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Technical Report Appendix

Modeling the Fate of Aluminum in a Watershed Under Acidified Conditions (Computer Programing and Data)

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MODELING THE FATE OF ALUMINUM IN A WATERSHED SYSTEM UNDER ACIDIFIED CONDITIONS

by

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Division of Water Pollution Control
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Appendix

PREFACE

This report contains the computer programming and data in the report entitled "Modeling The Fate of Aluminum in an Acidified Massachusetts Watershed". The report and its appendices report on research performed by Drew C. McAvoy as part of his PhD. degree.

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APPENDIX A

ANC COMPUTER PROGRAM LISTING WITH SAMPLE INPUT AND OUTPUT

```
00100 PROGRAM ANC1(INPUT,OUTPUT,TAPE1,TAPE2,TAPE6=OUTPUT)
00110 COMMON M,N,A,B,R,V(29),F1(29)
00120 DIMENSION V(29),PH(29),F1(29),CC(9)
00122C
00130C    THE FOLLOWING PROGRAM DETERMINES THE ACID
00140C    NEUTRALIZING CAPACITY OF LOW BUFFERED WATER
00150C    USING THE GRAN'S PLOT TECHNIQUE
00153C
00160 READ(1,10) V0,CA,N
00170 10 FORMAT(F10.0,F5.0,I5)
00180 WRITE(2,12)
00190 12 FORMAT(10X,12HINPUT VALUES,/)
00200 WRITE(2,15) V0,CA,N
00210 15 FORMAT(1X,16HINITIAL VOL(UL)=,F10.3,/,
00220+ 1X,17HTITRANT MOLARITY=,F5.3,/,
00230+ 1X,18HNO. OF DATA PAIRS=,I5,/)
00232 READ(1,20) (V(I),PH(I),I=1,N)
00234 20 FORMAT(F5.0,F5.0)
00240C
00250C    THE FOLLOWING CALCULATES THE GRAN'S FUNCTION (F1)
00260C
00270 DO 30 I=1,N
00280    F1(I)=(V0+V(I))*10**(-PH(I))
00290 30 CONTINUE
00300C
00302 WRITE(2,35)
00303 35 FORMAT(1X,15HTITRANT VOL(UL),7X,5HPH    ,2X,9HGRAN'S FN,/,
00304+ 1X,15H---------------,2X,10H----------,2X,9H---------)
00310 WRITE(2,40) (V(I),PH(I),F1(I),I=1,N)
00320 40 FORMAT(4X,F5.0,13X,F5.2,2X,F10.4)
00330C
00340C    THE FOLLOWING REGRESSES F1 (GRAN'S FUNCTION) ON V (TITRANTS VOL
00350C    AND INCREMENTALLY SUBTRACTS OFF DATA PAIRS UNTIL THE MAXIMUM
00360C    CORRELATION COEFFICENT IS FOUND.  AFTER DETERMINING THE BEST
00370C    FIT LINE THE EQUILIBRIUM VOLUME (VE) AND THE ACID NEUTRALIZING
00380C    CAPACITY (ANC) ARE DETERMINED.
00381C
00390 M=1
00400C
00410 CALL REGRESS
00420C
00430 CC(M)=R
00440 M=2
00450C
00460 CALL REGRESS
00470C
00480 60 CC(M)=R
00490 IF(CC(M-1).GE.CC(M)) GO TO 75
00500 M=M+1
00505 CALL REGRESS
00510 GO TO 60
00520C
00522 75 WRITE(2,79)
00523 79 FORMAT(1X,/,1X,23HCORRELATION COEFFICENTS,/)
00530 WRITE(2,80) (I,CC(I),I=1,M)
00540 80 FORMAT(5X,1HR,I1,1H=,F10.5)
00550 M=M-1
00560C
00570 CALL REGRESS
00580C
00582C  CON IS CORRECTION FROM MOL TO UMOL (EQ TO UEQ)
00583C
00585 CON=0.000001
```

```
00590 VE=-A/B
00600 ANC=VE*CA/(VO*CON)
00610C
00612 WRITE(2,82)
00614 82 FORMAT(1X,/,10X,7HRESULTS,/)
00620 WRITE(2,85) A,B,R,VE,ANC
00630 85 FORMAT(1X,13HA(INTERCEPT)=,F10.5,/,1X,9HB(SLOPE)=,F10.5,/,
00640+ 1X,20HR(CORRELATION COEF)=,F10.5,/,1X,24HVE(EQUILIBRIUM VOL, UL)=,
00641+ /,1X,33HANC(ACID NEUTRALIZING CAP UEQ/L)=,F10.5)
00650 STOP
00660 END
00670C
00680C   SUBROUTINE REGRESS
00690C
00700 SUBROUTINE REGRESS
00710 COMMON M,N,A,B,R,V(29),F1(29)
00720 DIMENSION V(29),PH(29),F1(29),CC(9)
00730C
00740 XSUM=0.0
00750 XSUM2=0.0
00760 DO 100 I=M,N
00770   XSUM=XSUM+V(I)
00780   XSUM2=XSUM2+V(I)**2
00790 100 CONTINUE
00800 XMEAN=XSUM/(N-M+1)
00810C
00820 YSUM=0.0
00830 YSUM2=0.0
00840 DO 110 I=M,N
00850   YSUM=YSUM+F1(I)
00860   YSUM2=YSUM2+F1(I)**2
00870 110 CONTINUE
00880 YMEAN=YSUM/(N-M+1)
00890C
00900 XYSUM=0.0
00910 DO 120 I=M,N
00920   XYSUM=XYSUM+V(I)*F1(I)
00930 120 CONTINUE
00940C
00950 SXX=(N-M+1)*XSUM2-XSUM**2
00960 SYY=(N-M+1)*YSUM2-YSUM**2
00970 SXY=(N-M+1)*XYSUM-XSUM*YSUM
00980 B=SXY/SXX
00990 A=YMEAN-B*XMEAN
01000 R=SXY/(SXX*SYY)**0.5
01010 RETURN
01020 END
```

```
  50000.0 .104    11
    0.0 5.06
   20.0 4.40
   40.0 4.09
   60.0 3.91
   80.0 3.79
  100.0 3.70
  120.0 3.62
  140.0 3.56
  160.0 3.50
  180.0 3.46
  200.0 3.41
```

INPUT VALUES

INITIAL VOL(UL)= 50000.000
TITRANT MOLARITY= .104
NO. OF DATA PAIRS= 11

TITRANT VOL(UL)	PH	GRAN'S FN
0.	4.92	.6011
20.	4.32	2.3941
40.	4.05	4.4598
60.	3.86	6.9102
80.	3.75	8.9056
100.	3.66	10.9607
120.	3.58	13.1829
140.	3.52	15.1420
160.	3.47	16.9964
180.	3.43	18.6436
200.	3.39	20.4505

CORRELATION COEFFICENTS

R1= .99916
R2= .99889

RESULTS

A(INTERCEPT)= .66811
B(SLOPE)= .10118
R(CORRELATION COEF)= .99916
VE(EQUILIBRIUM VOL, UL)= -6.60321
ANC(ACID NEUTRALIZING CAP UEQ/L)= -13.73468

APPENDIX B

EQUILIBRIUM CONSTANTS AND ENTHALPY DATA USED IN THIS STUDY

Thermodynamic Equilibrium Information

Reactions	log K (25°C)	ΔH° (cal-mol^{-1})
$Al^{3+} + H_2O = Al(OH)^{2+} + H^+$	-4.99[1]	11,900[1]
$Al^{3+} + 2H_2O = Al(OH)_2^+ + 2H^+$	-10.1[1]	
$Al^{3+} + 3H_2O = Al(OH)_3^0 + 3H^+$	-16.0[1]	
$Al^{3+} + 4H_2O = Al(OH)_4^- + 4H^+$	-23.0[1]	44,060[1]
$Al^{3+} + F^- = AlF^{2+}$	7.01[2]	1,100[3]
$Al^{3+} + 2F^- = AlF_2^+$	12.75[2]	2,000[3]
$Al^{3+} + 3F^- = AlF_3^0$	17.02[2]	2,200[3]
$Al^{3+} + 4F^- = AlF_4^-$	19.72[2]	2,200[3]
$Al^{3+} + 5F^- = AlF_5^{2-}$	20.91[2]	1,800[3]
$Al^{3+} + 6F^- = AlF_6^{3-}$	20.86[2]	
$Al^{3+} + SO_4^{2-} = Al(SO_4)^+$	3.02[1]	2,150[1]
$Al^{3+} + 2SO_4^{2-} = Al(SO_4)_2^-$	4.92[1]	2,840[1]
$Al(OH)_3(s) + 3H^+ = Al^{3+} 3H_2O$		
synthetic gibbsite	8.11[4]	
natural gibbsite	8.77[1]	-22,800[1]
microcrystallin gibbsite	9.36[2]	
$H^+ + CO_3^{2-} = HCO_3^-$	10.33[1]	-3,617[1]
$H^+ + HCO_3^- = H_2CO_3^*$	6.35[1]	2,247[1]
$H^+ + F^- = HF^0$	3.17[1]	3,460[1]
$H^+ + OH^- = H_2O$	13.99[3]	-13,340[3]

1. Ball et al. (1980)
2. Hem (1968)
3. Smith and Martell (1974)
4. May et al. (1979)

APPENDIX C

EQUAL COMPUTER PROGRAM LISTING WITH SAMPLE INPUT AND OUTPUT

```
      PROGRAM EQUIL(INPUT,OUTPUT,TAPE1,TAPE2,TAPE3,TAPE6=OUTPUT)
      COMMON TEMP,T,CON,XKOH1,XKOH2,XKOH4
      COMMON XKHF,XKF1,XKF2,XKF3,XKF4,XKF5
      COMMON XKSO41,XKSO42,XK1,XK2
      COMMON CA,ZMG,ZNA,ZK,H,SO4,CL,FO,F1,F2,F3,ZI,PH,MH
      COMMON AL,ALOH,ALOH2,ALOH4,ALF,ALF2,ALF3,ALF4,ALF5,ALSO4,ALSO42
      COMMON TSO4,TAL,TF,F(20),ZJ(20,20),Y(20),FF,HF,N,COUNT
      COMMON CB,CAA,CAL,CH,CORG,DOC,MAL,OAL
C
    2 CALL IN
      CALL TEMPCOR
      CALL STREAM
      CALL ORG
      CALL OUT
      GO TO 2
      STOP
      END
C     SUBROUTINE READS INPUT DATA
      SUBROUTINE IN
      COMMON TEMP,T,CON,XKOH1,XKOH2,XKOH4
      COMMON XKHF,XKF1,XKF2,XKF3,XKF4,XKF5
      COMMON XKSO41,XKSO42,XK1,XK2
      COMMON CA,ZMG,ZNA,ZK,H,SO4,CL,FO,F1,F2,F3,ZI,PH,MH
      COMMON AL,ALOH,ALOH2,ALOH4,ALF,ALF2,ALF3,ALF4,ALF5,ALSO4,ALSO42
      COMMON TSO4,TAL,TF,F(20),ZJ(20,20),Y(20),FF,HF,N,COUNT
      COMMON CB,CAA,CAL,CH,CORG,DOC,MAL,OAL
      READ(1,10) TEMP,TAL,TF,TSO4,PH,CA,ZMG,ZNA,ZK,CL,MAL,OAL,DOC
   10 FORMAT(F5.2,3F10.8,F5.2,7F10.8,F5.2)
      RETURN
      END
C     SUBROUTINE WRITES OUTPUT DATA
      SUBROUTINE OUT
      COMMON TEMP,T,CON,XKOH1,XKOH2,XKOH4
      COMMON XKHF,XKF1,XKF2,XKF3,XKF4,XKF5
      COMMON XKSO41,XKSO42,XK1,XK2
      COMMON CA,ZMG,ZNA,ZK,H,SO4,CL,FO,F1,F2,F3,ZI,PH,MH
      COMMON AL,ALOH,ALOH2,ALOH4,ALF,ALF2,ALF3,ALF4,ALF5,ALSO4,ALSO42
      COMMON TSO4,TAL,TF,F(20),ZJ(20,20),Y(20),FF,HF,N,COUNT
      COMMON CB,CAA,CAL,CH,CORG,DOC,MAL,OAL
      WRITE(2,20) TEMP,TAL,TF,TSO4,PH,CA,ZMG,ZNA,ZK,CL,MAL,OAL,DOC
   20 FORMAT(1X,F6.2,3G10.4,F6.2,2G10.4/5G10.4,F6.2)
      WRITE(2,25) COUNT
   25 FORMAT(1X,6HCOUNT=,F5.1)
      WRITE(2,30) XKOH1,XKOH2,XKOH4
   30 FORMAT(1X,3G10.4)
      WRITE(2,40) XKHF,XKF1,XKF2,XKF3,XKF4,XKF5
   40 FORMAT(1X,6G10.4)
      WRITE(2,50) XKSO41,XKSO42,XK1,XK2
   50 FORMAT(1X,4G10.4)
      WRITE(2,70) ZI,FO,F1,F2,F3
   70 FORMAT(1X,5F10.5)
      WRITE(2,72) CB,CAL,CH,CAA
   72 FORMAT(1X,4G10.4)
      WRITE(2,75) AL,ALOH,ALOH2,ALOH4
   75 FORMAT(1X,4G15.3)
      WRITE(2,76) ALF,ALF2,ALF3,ALF4,ALF5
   76 FORMAT(1X,5G15.3)
      WRITE(2,77) ALSO4,ALSO42,SO4,FF,HF
   77 FORMAT(1X,5G15.3)
      WRITE(3,78) CORG,PH,DOC
   78 FORMAT(1X,F10.8,2F5.2)
      RETURN
      END
```

```
C   SUBROUTINE ADJUSTS THE EQUILIBRIUM CONSTANTS (K'
C                FOR TEMPERATURE
 SUBROUTINE TEMPCOR
 COMMON TEMP,T,CON,XKOH1,XKOH2,XKOH4
 COMMON XKHF,XKF1,XKF2,XKF3,XKF4,XKF5
 COMMON XKSO41,XKSO42,XK1,XK2
 COMMON CA,ZMG,ZNA,ZK,H,SO4,CL,FO,F1,F2,F3,ZI,PH,MH
 COMMON AL,ALOH,ALOH2,ALOH4,ALF,ALF2,ALF3,ALF4,ALF5,ALSO4,ALSO42
 COMMON TSO4,TAL,TF,F(20),ZJ(20,20),Y(20),FF,HF,N,COUNT
 COMMON CB,CAA,CAL,CH,CORG,DOC,MAL,OAL
C     LOG K= LOG K298 - (HO/2.303*R)*(1/T-1/298)
C          R=1.987 CAL/K-MOL
 T=273.15+TEMP
 CON=(1/T-1/298.15)/4.5761
C      LOG K
 ZKOH1=-4.99-11900*CON
 ZKOH2=-10.10
 ZKOH4=-23.0-44060.*CON
 ZKF1=7.02-1100.*CON
 ZKF2=12.76-2000.*CON
 ZKF3=17.03-2500.*CON
 ZKF4=19.73-2200.*CON
 ZKF5=20.92-1800.*CON
 ZKSO41=3.02-2150.*CON
 ZKSO42=4.92-2840.*CON
 ZK1=-6.35-2247.*CON
 ZK2=-10.33+3617.*CON
 ZKHF=3.169-3460.*CON
C      K
 XKOH1=10**(ZKOH1)
 XKOH2=10**(ZKOH2)
 XKOH4=10**(ZKOH4)
 XKF1=10**(ZKF1)
 XKF2=10**(ZKF2)
 XKF3=10**(ZKF3)
 XKF4=10**(ZKF4)
 XKF5=10**(ZKF5)
 XKSO41=10**(ZKSO41)
 XKSO42=10**(ZKSO42)
 XK1=10**(ZK1)
 XK2=10**(ZK2)
 XKHF=10**(ZKHF)
 RETURN
 END
C   SUBROUTINE CALCULATES THE ACTIVITY COEF FROM THE
C       IONIC STRENGTH USING THE GUNTELBERG APPROXIMATION
 SUBROUTINE IONAD
 COMMON TEMP,T,CON,XKOH1,XKOH2,XKOH4
 COMMON XKHF,XKF1,XKF2,XKF3,XKF4,XKF5
 COMMON XKSO41,XKSO42,XK1,XK2
 COMMON CA,ZMG,ZNA,ZK,H,SO4,CL,FO,F1,F2,F3,ZI,PH,MH
 COMMON AL,ALOH,ALOH2,ALOH4,ALF,ALF2,ALF3,ALF4,ALF5,ALSO4,ALSO42
 COMMON TSO4,TAL,TF,F(20),ZJ(20,20),Y(20),FF,HF,N,COUNT
 COMMON CB,CAA,CAL,CH,CORG,DOC,MAL,OAL
 REAL LOGFO,LOGF1,LOGF2,LOGF3
 ZI3=AL*9.0
 ZI2=(CA+ZMG+SO4+ALOH+ALF+ALF5)*4.0
 ZI1=ZNA+ZK+MH+CL+ALOH2+ALOH4+ALF2+ALF4+ALSO4+ALSO42
 ZI=(ZI1+ZI2+ZI3)/2.0
 A=1825000.0*(78.54*T)**(-1.5)
```

```
C     LOG ACTIVITY COEF
 LOGF0=0.1*ZI
 LOGF1=-A*SQRT(ZI)/(1+SQRT(ZI))
 LOGF2=-A*4.0*SQRT(ZI)/(1+SQRT(ZI))
 LOGF3=-A*9.0*SQRT(ZI)/(1+SQRT(ZI))
C     ACTIVITY COEF
 F0=10**LOGF0
 F1=10**LOGF1
 F2=10**LOGF2
 F3=10**LOGF3
 RETURN
 END
C   SUBROUTINE SOLVES THE STREAMWATER CHEMICAL MASS BALANCE
C    EQUATIONS USING NEWTONS METHOD
 SUBROUTINE STREAM
 COMMON TEMP,T,CON,XKOH1,XKOH2,XKOH4
 COMMON XKHF,XKF1,XKF2,XKF3,XKF4,XKF5
 COMMON XKSO41,XKSO42,XK1,XK2
 COMMON CA,ZMG,ZNA,ZK,H,SO4,CL,F0,F1,F2,F3,ZI,PH,MH
 COMMON AL,ALOH,ALOH2,ALOH4,ALF,ALF2,ALF3,ALF4,ALF5,ALSO4,ALSO42
 COMMON TSO4,TAL,TF,F(20),ZJ(20,20),Y(20),FF,HF,N,COUNT
 COMMON CB,CAA,CAL,CH,CORG,DOC,MAL,OAL
C    INITIAL CONDITIONS
 COUNT=0.0
 N=3
 AAL=.000001
 AFF=.0000001
 ASO4=.00001
 H=10**(-PH)
 F0=1.0
 F1=1.0
 F2=1.0
 F3=1.0
 ZI=0.0
C   NONLINEAR EQUATIONS TO BE SOLVED
 80 F(1)=AAL/F3+XKOH1*AAL/(F2*H)+XKOH2*AAL/(F1*H**2)+
+         XKOH4*AAL/(F1*H**4)+XKF1*AAL*AFF/F2+XKF2*AAL*AFF**2/F1+
+          XKF3*AAL*AFF**3/F0+XKF4*AAL*AFF**4/F1+
+          XKF5*AAL*AFF**5/F2+XKSO41*AAL*ASO4/F1+
+         XKSO42*AAL*ASO4**2/F1-TAL
 F(2)=XKF1*AAL*AFF/F2+2*XKF2*AAL*AFF**2/F1
+       +3*XKF3*AAL*AFF**3/F0+4*XKF4*AAL*AFF**4/F1
+      +5*XKF5*AAL*AFF**5/F2+AFF/F1+XKHF*H*AFF/F0-TF
 F(3)=ASO4/F2+XKSO41*AAL*ASO4/F1+2*XKSO42*AAL*ASO4**2/F1-TSO4
C    CHANGES FUNCTIONS TO NEGATIVE VALUES
 DO 75 K=1,N
 F(K)=-F(K)
 75 CONTINUE
C   SET JACOBIAN MATRIX TO ZERO
 DO 100 I=1,N
 DO 90 J=1,N
 ZJ(I,J)=0.0
 90 CONTINUE
 100 CONTINUE
C   SETS JACOBIAN MATRIX  DF(XI)/DXI
 ZJ(1,1)=1.0/F3+XKOH1/(F2*H)+XKOH2/(F1*H**2)+XKOH4/(F1*H**4)
+          +XKF1*AFF/F2+XKF2*AFF**2/F1+XKF3*AFF**3/F0
+          +XKF4*AFF**4/F1+XKF5*AFF**5/F2+XKSO41*ASO4/F1
+          +XSO42*ASO4**2/F1
 ZJ(1,2)=XKF1*AAL/F2+2*AFF*XKF2*AAL/F1+3*(AFF**2)*XKF3*AAL/F0
+          +4*(AFF**3)*XKF4*AAL/F1+5*(AFF**4)*XKF5*AAL/F2
```

```
      ZJ(1,3)=XKSO41*AAL/F1+2*ASO4*XKSO42*AAL/F1
      ZJ(2,1)=XKF1*AFF/F2+2*XKF2*AFF**2/F1+3*XKF3*AFF**3/FO
     +        +4*XKF4*AFF**4/F1+5*XKF5*AFF**5/F2
      ZJ(2,2)=XKF1*AAL/F2+4*AFF*XKF2*AAL/F1+9*(AFF**2)*XKF3*AAL/FO
     +         +16*(AFF**3)*XKF4*AAL/F1+25*(AFF**4)*XKF5*AAL/F2
     +        +1/F1+XKHF*H/FO
      ZJ(2,3)=0.0
      ZJ(3,1)=XKSO41*ASO4/F1+2*XKSO42*ASO4**2/F1
      ZJ(3,2)=0.0
      ZJ(3,3)=1/F2+XKSO41*AAL/F1+4*ASO4*XKSO42*AAL/F1
C  CALLS SUBROUTINE TO SOLVE LINEAR SYSTEM OF EQUAIONS
C       ZJ(I,J)*Y(J)=-F(I)
      CALL SOLVE
C    ADDS CHANGE OF ACTIVITIES TO EXISTING ACTIVITIES
      AAL=AAL+Y(1)
      AFF=AFF+Y(2)
      ASO4=ASO4+Y(3)
C    CALCULATES CONC FROM ACTIVITIES AND ACTIVITY COEF'S
      AL=AAL/F3
      ALOH=XKOH1*AAL/(H*F2)
      ALOH2=XKOH2*AAL/(F1*H**2)
      ALOH4=XKOH4*AAL/(F1*H**4)
      ALF=XKF1*AAL*AFF/F2
      ALF2=XKF2*AAL*AFF**2/F1
      ALF3=XKF3*AAL*AFF**3/FO
      ALF4=XKF4*AAL*AFF**4/F1
      ALF5=XKF5*AAL*AFF**5/F2
      ALSO4=XKSO41*AAL*ASO4/F1
      ALSO42=XKSO42*AAL*ASO4**2/F1
      SO4=ASO4/F2
      FF=AFF/F1
      HF=XKHF*H*AFF/FO
      MH=H/F1
C    CALLS IONIC STRENGTH ADJUSTMENT SUBROUTINE
      CALL IONAD
C      CHECKS TOLERENCE
      IF(ABS(Y(1)/AAL).LE.0.0001) GO TO 190
      GO TO 198
      190 IF(ABS(Y(2)/AFF).LE.0.0001) GO TO 195
      GO TO 198
      195 IF(ABS(Y(3)/ASO4).LE.0.0001) GO TO 200
      198 COUNT=COUNT+1
      IF(COUNT.GE.10) GO TO 200
      GO TO 80
      200 RETURN
      END
C     SUBROUTINE SOLVES A SYSTEM OF LINEAR EQUATIONS
C        USING GAUSS ELIMINATION
      SUBROUTINE SOLVE
      COMMON TEMP,T,CON,XKOH1,XKOH2,XKOH4
      COMMON XKHF,XKF1,XKF2,XKF3,XKF4,XKF5
      COMMON XKSO41,XKSO42,XK1,XK2
      COMMON CA,ZMG,ZNA,ZK,H,SO4,CL,FO,F1,F2,F3,ZI,PH,MH
      COMMON AL,ALOH,ALOH2,ALOH4,ALF,ALF2,ALF3,ALF4,ALF5,ALSO4,ALSO42
      COMMON TSO4,TAL,TF,F(20),ZJ(20,20),Y(20),FF,HF,N,COUNT
      COMMON CB,CAA,CAL,CH,CORG,DOC,MAL,OAL
C  ELEMENT OF ELIMINATION
      N1=N-1
      DO 160 M=1,N1
      ZMAX=0.
      IMAX=0
```

```
C    FIND MAX OF COLUMN
 DO 120 I=M,N
 IF(ABS(ZJ(I,M)).LE.ZMAX) GO TO 120
 IMAX=I
 ZMAX=ABS(ZJ(I,M))
 120 CONTINUE
C    ERROR CHECK
 IF(IMAX.EQ.0) CALL ERROR(IMAX)
C    ROW INTERCHANGE
 IF(IMAX.EQ.M) GO TO 140
 V=F(M)
 F(M)=F(IMAX)
 F(IMAX)=V
 DO 130 J=M,N
 V=ZJ(M,J)
 ZJ(M.J)=ZJ(IMAX.J)
 ZJ(IMAX,J)=V
 130 CONTINUE
C    DIAGONALIZE
 140 M1=M+1
 DO 150 I=M1,N
 V=ZJ(I,M)/ZJ(M,M)
 F(I)=F(I)-V*F(M)
 DO 150 J=M,N
 ZJ(I,J)=ZJ(I,J)-V*ZJ(M,J)
 150 CONTINUE
 160 CONTINUE
C    BACK SUBSTITUTION
 DO 165 I=1,N
 Y(I)=0.0
 165 CONTINUE
 Y(N)=F(N)/ZJ(N,N)
 DO 180 K=1,N1
 I=N-K
 I1=I+1
 DO 170 J=I1,N
 Y(I)=Y(I)+Y(J)*ZJ(I,J)
 170 CONTINUE
 Y(I)=(F(I)-Y(I))/ZJ(I,I)
 180 CONTINUE
 RETURN
 END
C  ERROR SUBROUTINE
 SUBROUTINE ERROR(IMAX)
 WRITE(6,250) IMAX
 250 FORMAT(1X,11HERROR IMAX=,I5)
 STOP
 END
C     SUBROUTINE CALCULATES ORGANIC ANION CHARGE
 SUBROUTINE ORG
 COMMON TEMP,T,CON,XKOH1,XKOH2,XKOH4
 COMMON XKHF,XKF1,XKF2,XKF3,XKF4,XKF5
 COMMON XKSO41,XKSO42,XK1,XK2
 COMMON CA,ZMG,ZNA,ZK,H,SO4,CL,FO,F1,F2,F3,ZI,PH,MH
 COMMON AL,ALOH,ALOH2,ALOH4,ALF,ALF2,ALF3,ALF4,ALF5,ALSO4,ALSO42
 COMMON TSO4,TAL,TF,F(20),ZJ(20,20),Y(20),FF,HF,N,COUNT
 COMMON CB,CAA,CAL,CH,CORG,DOC,MAL,OAL
 CB=2*(CA+ZMG)+1*(ZNA+ZK)
 CAA=2*SO4+1*CL
 CAL=3*AL+2*(ALOH+ALF)+(ALOH2+ALF2+ALSO4)
+      -2*(ALF5)-1*(ALOH4+ALF4+ALSO42)
```

```
CH=H/F1
CORG=CB+CAL+CH-CAA
RETURN
END
```

INPUT FILE

```
9.50 .00001579 .00000326 .00007193 4.39 .00003069 .00001234 .00006568 .00000742
.00009422 .00002098 .00000519 3.58
7.50 .00001231 .00000321 .00007454 4.58 .00003293 .00001275 .00006351 .00001432
.00008096 .00001579 .00000348 2.61
4.00 .00001549 .00000332 .00007922 4.61 .00003019 .00001234 .00006829 .00000884
.00005049 .00001872 .00000322 2.57
2.00 .00001809 .00000321 .00008297 4.62 .00003219 .00001275 .00007482 .00000716
.00004175 .00002150 .00000341 2.55
6.50 .00000022 .00000284 .00005195 5.46 .00004716 .00002057 .00014876 .00000742
.00013230 .00000474 .00000452 5.07
8.00 .00000804 .00000279 .00005569 5.23 .00005564 .00002221 .00016877 .00002455
.00018110 .00001460 .00000656 7.09
9.00 .00000222 .00000305 .00006402 4.83 .00004616 .00002427 .00011135 .00003453
.00012186 .00000908 .00000686 8.69
7.50 .00000297 .00000268 .00005683 5.16 .00004466 .00002057 .00013136 .00001202
.00012525 .00000782 .00000486 5.40
3.00 .00000315 .00000305 .00006683 5.05 .00004591 .00002262 .00012092 .00001304
.00011227 .00000782 .00000467 5.32
7.00 .00000352 .00000295 .00007131 5.03 .00004716 .00002345 .00012658 .00000946
.00010889 .00000726 .00000374 5.01
5.00 .00000371 .00000316 .00007277 4.99 .00004915 .00002509 .00012397 .00000870
.00011425 .00000812 .00000441 5.07
1.00 .00000360 .00000295 .00006985 4.99 .00004765 .00002345 .00012353 .00000972
.00010635 .00000726 .00000367 4.69
6.50 .00000211 .00000253 .00006319 5.28 .00004516 .00001851 .00011222 .00000307
.00009252 .00000645 .00000434 4.26
7.00 .00000482 .00000284 .00006996 4.87 .00003867 .00001645 .00009439 .00000870
.00008406 .00000967 .00000486 4.69
4.00 .00000552 .00000305 .00007152 4.88 .00004341 .00001851 .00010570 .00000895
.00009309 .00001079 .00000526 4.57
8.00 .00000638 .00000289 .00007277 4.81 .00004266 .00001892 .00010091 .00000972
.00009083 .00001079 .00000441 4.39
5.00 .00000778 .00000326 .00007568 4.77 .00004491 .00002016 .00010797 .00000895
.00008970 .00001338 .00000560 4.61
2.00 .00000760 .00000295 .00007277 4.78 .00004316 .00001851 .00010265 .00001125
.00008829 .00001134 .00000374 4.16
```

