Water, Nature and People

IRWMS

(Integrated Real-time Basin Water Management System)

14 November 2005

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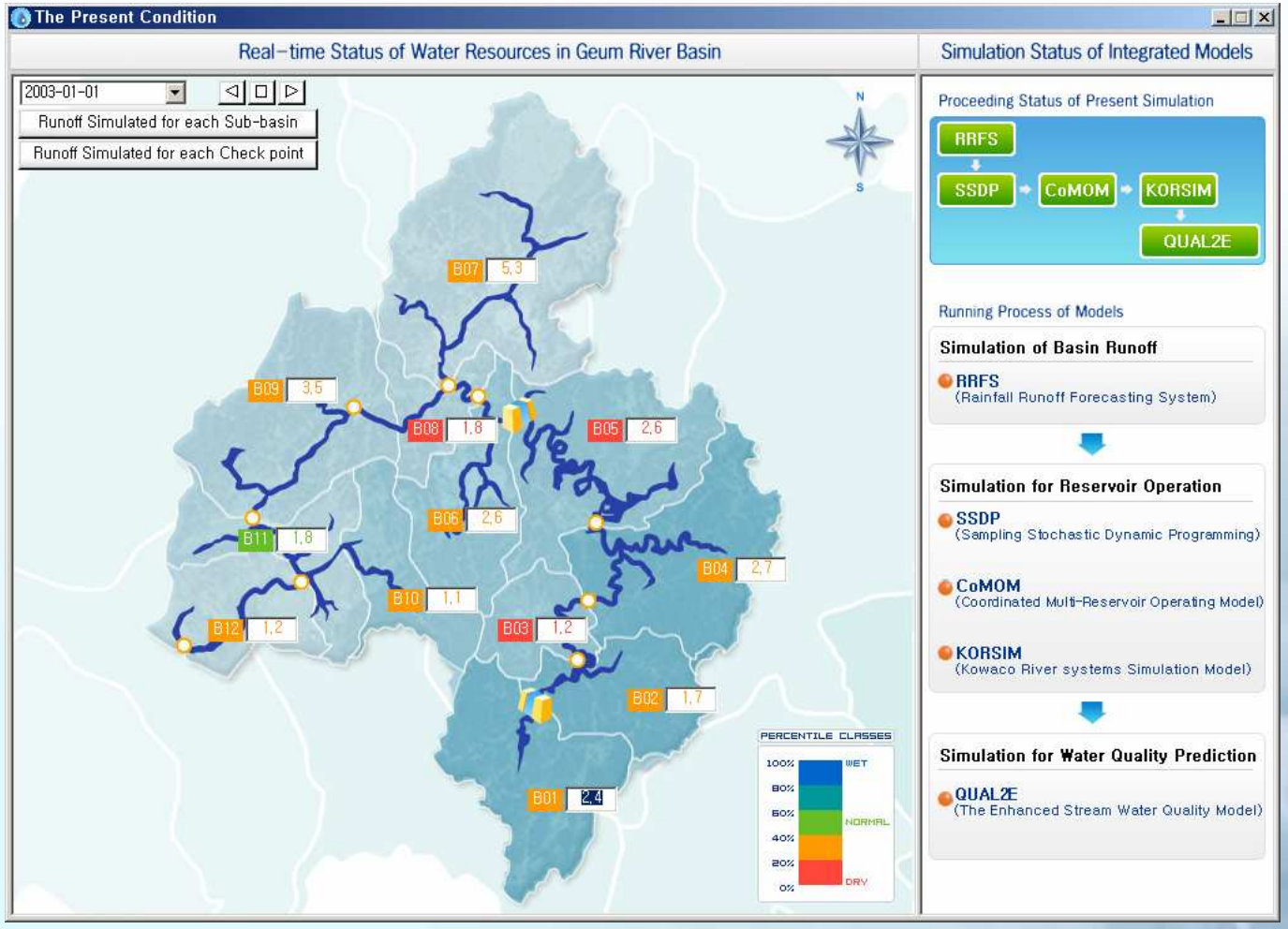
Hydrosystems Engineering Center

Contents

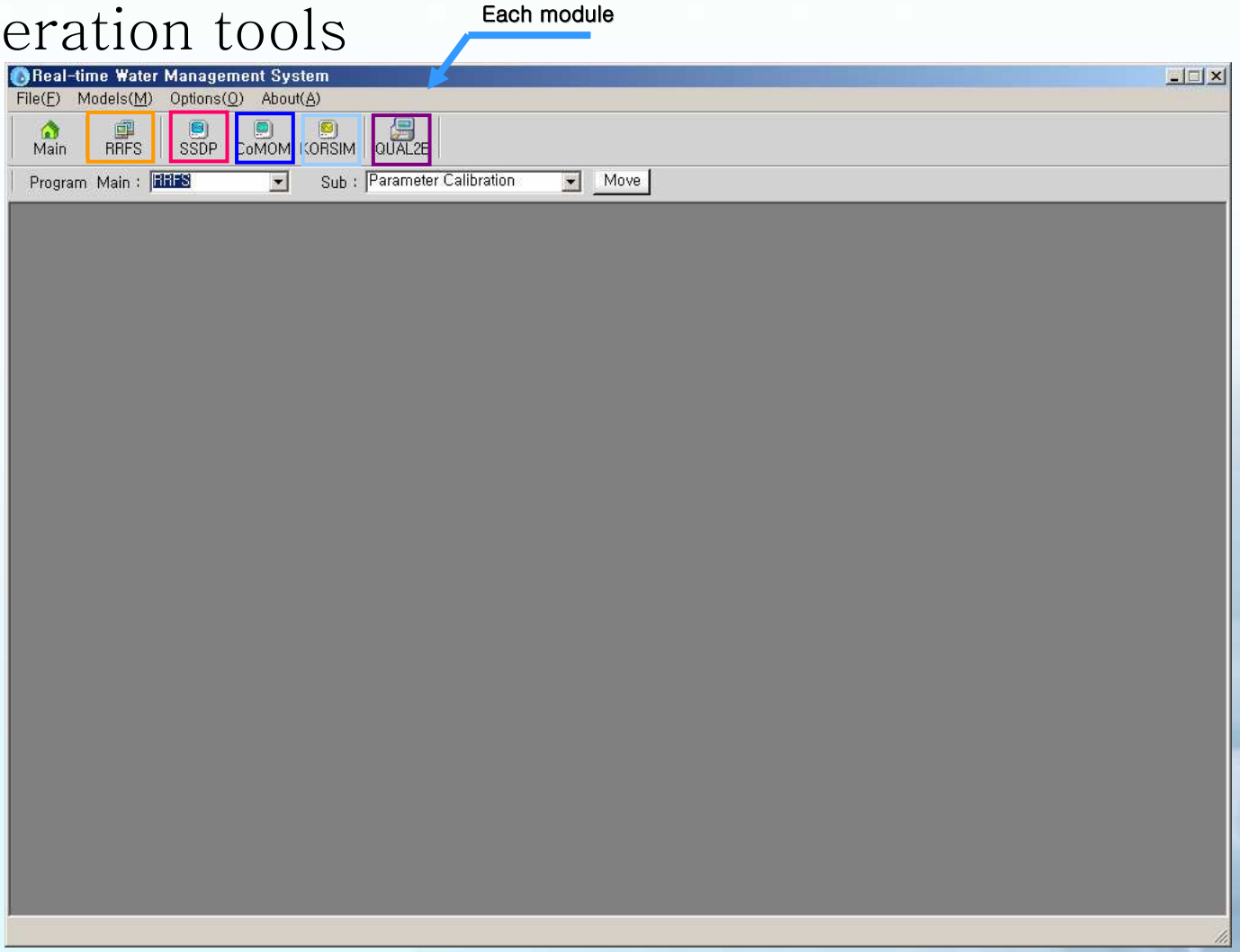
IRWMS Intro window

Main Frame

- Basin map & Present water resources condition



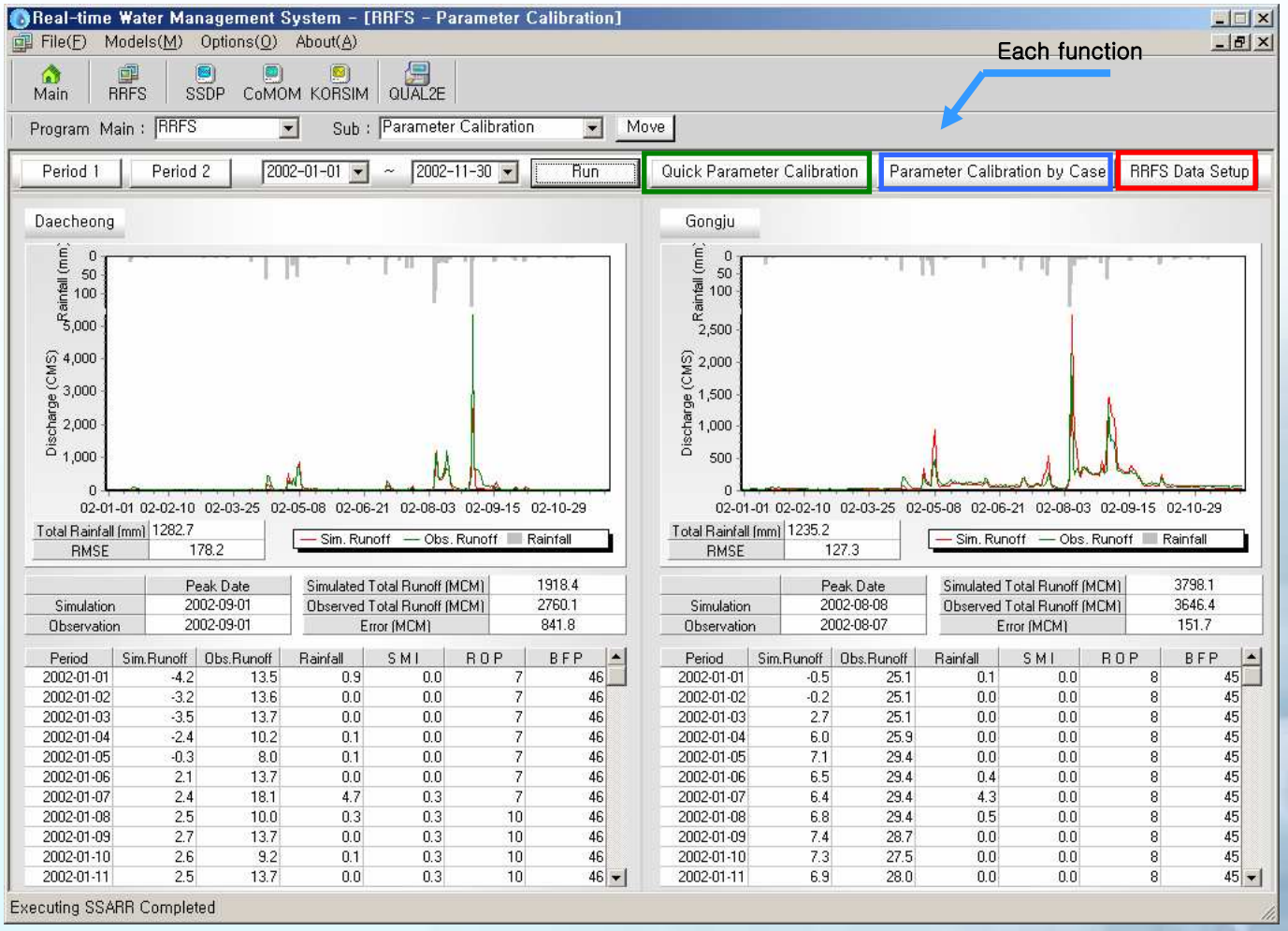
Operation tools

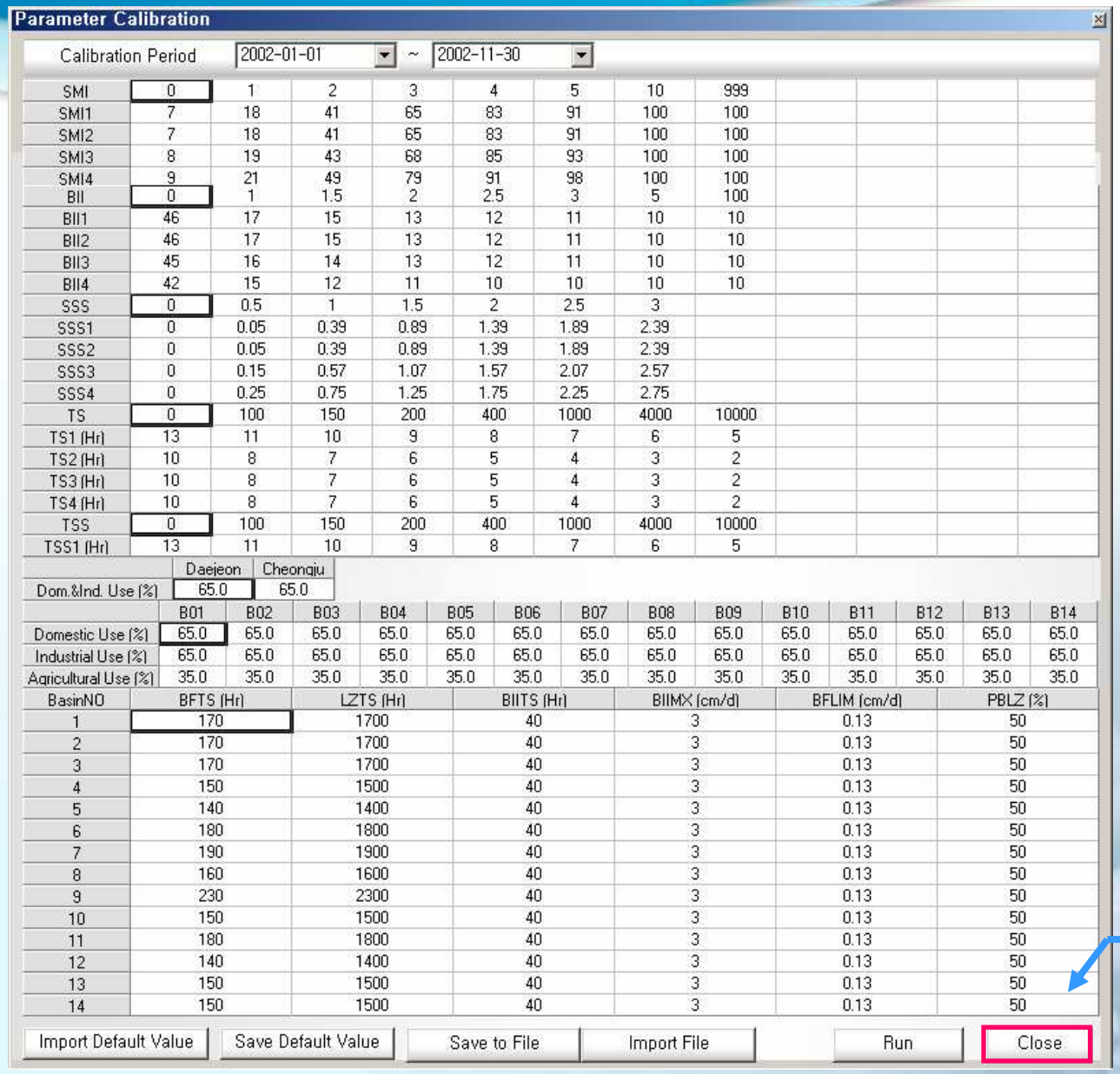


Rainfall Runoff Forecasting System (RRFS)

- Identifying characteristics of water use for municipal, industrial and agricultural purposes
- Deriving hydrologic rainfall-runoff relationship
- Estimating streamflow by sub-basins and major control point
- Integrated management of water quantity and quality

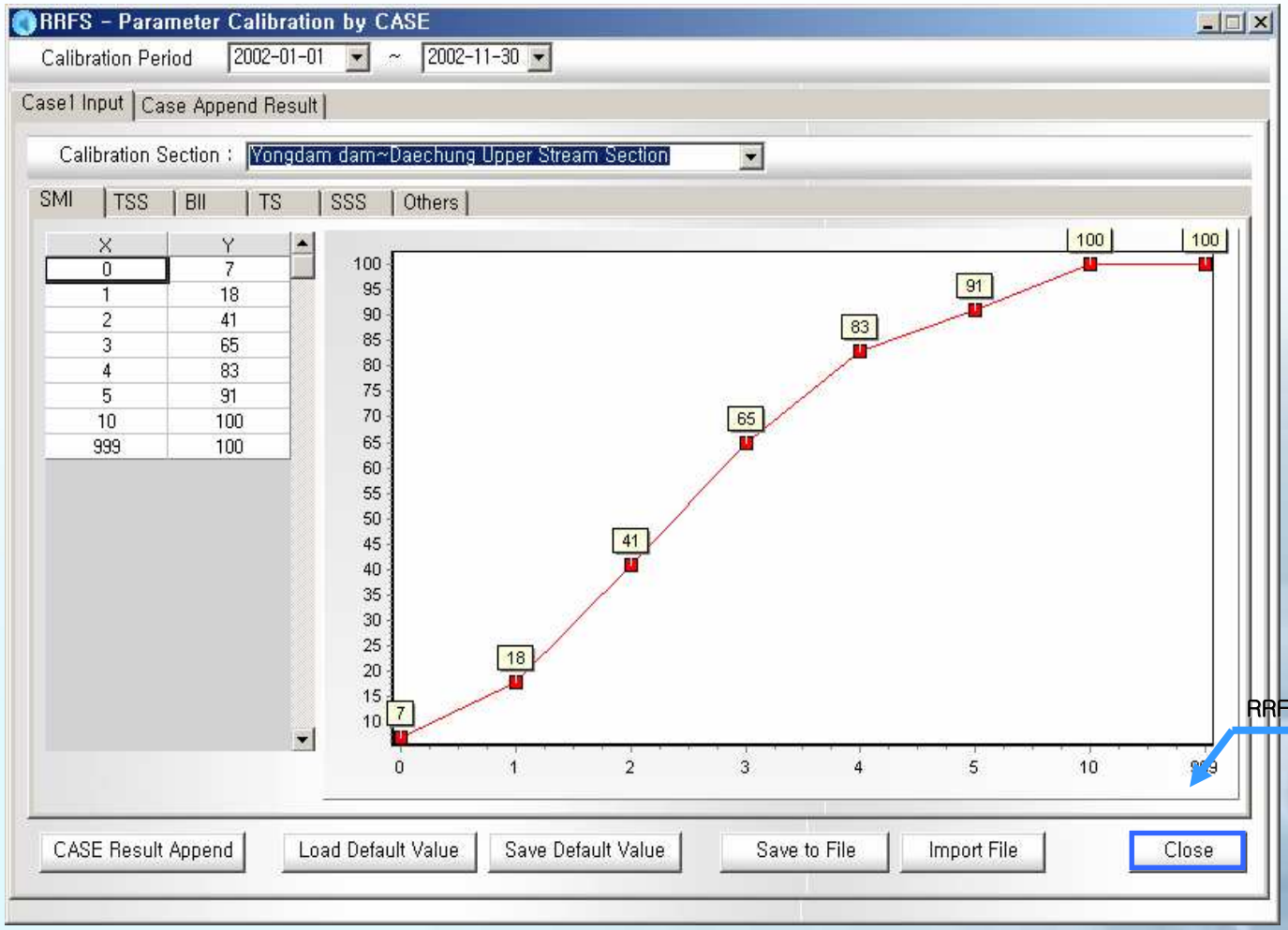
Parameter calibration

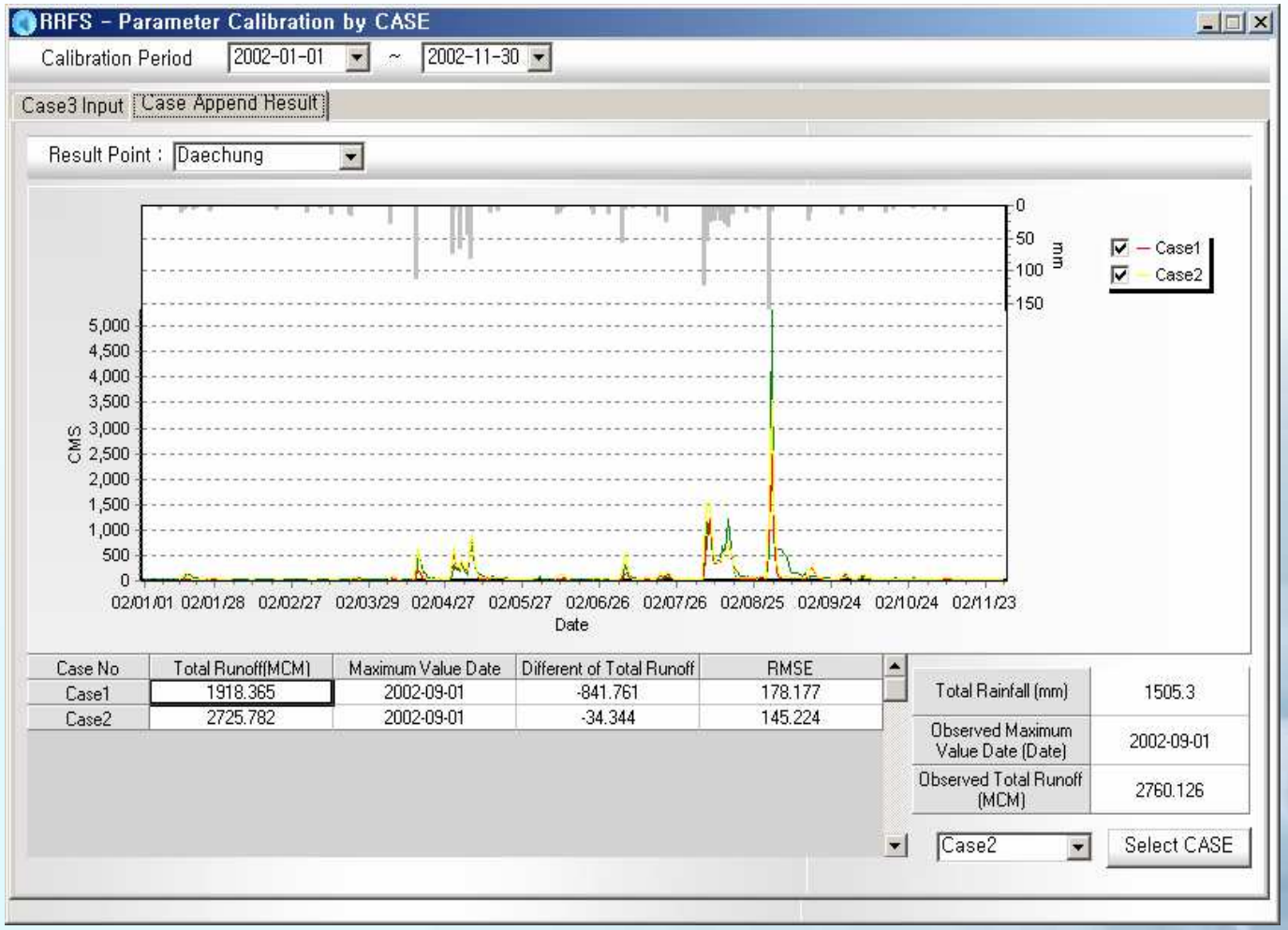



Parameter Calibration
Calibration Period
2002-01-01
~
2002-11-30
SMI 0 1 2 3 4 5 10 999
SMI1 7 18 41 65 83 91 100 100
SMI2 7 18 41 65 83 91 100 100
SMI3 8 19 43 68 85 93 100 100
SMI4 9 21 49 79 91 98 100 100
BII 0 1 1.5 2 2.5 3 5 100
BII1 46 17 15 13 12 11 10 10
BII2 46 17 15 13 12 11 10 10
BII3 45 16 14 13 12 11 10 10
BII4 42 15 12 11 10 10 10 10
SSS 0 0.5 1 1.5 2 2.5 3
SSS1 0 0.05 0.39 0.89 1.39 1.89 2.39
SSS2 0 0.05 0.39 0.89 1.39 1.89 2.39
SSS3 0 0.15 0.57 1.07 1.57 2.07 2.57
SSS4 0 0.25 0.75 1.25 1.75 2.25 2.75
TS 0 100 150 200 400 1000 4000 10000
TS1 (Hr) 13 11 10 9 8 7 6 5
TS2 (Hr) 10 8 7 6 5 4 3 2
TS3 (Hr) 10 8 7 6 5 4 3 2
TS4 (Hr) 10 8 7 6 5 4 3 2
TSS 0 100 150 200 400 1000 4000 10000
TSS1 (Hr) 13 11 10 9 8 7 6 5
Daejeon
Cheongju
Dom.&Ind. Use (%) 65.0 65.0
B01 B02 B03 B04 B05 B06 B07 B08 B09 B10 B11 B12 B13 B14
Domestic Use (%) 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0
Industrial Use (%) 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0 65.0
Agricultural Use (%) 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0
BasinNO BFTS (Hr) LZTS (Hr) BIITS (Hr) BIIMX (cm/d) BFLIM (cm/d) PBLZ (%)
1 170 1700 40 3 0.13 50
2 170 1700 40 3 0.13 50
3 170 1700 40 3 0.13 50
4 150 1500 40 3 0.13 50
5 140 1400 40 3 0.13 50
6 180 1800 40 3 0.13 50
7 190 1900 40 3 0.13 50
8 160 1600 40 3 0.13 50
9 230 2300 40 3 0.13 50
10 150 1500 40 3 0.13 50
11 180 1800 40 3 0.13 50
12 140 1400 40 3 0.13 50
13 150 1500 40 3 0.13 50
14 150 1500 40 3 0.13 50
Import Default Value
Save Default Value
Save to File
Import File
Run
Close
RRFS main

