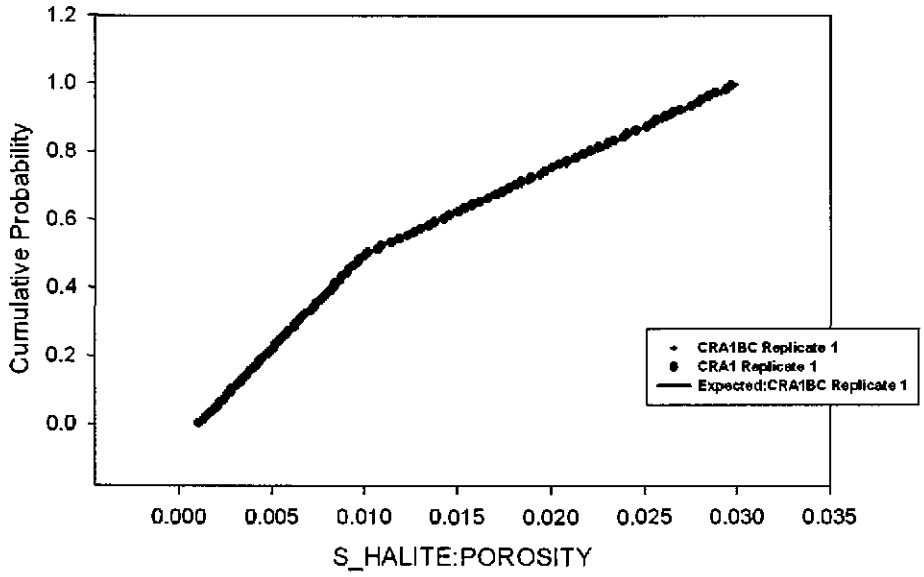

Figure 31. Observed and Expected CDFs for S_HALITE:PRMX_LOG
Uniform Distribution

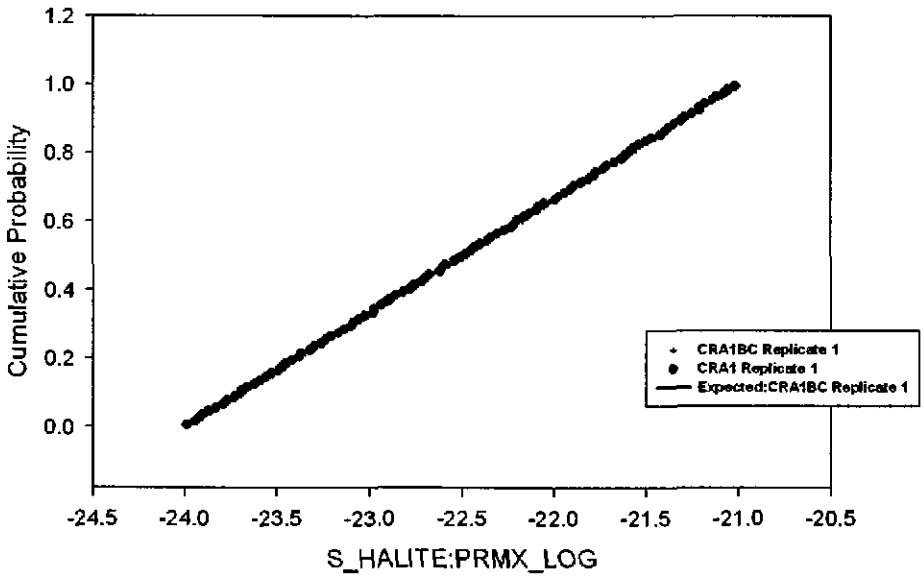

Figure 32. Observed and Expected CDFs for CONC_PLG:PRMX_LOG
Uniform Distribution

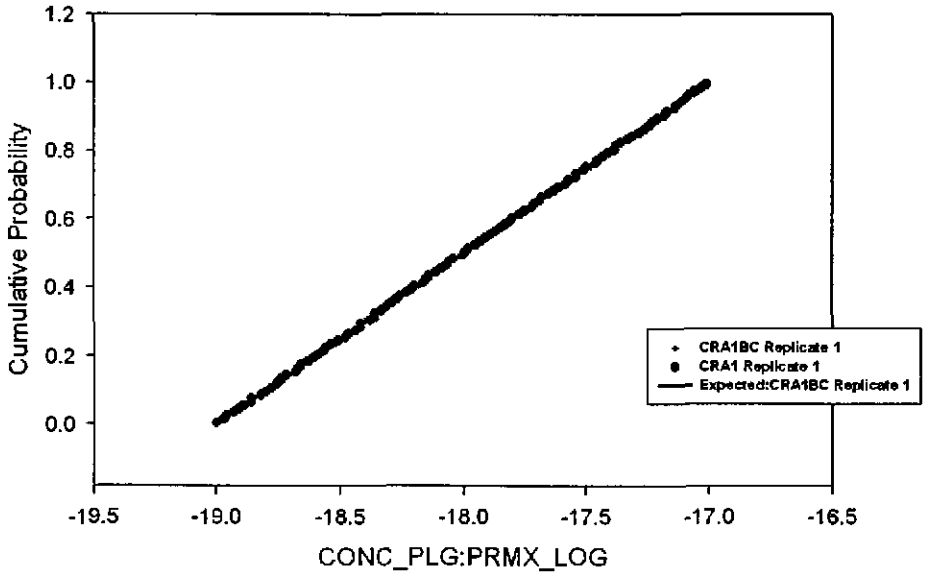

Figure 33. Observed and Expected CDFs for SPALLMOD:REPIPERM
Loguniform Distribution

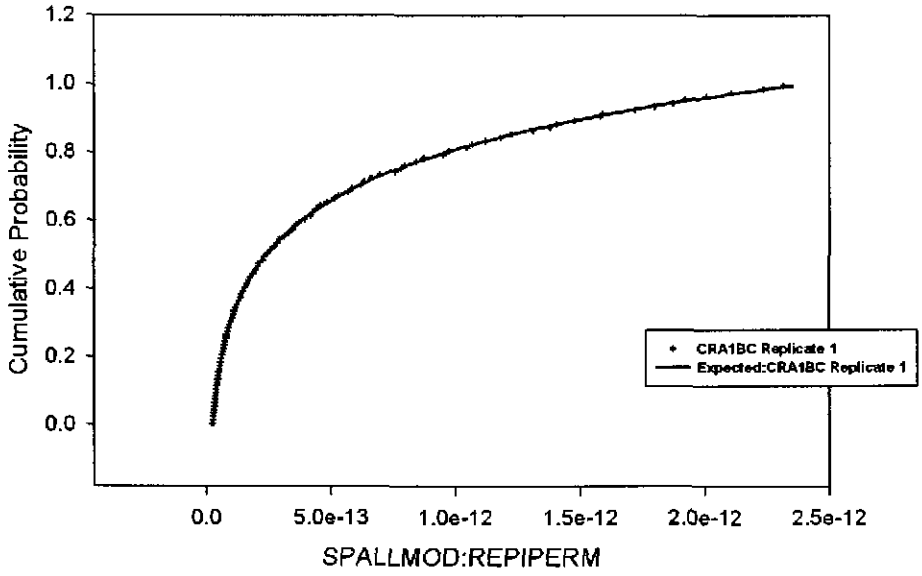

Figure 34. Observed and Expected CDFs for S_HALITE:PRESSURE
Uniform Distribution

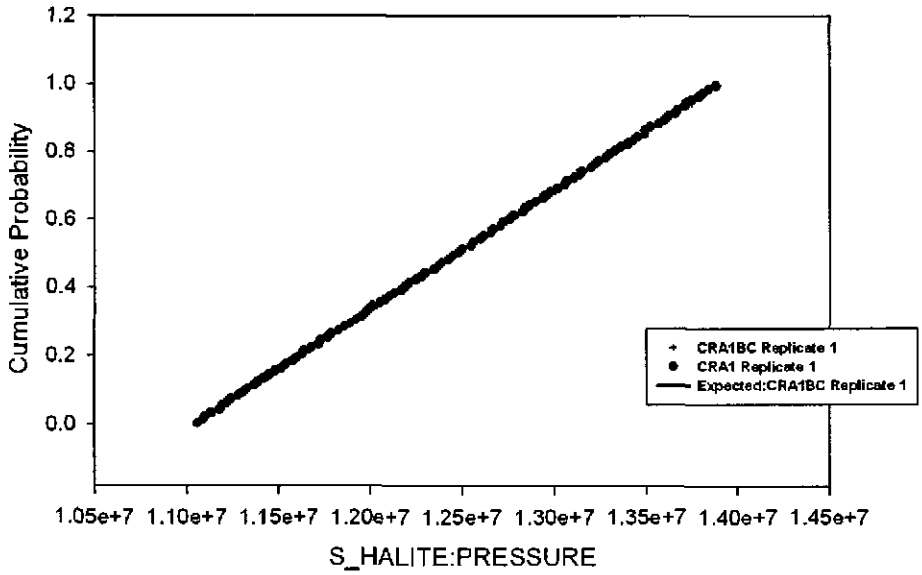

Figure 35. Observed and Expected CDFs for SHFTL_T1:PRMX_LOG User Continuous Distribution

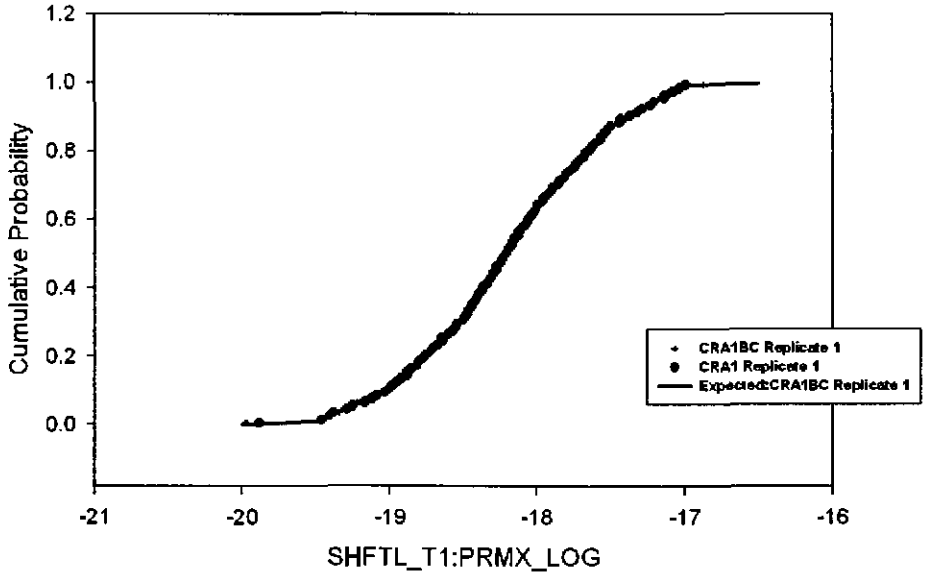

Figure 36. Observed and Expected CDFs for SHFTL_T2:PRMX_LOG User Continuous Distribution

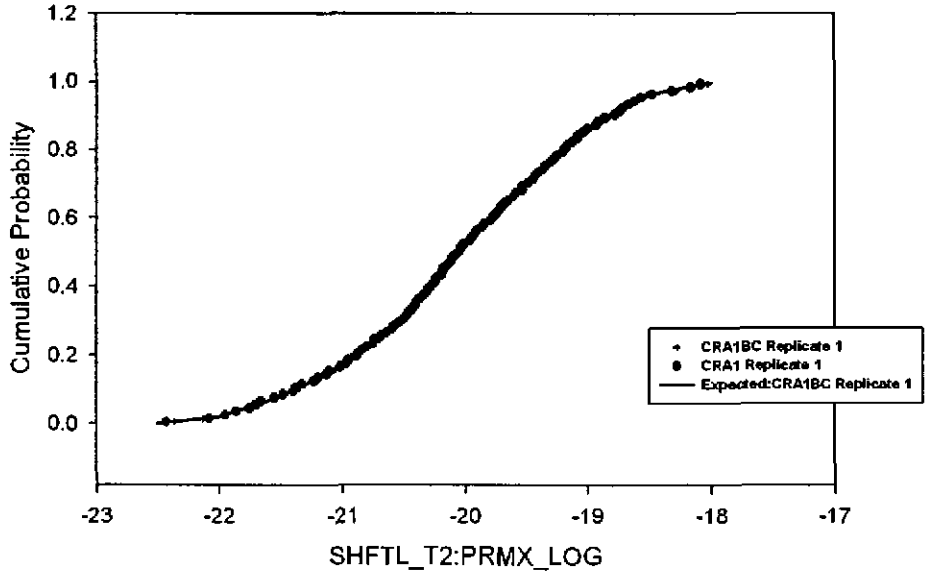

Figure 37. Observed and Expected CDFs for SHFTU:PRMX_LOG User Continuous Distribution

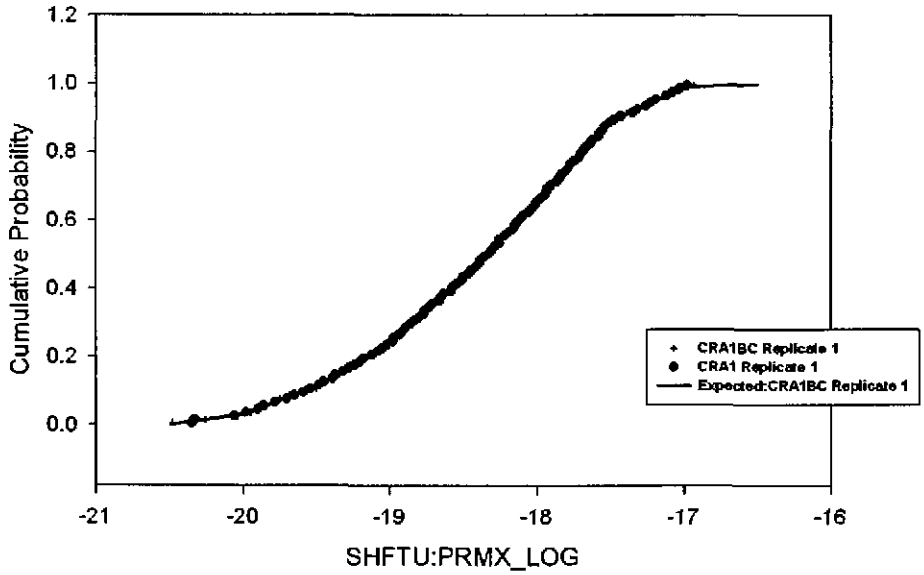

Figure 38. Observed and Expected CDFs for SHFTU:SAT_RBRN User Continuous Distribution

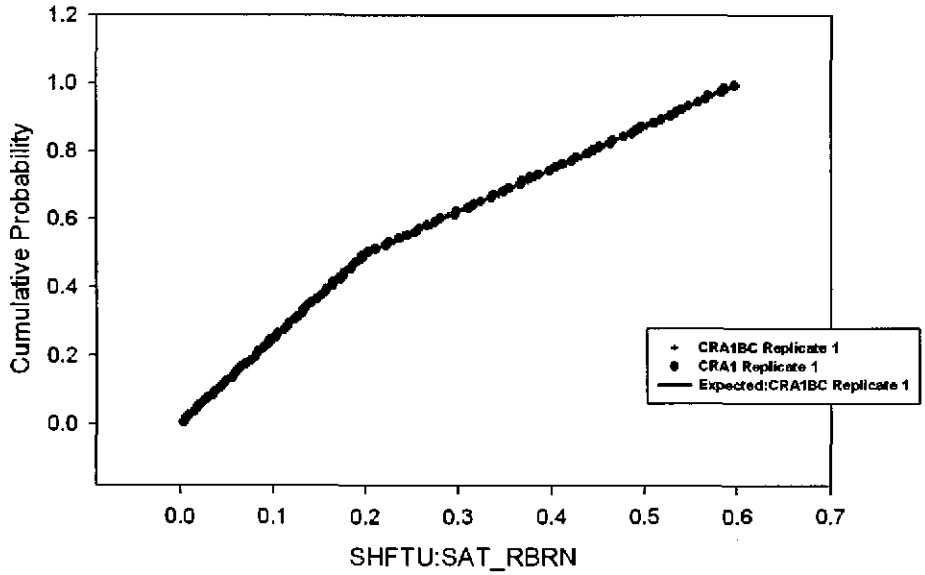

Figure 39. Observed and Expected CDFs for SHFTU:SAT_RGAS Uniform Distribution

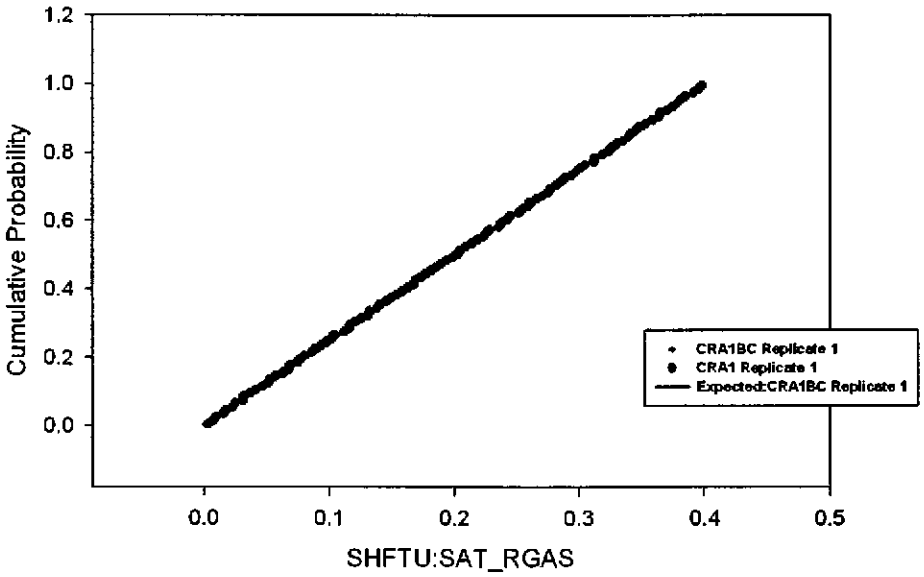

Figure 40. Observed and Expected CDFs for SPALLMOD:PARTDIAM Loguniform Distribution

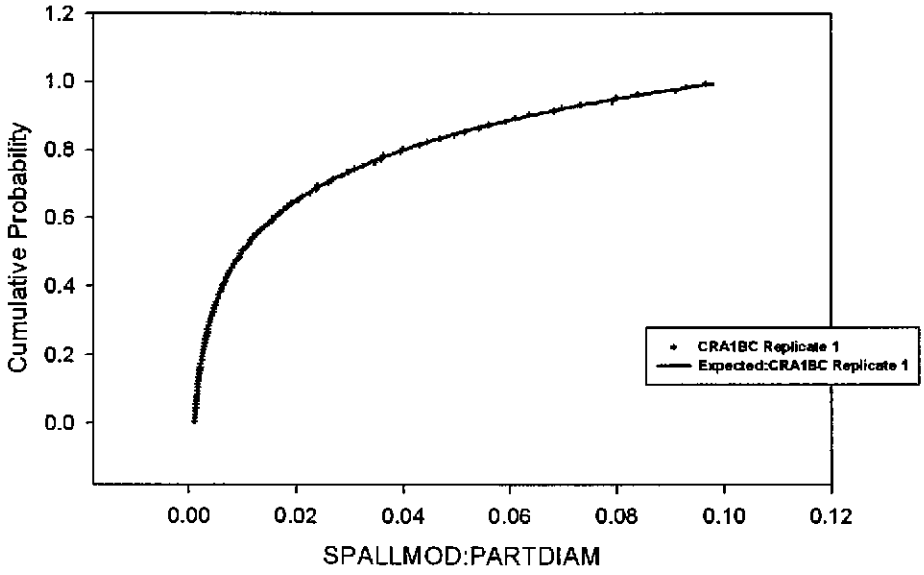

Figure 41. Observed and Expected CDFs for SPALLMOD:REPIPOR
Uniform Distribution

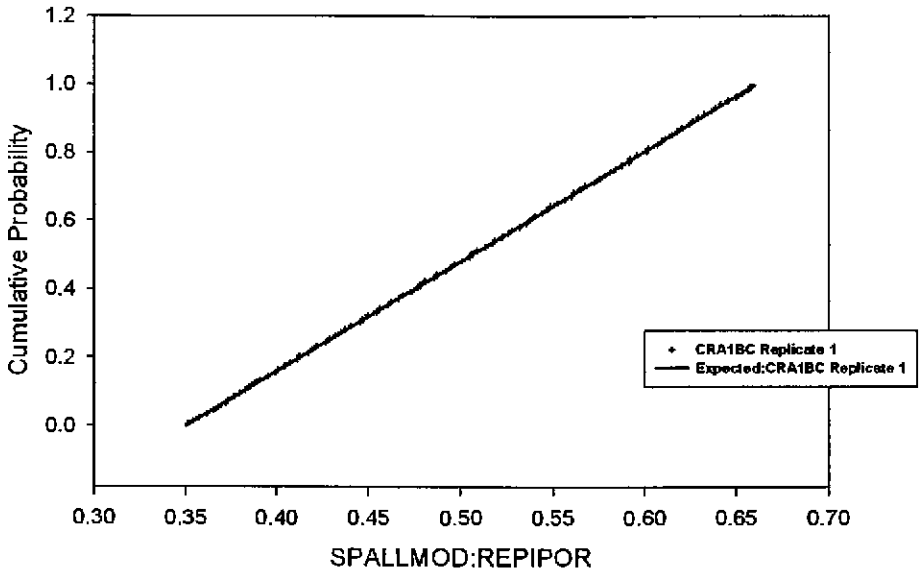

Figure 42. Observed and Expected CDFs for SPALLMOD:TENSLSTR
Uniform Distribution

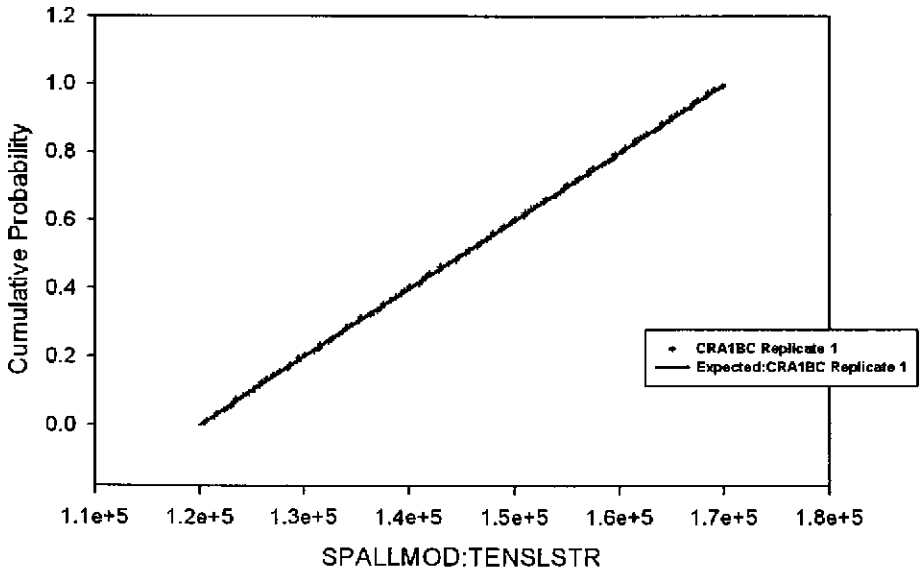

Figure 43. Observed and Expected CDFs for WAS_AREA:SAT_WICK
Uniform Distribution

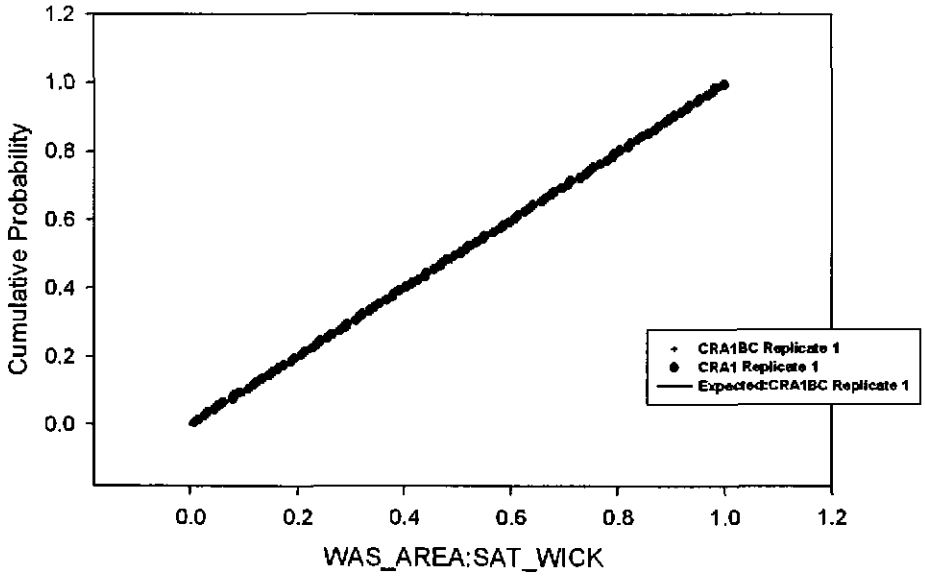

Figure 44. Observed and Expected CDFs for WAS_AREA:BIOGENFC
Uniform Distribution

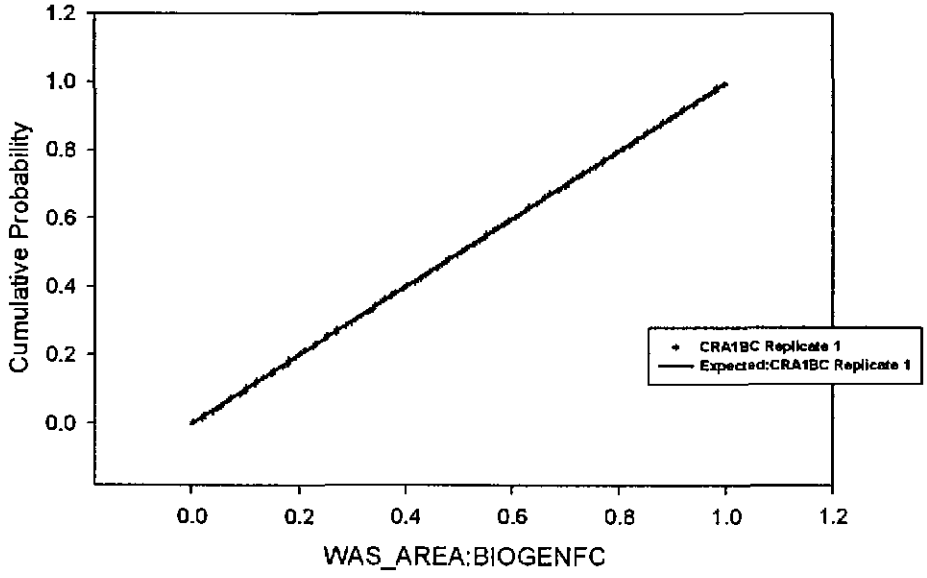

Figure 45. Observed and Expected CDFs for CELLULS:FBETA
Uniform Distribution

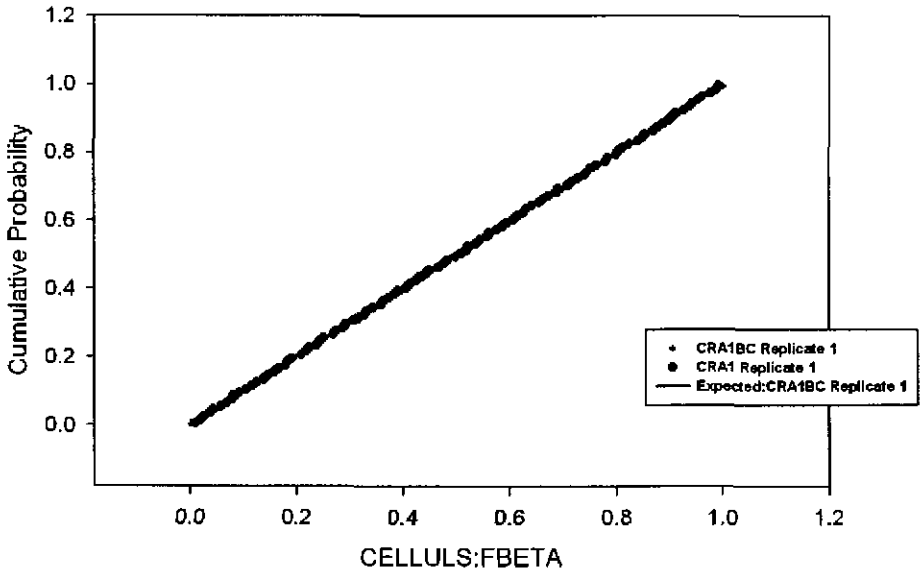

Figure 46. Observed and Expected CDFs for STEEL:CORRMCO2
Uniform Distribution

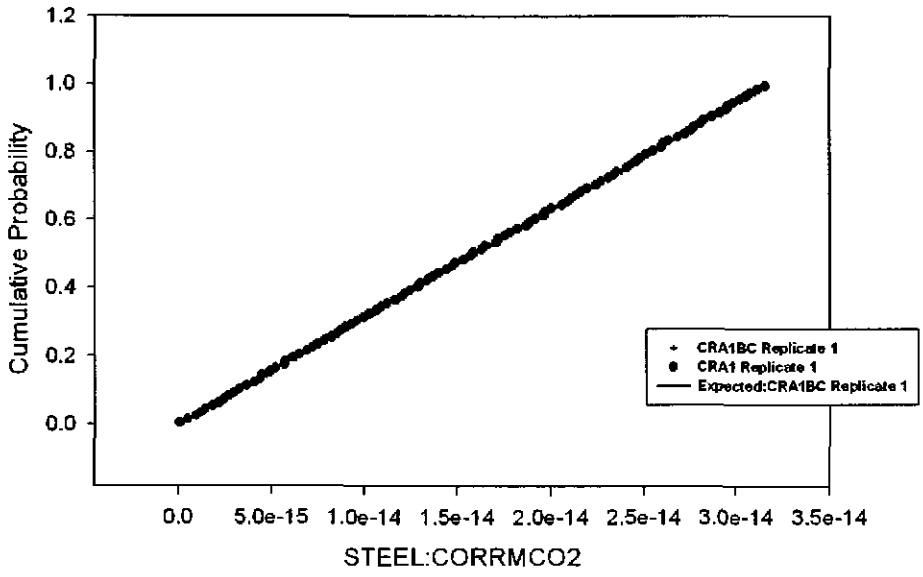

Figure 47. Observed and Expected CDFs for WAS_AREA:GRATMICH Uniform Distribution

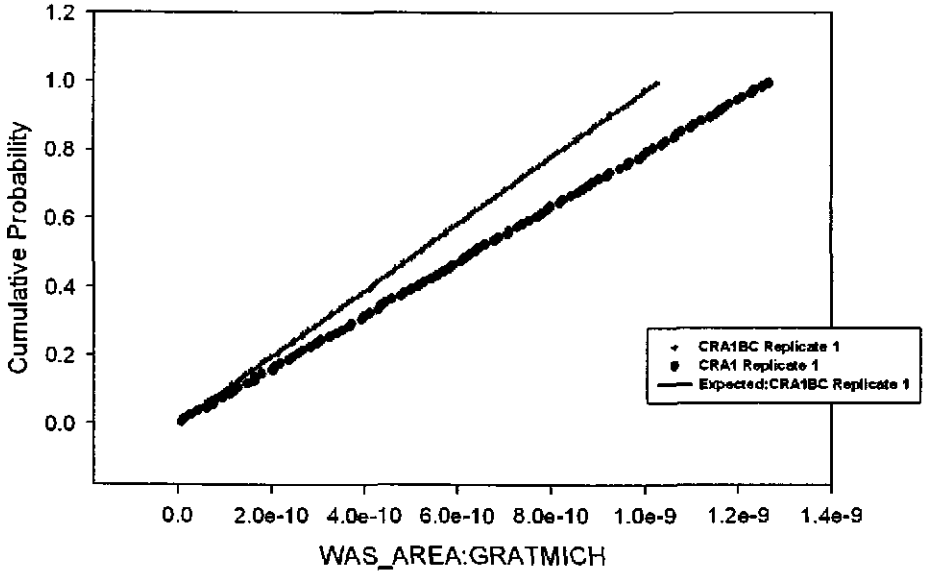

Figure 48. Observed and Expected CDFs for WAS_AREA:GRATMICI Uniform Distribution

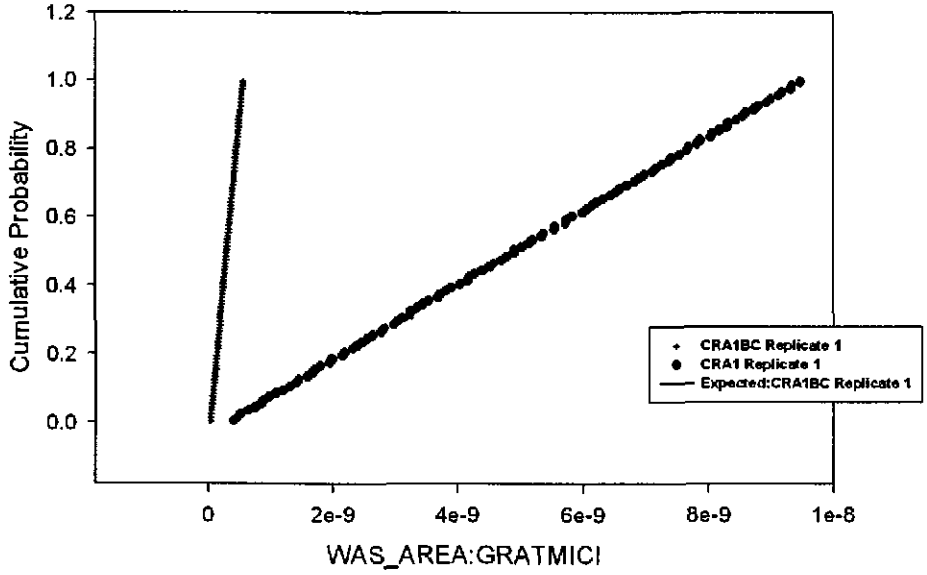

Figure 49. Observed and Expected CDFs for WAS_AREA:PROBDEG
User Discrete (Delta) Distribution