OUTPUT FILES

old,tape2

```
  9.50 .1579E-04 .3260E-05 .7193E-04  4.39 .3069E-04 .1234E-04
.6568E-04 .7420E-05 .9422E-04 .2098E-04 .5190E-05  3.58
COUNT=  9.0
 .3402E-05 .7943E-10 .1695E-24
 1071.     .9458E+07 .4782E+13 .8502E+17 .4381E+20 .7041E+21
 858.2     .6395E+05 .3628E-06 .6537E-10
    .00036   1.00008    .97662    .90969    .80819
 .1592E-03 .4425E-04 .4171E-04 .2385E-03
      -.475E-05       -.352E-06       -.188E-06       -.242E-12
       .386E-04       -.176E-04        .296E-06       -.151E-09        .252E-14
      -.221E-06       -.108E-08        .722E-04       -.991E-06       -.422E-07
  7.50 .1231E-04 .3210E-05 .7454E-04  4.58 .3293E-04 .1275E-04
.6351E-04 .1432E-04 .8096E-04 .1579E-04 .3480E-05  2.61
COUNT=  5.0
 .2925E-05 .7943E-10 .9690E-25
 1025.     .9327E+07 .4662E+13 .8237E+17 .4260E+20 .6882E+21
 835.1     .6169E+05 .3526E-06 .6844E-10
    .00036   1.00008    .97635    .90871    .80623
 .1692E-03 .3093E-04 .2694E-04 .2293E-03
       .743E-05        .734E-06        .705E-06        .124E-11
       .302E-05        .690E-07        .584E-10        .152E-14        .129E-20
       .346E-06        .172E-08        .742E-04        .503E-07        .132E-08
  4.00 .1549E-04 .3320E-05 .7922E-04  4.61 .3019E-04 .1234E-04
.6829E-04 .3840E-05 .5049E-04 .1872E-04 .3220E-05  2.57
COUNT=  8.0
 .2234E-05 .7943E-10 .3573E-25
 948.1     .9097E+07 .4456E+13 .7783E+17 .4053E+20 .6607E+21
 795.4     .5785E+05 .3351E-06 .7428E-10
    .00036   1.00008    .97602    .90747    .80376
 .1572E-03 .3930E-04 .2515E-04 .2080E-03
       .992E-05        .800E-06        .108E-05        .804E-12
       .316E-05        .570E-07        .385E-10        .812E-15        .564E-21
       .465E-06        .241E-08        .788E-04        .405E-07        .921E-09
  2.00 .1809E-04 .3210E-05 .8297E-04  4.62 .3219E-04 .1275E-04
.7482E-04 .7160E-05 .4175E-04 .2150E-04 .3410E-05  2.55
COUNT=  8.0
 .1910E-05 .7943E-10 .1998E-25
 905.8     .8966E+07 .4340E+13 .7531E+17 .3937E+20 .6452E+21
 773.2     .5572E+05 .3253E-06 .7791E-10
    .00037   1.00009    .97524    .90459    .79803
 .1719E-03 .5218E-04 .2460E-04 .2082E-03
      -.562E-05       -.395E-06       -.635E-06       -.277E-12
       .461E-04       -.215E-04        .377E-06       -.209E-09        .384E-14
      -.268E-06       -.145E-08        .832E-04       -.106E-05       -.225E-07
```

old,tape3

```
 .00000660 4.39 3.58
-.00000228 4.58 2.61
 .00001365 4.61 2.57
 .00004041 4.62 2.55
```

```
      PROGRAM SIMAL(OUTPUT,TAPE1,TAPE2,TAPE3,TAPE4,TAPE6=OUTPUT,TAPE7,TAPE8)
      COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
      COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(500)
      COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
      COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
      COMMON Z(500),W(500),U(500),U4(500)
      COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
      COMMON KSO,SKM,SMAL,SPCO2
      COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
      COMMON LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
      COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
      COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
      COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
      COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
      COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
      COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
      COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
      COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
      COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
      REAL   KSO,LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      REAL   K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
C    P=PRECIPITATION AT EACH TIME STEP (CM/HR)
C    Q1=STREAM FLOW AT SITE 1 (M3/S)
C    Q2=STREAM FLOW AT SITE 2 (M3/S)
C    Q3=STREAM FLOW AT SITE 3 (M3/S)
C    MAXT=MAX NUMBER OF TIME STEPS
C    DELT=TIME STEP (HR)
C    R=RELEASE RATE FROM SOIL (1/HR)
C    VSOIL=VOL OF WATER IN SOIL COMPARTMENT (M3)
C    VMIN=MIN VOL OF WATER IN SOIL COMPARTMENT (M3)
C    VMAX=MAX VOL OF WATER IN SOIL COMPARTMENT (M3)
C    VS=VOLUME OF STREAM SEGMENT (M3)
C    L=LATERAL FLOW FROM SOIL COMPARTMENT (M3/S)
C    A=WATERSHED DRAINAGE AREA (M2)
C    D=DEPTH OF SOIL COMPARTMENT (M)
C    MOISTF=FIELD CAPACITY MOISTURE CONTENT
C    MOISTS=SATURATED MOISTURE CONTENT
C    MOISTI=INITIAL MOISTURE CONTENT
C    VTOTAL=TOTAL VOLUME OF SOIL COMPARTMENT (M3)
C    KP=SO4 PARTITIONING COEFFICIENT (MG/KG/MG/L)
C    DENB=SOIL BULK DENSITY (GM/CM3)
C    STSO4I=INITIAL SOIL TOTAL SO4 (KG)
C    PSO4=PRECIPITATION SO4 (MG/L)
C    STSO4=TOTAL SOIL SO4 (GM)
C    SOLSO4=SOLUTION SOIL SO4 (MG/L)
C    SORSO4=SORBED SOIL SO4 (MG/KG)
C    SSO4=SOIL SOLUTION SULFATE (MOL/L)
C    ST=SOIL TEMPERATURE (K)
C    KSO=GIBBSITE SOLUBILITY CONSTANT
C    SKM=SELECTIVITY COEF (XK+M=K+XM)
C    SMAL=SELECTIVITY COEF (XM+AL=M+XAL)
C    KCO2=
C    KH=HENRY'S LAW CONSTANT FOR CO2
C    SPCO2=SOIL CO2 PARTIAL PRESSURE
C    EAL=EXCHANGEABLE AL FRACTION
C    EM=EXCHANGEABLE DIVALENT CATION (CA+MG) FRACTION
C    EK=EXCHANGEABLE K FRACTION
C    ZI=IONIC STRENGTH
C    F0,F1,F2,F3=ACTIVITY COEF'S
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```
C    ASH=ACTIVITY OF SOIL H
C    SH=SOIL H (MOL/L)
C    SAL=SOIL AL (MOL/L)
C    SHCO3=SOIL HCO3 (MOL/L)
C    SM=SOIL DIVALENT CATION, CA+MG (MOL/L)
C    SK=SOIL K (MOL/L)
C
 CALL IN
 CALL HYDRO
 CALL SULFATE
 CALL TEMPCOR
 CALL SCHEM
 CALL MASSBAL
 CALL STREAM
 CALL OUT
C
 STOP
 END
C
C    SUBROUTINE READS INPUT DATA
C
 SUBROUTINE IN
 COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
 COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(500)
 COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
 COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
 COMMON Z(500),W(500),U(500),U4(500)
 COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
 COMMON KSO,SKM,SMAL,SPCO2
 COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
 COMMON LKSO,LSKM,LSMAL,LPCO2,LSPCO2
 COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
 COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
 COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
 COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
 COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
 COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
 COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
 COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
 COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
 COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
 REAL   KSO,LKSO,LSKM,LSMAL,LPCO2,LSPCO2
 REAL   K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
 READ(1,10) MAXT,DELT,R,MOISTF,MOISTS,MOISTI
 10 FORMAT(I10,5F10.0)
 WRITE(2,15) MAXT,DELT,R,MOISTF,MOISTS,MOISTI
 15 FORMAT(1X,I10,F10.1,F10.4,3F10.2)
 READ(1,16) A,D
 16 FORMAT(2F10.0)
 WRITE(2,17) A,D
 17 FORMAT(1X,F10.1,F10.2)
 READ(1,20) (P(I),I=1,MAXT)
 20 FORMAT(6F10.0)
 WRITE(2,21) (P(I),I=1,MAXT)
 21 FORMAT(1X,6F10.4)
 READ(1,25) (Q1(I),I=1,MAXT)
 25 FORMAT(6F10.0)
 WRITE(2,26) (Q1(I),I=1,MAXT)
 26 FORMAT(1X,6F10.4)
 READ(1,30) (Q2(I),I=1,MAXT)
 30 FORMAT(6F10.0)
```

```
      WRITE(2,31) (Q2(I),I=1,MAXT)
   31 FORMAT(1X,6F10.4)
      READ(1,35) KP,DENB,STSO4I
   35 FORMAT(3F10.0)
      WRITE(2,36) KP,DENB,STSO4I
   36 FORMAT(1X,3F10.2)
      READ(1,40) (PSO4(I),I=1,MAXT)
   40 FORMAT(6F10.0)
      WRITE(2,41) (PSO4(I),I=1,MAXT)
   41 FORMAT(1X,6F10.2)
      READ(1,45) LKSO,LSKM,LSMAL,LPCO2,LSPCO2,EQCDOC
   45 FORMAT(6F10.0)
      WRITE(2,46) LKSO,LSKM,LSMAL,LPCO2,LSPCO2,EQCDOC
   46 FORMAT(1X,6F10.2)
      READ(1,47) EAL,EM,EK,TEMP
   47 FORMAT(4F10.0)
      WRITE(2,48) EAL,EM,EK,TEMP
   48 FORMAT(4F10.3)
      READ(4,50) (ZK1(I),I=1,MAXT)
   50 FORMAT(6F10.0)
      WRITE(2,51) (ZK1(I),I=1,MAXT)
   51 FORMAT(1X,6F10.4)
      READ(4,55) (ZK2(I),I=1,MAXT)
   55 FORMAT(6F10.0)
      WRITE(2,56) (ZK2(I),I=1,MAXT)
   56 FORMAT(1X,6F10.4)
      READ(4,60) (ZM21(I),I=1,MAXT)
   60 FORMAT(6F10.0)
      WRITE(2,61) (ZM21(I),I=1,MAXT)
   61 FORMAT(1X,6F10.4)
      READ(4,65) (ZM22(I),I=1,MAXT)
   65 FORMAT(6F10.0)
      WRITE(2,66) (ZM22(I),I=1,MAXT)
   66 FORMAT(1X,6F10.4)
      READ(4,70) (SO41(I),I=1,MAXT)
   70 FORMAT(6F10.0)
      WRITE(2,71) (SO41(I),I=1,MAXT)
   71 FORMAT(1X,6F10.4)
      READ(4,75) (SO42(I),I=1,MAXT)
   75 FORMAT(6F10.0)
      WRITE(2,76) (SO42(I),I=1,MAXT)
   76 FORMAT(1X,6F10.4)
      READ(4,80) (DOC(I),I=1,MAXT)
   80 FORMAT(6F10.0)
      WRITE(2,81) (DOC(I),I=1,MAXT)
   81 FORMAT(1X,6F10.4)
      READ(4,85) (TF(I),I=1,MAXT)
   85 FORMAT(6F10.0)
      WRITE(2,86) (TF(I),I=1,MAXT)
   86 FORMAT(1X,6F10.4)
      READ(4,90) (ZNA(I),I=1,MAXT)
   90 FORMAT(6F10.0)
      WRITE(2,91) (ZNA(I),I=1,MAXT)
   91 FORMAT(1X,6F10.4)
      READ(4,95) (CL(I),I=1,MAXT)
   95 FORMAT(6F10.0)
      WRITE(2,96) (CL(I),I=1,MAXT)
   96 FORMAT(1X,6F10.4)
      READ(4,97) (SDOC(I),I=1,MAXT)
   97 FORMAT(6F10.0)
```

```
      WRITE(2,98) (SDOC(I),I=1,MAXT)
   98 FORMAT(1X,6F10.2)
C
      RETURN
      END
C
C     SUBROUTINE WRITES OUTPUT DATA
C
      SUBROUTINE OUT
      COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
      COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(5
      COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
      COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
      COMMON Z(500),W(500),U(500),U4(500)
      COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
      COMMON KSO,SKM,SMAL,SPCO2
      COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
      COMMON LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
      COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
      COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
      COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
      COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
      COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
      COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
      COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
      COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
      COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
      REAL   KSO,LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      REAL   K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
      WRITE(3,200) (I,VSOIL(I),MOIST(I),L(I),VS(I),Q3(I),I=1,MAXT)
  200 FORMAT(1X,I5,F10.1,F10.3,F10.4,F10.1,F10.4)
C
      WRITE(3,210) (I,STSO4(I),SOLSO4(I),SORSO4(I),SSO4(I),I=1,MAXT)
  210 FORMAT(1X,I3,F15.2,2F10.2,F12.8)
C
      WRITE(3,230) (I,SAL(I),SK(I),SM(I),SH(I),SHCO3(I),I=1,MAXT)
  230 FORMAT(1X,I5,5G10.4)
C
      WRITE(3,240) (I,ZK(I),ZM2(I),SO4(I),DOC(I),TF(I),I=1,MAXT)
  240 FORMAT(1X,I5,5G10.4)
C     /
      WRITE(3,250) (I,PH(I),AL(I),FF(I),I=1,MAXT)
  250 FORMAT(1X,I5,F5.2,2G10.4)
C
      WRITE(3,255) (I,ALIN(I),ALORG(I),ALTOT(I),ANC(I),I=1,MAXT)
  255 FORMAT(1X,I5,3F8.2,G10.4)
C
      WRITE(7,260) (I+11,PH(I),I=1,MAXT)
      WRITE(7,260) (I+11,ALTOT(I),I=1,MAXT)
      WRITE(7,260) (I+11,ALORG(I),I=1,MAXT)
  260 FORMAT(1X,I5,F10.2)
      WRITE(8,265) (I+11,ANC(I),I=1,MAXT)
  265 FORMAT(1X,I5,F10.2)
C
      RETURN
      END
C
```

```
C    SUBROUTINE CALCULATES THE HYDROLOGIC INFORMATION
C
 SUBROUTINE HYDRO
 COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
 COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(500)
 COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
 COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
 COMMON Z(500),W(500),U(500),U4(500)
 COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
 COMMON KS0,SKM,SMAL,SPCO2
 COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
 COMMON LKS0,LSKM,LSMAL,LPCO2,LSPCO2
 COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
 COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
 COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
 COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
 COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
 COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(
 COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
 COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
 COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
 REAL    KS0,LKS0,LSKM,LSMAL,LPCO2,LSPCO2
 REAL    K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
 VTOTAL=A*D
 VMIN=MOISTF*VTOTAL
 VMAX=MOISTS*VTOTAL
 VSOIL(1)=MOISTI*VTOTAL
C
 DO 75 I=1,MAXT
 IF(VSOIL(I).LE.VMAX) GO TO 45
 Q0(I)=(VSOIL(I)-VMAX)/(DELT*3600)
 VSOIL(I)=VMAX
 GO TO 50
 45 IF(VSOIL(I).GE.VMIN) GO TO 49
 VSOIL(I+1)=VSOIL(I)+DELT*P(I)*A/100
 Q0(I)=0.0
 L(I)=0.0
 Q3(I)=Q1(I)+Q2(I)
 VS(I)=Q3(I)*DELT*3600
 GO TO 75
 49 Q0(I)=0.0
 50 IF(I.GE.5) GO TO 51
    L(I)=R*(VSOIL(I)-VMIN)/3600
    Q3(I)=Q0(I)+Q1(I)+Q2(I)+L(I)
    VS(I)=Q3(I)*DELT*3600
C
C     RUNGE-KUTTA ROUTINE FOR CALCULATING NEXT TIME STEP VOL
C
    K1=DELT*(P(I)*A/100-R*(VSOIL(I)-VMIN))
    K2=DELT*(P(I)*A/100-R*(VSOIL(I)+K1/2.0-VMIN))
    K3=DELT*(P(I)*A/100-R*(VSOIL(I)+K2/2.0-VMIN))
    K4=DELT*(P(I)*A/100-R*(VSOIL(I)+K3-VMIN))
C
 VSOIL(I+1)=VSOIL(I)+(K1+2.0*K2+2.0*K3+K4)/6.0
C
 GO TO 75
C
 51 L(I)=R*(VSOIL(I-4)-VMIN)/3600
    Q3(I)=Q0(I)+Q1(I)+Q2(I)+L(I)
    VS(I)=Q3(I)*DELT*3600
```

```
C
      K1=DELT*(P(I)*A/100-R*(VSOIL(I-4)-VMIN))
      K2=DELT*(P(I)*A/100-R*(VSOIL(I-4)+K1/2.0-VMIN))
      K3=DELT*(P(I)*A/100-R*(VSOIL(I-4)+K2/2.0-VMIN))
      K4=DELT*(P(I)*A/100-R*(VSOIL(I-4)+K3-VMIN))
C
 VSOIL(I+1)=VSOIL(I)+(K1+2.0*K2+2.0*K3+K4)/6.0
C
 75 CONTINUE
C
 DO 80 I=1,MAXT
      MOIST(I)=VSOIL(I)/VTOTAL
 80 CONTINUE
C
 RETURN
 END
C
C    SUBROUTINE CALCULATES SO4 IN THE SOIL COMPARTMENT
C
 SUBROUTINE SULFATE
 COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
 COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
 COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
 COMMON Z(500),W(500),U(500),U4(500)
 COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
 COMMON KSO,SKM,SMAL,SPCO2
 COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
 COMMON LKSO,LSKM,LSMAL,LPCO2,LSPCO2
 COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
 COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
 COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
 COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
 COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
 COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
 COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
 COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
 COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
 COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
 REAL   KSO,LKSO,LSKM,LSMAL,LPCO2,LSPCO2
 REAL   K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
 STSO4(1)=STSO4I*1000.0
C
C
 DO 150 I=1,MAXT
C
 Z(I)=P(I)*A/360000.0
 U(I)=KP*DENB*VTOTAL+VSOIL(I)
C
 IF(I.GE.7) GO TO 160
C
C    RUNGE-KUTTA ROUTINE FOR CALCULATING NEXT TIME STEP SO4
C
 SK1=DELT*3600.0*(Z(I)*PSO4(I)-L(I)*STSO4(I)/U(I))
 SK2=DELT*3600.0*(Z(I)*PSO4(I)-(L(I)/U(I))*(STSO4(I)+SK1/2.0))
 SK3=DELT*3600.0*(Z(I)*PSO4(I)-(L(I)/U(I))*(STSO4(I)+SK2/2.0))
 SK4=DELT*3600.0*(Z(I)*PSO4(I)-(L(I)/U(I))*(STSO4(I)+SK3))
C
 STSO4(I+1)=STSO4(I)+(SK1+2.0*SK2+2.0*SK3+SK4)/6.0
C
```

```
 SOLSO4(I)=STSO4(I)/U(I)
 SORSO4(I)=KP*SOLSO4(I)
 SSO4(I)=SOLSO4(I)/96020.0
C
 GO TO 150
C
 160 U4(I)=KP*DENB*VTOTAL+VSOIL(I-6)
C
C    RUNGE-KUTTA ROUTINE FOR CALCULATING NEXT TIME STEP SO4
C
 SK1=DELT*3600.0*(Z(I)*PSO4(I)-L(I)*STSO4(I-6)/U4(I))
 SK2=DELT*3600.0*(Z(I)*PSO4(I)-(L(I)/U4(I))*(STSO4(I-6)+SK1/2.0))
 SK3=DELT*3600.0*(Z(I)*PSO4(I)-(L(I)/U4(I))*(STSO4(I-6)+SK2/2.0))
 SK4=DELT*3600.0*(Z(I)*PSO4(I)-(L(I)/U4(I))*(STSO4(I-6)+SK3))
C
 STSO4(I+1)=STSO4(I)+(SK1+2.0*SK2+2.0*SK3+SK4)/6.0
C
 SOLSO4(I)=STSO4(I)/U(I)
 SORSO4(I)=KP*SOLSO4(I)
 SSO4(I)=SOLSO4(I-6)/96020.0
C
 150 CONTINUE
C
 RETURN
 END
C
C    SUBROUTINE CALCULATES EQUILIBRIUM SOIL CHEMISTRY
C
 SUBROUTINE SCHEM
 COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
 COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(500)
 COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
 COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
 COMMON Z(500),W(500),U(500),U4(500)
 COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
 COMMON KS0,SKM,SMAL,SPCO2
 COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
 COMMON LKS0,LSKM,LSMAL,LPCO2,LSPCO2
 COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
 COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
 COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
 COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
 COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
 COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
 COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
 COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
 COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
 COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
 REAL   KS0,LKS0,LSKM,LSMAL,LPCO2,LSPCO2
 REAL   K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
C   NEWTONS METHOD FOR SOLVING NONLINAER EQUATIONS
C
 DO 600 I=1,MAXT
C
C   SETS INITIAL CONDITIONS
C
 F0=1.0
 F1=1.0
 F2=1.0
 F3=1.0
 ZI=0.0
```

```
      CON1=KSO**2*SMAL*EM**3/EAL**2
      CON2=SKM*EK**2/EM
      COUNT=0.0
      ASH(I)=.00001
      580 COUNT=COUNT+1.0
      SF=3.0*KSO*ASH(I)**3/F3+2.0*CON1**.33*ASH(I)**2/F2
     +   +(1/F1+CON2**.5*CON1**.167/F1)*ASH(I)
     +   -XKCO21*XKH*SPCO2/(F1*ASH(I))-2.0*SSO4(I)-EQCDOC*SDOC(I)
      DSF=9.0*KSO*ASH(I)**2/F3+4.0*CON1**.33*ASH(I)/F2
     +    +(1/F1+CON2**.5*CON1**.167/F1)
     +    +XKCO21*XKH*SPCO2/(F1*ASH(I)**2)
      OLDASH=ASH(I)
      ASH(I)=ASH(I)-SF/DSF
C
C   CALCULATES MOLAR CONCENTRATIONS
C
      SH(I)=ASH(I)/F1
      SAL(I)=KSO*ASH(I)**3/F3
      SHCO3(I)=XKCO21*XKH*SPCO2/(F1*ASH(I))
      SM(I)=CON1**.33*ASH(I)**2/F2
      SK(I)=CON2**.5*CON1**.167*ASH(I)/F1
C
      CALL IONAD2(I)
C
      IF(COUNT.GE.20.0) CALL ERR2(COUNT)
      CASH=ASH(I)-OLDASH
      IF(ABS(CASH/OLDASH).LE.0.0001) GO TO 600
      GO TO 580
      600 CONTINUE
C
      RETURN
      END
C
C   SUBROUTINE CALCULATES ACTIVITY COEF FOR SOIL CHEMISTRY
C
      SUBROUTINE IONAD2(I)
      COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
      COMMON P(500),PSO4(500),QO(500),Q1(500),Q2(500),Q3(500)
      COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
      COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
      COMMON Z(500),W(500),U(500),U4(500)
      COMMON FO,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
      COMMON KSO,SKM,SMAL,SPCO2
      COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
      COMMON LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
      COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
      COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
      COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
      COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
      COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
      COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
      COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
      COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
      COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
      REAL    KSO,LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      REAL    K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
      ZI3=SAL(I)*9.0
      ZI2=(SM(I)+SSO4(I))*4.0
      ZI1=SK(I)+SH(I)+SHCO3(I)
      ZI=ZI1+ZI2+ZI3
```

```
      A=1825000.0*(78.54*T)**(-1.5)
      F1=10**(-A*SQRT(ZI)/(1+SQRT(ZI)))
      F2=10**(-A*4.0*SQRT(ZI)/(1+SQRT(ZI)))
      F3=10**(-A*9.0*SQRT(ZI)/(1+SQRT(ZI)))
C
      RETURN
      END
C
C     SUBROUTINE WRITES DIVERGENCE ERROR FROM NEWTON'S METHOD
C
      SUBROUTINE ERR2(COUNT)
      WRITE(6,650) COUNT
  650 FORMAT(1X,22HSOIL CHEM ERROR COUNT=,F5.1)
C
      STOP
      END
C
C     SUBROUTINE CALCULATES STREAMWATER
C     MASS BALANCE FOR  K,M2+,SO4
C
      SUBROUTINE MASSBAL
      COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
      COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(500)
      COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
      COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
      COMMON Z(500),W(500),U(500),U4(500)
      COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
      COMMON KSO,SKM,SMAL,SPCO2
      COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
      COMMON LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
      COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
      COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
      COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
      COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
      COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
      COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
      COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
      COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
      REAL    KSO,LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      REAL    K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
      DO 540 I=1,MAXT
      ZK1(I)=ZK1(I)*.000001
      ZK2(I)=ZK2(I)*.000001
      ZM21(I)=ZM21(I)*.000001
      ZM22(I)=ZM22(I)*.000001
      SO41(I)=SO41(I)*.000001
      SO42(I)=SO42(I)*.000001
      TF(I)=TF(I)*.000001
      ZNA(I)=ZNA(I)*.000001
      CL(I)=CL(I)*.000001
  540 CONTINUE
C
      DO 550 I=1,MAXT
      ZK(I)=(Q1(I)*ZK1(I)+Q2(I)*ZK2(I)+L(I)*SK(I))/Q3(I)
      ZM2(I)=(Q1(I)*ZM21(I)+Q2(I)*ZM22(I)+L(I)*SM(I))/Q3(I)
      SO4(I)=(Q1(I)*SO41(I)+Q2(I)*SO42(I)+L(I)*SSO4(I))/Q3(I)
  550 CONTINUE
C
      RETURN
      END
```

```
C
C      SUBROUTINE SOLVES THE STREAMWATER CHARGE AND MASS
C      BALANCE EQUATIONS USING NEWTON'S METHOD
C
 SUBROUTINE STREAM
 COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
 COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(500)
 COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
 COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
 COMMON Z(500),W(500),U(500),U4(500)
 COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
 COMMON KS0,SKM,SMAL,SPCO2
 COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
 COMMON LKS0,LSKM,LSMAL,LPCO2,LSPCO2
 COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
 COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
 COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
 COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
 COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
 COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
 COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
 COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
 COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
 COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
 REAL    KS0,LKS0,LSKM,LSMAL,LPCO2,LSPCO2
 REAL    K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
 GUESS=.00001
C      CALCULATES CONCENTRATIONS FOR EACH TIME STEP
 DO 805 I=1,MAXT
C      SETS INITIAL CONDITIONS
 N=2
 COUNT=0.0
 AH(I)=GUESS
 PRINT(6,*) I
 AFF(I)=0.5*TF(I)
 F0=1.0
 F1=1.0
 F2=1.0
 F3=1.0
 ZI=0.0
 PH(I)=-ALOG10(AH(I))
 700 COUNT=COUNT+1.0
 IF(PH(I).LE.4.75) GO TO 710
 KS0=10**(8.77)
 GO TO 720
 710 KS0=10**(8.11)
C       NONLINEAR EQUATIONS TO BE SOLVED
 720 F(1)=AH(I)/F1+ZK(I)+2.0*ZM2(I)+3.0*KS0*AH(I)**3/F3
+     +2.0*XKOH1*KS0*AH(I)**2/F2+XKOH2*KS0*AH(I)/F1
+     +2.0*XKF1*KS0*AH(I)**3*AFF(I)/F2
+     +XKF2*KS0*AH(I)**3*AFF(I)**2/F1
+     +XKSO41*KS0*F2*AH(I)**3*SO4(I)/F1+ZNA(I)
+     -2.0*SO4(I)-XKCO21*XKH*PCO2/(F1*AH(I))
+     -2.0*XKCO21*XKCO22*XKH*PCO2/(F2*AH(I)**2)
+     -XKOH4*KS0/(F1*AH(I))-XKF4*KS0*AH(I)**3*AFF(I)**4/F1
+     -2.0*XKF5*KS0*AH(I)**3*AFF(I)**5/F2
+     -3.0*XKF6*KS0*AH(I)**3*AFF(I)**6/F3
+     -AFF(I)/F1-XKSO42*KS0*F2**2*SO4(I)**2*AH(I)**3/F1
+     -XKW/(F1*AH(I))-EQCDOC*DOC(I)-CL(I)
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```
      F(2)=AH(I)*AFF(I)/(XKHF*FO)+AFF(I)/F1
     +     +XKF1*KSO*AH(I)**3*AFF(I)/F2
     +     +2.0*XKF2*KSO*AH(I)**3*AFF(I)**2/F1
     +     +3.0*XKF3*KSO*AH(I)**3*AFF(I)**3/FO
     +     +4.0*XKF4*KSO*AH(I)**3*AFF(I)**4/F1
     +     +5.0*XKF5*KSO*AH(I)**3*AFF(I)**5/F2
     +     +6.0*XKF6*KSO*AH(I)**3*AFF(I)**6/F3-TF(I)
C     CHANGES FUNCTIONS TO NEGATIVE VALUES
      DO 725 K=1,N
      F(K)=-F(K)
      725 CONTINUE
C     SETS JACOBIAN MATRIX DF(XI)/DXI
      ZJ(1,1)=1.0/F1+9.0*KSO*AH(I)**2/F3+4.0*XKOH1*KSO*AH(I)/F2
     +       +XKOH2*KSO/F1+6.0*XKF1*KSO*AH(I)**2*AFF(I)/F2
     +       +3.0*XKF2*KSO*AH(I)**2*AFF(I)**2/F1
     +       +3.0*XKSO41*KSO*F2*SO4(I)*AH(I)**2/F1
     +       +XKCO21*XKH*PCO2/(F1*AH(I)**2)
     +       +4.0*XKCO21*XKCO22*XKH*PCO2/(F2*AH(I)**3)
     +       +XKOH4*KSO/(F1*AH(I)**2)
     +       -3.0*XKF4*KSO*AH(I)**2*AFF(I)**4/F1
     +       -6.0*XKF5*KSO*AH(I)**2*AFF(I)**5/F2
     +       -9.0*XKF6*KSO*AH(I)**2*AFF(I)**6/F3
     +       -3.0*XKSO42*KSO*F2**2*SO4(I)**2*AH(I)**2/F1
     +       +XKW/(F1*AH(I)**2)
      ZJ(1,2)=2.0*XKF1*KSO*AH(I)**3/F2+2.0*XKF2*KSO*AH(I)**3*AFF(I)/F1
     +        -4.0*XKF4*KSO*AH(I)**3*AFF(I)**3/F1
     +        -10.0*XKF5*KSO*AH(I)**3*AFF(I)**4/F2
     +        -18.0*XKF6*KSO*AH(I)**3*AFF(I)**5/F3-1.0/F1
      ZJ(2,1)=AFF(I)/(XKHF*FO)+3.0*XKF1*KSO*AH(I)**2*AFF(I)/F2
     +        +6.0*XKF2*KSO*AH(I)**2*AFF(I)**2/F1
     +        +9.0*XKF3*KSO*AH(I)**2*AFF(I)**3/FO
     +        +12.0*XKF4*KSO*AH(I)**2*AFF(I)**4/F1
     +        +15.0*XKF5*KSO*AH(I)**2*AFF(I)**5/F2
     +        +18.0*XKF6*KSO*AH(I)**2*AFF(I)**6/F3
      ZJ(2,2)=AH(I)/(XKHF*FO)+1.0/F1+XKF1*KSO*AH(I)**3/F2
     +        +4.0*XKF2*KSO*AH(I)**3*AFF(I)/F1
     +        +9.0*XKF3*KSO*AH(I)**3*AFF(I)**2/FO
     +        +16.0*XKF4*KSO*AH(I)**3*AFF(I)**3/F1
     +        +25.0*XKF5*KSO*AH(I)**3*AFF(I)**4/F2
     +        +36.0*XKF6*KSO*AH(I)**3*AFF(I)**5/F3
C     CALLS SUBROUTINE TO SOLVE LINEAR SYSTEM OF EQUATIONS
C        . ZJ(I,J)*Y(J)=-F(I)
      CALL SOLVE
C     ADDS CHANGE OF ACTIVITIES TO EXISTING ACTIVITIES
      AH(I)=AH(I)+Y(1)
      AFF(I)=AFF(I)+Y(2)
      IF(AH(I).LE.0.0) GO TO 799
C     CALCULATES SPECIES ACTIVITIES
      AAL=KSO*AH(I)**3
      AALOH=XKOH1*AAL/AH(I)
      AALOH2=XKOH2*AAL/AH(I)**2
      AALOH3=XKOH3*AAL/AH(I)**3
      AALOH4=XKOH4*AAL/AH(I)**4
      AALSO4=XKSO41*AAL*F2*SO4(I)
      AALSO42=XKSO42*AAL*F2**2*SO4(I)**2
      AALF=XKF1*AAL*AFF(I)
      AALF2=XKF2*AAL*AFF(I)**2
      AALF3=XKF3*AAL*AFF(I)**3
      AALF4=XKF4*AAL*AFF(I)**4
      AALF5=XKF5*AAL*AFF(I)**5
      AALF6=XKF6*AAL*AFF(I)**6
      AHF=AH(I)*AFF(I)/XKHF
```

```
      AHCO3=XKCO21*XKH*PCO2/AH(I)
      ACO3=XKCO22*AHCO3/AH(I)
      AOH=XKW/AH(I)
C     CALCULATES CONC FROM ACTIVITIES AND ACTIVITY COEF'S
      AL(I)=AAL/F3
      ALOH(I)=AALOH/F2
      ALOH2(I)=AALOH2/F1
      ALOH3(I)=AALOH3/F0
      ALOH4(I)=AALOH4/F1
      ALSO4(I)=AALSO4/F1
      ALSO42(I)=AALSO42/F1
      ALF(I)=AALF/F2
      ALF2(I)=AALF2/F1
      ALF3(I)=AALF3/F0
      ALF4(I)=AALF4/F1
      ALF5(I)=AALF5/F2
      ALF6(I)=AALF6/F3
      HF(I)=AHF/F0
      HCO3(I)=AHCO3/F1
      CO3(I)=ACO3/F2
      OH(I)=AOH/F1
      H(I)=AH(I)/F1
      PH(I)=-ALOG10(AH(I))
      FF(I)=AFF(I)/F1
C     CALLS IONIC STRENTH ADJUSTMENT SUBROUTINE
      CALL IONAD(I)
C     CHECKS TOLERENCE
      IF(ABS(Y(1)/AH(I)).LE.0.0001) GO TO 790
      GO TO 798
      790 IF(ABS(Y(2)/AFF(I)).LE.0.0001) GO TO 800
C
      798 IF(COUNT.GE.40)  CALL ERR(COUNT)
      GO TO 700
      799 AH(I)=GUESS+0.5*GUESS
      GO TO 700
      800 GUESS=AH(I)
C
      ALIN(I)=(AL(I)+ALOH(I)+ALOH2(I)+ALOH3(I)+ALOH4(I)+ALSO4(I)+ALSO42(I)+
     +          ALF(I)+ALF2(I)+ALF3(I)+ALF4(I)+ALF5(I)+ALF6(I))*27000000.
      ALORG(I)=23.46*DOC(I)**1.084*ALIN(I)**0.022
      ALTOT(I)=ALIN(I)+ALORG(I)
      ALIN(I)=ALIN(I)/27.
      ALORG(I)=ALORG(I)/27.
      ALTOT(I)=ALTOT(I)/27.
      ANC(I)=HCO3(I)+2*CO3(I)+ALOH(I)+2*ALOH2(I)+3*ALOH3(I)+
     +       4*ALOH4(I)+OH(I)-H(I)
      ANC(I)=ANC(I)*1000000.
C
      805 CONTINUE
C
      RETURN
      END
C
```

```
C   SUBROUTINE ADJUSTS THE EQUILIBRIUM CONSTANTS (K'S)
C                FOR TEMPERATURE
C
 SUBROUTINE TEMPCOR
 COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
 COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(500)
 COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
 COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
 COMMON Z(500),W(500),U(500),U4(500)
 COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
 COMMON KSO,SKM,SMAL,SPCO2
 COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
 COMMON LKSO,LSKM,LSMAL,LPCO2,LSPCO2
 COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
 COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
 COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
 COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
 COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
 COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
 COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
 COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
 COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
 COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
 REAL    KSO,LKSO,LSKM,LSMAL,LPCO2,LSPCO2
 REAL    K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
C     CHANGES UEQ/L ORGANIC CHARGE TO EQ/L
C
 EQCDOC=EQCDOC*.000001
C
C     LOG K= LOG K298 - (HO/2.303*R)*(1/T-1/298)
C          R=1.987 CAL/K-MOL
C
 T=273.15+TEMP
 CON=(1/T-1/298.15)/4.5761
C      LOG K
 ZKOH1=-4.99-11900*CON
 ZKOH2=-10.10
 ZKOH3=-16.0
 ZKOH4=-23.0-44060.*CON
 ZKF1=7.01-1100.*CON
 ZKF2=12.75-2000.*CON
 ZKF3=17.02-2200.*CON
 ZKF4=19.72-2200.*CON
 ZKF5=20.91-1800.*CON
 ZKF6=20.86
 ZKSO41=3.02-2150.*CON
 ZKSO42=4.92-2840.*CON
 ZKCO21=-6.35+2247.*CON
 ZKCO22=-10.33-3617.*CON
 ZKHF=-3.169+3460.*CON
 ZKW=-4470.99/T+6.0875-0.01706*T
 ZKH=-1.5
 ZKSO=LKSO
C      K
 XKOH1=10**(ZKOH1)
 XKOH2=10**(ZKOH2)
 XKOH3=10**(ZKOH3)
 XKOH4=10**(ZKOH4)
 XKF1=10**(ZKF1)
```

```
      XKF3=10**(ZKF3)
      XKF4=10**(ZKF4)
      XKF5=10**(ZKF5)
      XKF6=10**(ZKF6)
      XKSO41=10**(ZKSO41)
      XKSO42=10**(ZKSO42)
      XKCO21=10**(ZKCO21)
      XKCO22=10**(ZKCO22)
      XKHF=10**(ZKHF)
      XKW=10**(ZKW)
      XKH=10**(ZKH)
      KSO=10**(ZKSO)
      SKM=10**(LSKM)
      SMAL=10**(LSMAL)
      PCO2=10**(LPCO2)
      SPCO2=10**(LSPCO2)
C
      RETURN
      END
C
C     SUBROUTINE CALCULATES THE ACTIVITY COEF FROM THE
C        IONIC STRENGTH USING THE GUNTELBERG APPROXIMATION
C
      SUBROUTINE IONAD(I)
      COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
      COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(500)
      COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
      COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
      COMMON Z(500),W(500),U(500),U4(500)
      COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
      COMMON KSO,SKM,SMAL,SPCO2
      COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
      COMMON LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
      COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
      COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
      COMMON XKHF,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
      COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
      COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
      COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
      COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
      COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
      COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
      REAL   KSO,LKSO,LSKM,LSMAL,LPCO2,LSPCO2
      REAL   K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
      REAL LOGF0,LOGF1,LOGF2,LOGF3
C
      ZI3=AL(I)*9.0
      ZI2=(ZM2(I)+SO4(I)+ALOH(I)+ALF(I)+ALF5(I))*4.0
      ZI1=ZK(I)+H(I)+ALOH2(I)+ALOH4(I)+ALF2(I)+ALF4(I)+ALSO4(I)+ALSO42(I)
      ZI=(ZI1+ZI2+ZI3)/2.0
      A=1825000.0*(78.54*T)**(-1.5)
C     LOG ACTIVITY COEF
      LOGF0=0.1*ZI
      LOGF1=-A*SQRT(ZI)/(1+SQRT(ZI))
      LOGF2=-A*4.0*SQRT(ZI)/(1+SQRT(ZI))
      LOGF3=-A*9.0*SQRT(ZI)/(1+SQRT(ZI))
C     ACTIVITY COEF
      F0=10**LOGF0
      F1=10**LOGF1
      F2=10**LOGF2
      F3=10**LOGF3
```

```
C
 RETURN
 END
C     SUBROUTINE SOLVES A SYSTEM OF LINEAR EQUATIONS
C        USING GAUSS ELIMINATION
C
 SUBROUTINE SOLVE
 COMMON MAXT,DELT,R,MOISTF,MOISTS,MOISTI,A,D,VTOTAL
 COMMON P(500),PSO4(500),Q0(500),Q1(500),Q2(500),Q3(500)
 COMMON L(500),VSOIL(500),VS(500),MOIST(500),KP,DENB
 COMMON STSO4I,STSO4(500),SOLSO4(500),SORSO4(500)
 COMMON Z(500),W(500),U(500),U4(500)
 COMMON F0,F1,F2,F3,ZI,EAL,EM,EK,SSO4(500)
 COMMON KSO,SKM,SMAL,SPCO2
 COMMON SAL(500),SK(500),SM(500),SH(500),SHCO3(500),ASH(500),SDOC(500)
 COMMON LKSO,LSKM,LSMAL,LPCO2,LSPCO2
 COMMON ZK1(500),ZK2(500),ZM21(500),ZM22(500),SO41(500),SO42(500)
 COMMON TEMP,XKOH1,XKOH2,XKOH3,XKOH4
 COMMON XKF1,XKF2,XKF3,XKF4,XKF5,XKF6,XKSO41,XKSO42
 COMMON XKHP,XKCO21,XKCO22,XKH,XKW,PCO2,N,T
 COMMON AL(500),ALOH(500),ALOH2(500),ALOH3(500),ALOH4(500)
 COMMON ALF(500),ALF2(500),ALF3(500),ALF4(500),ALF5(500),ALF6(500)
 COMMON ALSO4(500),ALSO42(500),HF(500),HCO3(500),CO3(500)
 COMMON OH(500),H(500),FF(500),PH(500),ZK(500),ZM2(500),SO4(500)
 COMMON EQCDOC,DOC(500),TF(500),F(10),ZJ(10,10),Y(10),AH(500),AFF(500)
 COMMON ZNA(500),CL(500),ALIN(500),ALORG(500),ALTOT(500),ANC(500)
 REAL   KSO,LKSO,LSKM,LSMAL,LPCO2,LSPCO2
 REAL   K1,K2,K3,K4,KP,L(500),MOISTI,MOISTF,MOISTS,MOIST(500)
C
C  ELEMENT OF ELIMINATION
 N1=N-1
 DO 160 M=1,N1
 ZMAX=0.
 IMAX=0
C    FIND MAX OF COLUMN
 DO 120 I=M,N
 IF(ABS(ZJ(I,M)).LE.ZMAX) GO TO 120
 IMAX=I
 ZMAX=ABS(ZJ(I,M))
 120 CONTINUE
C    ERROR CHECK
 IF(IMAX.EQ.0) CALL ERROR(IMAX)
C    ROW INTERCHANGE
 IF(IMAX.EQ.M) GO TO 140
 V=F(M)
 F(M)=F(IMAX)
 F(IMAX)=V
 DO 130 J=M,N
 V=ZJ(M,J)
 ZJ(M,J)=ZJ(IMAX,J)
 ZJ(IMAX,J)=V
 130 CONTINUE
C    DIAGONALIZE
 140 M1=M+1
 DO 150 I=M1,N
 V=ZJ(I,M)/ZJ(M,M)
 F(I)=F(I)-V*F(M)
 DO 150 J=M,N
 ZJ(I,J)=ZJ(I,J)-V*ZJ(M,J)
 150 CONTINUE
 160 CONTINUE
```

```
C    BACK SUBSTITUTION
 DO 165 I=1,N
 Y(I)=0.0
 165 CONTINUE
 Y(N)=F(N)/ZJ(N,N)
 DO 180 K=1,N1
 I=N-K
 I1=I+1
 DO 170 J=I1,N
 Y(I)=Y(I)+Y(J)*ZJ(I,J)
 170 CONTINUE
 Y(I)=(F(I)-Y(I))/ZJ(I,I)
 180 CONTINUE
 RETURN
 END
C  ERROR SUBROUTINE
 SUBROUTINE ERROR(IMAX)
 WRITE(6,250) IMAX
 250 FORMAT(1X,11HERROR IMAX=,I5)
 STOP
 END
C      ERR SUBROUTINE
 SUBROUTINE ERR(COUNT)
 WRITE(6,350) COUNT
 350 FORMAT(1X,23HDIVERGENCE ERROR COUNT=,F5.1)
 STOP
 END
```