Parameter setup

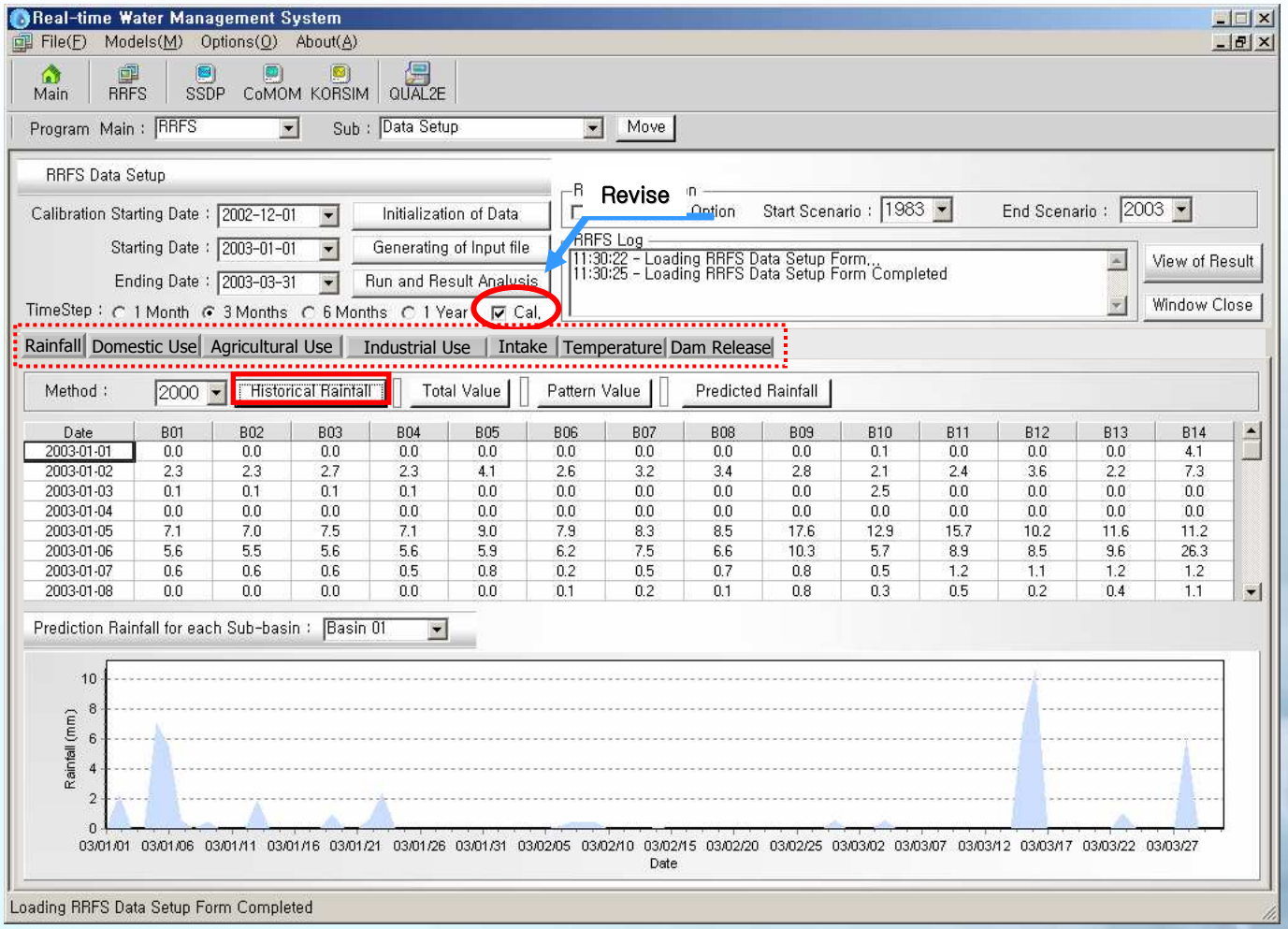
- Parameter calibration by case



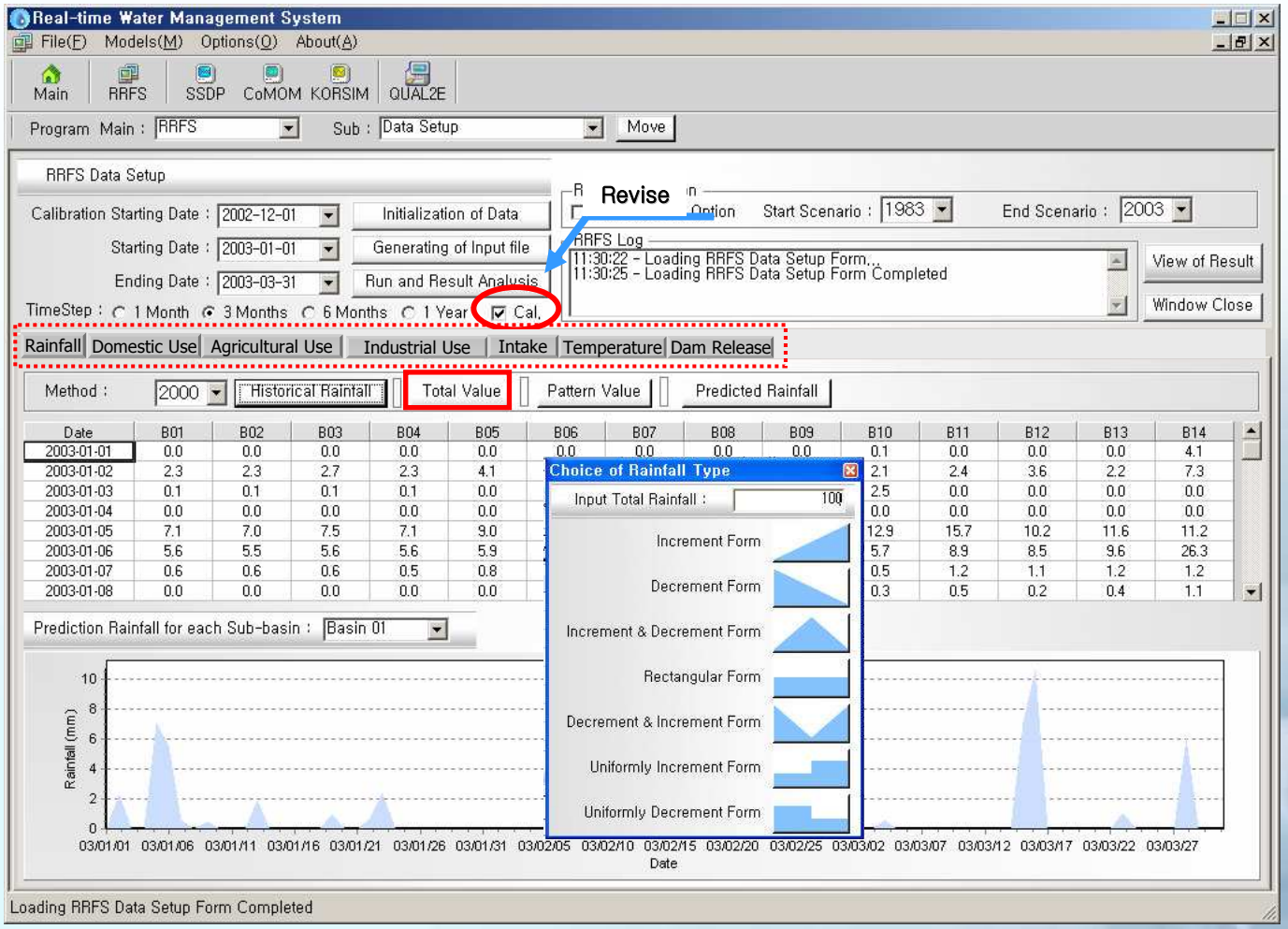

RRFS - Parameter Calibration by CASE
Calibration Period
2002-01-01
~
2002-11-30
Case3 Input
Case Append Result
Result Point :
Daechung
CMS
mm
Case1
Case2
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
0
50
100
150
02/01/01 02/01/28 02/02/27 02/03/29 02/04/27 02/05/27 02/06/26 02/07/26 02/08/25 02/09/24 02/10/24 02/11/23
Date
Case No | Total Runoff(MCM) | Maximum Value Date | Different of Total Runoff | RMSE
Case1 | 1918.365 | 2002-09-01 | -841.761 | 178.177
Case2 | 2725.782 | 2002-09-01 | -34.344 | 145.224
Total Rainfall (mm) 1505.3
Observed Maximum Value Date (Date) 2002-09-01
Observed Total Runoff (MCM) 2760.126
Case2
Select CASE

RRFS Input data

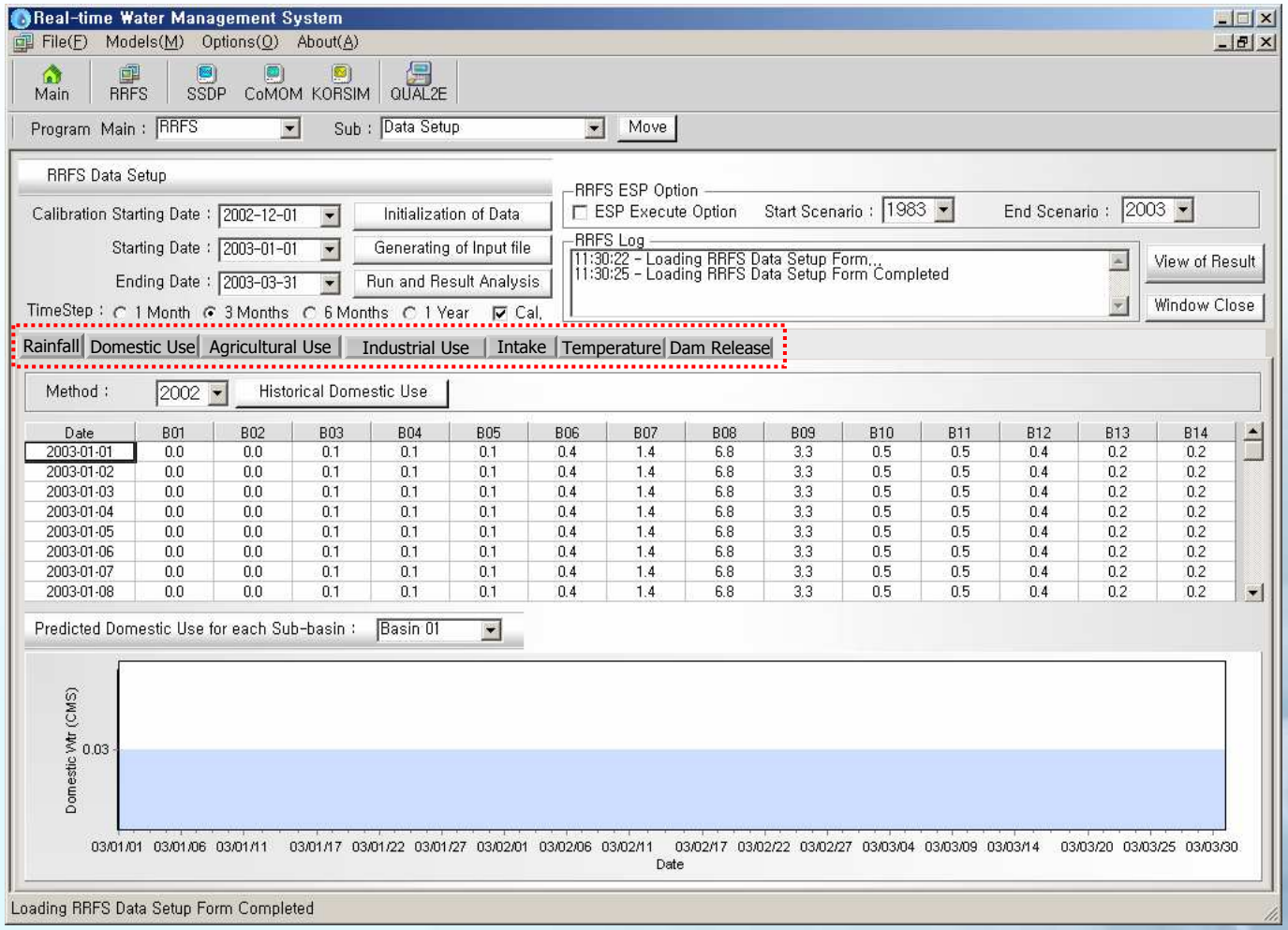
- Rainfall data (Historical Rainfall)



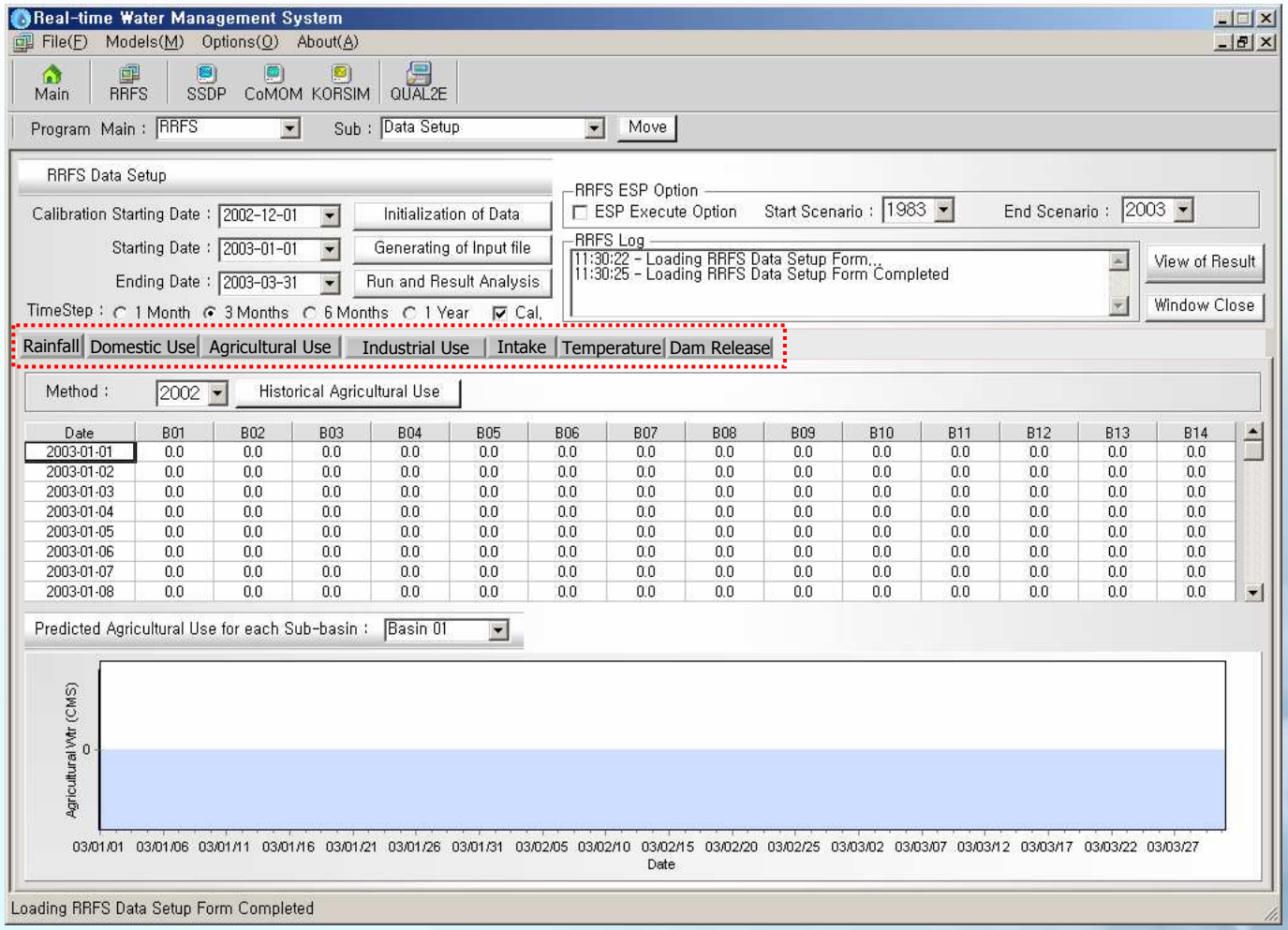
Rainfall data (Total Value)



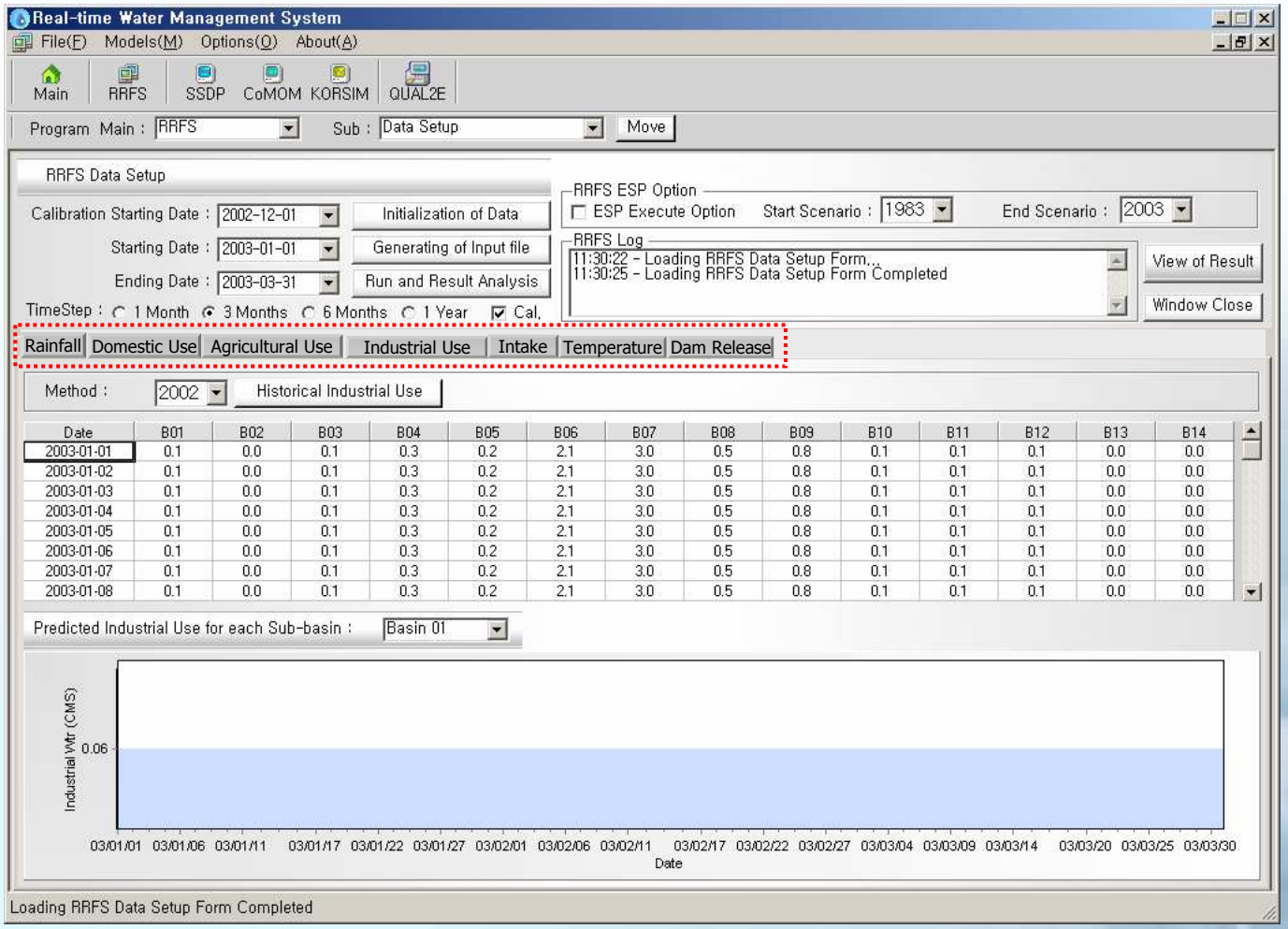
Domestic water use



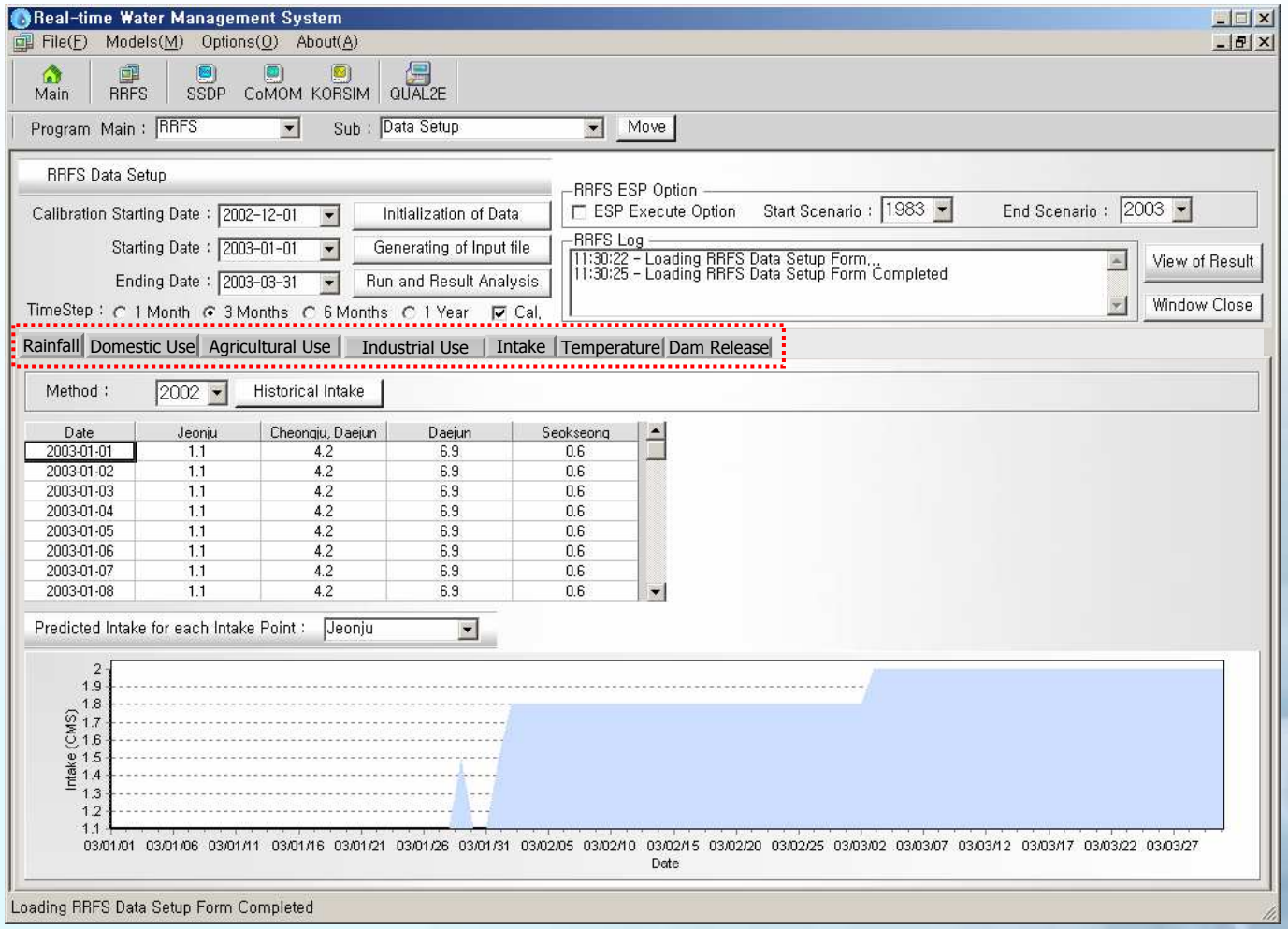
Agricultural water use



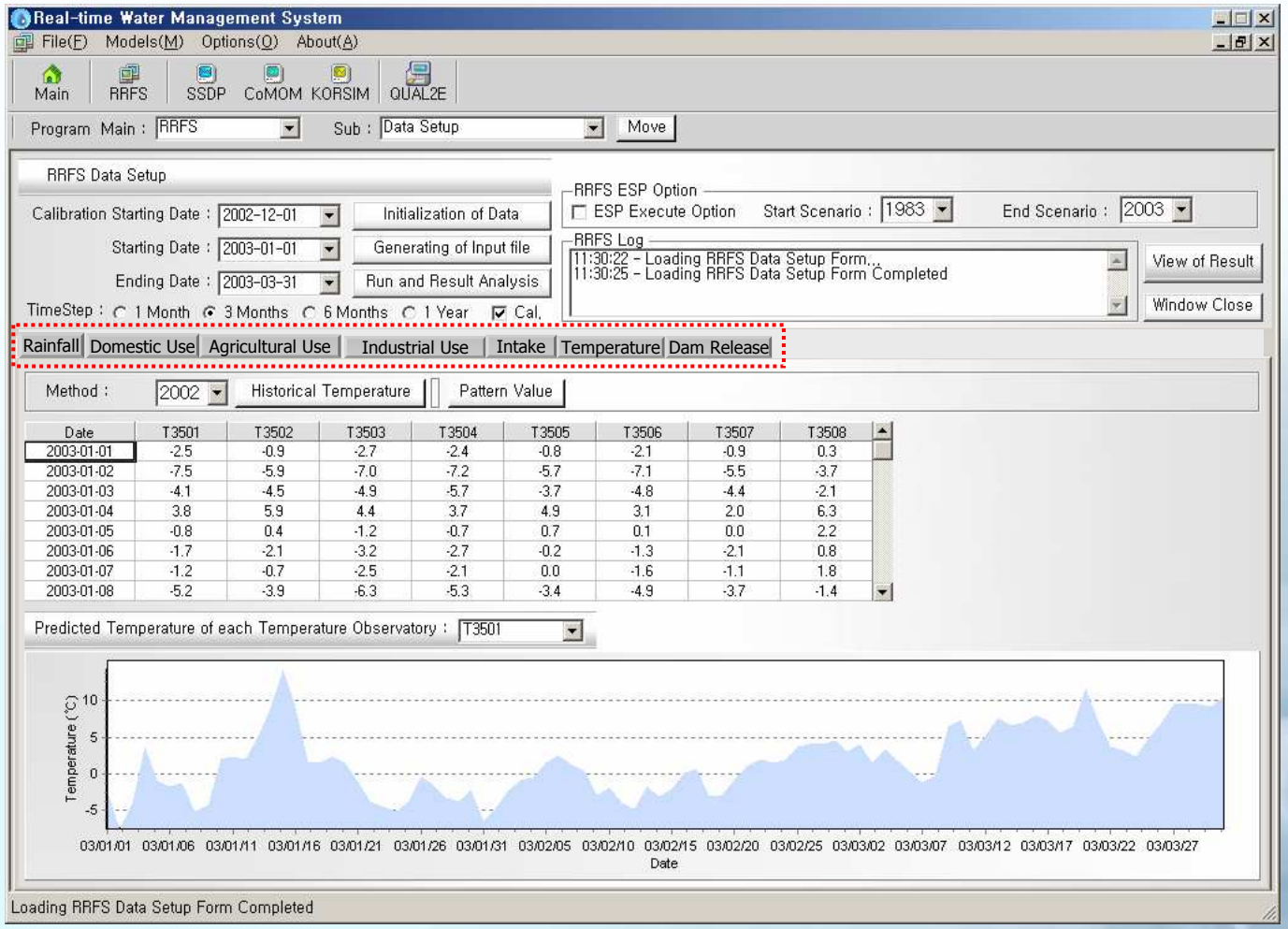
Industrial water use



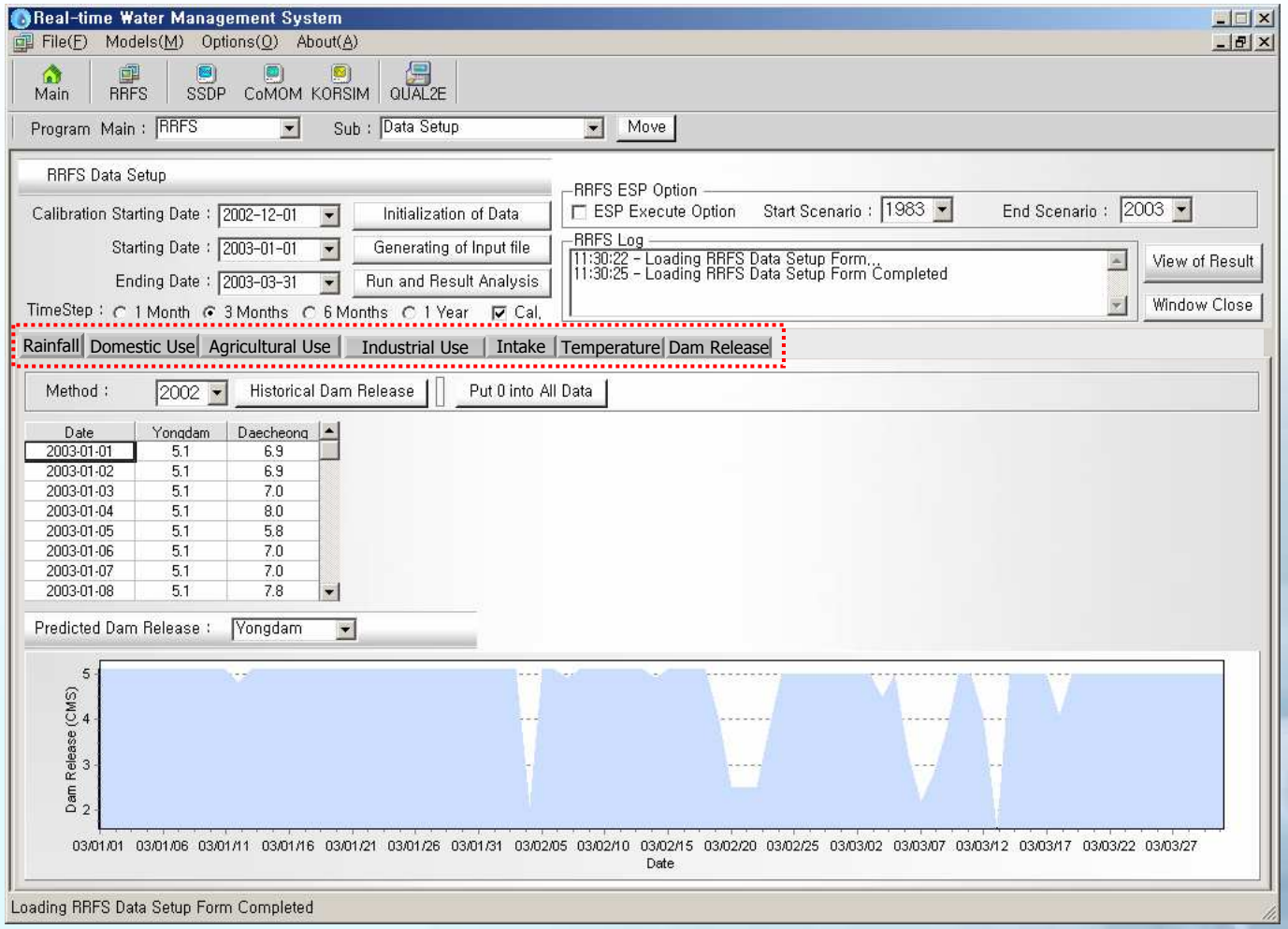
Intake


Real-time Water Management System
File(F) Models(M) Options(O) About(A)
Main RRFS SSDP CoMOM KORSIM QUAL2E
Program Main : RRFS Sub : Data Setup Move
RRFS Data Setup
Calibration Starting Date : 2002-12-01 Initialization of Data
Starting Date : 2003-01-01 Generating of Input file
Ending Date : 2003-03-31 Run and Result Analysis
TimeStep : 1 Month 3 Months 6 Months 1 Year Cal.
RRFS ESP Option
ESP Execute Option Start Scenario : 1983 End Scenario : 2003
RRFS Log
11:30:22 - Loading RRFS Data Setup Form...
11:30:25 - Loading RRFS Data Setup Form Completed
View of Result
Window Close
Rainfall Domestic Use Agricultural Use Industrial Use Intake Temperature Dam Release
Method : 2002 Historical Intake
Date Jeonju Cheongju, Daejun Daejun Seokseong
2003-01-01 1.1 4.2 6.9 0.6
2003-01-02 1.1 4.2 6.9 0.6
2003-01-03 1.1 4.2 6.9 0.6
2003-01-04 1.1 4.2 6.9 0.6
2003-01-05 1.1 4.2 6.9 0.6
2003-01-06 1.1 4.2 6.9 0.6
2003-01-07 1.1 4.2 6.9 0.6
2003-01-08 1.1 4.2 6.9 0.6
Predicted Intake for each Intake Point : Jeonju
Intake (CMS)
Date
Loading RRFS Data Setup Form Completed