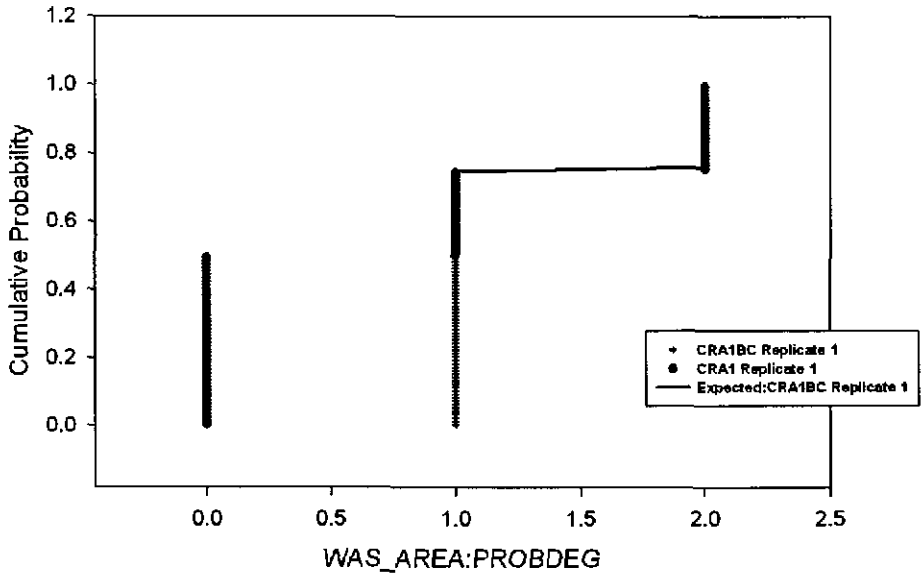

Figure 50. Observed and Expected CDFs for GLOBAL:OXSTAT
Uniform Distribution

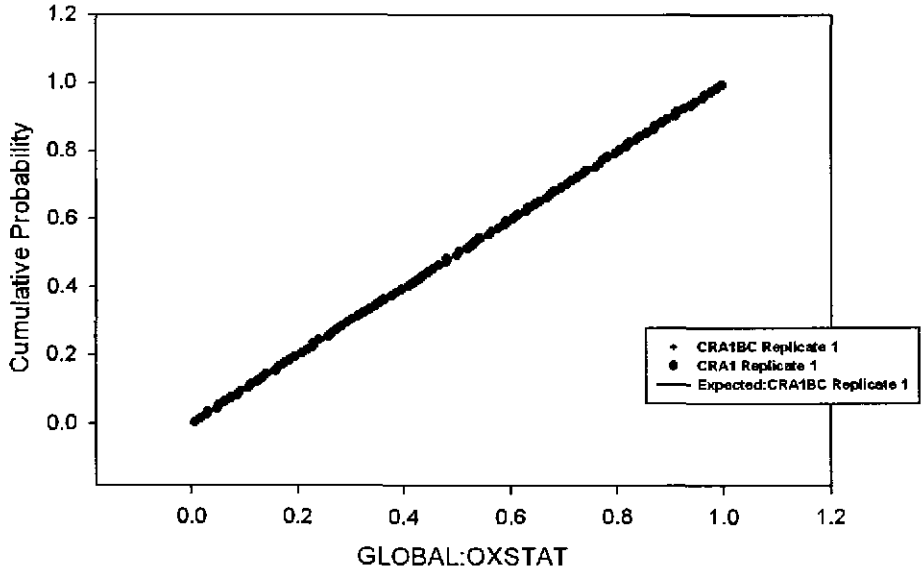

Figure 51. Observed and Expected CDFs for PHUMOX3:PHUMCIM User Continuous Distribution

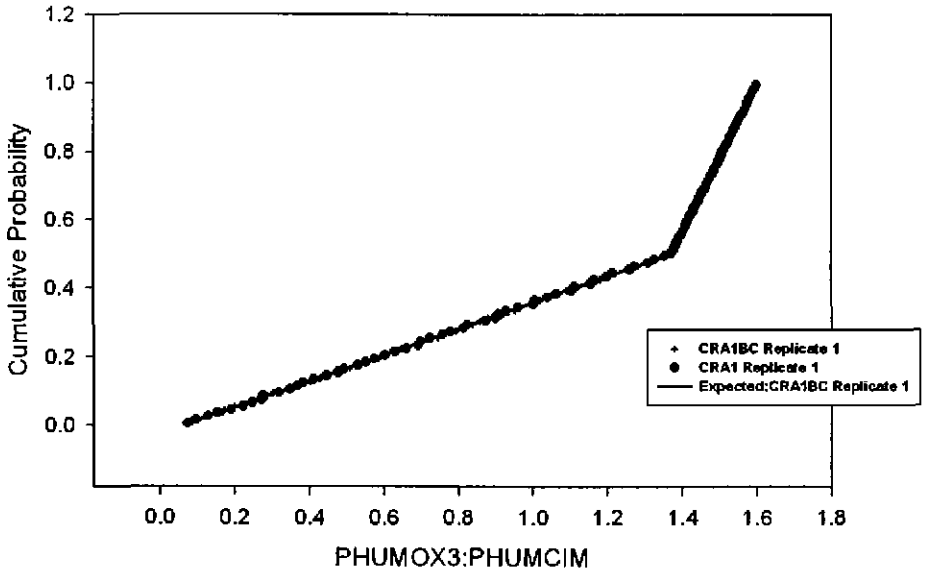

Figure 52. Observed and Expected CDFs for WAS_AREA:SAT_RBRN Uniform Distribution

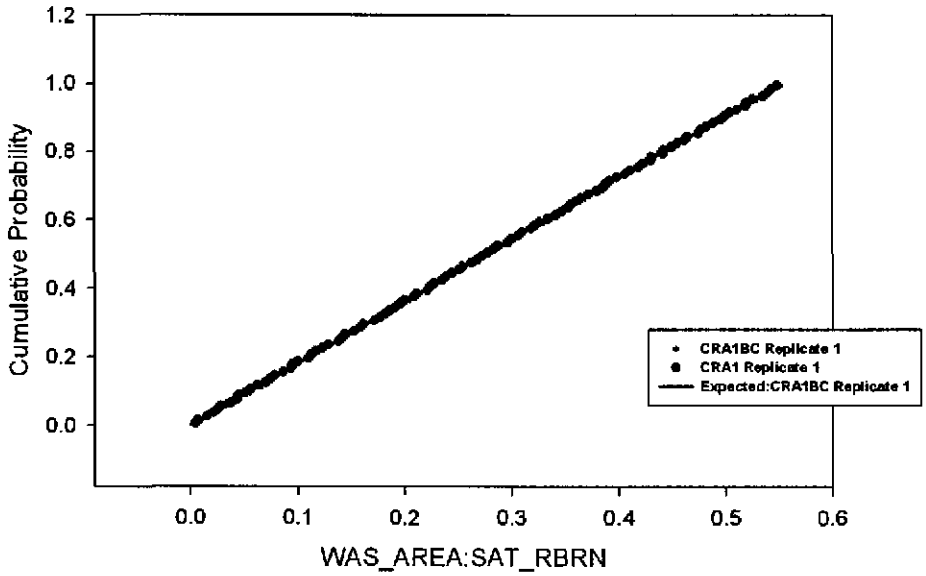

Figure 53. Observed and Expected CDFs for WAS_AREA:SAT_RGAS
Uniform Distribution

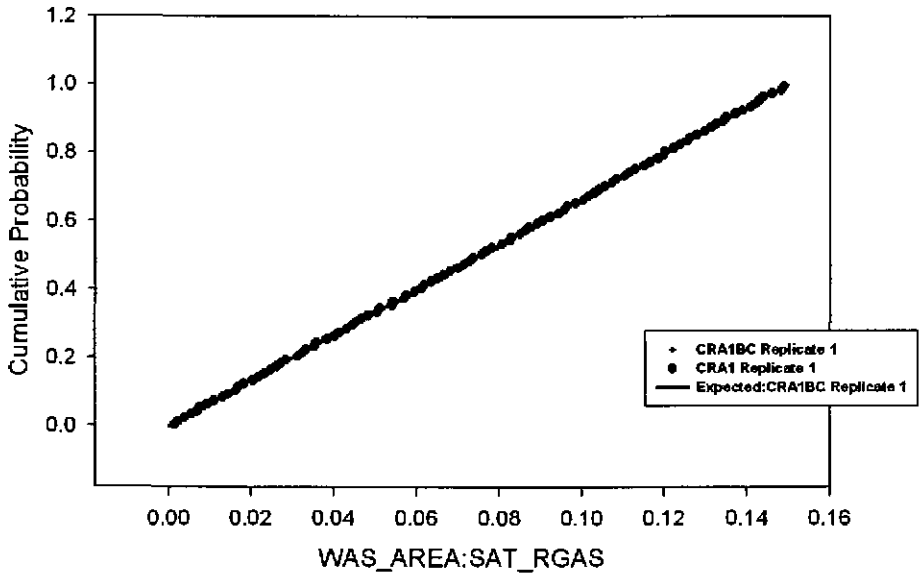

Figure 54. Observed and Expected CDFs for SOLMOD3:SOLVAR
User Continuous Distribution

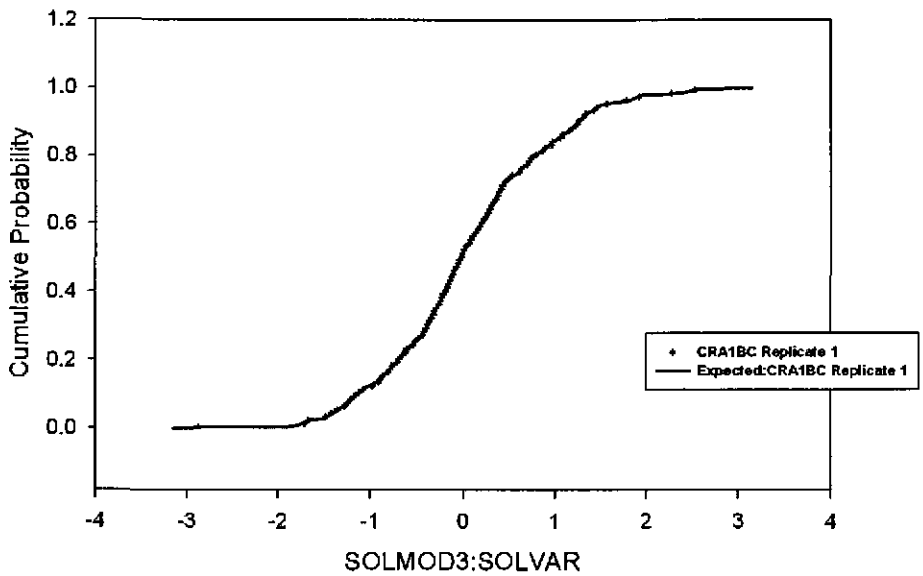

Figure 55. Observed and Expected CDFs for SOLMOD4:SOLVAR User Continuous Distribution

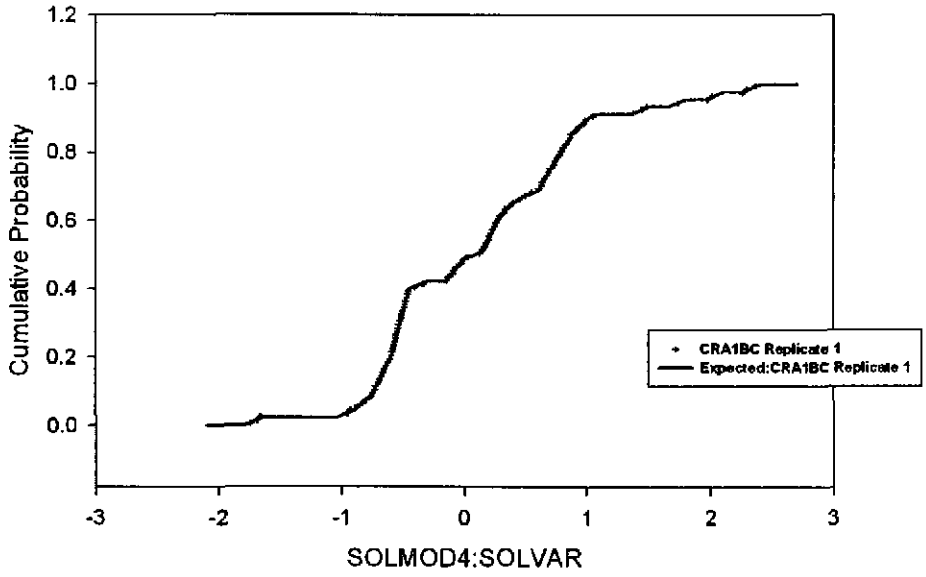

Figure 56. Observed and Expected CDFs for BOREHOLE:TAUFAIL Loguniform Distribution

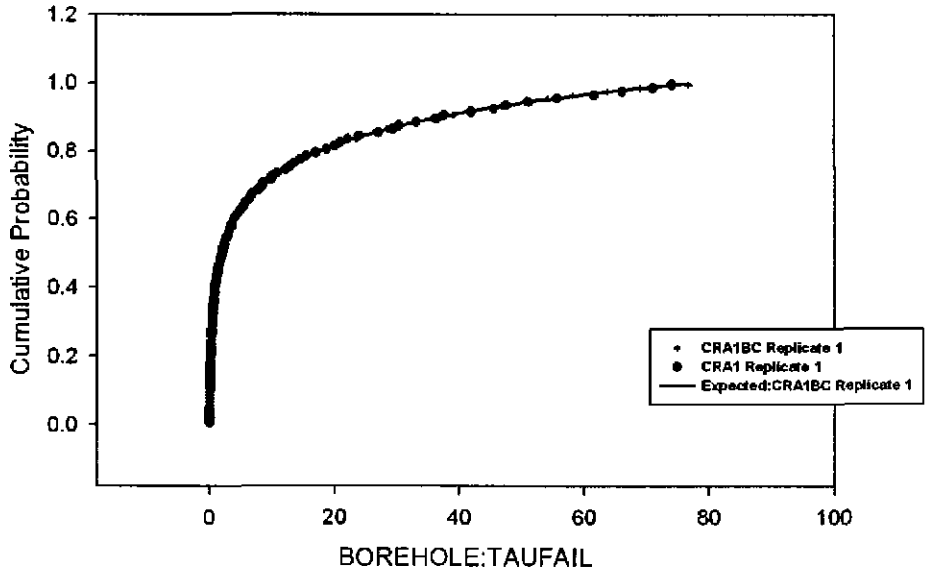

Figure 57. Observed and Expected CDFs for S_MB139:PORE_DIS Student Distribution

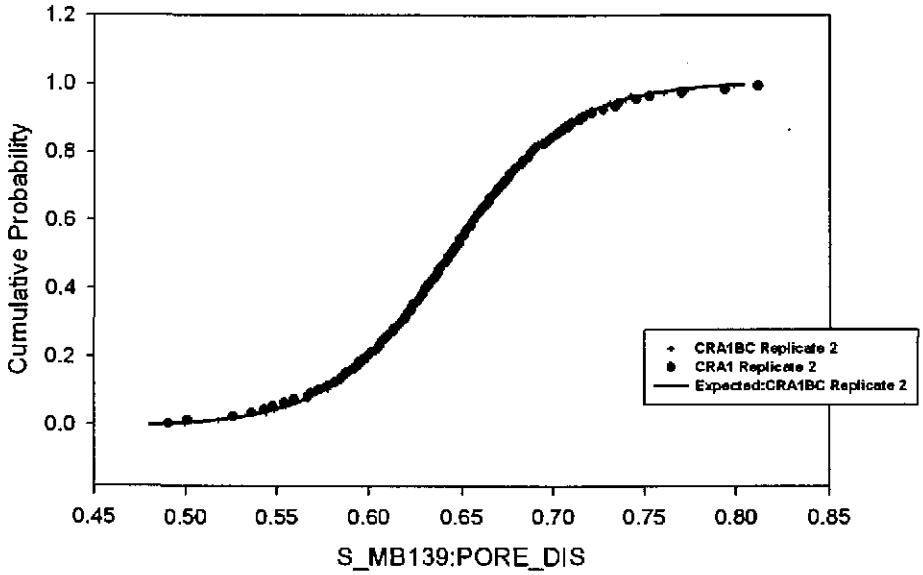

Figure 58. Observed and Expected CDFs for S_MB139:RELP_MOD User Discrete (Delta) Distribution

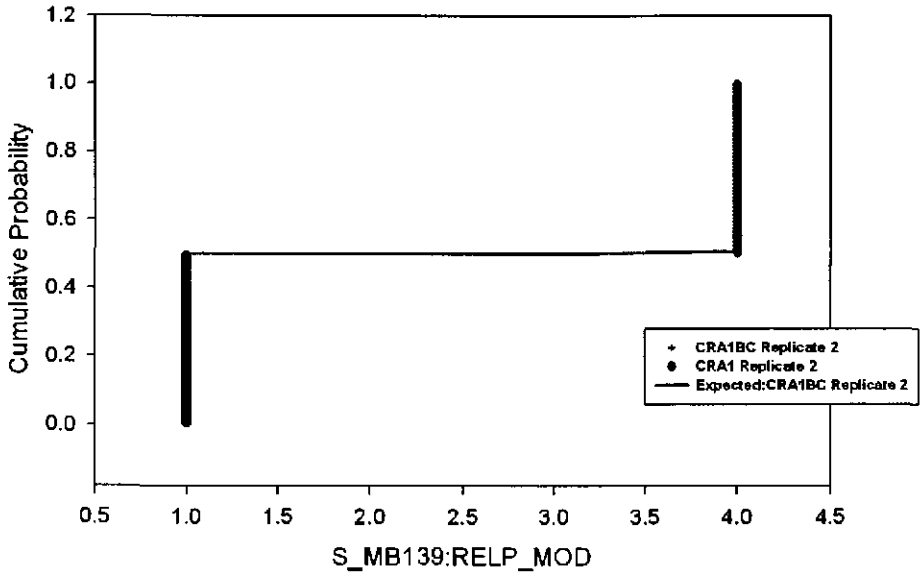

Figure 59. Observed and Expected CDFs for S_MB139:PRMX_LOG Student Distribution

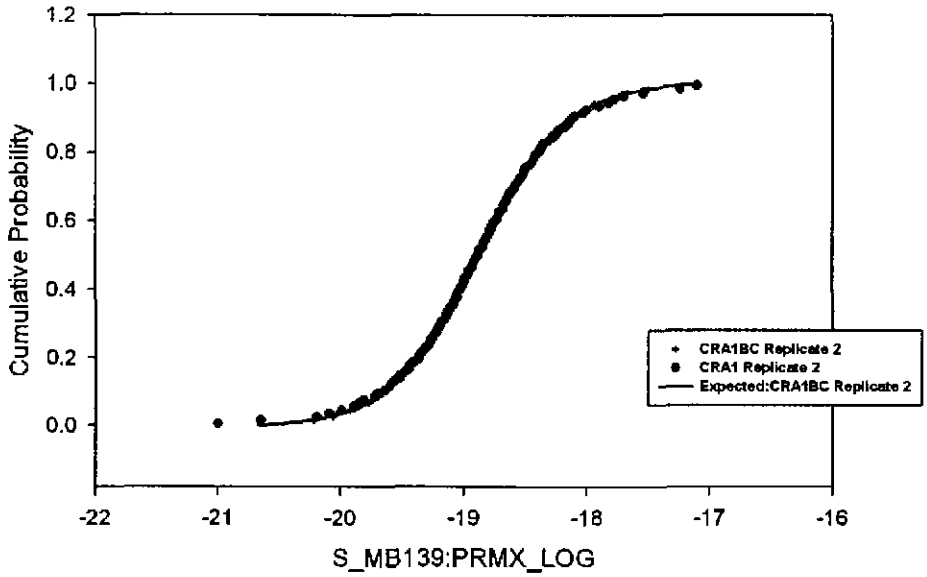

Figure 60. Observed and Expected CDFs for S_MB139:SAT_RBRN Student Distribution

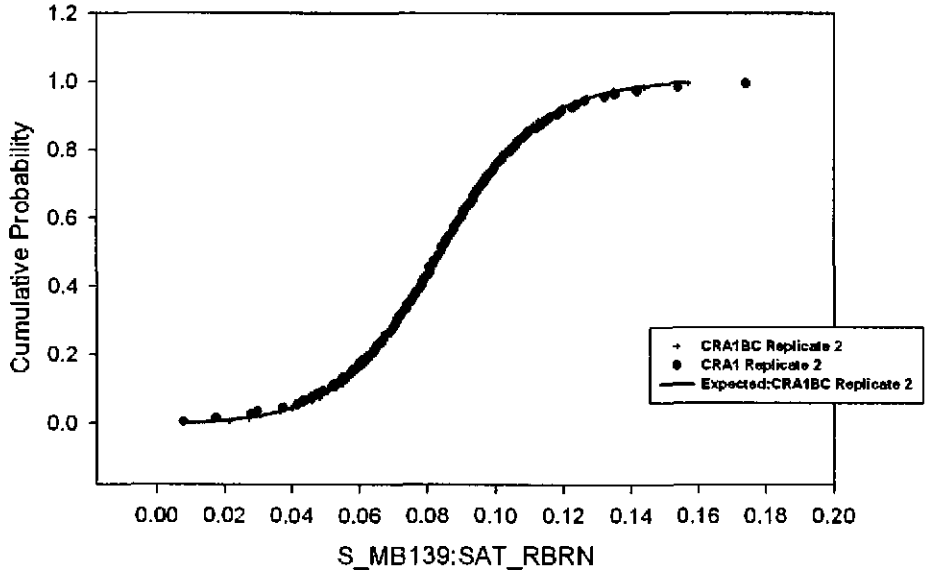

Figure 61. Observed and Expected CDFs for BH_SAND:PRMX_LOG Uniform Distribution

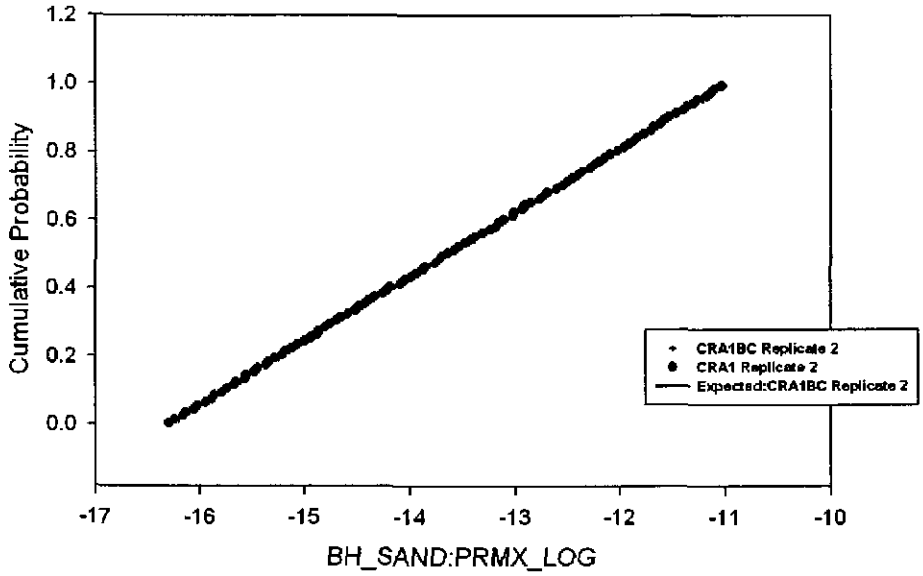

Figure 62. Observed and Expected CDFs for CASTILER:COMP_RCK Triangular Distribution

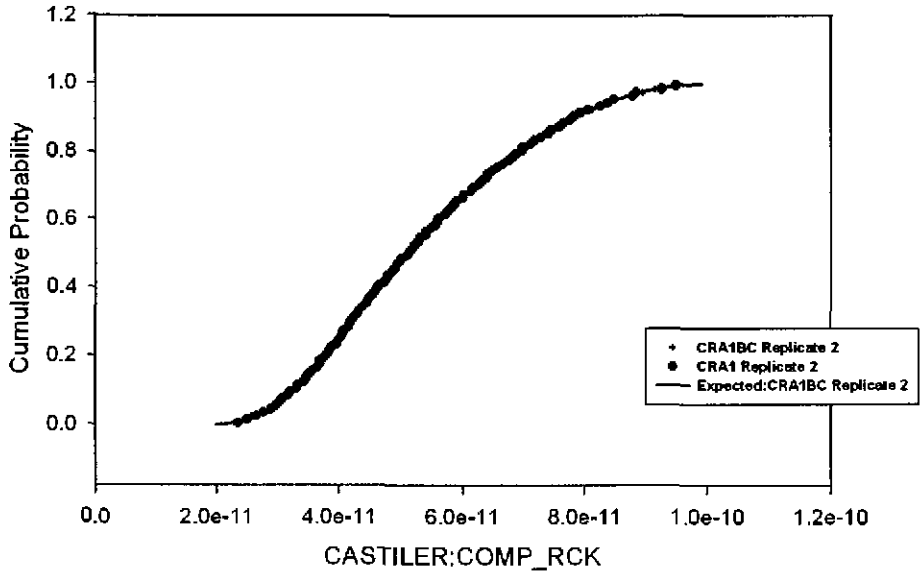

Figure 63. Observed and Expected CDFs for CASTILER:PRESSURE Triangular Distribution

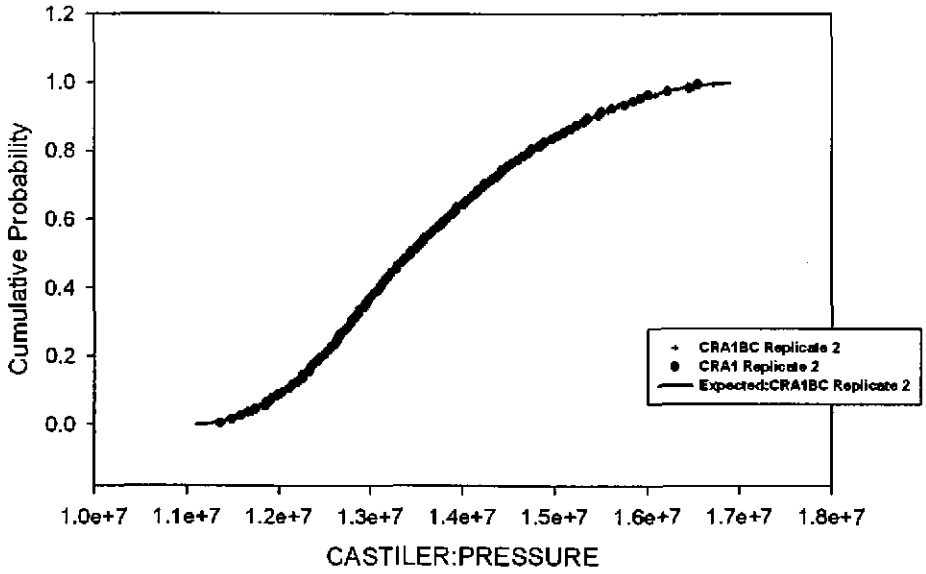

Figure 64. Observed and Expected CDFs for CASTILER:PRMX_LOG Triangular Distribution