150	1.0	0.036	0.29	0.58	.297
700000.0	0.10				
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
.025	.025	.050	.165	.125	.115
.075	.190	.100	.265	.255	.430
.485	.445	.100	.090	.025	0.0
.015	0.0	0.0	0.0	.025	.015
.040	.015	0.0	0.0	0.0	0.0
0.0	0.0	0.0	.03	.15	.28
.15	.10	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.00	0.00	0.00	0.00	0.00	0.00
.08	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0059	0.0059	0.0059	0.0059	0.0059	0.0059
0.0059	0.0059	0.0059	0.0059	0.0059	0.0059
0.0059	0.0062	0.0062	0.0062	0.0065	0.0068
0.0074	0.0079	0.0085	0.0113	0.0198	0.0340
0.0481	0.0991	0.1558	0.2124	0.2662	0.2974
0.3257	0.3540	0.3738	0.3682	0.3597	0.3512
0.3441	0.3158	0.3115	0.2974	0.2775	0.2662
0.2464	0.2379	0.2152	0.2067	0.1982	0.1954
0.1926	0.2124	0.2407	0.2690	0.2860	0.2832
0.2747	0.2690	0.2662	0.2549	0.2464	0.2379
0.2294	0.2209	0.2152	0.2096	0.2039	0.1954
0.1869	0.1784	0.1699	0.1643	0.1586	0.1501
0.1416	0.1359	0.1303	0.1246	0.1189	0.1133
0.1076	0.1020	0.0991	0.0963	0.0935	0.0906
0.0878	0.0850	0.0821	0.0793	0.0779	0.0762
0.0748	0.0731	0.0717	0.0700	0.0683	0.0666
0.0651	0.0629	0.0612	0.0595	0.0578	0.0561
0.0544	0.0527	0.0510	0.0504	0.0496	0.0490
0.0481	0.0476	0.0467	0.0462	0.0453	0.0445
0.0436	0.0425	0.0416	0.0405	0.0396	0.0388
0.0379	0.0374	0.0368	0.0360	0.0354	0.0348
0.0343	0.0334	0.0329	0.0326	0.0323	0.0317
0.0312	0.0309	0.0303	0.0300	0.0295	0.0292

0.0292	0.0289	0.0286	0.0283	0.0280	0.0280
0.0278	0.0275	0.0272	0.0266	0.0263	0.0261
0.0042	0.0042	0.0042	0.0042	0.0042	0.0042
0.0042	0.0042	0.0042	0.0042	0.0042	0.0042
0.0045	0.0045	0.0048	0.0048	0.0051	0.0057
0.0062	0.0074	0.0085	0.0142	0.0227	0.0425
0.0793	0.2209	0.3172	0.3965	0.4616	0.5239
0.5721	0.6146	0.6514	0.6457	0.6315	0.6146
0.6004	0.5721	0.5494	0.5239	0.4871	0.4616
0.4305	0.4022	0.3710	0.3568	0.3427	0.3314
0.3342	0.3597	0.4022	0.4475	0.4984	0.4956
0.4815	0.4673	0.4560	0.4446	0.4333	0.4163
0.3993	0.3880	0.3738	0.3625	0.3540	0.3370
0.3200	0.3030	0.2917	0.2804	0.2662	0.2549
0.2436	0.2351	0.2237	0.2124	0.2011	0.1954
0.1841	0.1756	0.1671	0.1614	0.1558	0.1501
0.1444	0.1388	0.1359	0.1331	0.1303	0.1274
0.1246	0.1218	0.1189	0.1161	0.1133	0.1105
0.1076	0.1048	0.1020	0.0991	0.0963	0.0935
0.0906	0.0878	0.0850	0.0835	0.0821	0.0807
0.0793	0.0779	0.0765	0.0750	0.0736	0.0719
0.0702	0.0683	0.0666	0.0649	0.0632	0.0612
0.0595	0.0583	0.0575	0.0564	0.0552	0.0541
0.0532	0.0521	0.0510	0.0501	0.0496	0.0490
0.0481	0.0476	0.0467	0.0462	0.0453	0.0447
0.0439	0.0433	0.0425	0.0419	0.0411	0.0405
0.0396	0.0394	0.0391	0.0385	0.0382	0.0379
0.85	0.84	400.0			
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
16.18	16.18	16.18	16.18	16.18	16.18
16.18	16.18	16.18	3.71	3.71	3.71
2.60	2.60	2.60	2.60	2.60	0.0
1.72	0.0	0.0	0.0	3.15	3.15
3.15	3.15	0.0	0.0	0.0	0.0
0.0	0.0	0.0	2.11	2.11	2.11
1.75	1.75	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0

0.0	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
3.30	0.0	0.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0	0.0	0.0
8.11	-4.8	2.5	-3.5	-2.5	7.1
.921	.049	.030	8.0		

3.0	3.0	3.0	3.0	3.0	3.0
3.0	3.0	3.0	3.1	3.1	3.2
3.2	3.2	3.3	3.3	3.4	3.5
3.9	4.4	5.5	6.5	7.5	8.5
10.5	12.0	13.5	15.5	17.5	19.1
17.3	15.8	14.3	12.8	11.3	9.8
9.5	9.3	9.1	8.9	8.7	8.5
8.3	8.1	7.9	7.7	7.5	7.3
7.1	6.9	6.8	6.7	6.6	6.5
6.4	6.3	6.2	6.1	6.0	5.9
5.8	5.7	5.6	5.5	5.4	5.3
5.2	5.1	5.0	4.9	4.8	4.7
4.6	4.5	4.4	4.3	4.2	4.1
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
4.0	4.0	4.0	4.0	4.0	4.0
7.5	7.5	7.5	7.5	7.5	7.5
7.5	7.5	7.5	7.5	7.5	7.5
7.6	7.7	7.9	8.1	8.3	8.5
9.0	10.0	12.5	16.0	20.5	24.6
26.8	29.0	31.2	33.4	35.6	38.0
39.0	40.0	41.0	42.0	43.0	43.7
43.0	42.0	41.0	40.0	39.0	38.1
37.6	37.0	36.4	35.8	35.2	34.6
33.0	31.8	30.6	29.4	28.2	27.0
26.9	26.8	26.6	26.4	26.2	26.0
25.3	24.7	24.1	23.5	22.9	22.3
21.8	21.2	20.6	20.0	19.4	18.8
18.2	17.6	17.0	16.4	15.8	15.2
15.1	14.9	14.7	14.5	14.3	14.1
13.9	13.7	13.5	13.4	13.3	13.2
13.1	13.0	12.9	12.8	12.7	12.6
12.5	12.4	12.3	12.2	12.1	12.0
11.8	11.6	11.4	11.2	11.0	10.8
10.8	10.8	10.8	10.8	10.8	10.8
10.8	10.8	10.8	10.8	10.8	10.8
10.8	10.8	10.8	10.8	10.8	10.8
10.8	10.8	10.8	10.8	10.8	10.8
10.8	10.8	10.8	10.8	10.8	10.8
10.8	10.8	10.8	10.8	10.8	10.8
10.8	10.8	10.8	10.8	10.8	10.8

56.0	56.0	56.0	56.0	56.0	56.0
56.0	56.0	56.0	55.5	55.5	55.5
55.5	55.5	55.5	55.5	55.5	55.5
54.0	52.0	50.0	48.0	46.0	44.0
44.2	44.4	44.6	44.8	44.9	45.0
44.9	44.8	44.6	44.4	44.2	44.0
44.0	44.0	44.0	44.0	44.0	44.0
43.9	43.8	43.6	43.4	43.2	43.0
43.0	43.0	43.0	43.0	43.0	43.0
43.0	43.0	43.0	43.0	43.0	43.0
43.0	43.0	43.0	43.0	43.0	43.0
43.2	43.4	43.6	43.8	43.9	44.0
44.0	44.0	44.0	44.0	44.0	44.0
44.1	44.2	44.3	44.4	44.5	44.6
44.7	44.8	44.9	45.0	45.1	45.2
45.3	45.4	45.5	45.6	45.8	46.0
46.0	46.0	45.9	45.8	45.8	45.7
45.7	45.6	45.6	45.5	45.5	45.5
45.5	45.5	45.5	45.5	45.4	45.3
45.3	45.2	45.2	45.1	45.1	45.0
45.1	45.1	45.2	45.2	45.3	45.3
45.4	45.4	45.5	45.5	45.5	45.5
46.0	46.0	46.0	46.0	46.0	46.0
46.5	46.5	46.5	46.5	46.5	46.5
46.5	46.5	46.5	46.5	46.5	46.5
66.0	66.0	66.0	66.0	66.0	66.0
66.0	66.0	66.0	66.0	66.0	66.0
66.0	66.0	66.0	66.0	66.0	66.0
67.0	69.0	71.0	73.0	75.0	76.0
76.0	75.5	75.5	75.0	74.5	74.0
73.7	73.3	72.9	72.6	72.3	72.0
72.0	72.0	72.0	72.0	72.0	72.0
72.0	72.0	72.0	72.0	72.0	72.0
72.0	72.0	72.0	72.0	72.0	72.0
72.0	72.0	72.0	72.0	72.0	72.0
72.0	71.8	71.6	71.4	71.2	71.0
70.9	70.9	70.9	70.8	70.7	70.6
70.5	70.4	70.3	70.2	70.1	70.0
70.0	70.0	70.0	70.0	70.0	69.9
69.9	69.8	69.8	69.7	69.7	69.6
69.6	69.5	69.5	69.4	69.4	69.3
69.3	69.2	69.2	69.1	69.1	69.0
69.0	69.0	69.0	69.0	69.0	69.0
69.0	69.0	69.0	69.0	69.0	69.0
68.9	68.8	68.8	68.7	68.7	68.6
68.6	68.5	68.5	68.4	68.4	68.3
68.3	68.2	68.2	68.1	68.1	68.0
68.0	68.0	68.0	68.0	68.0	68.0
68.0	68.0	68.0	68.0	68.0	68.0
68.0	68.0	68.0	68.0	68.0	68.0

76.0	76.0	76.0	76.0	76.0	76.0
76.0	76.0	76.0	76.0	76.0	76.0
76.0	76.0	76.0	76.0	75.5	75.0
77.5	76.0	76.5	77.0	78.0	79.0
80.0	81.0	81.5	82.0	82.5	83.0
83.0	83.0	83.0	83.0	83.0	83.0
83.0	83.0	83.5	83.5	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.5	84.5	85.0	85.0
85.0	85.0	85.0	85.0	85.0	85.0
84.5	84.0	83.5	83.0	82.5	82.0
82.0	82.0	82.0	82.0	82.0	82.0
82.2	82.5	82.8	83.0	83.2	83.5
83.8	84.0	84.2	84.5	84.8	85.0
84.8	84.5	84.2	84.0	83.8	83.5
83.2	83.0	82.8	82.5	82.2	82.0
82.1	82.2	82.3	82.3	82.4	82.5
82.5	82.6	82.7	82.8	82.9	83.0
82.9	82.8	82.6	82.5	82.3	82.2
82.1	82.0	81.9	81.8	81.7	81.6
81.5	81.4	81.3	81.2	81.1	81.0
80.9	80.8	80.6	80.5	80.4	80.2
80.0	79.9	79.8	79.7	79.6	79.5
79.5	79.4	79.3	79.2	79.1	79.0
52.0	52.0	52.0	52.0	52.0	52.0
52.0	52.0	52.5	52.5	53.0	53.0
53.0	53.0	53.0	53.0	53.0	53.0
53.5	54.0	54.5	55.0	55.5	56.0
57.0	58.0	59.0	60.0	61.0	62.0
62.2	62.4	62.6	62.8	62.9	63.0
63.2	63.4	63.6	63.8	64.0	64.0
64.0	64.0	64.0	64.0	64.0	64.0
65.0	66.0	67.0	68.0	69.0	70.0
70.0	70.0	70.0	70.0	70.0	70.0
70.0	70.0	70.0	70.0	70.0	70.0
70.0	70.0	69.9	69.8	69.7	69.6
69.5	69.4	69.3	69.2	69.1	69.0
69.0	69.0	69.0	69.0	68.9	68.9
68.8	68.8	68.7	68.7	68.6	68.6
68.5	68.5	68.4	68.4	68.3	68.3
68.2	68.2	68.1	68.1	68.0	68.0
68.1	68.2	68.3	68.4	68.5	68.6
68.7	68.8	68.9	70.0	70.0	70.0
68.9	68.9	68.8	68.7	68.7	68.6
68.6	68.5	68.5	68.4	68.3	68.3
68.2	68.2	68.1	68.1	68.0	68.0
68.0	67.9	67.7	67.5	67.3	67.0
66.8	66.5	66.3	66.1	65.9	65.7
65.5	65.4	65.3	65.2	65.1	65.0

4.2	4.2	4.2	4.2	4.2	4.2
4.2	4.2	4.2	4.3	4.3	4.3
4.3	4.3	4.3	4.4	4.4	4.4
4.5	4.7	4.9	5.1	5.3	5.5
5.8	6.1	6.5	7.0	7.5	8.0
8.1	8.2	8.3	8.4	8.5	8.4
8.3	8.2	8.1	8.0	7.8	7.6
7.4	7.2	7.0	6.8	6.6	6.4
6.3	6.2	6.2	6.1	6.1	6.0
6.0	6.0	6.0	6.1	6.1	6.1
6.1	6.1	6.0	6.0	5.9	5.9
5.8	5.8	5.7	5.7	5.6	5.5
5.5	5.5	5.4	5.4	5.3	5.3
5.3	5.3	5.3	5.3	5.3	5.3
5.3	5.3	5.3	5.3	5.2	5.2
5.2	5.2	5.2	5.2	5.1	5.1
5.1	5.1	5.1	5.1	4.9	4.9
4.9	4.9	4.9	4.9	4.9	4.9
4.8	4.8	4.8	4.8	4.8	4.8
4.7	4.7	4.7	4.7	4.7	4.7
4.6	4.6	4.6	4.6	4.6	4.6
4.5	4.5	4.5	4.5	4.5	4.5
4.5	4.5	4.4	4.4	4.4	4.4
4.4	4.4	4.4	4.4	4.4	4.4
4.4	4.4	4.4	4.4	4.4	4.4
2.69	2.69	2.69	2.69	2.69	2.69
2.69	2.69	2.69	2.69	2.69	2.69
2.68	2.66	2.64	2.62	2.60	2.59
2.56	2.53	2.50	2.47	2.44	2.41
2.47	2.53	2.59	2.65	2.73	2.80
2.79	2.78	2.77	2.76	2.75	2.75
2.75	2.76	2.77	2.78	2.79	2.80
2.82	2.84	2.86	2.88	2.89	2.90
2.92	2.94	2.97	3.00	3.03	3.06
3.07	3.08	3.09	3.10	3.10	3.10
3.10	3.10	3.10	3.10	3.10	3.10
3.10	3.11	3.12	3.13	3.14	3.15
3.16	3.17	3.18	3.19	3.20	3.20
3.21	3.22	3.23	3.24	3.25	3.25
3.26	3.26	3.27	3.27	3.28	3.28
3.26	3.24	3.22	3.20	3.18	3.15
3.13	3.11	3.09	3.07	3.06	3.05
3.05	3.04	3.04	3.03	3.03	3.02
3.02	3.02	3.01	3.01	3.01	3.00
3.00	2.99	2.98	2.97	2.96	2.95
2.94	2.93	2.92	2.90	2.88	2.87
2.87	2.87	2.86	2.86	2.85	2.85
2.85	2.85	2.85	2.85	2.85	2.85
2.85	2.85	2.85	2.85	2.85	2.85
2.85	2.85	2.85	2.85	2.85	2.85

112.0	112.0	112.0	112.0	112.0	112.0
112.0	112.0	112.0	112.0	112.0	112.0
112.0	112.0	112.0	112.0	112.0	112.0
111.0	110.0	109.0	108.0	106.0	104.0
100.0	96.0	92.0	88.0	84.0	81.0
82.0	83.0	85.0	87.0	88.0	89.0
89.0	90.0	90.0	91.0	91.0	92.0
92.0	93.0	93.0	94.0	94.0	95.0
95.0	94.0	93.0	92.0	91.0	90.0
90.0	91.0	91.0	92.0	92.0	92.0
93.0	93.0	94.0	94.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
95.0	95.0	95.0	95.0	95.0	95.0
93.0	93.0	93.0	93.0	94.0	94.0
94.0	94.0	94.0	93.0	93.0	93.0
93.0	93.0	93.0	93.0	93.0	93.0
93.0	93.0	94.0	94.0	94.0	94.0
94.0	94.0	93.0	93.0	93.0	93.0
93.0	93.0	93.0	92.0	92.0	92.0
91.0	91.0	90.0	90.0	89.0	89.0
89.0	89.0	89.0	89.0	89.0	89.0
88.0	86.0	84.0	82.0	81.0	80.0
81.0	81.0	82.0	82.0	83.0	83.0
83.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0
84.0	84.0	84.0	84.0	84.0	84.0