Temperature



Dam release


Real-time Water Management System
File(F) Models(M) Options(O) About(A)
Main RRFS SSDP CoMOM KORSIM QUAL2E
Program Main : RRFS Sub : Data Setup Move
RRFS Data Setup
Calibration Starting Date : 2002-12-01 Initialization of Data
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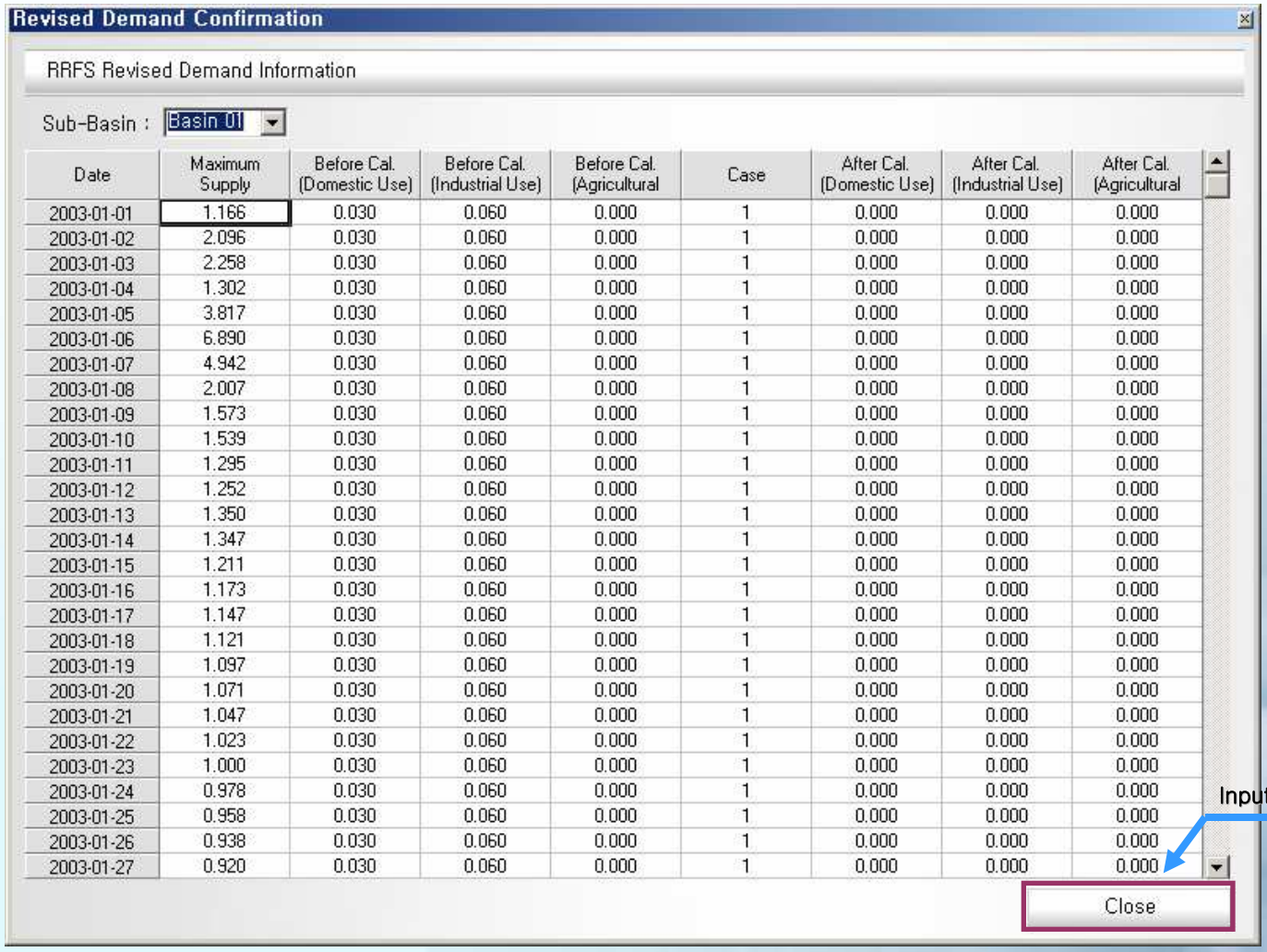
TimeStep : 1 Month 3 Months 6 Months 1 Year Cal.
RRFS ESP Option
ESP Execute Option Start Scenario : 1983 End Scenario : 2003
RRFS Log
11:30:22 - Loading RRFS Data Setup Form...
11:30:25 - Loading RRFS Data Setup Form Completed
View of Result
Window Close
Rainfall Domestic Use Agricultural Use Industrial Use Intake Temperature Dam Release
Method : 2002 Historical Dam Release Put 0 into All Data
Date Yongdam Daecheong
2003-01-01 5.1 6.9
2003-01-02 5.1 6.9
2003-01-03 5.1 7.0
2003-01-04 5.1 8.0
2003-01-05 5.1 5.8
2003-01-06 5.1 7.0
2003-01-07 5.1 7.0
2003-01-08 5.1 7.8
Predicted Dam Release : Yongdam
Dam Release (CMS)
Date
Loading RRFS Data Setup Form Completed

Running & Modification

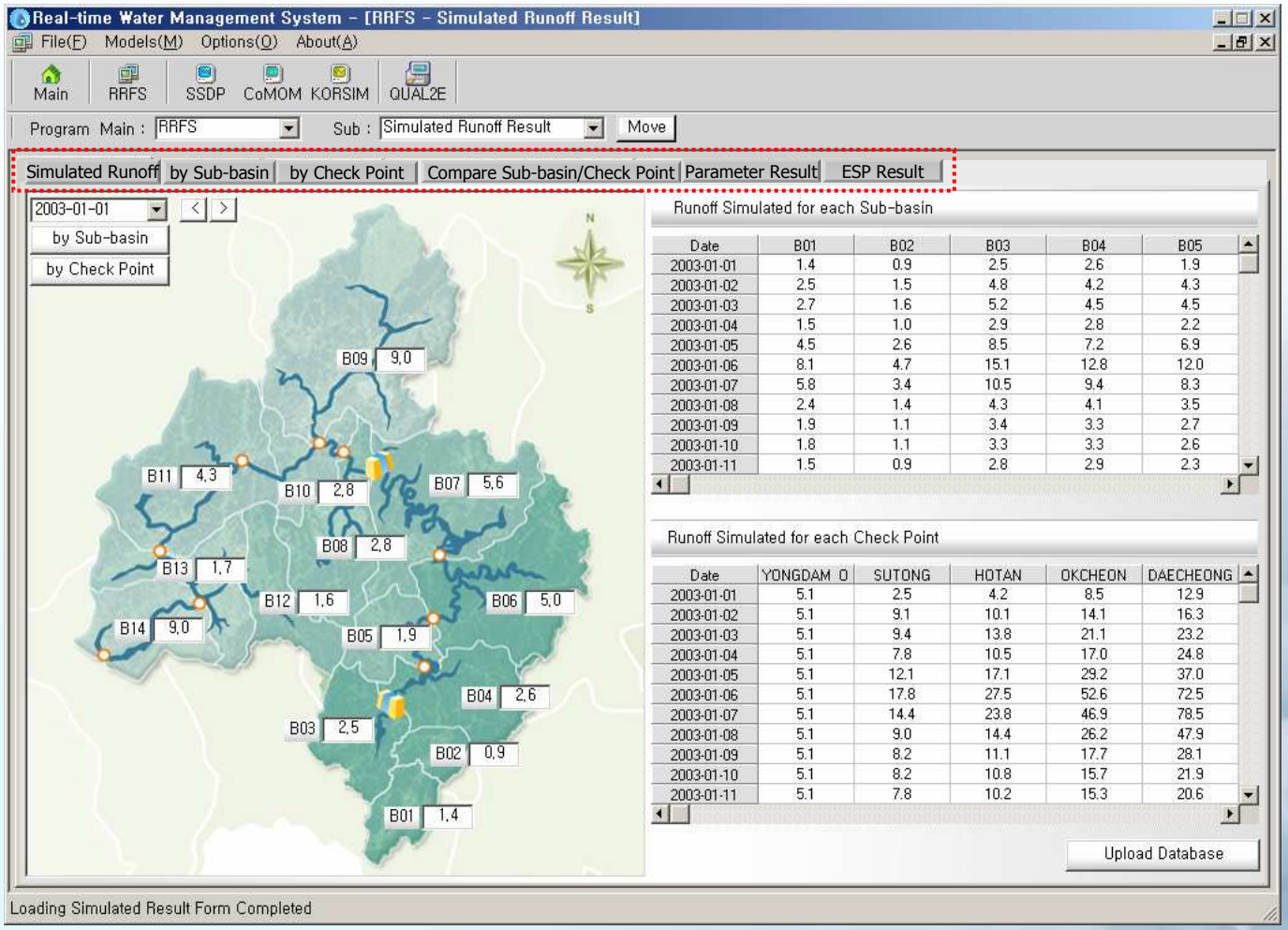
- Modified water demand control unit



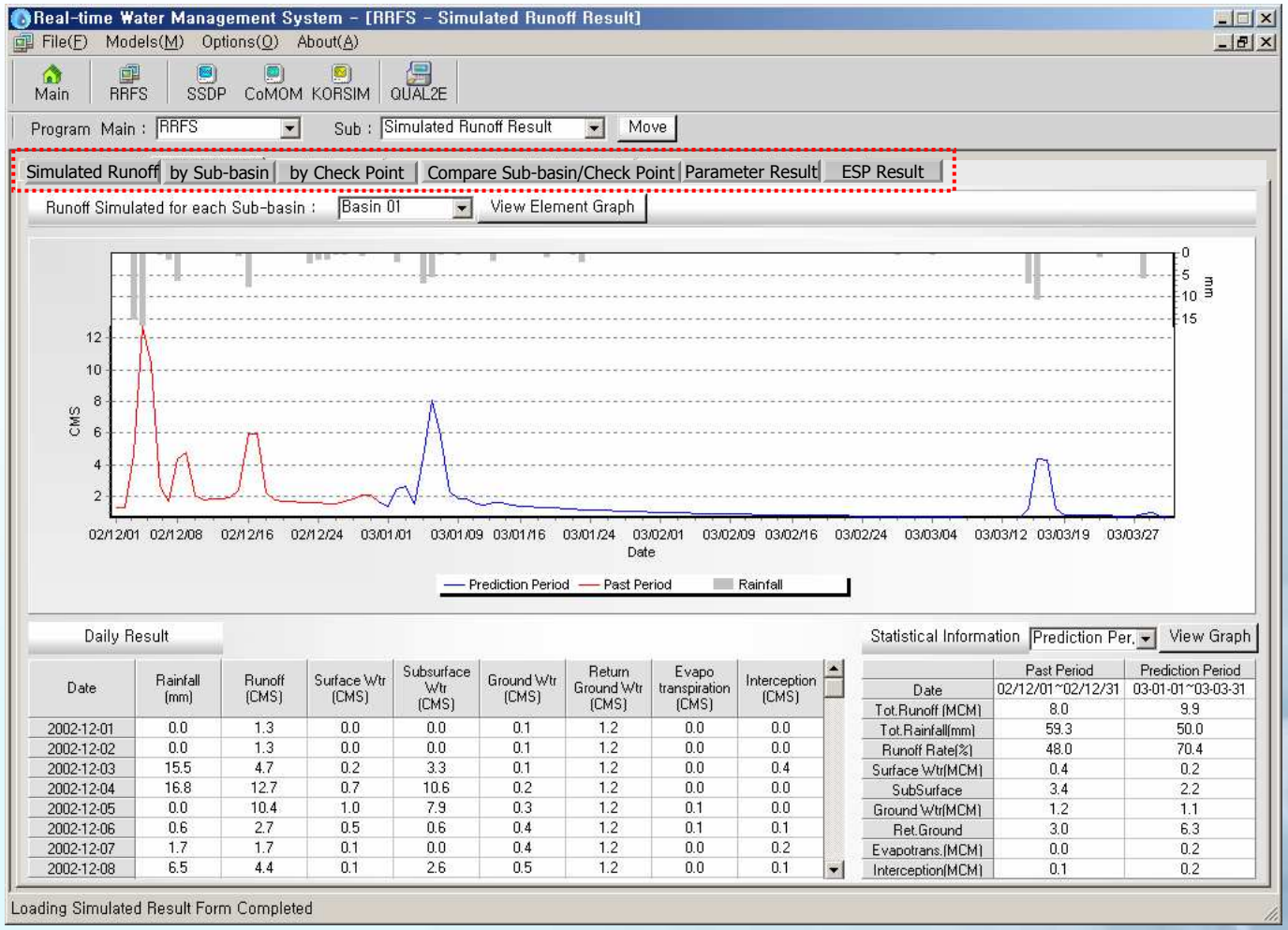
Date	Maximum Supply	Before Cal. (Domestic Use)	Before Cal. (Industrial Use)	Before Cal. (Agricultural	Case	After Cal. (Domestic Use)	After Cal. (Industrial Use)	After Cal. (Agricultural
2003-01-01	1.166	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-02	2.096	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-03	2.258	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-04	1.302	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-05	3.817	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-06	6.890	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-07	4.942	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-08	2.007	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-09	1.573	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-10	1.539	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-11	1.295	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-12	1.252	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-13	1.350	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-14	1.347	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-15	1.211	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-16	1.173	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-17	1.147	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-18	1.121	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-19	1.097	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-20	1.071	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-21	1.047	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-22	1.023	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-23	1.000	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-24	0.978	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-25	0.958	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-26	0.938	0.030	0.060	0.000	1	0.000	0.000	0.000
2003-01-27	0.920	0.030	0.060	0.000	1	0.000	0.000	0.000

RRFS results

- Simulated runoff results



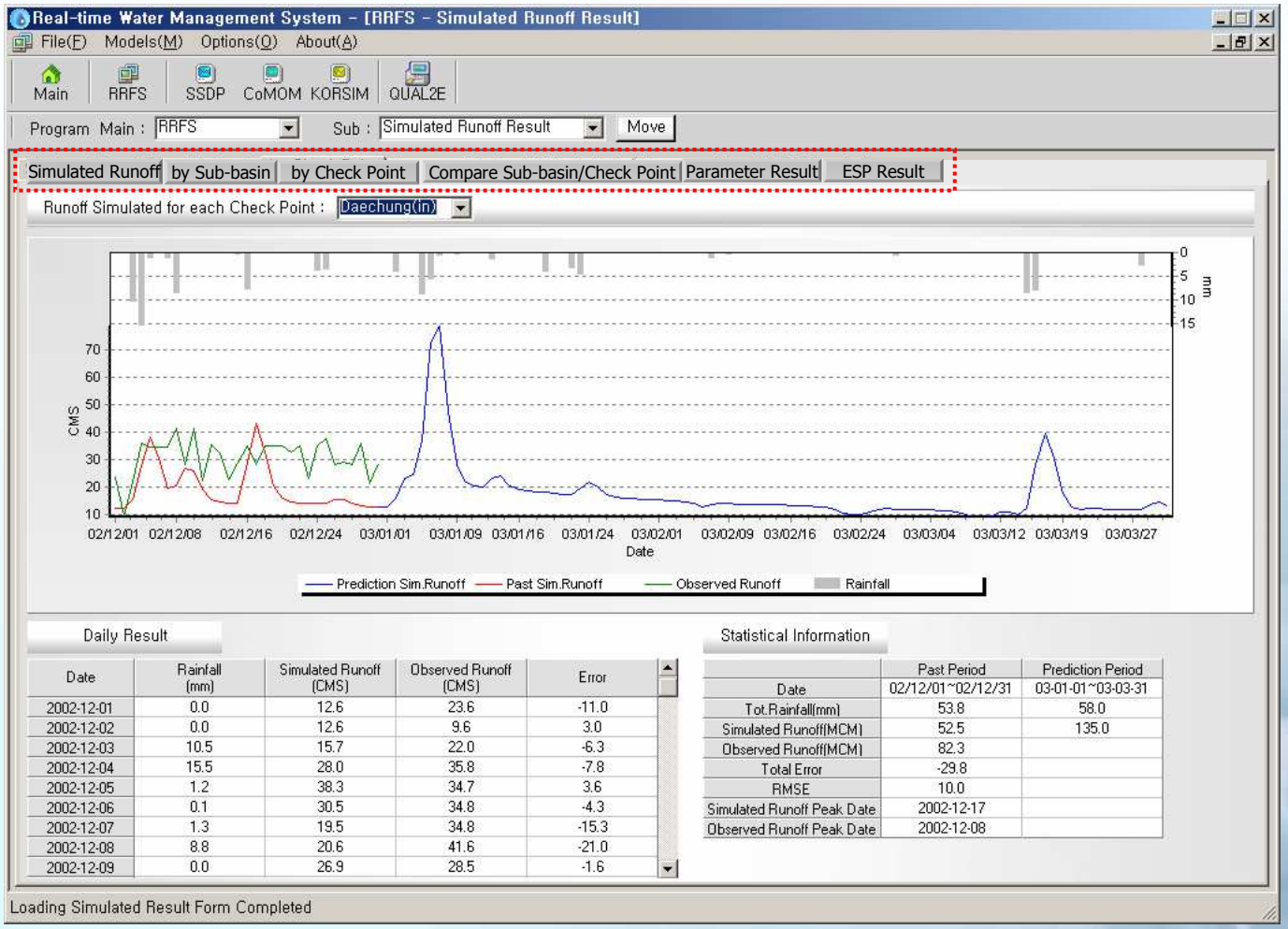
Results by Sub-basin



Date	Rainfall (mm)	Runoff (CMS)	Surface Wtr (CMS)	Subsurface Wtr (CMS)	Ground Wtr (CMS)	Return Ground Wtr (CMS)	Evapo transpiration (CMS)	Interception (CMS)
2002-12-01	0.0	1.3	0.0	0.0	0.1	1.2	0.0	0.0
2002-12-02	0.0	1.3	0.0	0.0	0.1	1.2	0.0	0.0
2002-12-03	15.5	4.7	0.2	3.3	0.1	1.2	0.0	0.4
2002-12-04	16.8	12.7	0.7	10.6	0.2	1.2	0.0	0.0
2002-12-05	0.0	10.4	1.0	7.9	0.3	1.2	0.1	0.0
2002-12-06	0.6	2.7	0.5	0.6	0.4	1.2	0.1	0.1
2002-12-07	1.7	1.7	0.1	0.0	0.4	1.2	0.0	0.2
2002-12-08	6.5	4.4	0.1	2.6	0.5	1.2	0.0	0.1

Date	Past Period 02/12/01~02/12/31	Prediction Period 03-01-01~03-03-31
Tot.Runoff (MCM)	8.0	9.9
Tot.Rainfall(mm)	59.3	50.0
Runoff Rate(%)	48.0	70.4
Surface Wtr(MCM)	0.4	0.2
SubSurface	3.4	2.2
Ground Wtr(MCM)	1.2	1.1
Ret.Ground	3.0	6.3
Evapotrans.(MCM)	0.0	0.2
Interception(MCM)	0.1	0.2

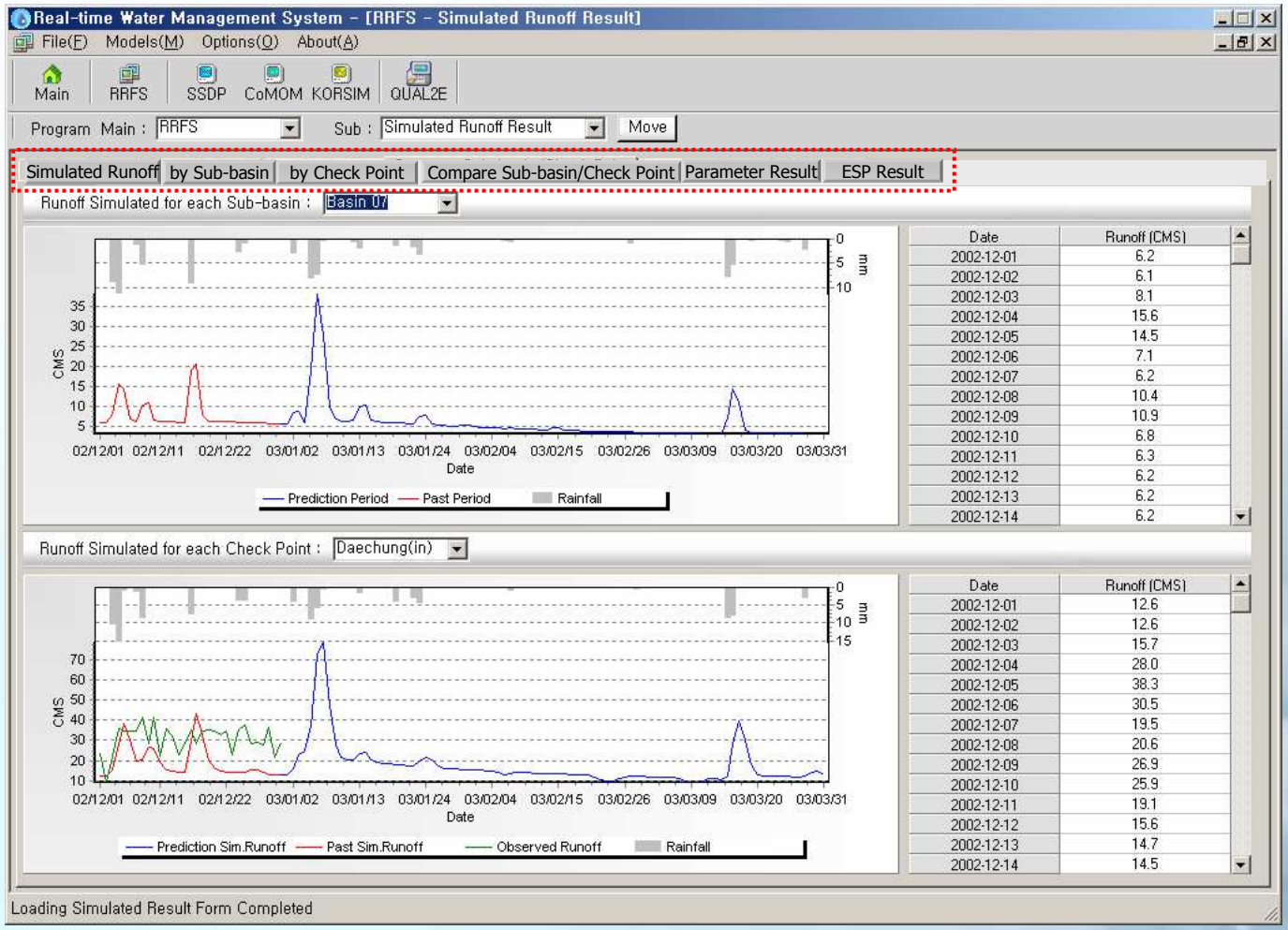
Results by main check point



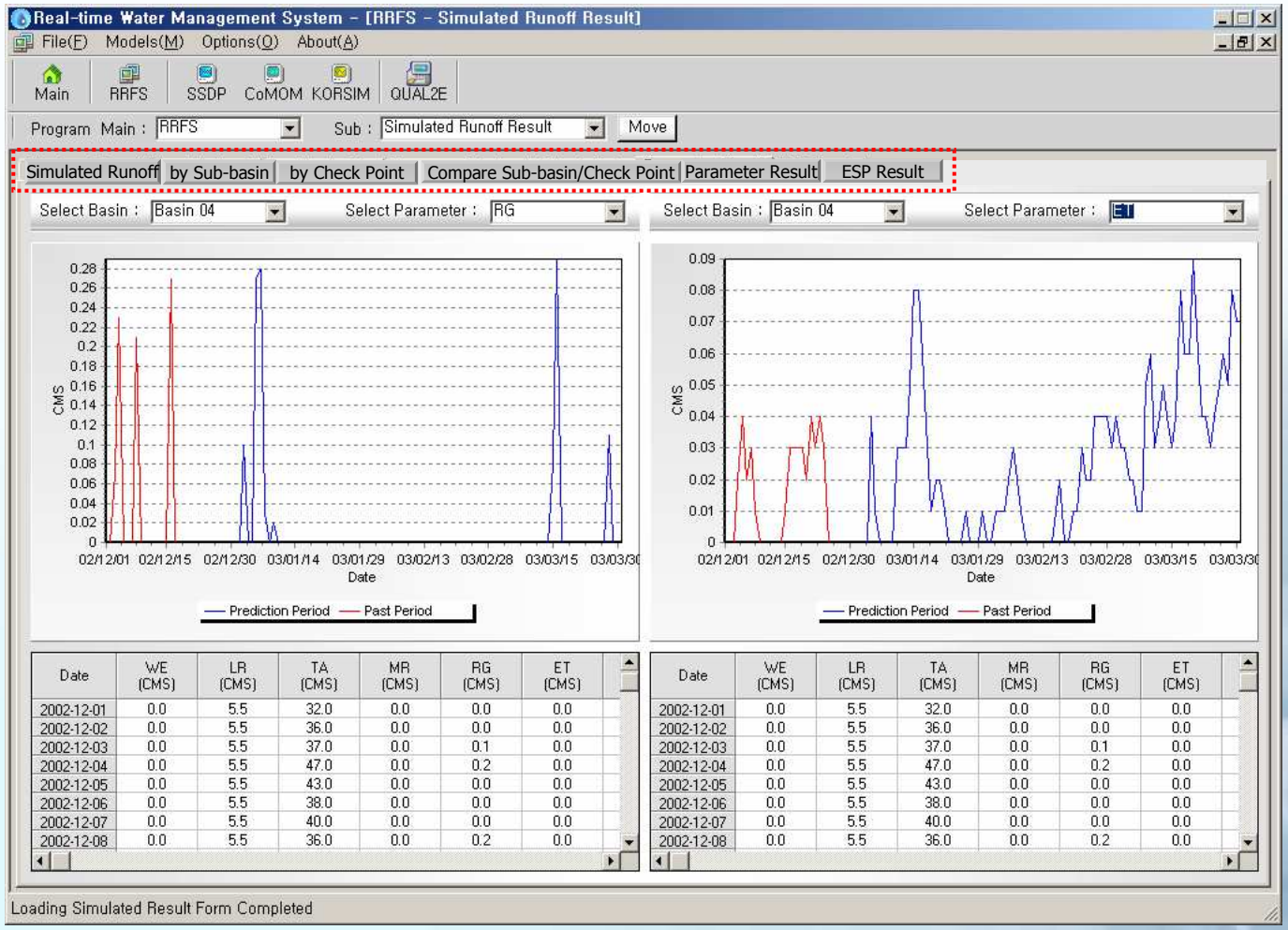
Date	Rainfall (mm)	Simulated Runoff (CMS)	Observed Runoff (CMS)	Error
2002-12-01	0.0	12.6	23.6	-11.0
2002-12-02	0.0	12.6	9.6	3.0
2002-12-03	10.5	15.7	22.0	-6.3
2002-12-04	15.5	28.0	35.8	-7.8
2002-12-05	1.2	38.3	34.7	3.6
2002-12-06	0.1	30.5	34.8	-4.3
2002-12-07	1.3	19.5	34.8	-15.3
2002-12-08	8.8	20.6	41.6	-21.0
2002-12-09	0.0	26.9	28.5	-1.6

