Supplementary Material

1. SWMM input file

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option                Value
FLOW_UNITS              LPS
INFILTRATION            HORTON
FLOW_ROUTING            KINWAVE
LINK_OFFSETS            DEPTH
MIN_SLOPE               0
ALLOW_PONDING           NO
SKIP_STEADY_STATE       NO

START_DATE              08/13/2014
START_TIME              00:00:00
REPORT_START_DATE       08/13/2014
REPORT_START_TIME       00:00:00
END_DATE                06/26/2016
END_TIME                06:00:00
SWEEP_START             01/01
SWEEP_END               12/31
DRY_DAYS                0
REPORT_STEP             00:05:00
WET_STEP                00:05:00
DRY_STEP                01:00:00
ROUTING_STEP            0:00:30

INERTIAL_DAMPING        PARTIAL
NORMAL_FLOW_LIMITED     BOTH
FORCE_MAIN_EQUATION     H-W
VARIABLE_STEP           0.75
LENGTHENING_STEP        0
MIN_SURFAREA            1.14
MAX_TRIALS              8
HEAD_TOLERANCE          0.0015
SYS_FLOW_TOL            5
LAT_FLOW_TOL            5

[EVAPORATION]
;;Evap Data    Parameters
```

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;;-------------  ----------------
CONSTANT            0.0
DRY_ONLY            NO

[JUNCTIONS]
;;Junction                Invert      MaxDepth            InitDepth       SurDepth    Aponded
;;--------------          ---------   ----------          ----------      ----------  ----------
Überlaufknoten_RÜB1 100             3                   0               0           0
Sammelpunkt         99              3                   0               0           0
Nach_RÜB1           100             3                   0               0           0
Nach_RÜB2           100             3                   0               0           0
Überlaufknoten_RÜB2 100             3                   0               0           0
Zulauf_RÜB2         100.0008        10                  0               0           0
Zulauf_RÜB1         101.22          10                  0               0           0

[OUTFALLS]
;;Outfall            Invert          Type            Stage Data          Gated
;;--------------     ----------      ----------      ----------------    ---------
Kläranlage          98              FREE                                NO
Überlauf_RÜB1       99.62           FREE                                NO
Überlauf_RÜB2       99.93           FREE                                NO

[STORAGE]
;;Storage Node   Invert   MaxDepth   InitDepth   Shape       Curve Name/Params   Fevap   Seepage
;;--------------  --------  ----------  ----------  ----------  ----------------------  --------  ----------
RÜB1            100     4           0           TABULAR     RÜB1                    0       0
RÜB2            100     6.53        0           TABULAR     RÜB2                    0       0

[CONDUITS]
;;Conduit          From Node       To Node         Length  Roughness  InOffset  OutOffset  InitFlow  MaxFlow
;;--------------  ----------------  ----------------------  ---------  ----------  ----------  ----------  ----------
Überlauf_RÜB1   Überlaufknoten_RÜB1 Überlauf_RÜB1   38      0.01    0       0           0           0
Zur_Kläranlage  Sammelpunkt     Kläranlage      100         0.01    0       0           0           0
Ablauf_RÜB1     Nach_RÜB1       Sammelpunkt     100         0.01    0       0           0           0
Ablauf_RÜB2     Nach_RÜB2       Sammelpunkt     100         0.01    0       0           0           0
Überlauf_RÜB2   Überlaufknoten_RÜB2 Überlauf_RÜB2   16.58   0.01    0       0           0           0
Zulaufleitung_RÜB1 Zulauf_RÜB1  RÜB1            1           0.01    0       0           0           0
Zulaufleitung_RÜB2 Zulauf_RÜB2  RÜB2            1           0.01    0       0           0           0

[PUMPS]
;;Pump           From Node       To Node         Pump Curve          Status      Sartup Shutoff
;;--------------  ----------------  ----------------  ----------------    ------      --------  --------
Pumpe_RÜB1      RÜB1            Nach_RÜB1       Pumpe_RÜB1          ON          0         0
```

Pumpe_RÜB2 RÜB2 Nach_RÜB2 Pumpe_RÜB2 ON 0 0

[WEIRS]

;;Weir From Node To Node Type CrestHt Qcoeff Gated EndCon EndCoeff Surcharge

;;---------- ---------- ---------- ---------- ---------- ---------- -------- -------- ---------- ----------

;Überlaufwehr am RÜB 1

Wehr_RÜB1 RÜB1 Überlaufknoten_RÜB1 SIDEFLOW 3.55 2 NO 0 0 YES

;Überlaufwehr am RÜB 2

Wehr_RÜB2 RÜB2 Überlaufknoten_RÜB2 SIDEFLOW 5.24 2 NO 0 0 YES

[OUTLETS]

;;Outlet From Node To Node CrestHt Type QTable/Qcoeff Qexpon Gated

;;---------- ---------- ---------- ---------- ---------- ---------- ---------- --------