8.6	8.6	8.6	8.6	8.6	8.6
8.6	8.6	8.6	8.6	8.6	8.6
8.6	8.6	8.6	8.6	8.6	8.6
8.4	8.2	8.0	7.8	7.6	7.4
7.2	7.0	6.8	6.6	6.4	6.2
6.0	5.9	5.7	5.6	5.5	5.6
5.8	6.0	6.3	6.6	6.9	7.2
7.5	7.6	7.7	7.7	7.6	7.5
7.2	6.9	6.6	6.3	6.1	5.9
5.3	5.5	5.7	5.9	6.1	6.3
6.4	6.5	6.6	6.7	6.8	6.9
7.0	7.0	7.1	7.1	7.2	7.2
7.2	7.3	7.3	7.3	7.3	7.4
7.4	7.4	7.4	7.4	7.5	7.5
7.5	7.5	7.6	7.6	7.6	7.7
7.7	7.7	7.8	7.8	7.8	7.9
7.9	7.9	8.0	8.0	8.1	8.1
8.2	8.2	8.2	8.2	8.2	8.2
8.3	8.3	8.3	8.3	8.3	8.3
8.4	8.4	8.4	8.4	8.4	8.4
8.5	8.5	8.5	8.5	8.5	8.5
8.6	8.6	8.6	8.6	8.6	8.6
8.7	8.7	8.7	8.7	8.7	8.7
8.8	8.8	8.8	8.8	8.8	8.8
8.9	8.9	8.9	8.9	8.9	8.9

t	VSOIL(t)	MOIST(t)	L(t)	VS(t)	Q3(t)
1	20790.0	.297	.0049	54.0	.0150
2	20772.7	.297	.0047	53.4	.0148
3	20756.0	.297	.0046	52.8	.0147
4	20739.8	.296	.0044	52.2	.0145
5	20724.3	.296	.0049	54.0	.0150
6	20707.0	.296	.0047	53.4	.0148
7	20690.2	.296	.0046	52.8	.0147
8	20674.1	.295	.0044	52.2	.0145
9	20658.6	.295	.0042	51.6	.0143
10	20643.6	.295	.0041	51.0	.0142
11	20629.2	.295	.0039	50.4	.0140
12	20615.4	.295	.0037	49.8	.0138
13	20602.1	.294	.0036	50.3	.0140
14	20761.4	.297	.0034	50.9	.0141
15	20921.1	.299	.0033	51.5	.0143
16	21253.2	.304	.0032	51.0	.0142
17	22376.5	.320	.0030	52.6	.0146
18	23225.3	.332	.0046	61.6	.0171
19	23999.7	.343	.0062	71.3	.0198
20	24493.4	.350	.0095	89.4	.0248
21	25766.0	.368	.0208	136.0	.0378
22	26380.1	.377	.0293	197.1	.0548
23	28098.7	.401	.0370	286.2	.0795
24	29721.1	.425	.0419	426.4	.1184
25	32529.3	.465	.0547	655.4	.1821
26	35670.7	.510	.0608	1370.9	.3808
27	38515.3	.550	.0780	1983.6	.5510
28	38927.1	.556	.0942	2531.2	.7031
29	39212.7	.560	.1223	3060.3	.8501
30	38952.2	.556	.1537	3510.0	.9750
31	38408.7	.549	.1822	3887.8	1.0800
32	37867.7	.541	.1863	4157.5	1.1549
33	37209.1	.532	.1891	4371.6	1.2143
34	36540.3	.522	.1865	4321.5	1.2004
35	35880.8	.513	.1811	4220.2	1.1723
36	35412.4	.506	.1757	4109.3	1.1415
37	34894.3	.498	.1691	4008.9	1.1136
38	34571.4	.494	.1624	3781.1	1.0503
39	34100.3	.487	.1558	3660.1	1.0167
40	33549.4	.479	.1511	3500.7	.9724
41	33015.0	.472	.1459	3278.0	.9105
42	32499.0	.464	.1427	3133.9	.8705
43	31994.3	.457	.1380	2933.7	.8149
44	31506.3	.450	.1325	2781.3	.7726
45	31037.9	.443	.1272	2568.1	.7134
46	30588.3	.437	.1220	2467.8	.6855
47	30363.2	.434	.1169	2368.2	.6578
48	30981.0	.443	.1121	2299.9	.6389

49	32509.9	.464	.1074	2283.0	.6342
50	33161.5	.474	.1029	2429.9	.6750
51	33485.3	.478	.1006	2676.7	.7435
52	33129.4	.473	.1068	2963.9	.8233
53	32751.8	.468	.1221	3263.4	.9065
54	32320.0	.462	.1286	3266.7	.9074
55	31865.2	.455	.1319	3197.0	.8881
56	31399.0	.449	.1283	3112.5	.8646
57	30945.4	.442	.1245	3048.2	.8467
58	30505.1	.436	.1202	2950.9	.8197
59	30080.1	.430	.1157	2863.3	.7954
60	29671.1	.424	.1110	2754.7	.7652
61	29278.7	.418	.1065	2646.6	.7352
62	28902.2	.413	.1021	2559.4	.7110
63	28541.4	.408	.0978	2472.5	.6868
64	28195.6	.403	.0937	2396.9	.6658
65	27864.2	.398	.0898	2331.7	.6477
66	27546.7	.394	.0860	2226.3	.6184
67	27242.6	.389	.0824	2121.5	.5893
68	26951.1	.385	.0790	2017.3	.5604
69	26672.0	.381	.0756	1934.1	.5372
70	26404.5	.377	.0725	1861.8	.5172
71	26148.2	.374	.0694	1779.2	.4942
72	25902.8	.370	.0665	1697.4	.4715
73	25667.6	.367	.0637	1616.1	.4489
74	25442.3	.363	.0610	1555.4	.4320
75	25226.4	.360	.0585	1484.9	.4125
76	25019.6	.357	.0560	1414.9	.3930
77	24821.5	.355	.0537	1345.2	.3737
78	24631.7	.352	.0514	1296.4	.3601
79	24449.9	.349	.0493	1227.5	.3410
80	24275.7	.347	.0472	1169.3	.3248
81	24108.8	.344	.0452	1121.1	.3114
82	23948.9	.342	.0433	1083.7	.3010
83	23795.8	.340	.0415	1046.9	.2908
84	23649.0	.338	.0398	1009.6	.2805
85	23508.4	.336	.0381	973.0	.2703
86	23373.8	.334	.0365	937.0	.2603
87	23244.7	.332	.0350	910.6	.2530
88	23121.1	.330	.0335	885.2	.2459
89	23002.7	.329	.0321	865.0	.2403
90	22889.3	.327	.0307	843.6	.2343
91	22780.6	.325	.0294	823.9	.2288
92	22676.4	.324	.0282	803.2	.2231
93	22576.7	.323	.0270	783.5	.2176
94	22481.1	.321	.0259	763.2	.2120
95	22389.6	.320	.0248	743.1	.2064
96	22301.9	.319	.0238	723.1	.2009
97	22217.8	.317	.0228	703.7	.1955
98	22137.3	.316	.0218	682.2	.1895

99	22060.2	.315	.0209	662.7	.1841
100	21986.3	.314	.0200	643.0	.1786
101	21915.5	.313	.0192	623.8	.1733
102	21847.7	.312	.0184	604.7	.1680
103	21782.7	.311	.0176	585.4	.1626
104	21720.5	.310	.0169	566.5	.1574
105	21660.9	.309	.0162	547.8	.1522
106	21603.8	.309	.0155	537.8	.1494
107	21549.0	.308	.0148	527.5	.1465
108	21496.6	.307	.0142	518.1	.1439
109	21446.4	.306	.0136	507.6	.1410
110	21398.2	.306	.0130	498.7	.1385
111	21352.1	.305	.0125	488.5	.1357
112	21308.0	.304	.0120	479.4	.1332
113	21265.7	.304	.0115	469.3	.1304
114	21225.1	.303	.0110	458.6	.1274
115	21186.3	.303	.0105	447.6	.1243
116	21149.1	.302	.0101	435.2	.1209
117	21113.5	.302	.0097	424.3	.1179
118	21079.3	.301	.0093	412.7	.1147
119	21046.6	301	.0089	402.0	.1117
120	21015.3	.300	.0085	390.6	.1085
121	20985.2	.300	.0081	379.9	.1055
122	20956.5	.299	.0078	372.6	.1035
123	20928.9	.299	.0075	366.4	.1018
124	20902.5	.299	.0072	358.4	.0996
125	20877.2	.298	.0069	350.8	.0975
126	20853.0	.298	.0066	343.7	.0955
127	20829.8	.298	.0063	337.6	.0938
128	20807.5	.297	.0060	329.5	.0915
129	20786.2	.297	.0058	322.8	.0897
130	20765.8	.297	.0055	317.6	.0882
131	20746.3	.296	.0053	313.9	.0872
132	20727.5	.296	.0051	308.8	.0858
133	20709.6	.296	.0049	303.0	.0842
134	20692.4	.296	.0047	299.4	.0832
135	20675.9	.295	.0045	293.3	.0815
136	20660.2	.295	.0043	289.7	.0805
137	20645.0	.295	.0041	284.0	.0789
138	20630.5	.295	.0039	280.2	.0778
139	20616.7	.295	.0038	276.7	.0769
140	21153.4	.302	.0036	272.9	.0758
141	21140.7	.302	.0035	268.4	.0746
142	21128.5	.302	.0033	264.6	.0735
143	21116.8	.302	.0032	260.2	.0723
144	21105.6	.302	.0085	277.3	.0770
145	21075.4	.301	.0084	272.9	.0758
146	21045.7	.301	.0083	270.7	.0752
147	21016.4	.300	.0082	268.1	.0745
148	20987.5	.300	.0081	263.4	.0732

t	STSO4(t)	SOLSO4(t)	SORSO4(t)	SSO4(t)
1	400000.00	5.65	4.80	.00005886
2	399900.31	5.65	4.80	.00005886
3	399804.14	5.65	4.80	.00005886
4	399711.38	5.65	4.80	.00005886
5	399621.89	5.65	4.80	.00005886
6	399522.20	5.65	4.80	.00005886
7	399426.04	5.65	4.80	.00005886
8	399333.27	5.65	4.80	.00005886
9	399243.79	5.65	4.80	.00005886
10	399157.47	5.65	4.80	.00005886
11	399074.67	5.65	4.80	.00005886
12	398995.27	5.65	4.80	.00005886
13	398919.16	5.65	4.80	.00005886
14	401677.45	5.68	4.83	.00005886
15	404438.80	5.70	4.85	.00005886
16	410034.35	5.76	4.89	.00005886
17	428656.59	5.92	5.04	.00005886
18	442751.52	6.05	5.14	.00005886
19	455681.03	6.16	5.24	.00005886
20	464047.83	6.23	5.30	.00005913
21	485367.21	6.41	5.45	.00005941
22	496261.04	6.50	5.52	.00005995
23	502532.26	6.44	5.47	.00006170
24	508360.21	6.38	5.42	.00006299
25	518603.72	6.29	5.34	.00006415
26	526208.55	6.14	5.22	.00006489
27	532933.78	6.02	5.12	.00006673
28	532954.73	5.99	5.10	.00006768
29	532389.80	5.97	5.07	.00006703
30	530017.90	5.96	5.07	.00006643
31	526500.72	5.96	5.06	.00006546
32	522575.29	5.95	5.06	.00006398
33	518471.60	5.95	5.05	.00006272
34	514387.09	5.95	5.05	.00006243
35	510377.06	5.94	5.05	.00006216
36	507049.24	5.94	5.05	.00006207
37	503622.98	5.93	5.04	.00006204
38	500888.43	5.92	5.04	.00006195
39	497751.74	5.92	5.03	.00006193
40	494427.00	5.92	5.03	.00006192
41	491202.65	5.92	5.03	.00006191
42	488089.11	5.92	5.03	.00006184
43	485047.56	5.92	5.03	.00006180
44	482108.22	5.92	5.03	.00006170
45	479290.52	5.92	5.03	.00006165
46	476588.08	5.92	5.03	.00006165
47	474437.35	5.91	5.02	.00006164
48	474161.91	5.86	4.98	.00006163

49	475905.85	5.77	4.90	.00006162
50	475457.10	5.72	4.86	.00006162
51	474492.98	5.68	4.83	.00006161
52	472354.60	5.68	4.83	.00006161
53	470085.48	5.68	4.83	.00006150
54	467496.93	5.68	4.83	.00006099
55	464792.95	5.68	4.83	.00006008
56	462062.32	5.68	4.83	.00005956
57	459428.43	5.68	4.83	.00005921
58	456886.92	5.68	4.83	.00005919
59	454433.93	5.68	4.82	.00005918
60	452074.16	5.68	4.82	.00005916
61	449809.98	5.68	4.82	.00005914
62	447638.71	5.67	4.82	.00005913
63	445557.45	5.67	4.82	.00005913
64	443562.95	5.67	4.82	.00005912
65	441651.88	5.67	4.82	.00005911
66	439820.87	5.67	4.82	.00005911
67	438066.63	5.67	4.82	.00005910
68	436386.00	5.67	4.82	.00005910
69	434775.90	5.67	4.82	.00005910
70	433233.39	5.67	4.82	.00005909
71	431755.63	5.67	4.82	.00005909
72	430339.90	5.67	4.82	.00005908
73	428983.61	5.67	4.82	.00005908
74	427684.26	5.67	4.82	.00005908
75	426439.46	5.67	4.82	.00005907
76	425246.92	5.67	4.82	.00005907
77	424104.44	5.67	4.82	.00005907
78	423009.92	5.67	4.82	.00005906
79	421961.36	5.67	4.82	.00005906
80	420956.81	5.67	4.82	.00005906
81	419994.44	5.67	4.82	.00005905
82	419072.46	5.67	4.82	.00005905
83	418189.19	5.67	4.82	.00005905
84	417343.00	5.67	4.82	.00005904
85	416532.34	5.67	4.82	.00005904
86	415755.70	5.67	4.82	.00005904
87	415011.67	5.67	4.82	.00005904
88	414298.88	5.67	4.82	.00005904
89	413616.00	5.67	4.82	.00005903
90	412961.79	5.67	4.82	.00005903
91	412335.05	5.67	4.82	.00005903
92	411734.62	5.67	4.82	.00005903
93	411159.39	5.67	4.82	.00005903
94	410608.31	5.67	4.82	.00005902
95	410080.36	5.67	4.82	.00005902
96	409574.58	5.67	4.82	.00005902
97	409090.02	5.67	4.82	.00005902
98	408625.81	5.67	4.82	.00005902

99	408181.09	5.67	4.82	.00005902
100	407755.03	5.67	4.82	.00005901
101	407346.86	5.67	4.82	.00005901
102	406955.82	5.67	4.82	.00005901
103	406581.20	5.67	4.82	.00005901
104	406222.31	5.67	4.82	.00005901
105	405878.48	5.67	4.82	.00005901
106	405549.08	5.67	4.82	.00005901
107	405233.51	5.67	4.82	.00005901
108	404931.19	5.67	4.82	.00005901
109	404641.56	5.67	4.82	.00005900
110	404364.08	5.67	4.82	.00005900
111	404098.26	5.67	4.82	.00005900
112	403843.59	5.66	4.82	.00005900
113	403599.61	5.66	4.82	.00005900
114	403365.88	5.66	4.82	.00005900
115	403141.95	5.66	4.82	.00005900
116	402927.43	5.66	4.82	.00005900
117	402721.91	5.66	4.81	.00005900
118	402525.02	5.66	4.81	.00005900
119	402336.39	5.66	4.81	.00005900
120	402155.68	5.66	4.81	.00005900
121	401982.56	5.66	4.81	.00005900
122	401816.70	5.66	4.81	.00005900
123	401657.81	5.66	4.81	.00005899
124	401505.58	5.66	4.81	.00005899
125	401359.75	5.66	4.81	.00005899
126	401220.04	5.66	4.81	.00005899
127	401086.19	5.66	4.81	.00005899
128	400957.96	5.66	4.81	.00005899
129	400835.11	5.66	4.81	.00005899
130	400717.42	5.66	4.81	.00005899
131	400604.67	5.66	4.81	.00005899
132	400496.66	5.66	4.81	.00005899
133	400393.18	5.66	4.81	.00005899
134	400294.04	5.66	4.81	.00005899
135	400199.06	5.66	4.81	.00005899
136	400108.07	5.66	4.81	.00005899
137	400020.90	5.66	4.81	.00005899
138	399937.39	5.66	4.81	.00005899
139	399857.38	5.66	4.81	.00005899
140	401628.56	5.65	4.80	.00005899
141	401555.12	5.65	4.80	.00005899
142	401484.78	5.65	4.80	.00005899
143	401417.38	5.65	4.80	.00005899
144	401352.82	5.65	4.80	.00005899
145	401178.84	5.65	4.80	.00005899
146	401007.46	5.65	4.80	.00005880
147	400839.09	5.65	4.80	.00005880
148	400673.10	5.65	4.80	.00005880

t	SAL(t)	SK(t)	SM(t)	SH(t)	SHCO3(t)
1	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
2	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
3	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
4	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
5	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
6	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
7	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
8	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
9	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
10	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
11	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
12	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
13	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
14	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
15	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
16	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
17	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
18	.3526E-05	.4645E-05	.6864E-04	.2838E-04	.2102E-05
19	.3481E-05	.4626E-05	.6807E-04	.2826E-04	.2111E-05
20	.3454E-05	.4614E-05	.6772E-04	.2819E-04	.2116E-05
21	.3427E-05	.4602E-05	.6737E-04	.2812E-04	.2121E-05
22	.3417E-05	.4597E-05	.6723E-04	.2809E-04	.2124E-05
23	.3484E-05	.4625E-05	.6807E-04	.2825E-04	.2112E-05
24	.3522E-05	.4640E-05	.6853E-04	.2835E-04	.2106E-05
25	.3552E-05	.4651E-05	.6890E-04	.2842E-04	.2102E-05
26	.3555E-05	.4652E-05	.6893E-04	.2842E-04	.2102E-05
27	.3629E-05	.4681E-05	.6984E-04	.2860E-04	.2090E-05
28	.3645E-05	.4687E-05	.7003E-04	.2863E-04	.2088E-05
29	.3558E-05	.4651E-05	.6893E-04	.2842E-04	.2103E-05
30	.3474E-05	.4616E-05	.6788E-04	.2820E-04	.2118E-05
31	.3368E-05	.4571E-05	.6653E-04	.2793E-04	.2138E-05
32	.3254E-05	.4522E-05	.6505E-04	.2763E-04	.2160E-05
33	.3132E-05	.4468E-05	.6346E-04	.2730E-04	.2185E-05
34	.3093E-05	.4450E-05	.6295E-04	.2719E-04	.2193E-05
35	.3056E-05	.4433E-05	.6245E-04	.2708E-04	.2201E-05
36	.3071E-05	.4440E-05	.6266E-04	.2713E-04	.2197E-05
37	.3112E-05	.4459E-05	.6320E-04	.2724E-04	.2188E-05
38	.3150E-05	.4476E-05	.6371E-04	.2735E-04	.2180E-05
39	.3213E-05	.4505E-05	.6454E-04	.2752E-04	.2167E-05
40	.3278E-05	.4534E-05	.6539E-04	.2770E-04	.2153E-05
41	.3343E-05	.4563E-05	.6624E-04	.2788E-04	.2140E-05
42	.3404E-05	.4590E-05	.6704E-04	.2804E-04	.2128E-05
43	.3468E-05	.4618E-05	.6786E-04	.2821E-04	.2115E-05
44	.3484E-05	.4625E-05	.6807E-04	.2825E-04	.2112E-05
45	.3504E-05	.4633E-05	.6832E-04	.2831E-04	.2109E-05
46	.3503E-05	.4633E-05	.6831E-04	.2830E-04	.2109E-05
47	.3480E-05	.4623E-05	.6802E-04	.2825E-04	.2113E-05
48	.3458E-05	.4613E-05	.6773E-04	.2819E-04	.2117E-05

49	.3391E-05	.4584E-05	.6687E-04	.2801E-04	.2130E-05
50	.3324E-05	.4555E-05	.6600E-04	.2783E-04	.2143E-05
51	.3258E-05	.4526E-05	.6514E-04	.2765E-04	.2157E-05
52	.3193E-05	.4496E-05	.6428E-04	.2747E-04	.2171E-05
53	.3143E-05	.4474E-05	.6363E-04	.2733E-04	.2181E-05
54	.3070E-05	.4440E-05	.6265E-04	.2713E-04	.2197E-05
55	.2888E-05	.4354E-05	.6021E-04	.2660E-04	.2238E-05
56	.2899E-05	.4360E-05	.6035E-04	.2664E-04	.2235E-05
57	.2919E-05	.4370E-05	.6064E-04	.2670E-04	.2230E-05
58	.2960E-05	.4390E-05	.6120E-04	.2682E-04	.2220E-05
59	.3002E-05	.4410E-05	.6176E-04	.2694E-04	.2211E-05
60	.3043E-05	.4429E-05	.6231E-04	.2706E-04	.2201E-05
61	.3063E-05	.4439E-05	.6259E-04	.2712E-04	.2197E-05
62	.3084E-05	.4448E-05	.6286E-04	.2718E-04	.2192E-05
63	.3105E-05	.4458E-05	.6314E-04	.2724E-04	.2187E-05
64	.3126E-05	.4468E-05	.6342E-04	.2730E-04	.2183E-05
65	.3147E-05	.4478E-05	.6371E-04	.2736E-04	.2178E-05
66	.3168E-05	.4487E-05	.6399E-04	.2742E-04	.2174E-05
67	.3190E-05	.4497E-05	.6427E-04	.2748E-04	.2169E-05
68	.3189E-05	.4497E-05	.6426E-04	.2747E-04	.2169E-05
69	.3211E-05	.4507E-05	.6455E-04	.2753E-04	.2165E-05
70	.3210E-05	.4507E-05	.6454E-04	.2753E-04	.2165E-05
71	.3232E-05	.4516E-05	.6483E-04	.2759E-04	.2160E-05
72	.3231E-05	.4516E-05	.6482E-04	.2759E-04	.2160E-05
73	.3231E-05	.4516E-05	.6482E-04	.2759E-04	.2160E-05
74	.3253E-05	.4526E-05	.6510E-04	.2765E-04	.2156E-05
75	.3252E-05	.4526E-05	.6510E-04	.2765E-04	.2156E-05
76	.3252E-05	.4525E-05	.6510E-04	.2765E-04	.2156E-05
77	.3252E-05	.4525E-05	.6509E-04	.2765E-04	.2156E-05
78	.3274E-05	.4535E-05	.6538E-04	.2771E-04	.2152E-05
79	.3273E-05	.4535E-05	.6537E-04	.2771E-04	.2152E-05
80	.3273E-05	.4535E-05	.6537E-04	.2771E-04	.2152E-05
81	.3273E-05	.4535E-05	.6537E-04	.2771E-04	.2152E-05
82	.3273E-05	.4535E-05	.6537E-04	.2771E-04	.2152E-05
83	.3295E-05	.4544E-05	.6565E-04	.2776E-04	.2147E-05
84	.3294E-05	.4544E-05	.6565E-04	.2776E-04	.2147E-05
85	.3294E-05	.4544E-05	.6565E-04	.2776E-04	.2147E-05
86	.3294E-05	.4544E-05	.6564E-04	.2776E-04	.2147E-05
87	.3316E-05	.4554E-05	.6593E-04	.2782E-04	.2143E-05
88	.3316E-05	.4554E-05	.6593E-04	.2782E-04	.2143E-05
89	.3316E-05	.4554E-05	.6592E-04	.2782E-04	.2143E-05
90	.3337E-05	.4563E-05	.6621E-04	.2788E-04	.2139E-05
91	.3337E-05	.4563E-05	.6621E-04	.2788E-04	.2139E-05
92	.3337E-05	.4563E-05	.6620E-04	.2788E-04	.2139E-05
93	.3359E-05	.4573E-05	.6649E-04	.2794E-04	.2134E-05
94	.3359E-05	.4573E-05	.6649E-04	.2794E-04	.2134E-05
95	.3359E-05	.4573E-05	.6649E-04	.2794E-04	.2134E-05
96	.3381E-05	.4582E-05	.6677E-04	.2800E-04	.2130E-05
97	.3381E-05	.4582E-05	.6677E-04	.2800E-04	.2130E-05
98	.3380E-05	.4582E-05	.6677E-04	.2800E-04	.2130E-05

99	.3402E-05	.4592E-05	.6705E-04	.2805E-04	.2126E-05
100	.3402E-05	.4592E-05	.6705E-04	.2805E-04	.2126E-05
101	.3424E-05	.4601E-05	.6734E-04	.2811E-04	.2122E-05
102	.3424E-05	.4601E-05	.6733E-04	.2811E-04	.2122E-05
103	.3446E-05	.4611E-05	.6762E-04	.2817E-04	.2117E-05
104	.3446E-05	.4611E-05	.6762E-04	.2817E-04	.2117E-05
105	.3446E-05	.4611E-05	.6762E-04	.2817E-04	.2117E-05
106	.3446E-05	.4611E-05	.6762E-04	.2817E-04	.2117E-05
107	.3446E-05	.4611E-05	.6762E-04	.2817E-04	.2117E-05
108	.3446E-05	.4611E-05	.6761E-04	.2817E-04	.2117E-05
109	.3468E-05	.4620E-05	.6790E-04	.2823E-04	.2113E-05
110	.3468E-05	.4620E-05	.6790E-04	.2823E-04	.2113E-05
111	.3468E-05	.4620E-05	.6790E-04	.2823E-04	.2113E-05
112	.3468E-05	.4620E-05	.6790E-04	.2823E-04	.2113E-05
113	.3468E-05	.4620E-05	.6790E-04	.2823E-04	.2113E-05
114	.3468E-05	.4620E-05	.6790E-04	.2823E-04	.2113E-05
115	.3490E-05	.4630E-05	.6818E-04	.2829E-04	.2109E-05
116	.3490E-05	.4630E-05	.6818E-04	.2829E-04	.2109E-05
117	.3490E-05	.4630E-05	.6818E-04	.2829E-04	.2109E-05
118	.3490E-05	.4630E-05	.6818E-04	.2829E-04	.2109E-05
119	.3490E-05	.4630E-05	.6818E-04	.2829E-04	.2109E-05
120	.3490E-05	.4630E-05	.6818E-04	.2829E-04	.2109E-05
121	.3512E-05	.4639E-05	.6846E-04	.2834E-04	.2105E-05
122	.3512E-05	.4639E-05	.6846E-04	.2834E-04	.2105E-05
123	.3512E-05	.4639E-05	.6846E-04	.2834E-04	.2105E-05
124	.3512E-05	.4639E-05	.6846E-04	.2834E-04	.2105E-05
125	.3512E-05	.4639E-05	.6846E-04	.2834E-04	.2105E-05
126	.3512E-05	.4639E-05	.6846E-04	.2834E-04	.2105E-05
127	.3534E-05	.4649E-05	.6875E-04	.2840E-04	.2101E-05
128	.3534E-05	.4649E-05	.6875E-04	.2840E-04	.2101E-05
129	.3534E-05	.4649E-05	.6875E-04	.2840E-04	.2101E-05
130	.3534E-05	.4649E-05	.6875E-04	.2840E-04	.2101E-05
131	.3534E-05	.4649E-05	.6875E-04	.2840E-04	.2101E-05
132	.3534E-05	.4648E-05	.6875E-04	.2840E-04	.2101E-05
133	.3557E-05	.4658E-05	.6903E-04	.2846E-04	.2097E-05
134	.3557E-05	.4658E-05	.6903E-04	.2846E-04	.2097E-05
135	.3557E-05	.4658E-05	.6903E-04	.2846E-04	.2097E-05
136	.3557E-05	.4658E-05	.6903E-04	.2846E-04	.2097E-05
137	.3557E-05	.4658E-05	.6903E-04	.2846E-04	.2097E-05
138	.3557E-05	.4658E-05	.6903E-04	.2846E-04	.2097E-05
139	.3579E-05	.4667E-05	.6931E-04	.2852E-04	.2093E-05
140	.3579E-05	.4667E-05	.6931E-04	.2852E-04	.2093E-05
141	.3579E-05	.4667E-05	.6931E-04	.2852E-04	.2093E-05
142	.3579E-05	.4667E-05	.6931E-04	.2852E-04	.2093E-05
143	.3579E-05	.4667E-05	.6931E-04	.2852E-04	.2093E-05
144	.3579E-05	.4667E-05	.6931E-04	.2852E-04	.2093E-05
145	.3602E-05	.4677E-05	.6960E-04	.2857E-04	.2088E-05
146	.3590E-05	.4672E-05	.6945E-04	.2854E-04	.2090E-05
147	.3590E-05	.4672E-05	.6945E-04	.2854E-04	.2090E-05
148	.3590E-05	.4672E-05	.6945E-04	.2854E-04	.2090E-05

t	ZK(t)	ZM2(t)	SO4(t)	DOC(t)	TF(t)
1	.4797E-05	.6293E-04	.6368E-04	4.200	.2690E-05
2	.4799E-05	.6286E-04	.6374E-04	4.200	.2690E-05
3	.4801E-05	.6280E-04	.6379E-04	4.200	.2690E-05
4	.4803E-05	.6273E-04	.6385E-04	4.200	.2690E-05
5	.4797E-05	.6293E-04	.6368E-04	4.200	.2690E-05
6	.4799E-05	.6286E-04	.6374E-04	4.200	.2690E-05
7	.4801E-05	.6280E-04	.6379E-04	4.200	.2690E-05
8	.4803E-05	.6273E-04	.6385E-04	4.200	.2690E-05
9	.4804E-05	.6267E-04	.6405E-04	4.200	.2690E-05
10	.4848E-05	.6239E-04	.6411E-04	4.300	.2690E-05
11	.4850E-05	.6231E-04	.6433E-04	4.300	.2690E-05
12	.4895E-05	.6224E-04	.6439E-04	4.300	.2690E-05
13	.4986E-05	.6225E-04	.6421E-04	4.300	.2680E-05
14	.4984E-05	.6204E-04	.6451E-04	4.300	.2660E-05
15	.5155E-05	.6205E-04	.6433E-04	4.300	.2640E-05
16	.5228E-05	.6199E-04	.6438E-04	4.400	.2620E-05
17	.5366E-05	.6188E-04	.6421E-04	4.400	.2600E-05
18	.5474E-05	.6254E-04	.6332E-04	4.400	.2590E-05
19	.5724E-05	.6248E-04	.6415E-04	4.500	.2560E-05
20	.6151E-05	.6310E-04	.6297E-04	4.700	.2530E-05
21	.6582E-05	.6428E-04	.6215E-04	4.900	.2500E-05
22	.7947E-05	.6476E-04	.6218E-04	5.100	.2470E-05
23	.9874E-05	.6455E-04	.6399E-04	5.300	.2440E-05
24	.1291E-04	.6417E-04	.6508E-04	5.500	.2410E-05
25	.1584E-04	.6547E-04	.6522E-04	5.800	.2470E-05
26	.2069E-04	.6636E-04	.6509E-04	6.100	.2530E-05
27	.2244E-04	.6596E-04	.6646E-04	6.500	.2590E-05
28	.2415E-04	.6521E-04	.6768E-04	7.000	.2650E-05
29	.2548E-04	.6443E-04	.6860E-04	7.500	.2730E-05
30	.2697E-04	.6419E-04	.6910E-04	8.000	.2800E-05
31	.2665E-04	.6380E-04	.6902E-04	8.100	.2790E-05
32	.2686E-04	.6323E-04	.6897E-04	8.200	.2780E-05
33	.2709E-04	.6272E-04	.6890E-04	8.300	.2770E-05
34	.2721E-04	.6245E-04	.6894E-04	8.400	.2760E-05
35	.2732E-04	.6216E-04	.6895E-04	8.500	.2750E-05
36	.2723E-04	.6195E-04	.6901E-04	8.400	.2750E-05
37	.2680E-04	.6201E-04	.6914E-04	8.300	.2750E-05
38	.2637E-04	.6230E-04	.6907E-04	8.200	.2760E-05
39	.2563E-04	.6228E-04	.6944E-04	8.100	.2770E-05
40	.2498E-04	.6241E-04	.6953E-04	8.000	.2780E-05
41	.2425E-04	.6254E-04	.6976E-04	7.800	.2790E-05
42	.2355E-04	.6262E-04	.6976E-04	7.600	.2800E-05
43	.2316E-04	.6280E-04	.6967E-04	7.400	.2820E-05
44	.2255E-04	.6264E-04	.6976E-04	7.200	.2840E-05
45	.2214E-04	.6278E-04	.6962E-04	7.000	.2860E-05
46	.2178E-04	.6272E-04	.6961E-04	6.800	.2880E-05
47	.2142E-04	.6262E-04	.6961E-04	6.600	.2890E-05
48	.2099E-04	.6238E-04	.6970E-04	6.400	.2900E-05