	Past Period	Prediction Period
Date	02/12/01~02/12/31	03-01-01~03-03-31
Tot.Rainfall(mm)	53.8	58.0
Simulated Runoff(MCM)	52.5	135.0
Observed Runoff(MCM)	82.3	
Total Error	-29.8	
RMSE	10.0	
Simulated Runoff Peak Date	2002-12-17	
Observed Runoff Peak Date	2002-12-08	

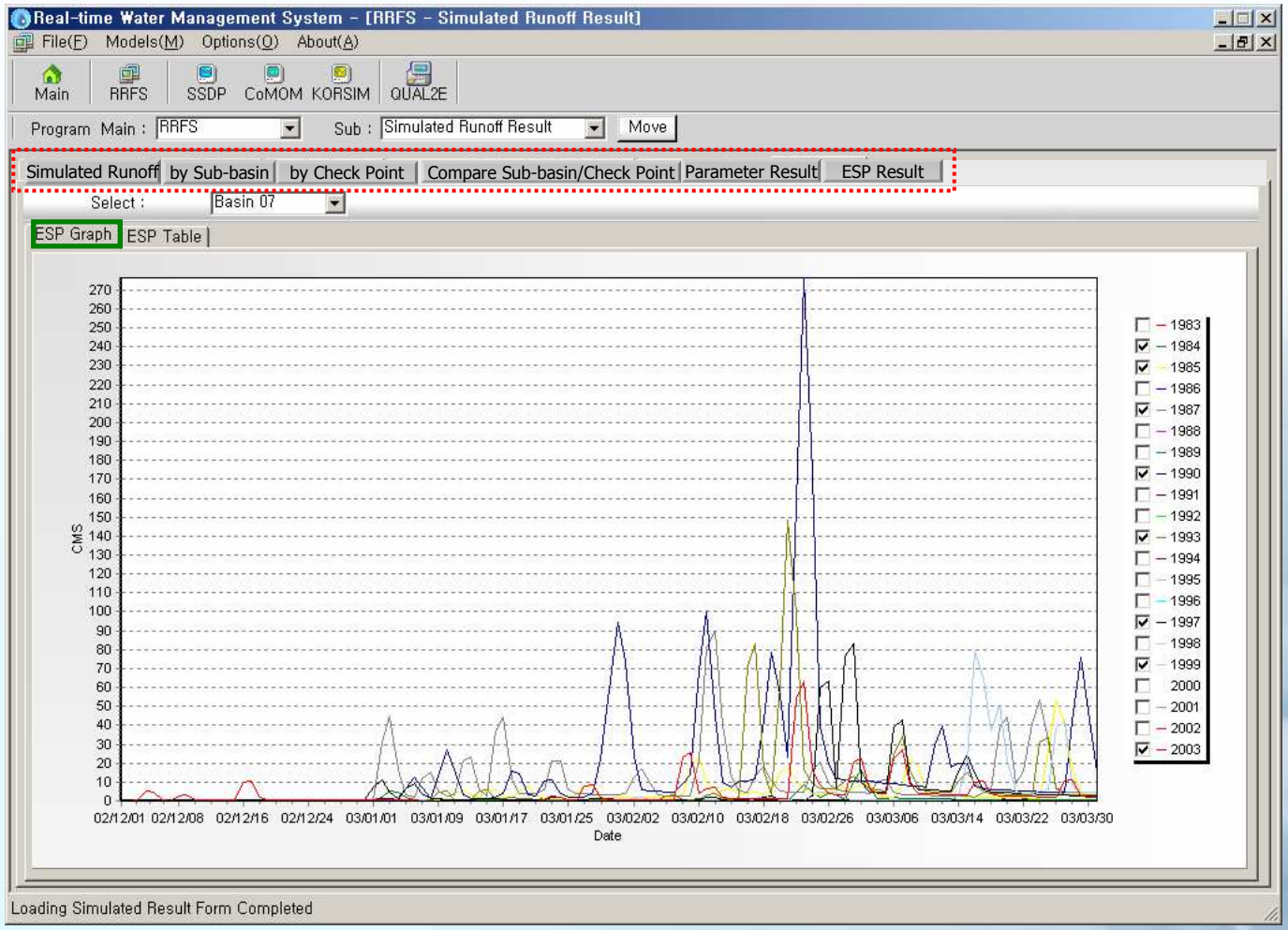
Results by check point and sub-basin



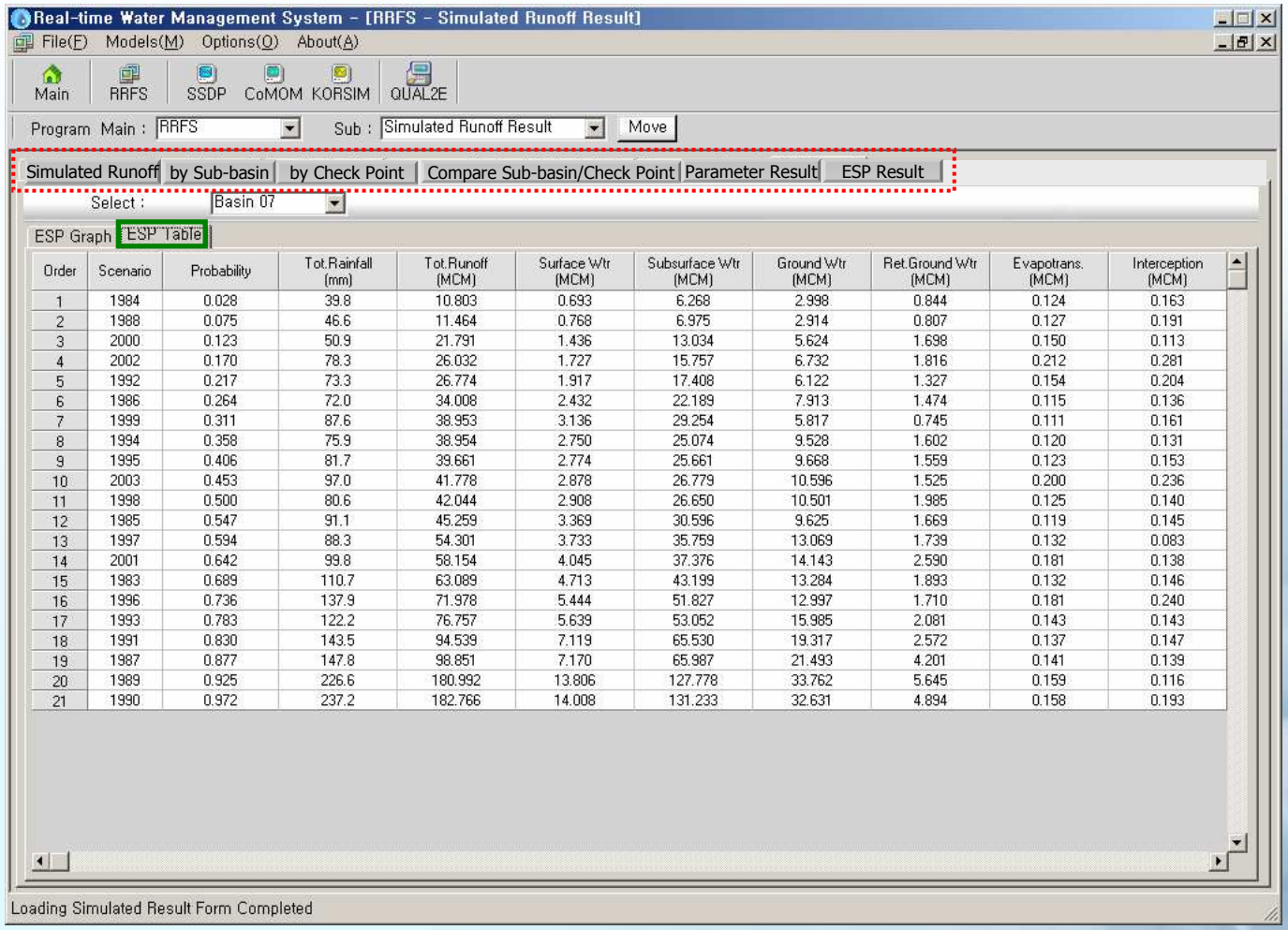
Variation of parameters



Simulated ESP results (Graph)



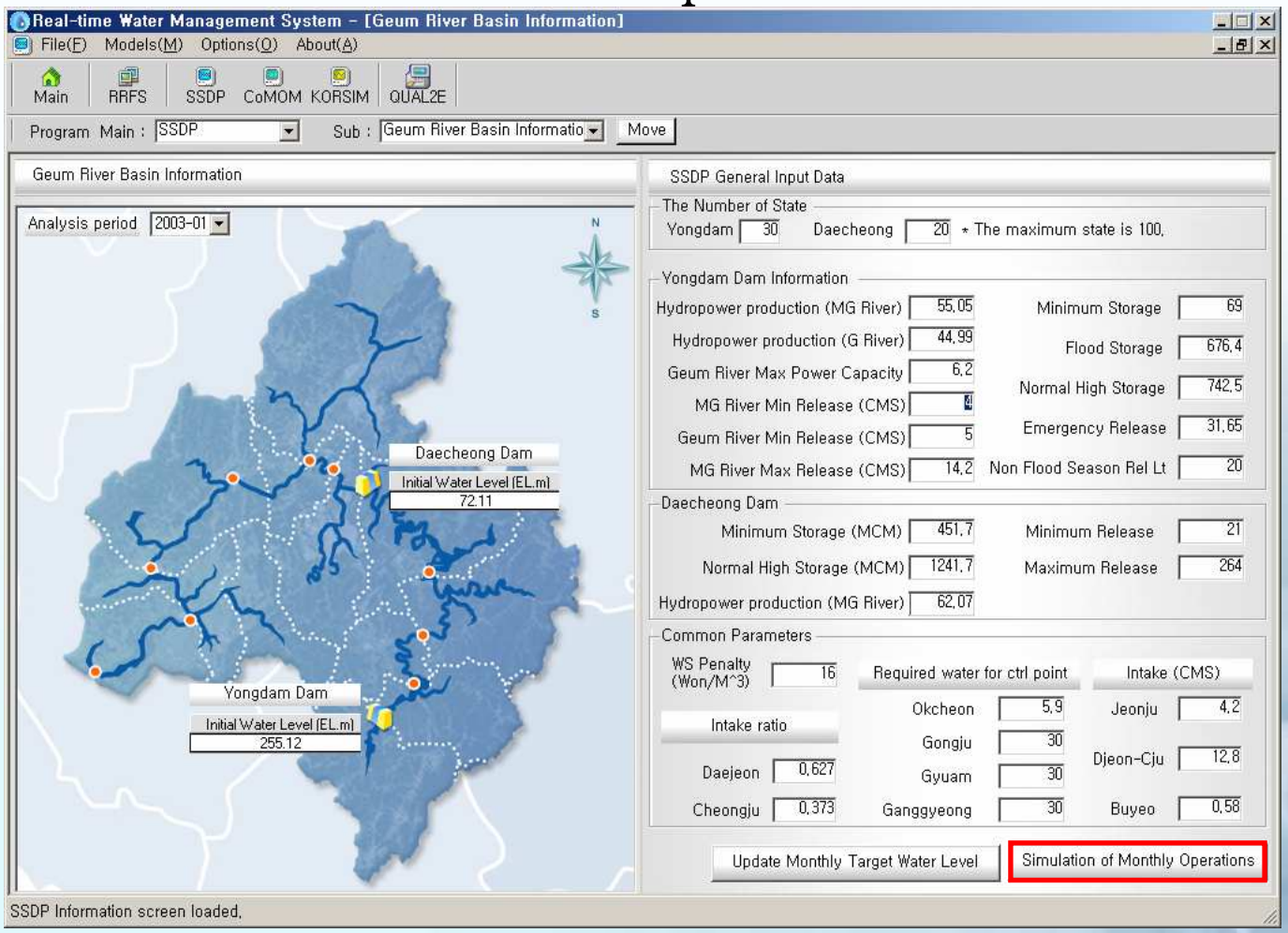
Simulated ESP results (table)



Order	Scenario	Probability	Tot.Rainfall (mm)	Tot.Runoff (MCM)	Surface Wtr (MCM)	Subsurface Wtr (MCM)	Ground Wtr (MCM)	Ret.Ground Wtr (MCM)	Evapotrans. (MCM)	Interception (MCM)
1	1984	0.028	39.8	10.803	0.693	6.268	2.998	0.844	0.124	0.163
2	1988	0.075	46.6	11.464	0.768	6.975	2.914	0.807	0.127	0.191
3	2000	0.123	50.9	21.791	1.436	13.034	5.624	1.698	0.150	0.113
4	2002	0.170	78.3	26.032	1.727	15.757	6.732	1.816	0.212	0.281
5	1992	0.217	73.3	26.774	1.917	17.408	6.122	1.327	0.154	0.204
6	1986	0.264	72.0	34.008	2.432	22.189	7.913	1.474	0.115	0.136
7	1999	0.311	87.6	38.953	3.136	29.254	5.817	0.745	0.111	0.161
8	1994	0.358	75.9	38.954	2.750	25.074	9.528	1.602	0.120	0.131
9	1995	0.406	81.7	39.661	2.774	25.661	9.668	1.559	0.123	0.153
10	2003	0.453	97.0	41.778	2.878	26.779	10.596	1.525	0.200	0.236
11	1998	0.500	80.6	42.044	2.908	26.650	10.501	1.985	0.125	0.140
12	1985	0.547	91.1	45.259	3.369	30.596	9.625	1.669	0.119	0.145
13	1997	0.594	88.3	54.301	3.733	35.759	13.069	1.739	0.132	0.083
14	2001	0.642	99.8	58.154	4.045	37.376	14.143	2.590	0.181	0.138
15	1983	0.689	110.7	63.089	4.713	43.199	13.284	1.893	0.132	0.146
16	1996	0.736	137.9	71.978	5.444	51.827	12.997	1.710	0.181	0.240
17	1993	0.783	122.2	76.757	5.639	53.052	15.985	2.081	0.143	0.143
18	1991	0.830	143.5	94.539	7.119	65.530	19.317	2.572	0.137	0.147
19	1987	0.877	147.8	98.851	7.170	65.987	21.493	4.201	0.141	0.139
20	1989	0.925	226.6	180.992	13.806	127.778	33.762	5.645	0.159	0.116
21	1990	0.972	237.2	182.766	14.008	131.233	32.631	4.894	0.158	0.193

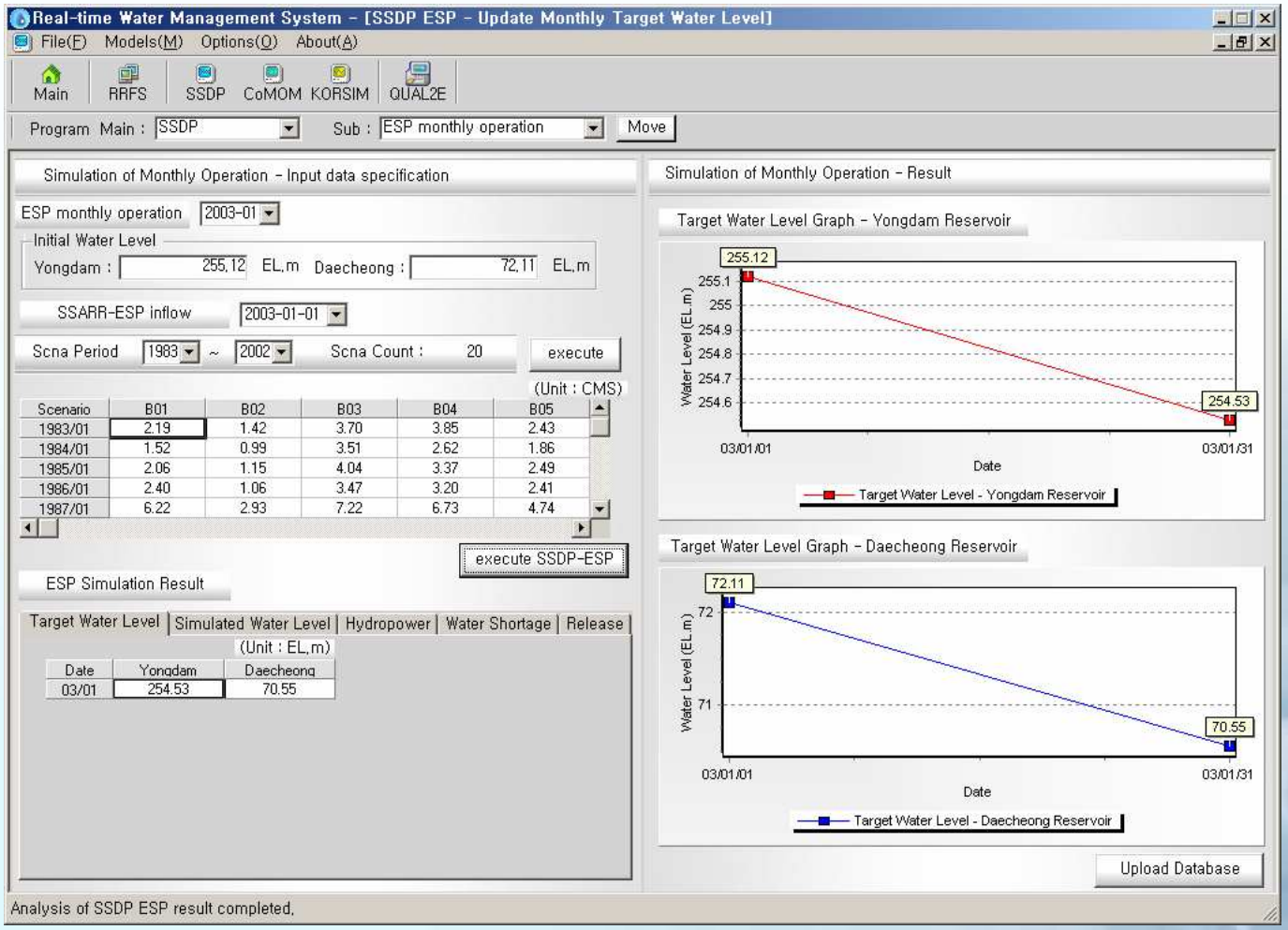
- Sampling Stochastic Dynamic Programming (SSDP)
  - Establishing monthly optimal multi-reservoir operating policy considering the uncertainties of inflows
  - Deriving joint operating policy for multi-reservoir system in Korea during the 9-months of reservoir drawdown period using stochastic optimization model

Basin Information & Input data

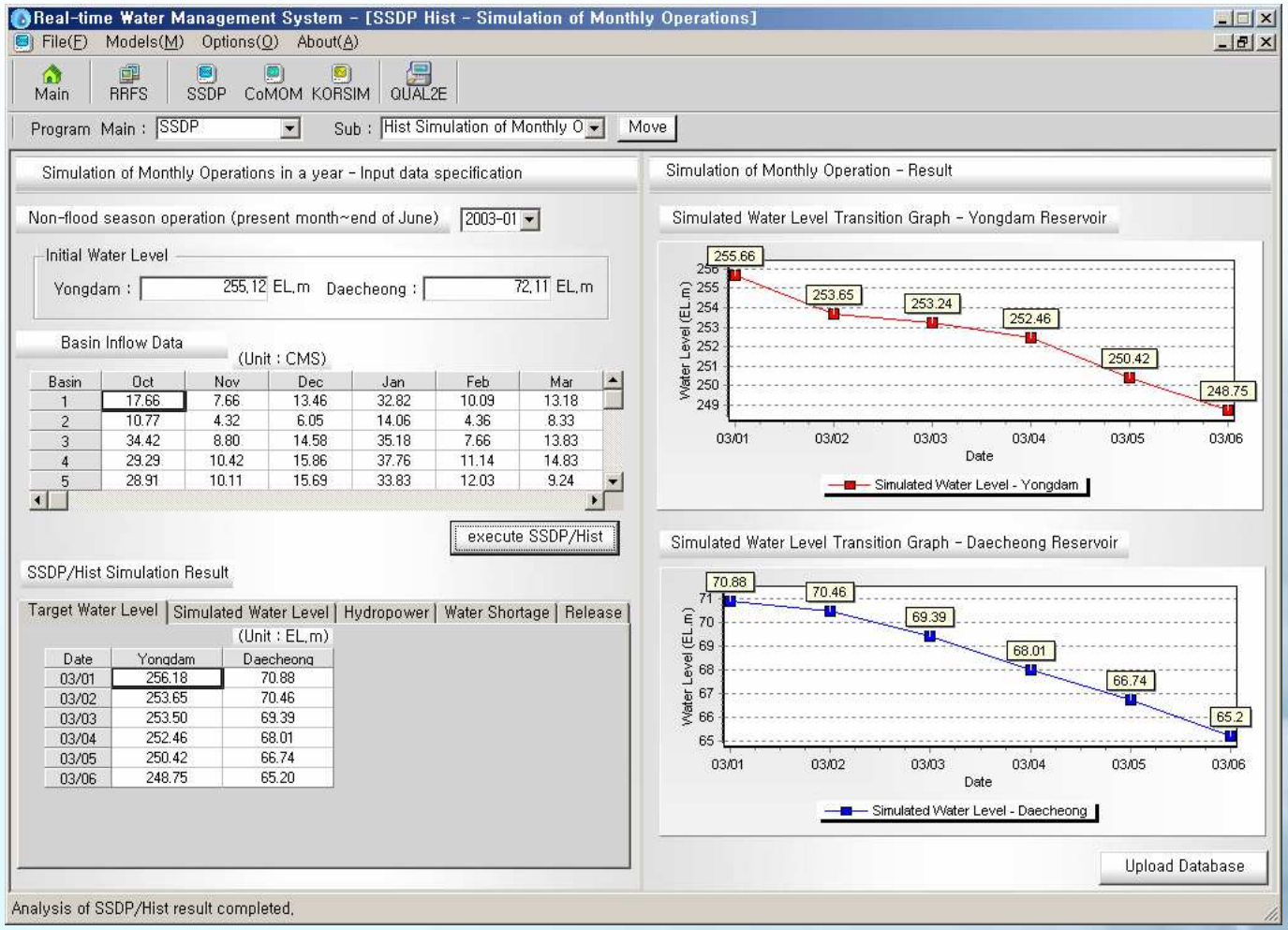


Running & Results

- SSDP ESP operation



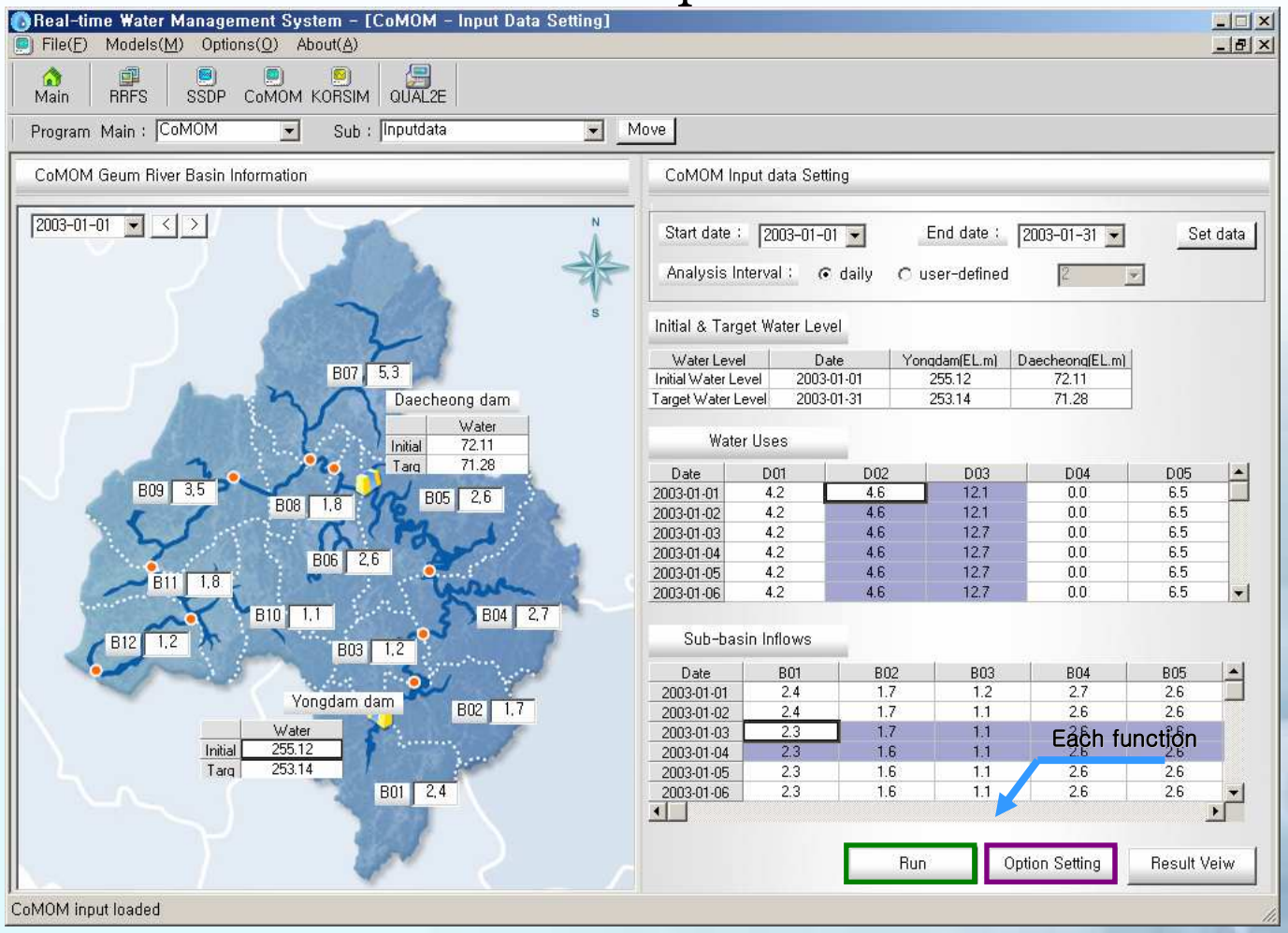
Simulation of SSDP HIST



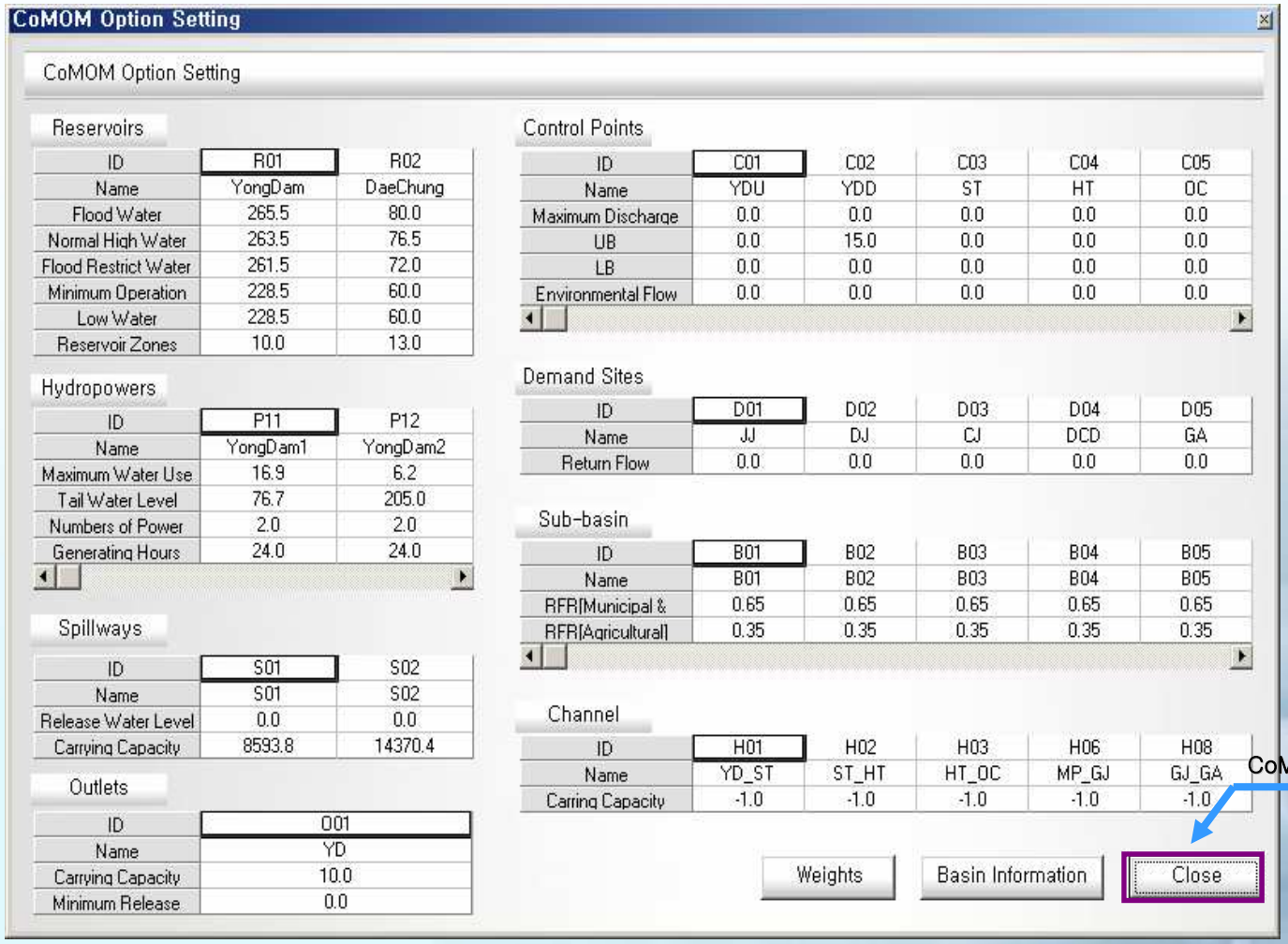
CoMOM 4.0

- Establishing a coordinated multi-reservoir daily operation that finds an efficient operating policy to meet the monthly storage target
- Supplying water efficiently to minimize unnecessary spill, maitains flood reserve volume and keep water storage high so that it can maximize the head and the efficiency of hydro turbine operation