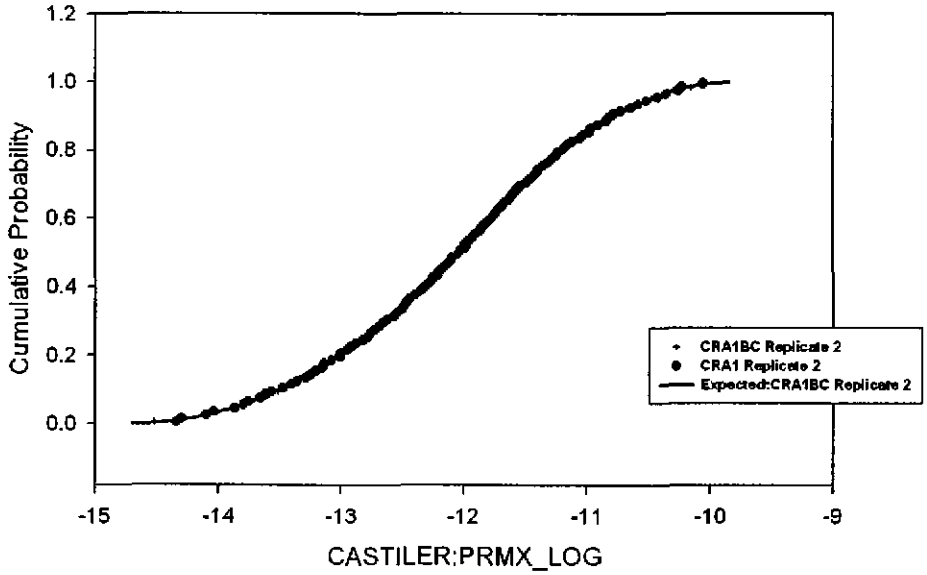

Figure 65. Observed and Expected CDFs for GLOBAL:PBRINE Uniform Distribution

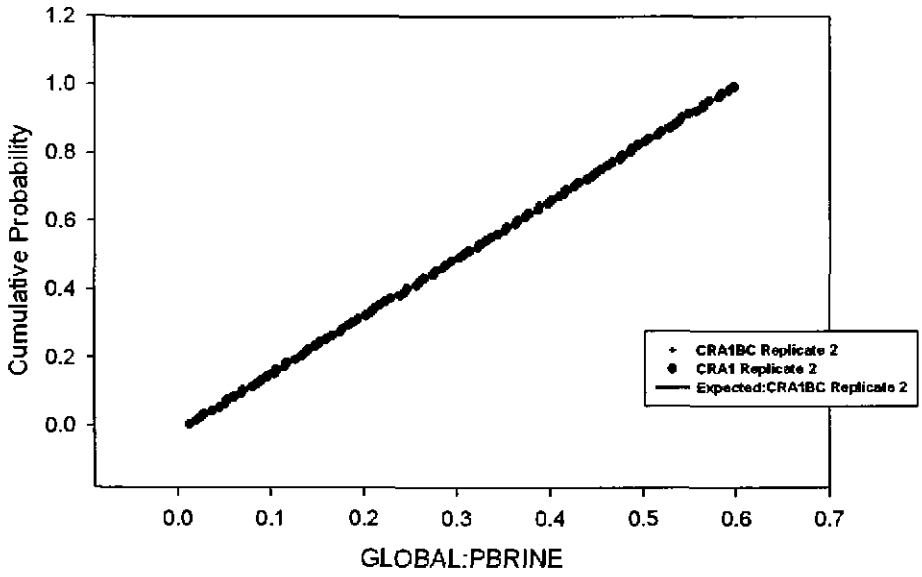

Figure 66. Observed and Expected CDFs for GLOBAL:CLIMTIDX User Continuous Distribution

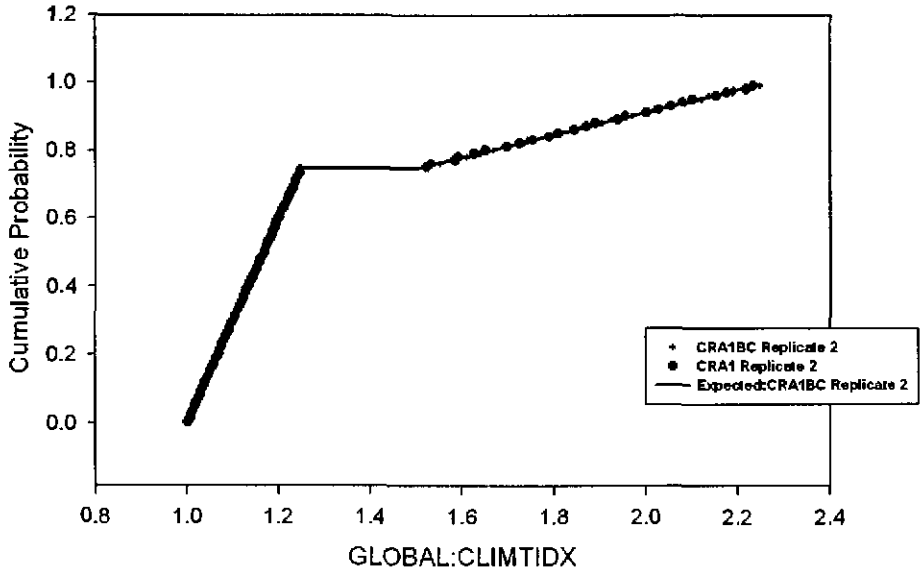

Figure 67. Observed and Expected CDFs for CULEBRA:APOROS Loguniform Distribution

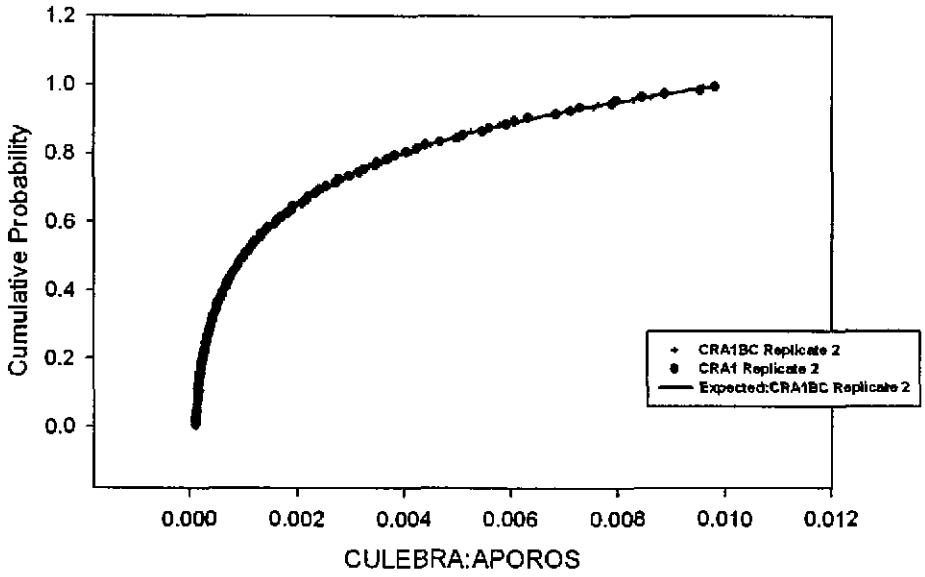

Figure 68. Observed and Expected CDFs for CULEBRA:HMBLKLT Uniform Distribution

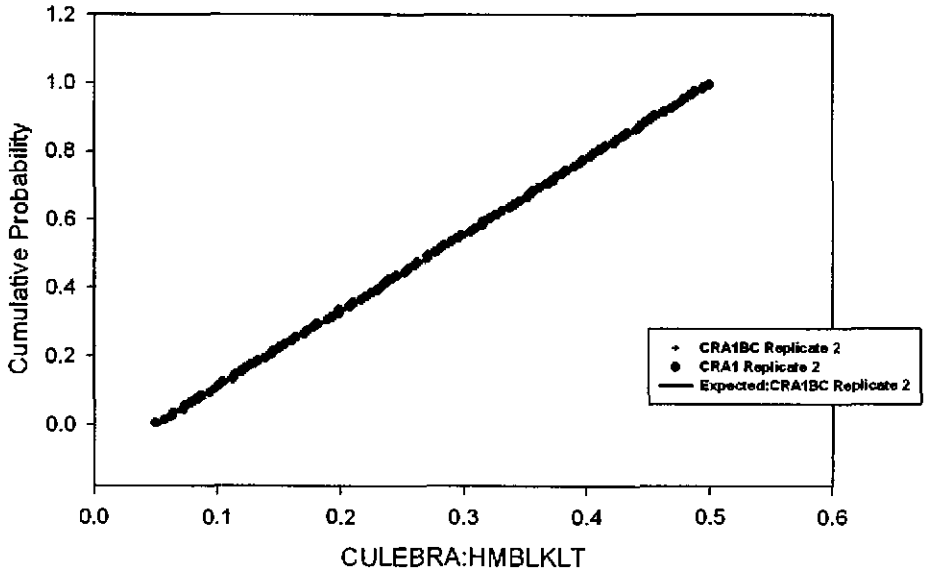

Figure 69. Observed and Expected CDFs for AM+3:MKD_AM
Loguniform Distribution

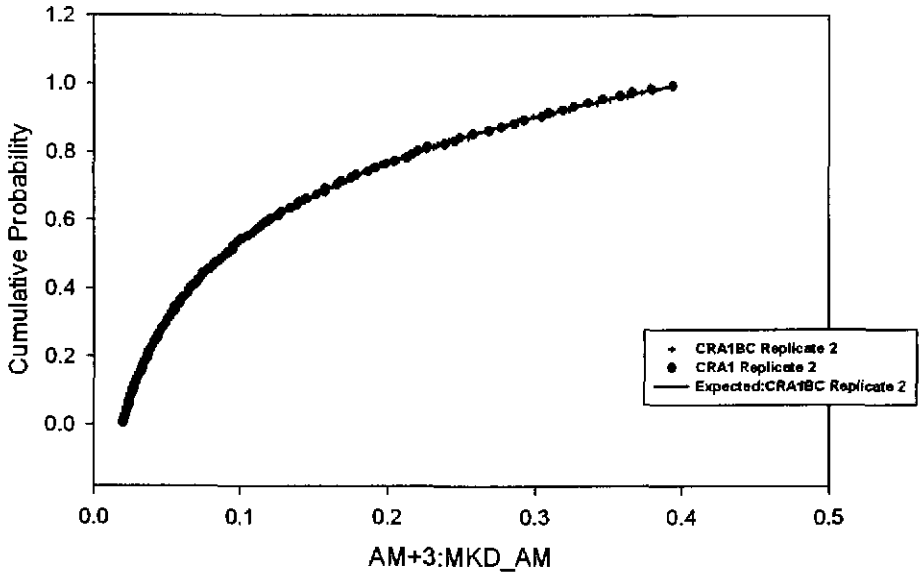

Figure 70. Observed and Expected CDFs for PU+3:MKD_PU
Loguniform Distribution

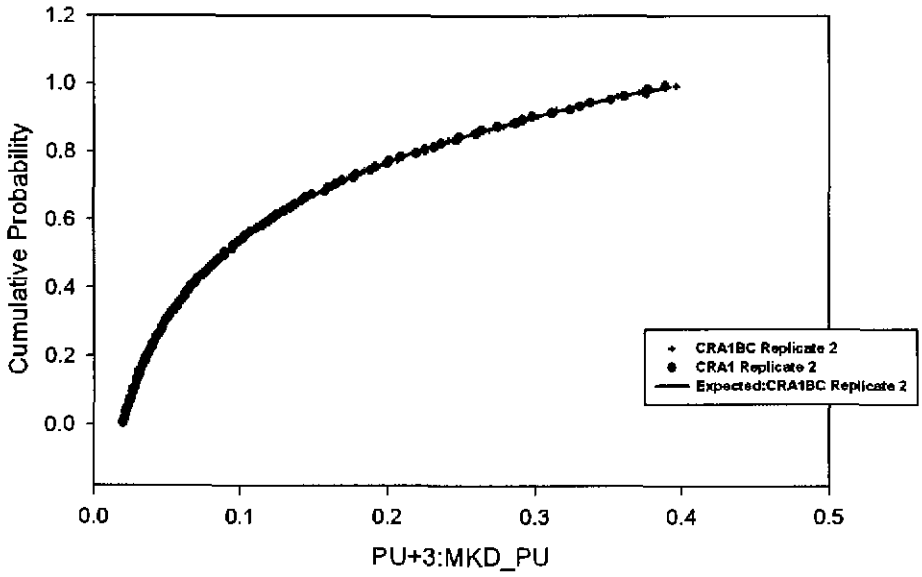

Figure 71. Observed and Expected CDFs for PU+4:MKD_PU Loguniform Distribution

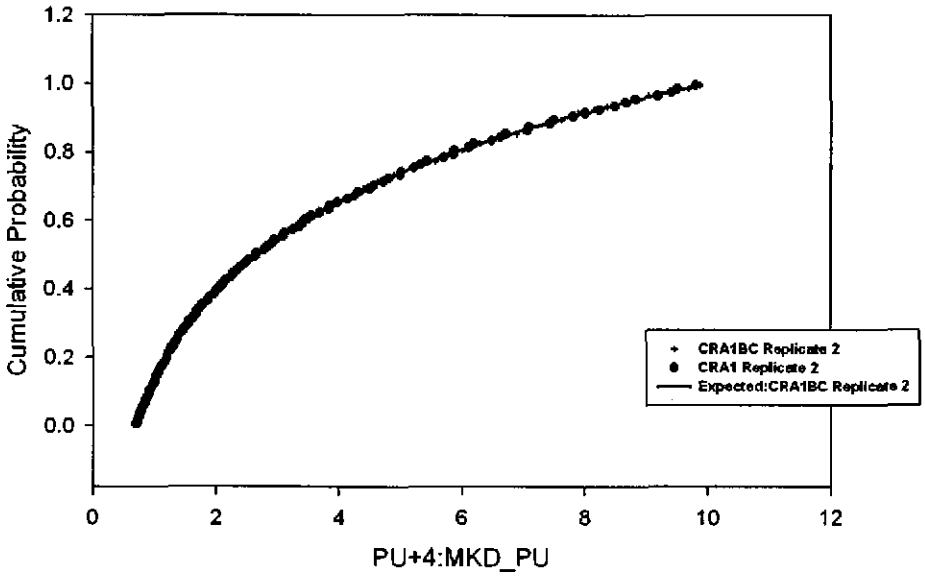

Figure 72. Observed and Expected CDFs for TH+4:MKD_TH Loguniform Distribution

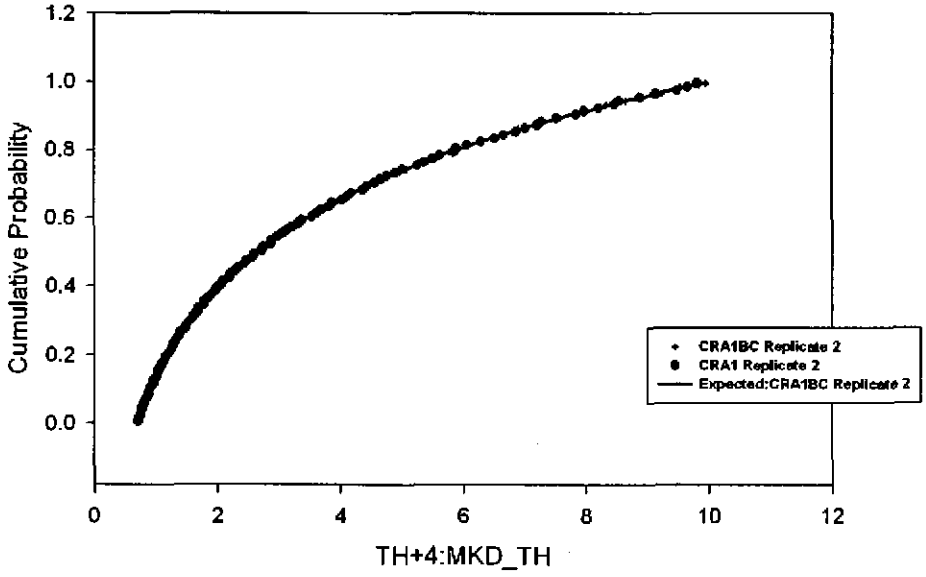

Figure 73. Observed and Expected CDFs for U+4:MKD_U Loguniform Distribution

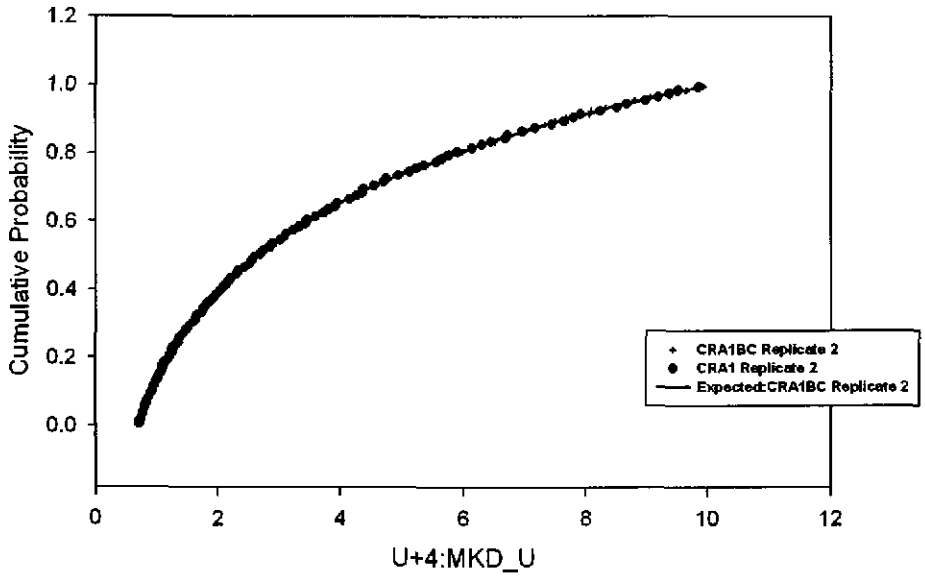

Figure 74. Observed and Expected CDFs for U+6:MKD_U Loguniform Distribution

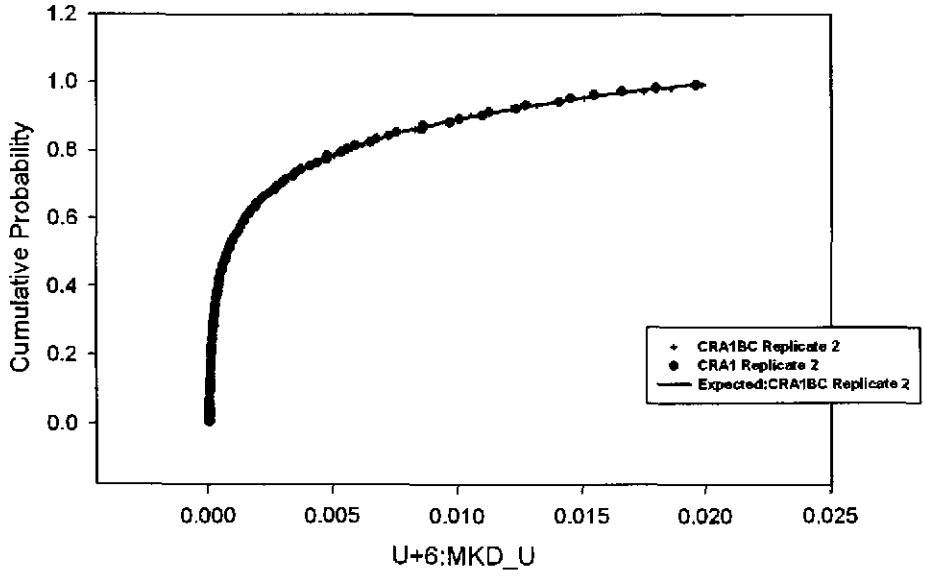

Figure 75. Observed and Expected CDFs for CULEBRA:DPOROS User Continuous Distribution

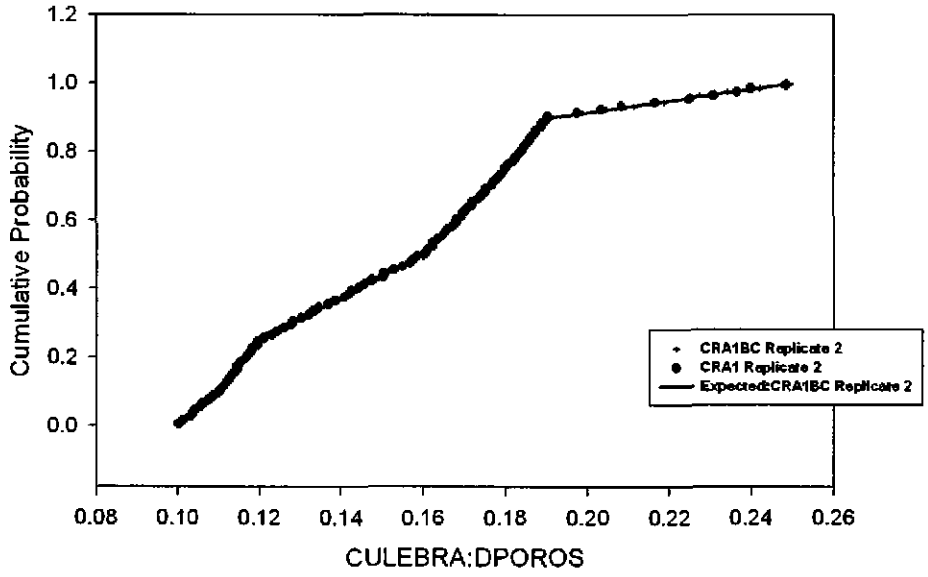

Figure 76. Observed and Expected CDFs for CONC_PCS:PORE_DIS User Continuous Distribution

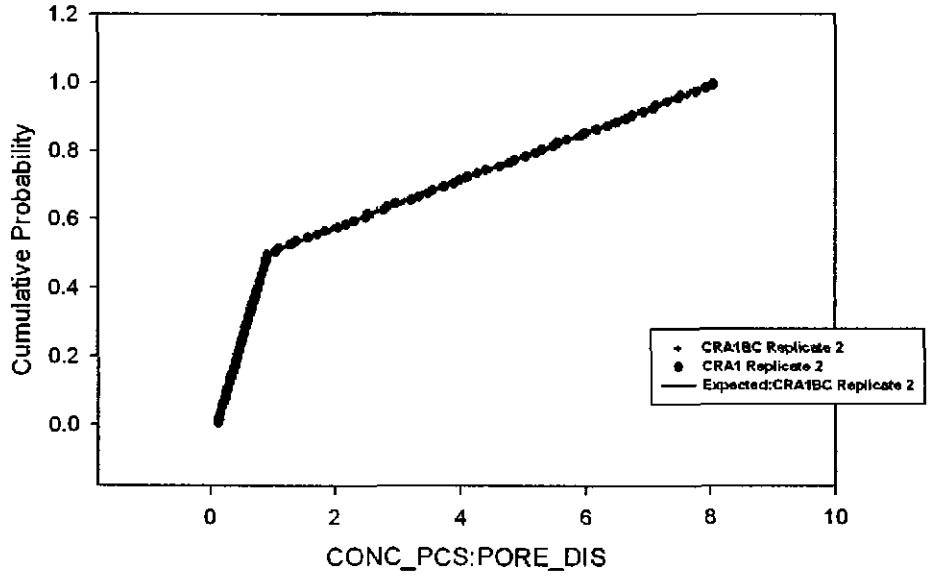

Figure 77. Observed and Expected CDFs for CONC_PCS:SAT_RBRN User Continuous Distribution

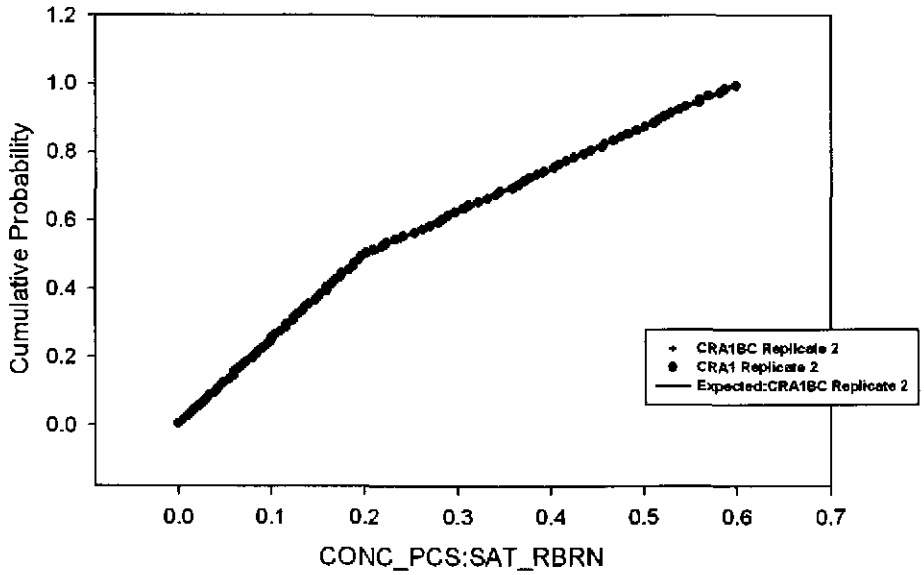

Figure 78. Observed and Expected CDFs for CONC_PCS:SAT_RGAS Uniform Distribution

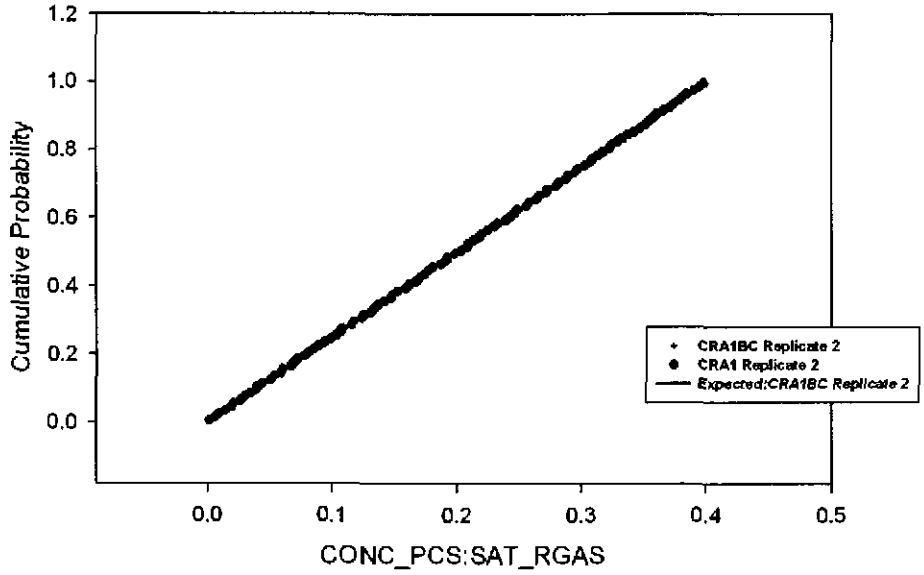

Figure 79. Observed and Expected CDFs for CONC_PCS:PRMX_LOG
Triangular Distribution

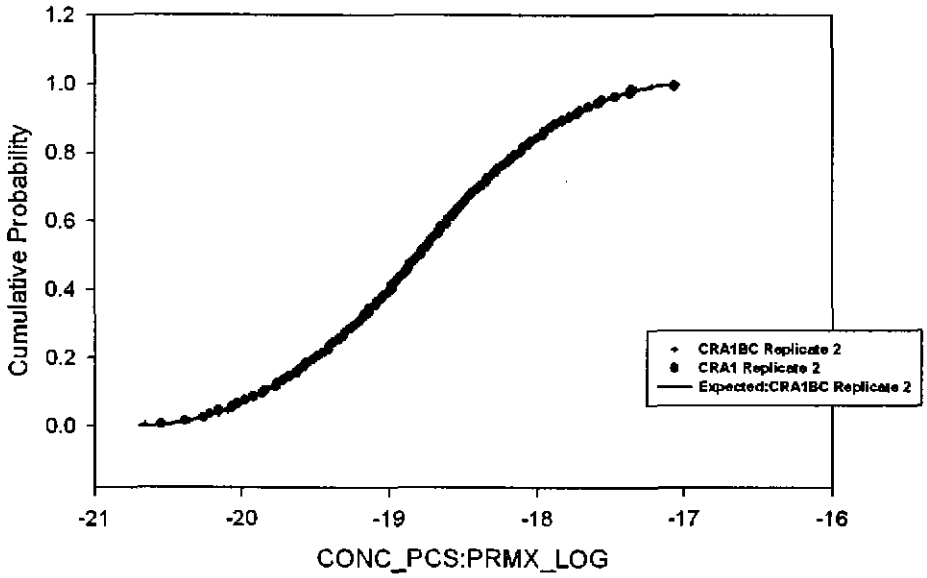

Figure 80. Observed and Expected CDFs for GLOBAL:TRANSIDX
Uniform Distribution

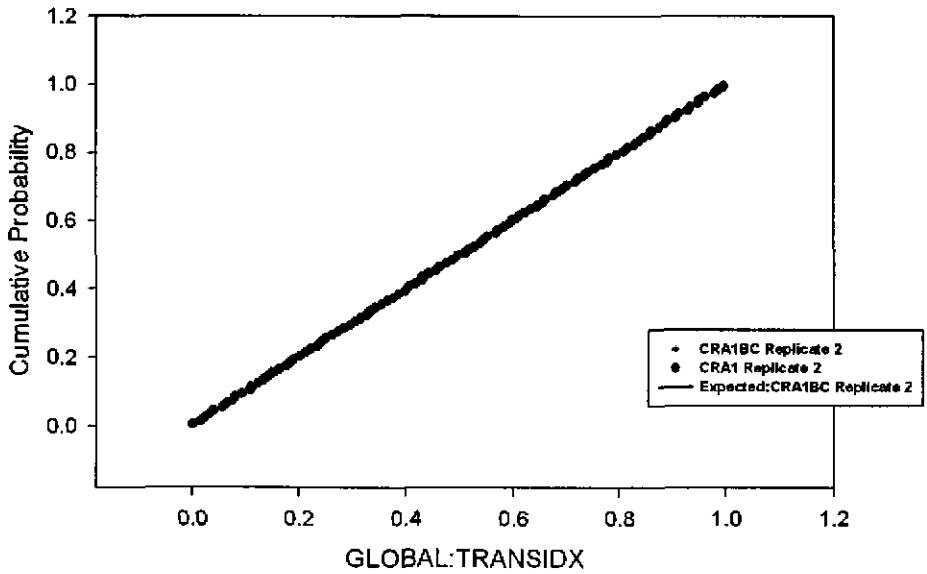

Figure 81. Observed and Expected CDFs for CULEBRA:MINP_FAC
Uniform Distribution

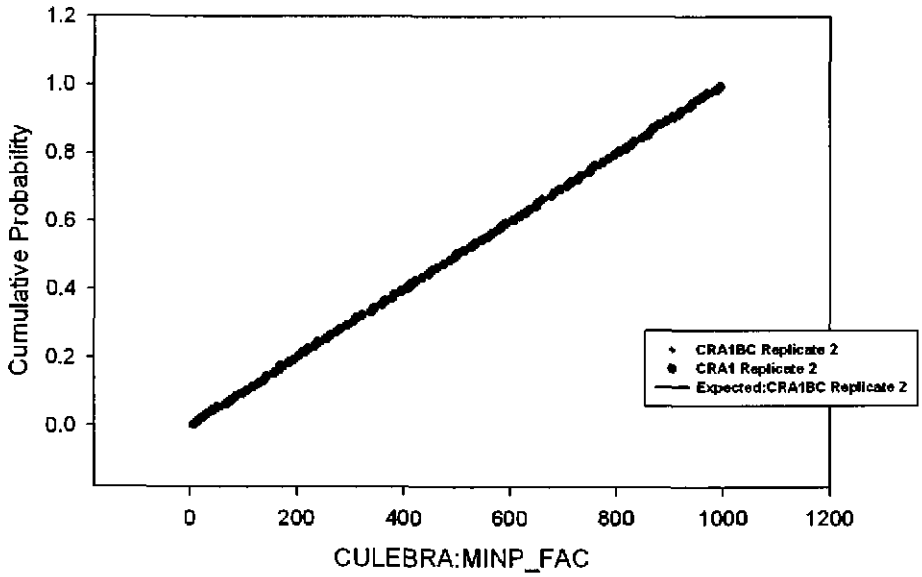

Figure 82. Observed and Expected CDFs for BOREHOLE:DOMEGA
User Continuous Distribution