49	.2032E-04	.6232E-04	.7020E-04	6.300	.2920E-05
50	.1981E-04	.6196E-04	.7100E-04	6.200	.2940E-05
51	.1937E-04	.6168E-04	.7177E-04	6.200	.2970E-05
52	.1875E-04	.6152E-04	.7240E-04	6.100	.3000E-05
53	.1819E-04	.6172E-04	.7272E-04	6.100	.3030E-05
54	.1740E-04	.6162E-04	.7309E-04	6.000	.3060E-05
55	.1721E-04	.6128E-04	.7286E-04	6.000	.3070E-05
56	.1709E-04	.6125E-04	.7281E-04	6.000	.3080E-05
57	.1692E-04	.6121E-04	.7297E-04	6.000	.3090E-05
58	.1686E-04	.6140E-04	.7292E-04	6.100	.3100E-05
59	.1677E-04	.6153E-04	.7307E-04	6.100	.3100E-05
60	.1662E-04	.6158E-04	.7309E-04	6.100	.3100E-05
61	.1619E-04	.6159E-04	.7311E-04	6.100	.3100E-05
62	.1589E-04	.6157E-04	.7310E-04	6.100	.3100E-05
63	.1551E-04	.6143E-04	.7315E-04	6.000	.3100E-05
64	.1515E-04	.6134E-04	.7319E-04	6.000	.3100E-05
65	.1484E-04	.6128E-04	.7321E-04	5.900	.3100E-05
66	.1445E-04	.6118E-04	.7322E-04	5.900	.3100E-05
67	.1412E-04	.6119E-04	.7307E-04	5.800	.3100E-05
68	.1372E-04	.6121E-04	.7292E-04	5.800	.3110E-05
69	.1340E-04	.6137E-04	.7268E-04	5.700	.3120E-05
70	.1303E-04	.6135E-04	.7249E-04	5.700	.3130E-05
71	.1262E-04	.6127E-04	.7232E-04	5.600	.3140E-05
72	.1230E-04	.6132E-04	.7206E-04	5.500	.3150E-05
73	.1197E-04	.6133E-04	.7196E-04	5.500	.3160E-05
74	.1163E-04	.6135E-04	.7190E-04	5.500	.3170E-05
75	.1125E-04	.6125E-04	.7186E-04	5.400	.3180E-05
76	.1087E-04	.6117E-04	.7181E-04	5.400	.3190E-05
77	.1049E-04	.6108E-04	.7176E-04	5.300	.3200E-05
78	.1018E-04	.6116E-04	.7167E-04	5.300	.3200E-05
79	.1007E-04	.6116E-04	.7173E-04	5.300	.3210E-05
80	.9971E-05	.6123E-04	.7179E-04	5.300	.3220E-05
81	.9819E-05	.6115E-04	.7195E-04	5.300	.3230E-05
82	.9707E-05	.6114E-04	.7205E-04	5.300	.3240E-05
83	.9596E-05	.6118E-04	.7209E-04	5.300	.3250E-05
84	.9483E-05	.6112E-04	.7222E-04	5.300	.3250E-05
85	.9366E-05	.6111E-04	.7230E-04	5.300	.3260E-05
86	.9249E-05	.6105E-04	.7240E-04	5.300	.3260E-05
87	.9180E-05	.6118E-04	.7240E-04	5.300	.3270E-05
88	.9164E-05	.6122E-04	.7248E-04	5.300	.3270E-05
89	.9117E-05	.6122E-04	.7257E-04	5.200	.3280E-05
90	.9076E-05	.6122E-04	.7268E-04	5.200	.3280E-05
91	.9027E-05	.6122E-04	.7261E-04	5.200	.3260E-05
92	.8984E-05	.6119E-04	.7254E-04	5.200	.3240E-05
93	.8934E-05	.6122E-04	.7244E-04	5.200	.3220E-05
94	.8889E-05	.6119E-04	.7241E-04	5.200	.3200E-05
95	.8844E-05	.6124E-04	.7231E-04	5.100	.3180E-05
96	.8800E-05	.6128E-04	.7224E-04	5.100	.3150E-05
97	.8747E-05	.6125E-04	.7213E-04	5.100	.3130E-05
98	.8712E-05	.6122E-04	.7206E-04	5.100	.3110E-05

99	.8666E-05	.6121E-04	.7196E-04	5.100	.3090E-05
100	.8616E-05	.6111E-04	.7188E-04	5.100	.3070E-05
101	.8568E-05	.6113E-04	.7174E-04	4.900	.3060E-05
102	.8519E-05	.6104E-04	.7169E-04	4.900	.3050E-05
103	.8412E-05	.6106E-04	.7180E-04	4.900	.3050E-05
104	.8306E-05	.6102E-04	.7190E-04	4.900	.3040E-05
105	.8199E-05	.6101E-04	.7201E-04	4.900	.3040E-05
106	.8088E-05	.6093E-04	.7212E-04	4.900	.3030E-05
107	.7984E-05	.6091E-04	.7224E-04	4.900	.3030E-05
108	.7874E-05	.6086E-04	.7239E-04	4.900	.3020E-05
109	.7884E-05	.6088E-04	.7247E-04	4.800	.3020E-05
110	.7882E-05	.6082E-04	.7262E-04	4.800	.3020E-05
111	.7891E-05	.6081E-04	.7274E-04	4.800	.3010E-05
112	.7886E-05	.6075E-04	.7345E-04	4.800	.3010E-05
113	.7894E-05	.6070E-04	.7352E-04	4.800	.3010E-05
114	.7892E-05	.6063E-04	.7359E-04	4.800	.3000E-05
115	.7893E-05	.6056E-04	.7297E-04	4.700	.3000E-05
116	.7895E-05	.6045E-04	.7296E-04	4.700	.2990E-05
117	.7894E-05	.6042E-04	.7287E-04	4.700	.2980E-05
118	.7900E-05	.6032E-04	.7279E-04	4.700	.2970E-05
119	.7899E-05	.6029E-04	.7275E-04	4.700	.2960E-05
120	.7885E-05	.6013E-04	.7271E-04	4.700	.2950E-05
121	.7883E-05	.6015E-04	.7271E-04	4.600	.2940E-05
122	.7879E-05	.6004E-04	.7266E-04	4.600	.2930E-05
123	.7889E-05	.6007E-04	.7265E-04	4.600	.2920E-05
124	.7898E-05	.6001E-04	.7257E-04	4.600	.2900E-05
125	.7897E-05	.6001E-04	.7251E-04	4.600	.2880E-05
126	.7898E-05	.5993E-04	.7251E-04	4.600	.2870E-05
127	.7901E-05	.5996E-04	.7245E-04	4.500	.2870E-05
128	.7914E-05	.5992E-04	.7241E-04	4.500	.2870E-05
129	.7909E-05	.5991E-04	.7236E-04	4.500	.2860E-05
130	.7902E-05	.5979E-04	.7237E-04	4.500	.2860E-05
131	.7907E-05	.5977E-04	.7231E-04	4.500	.2850E-05
132	.7923E-05	.5973E-04	.7227E-04	4.500	.2850E-05
133	.7924E-05	.5990E-04	.7226E-04	4.500	.2850E-05
134	.7929E-05	.5988E-04	.7219E-04	4.500	.2850E-05
135	.7934E-05	.5987E-04	.7202E-04	4.400	.2850E-05
136	.7939E-05	.5985E-04	.7189E-04	4.400	.2850E-05
137	.7939E-05	.5983E-04	.7177E-04	4.400	.2850E-05
138	.7939E-05	.5980E-04	.7155E-04	4.400	.2850E-05
139	.7917E-05	.5990E-04	.7143E-04	4.400	.2850E-05
140	.7916E-05	.5987E-04	.7125E-04	4.400	.2850E-05
141	.7907E-05	.5981E-04	.7114E-04	4.400	.2850E-05
142	.7906E-05	.5978E-04	.7102E-04	4.400	.2850E-05
143	.7897E-05	.5973E-04	.7091E-04	4.400	.2850E-05
144	.7649E-05	.6033E-04	.6997E-04	4.400	.2850E-05
145	.7627E-05	.6029E-04	.6991E-04	4.400	.2850E-05
146	.7638E-05	.6030E-04	.6979E-04	4.400	.2850E-05
147	.7644E-05	.6031E-04	.6970E-04	4.400	.2850E-05
148	.7653E-05	.6034E-04	.6959E-04	4.400	.2850E-05

t	PH(t)	AL(t)	FF(t)
1	5.23	.1473E-06	.8520E-06
2	5.22	.1557E-06	.8276E-06
3	5.21	.1643E-06	.8041E-06
4	5.20	.1732E-06	.7817E-06
5	5.20	.1840E-06	.7564E-06
6	5.19	.1939E-06	.7348E-06
7	5.18	.2040E-06	.7140E-06
8	5.17	.2144E-06	.6942E-06
9	5.16	.2389E-06	.6523E-06
10	5.15	.2564E-06	.6256E-06
11	5.13	.2865E-06	.5851E-06
12	5.12	.2993E-06	.5697E-06
13	5.14	.2737E-06	.5998E-06
14	5.11	.3339E-06	.5275E-06
15	5.12	.3011E-06	.5593E-06
16	5.10	.3547E-06	.5016E-06
17	5.11	.3400E-06	.5121E-06
18	5.20	.1787E-06	.7464E-06
19	5.10	.3432E-06	.5030E-06
20	5.15	.2539E-06	.5998E-06
21	5.18	.2074E-06	.6685E-06
22	5.17	.2155E-06	.6481E-06
23	5.03	.5850E-06	.3381E-06
24	4.96	.9278E-06	.2377E-06
25	4.95	.1024E-05	.2250E-06
26	4.96	.9254E-06	.2487E-06
27	4.85	.1972E-05	.1374E-06
28	4.76	.3724E-05	.8021E-07
29	4.55	.3507E-05	.8714E-07
30	4.51	.4617E-05	.6955E-07
31	4.51	.4736E-05	.6771E-07
32	4.50	.4836E-05	.6618E-07
33	4.51	.4723E-05	.6739E-07
34	4.52	.4404E-05	.7159E-07
35	4.52	.4447E-05	.7071E-07
36	4.52	.4253E-05	.7363E-07
37	4.53	.4054E-05	.7693E-07
38	4.54	.3711E-05	.8362E-07
39	4.54	.3675E-05	.8464E-07
40	4.55	.3485E-05	.8909E-07
41	4.56	.3239E-05	.9543E-07
42	4.58	.2940E-05	.1043E-06
43	4.59	.2700E-05	.1132E-06
44	4.60	.2502E-05	.1217E-06
45	4.61	.2274E-05	.1331E-06
46	4.63	.2006E-05	.1491E-06
47	4.64	.1892E-05	.1571E-06
48	4.65	.1723E-05	.1704E-06

49	4.65	.1727E-05	.1710E-06
50	4.64	.1864E-05	.1615E-06
51	4.63	.2060E-05	.1498E-06
52	4.62	.2117E-05	.1478E-06
53	4.62	.2221E-05	.1431E-06
54	4.61	.2355E-05	.1373E-06
55	4.60	.2554E-05	.1284E-06
56	4.60	.2419E-05	.1350E-06
57	4.59	.2645E-05	.1253E-06
58	4.60	.2541E-05	.1301E-06
59	4.59	.2706E-05	.1232E-06
60	4.59	.2718E-05	.1227E-06
61	4.59	.2636E-05	.1260E-06
62	4.58	.2834E-05	.1183E-06
63	4.59	.2691E-05	.1238E-06
64	4.58	.2784E-05	.1202E-06
65	4.59	.2600E-05	.1275E-06
66	4.59	.2691E-05	.1238E-06
67	4.59	.2589E-05	.1280E-06
68	4.59	.2593E-05	.1282E-06
69	4.60	.2418E-05	.1365E-06
70	4.60	.2423E-05	.1367E-06
71	4.61	.2348E-05	.1408E-06
72	4.62	.2211E-05	.1486E-06
73	4.62	.2222E-05	.1484E-06
74	4.61	.2246E-05	.1475E-06
75	4.62	.2212E-05	.1498E-06
76	4.61	.2273E-05	.1468E-06
77	4.62	.2237E-05	.1492E-06
78	4.62	.2230E-05	.1496E-06
79	4.61	.2260E-05	.1483E-06
80	4.61	.2271E-05	.1481E-06
81	4.61	.2354E-05	.1441E-06
82	4.61	.2397E-05	.1422E-06
83	4.60	.2413E-05	.1418E-06
84	4.60	.2481E-05	.1385E-06
85	4.60	.2521E-05	.1370E-06
86	4.59	.2584E-05	.1341E-06
87	4.60	.2554E-05	.1358E-06
88	4.60	.2570E-05	.1351E-06
89	4.60	.2499E-05	.1388E-06
90	4.60	.2535E-05	.1371E-06
91	4.60	.2527E-05	.1367E-06
92	4.60	.2528E-05	.1359E-06
93	4.60	.2501E-05	.1364E-06
94	4.60	.2512E-05	.1351E-06
95	4.61	.2380E-05	.1407E-06
96	4.61	.2363E-05	.1404E-06
97	4.61	.2350E-05	.1402E-06
98	4.61	.2347E-05	.1396E-06

99	4.61	.2332E-05	.1395E-06
100	4.61	.2351E-05	.1377E-06
101	4.62	.2120E-05	.1500E-06
102	4.62	.2142E-05	.1483E-06
103	4.62	.2180E-05	.1460E-06
104	4.62	.2236E-05	.1425E-06
105	4.61	.2281E-05	.1401E-06
106	4.61	.2352E-05	.1361E-06
107	4.60	.2409E-05	.1333E-06
108	4.60	.2480E-05	.1296E-06
109	4.61	.2397E-05	.1335E-06
110	4.60	.2455E-05	.1307E-06
111	4.60	.2494E-05	.1286E-06
112	4.59	.2722E-05	.1192E-06
113	4.59	.2753E-05	.1180E-06
114	4.58	.2803E-05	.1159E-06
115	4.60	.2532E-05	.1265E-06
116	4.60	.2564E-05	.1248E-06
117	4.60	.2548E-05	.1251E-06
118	4.60	.2556E-05	.1244E-06
119	4.60	.2556E-05	.1239E-06
120	4.59	.2596E-05	.1219E-06
121	4.60	.2488E-05	.1261E-06
122	4.60	.2509E-05	.1248E-06
123	4.60	.2497E-05	.1249E-06
124	4.60	.2494E-05	.1243E-06
125	4.60	.2483E-05	.1240E-06
126	4.60	.2508E-05	.1225E-06
127	4.61	.2381E-05	.1281E-06
128	4.61	.2380E-05	.1282E-06
129	4.61	.2370E-05	.1282E-06
130	4.60	.2407E-05	.1265E-06
131	4.61	.2397E-05	.1266E-06
132	4.61	.2396E-05	.1266E-06
133	4.61	.2344E-05	.1290E-06
134	4.61	.2330E-05	.1297E-06
135	4.62	.2186E-05	.1370E-06
136	4.62	.2156E-05	.1386E-06
137	4.62	.2129E-05	.1401E-06
138	4.63	.2078E-05	.1430E-06
139	4.63	.2024E-05	.1463E-06
140	4.63	.1984E-05	.1487E-06
141	4.63	.1970E-05	.1496E-06
142	4.63	.1946E-05	.1512E-06
143	4.64	.1932E-05	.1521E-06
144	4.66	.1583E-05	.1796E-06
145	4.66	.1580E-05	.1798E-06
146	4.67	.1550E-05	.1826E-06
147	4.67	.1526E-05	.1850E-06
148	4.67	.1490E-05	.1887E-06

t	ALIN(t)	ALORG(t)	ALTOT(t)	ANC(t)
1	1.98	4.49	6.48	-4.270
2	2.03	4.50	6.52	-4.388
3	2.07	4.50	6.57	-4.503
4	2.11	4.50	6.61	-4.618
5	2.16	4.50	6.66	-4.750
6	2.20	4.50	6.71	-4.867
7	2.24	4.51	6.75	-4.982
8	2.29	4.51	6.79	-5.096
9	2.38	4.51	6.89	-5.346
10	2.44	4.63	7.07	-5.515
11	2.54	4.64	7.18	-5.785
12	2.58	4.64	7.22	-5.893
13	2.50	4.63	7.13	-5.673
14	2.67	4.64	7.31	-6.170
15	2.56	4.64	7.19	-5.908
16	2.71	4.76	7.46	-6.326
17	2.65	4.76	7.41	-6.217
18	2.08	4.73	6.81	-4.687
19	2.63	4.87	7.51	-6.240
20	2.34	5.09	7.43	-5.492
21	2.15	5.32	7.47	-5.019
22	2.16	5.56	7.72	-5.106
23	3.13	5.84	8.97	-7.716
24	3.75	6.10	9.86	-9.179
25	3.96	6.47	10.44	-9.515
26	3.84	6.83	10.67	-9.163
27	5.48	7.38	12.86	-12.01
28	7.84	8.06	15.90	-14.94
29	6.85	8.66	15.51	-27.60
30	8.21	9.32	17.53	-30.24
31	8.34	9.45	17.79	-30.49
32	8.44	9.58	18.03	-30.71
33	8.31	9.70	18.01	-30.47
34	7.93	9.82	17.75	-29.77
35	7.97	9.95	17.92	-29.87
36	7.74	9.82	17.56	-29.43
37	7.51	9.68	17.20	-28.97
38	7.12	9.55	16.66	-28.13
39	7.09	9.42	16.51	-28.04
40	6.87	9.29	16.16	-27.54
41	6.59	9.03	15.62	-26.88
42	6.24	8.76	15.00	-26.03
43	5.97	8.51	14.47	-25.29
44	5.74	8.25	13.99	-24.66
45	5.47	7.99	13.47	-23.88
46	5.15	7.74	12.89	-22.89
47	5.01	7.49	12.50	-22.45
48	4.80	7.23	12.03	-21.75

49	4.82	7.11	11.93-21.77
50	5.02	7.00	12.01-22.33
51	5.30	7.00	12.30-23.10
52	5.40	6.88	12.28-23.31
53	5.56	6.89	12.45-23.69
54	5.75	6.77	12.52-24.16
55	6.01	6.78	12.79-24.83
56	5.85	6.77	12.62-24.38
57	6.14	6.78	12.92-25.12
58	6.02	6.90	12.92-24.78
59	6.22	6.91	13.13-25.31
60	6.24	6.91	13.15-25.35
61	6.14	6.90	13.04-25.09
62	6.38	6.91	13.29-25.71
63	6.21	6.78	12.99-25.26
64	6.32	6.79	13.11-25.55
65	6.09	6.66	12.75-24.98
66	6.21	6.66	12.87-25.27
67	6.08	6.54	12.62-24.94
68	6.09	6.54	12.63-24.96
69	5.88	6.41	12.29-24.38
70	5.90	6.41	12.31-24.40
71	5.81	6.28	12.10-24.14
72	5.65	6.16	11.81-23.66
73	5.67	6.16	11.83-23.70
74	5.71	6.16	11.87-23.79
75	5.67	6.04	11.71-23.67
76	5.76	6.04	11.80-23.88
77	5.72	5.92	11.64-23.76
78	5.71	5.92	11.63-23.73
79	5.76	5.92	11.68-23.84
80	5.78	5.92	11.70-23.88
81	5.90	5.92	11.82-24.17
82	5.96	5.92	11.88-24.31
83	5.99	5.92	11.91-24.37
84	6.07	5.93	12.00-24.60
85	6.13	5.93	12.06-24.73
86	6.21	5.93	12.14-24.93
87	6.18	5.93	12.11-24.83
88	6.20	5.93	12.13-24.89
89	6.12	5.81	11.93-24.65
90	6.17	5.81	11.98-24.77
91	6.14	5.81	11.95-24.75
92	6.12	5.81	11.93-24.75
93	6.07	5.81	11.88-24.66
94	6.07	5.81	11.87-24.70
95	5.89	5.68	11.57-24.25
96	5.84	5.68	11.52-24.20
97	5.81	5.68	11.49-24.15
98	5.78	5.68	11.46-24.14

99	5.75	5.68	11.43-24.09
100	5.75	5.68	11.43-24.16
101	5.45	5.43	10.88-23.34
102	5.47	5.43	10.90-23.41
103	5.52	5.43	10.95-23.55
104	5.58	5.43	11.02-23.76
105	5.64	5.43	11.08-23.91
106	5.72	5.44	11.16-24.16
107	5.79	5.44	11.23-24.36
108	5.87	5.44	11.31-24.59
109	5.77	5.32	11.09-24.32
110	5.84	5.32	11.16-24.51
111	5.88	5.32	11.20-24.64
112	6.17	5.32	11.49-25.37
113	6.21	5.33	11.53-25.47
114	6.26	5.33	11.58-25.62
115	5.92	5.20	11.12-24.77
116	5.95	5.20	11.15-24.87
117	5.92	5.20	11.12-24.82
118	5.93	5.20	11.13-24.84
119	5.92	5.20	11.12-24.85
120	5.96	5.20	11.16-24.98
121	5.81	5.08	10.89-24.62
122	5.83	5.08	10.91-24.69
123	5.81	5.08	10.89-24.65
124	5.79	5.08	10.86-24.64
125	5.76	5.08	10.83-24.61
126	5.78	5.08	10.86-24.69
127	5.62	4.95	10.58-24.26
128	5.62	4.95	10.57-24.26
129	5.60	4.95	10.55-24.23
130	5.65	4.96	10.60-24.36
131	5.62	4.95	10.58-24.32
132	5.62	4.95	10.58-24.32
133	5.56	4.95	10.51-24.14
134	5.54	4.95	10.49-24.09
135	5.36	4.83	10.19-23.58
136	5.32	4.83	10.15-23.47
137	5.29	4.83	10.11-23.37
138	5.22	4.83	10.05-23.18
139	5.15	4.83	9.98-22.98
140	5.10	4.83	9.93-22.83
141	5.08	4.82	9.91-22.77
142	5.05	4.82	9.87-22.68
143	5.03	4.82	9.86-22.63
144	4.57	4.81	9.38-21.15
145	4.57	4.81	9.38-21.14
146	4.53	4.81	9.34-21.01
147	4.49	4.81	9.30-20.89
148	4.44	4.81	9.25-20.73

APPENDIX E

RAW DATA COLLECTED FOR THIS STUDY

NOMENCLATURE FOR RAINFALL DATA

VOL = rainfall volume (in)
pH = pH
MAL = monomeric aluminum (mg/L)
TF = total fluoride (mg/L)
CL = chloride (mg/L)
NO3 = nitrate (mg-N/L)
SO4 = sulfate (mg/L)
CA = calcium (mg/L)
MG = magnesium (mg/L)
NA = sodium (mg/L)
K = potassium (mg/l)
FE = iron (mg/L)
SI = silica (mg/L)

HOURLY RAIN VOLUME AT WORCESTER AIRPORT

DATE	TIME	VOLUME
05/03/85	02:00	.03
05/03/85	03:00	.09
05/03/85	04:00	.08
05/03/85	05:00	.05
05/03/85	06:00	.10
05/03/85	07:00	.10
05/03/85	08:00	.10
05/03/85	09:00	.09
05/03/85	10:00	.23
05/03/85	11:00	.11
05/03/85	12:00	.10
05/03/85	13:00	.10
05/03/85	14:00	.07
05/03/85	15:00	.05
05/03/85	16:00	.04
05/03/85	17:00	.02
05/06/85	06:00	.05
05/06/85	07:00	.11
05/06/85	08:00	.08
05/06/85	09:00	.07
05/06/85	10:00	.01
05/06/85	11:00	.05
05/06/85	12:00	.04
05/06/85	13:00	.02
05/06/85	18:00	.02
05/06/85	19:00	.01
05/06/85	23:00	.01
05/06/85	24:00	.01
05/08/85	05:00	.02
11/02/85	16:00	.01
11/03/85	04:00	.01
11/03/85	15:00	.01
11/03/85	21:00	.01
11/04/85	23:00	.02
11/04/85	24:00	.02
11/05/85	01:00	.04
11/05/85	02:00	.13
11/05/85	03:00	.10
11/05/85	04:00	.09
11/05/85	05:00	.06
11/05/85	06:00	.15
11/05/85	07:00	.08
11/05/85	08:00	.21
11/05/85	09:00	.20
11/05/85	10:00	.34
11/05/85	11:00	.38
11/05/85	12:00	.35
11/05/85	13:00	.08
11/05/85	14:00	.07
11/05/85	15:00	.02
11/05/85	17:00	.01
11/05/85	21:00	.02
11/05/85	22:00	.01
11/05/85	23:00	.03
11/05/85	24:00	.01
11/06/85	08:00	.01
11/06/85	09:00	.06
11/06/85	10:00	.11
11/06/85	11:00	.06
11/10/85	05:00	.03
11/10/85	23:00	.01
11/10/85	24:00	.02
11/11/85	01:00	.01
11/11/85	05:00	.01
11/11/85	07:00	.01
11/11/85	08:00	.03
11/11/85	09:00	.14
11/11/85	10:00	.05
11/11/85	11:00	.05
11/11/85	12:00	.02
11/11/85	13:00	.02
11/11/85	14:00	.06
11/11/85	15:00	.03
11/11/85	18:00	.01
11/11/85	21:00	.01
11/12/85	08:00	.07
11/12/85	09:00	.02
11/12/85	10:00	.02
11/12/85	11:00	.06
11/12/85	12:00	.03
11/12/85	13:00	.02
11/12/85	14:00	.03
11/12/85	15:00	.02
11/12/85	16:00	.02
11/12/85	17:00	.01
11/12/85	19:00	.01
11/12/85	20:00	.02
11/12/85	21:00	.01
11/12/85	22:00	.02
11/12/85	23:00	.01
11/14/85	16:00	.01
11/14/85	18:00	.04
11/14/85	19:00	.05

HOURLY RAIN VOLUME AT WORCESTER AIRPORT

DATE	TIME	VOLUME
11/14/85	20:00	.03
11/14/85	21:00	.07
11/14/85	22:00	.25
11/14/85	23:00	.02

RAW RAINWATER DATA

DATE	TIME	VOL	pH	MAL	TF	CL	NO3	SO4
04/22/85	10:00		3.96			1.93	2.06	11.20
05/03/85	10:00	.40	4.16		.017	.84	.51	4.34
05/04/85	09:00	.30	4.32		.012	.62	0.00	2.93
05/07/85	10:15	.30	3.89		.026	1.02	1.29	7.76
11/05/85	01:00		5.64		.120	12.20	1.37	16.20
11/05/85	05:00		5.40		.026	2.08	.25	3.71
11/05/85	10:00	.70	4.94	.153	.013	1.63	.15	2.60
11/05/85	12:00		5.29	.076	.008	.70	0.00	1.72
11/05/85	15:00		5.33		.027	1.61	.28	3.15
11/06/85	10:00	.50	4.56	.121	.008	4.63	.16	2.11
11/07/85	10:00	.20	4.58	.055	.003	3.27	0.00	1.75
11/11/85	10:00	.35	4.39	.131	.005	.61	.77	3.30
11/12/85	10:00	.12	3.81			.66	.80	5.83
11/13/85	10:00	.22	4.29					
11/15/85	10:00	.26	3.97	.191		.25	1.26	6.16

RAW RAINWATER DATA

DATE	TIME	CA	MG	NA	K	FE	SI
04/22/85	10:00	2.42	.48	1.86	2.94	.01	.15
05/03/85	10:00	1.05	.18	.56	1.84	.02	0.00
05/04/85	09:00	.47	.05	.16	.70	.02	.01
05/07/85	10:15	.93	.16	.58	1.02	0.00	.08
11/05/85	01:00	6.83	1.54	10.20	3.65	.12	.16
11/05/85	05:00	.76	.11	.67	.31	0.00	.07
11/05/85	10:00	.48	.12	1.09	.14	0.00	.04
11/05/85	12:00	.25	.03	.28	0.00	0.00	0.00
11/05/85	15:00	1.47	.19	1.06	.32	.02	0.00
11/06/85	10:00	.20	.03	.34	0.00	0.00	.01
11/07/85	10:00	.09	.01	.13	0.00	0.00	.03
11/11/85	10:00	.32	.06	.17	.90	0.00	.03
11/12/85	10:00	.27	.06	.21	.06	.06	.04
11/13/85	10:00						
11/15/85	10:00	.69	.15	.48	.62	.01	0.00

NOMENCLATURE FOR SOIL DATA

SITE 5 = PAXTON
SITE 6 = MARLOW
SITE 7 = MERRIMAC
SITE 8 = CANTON
SITE 9 = RAYPOLE
SITE 10 = SCITUATE
SITE 11 = RIDGEBURY
SITE 12 = WHITMAN
SITE 13 = WOODBRIDGE

BDEN = dry bulk density (gm/cm^3)
WET = moisture content
SWET = saturated moisture content
FWET = field capacity moisture content
PHW = water pH
PHS = salt pH
ORG = % organic matter content
XCA = exchangeable calcium (meq/100 g soil)
XMG = exchangeable magnesium (meq/100 g soil)
XK = exchangeable potassium (meq/100 g soil)
XNA = exchangeable sodium (meq/100 g soil)
XFE = exchangeable iron (meq/100 g soil)
XAL = exchangeable aluminum (meq/100 g soil)
XH = exchangeable hydrogen ion (meq/100 g soil)