Basin information & Input data

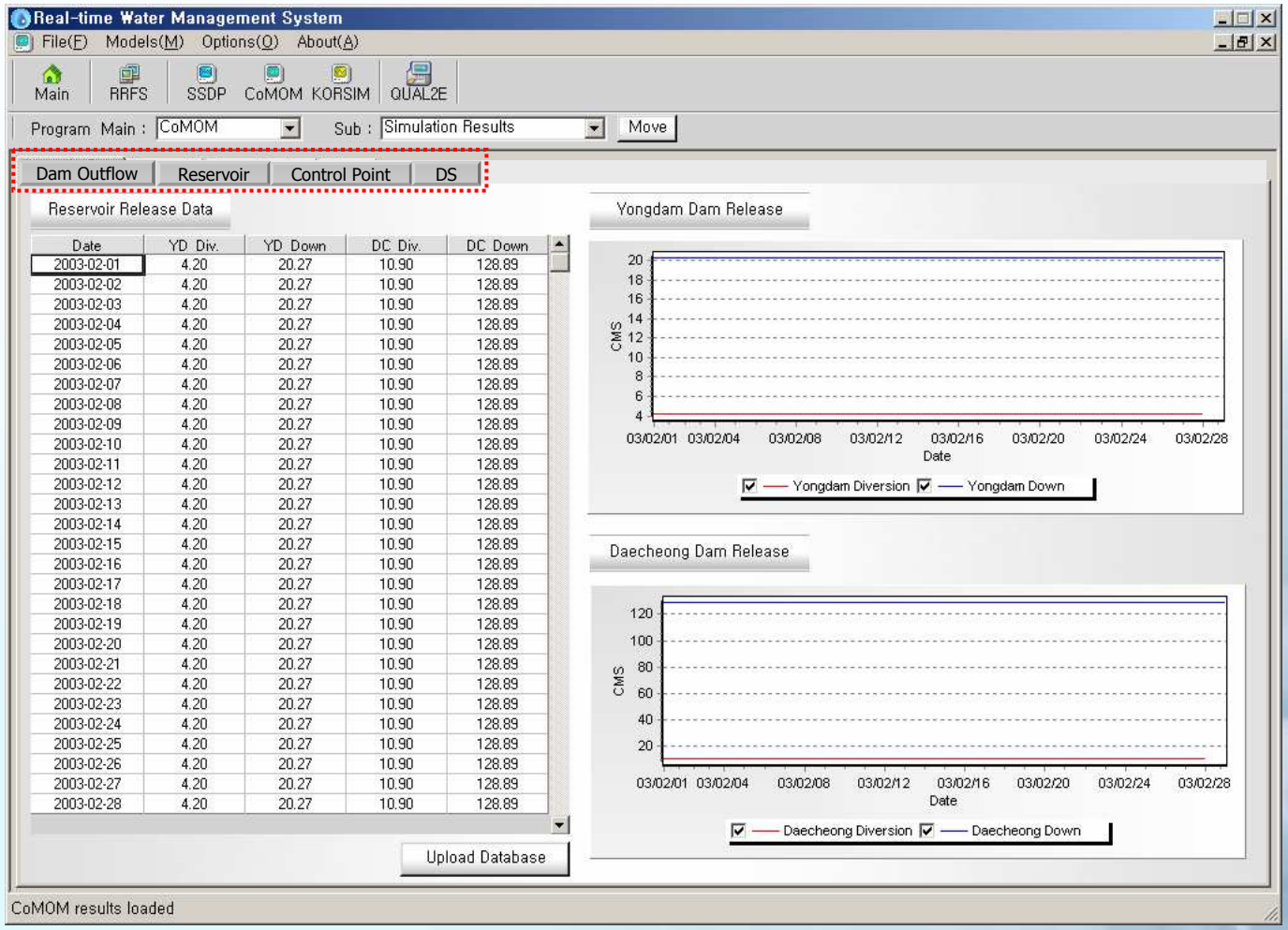


Options & Parameter setting

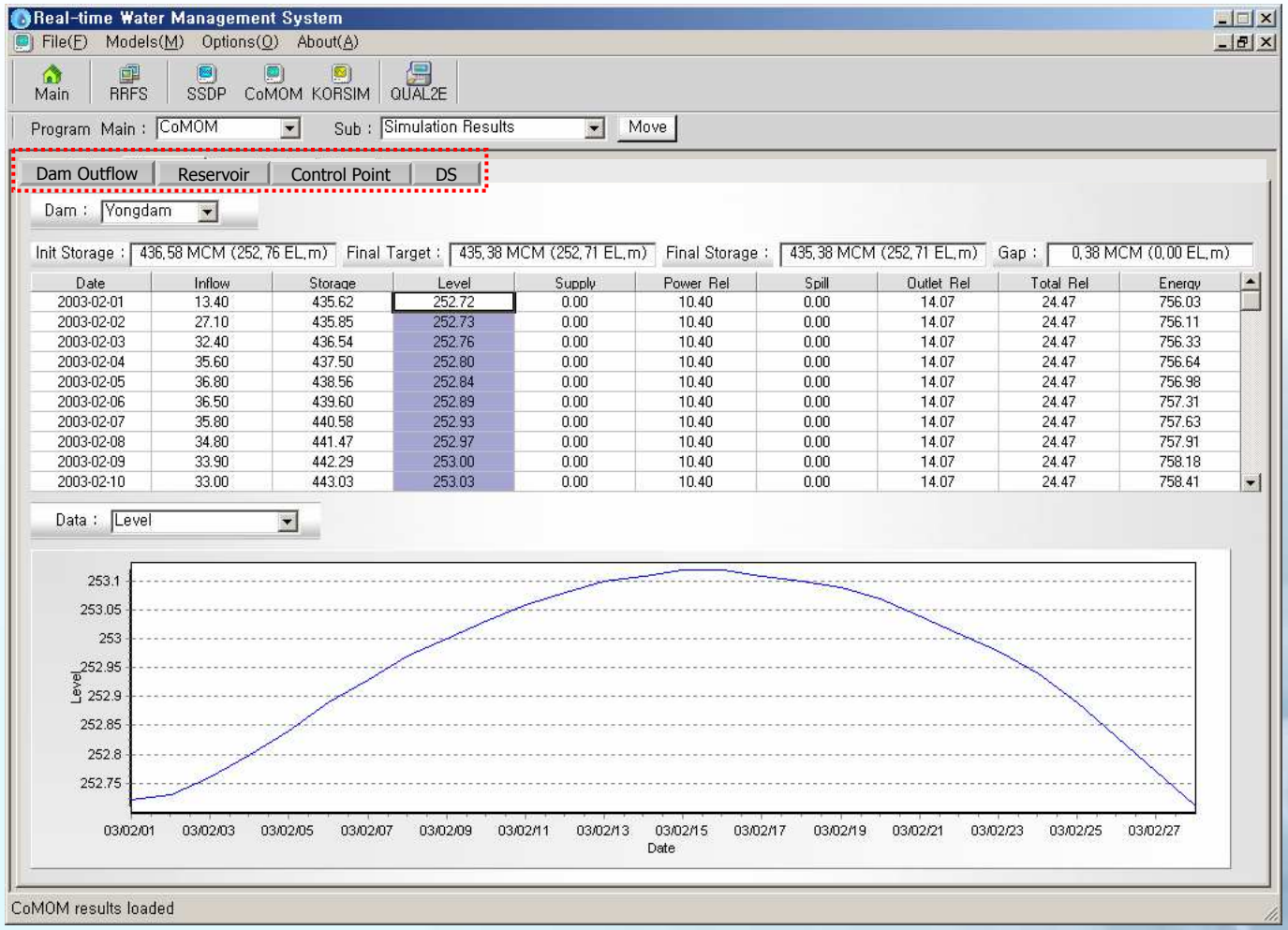


Running & Results

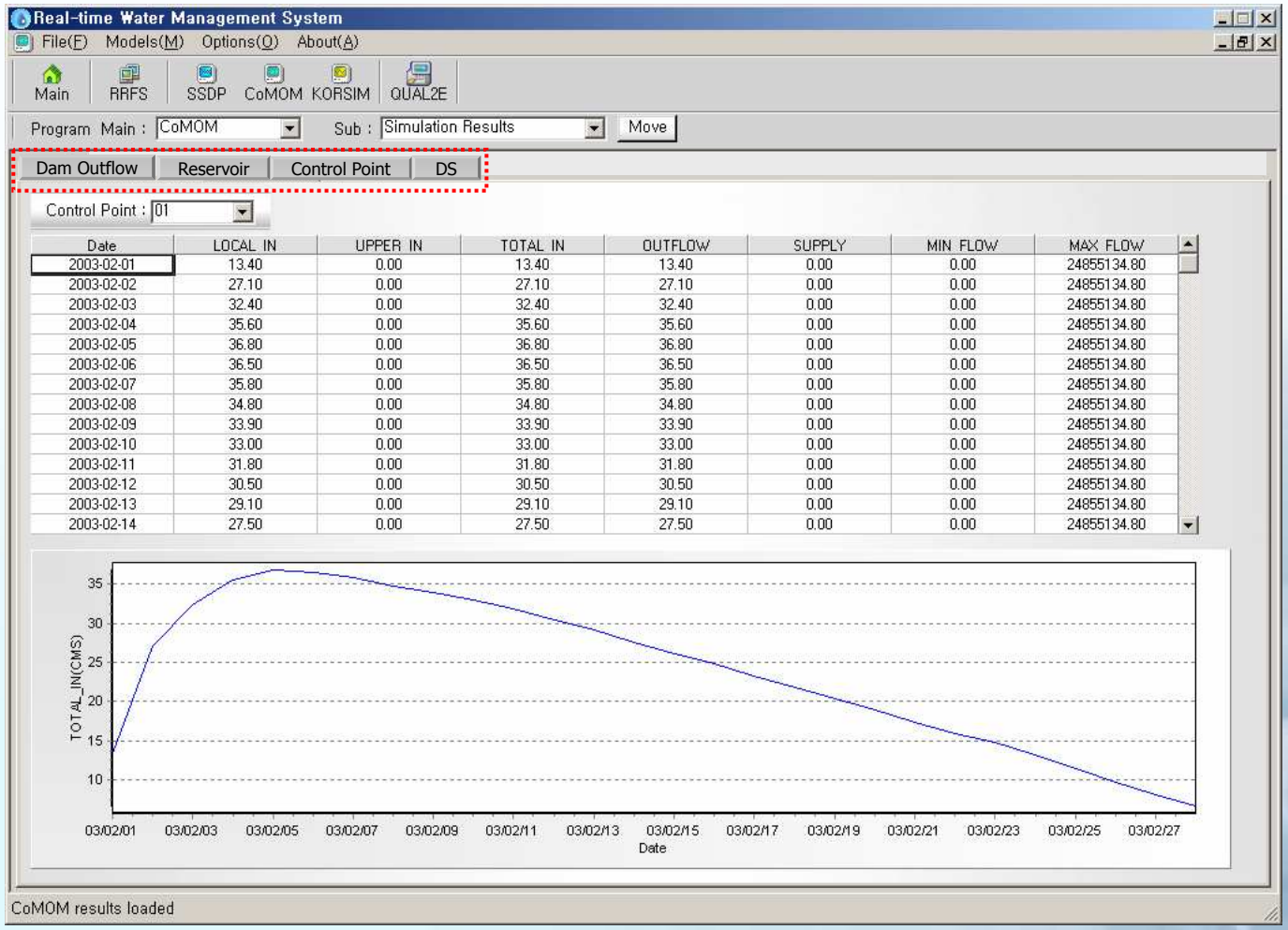
- Reservoir outflow control



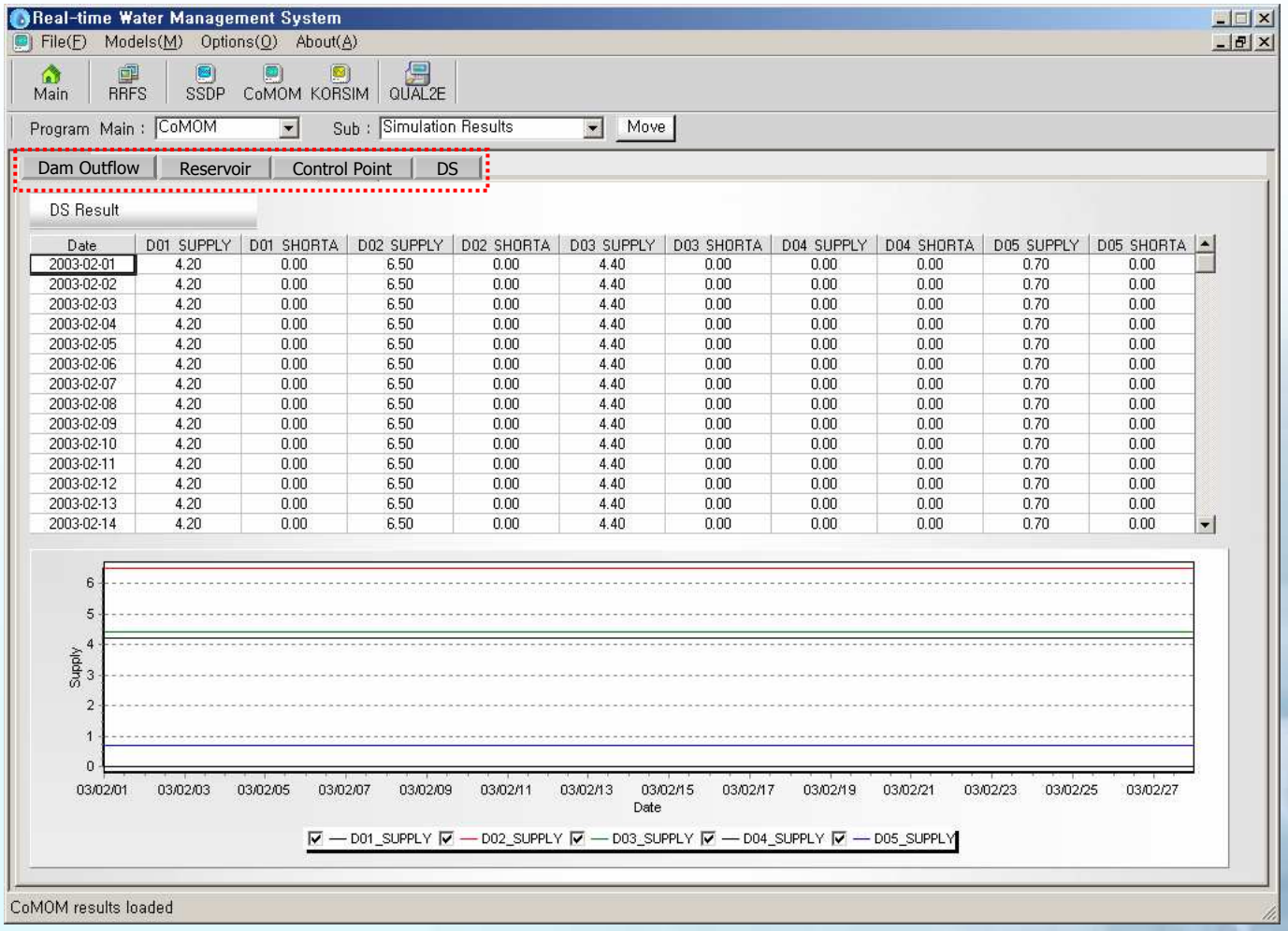
Reservoir condition



Control point condition

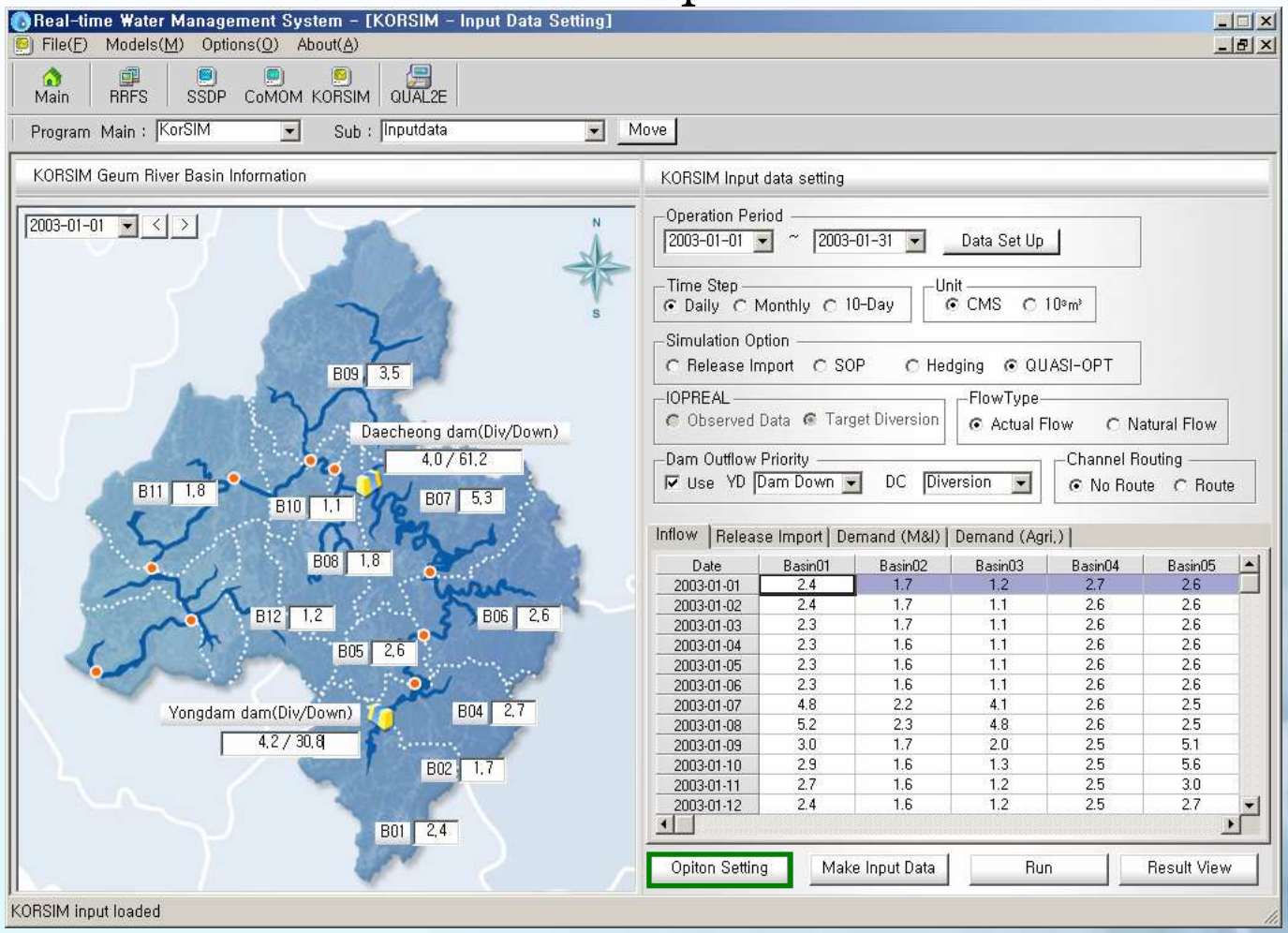


Demand site condition



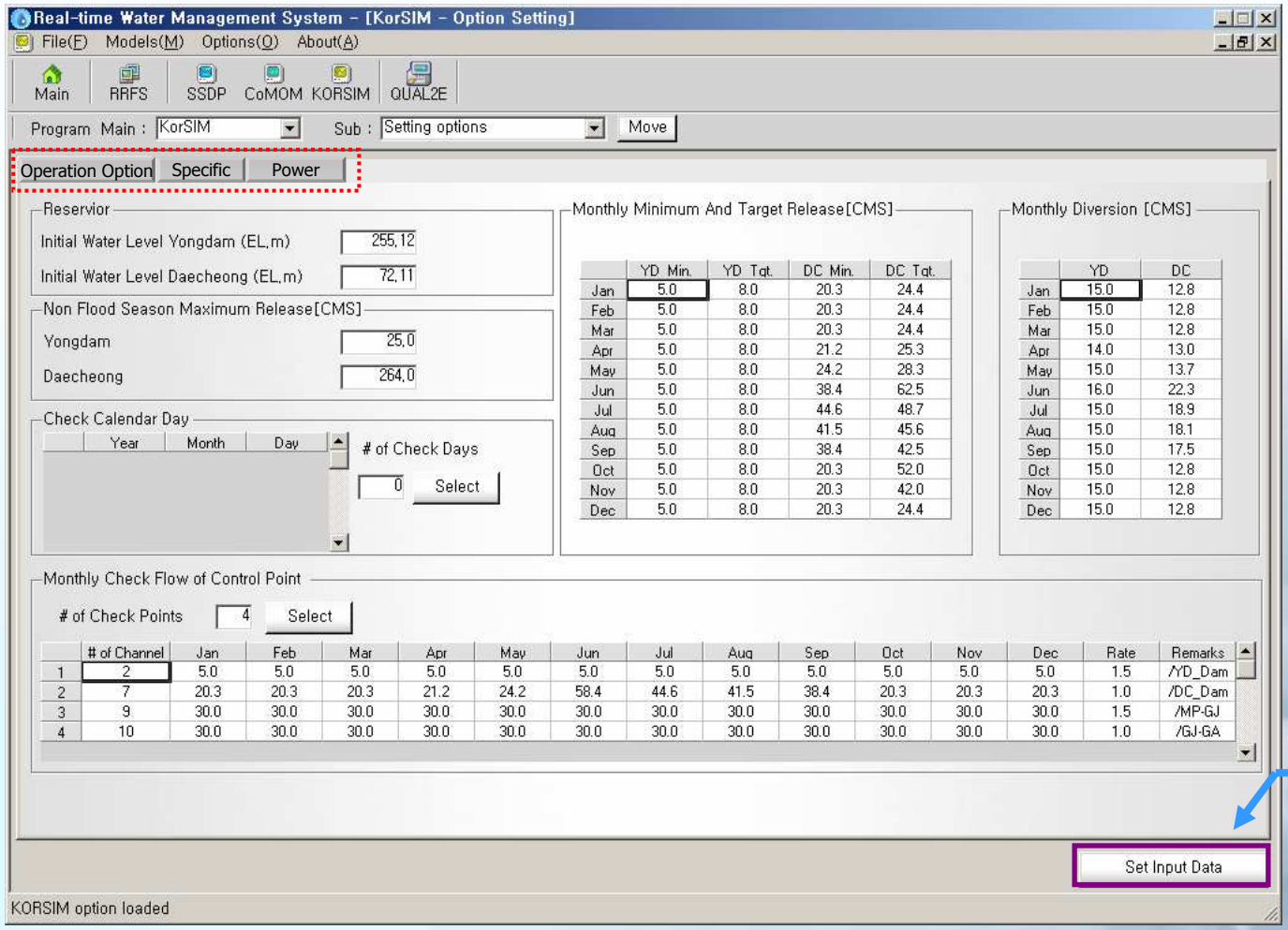
- KOWACO RESERVOIR SYSTEM SIMULATION MODEL (KORSIM)
  - Reservoir system simulation model to incorporate reservoir operation rules and various constraints related to water management
  - Improvement of operating environment by automation and formulation