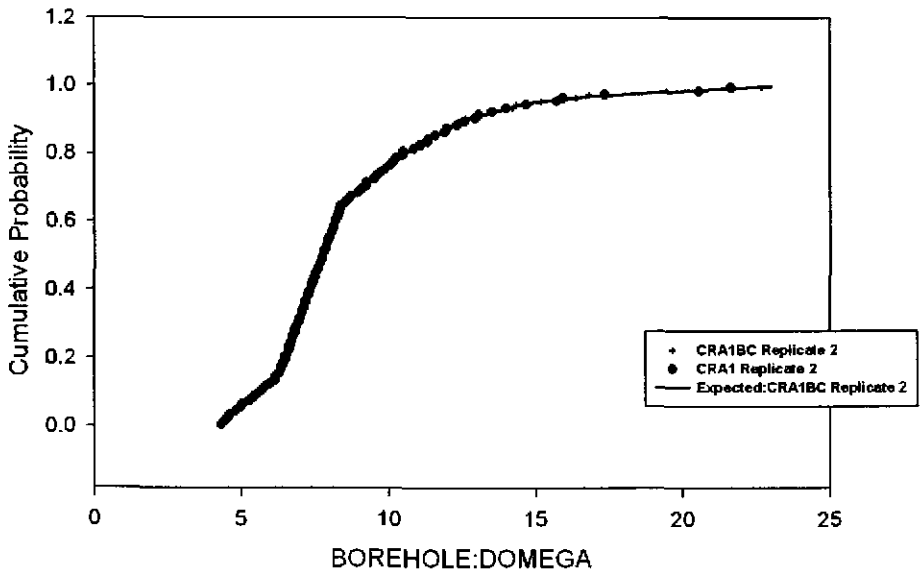

Figure 83. Observed and Expected CDFs for DRZ_PCS:PRMX_LOG Triangular Distribution

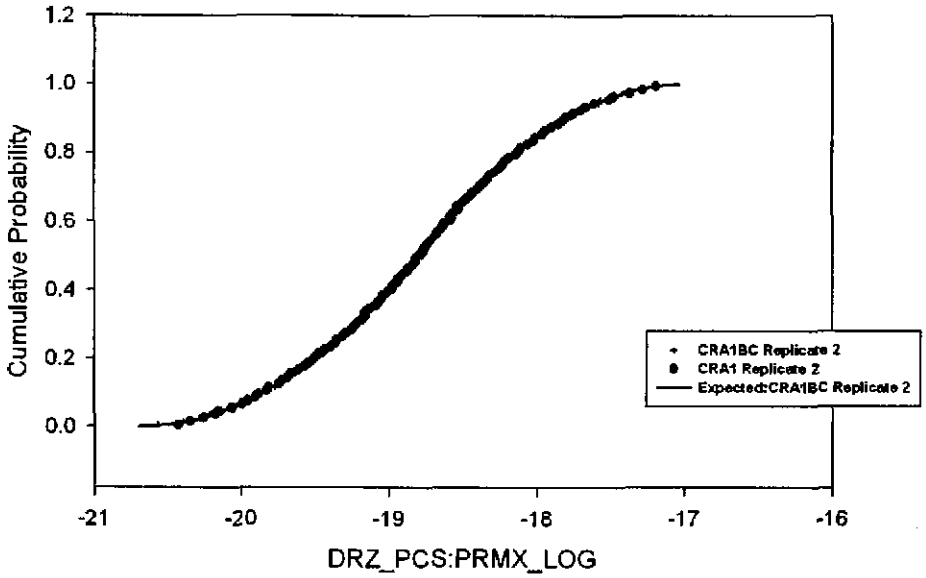

Figure 84. Observed and Expected CDFs for DRZ_1:PRMX_LOG Uniform Distribution

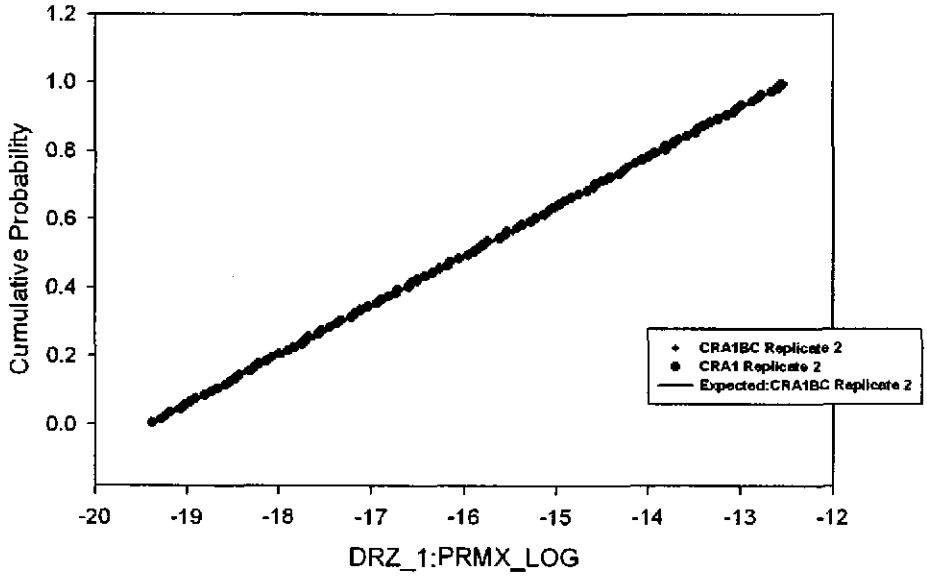

Figure 85. Observed and Expected CDFs for S_HALITE:COMP_RCK Uniform Distribution

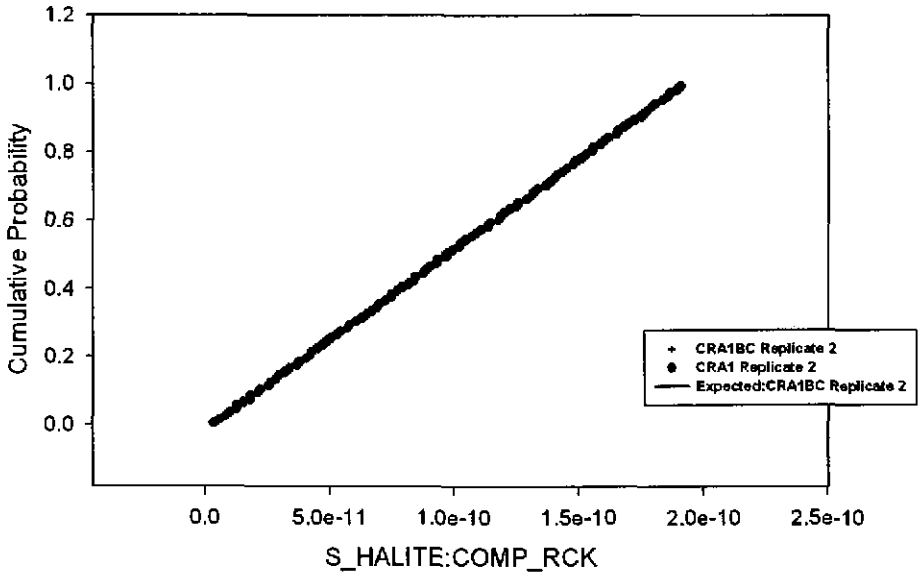

Figure 86. Observed and Expected CDFs for S_HALITE:POROSITY User Continuous Distribution

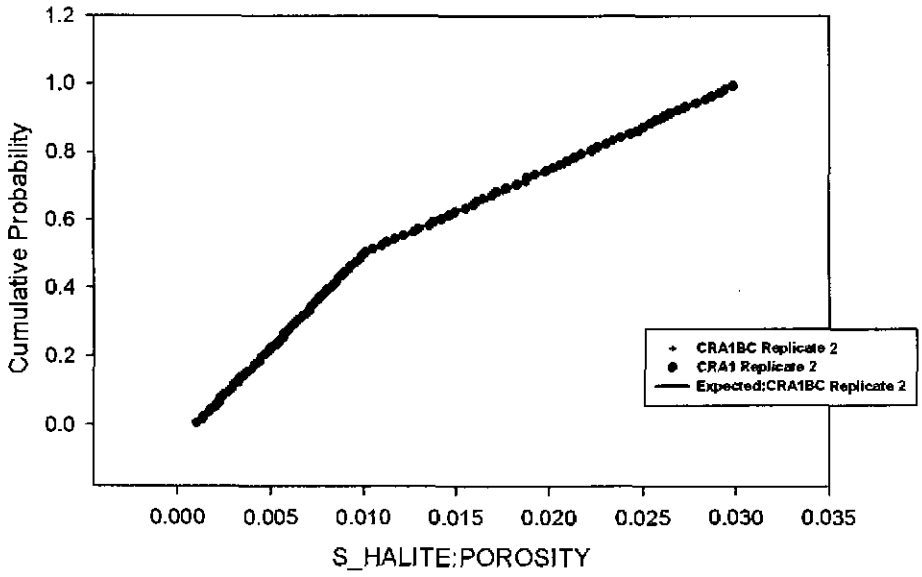

Figure 87. Observed and Expected CDFs for S_HALITE:PRMX_LOG
Uniform Distribution

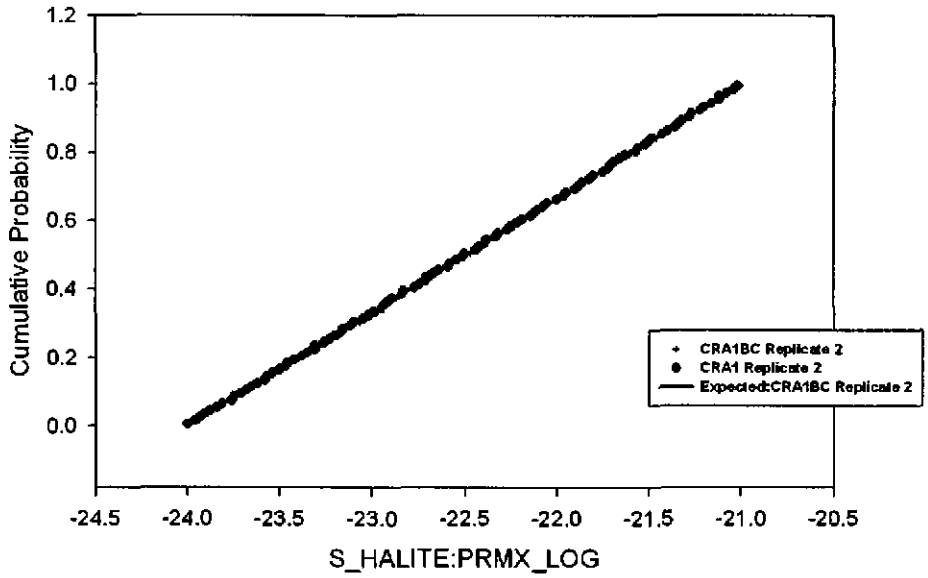

Figure 88. Observed and Expected CDFs for CONC_PLG:PRMX_LOG
Uniform Distribution

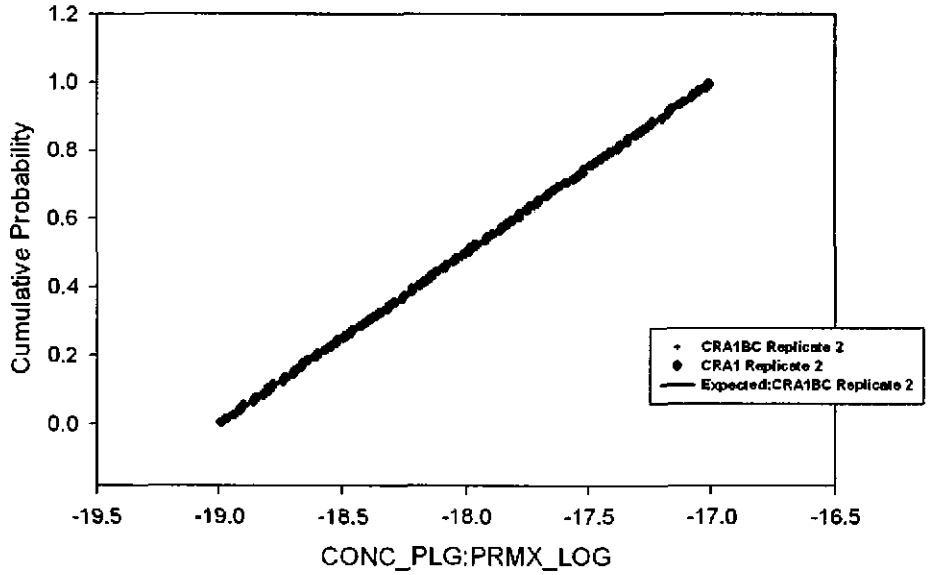

Figure 89. Observed and Expected CDFs for SPALLMOD:REPIPERM Loguniform Distribution

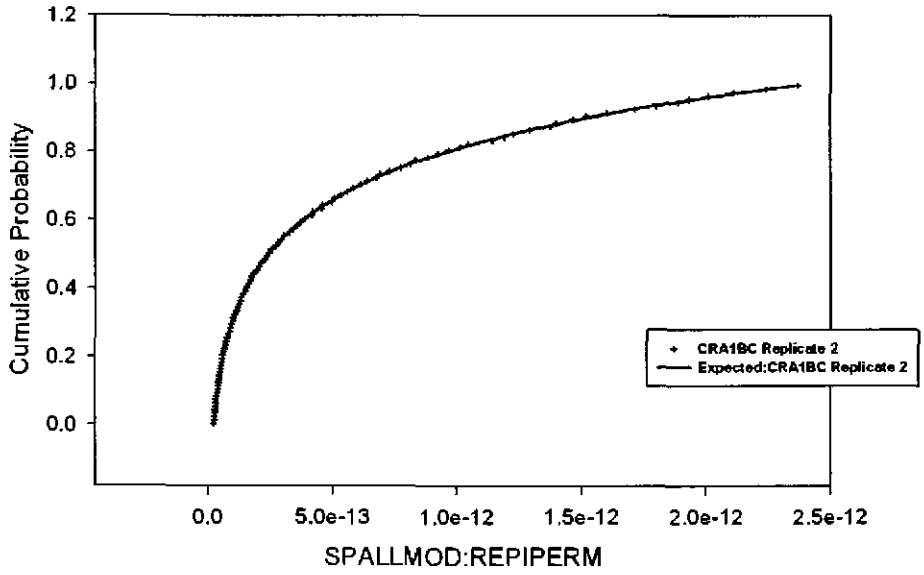

Figure 90. Observed and Expected CDFs for S_HALITE:PRESSURE Uniform Distribution

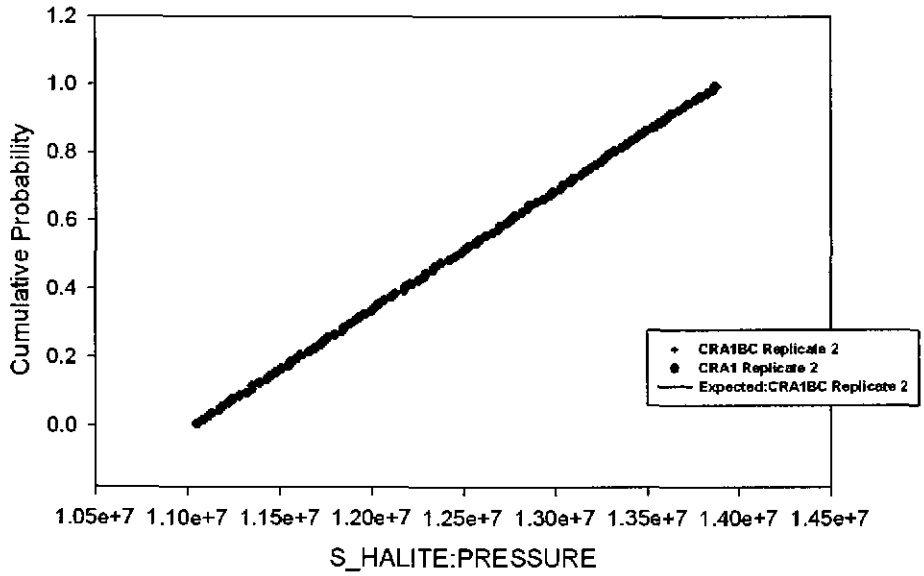

Figure 91. Observed and Expected CDFs for SHFTL_T1:PRMX_LOG
User Continuous Distribution

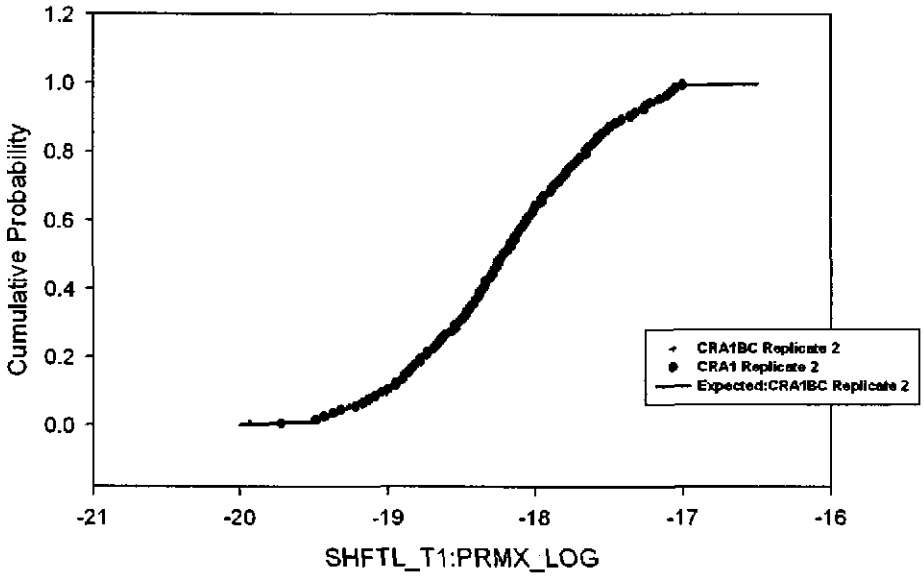

Figure 92. Observed and Expected CDFs for SHFTL_T2:PRMX_LOG
User Continuous Distribution

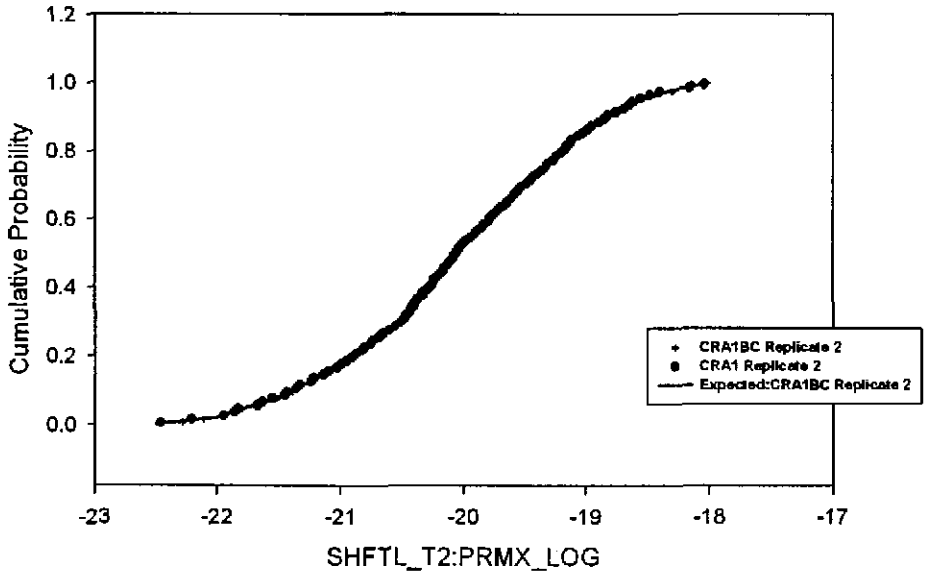

Figure 93. Observed and Expected CDFs for SHFTU:PRMX_LOG User Continuous Distribution

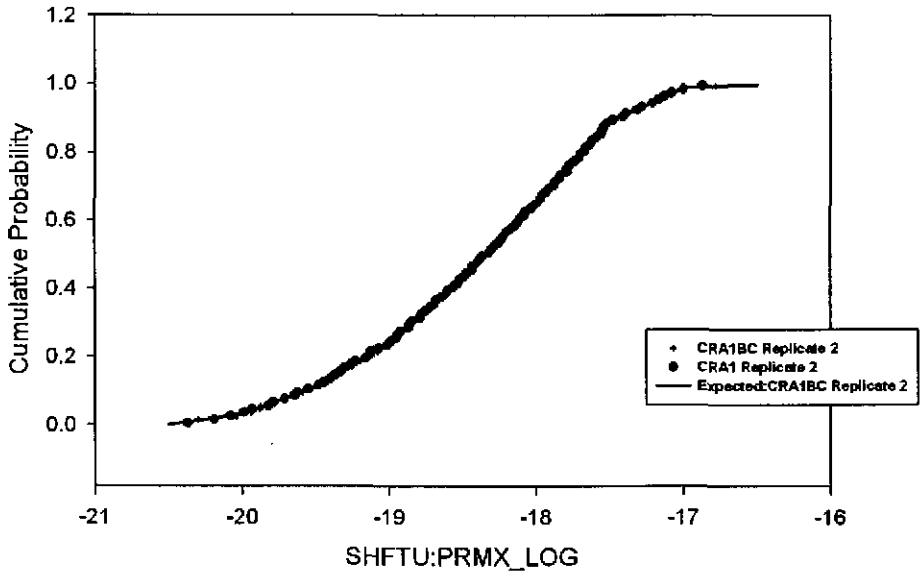

Figure 94. Observed and Expected CDFs for SHFTU:SAT_RBRN User Continuous Distribution

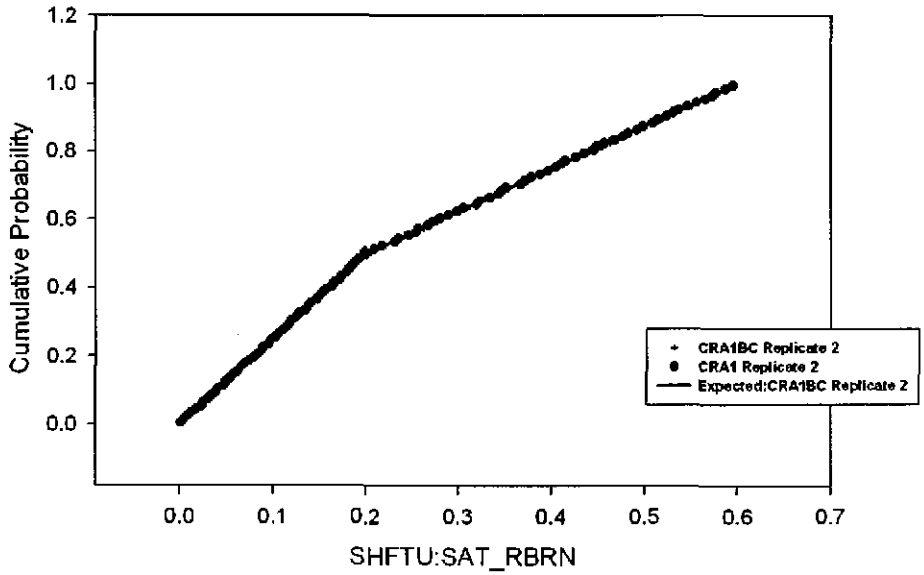

Figure 95. Observed and Expected CDFs for SHFTU:SAT_RGAS
Uniform Distribution

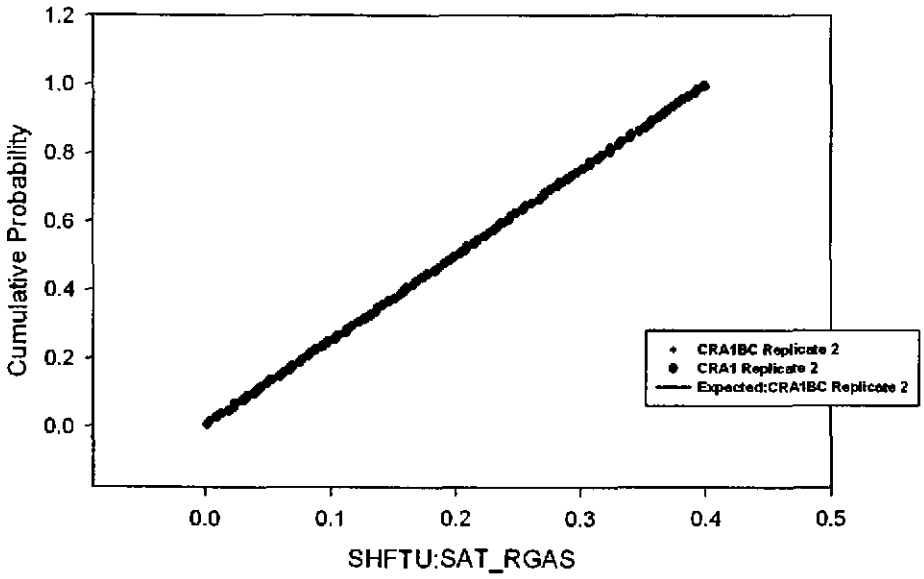

Figure 96. Observed and Expected CDFs for SPALLMOD:PARTDIAM
Loguniform Distribution

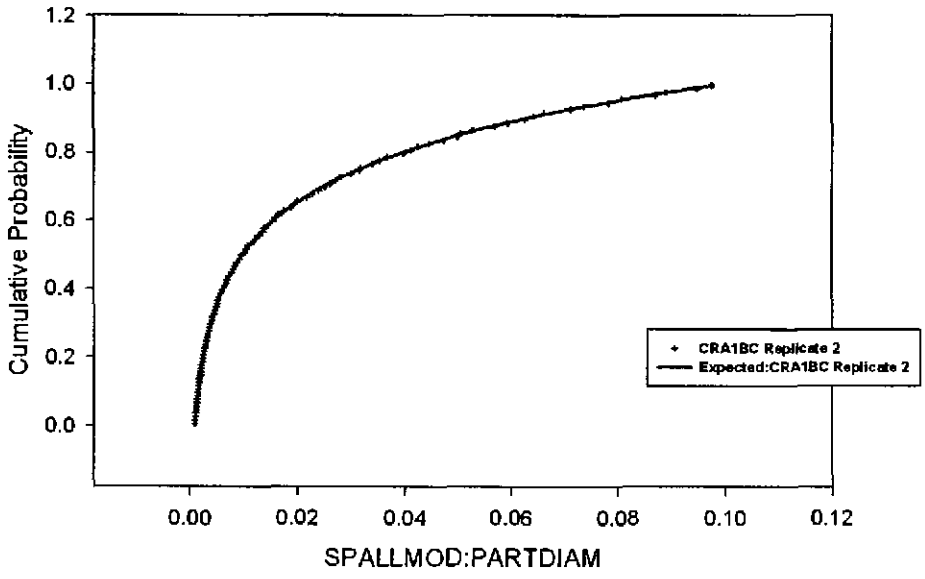

Figure 97. Observed and Expected CDFs for SPALLMOD:REPIPOR
Uniform Distribution

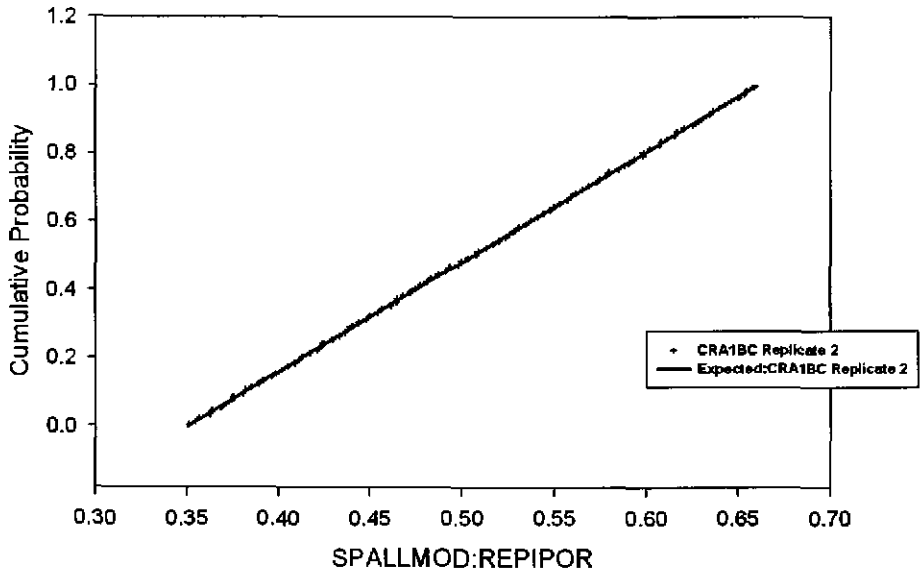

Figure 98. Observed and Expected CDFs for SPALLMOD:TENSLSTR
Uniform Distribution

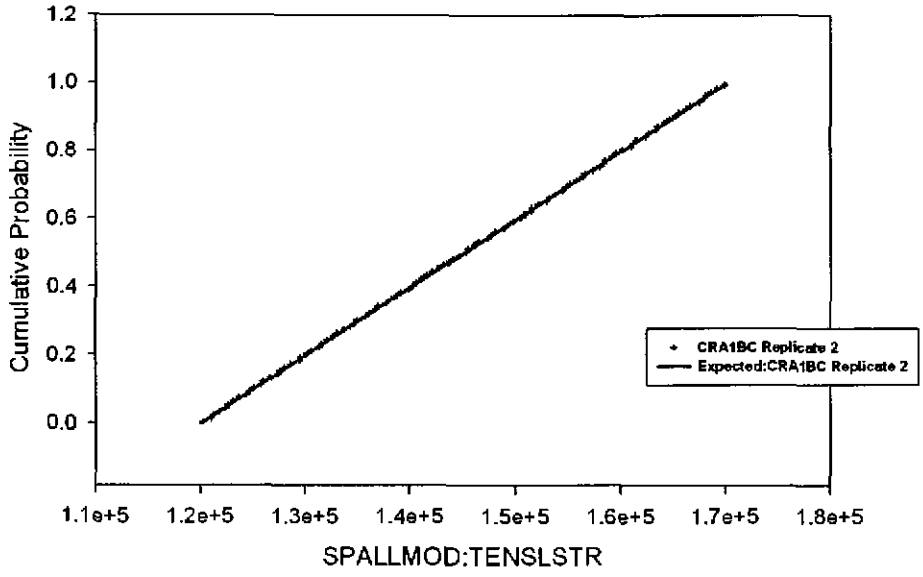

Figure 99. Observed and Expected CDFs for WAS_AREA:SAT_WICK
Uniform Distribution

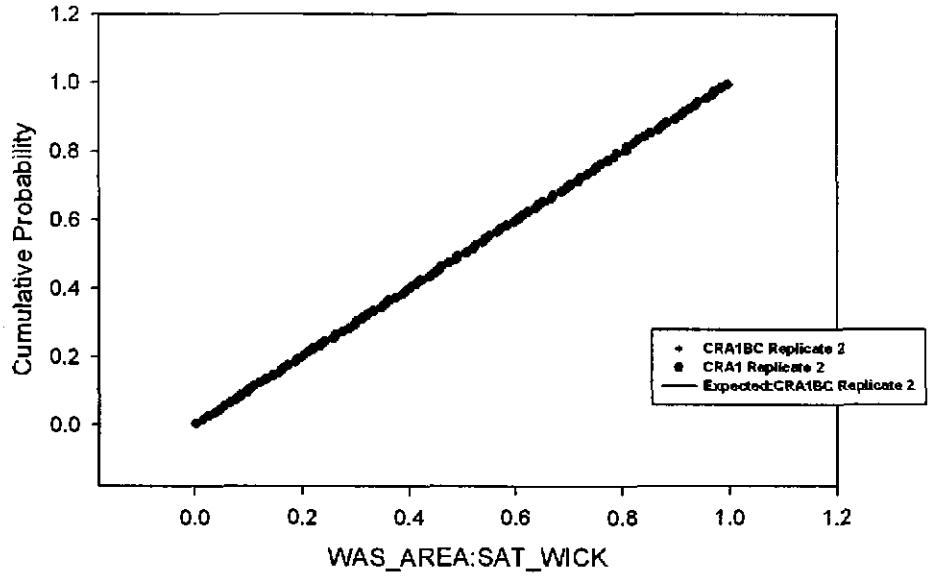

Figure 100. Observed and Expected CDFs for WAS_AREA:BIOGENFC
Uniform Distribution