RAW SOIL CHEMISTRY DATA FOR SITE 5

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
OI	MAT							67.00
OA	2.5- 0.0	.98	.19	.33	.17	3.55	2.80	34.40
A	0.0- 6.5					3.70	3.10	18.20
BW1	6.5-11.5	.76	.33	.63	.26	4.10	3.85	11.10
BW2	11.5-37.0					4.35	4.00	5.60
BC	37.0-54.5					4.45	4.25	2.70
CR	54.5-					4.70	4.10	1.00

RAW SOIL CHEMISTRY DATA FOR SITE 6

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
OA	16.5- 0.0	1.30	.34	.49	.23	3.35	2.80	41.00
E	0.0- 5.0					3.90	3.00	4.60
BHS	5.0- 7.5					4.00	3.10	9.60
BS	7.5-16.5					4.15	3.80	11.30
BW	16.5-32.0	.78	.45	.72	.42	4.35	4.10	9.40

RAW SOIL CHEMISTRY DATA FOR SITE 7

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
A	0.0- 7.5					3.75	2.85	18.50
E	7.5-15.0	1.03	.30	.54	.24	4.25	3.25	2.20
BW1	15.0-30.5					4.45	4.00	10.00
BW2	30.5-48.5	1.13	.27	.52	.19	4.45	4.30	5.10
BW3	48.5-76.0					4.50	4.30	3.10
C	76.0-					4.55	4.40	1.20

RAW SOIL CHEMISTRY DATA FOR SITE 8

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
A	0.0- 6.5					3.55	2.65	22.50
E	6.5- 9.0	.31	.39	.67	.28	3.75	2.90	7.20
BW	9.0-38.0	.61	.54	.70	.42	4.25	3.65	14.70

RAW SOIL CHEMISTRY DATA FOR SITE 9

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
A	0.0-18.0	.37	.70	.78	.51	3.85	3.35	37.00
BW	18.0-33.0					4.05	3.55	9.70
BG	33.0-45.5					4.30	3.90	9.80
CG1	45.5-61.0					4.30	3.95	4.10

RAW SOIL CHEMISTRY DATA FOR SITE 9

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
CG2	61.0-81.5					4.50	4.25	3.10

RAW SOIL CHEMISTRY DATA FOR SITE 10

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
AP	0.0-25.5	.68	.43	.70	.34	3.95	3.60	16.40
BW1	25.5-45.5					4.20	3.85	6.70
BW2	45.5-63.5					4.55	4.10	4.00
C	63.5-					4.90	4.50	1.20

RAW SOIL CHEMISTRY DATA FOR SITE 11

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
A	0.0-18.0	.69	.56	.67	.43	3.90	3.65	19.90
BG	18.0-33.0					4.35	4.00	7.50
CG	33.0-	1.52	.36	.40	.13	4.60	4.15	2.10

RAW SOIL CHEMISTRY DATA FOR SITE 12

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
A	0.0-20.5					4.10	3.65	18.40
BG	20.5-35.0	1.23	.42	.48	.22	4.30	3.90	9.30
CG	35.0-					4.40	3.85	13.10

RAW SOIL CHEMISTRY DATA FOR SITE 13

HORIZON	DEPTH	BDEN	WET	SWET	FWET	PHW	PHS	ORG
A	0.0- 5.0							29.90
BW1	5.0-11.5					4.55	3.85	9.40
BW2	11.5-18.0					4.60	4.00	8.00
BW3	18.0-30.5	.85	.24	.51	.21	4.65	4.10	5.20
BW4	30.5-53.5					4.70	4.05	4.80

RAW SOIL CHEMISTRY DATA FOR SITE 5

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
OI	MAT	1.25	.63	.34	.08	.01	3.29	1.45
OA	2.5- 0.0	.35	.23	.24	.22	.02	5.95	.69
A	0.0- 6.5	.06	.08	.14	.02	.01	5.99	.42
BW1	6.5-11.5	.06	.02	.04	.01	0.00	1.94	0.00
BW2	11.5-37.0	.05	.01	.03	.01	0.00	.83	.02
BC	37.0-54.5	.04	.01	.03	.01	0.00	.58	.01
CR	54.5-	.10	.02	.09	.02	0.00	.74	.01

RAW SOIL CHEMISTRY DATA FOR SITE 6

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
OA	16.5- 0.0	.20	.16	.25	.03	0.00	4.57	1.36
E	0.0- 5.0	.05	.02	.10	.01	.02	3.13	.26
BHS	5.0- 7.5	.09	.04	.09	.02	.01	6.09	.06
BS	7.5-16.5	.05	.01	.04	.01	0.00	2.47	0.00
BW	16.5-32.0	.05	.01	.02	.01	0.00	1.17	0.00

RAW SOIL CHEMISTRY DATA FOR SITE 7

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
A	0.0- 7.5	.09	.08	.17	.02	.01	4.72	.89
E	7.5-15.0	.02	.01	.03	.01	0.00	3.15	0.00
BW1	15.0-30.5	.03	.01	.03	.01	0.00	1.59	0.00
BW2	30.5-48.5	.02	.01	.02	.01	0.00	.50	.02
BW3	48.5-76.0	.02	0.00	.01	.01	0.00	.30	.01
C	76.0-	.02	0.00	.01	.01	0.00	.31	.02

RAW SOIL CHEMISTRY DATA FOR SITE 8

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
A	0.0- 6.5	.10	.11	.23	.06	.02	6.21	1.05
E	6.5- 9.0	.05	.08	.10	.03	.21	4.85	.69
BW	9.0-38.0	.05	.04	.05	.02	0.00	2.67	0.00

RAW SOIL CHEMISTRY DATA FOR SITE 9

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
A	0.0-18.0	.06	.06	.14	.04	0.00	5.87	.01
BW	18.0-33.0	.03	.02	.04	.02	0.00	2.69	0.00
BG	33.0-45.5	.05	.01	.03	.02	0.00	1.55	0.00
CG1	45.5-61.0	.07	.01	.02	.03	0.00	.94	.02

RAW SOIL CHEMISTRY DATA FOR SITE 9

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
CG2	61.0-81.5	.04	.01	.02	.03	0.00	.39	.01

RAW SOIL CHEMISTRY DATA FOR SITE 10

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
AP	0.0-25.5	.14	.03	.08	.02	0.00	1.97	.06
BW1	25.5-45.5	.07	.02	.03	.02	0.00	1.31	0.00
BW2	45.5-63.5	.05	.02	.02	.01	0.00	.29	0.00
C	63.5-	.19	.01	.04	.02	0.00	.17	.02

RAW SOIL CHEMISTRY DATA FOR SITE 11

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
A	0.0-18.0	.10	.05	.14	.04	0.00	3.01	.01
BG	18.0-33.0	.11	.02	.03	.03	0.00	1.27	.06
CG	33.0-	.06	.01	.03	.02	0.00	.45	0.00

RAW SOIL CHEMISTRY DATA FOR SITE 12

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
A	0.0-20.5	.12	.08	.14	.05	0.00	3.34	0.00
BG	20.5-35.0	.11	.04	.07	.03	0.00	1.75	.08
CG	35.0-	.21	.07	.10	.04	0.00	3.10	.12

RAW SOIL CHEMISTRY DATA FOR SITE 13

HORIZON	DEPTH	XCA	XMG	XK	XNA	XFE	XAL	XH
A	0.0- 5.0	.19	.31	.31	.05	.39	6.40	1.91
BW1	5.0-11.5	.06	.07	.15	.03	0.00	2.54	.03
BW2	11.5-18.0	.04	.03	.03	.02	0.00	1.97	0.00
BW3	18.0-30.5	.05	.02	.04	.01	0.00	1.35	0.00
BW4	30.5-53.5	.05	.02	.03	.01	0.00	1.09	.01

NOMENCLATURE FOR STREAMWATER DATA

SITE 1 = mountain stream site
SITE 2 = wetland stream site
SITE 3 = downstream site

TEMP = temperature (C)
COND = conductivity (umhos/cm)
FLOW = stream flow (cfs)
PH = pH
ANC = acid neutralizing capacity (ueq/L)
SO4 = sulfate (mg/L)
CL = chloride (mg/L)
TAL = acid soluble aluminum (mg/L)
MAL = monomeric aluminum (mg/L)
OAL = organic monomeric aluminum (mg/L)
DOC = dissolved organic carbon (mg/L)
TF = total fluoride (mg/L)
F = free fluoride (mg/L)
CA = calcium (mg/L)
MG = magnesium (mg/L)
NA = sodium (mg/L)
K = potassium (mg/L)
FE = iron (mg/L)
SI = silica (mg/L)

RAW STREAMWATER DATA FOR SITE 1

DATE	TIME	TEMP	COND	FLOW	PH	ANC	SO4	CL
03/05/85	14:10	1.0	27.0		4.88	- 7.0	7.59	3.12
03/19/85	10:00	1.0	22.0		4.75	- 13.9	7.94	2.87
03/26/85	10:10	1.5	24.0		4.89	4.2	8.55	2.89
04/02/85	10:00	4.0	28.0	.4	4.79	- 9.3	7.24	3.30
04/06/85	10:00	6.0	28.0	1.1	4.67	- 16.1	7.59	2.95
04/09/85	10:00	4.0	25.0	1.6	4.72	- 4.7	8.30	2.40
04/13/85	11:00	6.0	27.0	.7	4.71	- 21.8	6.20	2.80
04/13/85	23:00				4.92	5.0	6.50	2.20
04/19/85	11:00	9.0	28.0	.4	4.88	- 3.5	5.90	1.90
04/20/85	09:15	10.0	26.0	.4				
04/22/85	11:00			1.0	4.83	- 17.8	7.00	
04/22/85	23:00				4.83	- 14.7	7.59	3.69
04/23/85	10:00	11.0	26.0	.6				
04/23/85	16:00				4.89		7.59	3.71
04/24/85	09:00	9.0	25.0	.5	4.86	- 14.7	7.59	3.43
04/25/85	10:15	10.0	28.0	.5				
04/30/85	10:30	13.0	29.0	.3	4.95	- 10.0	7.24	4.65
05/02/85	10:55	12.5	26.0	.2	5.09	- 6.2	7.47	2.40
05/02/85	16:55				4.99	- 7.7	7.63	2.40
05/02/85	22:55				5.04		7.63	3.00
05/03/85	04:55				5.02	- 8.0	7.63	2.76
05/03/85	10:55	8.0	22.0	1.1	5.06	- 12.7	6.36	2.64
05/03/85	16:55				4.92	- 9.7	7.16	2.28
05/03/85	22:55				4.84	- 9.5	7.63	2.82
05/04/85	04:55				4.83	- 10.4	7.63	2.36
05/04/85	10:55	8.0	25.0	1.2	4.85	- 13.9	7.63	3.48
05/04/85	16:55				4.83	- 15.5	7.63	2.28
05/04/85	22:55				4.87	- 14.6	7.31	2.16
05/05/85	04:55				4.87	- 10.8	6.20	2.34
05/05/85	10:55	10.0	25.0	.7	4.83		7.24	4.40
05/05/85	16:55				4.80	- 17.8	7.59	3.09
05/05/85	22:55				4.90		7.24	4.10
05/06/85	04:55				4.83	- 15.6	7.24	4.22
05/06/85	10:55	9.0	25.0	.7	4.83		7.24	3.24
05/06/85	16:55				4.88	- 14.9	7.20	2.07
05/06/85	22:55				4.89		7.45	3.55
05/07/85	04:55				4.82	- 17.8	7.24	3.34
05/07/85	10:55	9.0	25.0	1.1	4.83		6.70	2.11
05/07/85	16:55				4.85	- 27.1	7.27	2.16
05/07/85	22:55				4.88		7.45	2.72
05/08/85	04:55				4.84	- 18.2	6.70	
05/08/85	10:55	9.0	25.0	.7				
05/08/85	16:55				4.83	- 9.5	7.45	2.60
05/09/85	10:55	9.0	23.0	.6	4.83	- 9.5	7.30	2.02
05/10/85	10:30	12.5	26.0	.5	4.90	- 11.3	7.55	2.03
05/11/85	09:00	13.0	27.0	.4	4.93	- 16.4	7.69	1.71
05/14/85	09:45	16.0	28.0	.3	5.07	- 9.2	6.90	3.71

RAW STREAMWATER DATA FOR SITE 1

DATE	TIME	TAL	MAL	OAL	DOC	TF	F
03/05/85	14:10	.634	.598	.227	2.06	.056	
03/19/85	10:00	.663	.485	.162	2.50	.056	
03/26/85	10:10	.786	.493	.080	2.20	.061	
04/02/85	10:00	.479	.370	.099	2.00	.044	
04/06/85	10:00	.553	.456	.029	2.20	.048	
04/09/85	10:00	.631	.533	.061	2.28	.052	.001
04/13/85	11:00	.566	.469	.114	2.10	.052	
04/13/85	23:00	.522	.417	.073	2.02	.044	
04/19/85	11:00	.443	.370	.086	2.04	.044	
04/20/85	09:15						
04/22/85	11:00	.490	.287	.061	2.30	.042	
04/22/85	23:00		.388	.072	2.26	.042	
04/23/85	10:00						
04/23/85	16:00	.387	.314	.107	2.14		
04/24/85	09:00	.428	.324	.107	2.14	.045	
04/25/85	10:15						
04/30/85	10:30	.314	.231	.055	2.04	.040	.004
05/02/85	10:55	.301	.212	.045	2.00	.038	
05/02/85	16:55		.212	.034	2.02	.038	
05/02/85	22:55		.223	.034	1.98	.038	
05/03/85	04:55		.233	.045	2.20	.039	
05/03/85	10:55	.363	.235	.060	2.32	.043	
05/03/85	16:55		.320	.076	2.65	.040	
05/03/85	22:55		.352	.071	2.53	.042	
05/04/85	04:55		.394	.076	2.39	.040	
05/04/85	10:55	.439	.376	.081	2.26	.058	
05/04/85	16:55		.345	.065	2.24	.058	
05/04/85	22:55		.340	.096	2.22	.059	
05/05/85	04:55		.350	.091	2.18	.060	
05/05/85	10:55		.356	.065	2.14	.060	
05/05/85	16:55		.283	.055	2.16	.059	
05/05/85	22:55		.293	.039	2.16	.060	
05/06/85	04:55		.299	.060	2.16	.061	
05/06/85	10:55		.324	.050	2.12	.060	
05/06/85	16:55		.335	.050	2.16	.062	
05/06/85	22:55		.345	.055	2.18	.057	
05/07/85	04:55		.345	.055	2.18	.056	
05/07/85	10:55	.470	.345	.055	2.22	.062	
05/07/85	16:55		.335		2.20	.060	
05/07/85	22:55		.335	.045	2.18	.062	
05/08/85	04:55		.356	.070	2.18	.064	
05/08/85	10:55						
05/08/85	16:55		.345	.055	2.12	.057	
05/09/85	10:55	.470	.382	.070	2.12	.062	
05/10/85	10:30		.330	.060	2.08	.062	
05/11/85	09:00	.349	.288	.055	2.06	.058	
05/14/85	09:45	.314	.236	.050	2.08	.052	

RAW STREAMWATER DATA FOR SITE 1

DATE	TIME	CA	MG	NA	K	FE	SI
03/05/85	14:10	1.45	.34	1.86	.10	.01	2.89
03/19/85	10:00	1.40	.34	1.72	.31	0.00	2.89
03/26/85	10:10	1.92	.38	1.78	.47	0.00	3.09
04/02/85	10:00	1.55	.35	2.14	.31	.01	3.00
04/06/85	10:00	1.54	.33	1.57		0.00	2.79
04/09/85	10:00	1.36	.34	1.79	.53	0.00	2.85
04/13/85	11:00	1.58	.33	1.85	.29	0.00	2.78
04/13/85	23:00	1.66	.35	2.12	.25	0.00	2.84
04/19/85	11:00	1.70	.35	2.19		0.00	3.07
04/20/85	09:15						
04/22/85	11:00	1.52	.37	1.97	.29	0.00	3.07
04/22/85	23:00	1.57	.37	2.06	.38	0.00	3.13
04/23/85	10:00						
04/23/85	16:00	1.54	.36	2.07	.38	0.00	3.11
04/24/85	09:00	1.55	.36	1.91	.25	0.00	3.16
04/25/85	10:15						
04/30/85	10:30	1.65	.37	2.06	.02	0.00	3.30
05/02/85	10:55	1.57	.37	2.24	.33	.01	3.40
05/02/85	16:55	1.56	.37	2.23	.33	.01	3.46
05/02/85	22:55	1.56	.37	2.30	.37	.01	3.48
05/03/85	04:55	1.59	.38	2.38	.35	.01	3.34
05/03/85	10:55	1.51	.35	2.06	.44	0.00	3.39
05/03/85	16:55	1.47	.35	2.58	.40	0.00	3.15
05/03/85	22:55	1.48	.36	1.96	.44	0.00	3.34
05/04/85	04:55	1.51	.34	1.98	.37	0.00	3.36
05/04/85	10:55	1.52	.34	1.92	.34	0.00	3.28
05/04/85	16:55	1.57	.36	2.09	.37	0.00	3.35
05/04/85	22:55	1.59	.36	2.08	.35	0.00	3.29
05/05/85	04:55	1.55	.35	2.02	.32	0.00	3.39
05/05/85	10:55	1.54	.34	2.13	.14	0.00	3.17
05/05/85	16:55	1.57	.35	2.08		0.00	3.21
05/05/85	22:55	1.57	.35	2.05	.13	0.00	3.21
05/06/85	04:55	1.57	.34	2.05		0.00	3.19
05/06/85	10:55	1.60	.35	1.80	.06	.02	3.17
05/06/85	16:55	1.62	.34	1.72	.07	.02	3.28
05/06/85	22:55	1.65	.35	1.65	.08	.01	3.31
05/07/85	04:55	1.58	.34	1.58	.10	.01	3.21
05/07/85	10:55	1.59	.35	1.78	.10	.01	3.28
05/07/85	16:55	1.53	.37	1.81	.06	.01	3.23
05/07/85	22:55	1.56	.36	1.89	.08	0.00	3.18
05/08/85	04:55	1.63	.35	1.85	.09	0.00	3.25
05/08/85	10:55						
05/08/85	16:55	1.60	.37	1.87	.10	0.00	3.26
05/09/85	10:55	1.57	.36	1.52	0.00	0.00	3.29
05/10/85	10:30	1.43	.36	1.67	.07	0.00	3.25
05/11/85	09:00	1.63	.36	1.86	.23	0.00	3.38
05/14/85	09:45	1.60	.35	1.83	.17	0.00	3.33

RAW STREAMWATER DATA FOR SITE 1

DATE	TIME	TEMP	COND	FLOW	PH	ANC	SO4	CL
05/22/85	10:50	13.0	27.5	1.6	4.82	- 19.1	8.19	2.14
06/14/85	10:50	12.0	25.0	.1	5.21	3.4	7.02	1.52
07/12/85	10:20	17.0	29.0	.0	5.20	- 8.4	6.20	5.52
08/09/85	10:45	19.5	28.0	.1	5.67	- 3.0	5.72	2.16
09/25/85	10:50	15.0	30.0	.6	4.90	- 12.5	6.84	1.96
10/30/85	11:05	5.0	20.0	.3	5.01	- 11.5	6.35	4.02
11/04/85	10:00	7.0	25.0	.6	5.06		5.75	3.27
11/04/85	16:00				5.09	- 15.7	7.23	2.05
11/04/85	22:00				5.12	- 28.3	7.27	2.05
11/05/85	04:00				5.02	- 12.8	7.15	2.32
11/05/85	10:00	8.0	21.0		5.03		5.47	3.12
11/05/85	16:00				4.16		7.95	1.92
11/05/85	22:00				4.37	- 49.9	7.95	1.90
11/06/85	04:00				4.45		8.11	1.91
11/06/85	10:00	9.5	28.0		4.39		6.91	3.34
11/06/85	16:00				4.42		8.07	1.76
11/06/85	22:00				4.43	- 51.2	8.15	1.75
11/07/85	04:00				4.48		8.15	1.78
11/07/85	10:00	9.0	25.0	5.3	4.53		7.91	1.93
11/07/85	16:00				4.47	- 47.1	7.87	1.79
11/08/85	04:00				4.46		8.15	1.90
11/08/85	10:00	8.0	15.0	2.0				
11/08/85	16:00				4.70	- 21.4	7.83	1.91
11/09/85	04:00				4.78		7.94	2.35
11/09/85	10:00			1.2	4.70			
11/09/85	22:00				4.63	- 27.9	7.75	1.79
11/10/85	10:00	9.0	25.0	.8				
11/10/85	16:00				4.63	- 31.0		
11/11/85	04:00				4.63		7.61	2.16
11/11/85	06:00				4.63	- 30.0	7.66	1.90
11/11/85	09:30	7.5	23.0	1.5	4.58		7.16	2.87
11/11/85	24:00				4.62		7.91	1.93
11/12/85	06:00				4.67		7.76	1.40
11/12/85	12:00	4.0	29.0	1.6	4.61	- 29.3	7.61	1.79
11/12/85	18:00				4.64		7.16	1.84
11/12/85	24:00				4.64		7.76	1.79
11/13/85	06:00				4.62		8.35	1.66
11/13/85	11:00	9.0	28.0	3.6				
11/13/85	17:00				4.58		7.76	1.84
11/14/85	05:00				4.63		8.05	1.84
11/14/85	11:00	8.0	25.0	1.6	4.55	- 35.8		1.80
11/14/85	17:00				4.53		7.97	2.08
11/14/85	23:00				4.60		7.69	2.26
11/15/85	05:00				4.63		7.56	2.17
11/15/85	10:30	5.0	25.0	2.4	4.52	- 72.1		
11/15/85	16:30				4.55		8.25	2.03

RAW STREAMWATER DATA FOR SITE 1

DATE	TIME	TAL	MAL	OAL	DOC	TF	F
05/22/85	10:50	.449	.356	.117	2.51	.059	
06/14/85	10:50	.217	.180	.039	2.00	.051	.012
07/12/85	10:20	.159	.102	.062	2.00	.045	.026
08/09/85	10:45		.091	.064	2.20	.037	.034
09/25/85	10:50	.276	.235	.133	2.89	.052	
10/30/85	11:05	.237	.201	.062	2.22	.051	
11/04/85	10:00	.306	.194		2.22	.051	
11/04/85	16:00		.184	.072	2.20	.051	
11/04/85	22:00		.194	.082	2.28	.051	
11/05/85	04:00		.194	.102	2.89	.049	
11/05/85	10:00	.349	.230	.121	3.17	.043	
11/05/85	16:00		.657	.242	5.17	.053	
11/05/85	22:00		.636	.222	4.26	.054	
11/06/85	04:00		.626	.242	3.80	.055	
11/06/85	10:00	.626	.566	.140	3.58	.062	
11/06/85	16:00		.596	.165	3.72	.062	
11/06/85	22:00		.596	.145	3.44	.062	
11/07/85	04:00		.596	.145	3.29	.063	
11/07/85	10:00		.586				
11/07/85	16:00	.616	.546	.123	3.01	.062	
11/08/85	04:00		.521	.113	2.91	.062	
11/08/85	10:00						
11/08/85	16:00	.531	.495	.113	2.79		
11/09/85	04:00		.485	.123	2.75	.062	
11/09/85	10:00		.476				
11/09/85	22:00	.461	.446	.090	2.65	.060	
11/10/85	10:00						
11/10/85	16:00	.475	.405		2.61	.057	
11/11/85	04:00		.395	.083	2.57	.058	
11/11/85	06:00	.600	.490	.121	2.77	.063	
11/11/85	09:30		.426	.094	2.61	.061	
11/11/85	24:00		.510	.116	2.71	.063	
11/12/85	06:00		.535	.111	2.65	.062	
11/12/85	12:00	.630	.505	.087	2.57	.063	
11/12/85	18:00		.490	.101	2.61	.060	
11/12/85	24:00		.550	.100	2.59	.061	
11/13/85	06:00		.590	.113	2.61	.061	
11/13/85	11:00		.590				
11/13/85	17:00	.680	.575	.101	2.67	.060	
11/14/85	05:00		.550	.101	2.65	.060	
11/14/85	11:00	.670	.560		2.65	.061	
11/14/85	17:00		.525	.087	2.63	.060	
11/14/85	23:00		.500		2.77	.058	
11/15/85	05:00		.560	.101	2.75	.061	
11/15/85	10:30		.610	.101	2.69	.063	
11/15/85	16:30		.590	.092	2.65	.062	

RAW STREAMWATER DATA FOR SITE 1

DATE	TIME	CA	MG	NA	K	FE	SI
05/22/85	10:50	1.50	.33	1.73	.29	0.00	3.19
06/14/85	10:50	1.60	.37	1.77	.04	.08	3.78
07/12/85	10:20	1.23	.32	2.47	.40	0.00	4.12
08/09/85	10:45	1.51	.32	2.42	.48	.03	4.17
09/25/85	10:50	1.39	.32	1.87	.32	.03	3.89
10/30/85	11:05	1.53	.37	1.97	.03	.01	4.06
11/04/85	10:00	1.64	.40	2.14	.11	.01	4.14
11/04/85	16:00	1.61	.38	2.05	.10	0.00	3.91
11/04/85	22:00	1.59	.38	2.11	.14	0.00	3.94
11/05/85	04:00	1.59	.38	2.17	.52	.02	3.69
11/05/85	10:00	1.27	.30	1.73	.33	.04	3.11
11/05/85	16:00	1.28	.32	1.37	.75	.05	2.74
11/05/85	22:00	1.25	.30	1.43	.38	.03	2.72
11/06/85	04:00	1.26	.31	1.48	.21	.03	2.89
11/06/85	10:00	1.23	.30	1.51	.29	.01	2.87
11/06/85	16:00	1.21	.31	1.48	.21	.03	2.88
11/06/85	22:00	1.24	.29	1.50	.12	.03	2.87
11/07/85	04:00	1.24	.30	1.52	.19	.03	2.98
11/07/85	10:00	1.25	.31	1.45	.23	0.00	2.99
11/07/85	16:00	1.29	.29	1.63	.19	.02	2.99
11/08/85	04:00	1.36	.31	1.65	.09	.02	3.12
11/08/85	10:00						
11/08/85	16:00	1.31	.31	1.62	.02	.01	3.15
11/09/85	04:00	1.29	.31	1.66	0.00	.03	3.22
11/09/85	10:00						
11/09/85	22:00	1.30	.32	1.72	.16	.02	3.29
11/10/85	10:00						
11/10/85	16:00	1.37	.31	1.60	.17	0.00	3.34
11/11/85	04:00	1.36	.33	1.60	.45	.02	3.37
11/11/85	06:00	1.28	.30	1.50	.34	0.00	3.20
11/11/85	09:30	1.32	.31	1.46	.56	0.00	3.27
11/11/85	24:00	1.29	.30	1.48	.22	0.00	3.19
11/12/85	06:00	1.30	.31	1.86	.28	0.00	3.21
11/12/85	12:00	1.21	.30	1.57	.15	.03	3.07
11/12/85	18:00	1.20	.29	1.51	.34	.03	3.00
11/12/85	24:00	1.18	.28	1.41	.28	.04	3.04
11/13/85	06:00	1.17	.29	1.36	.19	.04	2.96
11/13/85	11:00						
11/13/85	17:00	1.32	.30	1.65	.20	0.00	3.18
11/14/85	05:00	1.33	.30	1.71	.13	0.00	3.24
11/14/85	11:00	1.32	.31	1.64	.32	.01	3.31
11/14/85	17:00	1.31	.31	1.70	.25	.02	3.25
11/14/85	23:00	1.27	.30	1.67	.18	.03	3.20
11/15/85	05:00	1.27	.31	1.69	.24	.02	3.22
11/15/85	10:30	1.34	.32	1.73	.13	.01	3.40
11/15/85	16:30	1.33	.31	1.71	.43	.01	3.34

RAW STREAMWATER DATA FOR SITE 1

DATE	TIME	TEMP	COND	FLOW	PH	ANC	SO4	CL
11/15/85	22:30				4.61		8.53	2.12
11/16/85	09:50	2.0	21.0	1.5	4.62	- 49.3	7.97	1.48
01/16/86	11:00	1.0	23.0		4.92	- 13.7	8.49	3.05

RAW STREAMWATER DATA FOR SITE 1

DATE	TIME	TAL	MAL	OAL	DOC	TF	F
11/15/85	22:30		.630	.106	2.63	.064	
11/16/85	09:50	.680	.580	.092	2.55	.061	
01/16/86	11:00	.389	.261	.060	1.86	.064	.003

RAW STREAMWATER DATA FOR SITE 1

DATE	TIME	CA	MG	NA	K	FE	SI
11/15/85	22:30	1.35	.32	1.75	.15	.01	3.39
11/16/85	09:50	1.29	.31	1.72	.28	0.00	3.21
01/16/86	11:00	1.86	.42	2.96	.22	.03	3.57

RAW STREAMWATER DATA FOR SITE 2

DATE	TIME	TEMP	COND	FLOW	pH	ANC	SO4	CL
03/05/85	14:35	1.0	29.0		5.17 -	5.4	7.94	4.36
03/19/85	10:20	1.0	27.0		5.13 -	5.6	7.24	3.92
03/26/85	10:40	1.0	28.0		5.16	3.0	7.59	4.25
04/02/85	10:45	3.5	28.0	.6	5.15 -	1.9	7.24	4.00
04/06/85	10:45	7.0	30.0	1.1	4.96 -	8.9	7.24	4.27
04/09/85	10:30	4.5	29.0	1.9	4.97 -	3.1	4.10	4.80
04/13/85	11:15	7.0	30.0	.7	5.08 -	7.0	6.20	3.30
04/13/85	23:15				5.16	8.5	5.90	4.60
04/19/85	11:10	10.0	30.0	.6	5.26 -	3.8	5.90	4.60
04/20/85	10:00	9.0	30.0	.5				
04/22/85	11:10			1.0	5.22	1.6	7.24	4.20
04/22/85	23:10				5.27		7.24	4.69
04/23/85	10:25	11.0	30.0	1.1				
04/23/85	16:25				5.25		7.24	4.87
04/24/85	09:35	9.0	29.0	.8	5.17 -	6.7	7.00	
04/25/85	10:30	10.0	30.0	.7				
04/30/85	10:40	13.0	30.0	.4	5.25	9.0	6.73	2.35
05/02/85	11:10	12.0	30.0	.3	5.38	9.6	6.36	5.28
05/02/85	17:10				5.41		6.36	5.40
05/02/85	23:10				5.43		6.36	5.58
05/03/85	05:10				5.32	13.7	6.04	5.34
05/03/85	11:10	8.0	28.0	1.3	5.31	8.6	6.04	5.88
05/03/85	17:10				5.25	5.5	6.04	5.52
05/03/85	23:10				5.14	2.3	6.20	4.86
05/04/85	05:10				5.10	2.3	6.04	4.86
05/04/85	11:10	8.5	29.0	2.3	5.10	2.7	6.36	4.68
05/04/85	17:10				5.07	1.2	6.36	4.92
05/04/85	23:10				5.09 -	1.7	6.52	4.80
05/05/85	05:10				5.09 -	1.7	6.68	4.92
05/05/85	11:10	10.0	25.0	1.4	5.17		6.56	5.06
05/05/85	17:10				5.08	0.0	6.56	4.32
05/05/85	23:10				5.21		6.90	4.81
05/06/85	05:10				5.17 -	3.7	6.90	4.02
05/06/85	11:10	9.0	28.0	1.2	5.16		6.56	4.33
05/06/85	17:10				5.26	5.9	6.90	4.68
05/06/85	23:10				5.22		6.54	3.93
05/07/85	05:10				5.17	25.6	6.90	4.41
05/07/85	11:10	9.0	29.0	1.4	5.13		7.02	4.76
05/07/85	17:10				5.26	2.9	6.86	4.12
05/07/85	23:10				5.17		9.35	4.47
05/08/85	05:10				5.15	6.5	7.02	4.53
05/08/85	11:10	9.0	29.0	1.2				
05/08/85	17:10				5.11 -	7.7	6.70	4.25
05/09/85	11:10	9.5	28.0	.8	5.13	1.5	6.00	4.30
05/10/85	10:45	13.0	30.0	.6	5.17 -	5.7	6.99	4.27
05/11/85	09:10	14.0	30.0	.5	5.16	7.0	6.71	4.32
05/14/85	09:55	16.5	30.0	.3	5.31	3.1	5.52	4.96