Basin Information & Input data

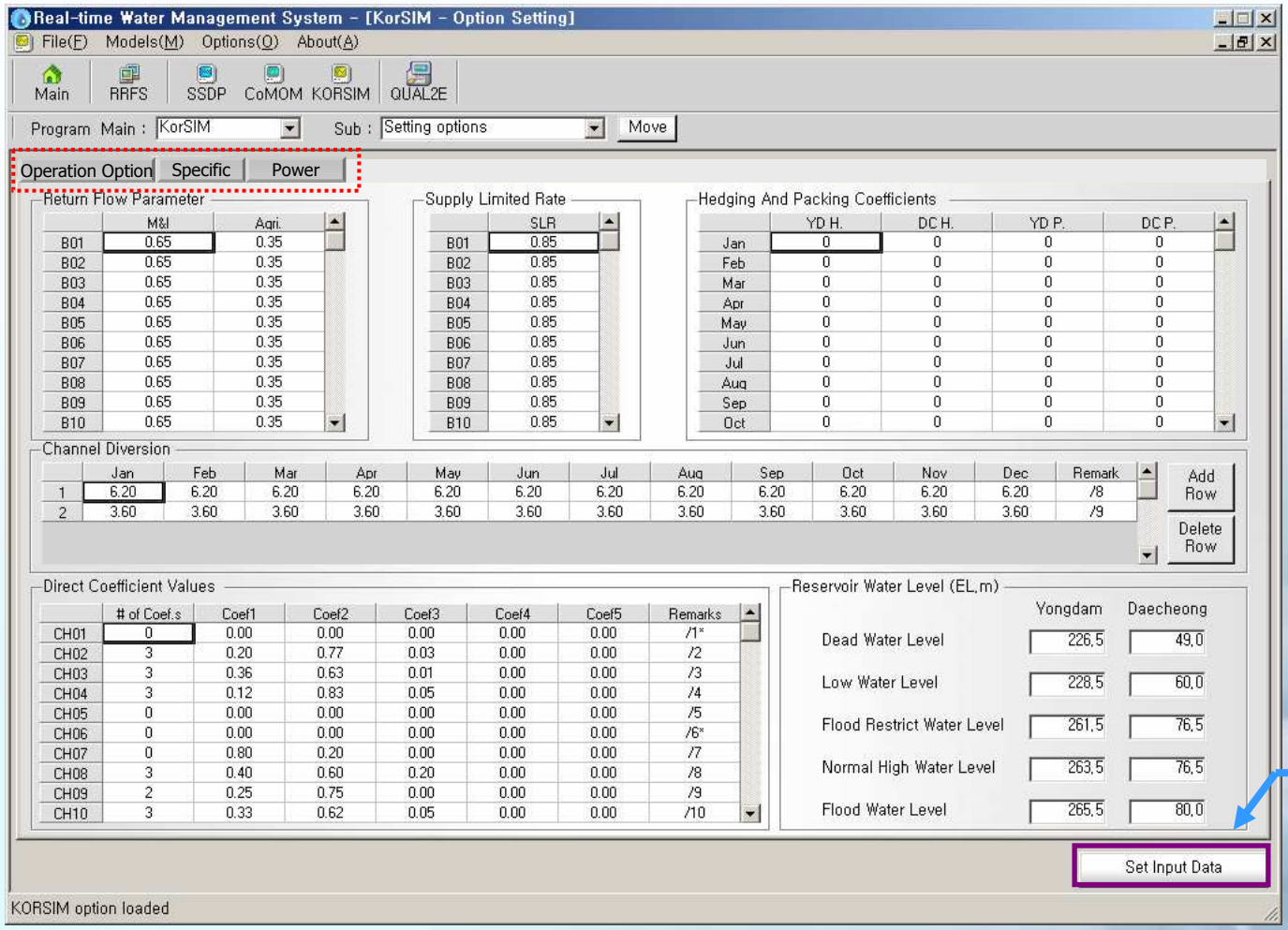


Operation control

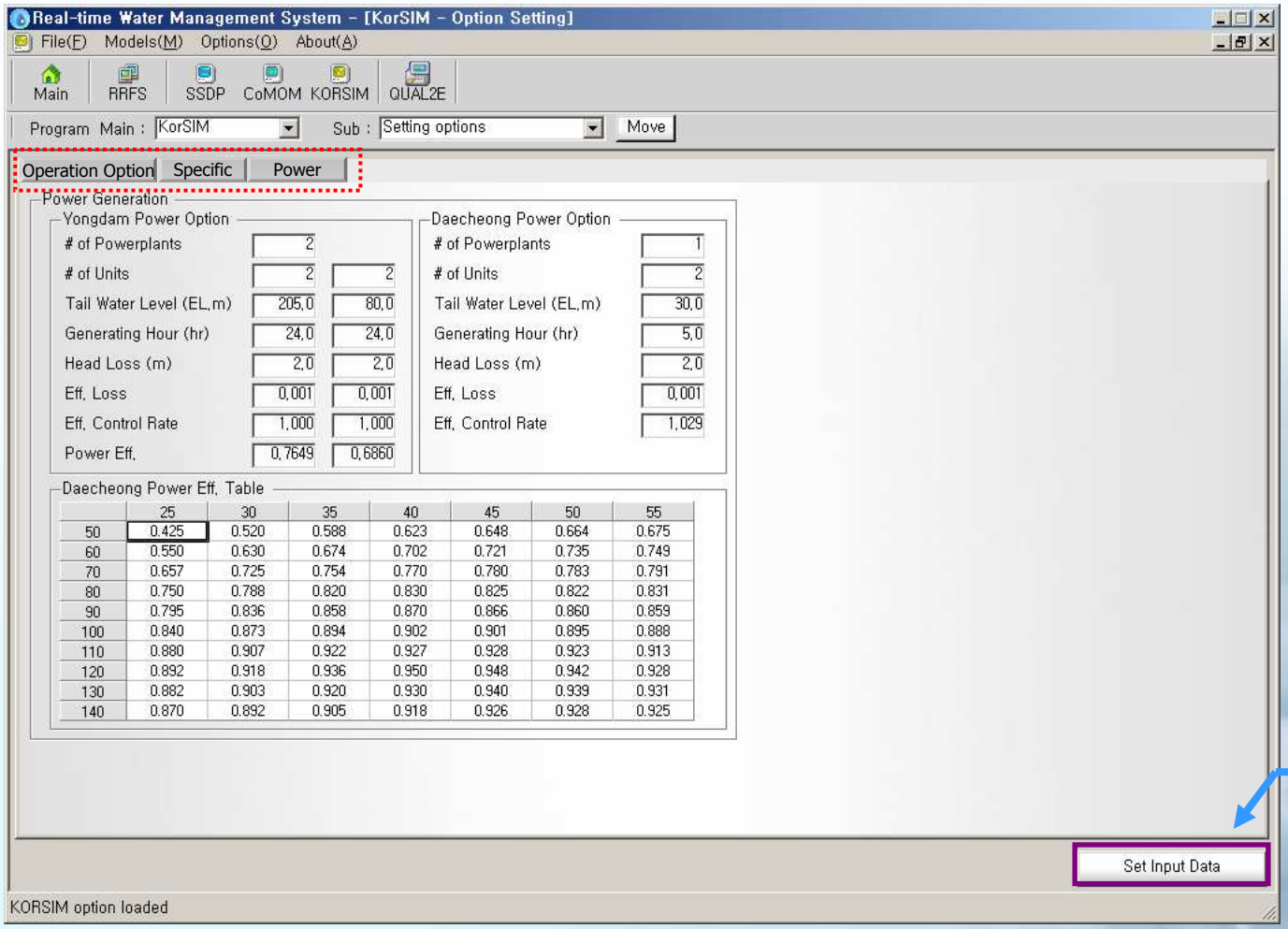
- Option setting



Parameter & Specific coefficients setting



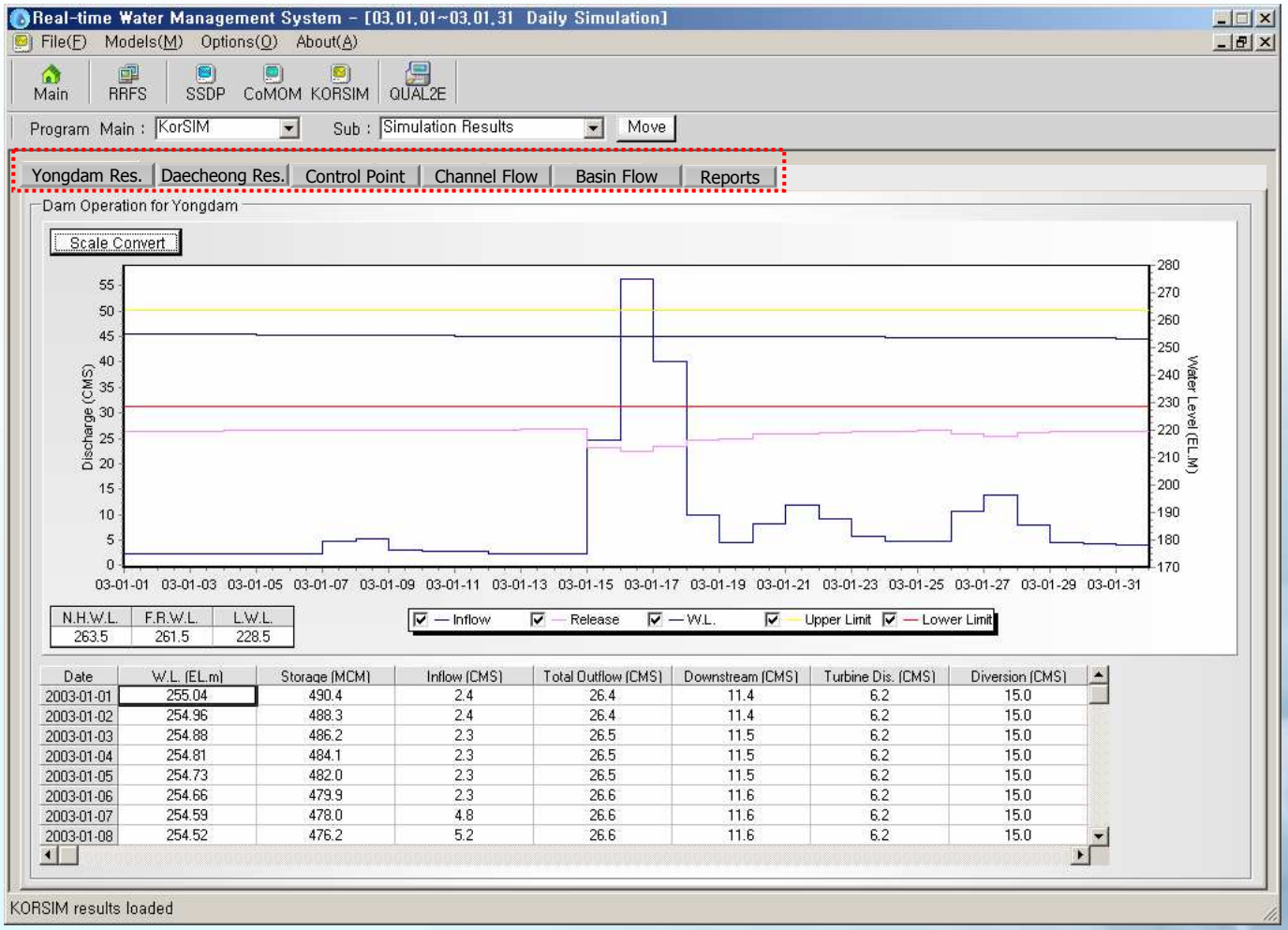
Power generation setting



KorSIM main

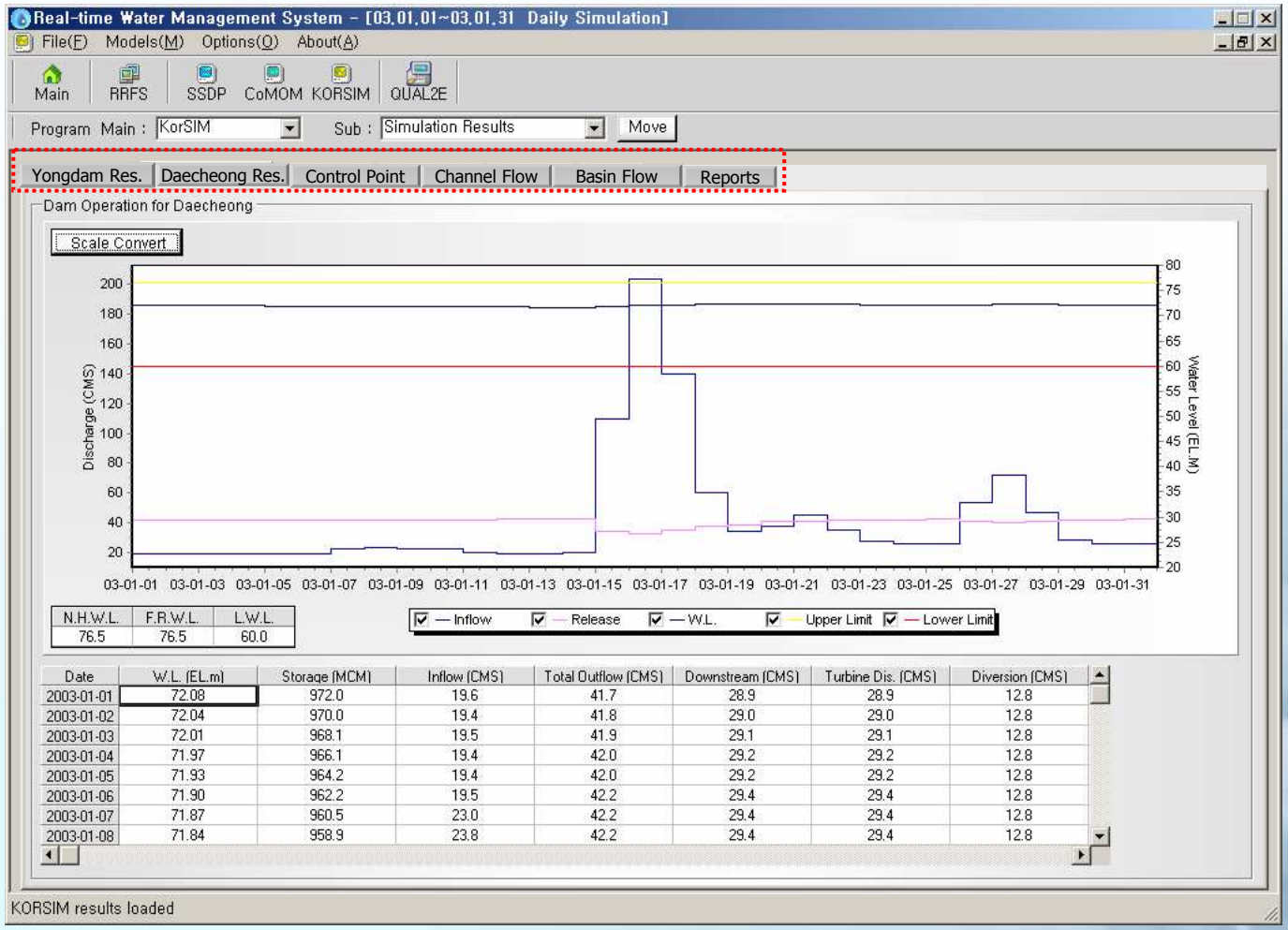
Running & Results

- Results simulated for Yongdam reservoir

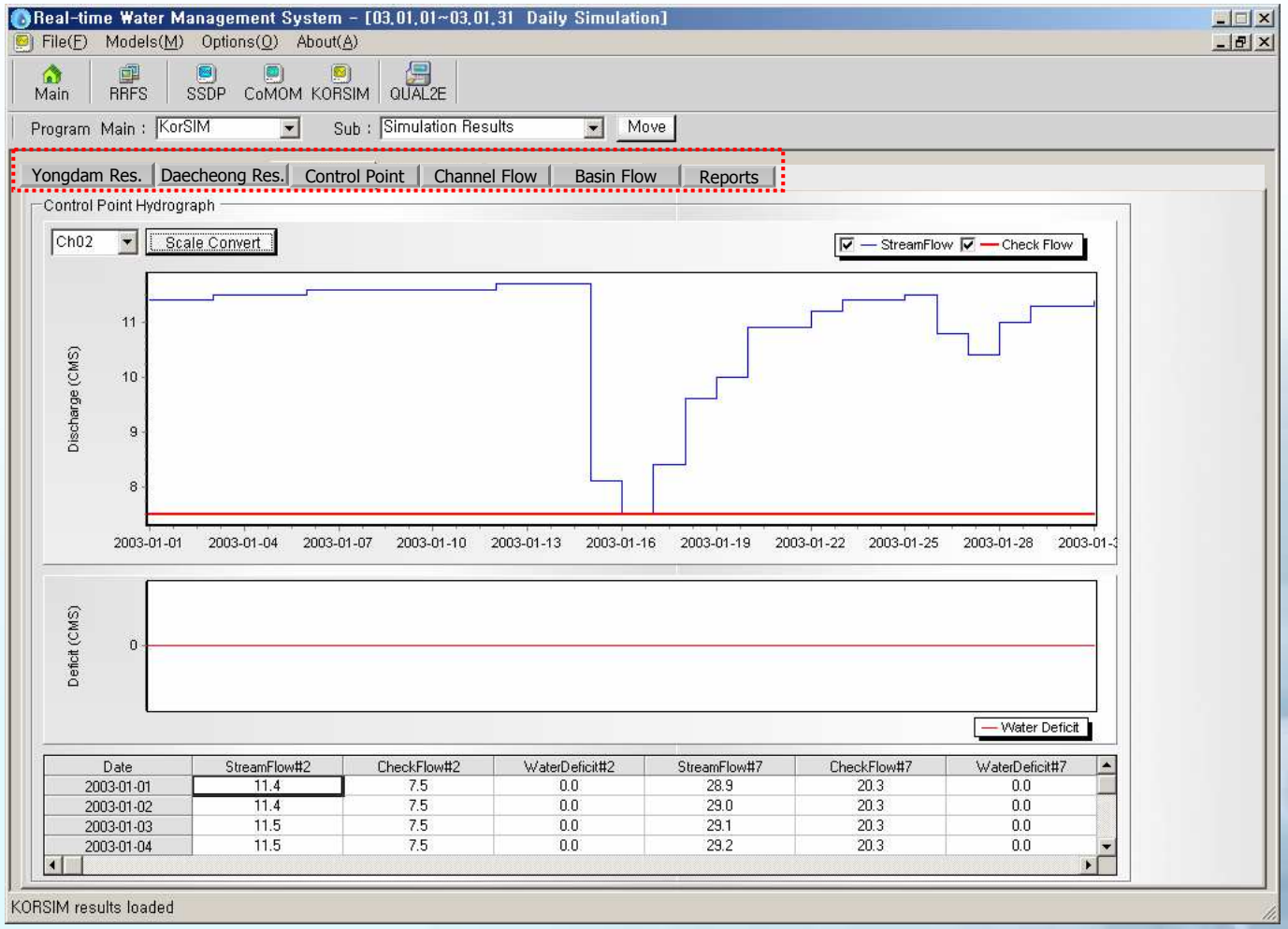


Date	W.L. (EL.m)	Storage (MCM)	Inflow (CMS)	Total Outflow (CMS)	Downstream (CMS)	Turbine Dis. (CMS)	Diversion (CMS)
2003-01-01	255.04	490.4	2.4	26.4	11.4	6.2	15.0
2003-01-02	254.96	488.3	2.4	26.4	11.4	6.2	15.0
2003-01-03	254.88	486.2	2.3	26.5	11.5	6.2	15.0
2003-01-04	254.81	484.1	2.3	26.5	11.5	6.2	15.0
2003-01-05	254.73	482.0	2.3	26.5	11.5	6.2	15.0
2003-01-06	254.66	479.9	2.3	26.6	11.6	6.2	15.0
2003-01-07	254.59	478.0	4.8	26.6	11.6	6.2	15.0
2003-01-08	254.52	476.2	5.2	26.6	11.6	6.2	15.0

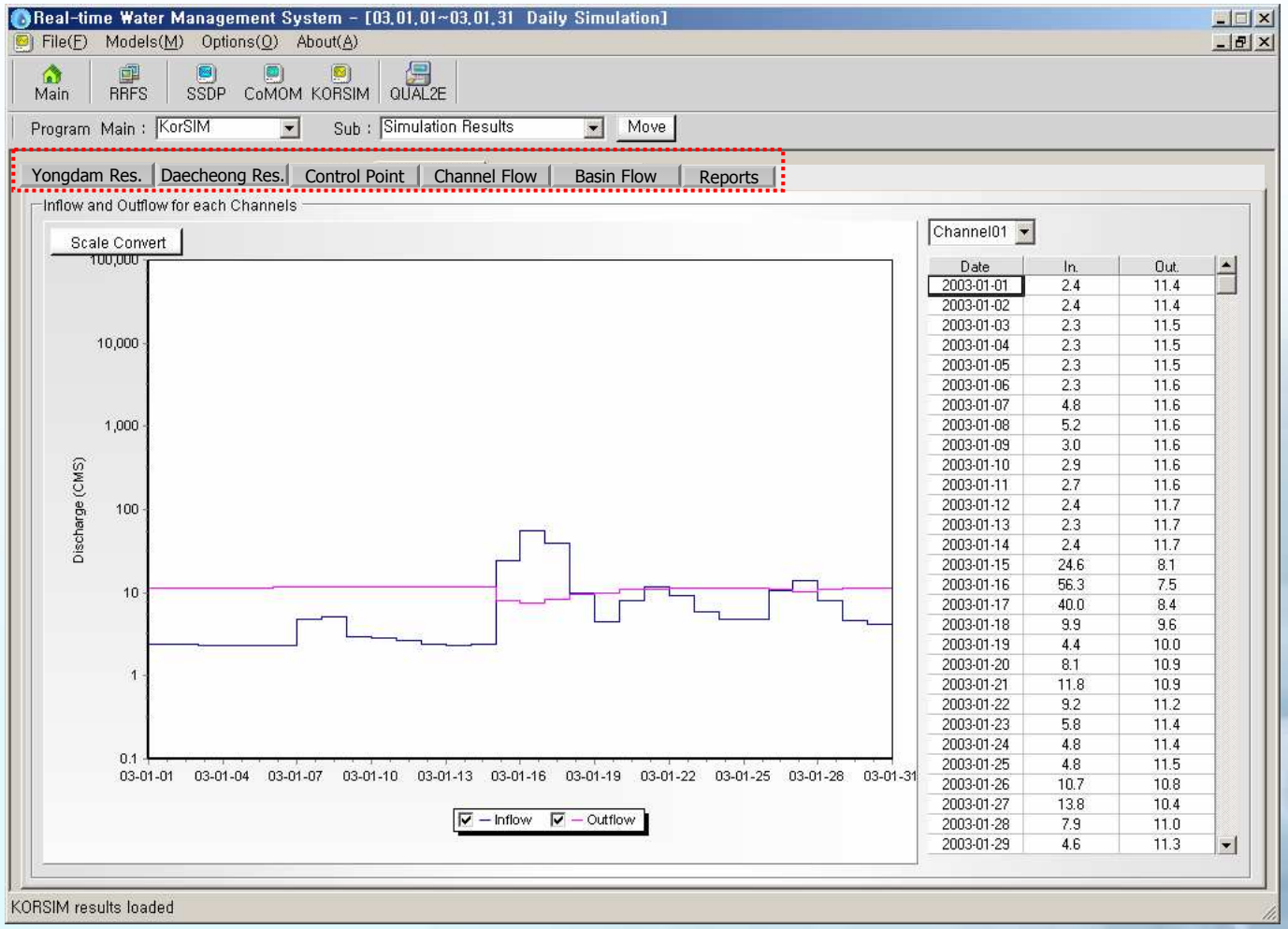
Results simulated for Daecheong reservoir