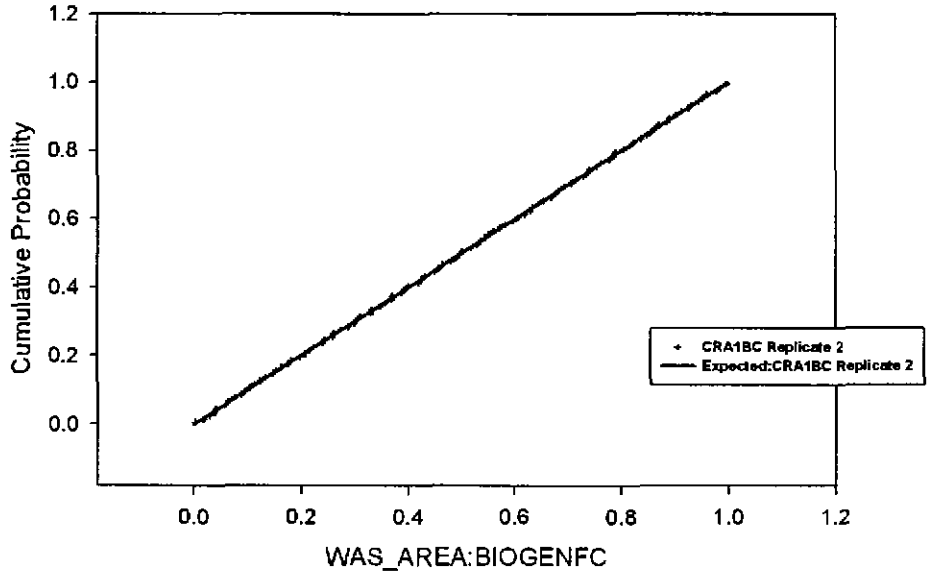

Figure 101. Observed and Expected CDFs for CELLULS:FBETA
Uniform Distribution

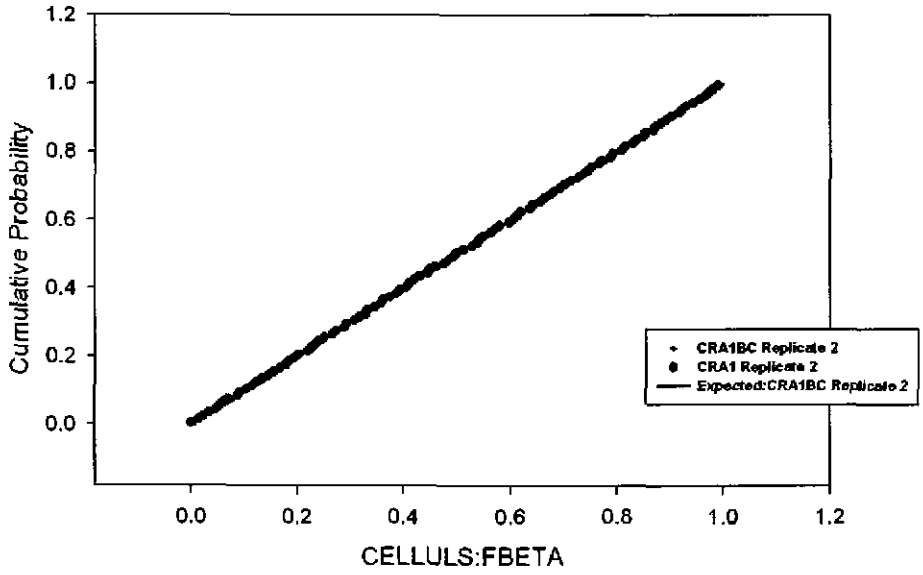

Figure 102. Observed and Expected CDFs for STEEL:CORRMCO2
Uniform Distribution

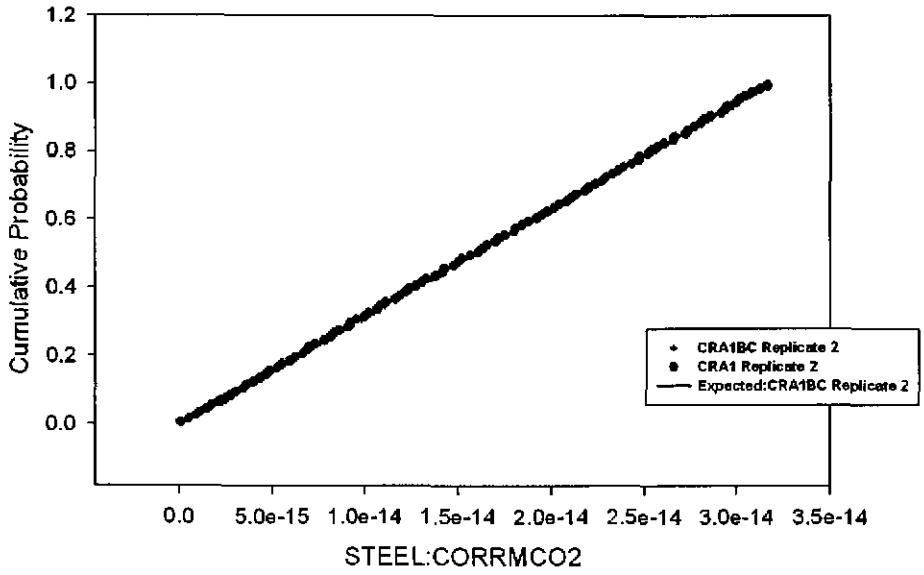

Figure 103. Observed and Expected CDFs for WAS_AREA:GRATMICH
Uniform Distribution

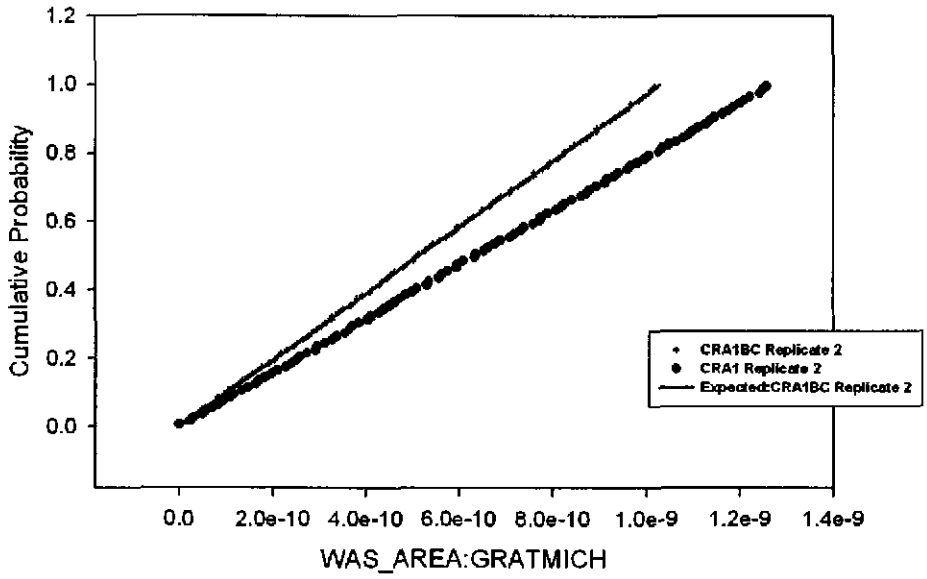

Figure 104. Observed and Expected CDFs for WAS_AREA:GRATMICI
Uniform Distribution

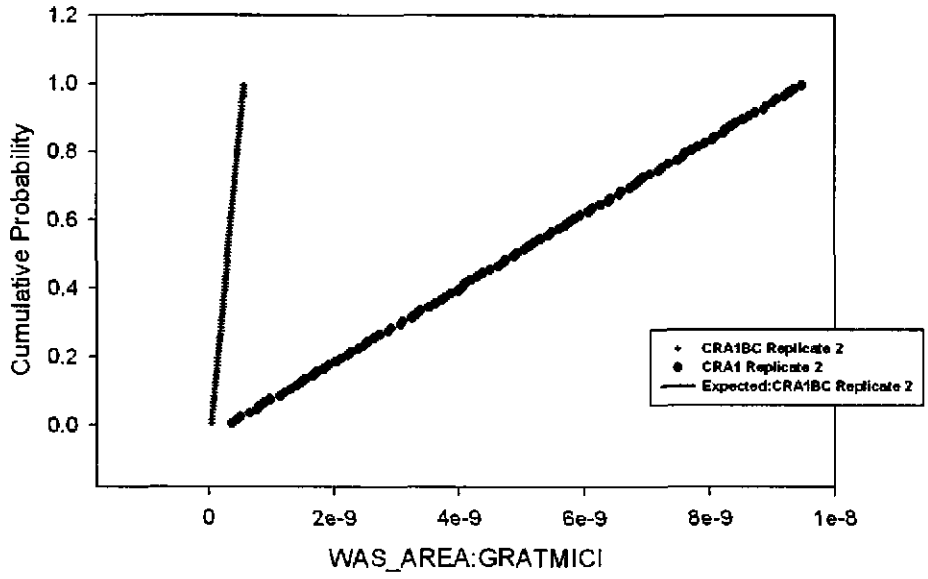

Figure 105. Observed and Expected CDFs for WAS_AREA:PROBDEG
User Discrete (Delta) Distribution

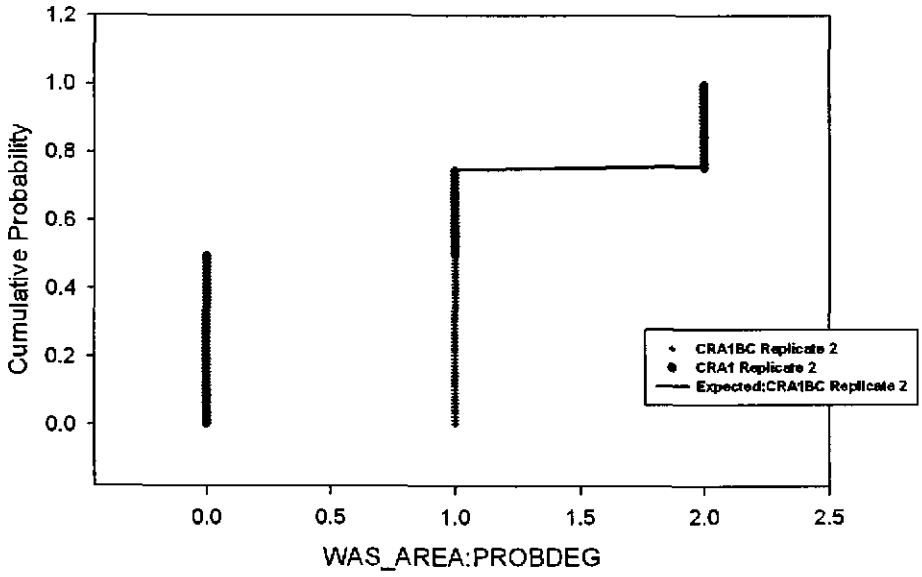

Figure 106. Observed and Expected CDFs for GLOBAL:OXSTAT
Uniform Distribution

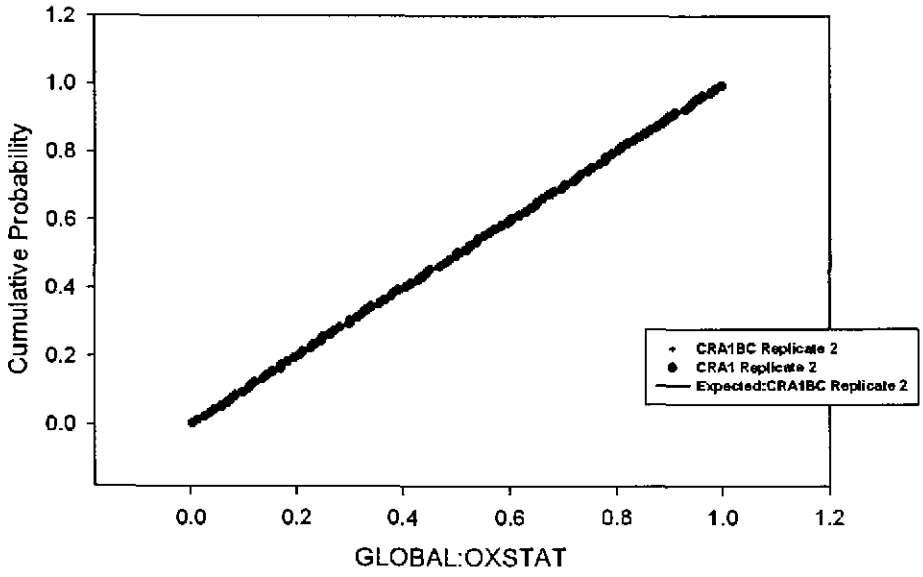

Figure 107. Observed and Expected CDFs for PHUMOX3:PHUMCIM User Continuous Distribution

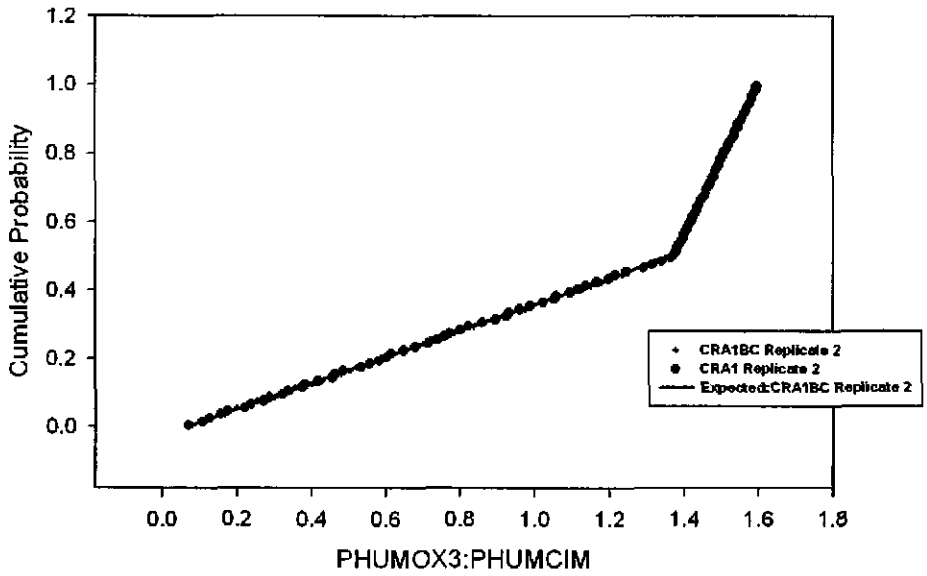

Figure 108. Observed and Expected CDFs for WAS_AREA:SAT_RBRN Uniform Distribution

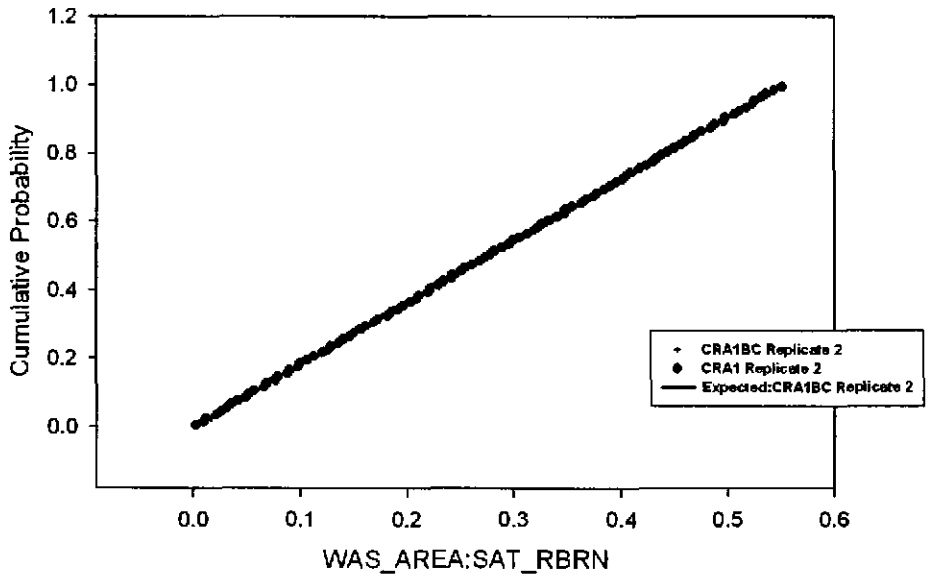

Figure 109. Observed and Expected CDFs for WAS_AREA:SAT_RGAS
Uniform Distribution

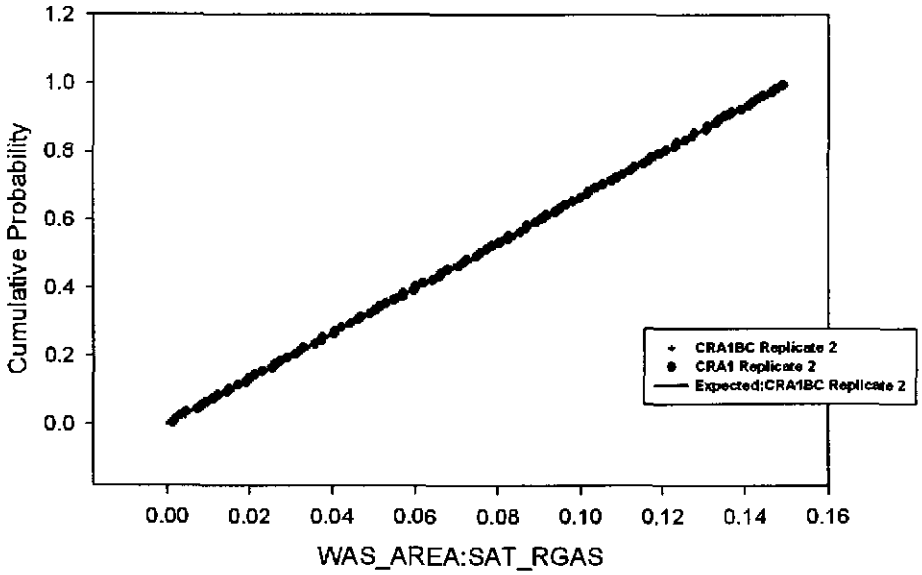

Figure 110. Observed and Expected CDFs for SOLMOD3:SOLVAR
User Continuous Distribution

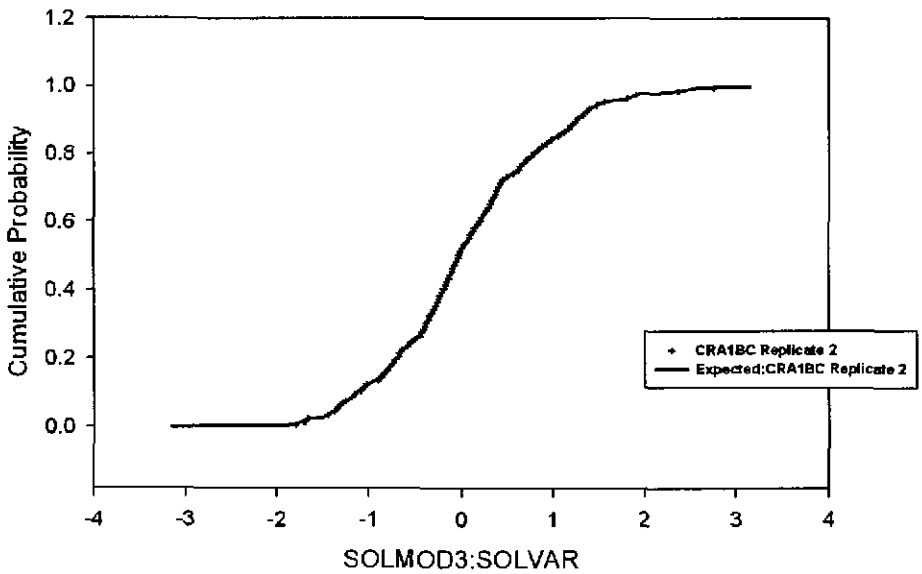

Figure 111. Observed and Expected CDFs for SOLMOD4:SOLVAR User Continuous Distribution

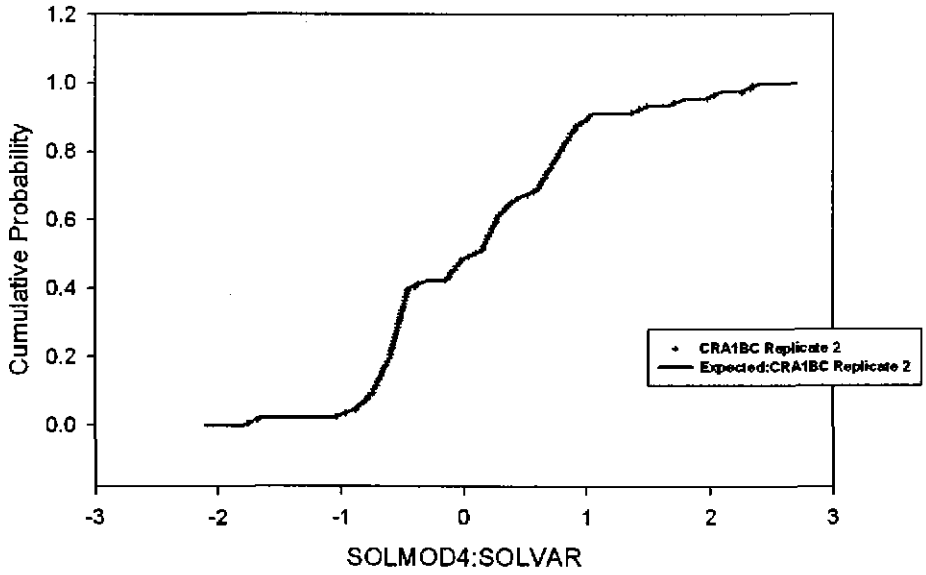

Figure 112. Observed and Expected CDFs for BOREHOLE:TAUFAIL Loguniform Distribution

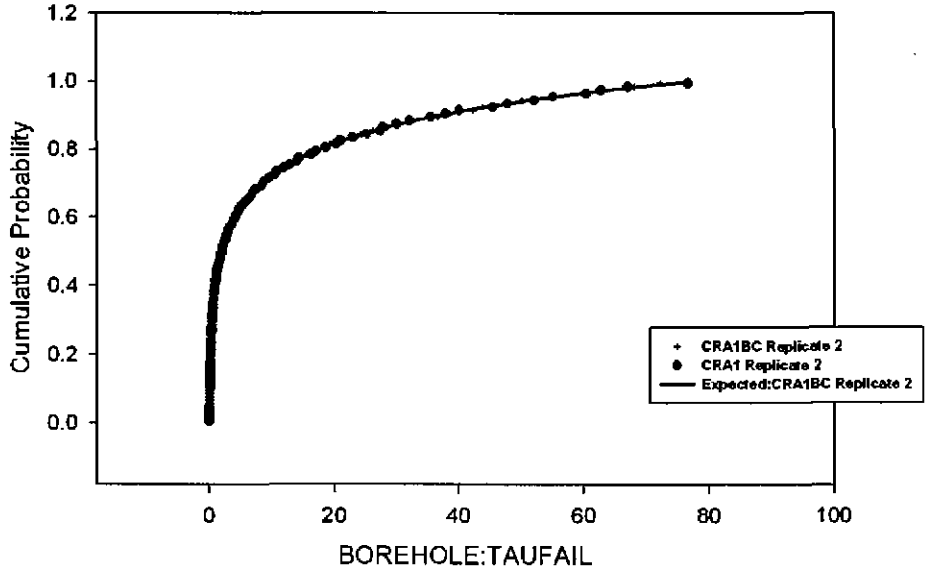

Figure 113. Observed and Expected CDFs for S_MB139:PORE_DIS Student Distribution

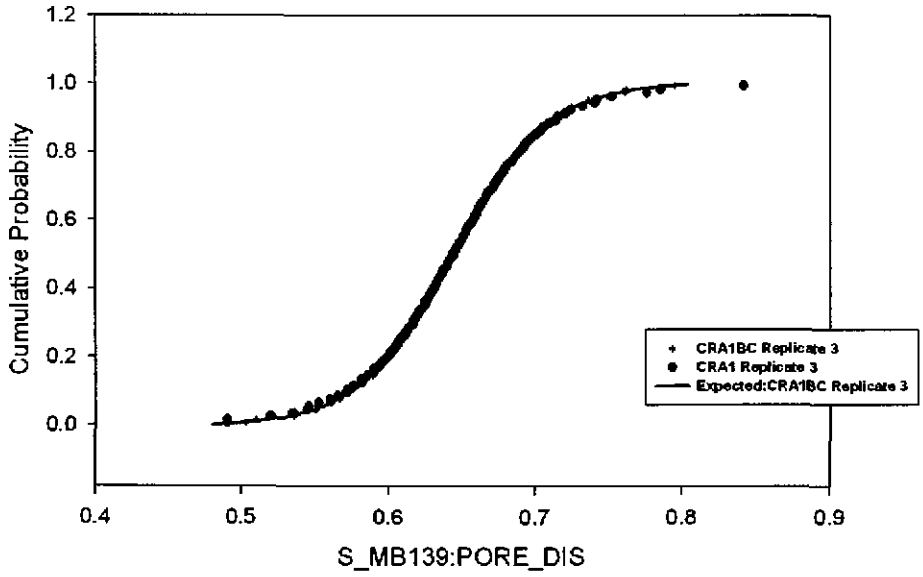

Figure 114. Observed and Expected CDFs for S_MB139:RELP_MOD User Discrete (Delta) Distribution

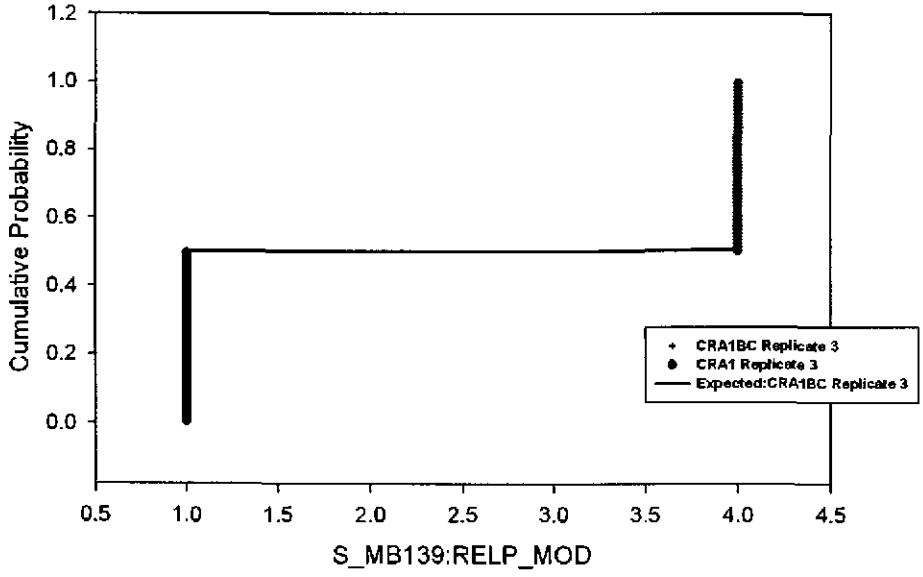

Figure 115. Observed and Expected CDFs for S_MB139:PRMX_LOG Student Distribution

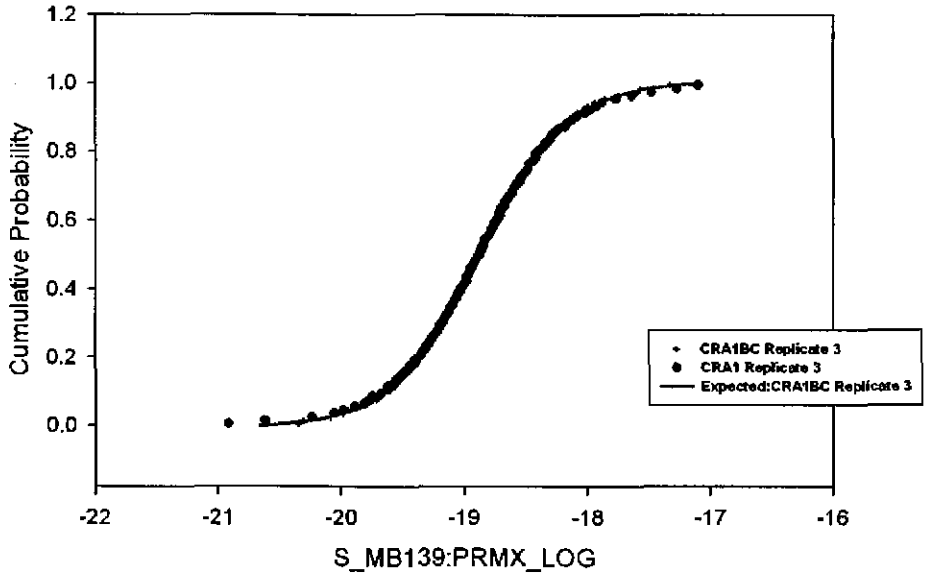

Figure 116. Observed and Expected CDFs for S_MB139:SAT_RBRN Student Distribution

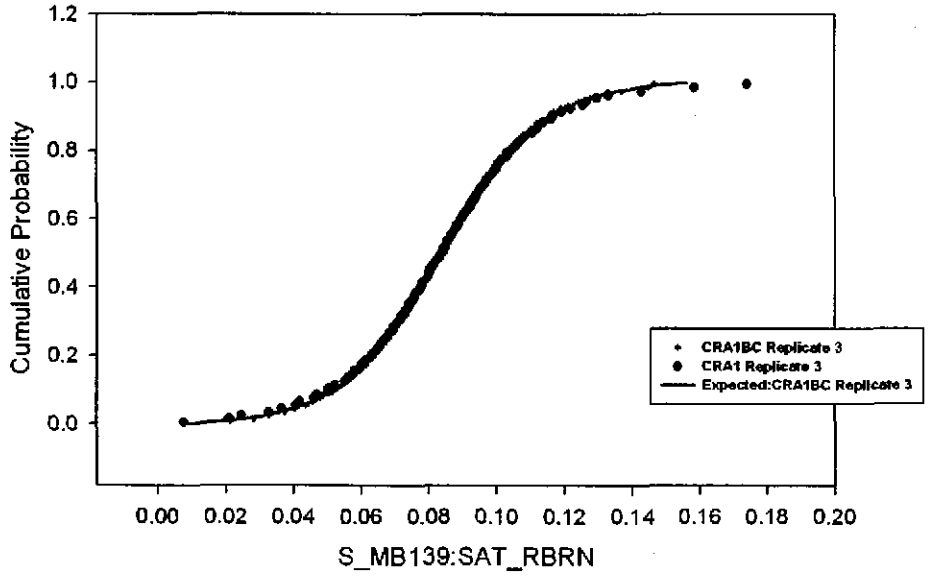

Figure 117. Observed and Expected CDFs for BH_SAND:PRMX_LOG Uniform Distribution

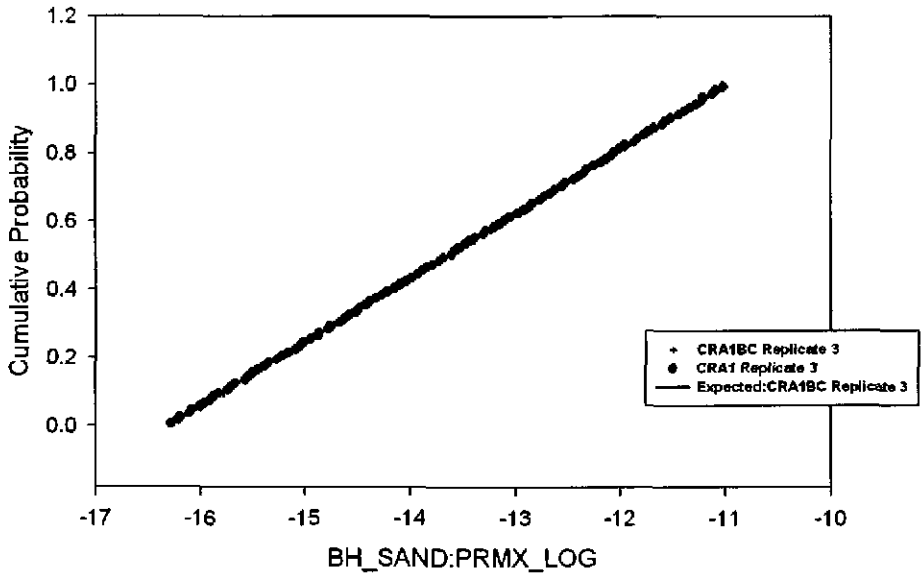

Figure 118. Observed and Expected CDFs for CASTILER:COMP_RCK Triangular Distribution