RAW STREAMWATER DATA FOR SITE 2

DATE	TIME	TAL	MAL	OAL	DOC	TF	F
03/05/85	14:35	.236	.209	.109	3.84	.062	
03/19/85	10:20	.254	.150	.052	3.93	.053	
03/26/85	10:40	.297	.183	.064	3.80	.062	
04/02/85	10:45	.218	.153	.066	3.82	.046	
04/06/85	10:45	.232	.163	.082	4.06	.049	
04/09/85	10:30	.240	.164	.077	4.31	.056	.026
04/13/85	11:15	.222	.157	.071	3.88	.054	
04/13/85	23:15	.226	.153	.068	3.70	.049	
04/19/85	11:10	.181	.118	.071	3.88	.045	
04/20/85	10:00						
04/22/85	11:10	.241	.174	.106	4.37	.047	
04/22/85	23:10		.151	.089	4.75		
04/23/85	10:25						
04/23/85	16:25	.221	.159	.086	4.55		
04/24/85	09:35	.231	.169	.086	4.51	.046	
04/25/85	10:30						
04/30/85	10:40	.210	.148	.086	4.61	.044	.040
05/02/85	11:10	.202	.139	.081	4.77	.045	
05/02/85	17:10		.149	.086	4.75	.045	
05/02/85	23:10		.139	.086	4.81	.045	
05/03/85	05:10		.144	.097	4.91	.042	
05/03/85	11:10	.235	.182	.098	4.81	.046	
05/03/85	17:10		.204	.113	5.46	.046	
05/03/85	23:10		.225	.119	5.84	.043	
05/04/85	05:10		.235	.140	6.18	.045	
05/04/85	11:10	.293	.226	.138	5.82	.064	
05/04/85	17:10		.200	.112	5.48	.064	
05/04/85	23:10		.205	.122	5.43	.064	
05/05/85	05:10		.205	.127	5.21	.064	
05/05/85	11:10		.200	.107	5.01	.066	
05/05/85	17:10		.164	.102	4.91	.070	
05/05/85	23:10		.190	.107	4.93	.068	
05/06/85	05:10		.184	.112	4.97	.066	
05/06/85	11:10	.231	.195	.107	4.83	.059	
05/06/85	17:10		.174	.096	4.85	.064	
05/06/85	23:10		.179	.107	4.89	.064	
05/07/85	05:10		.184	.117	4.93	.063	
05/07/85	11:10	.283	.184	.096	4.83	.063	
05/07/85	17:10		.169	.086	4.83	.062	
05/07/85	23:10		.190	.096	4.99	.064	
05/08/85	05:10		.184	.086	4.93	.063	
05/08/85	11:10						
05/08/85	17:10		.184	.102	4.65	.067	
05/09/85	11:10	.262	.190	.096	4.61	.062	
05/10/85	10:45		.179	.086	4.59	.064	
05/11/85	09:10	.207	.176	.090	4.79	.058	
05/14/85	09:55	.252	.174	.122	5.61	.059	

RAW STREAMWATER DATA FOR SITE 2

DATE	TIME	CA	MG	NA	K	FE	SI
03/05/85	14:35	2.36	.65	3.14	.29	.01	2.90
03/19/85	10:20	2.12	.61	2.96	.44	0.00	2.50
03/26/85	10:40			3.44	.49	0.00	1.90
04/02/85	10:45	2.36	.60	3.02		0.00	1.97
04/06/85	10:45	2.36	.62	3.06		.01	2.02
04/09/85	10:30	2.14	.63	2.90	.42	0.00	1.99
04/13/85	11:15	2.06	.63	3.57	.38	0.00	1.67
04/13/85	23:15	2.62	.64	3.42	.46	0.00	1.73
04/19/85	11:10	2.18	.60	3.72	.42	.01	1.46
04/20/85	10:00						
04/22/85	11:10	2.29	.59	3.33	.22	0.00	1.56
04/22/85	23:10	2.35	.63	3.28	.09	0.00	1.33
04/23/85	10:25						
04/23/85	16:25	2.29	.61	3.25	.27	0.00	1.23
04/24/85	09:35	2.29	.61	3.23	.56	0.00	1.18
04/25/85	10:30						
04/30/85	10:40	2.14	.53	3.22	.10	0.00	.83
05/02/85	11:10	1.93	.51	3.46	.46	.02	.81
05/02/85	17:10	1.99	.53	3.50	.39	.01	.38
05/02/85	23:10	1.99	.53	3.51	.47	.02	.77
05/03/85	05:10	1.96	.53	3.38	.46	.03	.91
05/03/85	11:10	2.05	.53	3.71	.58	.01	1.60
05/03/85	17:10	2.10	.51	3.50	.40	.01	2.28
05/03/85	23:10	2.01	.51	3.02	.48	.01	1.98
05/04/85	05:10	2.04	.55	3.03	.49	.02	2.00
05/04/85	11:10	1.97	.53	3.03	.52	0.00	2.07
05/04/85	17:10	2.04	.53	3.06	.44	0.00	2.08
05/04/85	23:10	2.10	.53	3.12	.44	0.00	2.07
05/05/85	05:10	2.07	.54	3.19	.46	.02	2.04
05/05/85	11:10	2.08	.53	3.15	.32	0.00	1.92
05/05/85	17:10	2.09	.53	3.22	.08	0.00	1.89
05/05/85	23:10	2.09	.53	3.16	.25	0.00	1.76
05/06/85	05:10	2.09	.53	3.18	.12	0.00	1.70
05/06/85	11:10	2.03	.53	2.34	.14	.02	1.81
05/06/85	17:10	2.02	.55	2.72	.17	.02	1.83
05/06/85	23:10	2.07	.53	2.87	.12	.01	1.81
05/07/85	05:10	2.03	.55	3.06	.16	.02	1.88
05/07/85	11:10	2.25	.54	2.94	.14	.01	1.88
05/07/85	17:10	2.23	.54	2.86	.12	.01	1.77
05/07/85	23:10	2.25	.55	3.11	.18	0.00	1.67
05/08/85	05:10	2.26	.55	3.11	.13	.01	1.70
05/08/85	11:10						
05/08/85	17:10	2.06	.55	2.74	.13	0.00	1.49
05/09/85	11:10	2.10	.57	2.93	.09	0.00	1.50
05/10/85	10:45	2.02	.54	3.09	.12	0.00	1.23
05/11/85	09:10	1.88	.52	3.13	.12	.01	.91
05/14/85	09:55	1.90	.46	3.21	.24	0.00	.87

RAW STREAMWATER DATA FOR SITE 2

DATE	TIME	TEMP	COND	FLOW	pH	ANC	SO4	CL
05/22/85	11:20	14.5	30.0	1.7	5.21	- 9.1	5.18	3.84
06/14/85	11:00	11.0	26.0	.1	5.43	20.2	4.19	4.12
07/12/85	10:40	15.0	30.0	.0	5.33	19.9	4.13	5.70
08/09/85	10:55	18.5	30.0	.1	5.51	5.6	5.41	4.02
09/25/85	11:00	15.0	31.0	.8	5.30	12.6	4.05	4.75
10/30/85	11:20	5.0	21.0	.3	5.38	- 3.2	4.15	4.93
11/04/85	10:30	6.5	25.0	.4	5.46		4.99	4.69
11/04/85	16:30				5.34	- 12.8	4.75	4.93
11/04/85	22:30				5.50	- 3.7	5.07	4.77
11/05/85	04:30				5.38	- 2.8	5.07	4.93
11/05/85	10:30	8.0	30.0	3.7	5.23		5.35	6.42
11/05/85	16:30				4.71		5.31	4.93
11/05/85	22:30				4.73	- 28.0	6.07	4.35
11/06/85	04:30				4.82		6.19	4.14
11/06/85	10:30	9.0	30.0		4.83		6.15	4.32
11/06/85	16:30				4.80		6.75	4.24
11/06/85	22:30				4.78	- 18.6	6.63	4.48
11/07/85	04:30				4.67		5.75	3.64
11/07/85	10:30	9.0	29.0		4.85	- 21.3		
11/07/85	16:30				4.80		6.59	3.87
11/08/85	10:30	8.0	22.0	3.7				
11/08/85	16:30				4.94	- 16.7	6.57	3.88
11/09/85	04:30				4.93		6.72	3.75
11/09/85	10:30			2.5				
11/09/85	22:30				5.13	- 11.9	6.55	3.72
11/10/85	10:30	9.0	29.0	1.8				
11/10/85	16:30				5.07	- 12.3	6.23	4.03
11/11/85	04:30				5.09		6.13	3.75
11/11/85	10:30	7.5	28.0	2.7	5.16		6.42	4.44
11/11/85	16:30				5.08	- 14.0	6.57	3.98
11/11/85	22:30				5.03		6.42	3.94
11/12/85	04:30				5.02		6.57	3.98
11/12/85	10:30	3.0	30.0	3.4	5.05	- 14.7	6.42	3.98
11/12/85	16:30				5.07		5.73	4.04
11/12/85	22:30				5.05		6.72	3.94
11/13/85	04:30				5.02		6.42	3.84
11/13/85	10:30	8.0	29.0					
11/13/85	16:30				5.03		6.85	3.82
11/14/85	04:30				5.06		6.57	3.95
11/14/85	10:30	7.0	29.0	2.9	5.03	- 16.1	6.85	3.86
11/14/85	16:30				5.04		6.43	3.82
11/14/85	22:30				5.06		6.28	4.14
11/15/85	04:30				5.04		6.43	3.77
11/15/85	10:30	5.0	28.0	3.7	4.99	- 38.6	6.99	4.05
11/15/85	16:30				4.98		6.57	3.95
11/15/85	22:30				5.00		6.85	4.04

RAW STREAMWATER DATA FOR SITE 2

DATE	TIME	TAL	MAL	OAL	DOC	TF	F
05/22/85	11:20	.335	.210	.148	7.19	.064	
06/14/85	11:00	.243	.222	.169	6.85	.060	.060
07/12/85	10:40	.247	.159	.107	4.63	.062	.062
08/09/85	10:55	.214	.193	.143	5.09	.060	.050
09/25/85	11:00	.378	.286	.232	10.65	.051	
10/30/85	11:20	.180	.165	.124	5.28	.052	
11/04/85	10:30	.255	.128	.122	5.07	.054	
11/04/85	16:30		.122		5.05	.054	
11/04/85	22:30		.133	.112	5.17	.053	
11/05/85	04:30		.158	.112	5.79	.054	
11/05/85	10:30	.374	.394	.177	7.09	.053	
11/05/85	16:30		.338	.212	10.16	.055	
11/05/85	22:30		.323	.222	10.68	.053	
11/06/85	04:30		.328	.222	9.80	.054	
11/06/85	10:30	.325	.245	.185	8.69	.058	
11/06/85	16:30		.225	.155	8.27	.060	
11/06/85	22:30		.235	.160	7.94	.059	
11/07/85	04:30		.235		7.29	.059	
11/07/85	10:30						
11/07/85	16:30	.224	.203	.128	6.57	.059	
11/08/85	10:30						
11/08/85	16:30	.203	.183	.123	5.77	.056	
11/09/85	04:30		.193	.123	5.56	.058	
11/09/85	10:30						
11/09/85	22:30	.190	.175	.110	5.24	.057	
11/10/85	10:30						
11/10/85	16:30	.193	.153	.098	5.05	.055	
11/11/85	04:30		.168	.118	5.19	.054	
11/11/85	10:30		.211	.131	5.40	.051	
11/11/85	16:30	.321	.216	.131	5.40	.055	
11/11/85	22:30		.221	.126	5.77	.055	
11/12/85	04:30		.241	.141	5.74	.056	
11/12/85	10:30	.321	.211	.126	5.32	.058	
11/12/85	16:30		.206	.119	5.17	.057	
11/12/85	22:30		.206	.126	5.11	.059	
11/13/85	04:30		.221	.130	5.17	.059	
11/13/85	10:30						
11/13/85	16:30	.311	.193	.112	5.13	.058	
11/14/85	04:30		.213	.121	5.13	.058	
11/14/85	10:30	.306	.196	.101	5.01	.056	
11/14/85	16:30		.201	.101	4.93	.055	
11/14/85	22:30		.199	.106	5.01	.054	
11/15/85	04:30		.206	.131	5.05	.055	
11/15/85	10:30		.219	.119	5.07	.060	
11/15/85	16:30		.211	.113	4.95	.057	
11/15/85	22:30		.213	.106	4.91	.059	

RAW STREAMWATER DATA FOR SITE 2

DATE	TIME	CA	MG	NA	K	FE	SI
05/22/85	11:20	1.86	.44	2.92	.37	0.00	1.94
06/14/85	11:00	1.60	.39	2.82	.14	.10	2.84
07/12/85	10:40	1.54	.39	3.47	.39	.02	3.10
08/09/85	10:55	1.84	.42	3.08	.53	.12	3.19
09/25/85	11:00	1.81	.44	2.76	.89	.48	4.17
10/30/85	11:20	1.68	.48	3.05	.08	.12	4.42
11/04/85	10:30	1.89	.50	3.42	.29	.10	4.35
11/04/85	16:30	1.86	.49	3.22	.15	.11	4.36
11/04/85	22:30	1.82	.51	3.39	.16	.13	4.41
11/05/85	04:30	1.97	.56	3.32	.34	.15	4.29
11/05/85	10:30	2.23	.54	3.88	.96	.15	3.39
11/05/85	16:30	2.00	.60	2.38	1.48	.17	2.72
11/05/85	22:30	1.90	.60	2.44	1.71	.20	2.65
11/06/85	04:30	1.91	.59	2.64	1.49	.18	2.67
11/06/85	10:30	1.85	.59	2.56	1.35	.14	2.81
11/06/85	16:30	1.88	.62	2.43	1.05	.13	2.93
11/06/85	22:30	1.85	.63	2.59	1.02	.13	2.94
11/07/85	04:30	1.85	.61	2.60	.88	.15	2.96
11/07/85	10:30						
11/07/85	16:30	1.84	.60	2.55	.60	.08	3.04
11/08/85	10:30						
11/08/85	16:30	1.81	.57	2.71	.46	.07	3.17
11/09/85	04:30	1.83	.57	2.56	.81	.07	3.31
11/09/85	10:30						
11/09/85	22:30	1.80	.56	2.76	.25	.09	3.34
11/10/85	10:30						
11/10/85	16:30	1.83	.54	2.83	.26	.07	3.31
11/11/85	04:30	1.87	.56	2.72	.44	.17	3.56
11/11/85	10:30	1.79	.50	3.02	.47	.05	3.10
11/11/85	16:30	1.77	.53	2.66	.46	.08	3.28
11/11/85	22:30	1.72	.52	2.55	.35	.12	3.13
11/12/85	04:30	1.72	.53	2.60	.54	.13	3.08
11/12/85	10:30	1.84	.55	2.78	.51	.08	3.37
11/12/85	16:30	1.88	.55	2.90	.39	.02	3.23
11/12/85	22:30	1.89	.55	2.87	.26	.03	3.24
11/13/85	04:30	1.93	.58	2.81	.51	.06	3.17
11/13/85	10:30						
11/13/85	16:30	1.91	.57	2.81	.36	.05	3.26
11/14/85	04:30	1.92	.57	2.86	.40	.04	3.25
11/14/85	10:30	1.89	.57	2.91	.37	.07	3.34
11/14/85	16:30	1.86	.57	2.81	.61	.08	3.31
11/14/85	22:30	1.88	.56	2.94	.46	.14	3.38
11/15/85	04:30	1.90	.57	2.84	.32	.15	3.35
11/15/85	10:30	1.97	.61	2.85	.34	.07	3.32
11/15/85	16:30	1.94	.60	2.94	.46	.06	3.28
11/15/85	22:30	1.99	.61	3.01	.34	.06	3.46

RAW STREAMWATER DATA FOR SITE 2

DATE	TIME	TEMP	COND	FLOW	pH	ANC	SO4	CL
11/16/85	10:05	1.0	24.0	2.5	4.99	- 25.9	6.71	3.77
01/16/86	11:15	1.0	29.0		5.28	- 3.0	7.81	4.95

RAW STREAMWATER DATA FOR SITE 2

DATE	TIME	TAL	MAL	OAL	DOC	TF	F
11/16/85	10:05	.301	.196	.099	4.69	.056	
01/16/86	11:15	.227	.141	.085	3.42	.072	.038

RAW STREAMWATER DATA FOR SITE 2

DATE	TIME	CA	MG	NA	K	FE	SI
11/16/85	10:05	1.91	.57	2.84	.38	0.00	3.24
01/16/86	11:15	2.48	.68	3.74	.14	.06	4.23

RAW STREAMWATER DATA FOR SITE 3

DATE	TIME	TEMP	COND	FLOW	pH	ANC	SO4	CL
03/05/85	15:00	1.0	27.0		4.90	- 2.9	7.94	3.92
03/19/85	10:40	1.0	25.0		4.95	- 4.1	7.59	4.03
03/26/85	11:15	2.0	26.0		4.97	- 4.9	7.94	2.91
04/02/85	11:15	3.0	25.0	1.5	4.91	- 16.2	7.59	3.76
04/06/85	11:15	7.5	29.0	2.6	4.82	- 15.1	7.24	4.01
04/09/85	10:50	4.0	27.0	4.5	4.80	- 9.4		
04/13/85	12:15	8.0	29.0	2.0	4.97	- 24.4	8.20	4.20
04/14/85	00:15				4.94	- 13.0	8.20	3.30
04/20/85	10:30	8.0	29.0	1.1				
04/22/85	11:30				4.93	- 14.6	6.90	4.90
04/22/85	23:30				5.03		7.59	4.52
04/23/85	09:15	11.0	29.0	2.3				
04/23/85	15:15				5.07		7.00	
04/24/85	09:55	8.0	28.0	1.5	5.05	- 2.8	7.59	3.82
04/25/85	10:50	10.0	30.0	1.4				
04/30/85	10:55	12.0	29.0	.9	5.06	- 2.6	7.24	4.77
05/02/85	10:20	12.0	30.0	.8	5.17	- 6.3	7.31	4.20
05/02/85	16:20				5.14		7.31	4.08
05/02/85	22:20				5.23		7.31	4.06
05/03/85	04:20				5.10	- 6.2	7.00	3.84
05/03/85	10:00	9.0	28.0	2.4	5.11	- 1.0	7.00	3.84
05/03/85	16:00				4.94	- .9	6.68	4.08
05/03/85	22:00				4.93	- 4.2	6.68	3.72
05/04/85	04:00				4.94	- 7.1	6.68	3.72
05/04/85	10:00	8.0	28.0	4.9	4.95	- 5.8	6.84	4.08
05/04/85	16:00				4.94	- 5.0	6.68	3.96
05/04/85	22:00				4.96	- 6.3	7.00	4.08
05/05/85	04:00				5.02	- 9.6	7.00	4.08
05/05/85	10:00	10.0	29.0	3.0	5.06		6.90	4.96
05/05/85	16:00				4.96	- 3.7	6.70	
05/05/85	22:00				5.05		6.90	4.19
05/06/85	04:00				4.98	- 6.6	6.30	
05/06/85	10:00	9.0	27.0	2.6	5.04		6.90	3.70
05/06/85	16:00				5.04	- 9.3	6.90	3.73
05/06/85	22:00				4.98		7.24	3.75
05/07/85	04:00				4.99	- 9.5	6.90	3.64
05/07/85	10:00	9.0	29.0	3.1	5.00		7.31	3.16
05/07/85	16:00				5.07	- 10.8	7.61	3.40
05/07/85	22:00				5.03		7.27	3.68
05/08/85	04:00				5.04	- 9.5	7.61	3.66
05/08/85	10:00	9.0	29.0	2.5				
05/08/85	16:00				4.98	- 8.9	6.70	3.60
05/09/85	10:00	9.5	27.0	1.9	5.02	- 7.2	6.70	3.57
05/10/85	10:00	12.0	29.0	1.4	5.04	- 7.7	7.02	3.12
05/11/85	09:30	14.0	30.0	1.3	5.05	- 8.2	6.70	2.70
05/14/85	09:30	14.5	30.0	.8	5.10	- 7.4	6.56	4.05
05/22/85	10:10	14.0	29.0	4.1	5.02	.5	7.00	3.12

RAW STREAMWATER DATA FOR SITE 3

DATE	TIME	TAL	MAL	OAL	DOC	TF	F
03/05/85	15:00	.336	.290	.128	2.88	.059	
03/19/85	10:40	.363	.254	.087	3.24	.051	
03/26/85	11:15	.286	.265	.069	3.21	.059	
04/02/85	11:15	.370	.234	.061	3.23	.042	
04/06/85	11:15	.318	.232	.082	3.40	.045	
04/09/85	10:50	.359	.262	.088	3.58	.054	.007
04/13/85	12:15	.308	.254	.087	3.17	.054	
04/14/85	00:15	.300	.205	.079	3.01	.046	
04/20/85	10:30						
04/22/85	11:30	.309	.230	.117	3.96	.038	
04/22/85	23:30		.241	.117	3.88		
04/23/85	09:15						
04/23/85	15:15	.273	.210	.091	3.72		
04/24/85	09:55	.283	.210	.086	3.70	.041	
04/25/85	10:50						
04/30/85	10:55	.231	.190	.086	3.48	.040	.020
05/02/85	10:20	.254	.181	.086	3.42	.039	
05/02/85	16:20		.176	.086	3.44	.039	
05/02/85	22:20		.176	.086	3.44	.039	
05/03/85	04:20		.223	.118	4.47	.038	
05/03/85	10:00	.331	.235	.135	4.67	.040	
05/03/85	16:00		.278	.182	5.84	.040	
05/03/85	22:00		.278	.161	5.43	.038	
05/04/85	04:00		.299	.151	5.15	.040	
05/04/85	10:00	.397	.273	.138	4.99	.058	
05/04/85	16:00		.252	.117	4.85	.060	
05/04/85	22:00		.252	.127	4.81	.056	
05/05/85	04:00		.252	.127	4.69	.056	
05/05/85	10:00		.242	.138	4.33	.058	
05/05/85	16:00		.210	.107	4.31	.058	
05/05/85	22:00		.200	.117	4.18	.064	
05/06/85	04:00		.210	.117	4.22	.061	
05/06/85	10:00	.293	.221	.112	4.35	.058	
05/06/85	16:00		.216	.107	4.26	.058	
05/06/85	22:00		.216	.107	4.24	.058	
05/07/85	04:00		.226	.102	4.22	.058	
05/07/85	10:00	.314	.226	.096	4.20	.063	
05/07/85	16:00		.210	.081	4.10	.061	
05/07/85	22:00		.210	.091	4.10	.059	
05/08/85	04:00		.210	.086	4.14	.060	
05/08/85	10:00						
05/08/85	16:00		.231	.096	3.86	.064	
05/09/85	10:00	.293	.221	.091	3.70	.064	
05/10/85	10:00		.210	.086	3.70	.064	
05/11/85	09:30	.247	.197	.095	3.76	.056	
05/14/85	09:30	.293	.200	.096	4.00	.051	
05/22/85	10:10	.376	.247	.138	5.38	.051	

RAW STREAMWATER DATA FOR SITE 3

DATE	TIME	CA	MG	NA	K	FE	SI
03/05/85	15:00	2.16	.53	2.43	.25	.01	3.01
03/19/85	10:40	1.98	.50	2.47	.45	0.00	2.75
03/26/85	11:15			2.78	.49	0.00	3.04
04/02/85	11:15	2.20	.51	2.71		0.00	2.52
04/06/85	11:15	2.15	.49	2.44		.01	2.54
04/09/85	10:50	1.97	.50	2.50	.52	.01	2.41
04/13/85	12:15	2.30	.49	2.72	.34	0.00	2.38
04/14/85	00:15	2.30	.50	2.70	.43	.01	2.36
04/20/85	10:30						
04/22/85	11:30	2.14	.49	2.86	.43	0.00	2.34
04/22/85	23:30	2.08	.50	2.74	.21	0.00	2.24
04/23/85	09:15						
04/23/85	15:15	2.09	.52	2.81	.42	.02	2.16
04/24/85	09:55	2.11	.52	2.78	.50	0.00	2.15
04/25/85	10:50						
04/30/85	10:55	2.12	.47	2.80	.27	0.00	2.04
05/02/85	10:20	2.12	.49	2.87	.46	.02	2.17
05/02/85	16:20	1.86	.48	2.90	.55		2.21
05/02/85	22:20	2.00	.50	2.91	.49	.03	2.23
05/03/85	04:20	1.92	.48	2.72	.46	.02	2.25
05/03/85	10:00	1.96	.43	2.62	.52		2.26
05/03/85	16:00	1.95	.44	2.77	.59	.03	2.54
05/03/85	22:00	1.89	.43	2.62	.44	.01	2.67
05/04/85	04:00	1.93	.44	2.58	.49	.01	2.50
05/04/85	10:00	1.93	.43	2.64	.42	0.00	2.44
05/04/85	16:00	1.94	.45	2.68	.48	.01	2.55
05/04/85	22:00	1.90	.45	2.68	.47	0.00	2.44
05/05/85	04:00	1.95	.45	2.76	.57	.01	2.47
05/05/85	10:00	1.99	.47	2.70	.07	0.00	2.44
05/05/85	16:00	2.02	.46	2.68	.09	0.00	2.44
05/05/85	22:00	2.01	.46	2.74	.11	0.00	2.44
05/06/85	04:00	2.08	.47	2.75	.27	0.00	2.39
05/06/85	10:00	2.00	.46	2.62	.19	.02	2.36
05/06/85	16:00	2.07	.45	2.42	.17	.02	2.44
05/06/85	22:00	2.01	.46	2.43	.14	.02	2.46
05/07/85	04:00	1.84	.47	2.53	.21	.03	2.46
05/07/85	10:00	2.00	.48	2.34	.15	0.00	2.61
05/07/85	16:00	2.02	.47	2.54	.20	0.00	2.45
05/07/85	22:00	1.93	.49	2.70	.21	.02	2.37
05/08/85	04:00	1.99	.48	2.59	.15	.01	2.35
05/08/85	10:00						
05/08/85	16:00	1.89	.49	2.56	.14	.01	2.32
05/09/85	10:00	2.07	.49	2.60	.15	0.00	2.31
05/10/85	10:00	2.07	.48	2.44	.13	0.00	2.20
05/11/85	09:30	2.03	.46	2.50	.18	.01	2.00
05/14/85	09:30	1.97	.44	2.70	.41	0.00	1.92
05/22/85	10:10	1.85	.40	2.51	.47	0.00	2.70

RAW STREAMWATER DATA FOR SITE 3

DATE	TIME	TEMP	COND	FLOW	pH	ANC	SO4	CL
06/14/85	10:00	12.0	29.0	.3	5.35	8.2	6.00	3.30
07/12/85	11:00	16.0	30.0	.0	5.94	43.0	5.41	3.72
08/09/85	09:35	17.5	30.0	.1	5.92	38.0	5.41	3.36
09/25/85	11:15	15.0	31.0	1.8	5.15 -	8.1	5.75	3.19
10/30/85	10:45	5.0	23.0	.9	5.19 -	4.6	4.91	4.45
11/04/85	11:00	6.5	22.0	1.0	5.28		6.07	3.28
11/04/85	17:00				5.18		5.95	3.34
11/04/85	23:00				5.26		6.15	3.30
11/05/85	05:00				5.30		6.03	3.28
11/05/85	11:00	8.0	25.0		4.83		5.83	3.31
11/05/85	17:00				4.63		7.00	2.74
11/05/85	23:00				4.63 -	34.9	7.00	3.27
11/06/85	05:00				4.64		6.95	3.12
11/06/85	11:00	9.0	29.0		4.57		6.63	3.12
11/06/85	17:00				4.48		7.15	2.80
11/06/85	23:00				4.56		7.19	2.92
11/07/85	05:00				4.63 -	33.3	7.15	2.97
11/07/85	10:00	9.0	29.0		4.56			
11/07/85	16:00						7.35	2.85
11/08/85	04:00				4.50		7.35	2.97
11/08/85	10:00	7.0	15.0	6.1				
11/08/85	16:00				4.80 -	24.0	7.13	2.83
11/09/85	04:00				4.87		7.15	3.10
11/09/85	10:00			4.2				
11/09/85	22:00				4.90 -	20.5	7.15	2.89
11/10/85	10:00	9.0	27.0	3.3				
11/10/85	16:00				4.85 -	19.2	6.57	3.16
11/11/85	04:00				4.88		6.12	3.16
11/11/85	10:00	7.0	26.0	4.4	4.87		6.72	2.98
11/11/85	16:00				4.87 -	16.9	6.72	3.07
11/11/85	22:00				4.86		6.42	2.84
11/12/85	04:00				4.84		6.57	3.16
11/12/85	10:00	4.0	29.0	5.3	4.88 -	21.0	6.87	3.30
11/12/85	16:00				4.88		6.87	3.21
11/12/85	22:00				4.84		6.87	2.75
11/13/85	04:00				4.82		6.87	3.12
11/13/85	10:00	8.0	29.0					
11/13/85	16:00				4.83		6.43	3.31
11/14/85	04:00				4.86		6.85	3.13
11/14/85	10:00	8.0	27.0	5.2	4.81 -	37.6	6.99	3.22
11/14/85	16:00				4.83		7.13	2.99
11/14/85	22:00				4.82		6.71	2.90
11/15/85	04:00				4.83		6.71	3.13
11/15/85	10:00	5.0	28.0	6.3	4.77 -	37.6	7.27	3.18
11/15/85	16:00				4.78		7.41	3.17
11/15/85	22:00				4.79		7.83	3.86