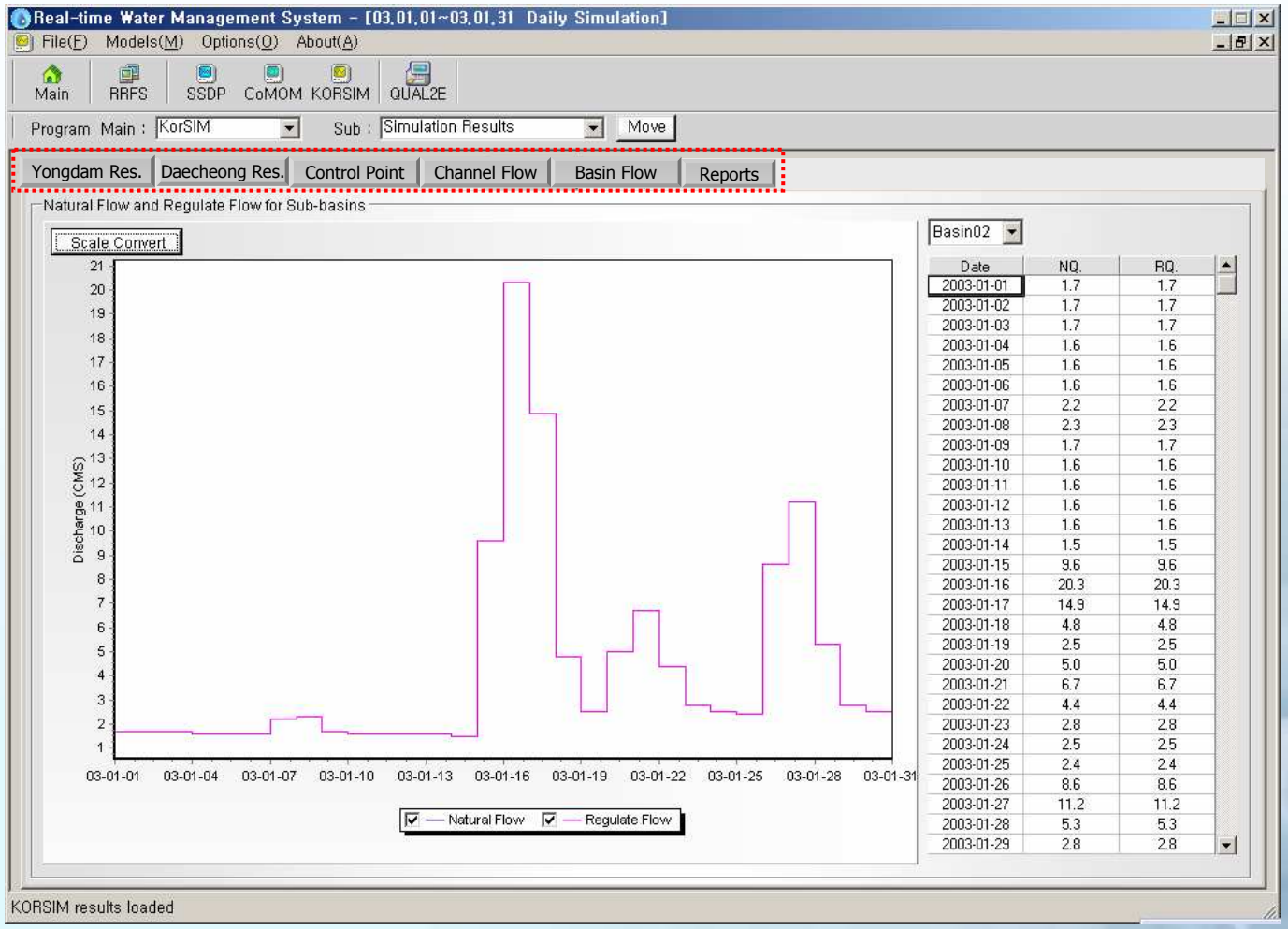
Result simulated at control point



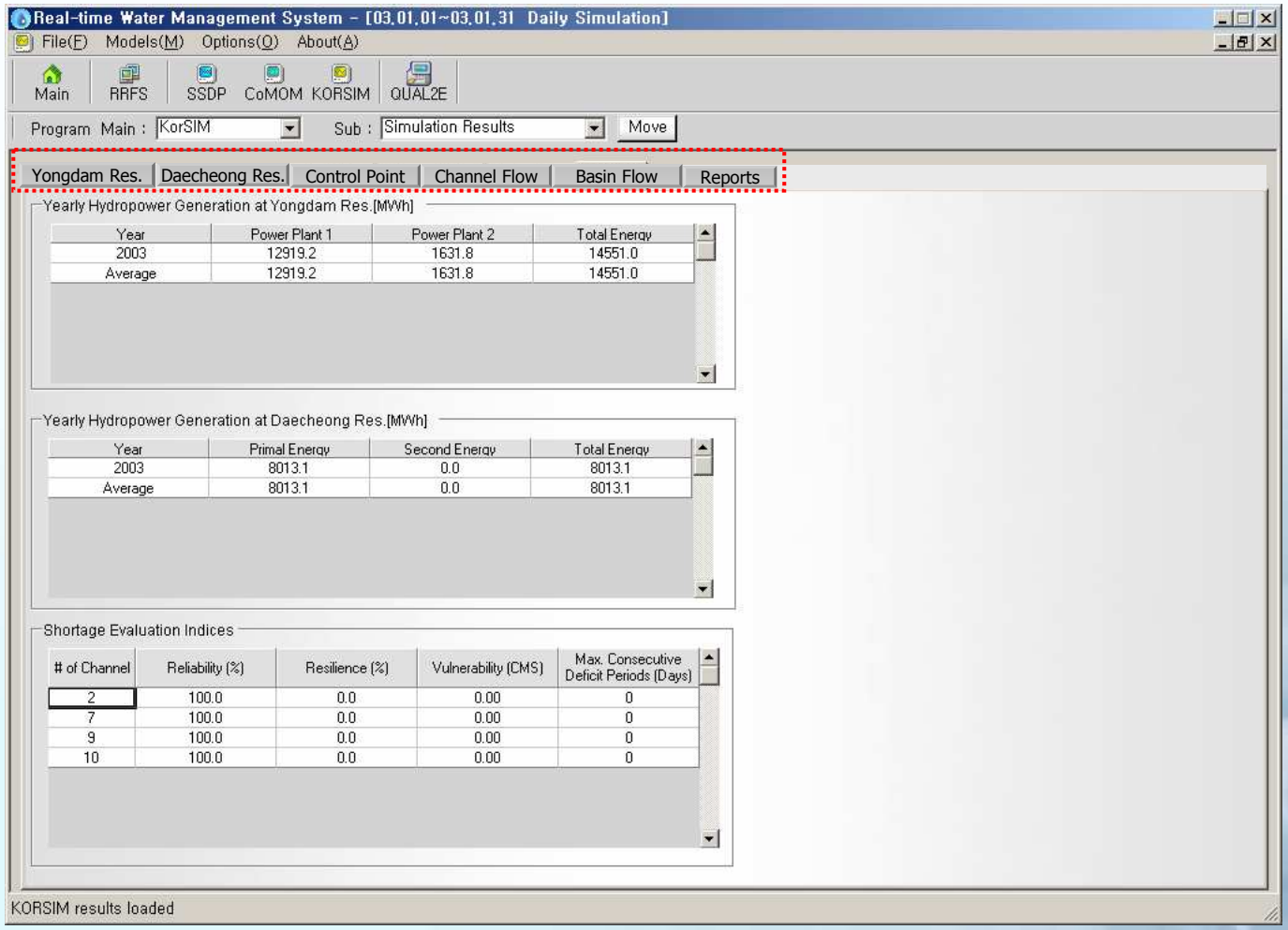
Results simulated for channel flow



Results simulated for basin flow



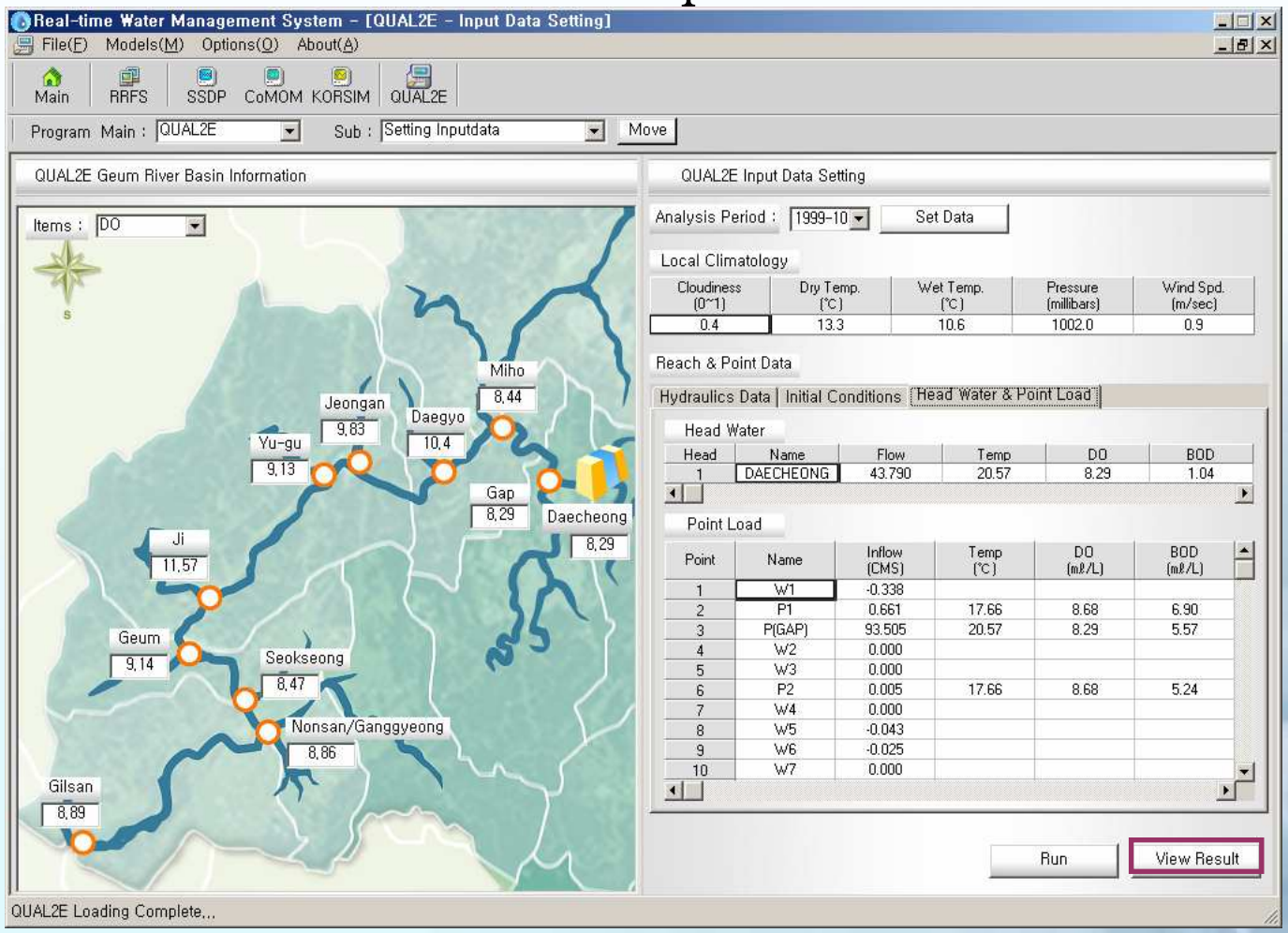
Reports


Real-time Water Management System – [03.01.01~03.01.31 Daily Simulation]
File(F) Models(M) Options(O) About(A)
Main
RRFS
SSDP
CoMOM
KORSIM
QUAL2E
Program Main : KorSIM
Sub : Simulation Results
Move
Yongdam Res.
Daecheong Res.
Control Point
Channel Flow
Basin Flow
Reports
Yearly Hydropower Generation at Yongdam Res.[MWh]
Year | Power Plant 1 | Power Plant 2 | Total Energy
2003 | 12919.2 | 1631.8 | 14551.0
Average | 12919.2 | 1631.8 | 14551.0
Yearly Hydropower Generation at Daecheong Res.[MWh]
Year | Primal Energy | Second Energy | Total Energy
2003 | 8013.1 | 0.0 | 8013.1
Average | 8013.1 | 0.0 | 8013.1
Shortage Evaluation Indices
# of Channel | Reliability (%) | Resilience (%) | Vulnerability (CMS) | Max. Consecutive Deficit Periods (Days)
2 | 100.0 | 0.0 | 0.00 | 0
7 | 100.0 | 0.0 | 0.00 | 0
9 | 100.0 | 0.0 | 0.00 | 0
10 | 100.0 | 0.0 | 0.00 | 0
KORSIM results loaded

QUAL2E-PLUS

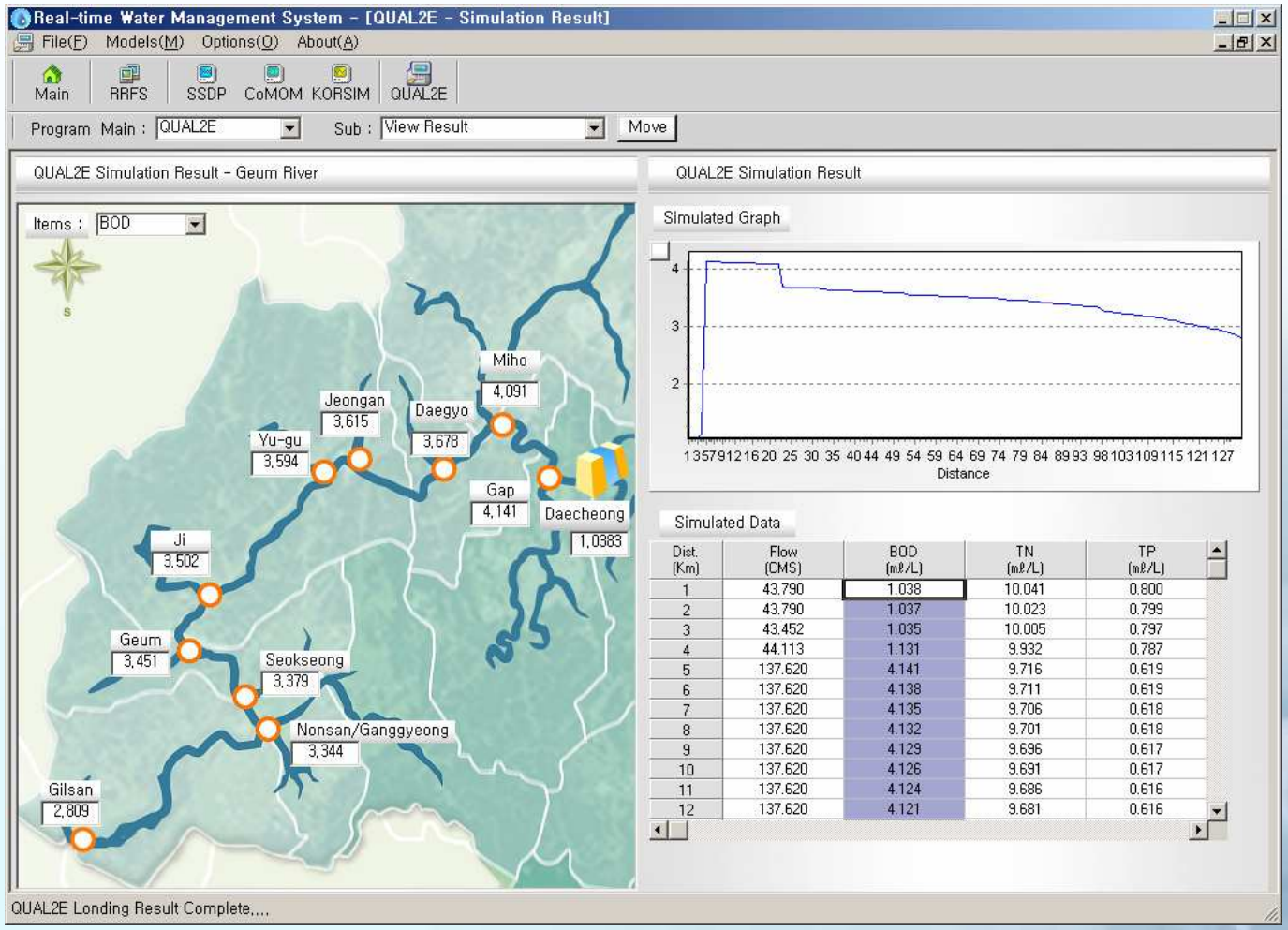
- Project long term monthly water quality in reservoir downstream to estimate discharge release
- Compute BOD, DO, TN, and TP variations from reservoir downstream to estuary

Basin Information & Input data



Running & Result

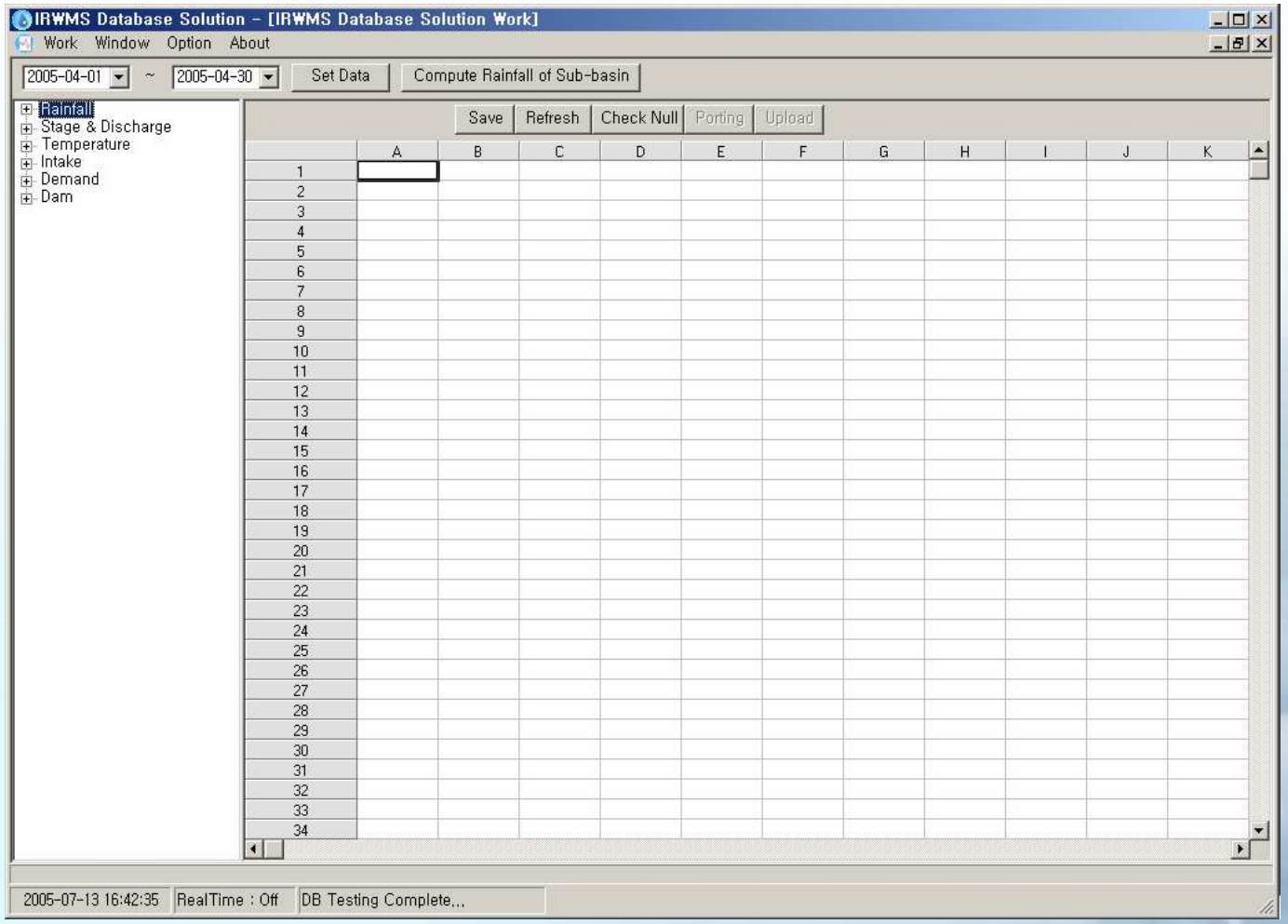
- Simulated results



IRWMS DB Solution

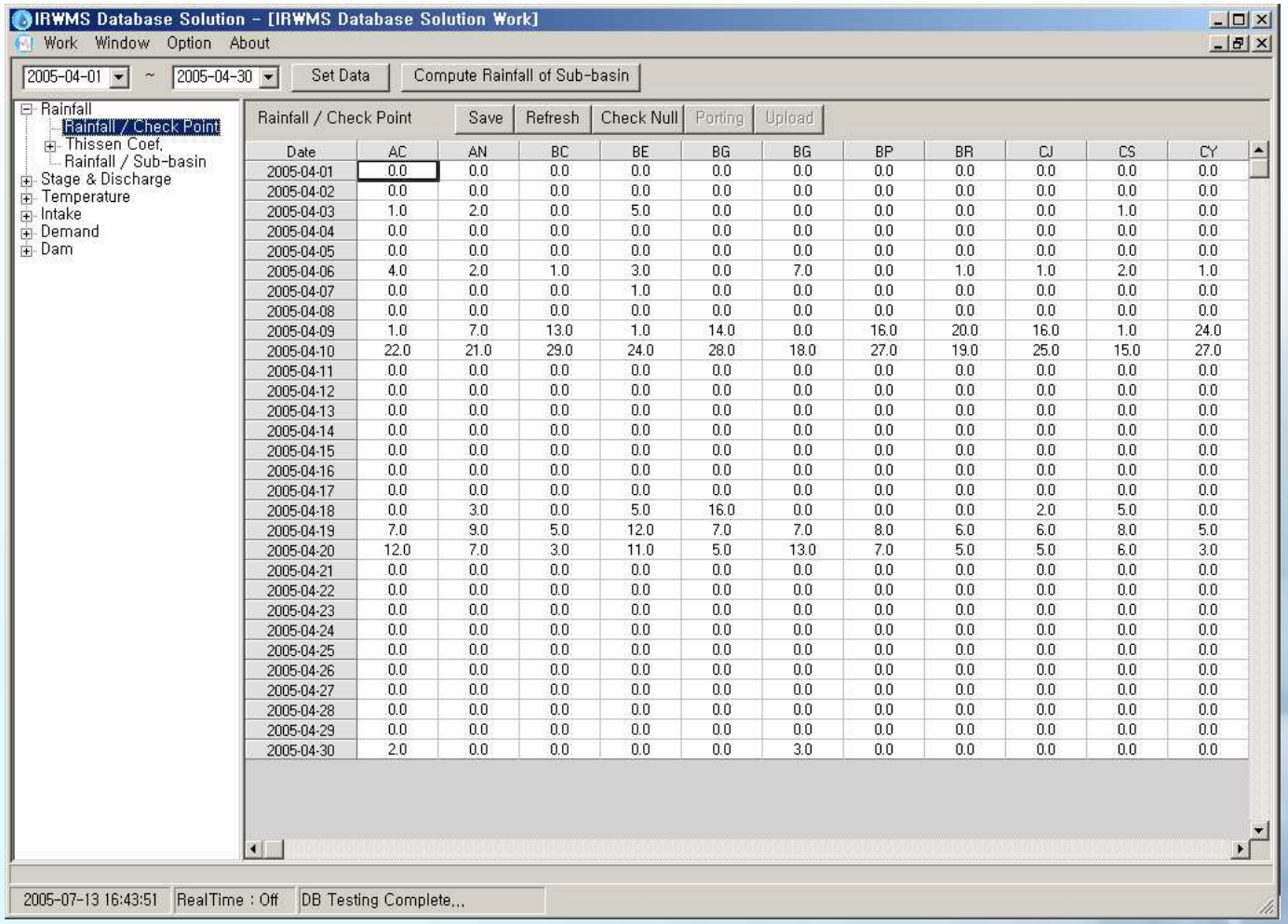
- Data management program which executes transformation and validation of data
- Practical application where the decision making and acquisition of reliable data
- Automated system that supports a data management from inquiry, search, correction, computation, and verification for a raw data, and provides users with GUI environment which is helpful to handle a data set stored in DBMS

Main window

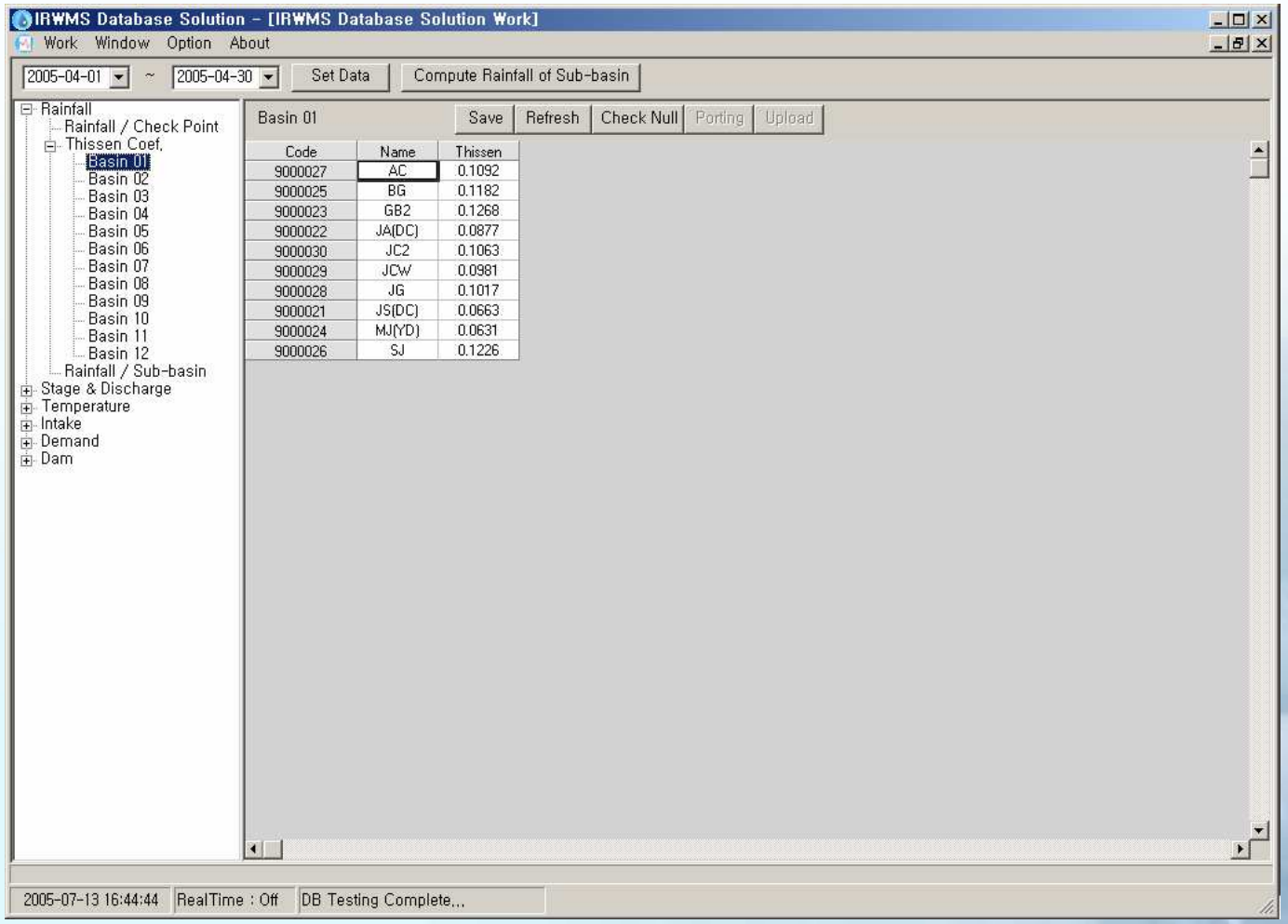

IRWMS Database Solution – [IRWMS Database Solution Work]
Work Window Option About
2005-04-01 ~ 2005-04-30 Set Data Compute Rainfall of Sub-basin
Rainfall
Stage & Discharge
Temperature
Intake
Demand
Dam
Save Refresh Check Null Porting Upload
A B C D E F G H I J K
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
2005-07-13 16:42:35 RealTime : Off DB Testing Complete...