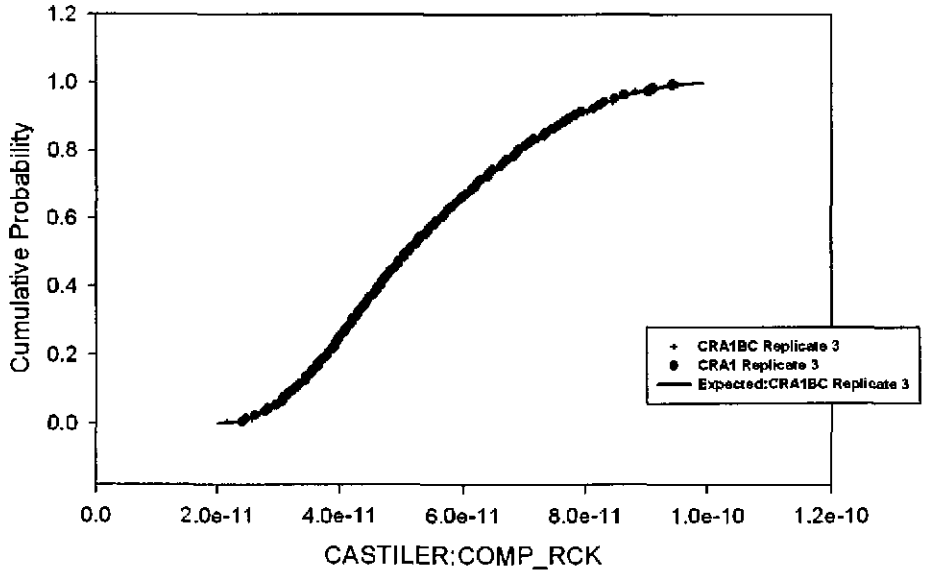

Figure 119. Observed and Expected CDFs for CASTILER:PRESSURE Triangular Distribution

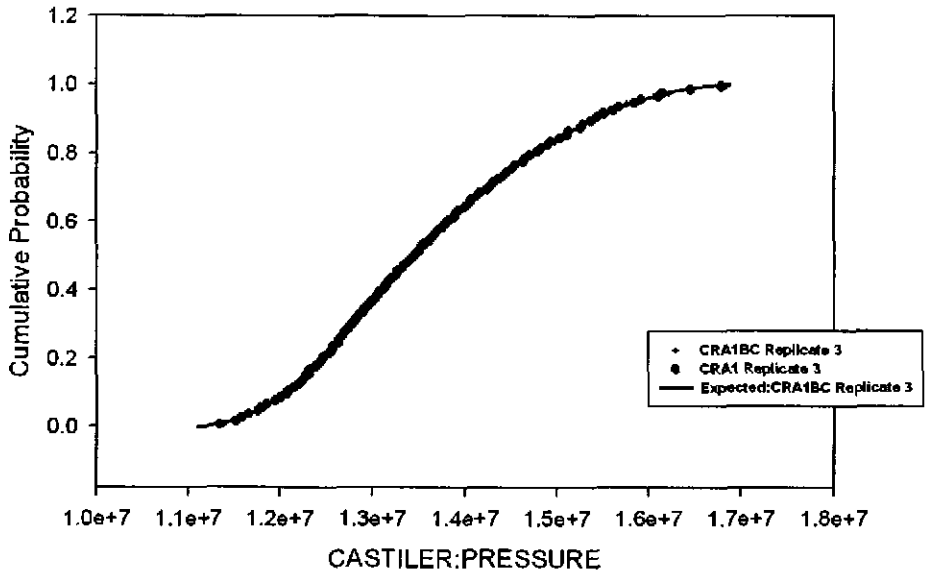

Figure 120. Observed and Expected CDFs for CASTILER:PRMX_LOG Triangular Distribution

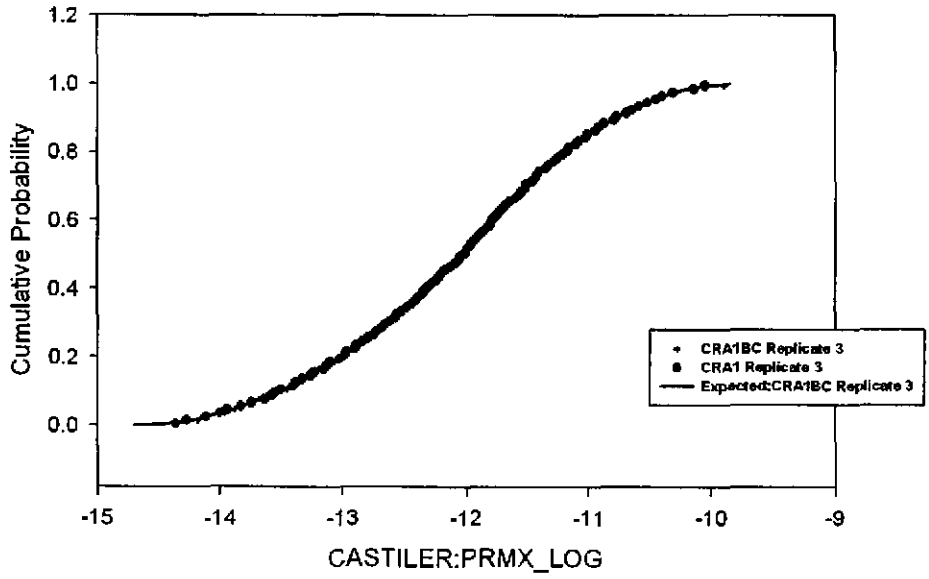

Figure 121. Observed and Expected CDFs for GLOBAL:PBRINE Uniform Distribution

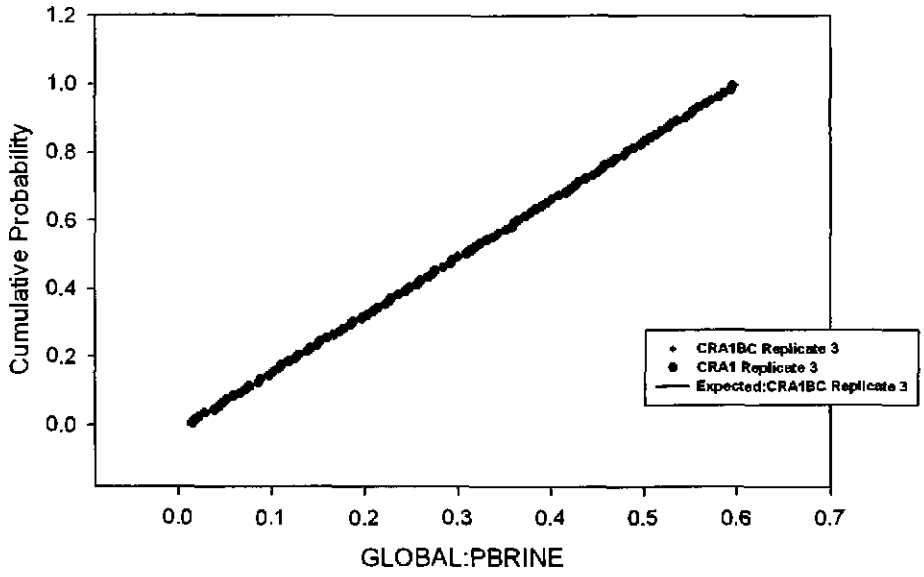

Figure 122. Observed and Expected CDFs for GLOBAL:CLIMTIDX *User Continuous Distribution*

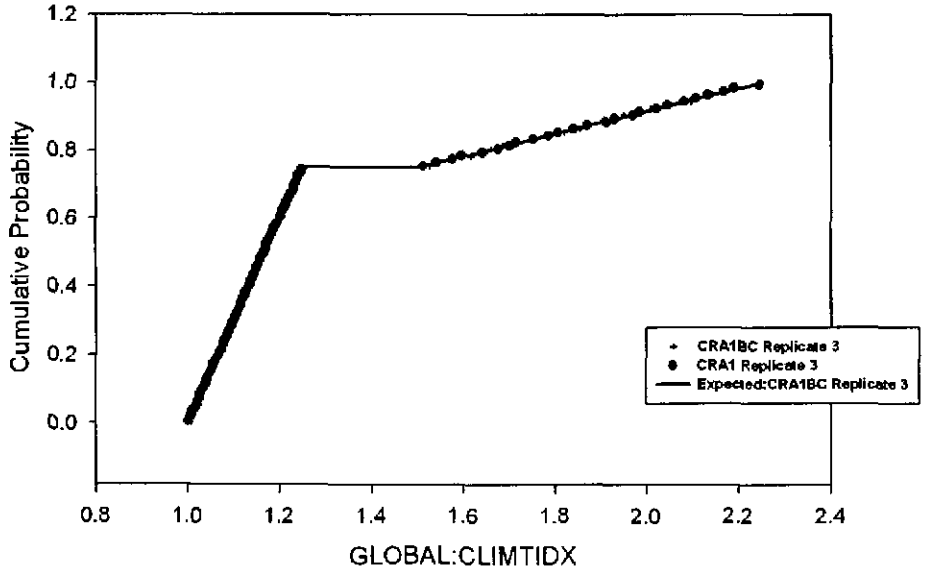

Figure 123. Observed and Expected CDFs for CULEBRA:APOROS Loguniform Distribution

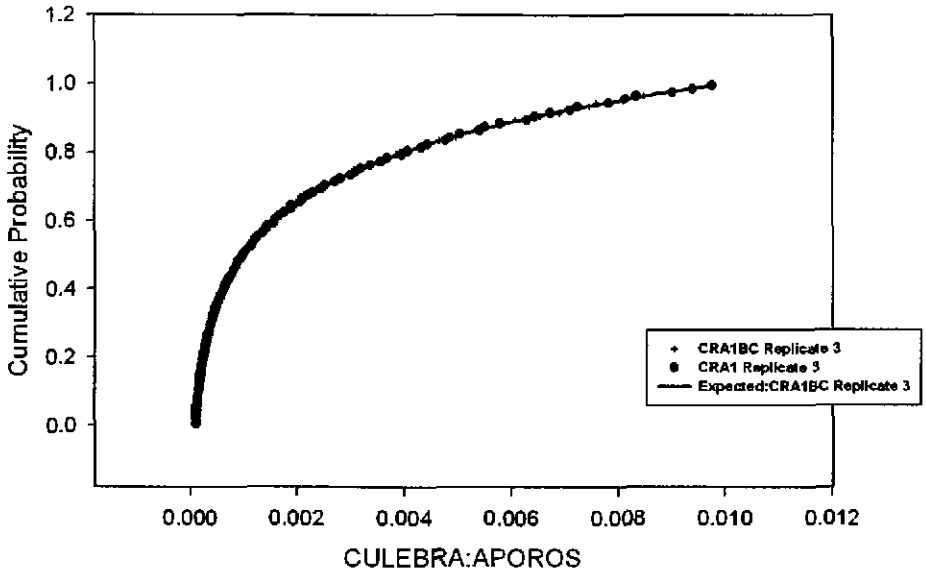

Figure 124. Observed and Expected CDFs for CULEBRA:HMBLKLT Uniform Distribution

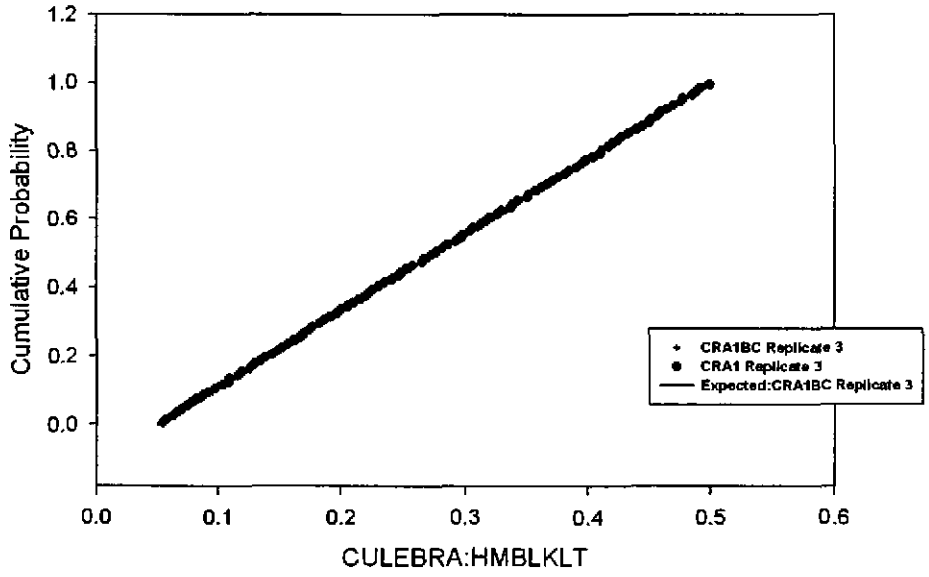

Figure 125. Observed and Expected CDFs for AM+3:MKD_AM Loguniform Distribution

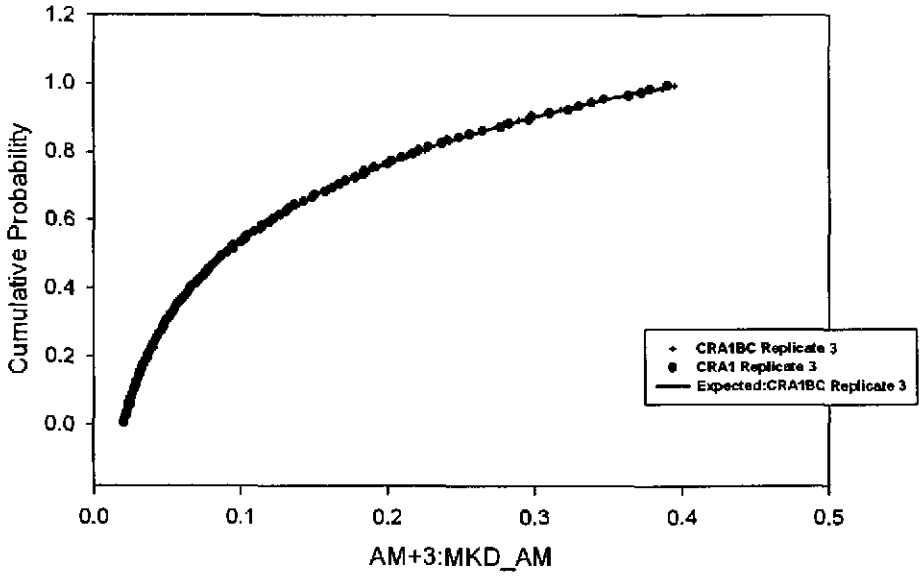

Figure 126. Observed and Expected CDFs for PU+3:MKD_PU Loguniform Distribution

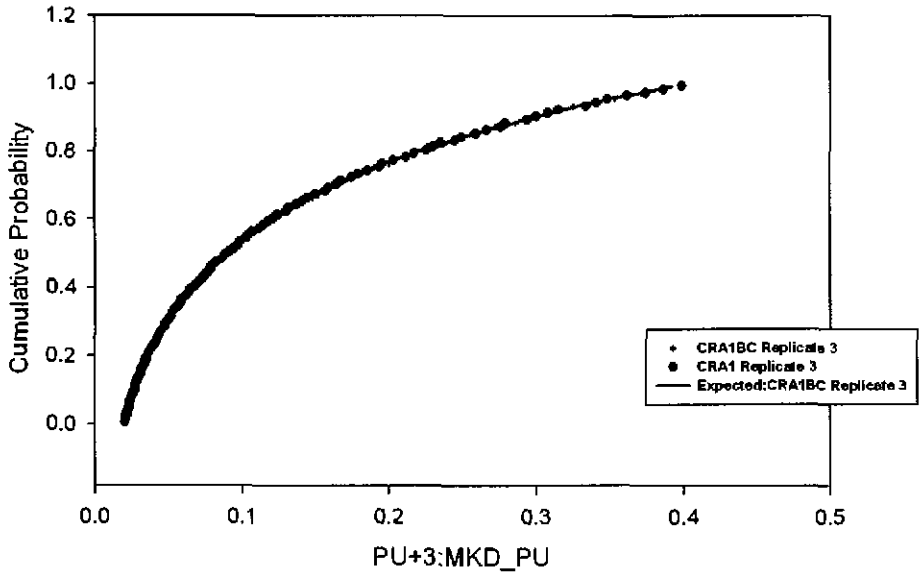

Figure 127. Observed and Expected CDFs for PU+4:MKD_PU
Loguniform Distribution

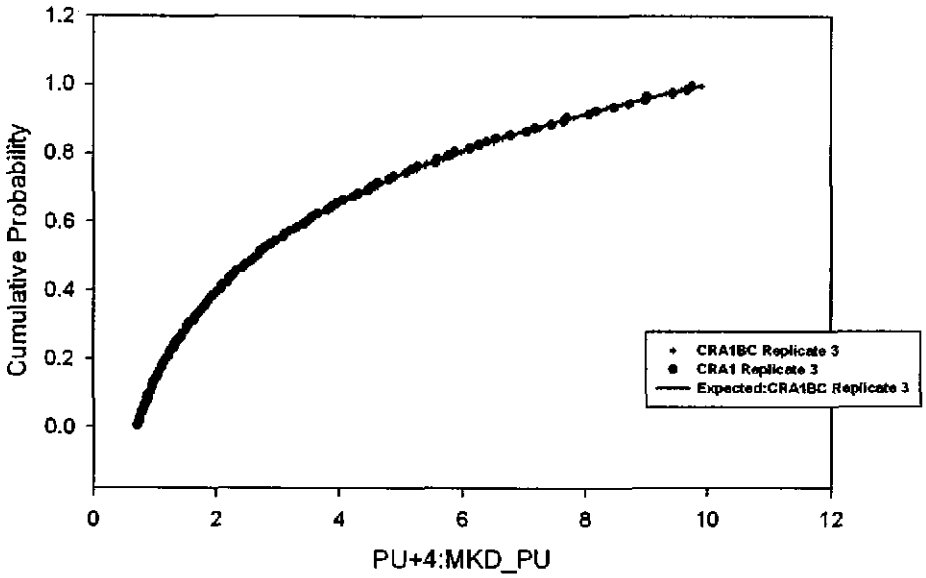

Figure 128. Observed and Expected CDFs for TH+4:MKD_TH
Loguniform Distribution

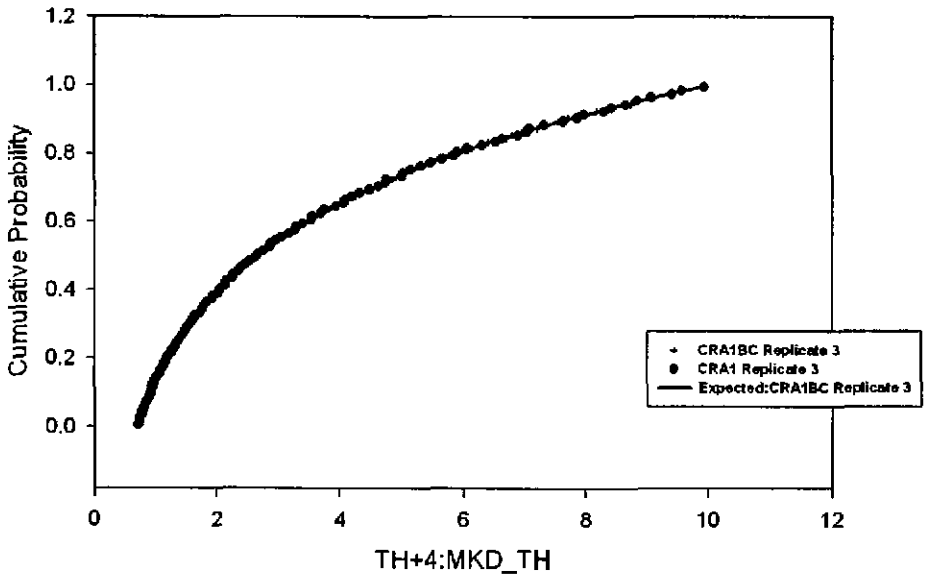

Figure 129. Observed and Expected CDFs for U+4:MKD_U Loguniform Distribution

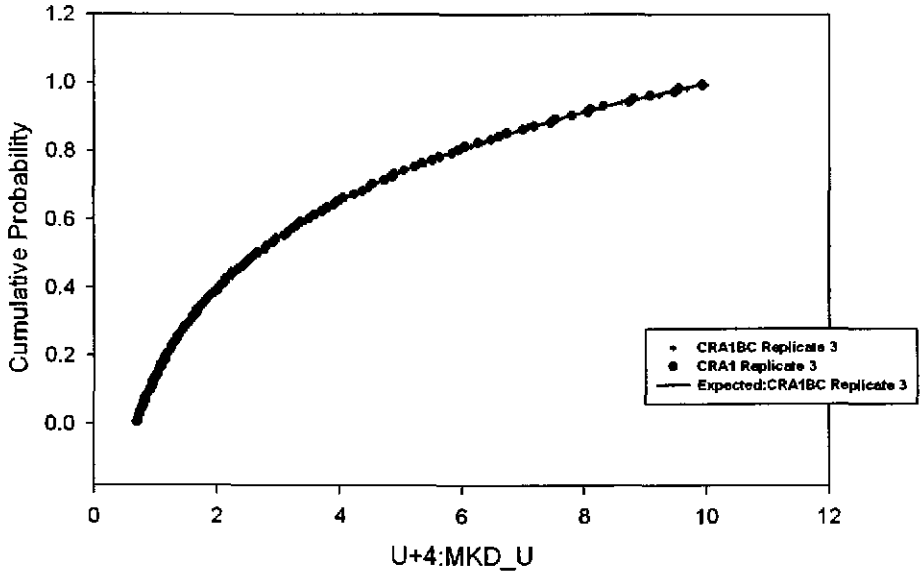

Figure 130. Observed and Expected CDFs for U+6:MKD_U Loguniform Distribution

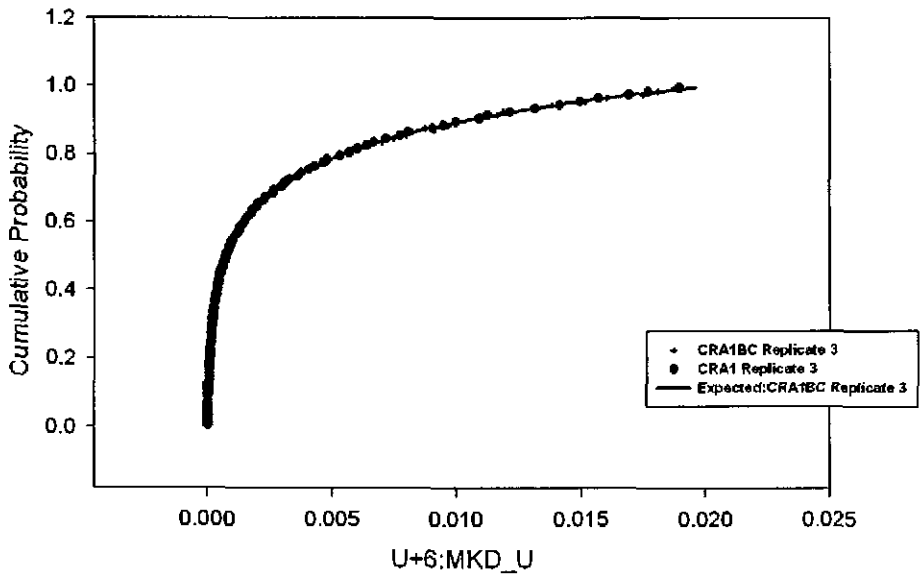

Figure 131. Observed and Expected CDFs for CULEBRA:DPOROS User Continuous Distribution

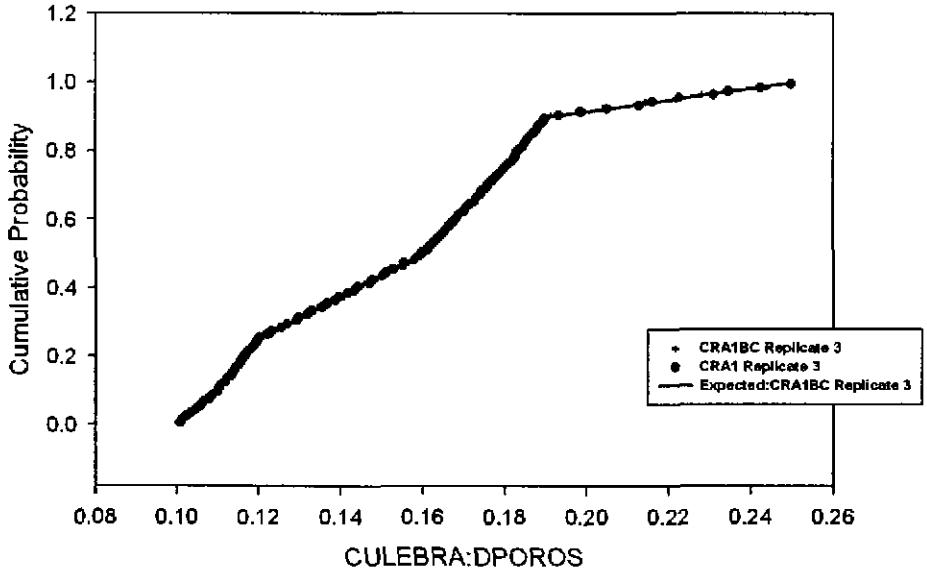

Figure 132. Observed and Expected CDFs for CONC_PCS:PORE_DIS User Continuous Distribution

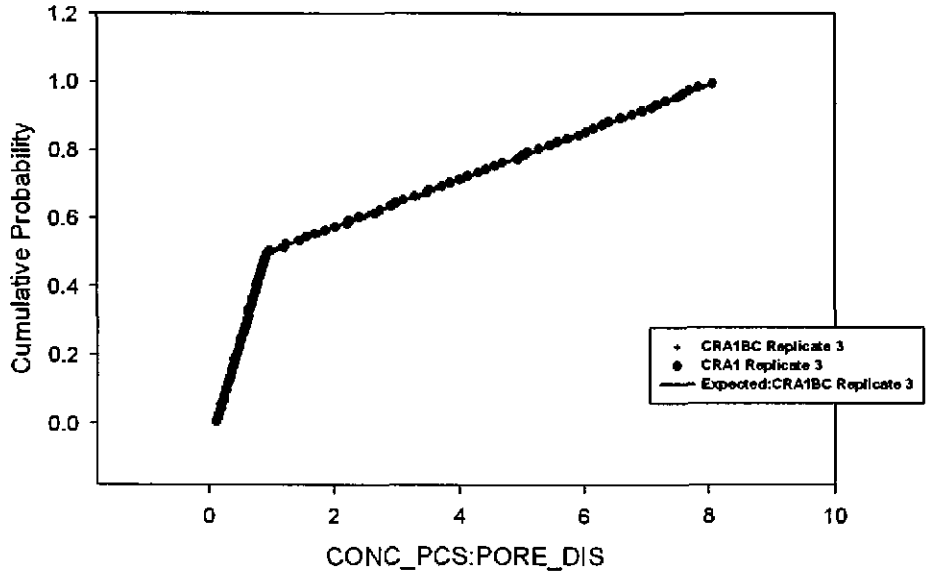

Figure 133. Observed and Expected CDFs for CONC_PCS:SAT_RBRN
User Continuous Distribution

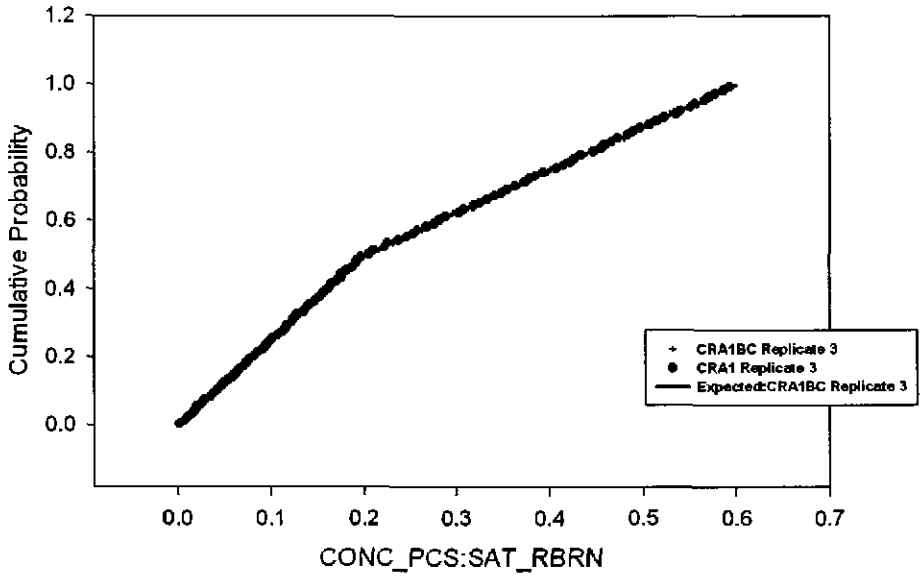

Figure 134. Observed and Expected CDFs for CONC_PCS:SAT_RGAS
Uniform Distribution