RAW STREAMWATER DATA FOR SITE 3

DATE	TIME	TAL	MAL	OAL	DOC	TF	F
06/14/85	10:00	.259	.233	.143	4.63	.049	.045
07/12/85	11:00	.376	.231	.179	4.83	.052	
08/09/85	09:35	.246	.232	.205	5.53	.046	.046
09/25/85	11:15	.296	.255	.179	6.88	.049	
10/30/85	10:45	.216	.198	.124	4.26	.047	
11/04/85	11:00	.296	.174	.117	4.26	.050	
11/04/85	17:00		.168	.122	4.24	.051	
11/04/85	23:00		.174	.133	4.29	.051	
11/05/85	05:00		.184	.133	4.43	.049	
11/05/85	11:00				5.51	.046	
11/05/85	17:00		.429	.242	7.96	.053	
11/05/85	23:00		.475	.263	8.43	.052	
11/06/85	05:00		.439	.242	7.60	.053	
11/06/85	11:00		.366				
11/06/85	17:00		.366		6.05	.058	
11/06/85	23:00		.361		6.13	.059	
11/07/85	05:00		.356		5.87	.059	
11/07/85	10:00						
11/07/85	16:00	.354	.334	.168	5.30	.061	
11/08/85	04:00		.329	.163	5.21	.062	
11/08/85	10:00						
11/08/85	16:00	.299	.284	.130	4.91	.058	
11/09/85	04:00		.264	.133	4.79	.057	
11/09/85	10:00						
11/09/85	22:00	.275	.245	.120	4.53	.054	
11/10/85	10:00						
11/10/85	16:00	.289	.234	.118	4.43	.054	
11/11/85	04:00		.244	.133	4.53	.052	
11/11/85	10:00		.261	.131	4.69	.054	
11/11/85	16:00	.381	.306	.141	4.83	.055	
11/11/85	22:00		.296	.151	4.79	.057	
11/12/85	04:00		.316	.161	4.89	.059	
11/12/85	10:00	.421	.291	.142	4.57	.058	
11/12/85	16:00		.301	.136	4.47	.058	
11/12/85	22:00		.311	.150	4.39	.057	
11/13/85	04:00		.331	.143	4.33	.059	
11/13/85	10:00						
11/13/85	16:00	.411	.311	.146	4.43	.058	
11/14/85	04:00		.306	.139	4.47	.058	
11/14/85	10:00	.426	.291	.119	4.39	.055	
11/14/85	16:00		.286	.122	4.31	.054	
11/14/85	22:00		.286	.126	4.39	.053	
11/15/85	04:00		.296	.141	4.45	.054	
11/15/85	10:00		.361	.151	4.61	.062	
11/15/85	16:00		.341	.141	4.47	.062	
11/15/85	22:00		.366		4.47	.064	

RAW STREAMWATER DATA FOR SITE 3

DATE	TIME	CA	MG	NA	K	FE	SI
06/14/85	10:00	1.88	.40	2.61	.15	.06	3.44
07/12/85	11:00	2.09	.40	2.64	.65	.34	3.95
08/09/85	09:35	1.99	.39	2.58	.64	.28	4.33
09/25/85	11:15	1.75	.36	2.35	.50	.20	4.12
10/30/85	10:45	1.72	.44	2.58	.18	.10	4.38
11/04/85	11:00	1.81	.45	2.58	.12	.12	4.33
11/04/85	17:00	1.77	.42	2.57	.18	.11	4.16
11/04/85	23:00	1.78	.43	2.58	.19	.12	4.15
11/05/85	05:00	1.77	.42	2.57	.21	.14	4.06
11/05/85	11:00	1.68	.39	2.39	.78	.13	3.25
11/05/85	17:00	1.74	.44	1.86	1.01	.12	2.88
11/05/85	23:00	1.76	.49	2.05	1.05	.14	2.84
11/06/85	05:00	1.78	.47	2.11	.86	.14	2.79
11/06/85	11:00	1.77	.48	2.21	.89	.09	2.95
11/06/85	17:00	1.64	.46	2.06	.74	.08	2.94
11/06/85	23:00	1.68	.48	2.11	.70	.10	2.94
11/07/85	05:00	1.67	.47	2.17	.59	.10	2.93
11/07/85	10:00						
11/07/85	16:00	1.72	.47	2.25	.47	.07	3.09
11/08/85	04:00	1.69	.47	2.25	.38	.09	3.12
11/08/85	10:00						
11/08/85	16:00	1.66	.47	2.28	.33	.07	3.24
11/09/85	04:00	1.66	.47	2.29	.22	.09	3.35
11/09/85	10:00						
11/09/85	22:00	1.68	.45	2.33	.22	.07	3.37
11/10/85	10:00						
11/10/85	16:00	1.72	.45	2.30	.30	.07	3.53
11/11/85	04:00	1.73	.45	2.21	.34	.11	3.57
11/11/85	10:00	1.55	.40	2.17	.34	.09	3.15
11/11/85	16:00	1.53	.40	2.17	.45	.10	3.22
11/11/85	22:00	1.53	.40	2.12	.59	.08	3.18
11/12/85	04:00	1.54	.43	2.73	.45	.11	3.18
11/12/85	10:00	1.74	.45	2.43	.35	.01	3.34
11/12/85	16:00	1.69	.44	2.75	.39	.01	3.26
11/12/85	22:00	1.66	.44	2.32	.40	.06	3.31
11/13/85	04:00	1.70	.43	2.30	.30	.03	3.28
11/13/85	10:00						
11/13/85	16:00	1.77	.45	2.32	.39	0.00	3.25
11/14/85	04:00	1.78	.45	2.34	.43	0.00	3.28
11/14/85	10:00	1.71	.46	2.32	.38	.11	3.44
11/14/85	16:00	1.70	.45	2.41	.47	.11	3.48
11/14/85	22:00	1.66	.44	2.55	.37	.08	3.29
11/15/85	04:00	1.69	.44	2.32	.41	.08	3.37
11/15/85	10:00	1.80	.49	2.48	.35	.07	3.53
11/15/85	16:00	1.81	.48	2.53	.46	.04	3.53
11/15/85	22:00	1.89	.51	2.61	.46	.06	3.71

RAW STREAMWATER DATA FOR SITE 3

DATE	TIME	TEMP	COND	FLOW	pH	ANC	SO4	CL
11/16/85	10:25	2.0	23.0	4.2	4.78	- 34.3	6.99	3.13
01/16/86	11:40	1.0	26.0		5.19	- 7.0	8.00	3.80

RAW STREAMWATER DATA FOR SITE 3

DATE	TIME	TAL	MAL	OAL	DOC	TF	F
11/16/85	10:25	.431	.306	.101	4.16	.056	
01/16/86	11:40	.278	.176	.082	2.87	.064	.016

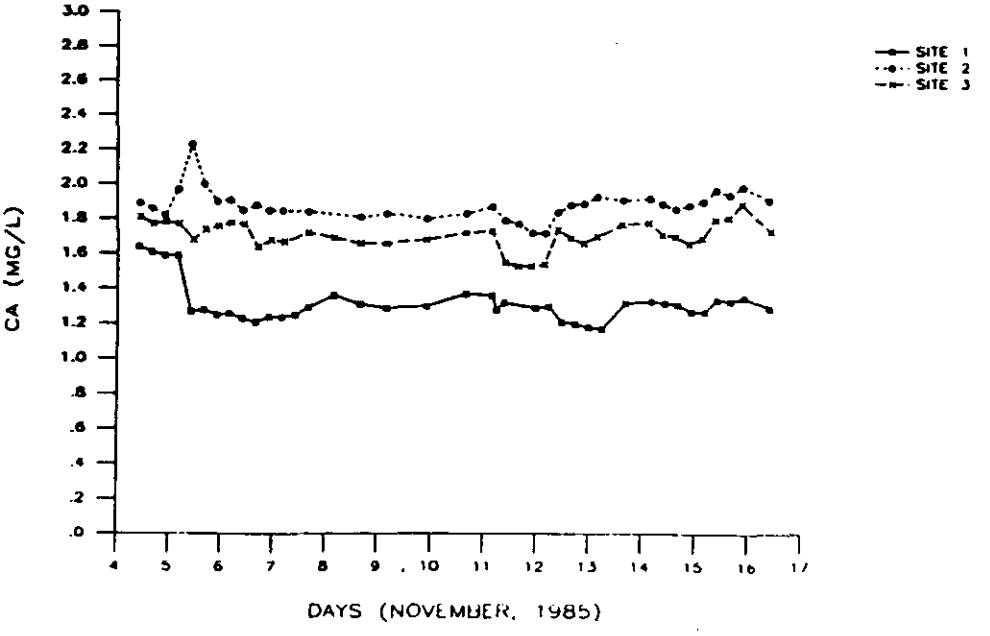
RAW STREAMWATER DATA FOR SITE 3

DATE	TIME	CA	MG	NA	K	FE	SI
11/16/85	10:25	1.73	.45	2.36	.44	0.00	3.32
01/16/86	11:40	2.28	.55	3.09	.19	.06	4.02

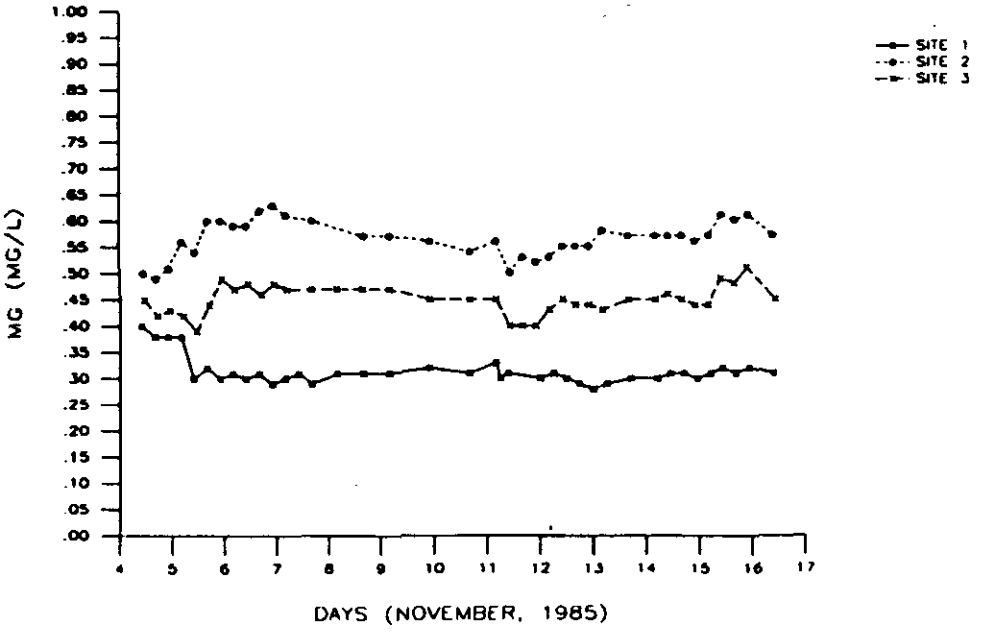
APPENDIX F

PLOTS OF STREAMWATER IONS

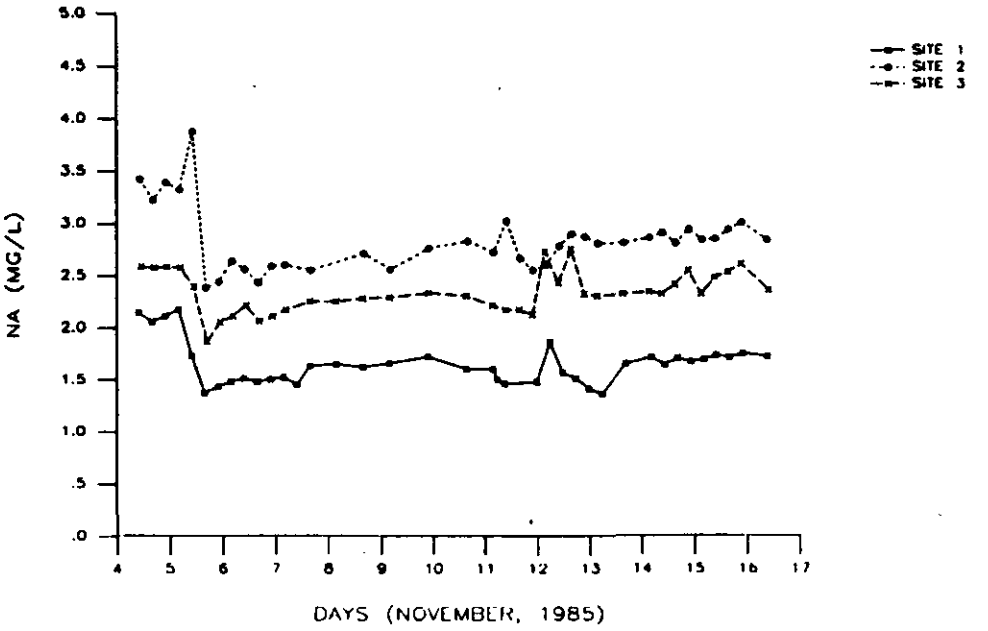
CALCIUM



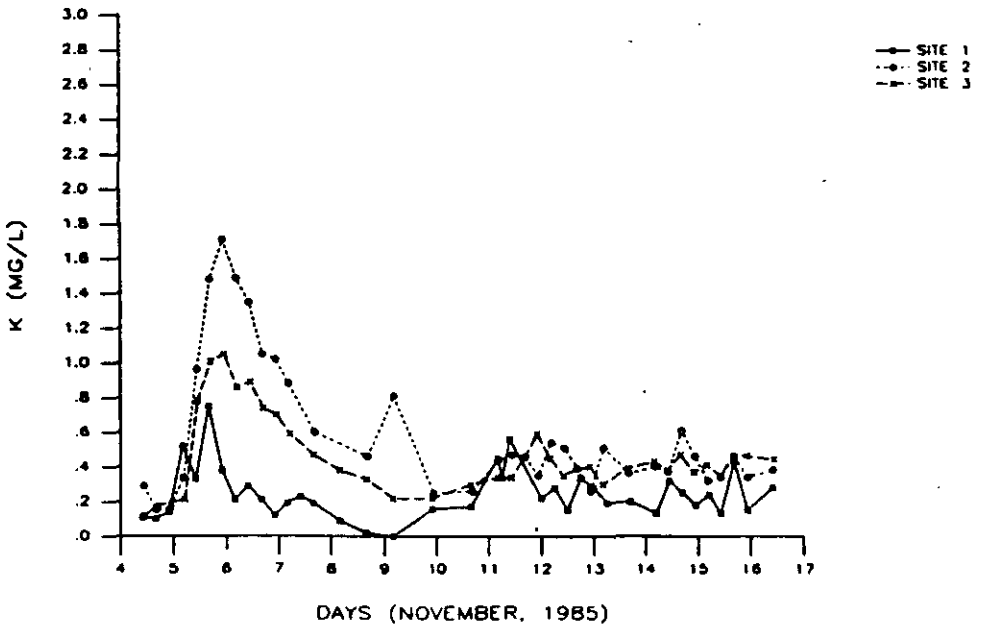
MAGNESIUM



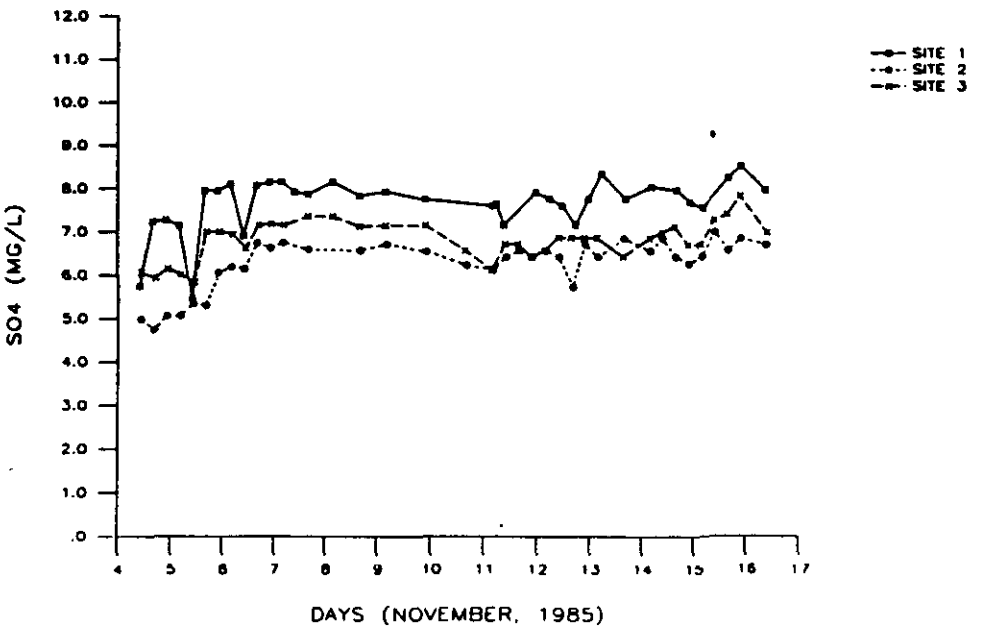
SODIUM



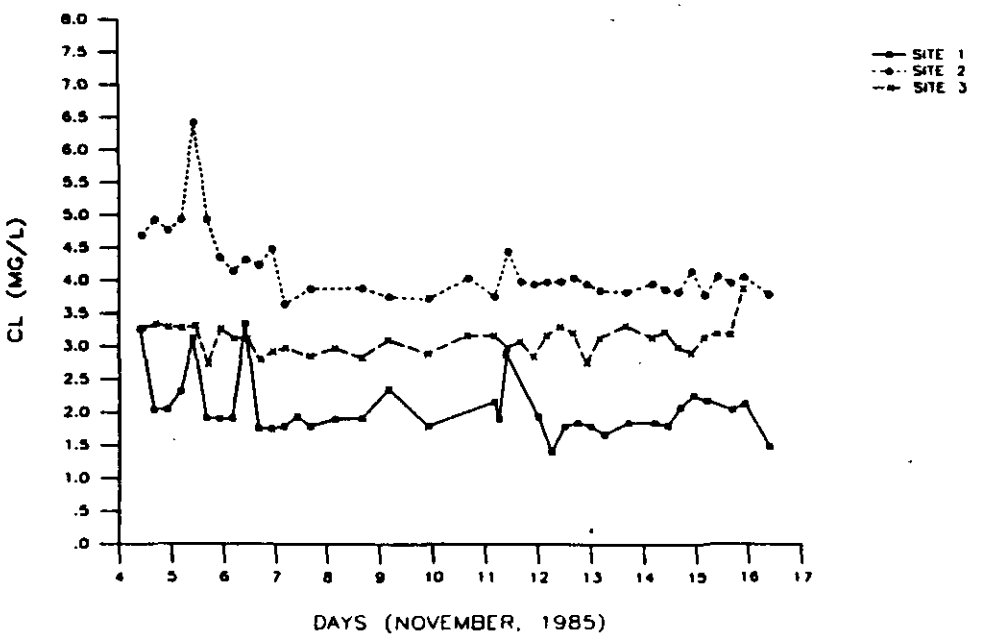
POTASSIUM



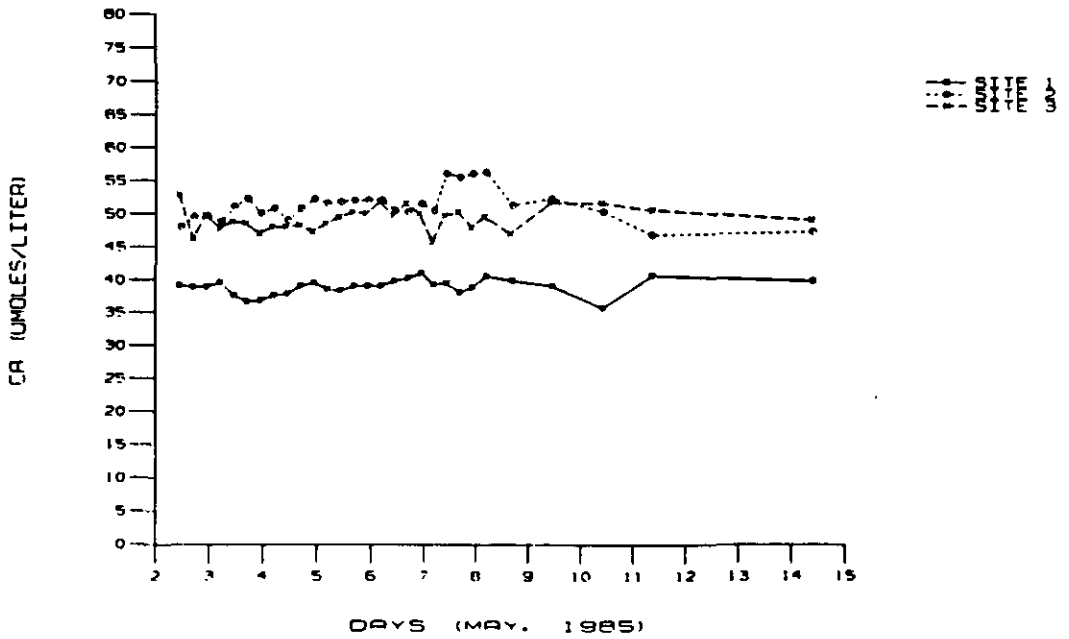
STREAMWATER SULFATE



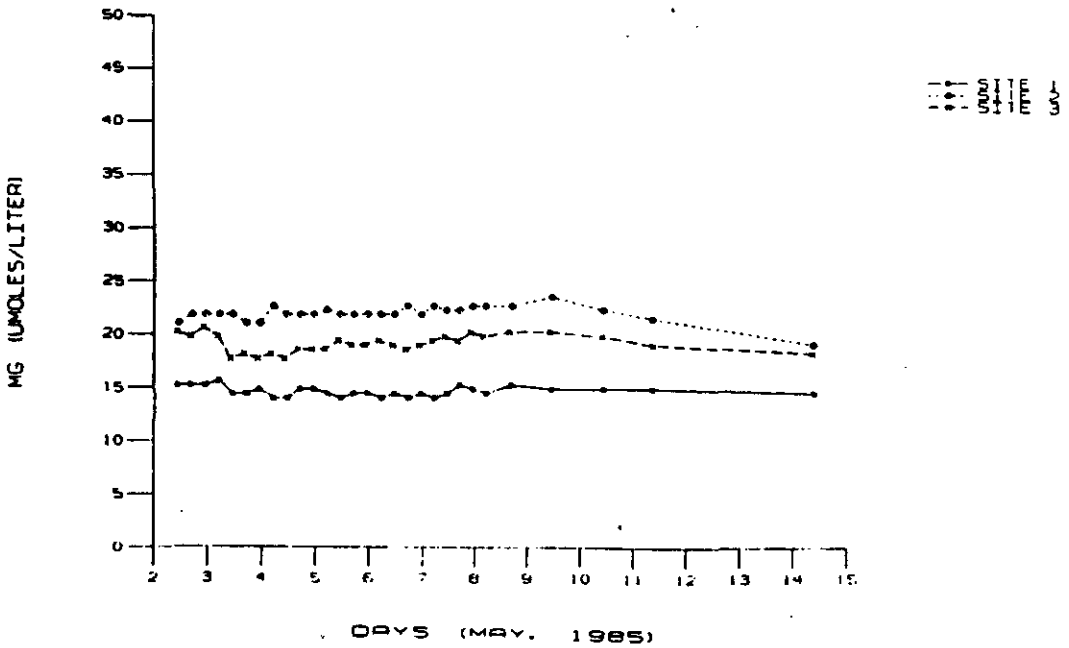
CHLORIDE



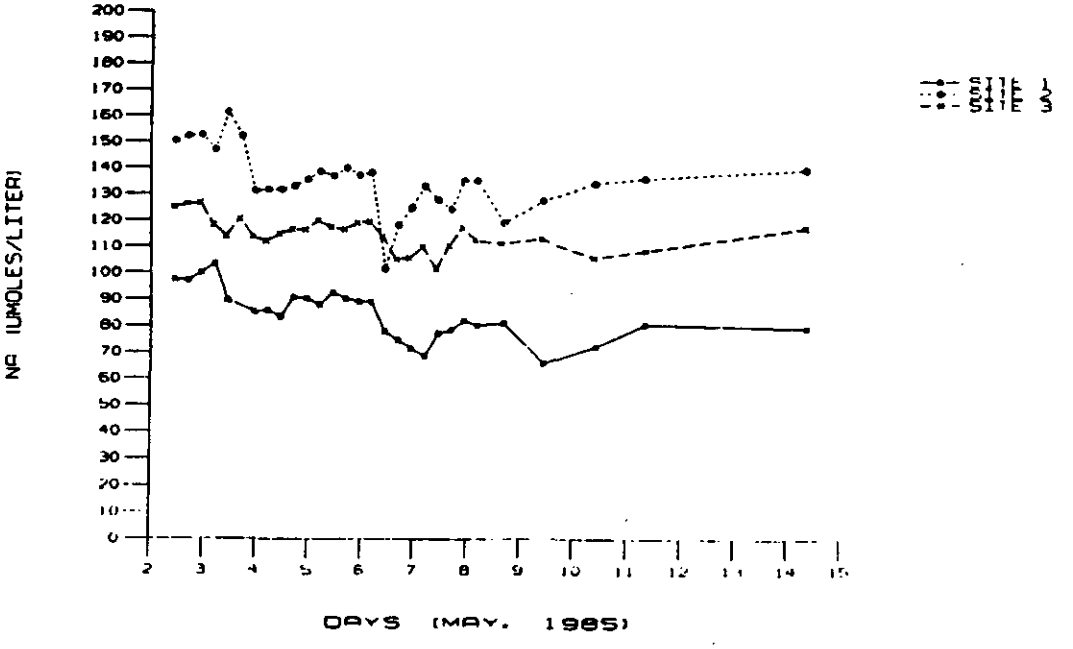
CALCIUM



MAGNESIUM



SODIUM



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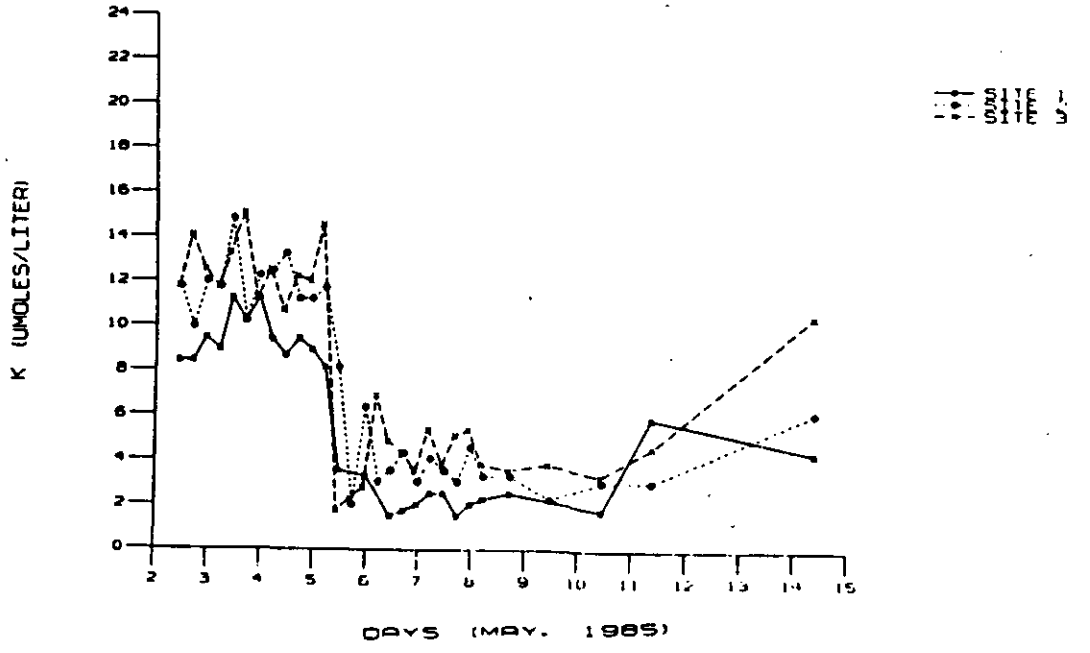
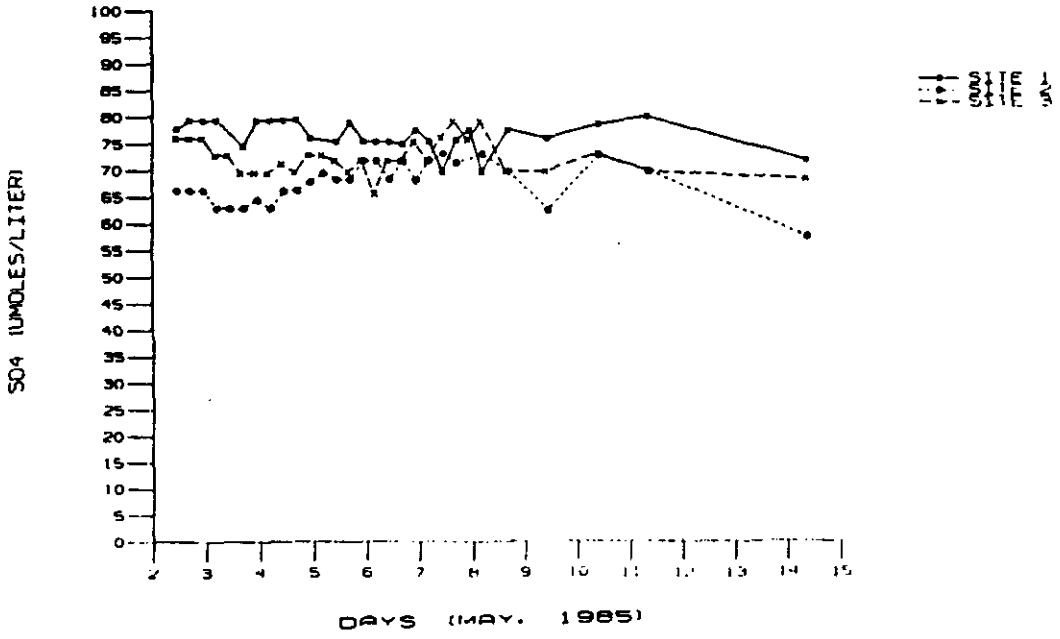


SULFATE



CHLORIDE