Data Selection

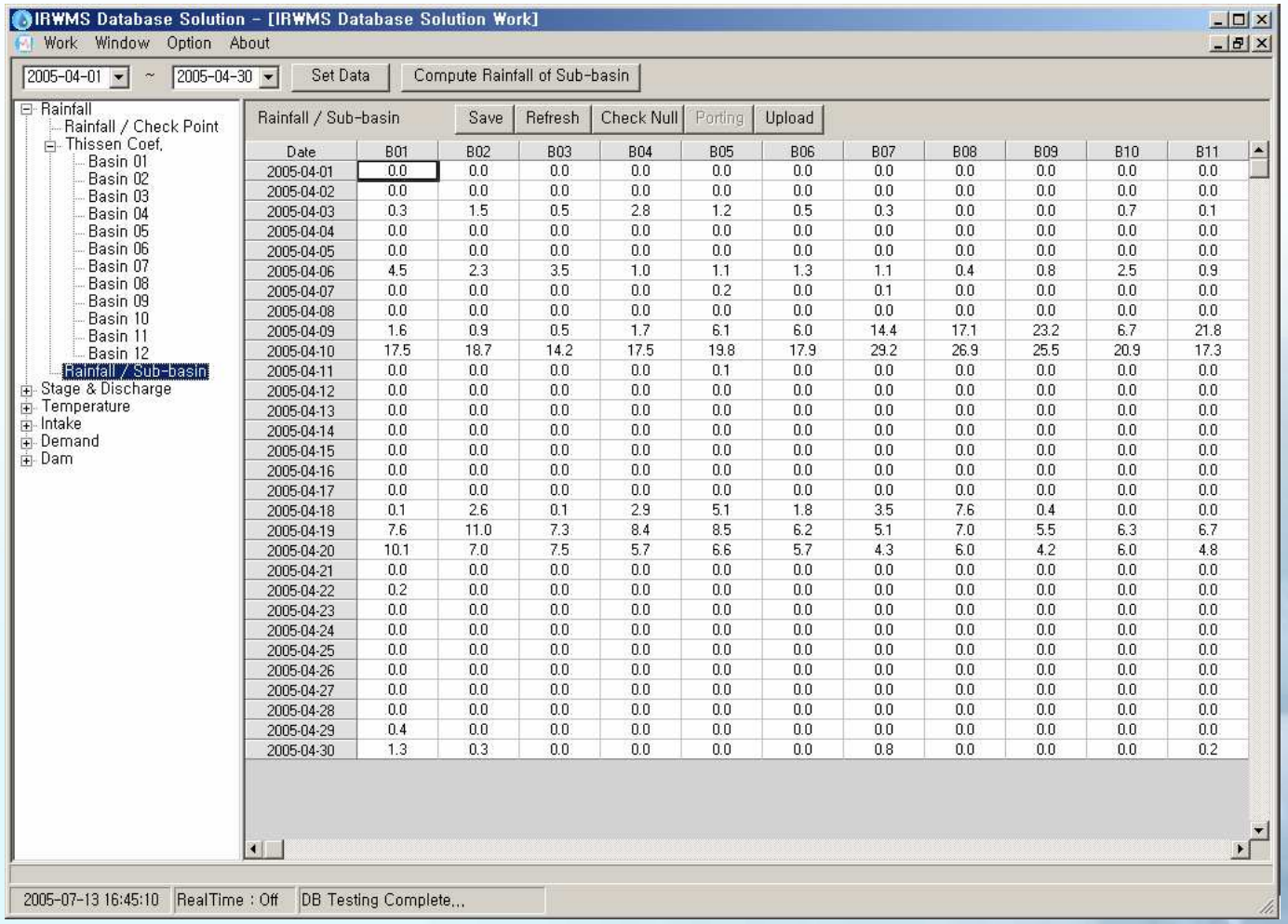
- Rainfall data by point



Thiessen coefficient management

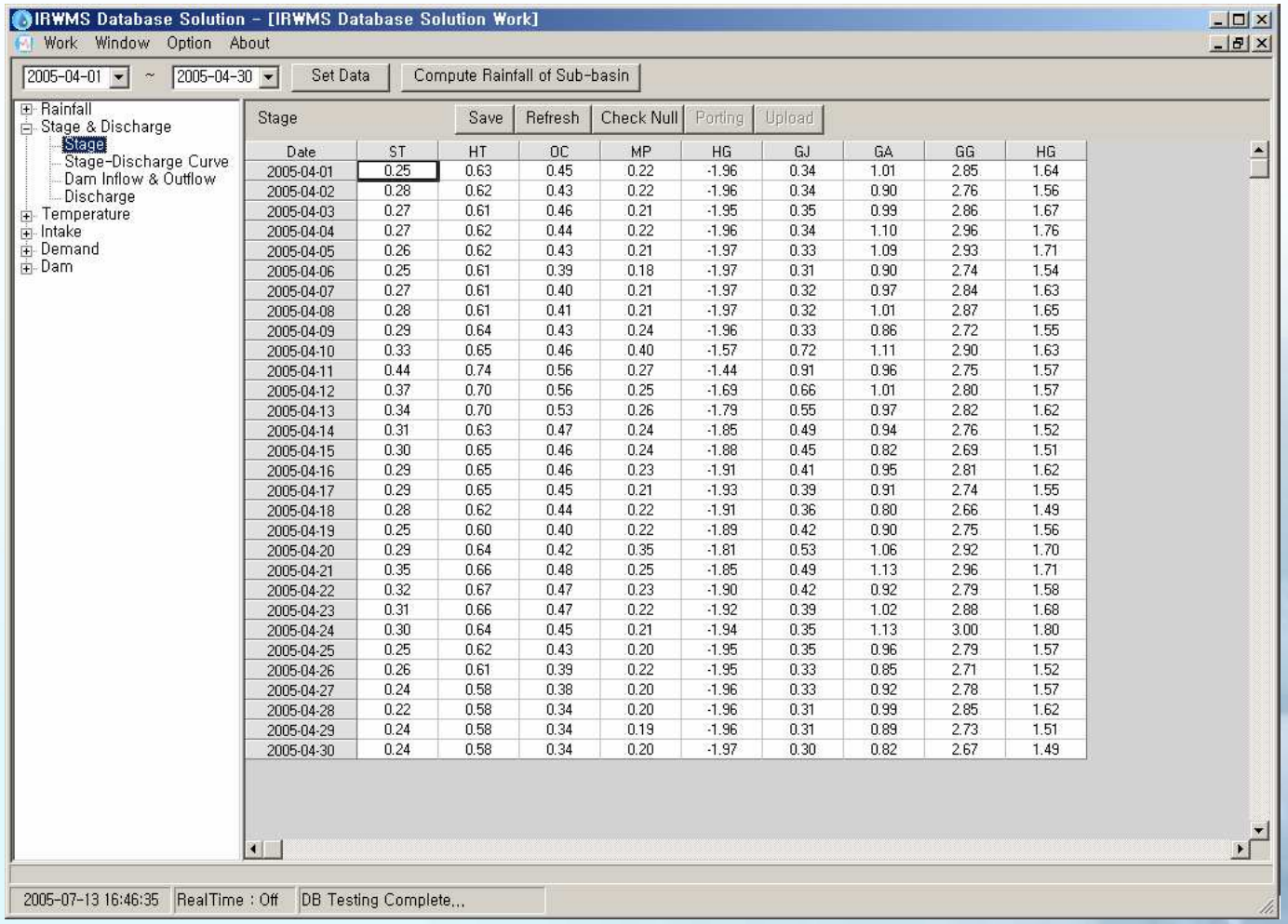


Mean Areal precipitation

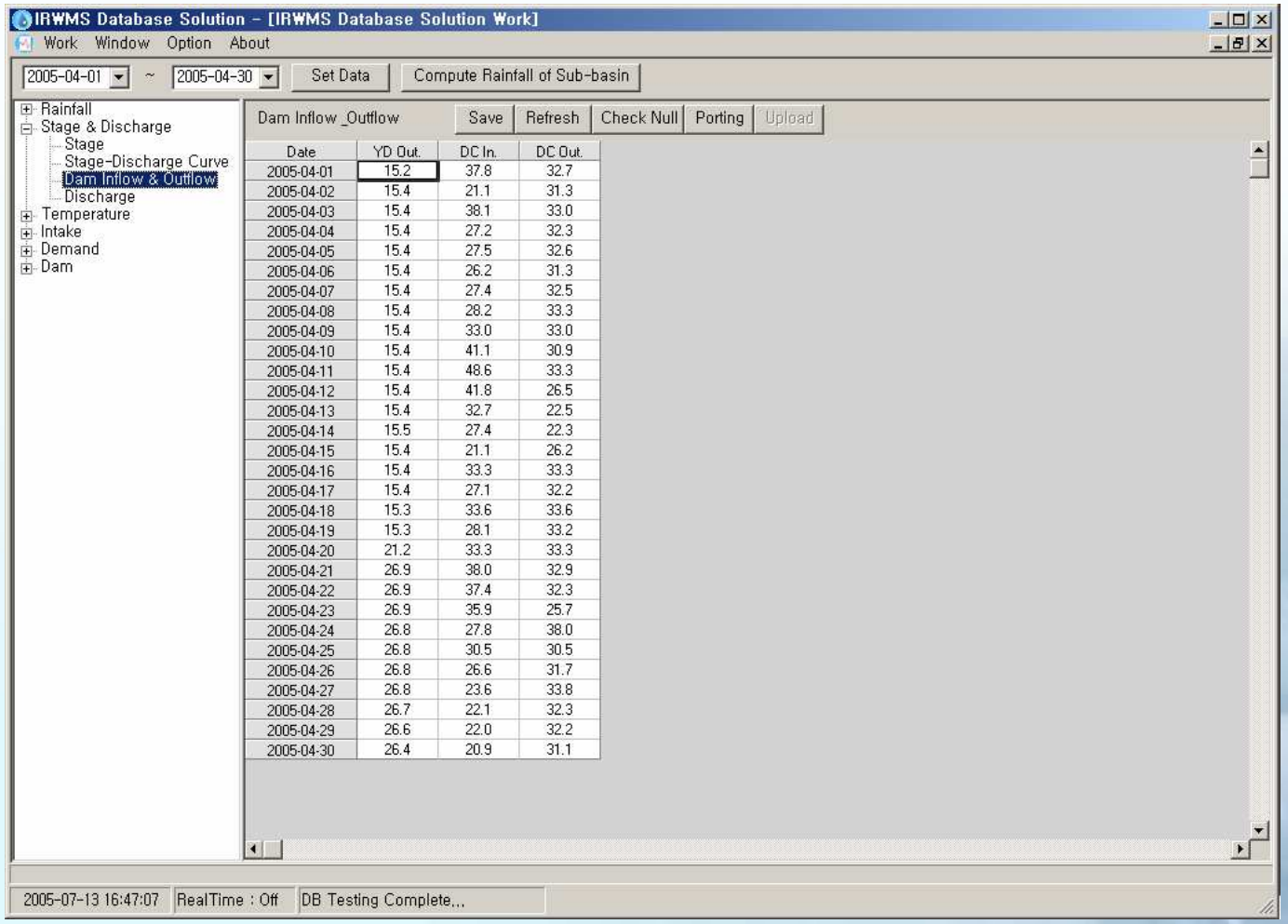


Date	B01	B02	B03	B04	B05	B06	B07	B08	B09	B10	B11
2005-04-01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-02	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-03	0.3	1.5	0.5	2.8	1.2	0.5	0.3	0.0	0.0	0.7	0.1
2005-04-04	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-05	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-06	4.5	2.3	3.5	1.0	1.1	1.3	1.1	0.4	0.8	2.5	0.9
2005-04-07	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0
2005-04-08	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-09	1.6	0.9	0.5	1.7	6.1	6.0	14.4	17.1	23.2	6.7	21.8
2005-04-10	17.5	18.7	14.2	17.5	19.8	17.9	29.2	26.9	25.5	20.9	17.3
2005-04-11	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-18	0.1	2.6	0.1	2.9	5.1	1.8	3.5	7.6	0.4	0.0	0.0
2005-04-19	7.6	11.0	7.3	8.4	8.5	6.2	5.1	7.0	5.5	6.3	6.7
2005-04-20	10.1	7.0	7.5	5.7	6.6	5.7	4.3	6.0	4.2	6.0	4.8
2005-04-21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-22	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-29	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2005-04-30	1.3	0.3	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.2

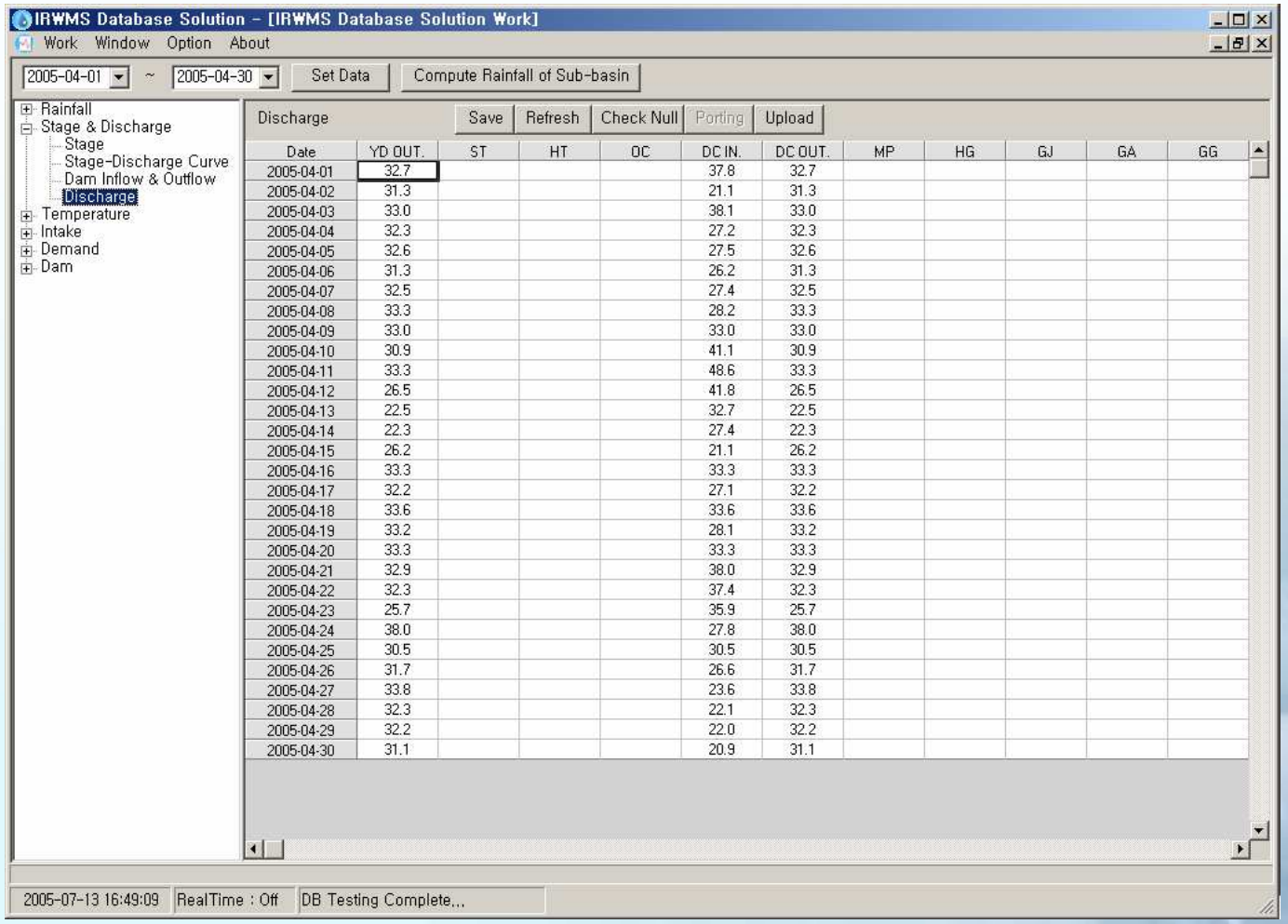
Water level data



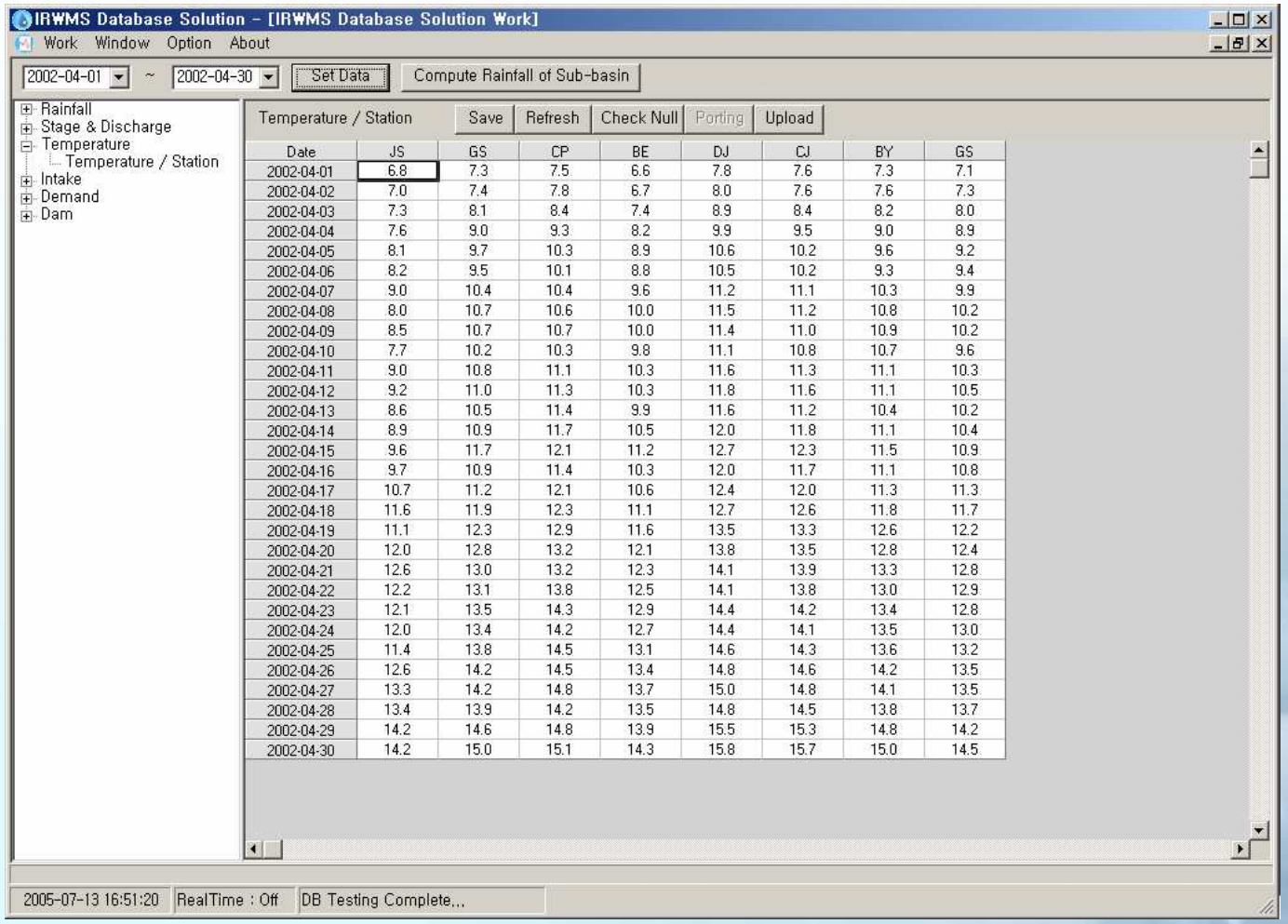
Reservoir inflow & outflow



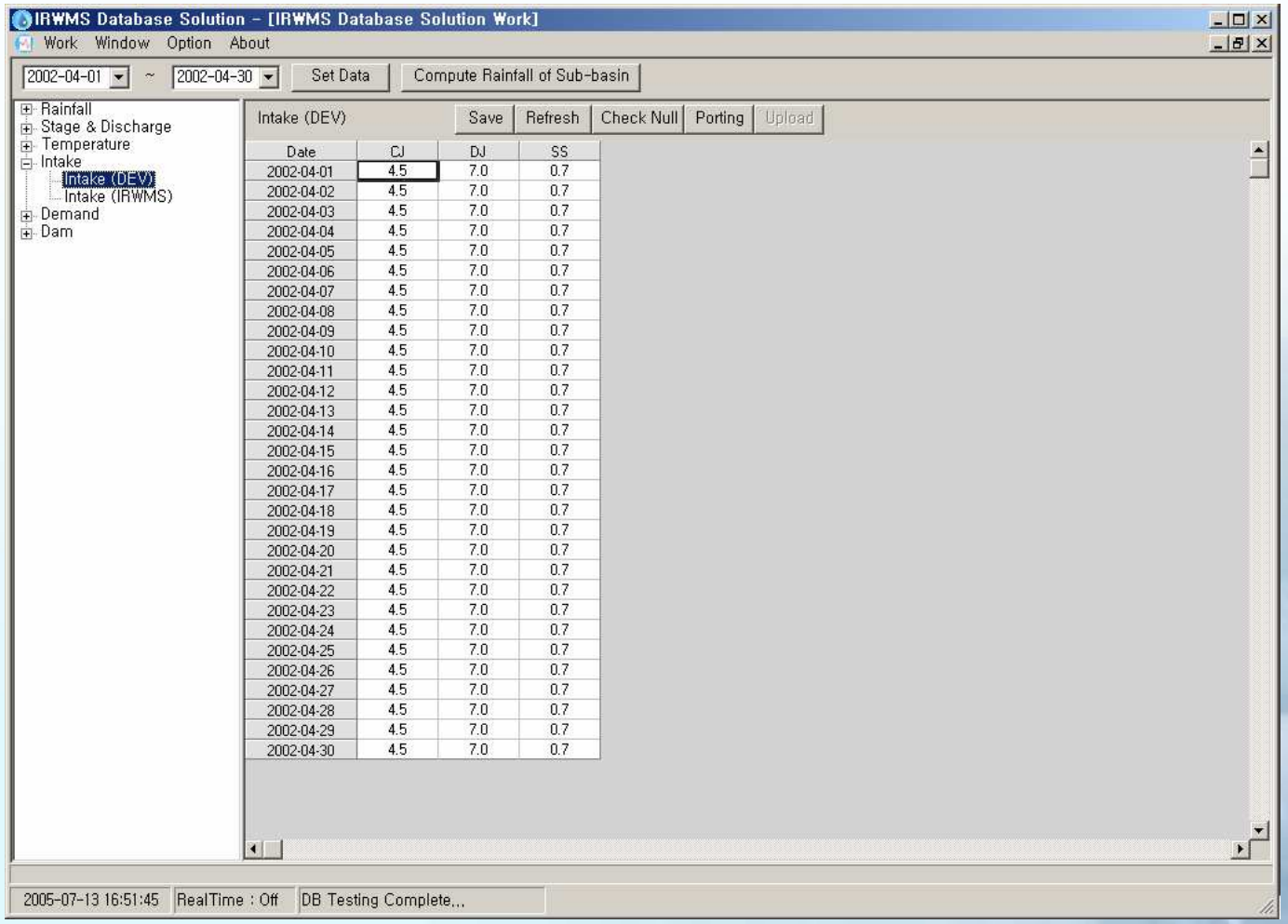
Dam release


IRWMS Database Solution - [IRWMS Database Solution Work]
Work Window Option About
2005-04-01 ~ 2005-04-30 Set Data Compute Rainfall of Sub-basin
Rainfall
Stage & Discharge
Stage
Stage-Discharge Curve
Dam Inflow & Outflow
Discharge
Temperature
Intake
Demand
Dam
Discharge
Save Refresh Check Null Porting Upload
Date YD OUT. ST HT OC DC IN. DC OUT. MP HG GJ GA GG
2005-04-01 32.7 37.8 32.7
2005-04-02 31.3 21.1 31.3
2005-04-03 33.0 38.1 33.0
2005-04-04 32.3 27.2 32.3
2005-04-05 32.6 27.5 32.6
2005-04-06 31.3 26.2 31.3
2005-04-07 32.5 27.4 32.5
2005-04-08 33.3 28.2 33.3
2005-04-09 33.0 33.0 33.0
2005-04-10 30.9 41.1 30.9
2005-04-11 33.3 48.6 33.3
2005-04-12 26.5 41.8 26.5
2005-04-13 22.5 32.7 22.5
2005-04-14 22.3 27.4 22.3
2005-04-15 26.2 21.1 26.2
2005-04-16 33.3 33.3 33.3
2005-04-17 32.2 27.1 32.2
2005-04-18 33.6 33.6 33.6
2005-04-19 33.2 28.1 33.2
2005-04-20 33.3 33.3 33.3
2005-04-21 32.9 38.0 32.9
2005-04-22 32.3 37.4 32.3
2005-04-23 25.7 35.9 25.7
2005-04-24 38.0 27.8 38.0
2005-04-25 30.5 30.5 30.5
2005-04-26 31.7 26.6 31.7
2005-04-27 33.8 23.6 33.8
2005-04-28 32.3 22.1 32.3
2005-04-29 32.2 22.0 32.2
2005-04-30 31.1 20.9 31.1
2005-07-13 16:49:09 RealTime : Off DB Testing Complete...

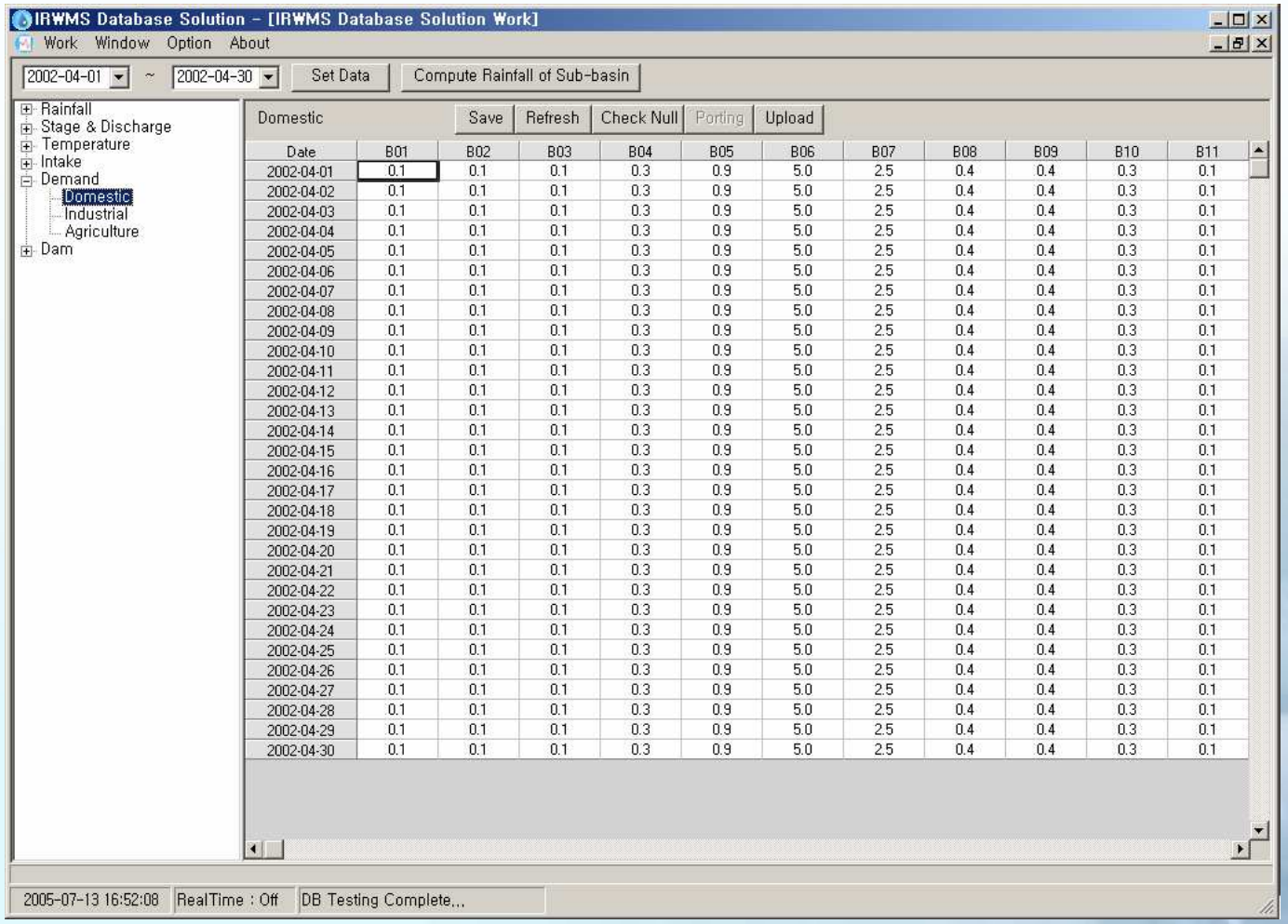
Temperature



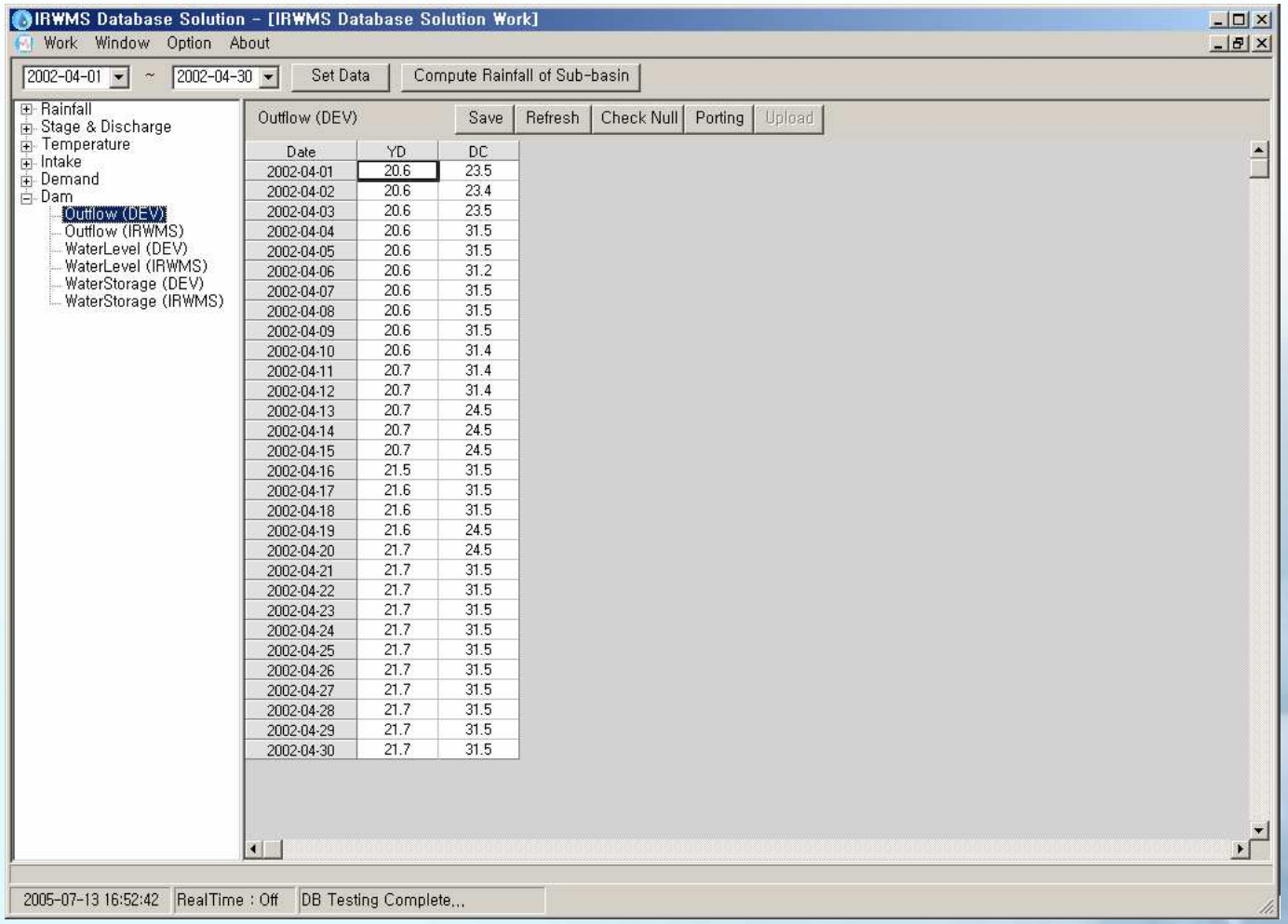
Intake flow


IRWMS Database Solution - [IRWMS Database Solution Work]
Work Window Option About
2002-04-01 ~ 2002-04-30 Set Data Compute Rainfall of Sub-basin
Rainfall
Stage & Discharge
Temperature
Intake
Intake (DEV)
Intake (IRWMS)
Demand
Dam
Intake (DEV) Save Refresh Check Null Porting Upload
Date CJ DJ SS
2002-04-01 4.5 7.0 0.7
2002-04-02 4.5 7.0 0.7
2002-04-03 4.5 7.0 0.7
2002-04-04 4.5 7.0 0.7
2002-04-05 4.5 7.0 0.7
2002-04-06 4.5 7.0 0.7
2002-04-07 4.5 7.0 0.7
2002-04-08 4.5 7.0 0.7
2002-04-09 4.5 7.0 0.7
2002-04-10 4.5 7.0 0.7
2002-04-11 4.5 7.0 0.7
2002-04-12 4.5 7.0 0.7
2002-04-13 4.5 7.0 0.7
2002-04-14 4.5 7.0 0.7
2002-04-15 4.5 7.0 0.7
2002-04-16 4.5 7.0 0.7
2002-04-17 4.5 7.0 0.7
2002-04-18 4.5 7.0 0.7
2002-04-19 4.5 7.0 0.7
2002-04-20 4.5 7.0 0.7
2002-04-21 4.5 7.0 0.7
2002-04-22 4.5 7.0 0.7
2002-04-23 4.5 7.0 0.7
2002-04-24 4.5 7.0 0.7
2002-04-25 4.5 7.0 0.7
2002-04-26 4.5 7.0 0.7
2002-04-27 4.5 7.0 0.7
2002-04-28 4.5 7.0 0.7
2002-04-29 4.5 7.0 0.7
2002-04-30 4.5 7.0 0.7
2005-07-13 16:51:45 RealTime : Off DB Testing Complete...

Demand flow


IRWMS Database Solution - [IRWMS Database Solution Work]
Work Window Option About
2002-04-01 ~ 2002-04-30 Set Data Compute Rainfall of Sub-basin
Rainfall
Stage & Discharge
Temperature
Intake
Demand
Domestic
Industrial
Agriculture
Dam
Domestic Save Refresh Check Null Porting Upload
Date B01 B02 B03 B04 B05 B06 B07 B08 B09 B10 B11
2002-04-01 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-02 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-03 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-04 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-05 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-06 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-07 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-08 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-09 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-10 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-11 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-12 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-13 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-14 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-15 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-16 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-17 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-18 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-19 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-20 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-21 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-22 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-23 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-24 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-25 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-26 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-27 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-28 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-29 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2002-04-30 0.1 0.1 0.1 0.3 0.9 5.0 2.5 0.4 0.4 0.3 0.1
2005-07-13 16:52:08 RealTime : Off DB Testing Complete...

Observation dam data




Thank you