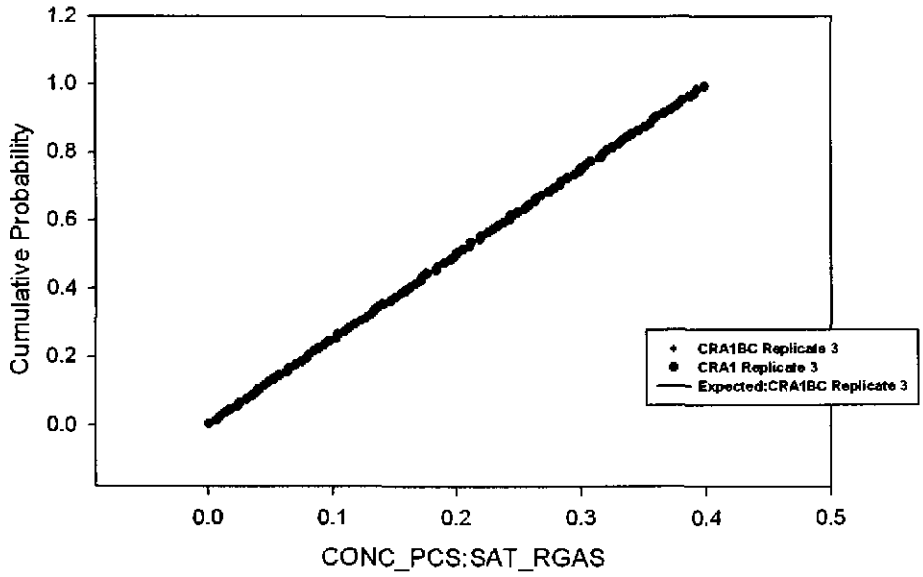

Figure 135. Observed and Expected CDFs for CONC_PCS:PRMX_LOG Triangular Distribution

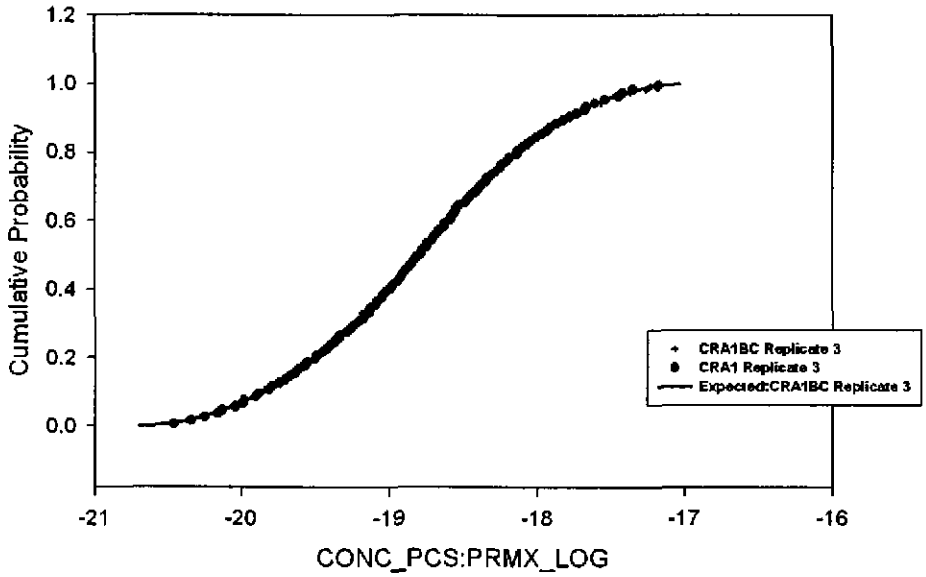

Figure 136. Observed and Expected CDFs for GLOBAL:TRANSIDX Uniform Distribution

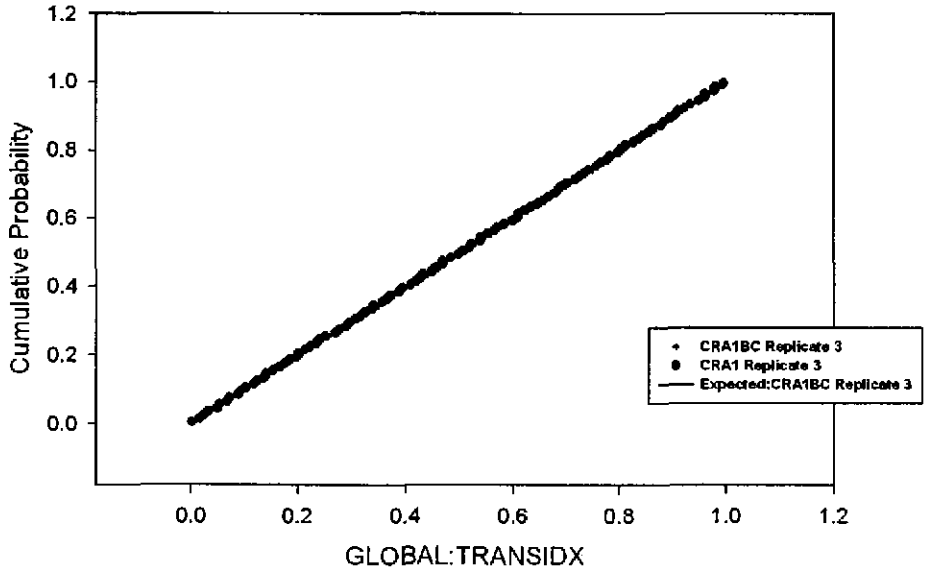

Figure 137. Observed and Expected CDFs for CULEBRA:MINP_FAC Uniform Distribution

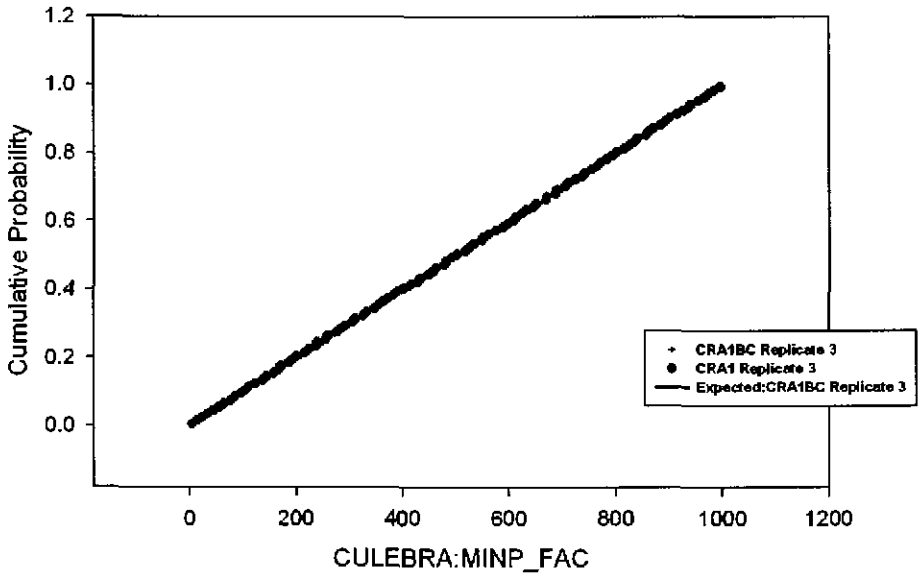

Figure 138. Observed and Expected CDFs for BOREHOLE:DOMEGA User Continuous Distribution

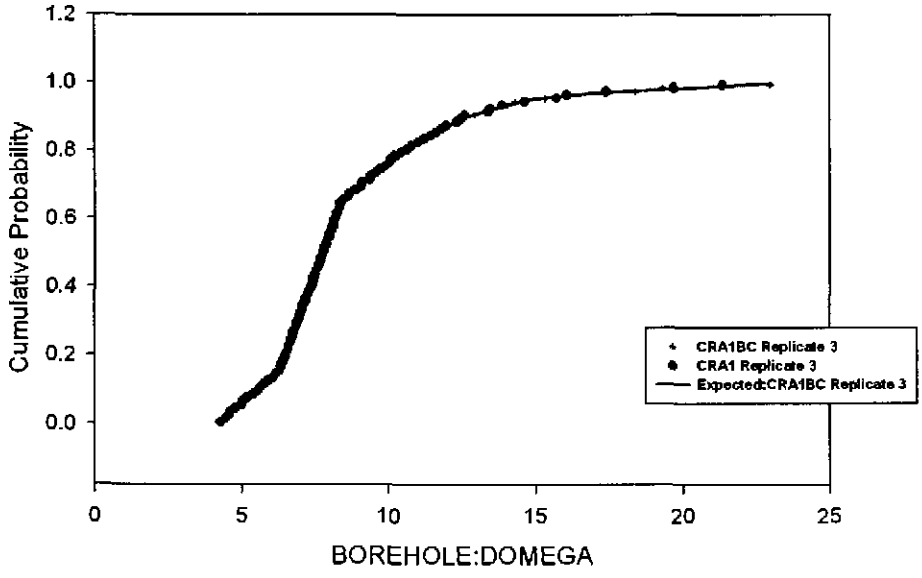

Figure 139. Observed and Expected CDFs for DRZ_PCS:PRMX_LOG
Triangular Distribution

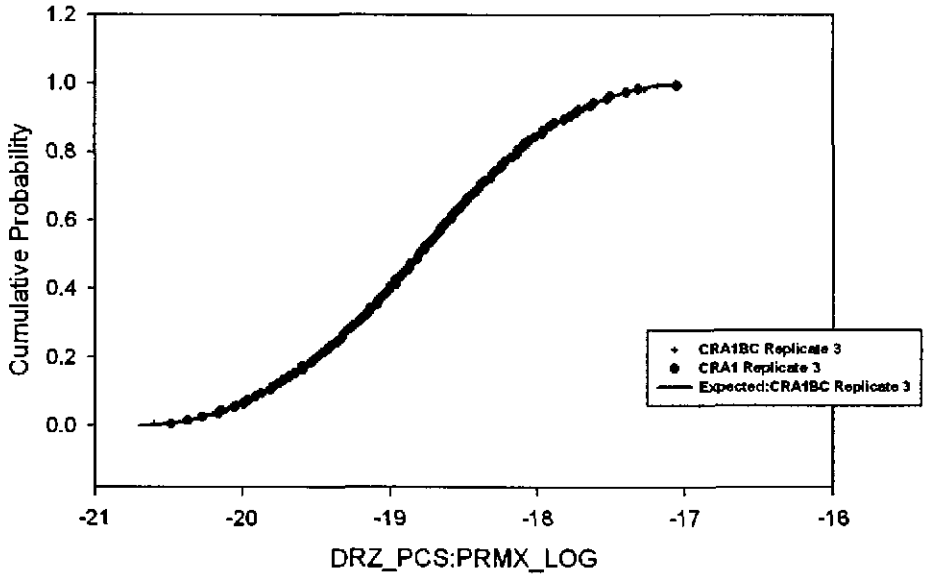

Figure 140. Observed and Expected CDFs for DRZ_1:PRMX_LOG
Uniform Distribution

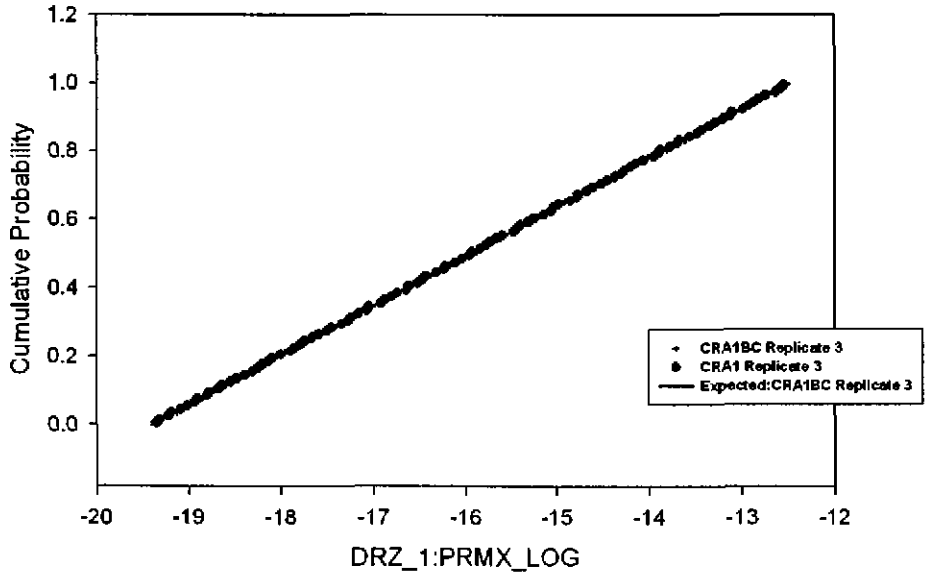

Figure 141. Observed and Expected CDFs for S_HALITE:COMP_RCK Uniform Distribution

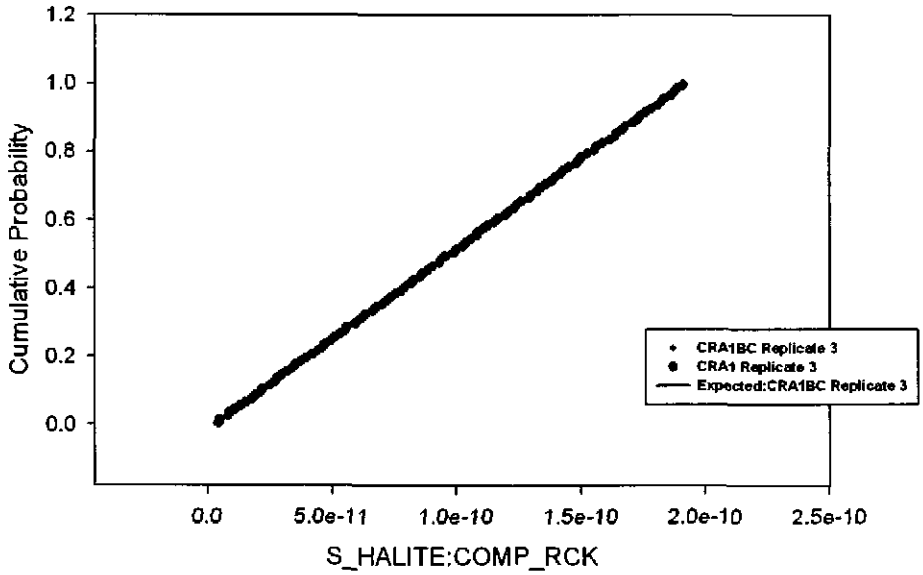

Figure 142. Observed and Expected CDFs for S_HALITE:POROSITY User Continuous Distribution

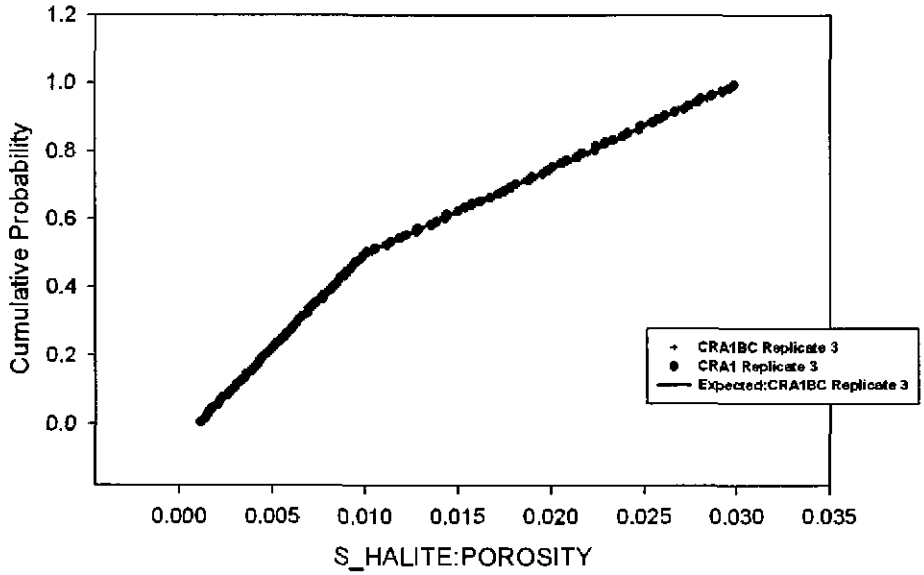

Figure 143. Observed and Expected CDFs for S_HALITE:PRMX_LOG
Uniform Distribution

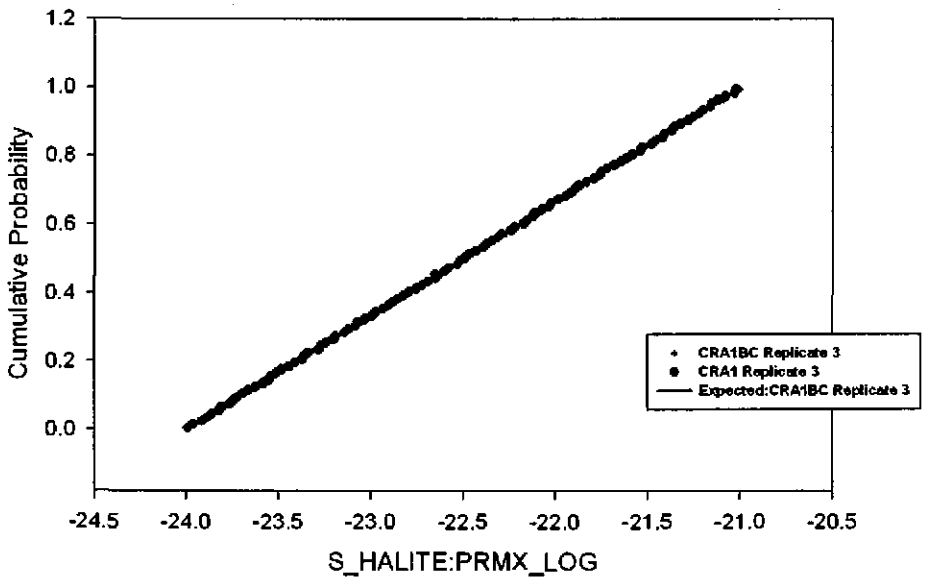

Figure 144. Observed and Expected CDFs for CONC_PLG:PRMX_LOG
Uniform Distribution

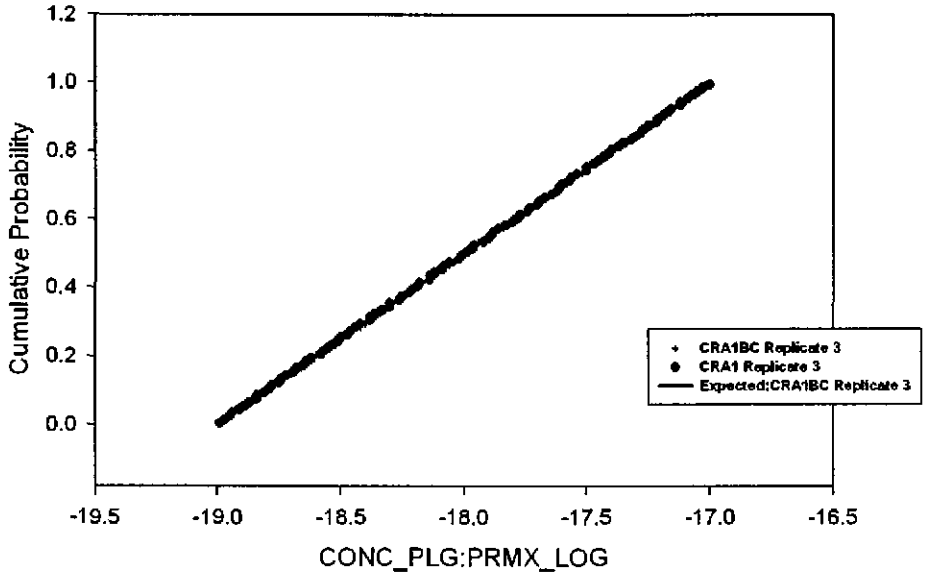

Figure 145. Observed and Expected CDFs for SPALLMOD:REPIPERM Loguniform Distribution

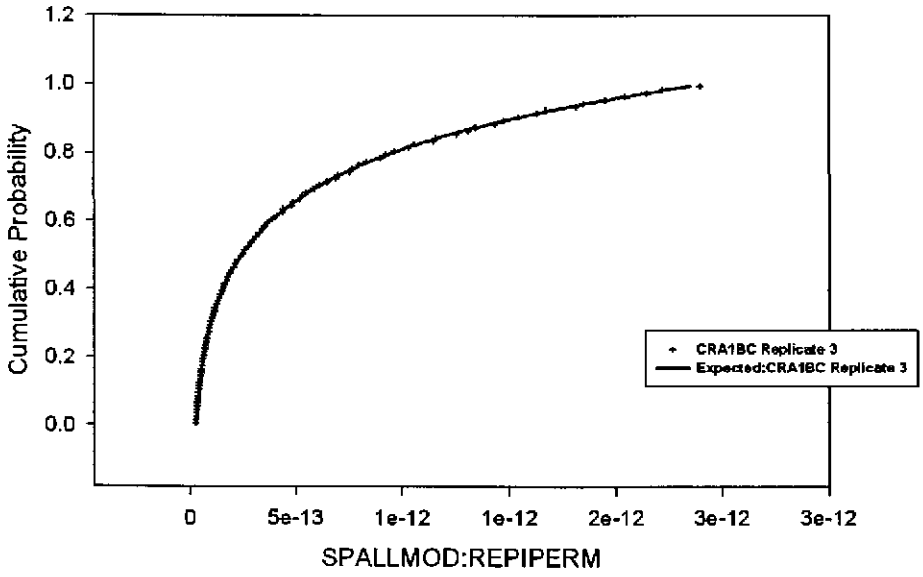

Figure 146. Observed and Expected CDFs for S_HALITE:PRESSURE Uniform Distribution

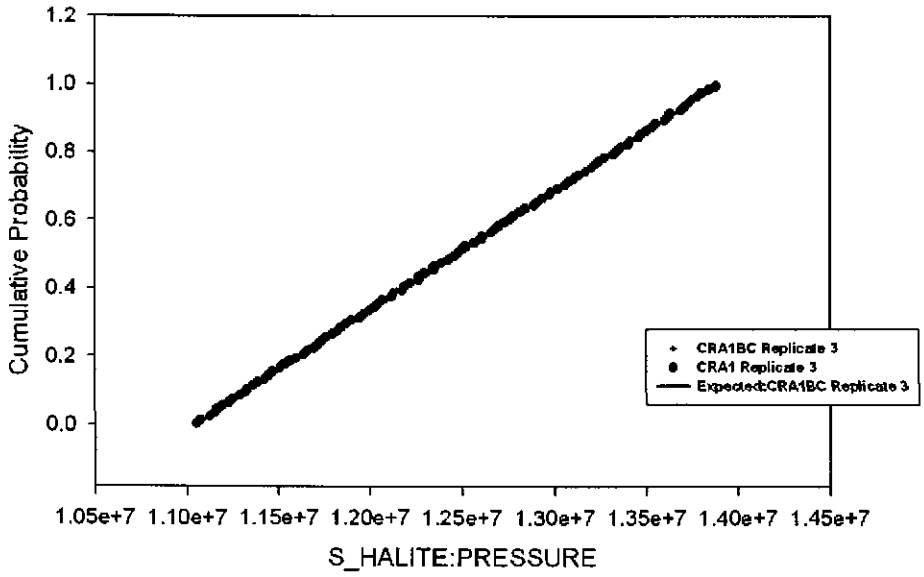

Figure 147. Observed and Expected CDFs for SHFTL_T1:PRMX_LOG User Continuous Distribution

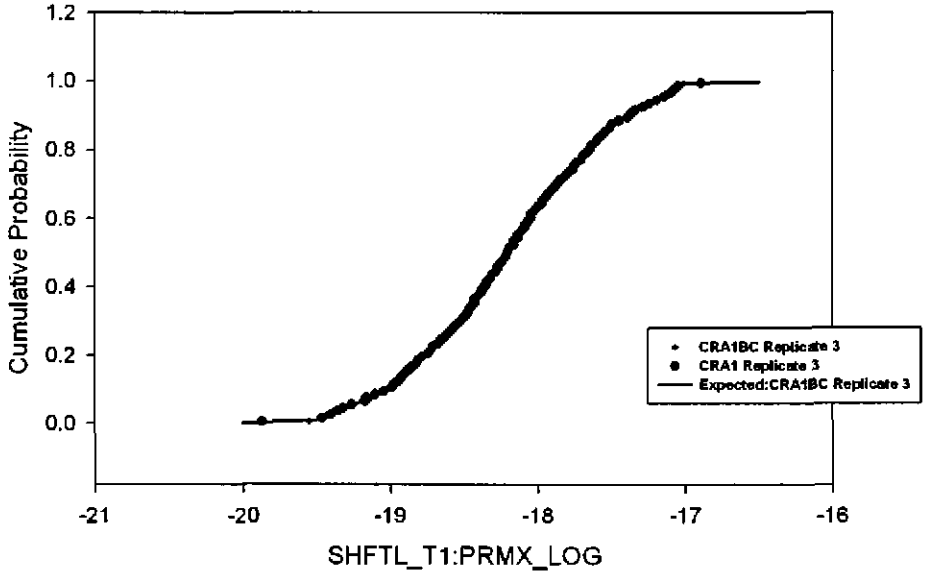

Figure 148. Observed and Expected CDFs for SHFTL_T2:PRMX_LOG User Continuous Distribution

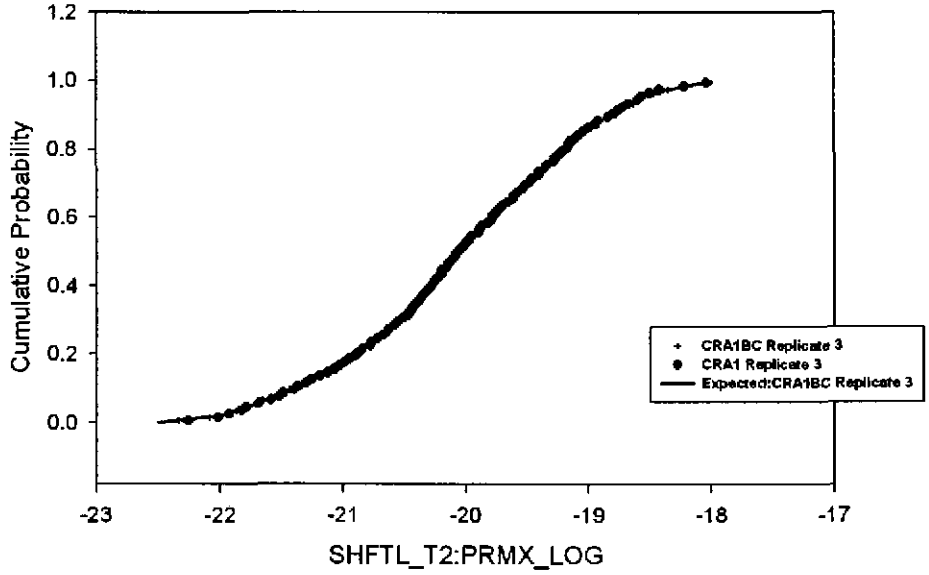

Figure 149. Observed and Expected CDFs for SHFTU:PRMX_LOG User Continuous Distribution

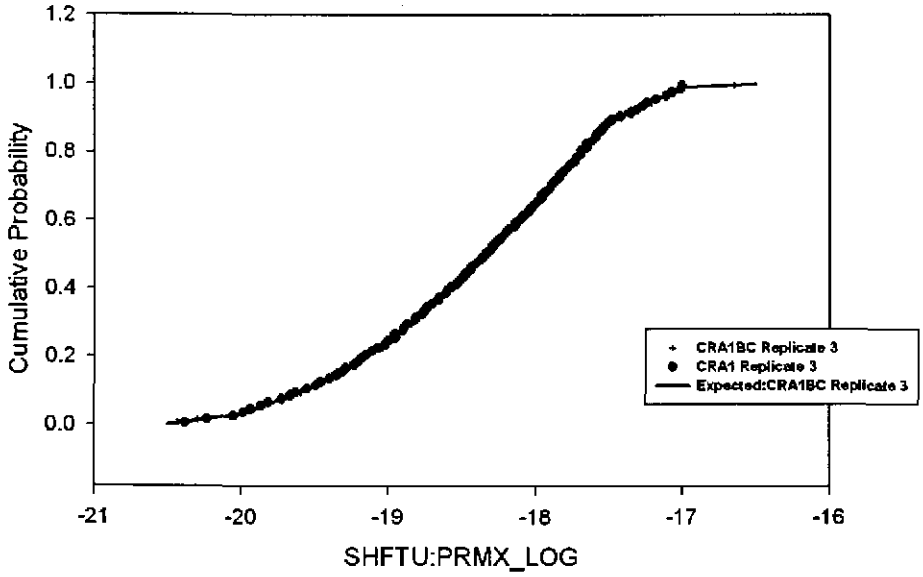

Figure 150. Observed and Expected CDFs for SHFTU:SAT_RBRN User Continuous Distribution

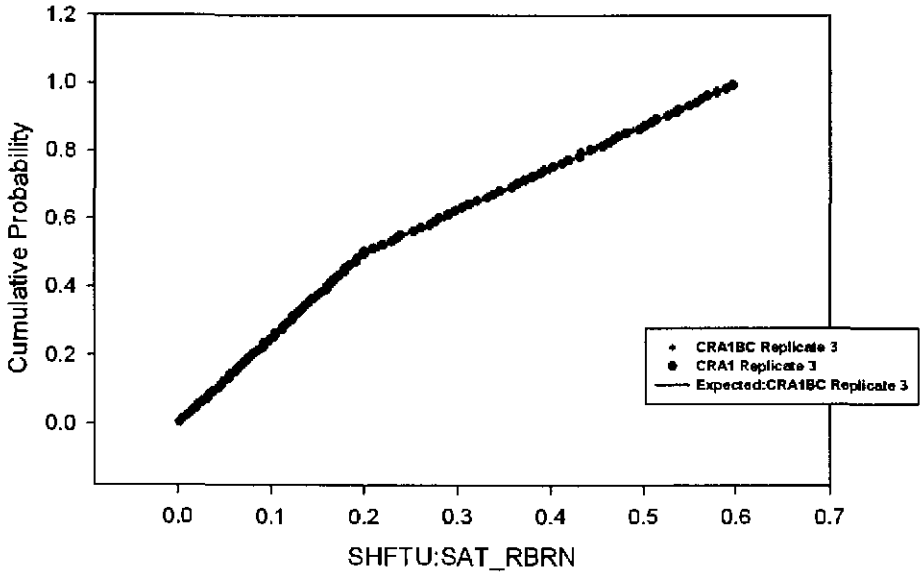

Figure 151. Observed and Expected CDFs for SHFTU:SAT_RGAS
Uniform Distribution

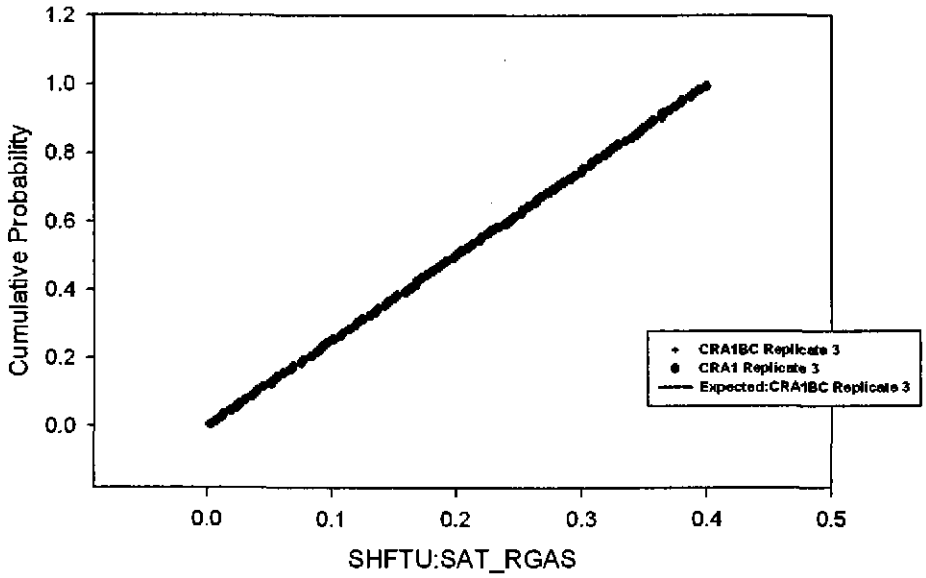

Figure 152. Observed and Expected CDFs for SPALLMOD:PARTDIAM
Loguniform Distribution

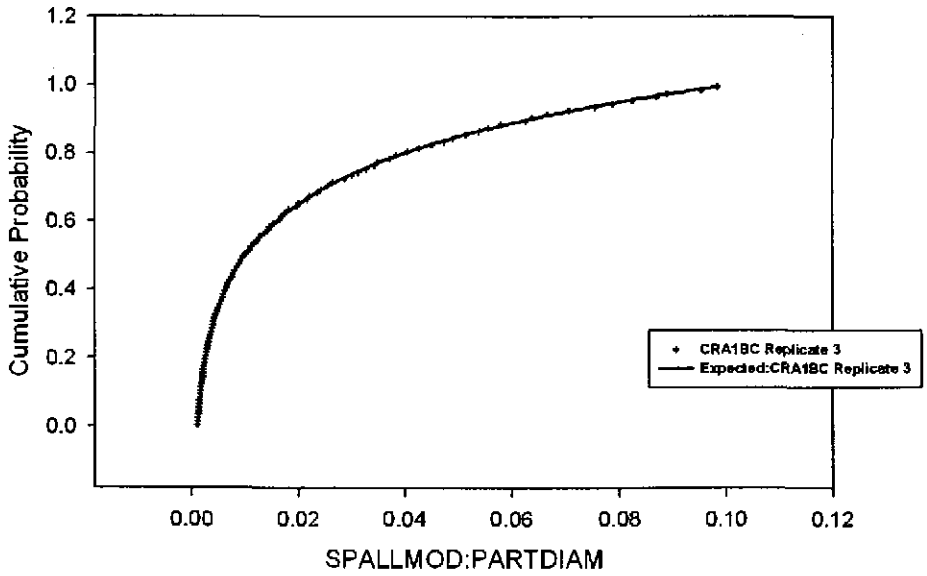

Figure 153. Observed and Expected CDFs for SPALLMOD:REPIPOR Uniform Distribution

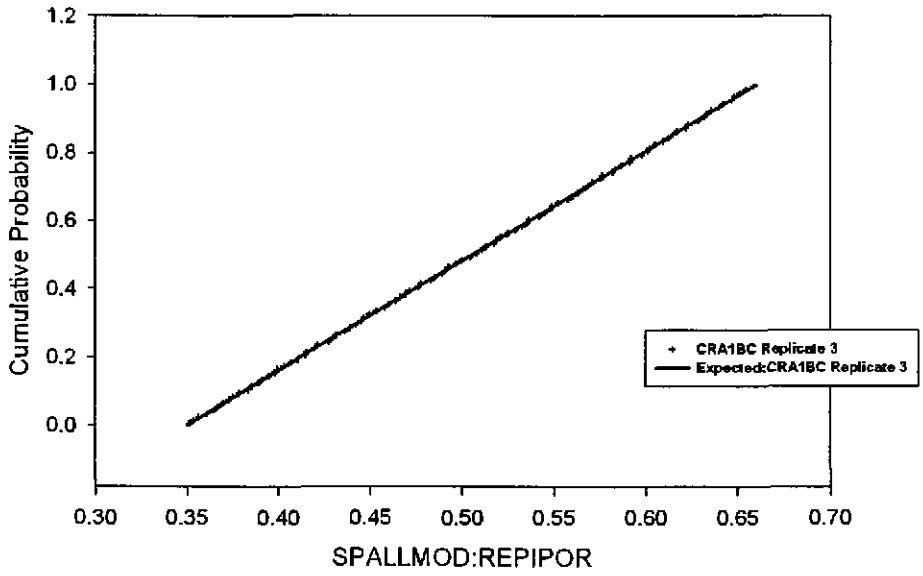

Figure 154. Observed and Expected CDFs for SPALLMOD:TENSLSTR Uniform Distribution

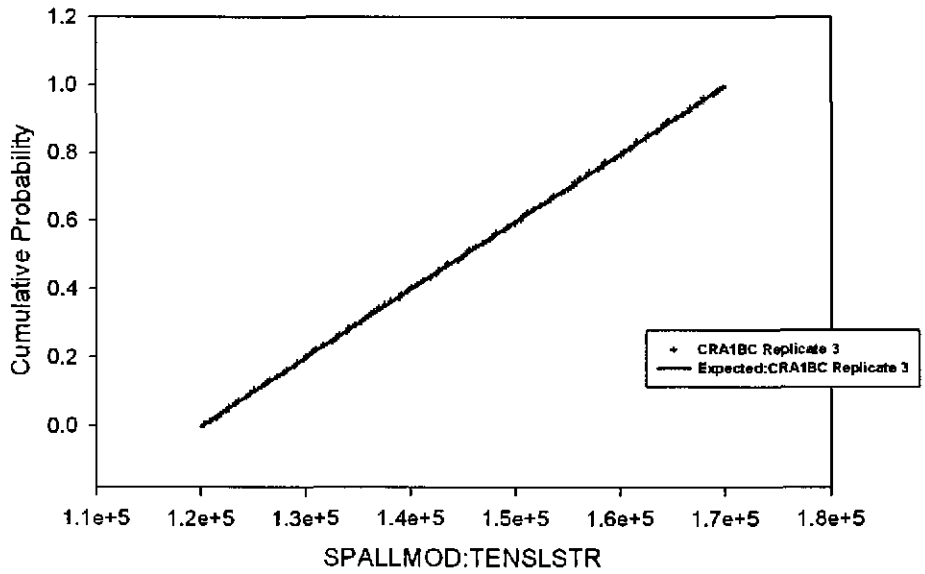

Figure 155. Observed and Expected CDFs for WAS_AREA:SAT_WICK Uniform Distribution

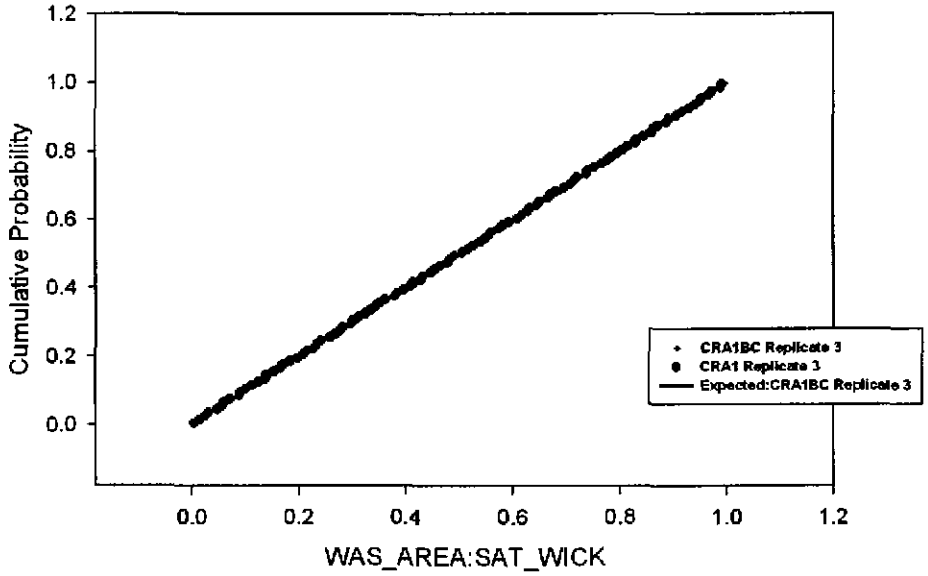

Figure 156. Observed and Expected CDFs for WAS_AREA:BIOGENFC Uniform Distribution

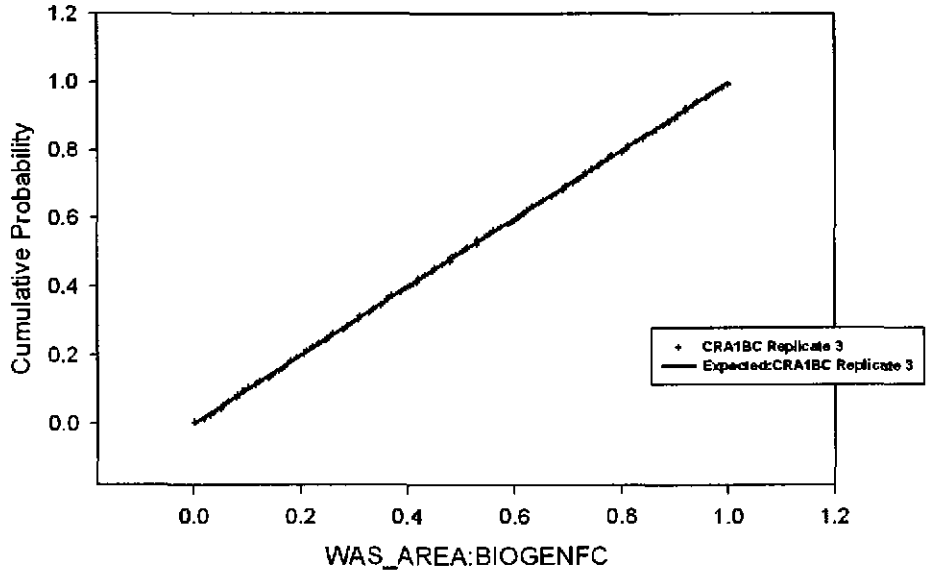

Figure 157. Observed and Expected CDFs for CELLULS:FBETA
Uniform Distribution

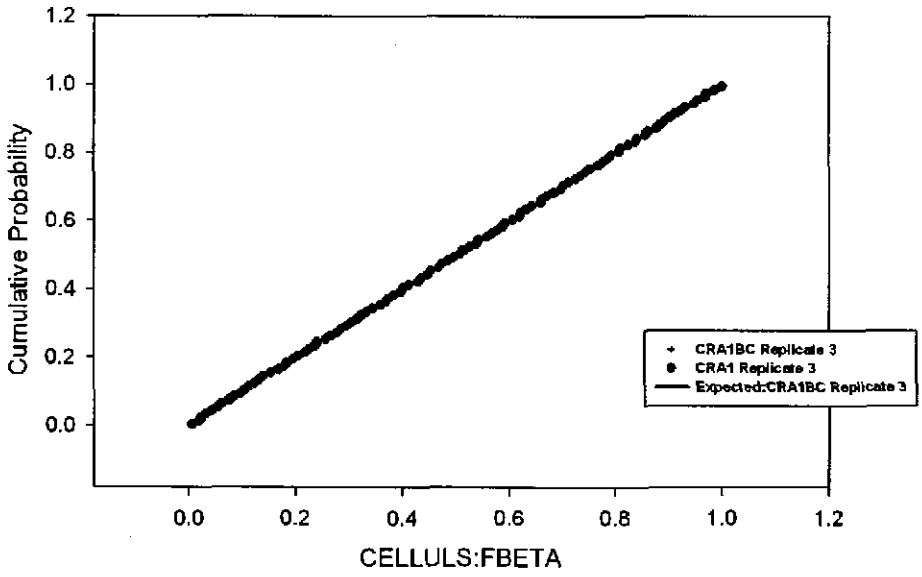

Figure 158. Observed and Expected CDFs for STEEL:CORRMCO2
Uniform Distribution

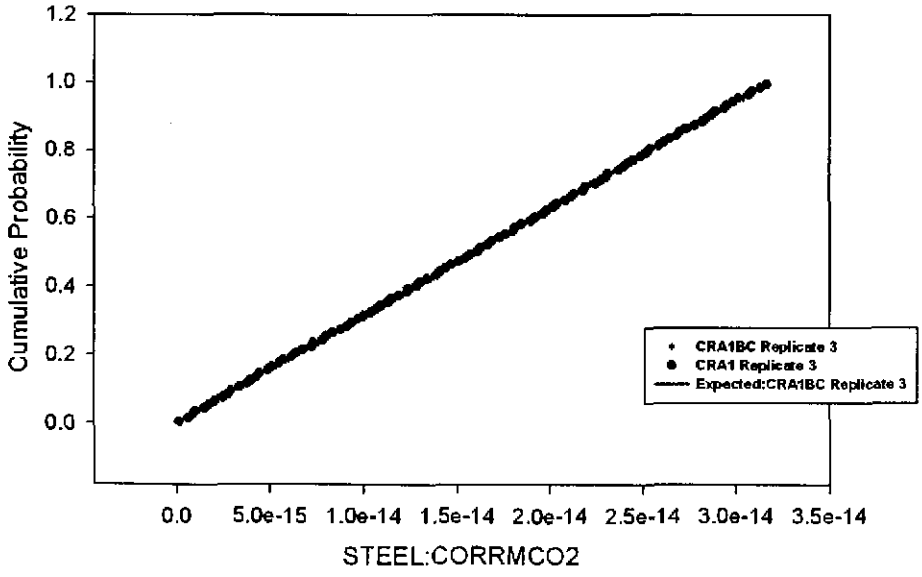

Figure 159. Observed and Expected CDFs for WAS_AREA:GRATMICH Uniform Distribution

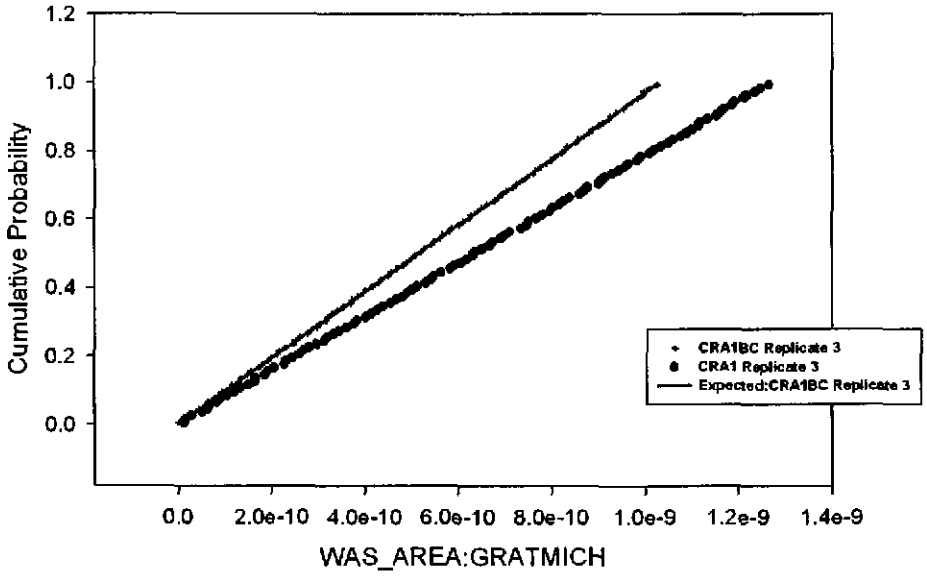

Figure 160. Observed and Expected CDFs for WAS_AREA:GRATMICI Uniform Distribution

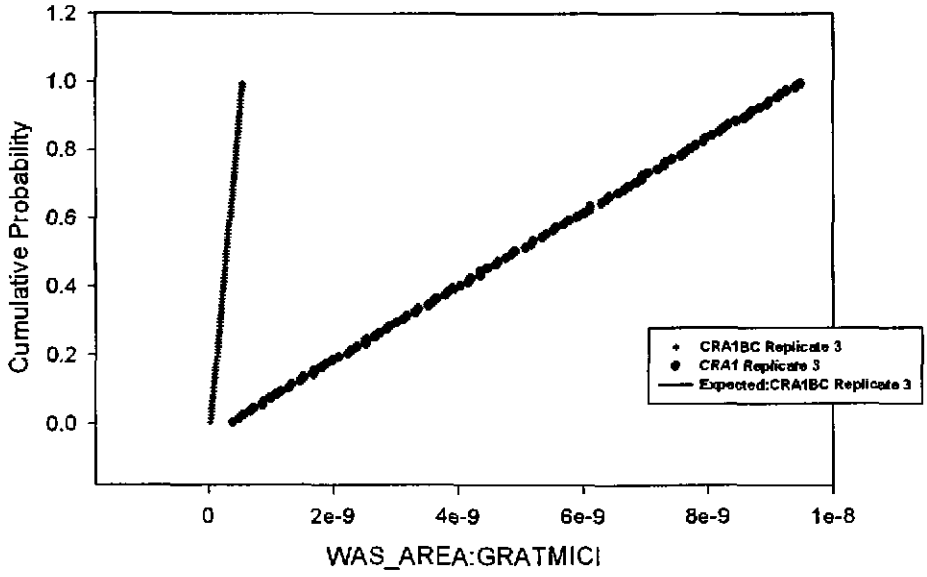

Figure 161. Observed and Expected CDFs for WAS_AREA:PROBDEG User Discrete (Delta) Distribution

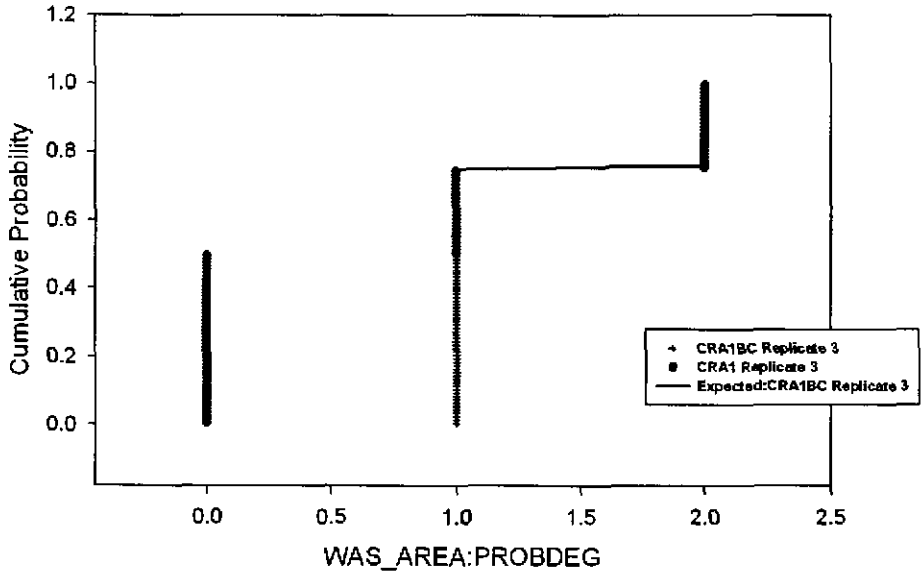

Figure 162. Observed and Expected CDFs for GLOBAL:OXSTAT Uniform Distribution

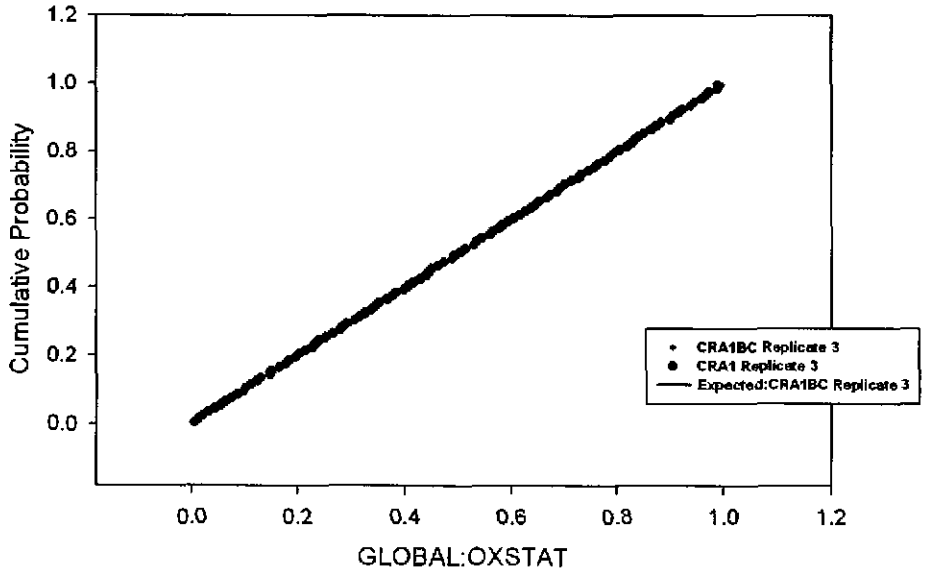

Figure 163. Observed and Expected CDFs for PHUMOX3:PHUMCIM User Continuous Distribution

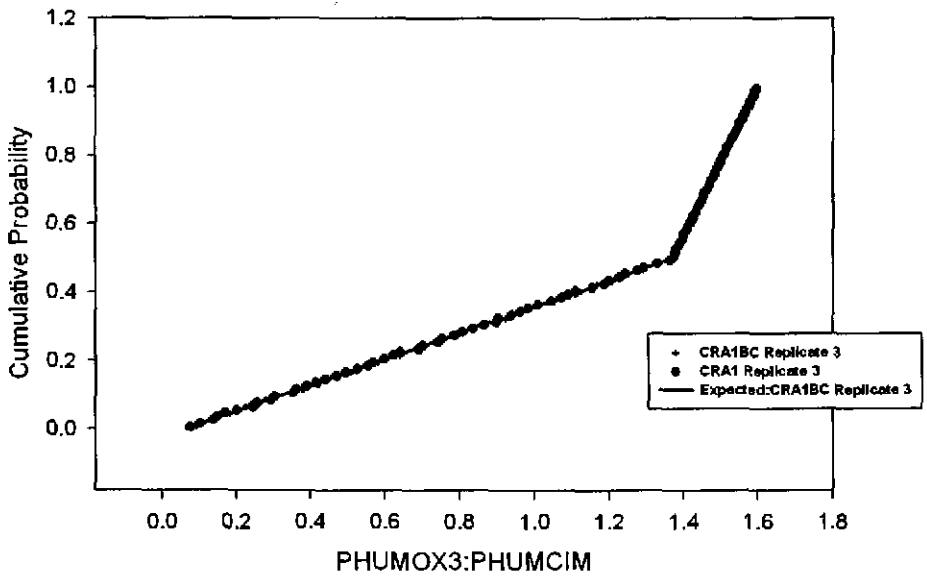

Figure 164. Observed and Expected CDFs for WAS_AREA:SAT_RBRN Uniform Distribution

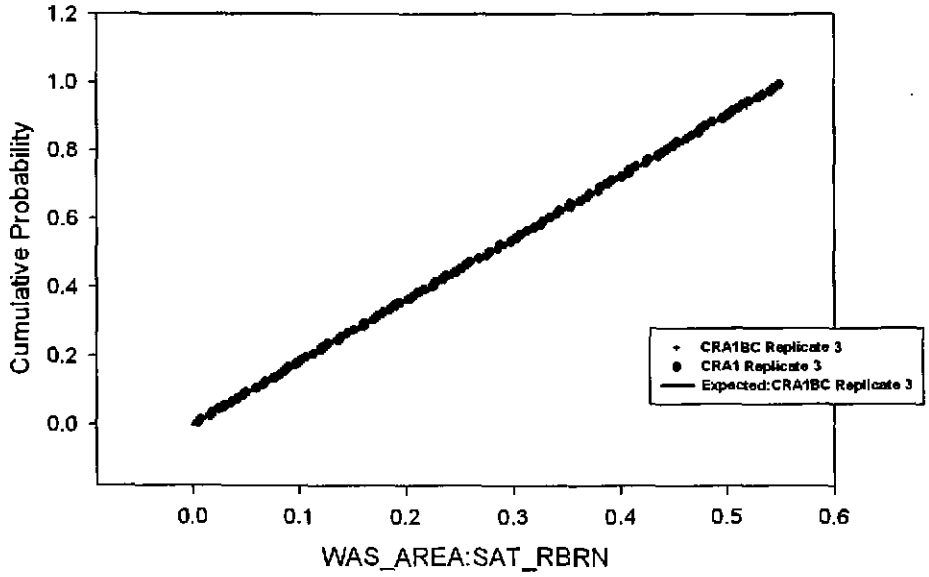

Figure 165. Observed and Expected CDFs for WAS_AREA:SAT_RGAS Uniform Distribution

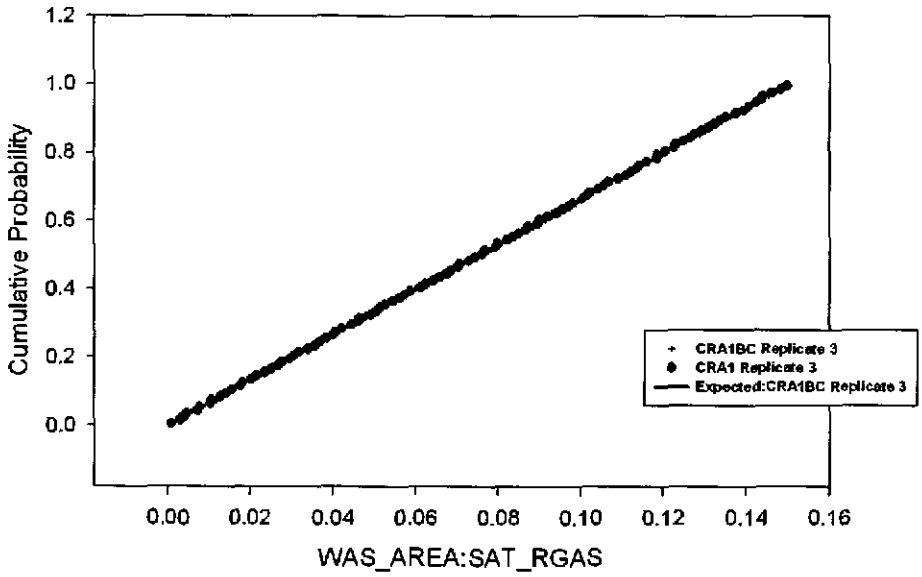

Figure 166. Observed and Expected CDFs for SOLMOD3:SOLVAR User Continuous Distribution

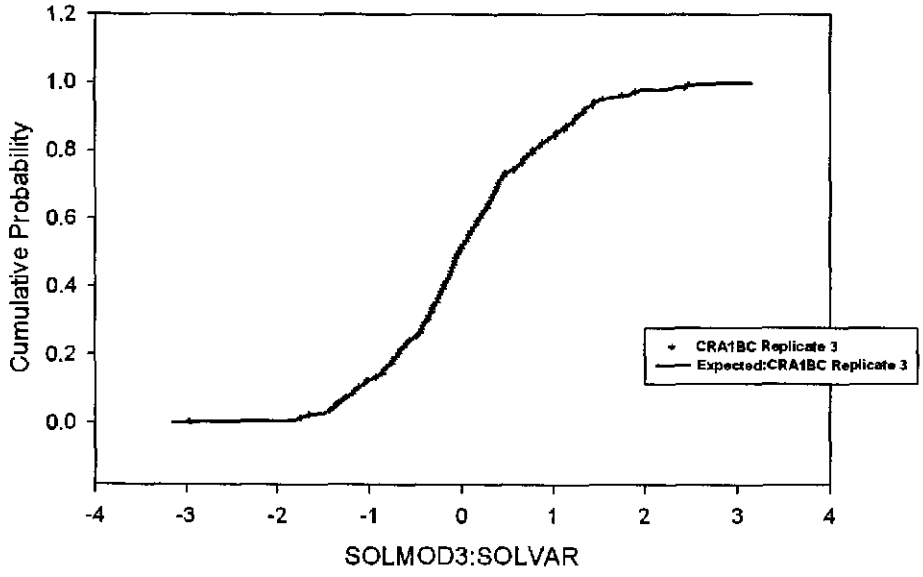

Figure 167. Observed and Expected CDFs for SOLMOD4:SOLVAR User Continuous Distribution

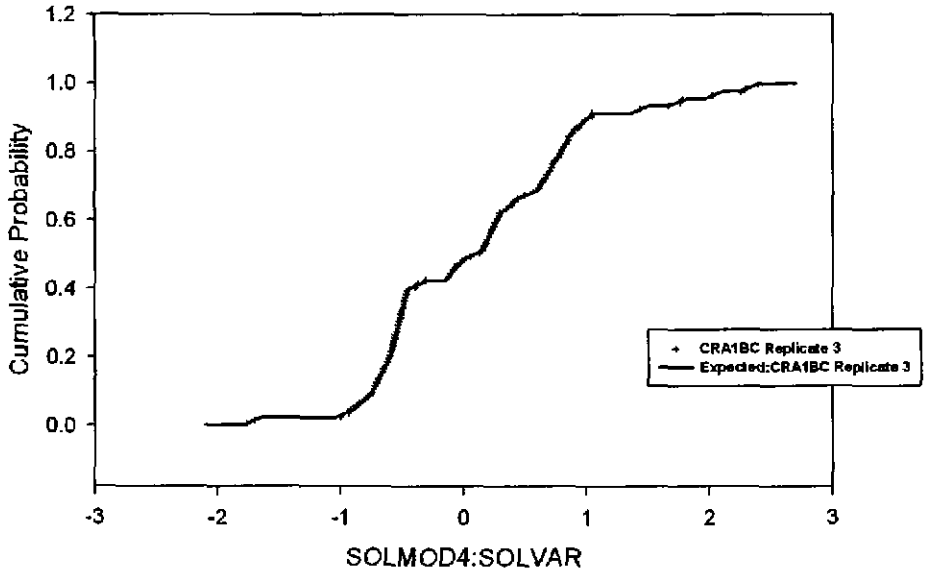

Figure 168. Observed and Expected CDFs for BOREHOLE:TAUFAIL Loguniform Distribution