Drossel_RÜB1 RÜB1 Nach_RÜB1 0 TABULAR/DEPTH Ablauf_RÜB1 NO

Drossel_RÜB2 RÜB2 Nach_RÜB2 0 TABULAR/DEPTH Ablauf_RÜB2 NO

[XSECTIONS]

;;Link Shape Geom1 Geom2 Geom3 Geom4 Barrels

;;---------- ---------- ---------- ---------- ---------- ---------- ----------

Überlauf_RÜB1 CIRCULAR 1.2 0 0 0 1

Zur_Kläranlage CIRCULAR 1 0 0 0 1

Ablauf_RÜB1 CIRCULAR 0.4 0 0 0 1

Ablauf_RÜB2 CIRCULAR 0.5 0 0 0 1

Überlauf_RÜB2 CIRCULAR 1.8 0 0 0 1

Zulaufleitung_RÜB1 CIRCULAR 1 0 0 0 1

Zulaufleitung_RÜB2 CIRCULAR 3 0 0 0 1

Wehr_RÜB1 RECT_OPEN 0.45 8 0 0

Wehr_RÜB2 RECT_OPEN 1.27 11.7 0 0

[POLLUTANTS]

;;Pollutant Units Cppt Cgw Crdii Kdecay SnowOnly Co-Pollutant Co-Frac Cdwf Cinit

;;---------- ------ ---------- ---------- ---------- ---------- ---------- ---------- ---------- ---------- --------

AFS MG/L 0.0 0.0 0.0 0.0 NO * 0.0 0.0 0.0

[INFLOWS]

;;Node Inflow Time Series Type Funits Fscale Baseline Pattern

;;---------- ---------- ---------- -------- -------- -------- -------- --------

Zulauf_RÜB2 FLOW Zulaufstrom_RÜB2 FLOW 1.0 1.0

Zulauf_RÜB2 AFS Zulauf_AFS_RÜB2 CONCEN 1.0 1.0

Zulauf_RÜB1 FLOW Zulaufstrom_RÜB1 FLOW 1.0 1.0

Zulauf_RÜB1 AFS Zulauf_AFS_RÜB1 CONCEN 1.0 1.0

[CURVES]

```
;;Curve                Type        X-Value     Y-Value
;;--------------       ----------  ----------  ----------
;Konstante Drossel an RÜB1
Ablauf_RÜB1           Rating      0           58
Ablauf_RÜB1                       3.55        58
;
;Konstante Drossel am RÜB 2
Ablauf_RÜB2           Rating      0           183
Ablauf_RÜB2                       5.24        183
;
;Rundbecken 805 m3
RÜB1                  Storage     0           227
RÜB1                              3.55        227
;
;Rechteckbecken 1949 m3
RÜB2                  Storage     0           372
RÜB2                              5.24        372

[TIMESERIES]
;;Time Series      Date          Time          Value
;;--------------   ----------  ----------    ----------
;Qzu Brühlstraße
Zulaufstrom_RÜB1 FILE "Zulaufstrom_RÜB1.dat"
;
;Qzu GSS
Zulaufstrom_RÜB2 FILE "Zulaufstrom_RÜB2.dat"
;
;AFS Zulaufmessung GSS
Zulauf_AFS_RÜB2   FILE "Zulauf_AFS_RÜB2.dat"
;
;Zulaufmessung AFS Brühl
Zulauf_AFS_RÜB1   FILE "Zulaufs_AFS_RÜB1.dat"

[REPORT]
;;Reporting Options
INPUT                 NO
CONTROLS          NO
SUBCATCHMENTS     ALL
NODES                 ALL
LINKS                 ALL
```

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units None

[COORDINATES]

;;Node	X-Coord	Y-Coord
;;----------	----------	----------
Überlaufknoten_RÜB1	1716.329	4624.553
Sammelpunkt	4648.391	5387.366
Nach_RÜB1	3349.225	5387.366
Nach_RÜB2	4648.391	6102.503
Überlaufknoten_RÜB2	6185.936	6960.667
Zulauf_RÜB2	4648.391	7651.967
Zulauf_RÜB1	-393.325	5375.447
Kläranlage	4648.391	4147.795
Überlauf_RÜB1	1716.329	3957.092
Überlauf_RÜB2	8045.292	6972.586
RÜB1	1716.329	5375.447
RÜB2	4648.391	6972.586

[VERTICES]

;;Link	X-Coord	Y-Coord
;;----------	----------	----------

2. Volume Based Control Rule

RULE STEUERUNG2_1
IF NODE RÜB1 DEPTH > 1.78
AND NODE RÜB2 DEPTH < 2.63
THEN PUMP PUMPE_RÜB1 SETTING = 2
AND PUMP PUMPE_RÜB2 SETTING = 0.590643274853801

RULE STEUERUNG2_2
IF NODE RÜB1 DEPTH < 1.78
AND NODE RÜB2 DEPTH > 2.63
THEN PUMP PUMPE_RÜB1 SETTING = 0.5
AND PUMP PUMPE_RÜB2 SETTING = 1.2046783625731
ELSE PUMP PUMPE_RÜB1 SETTING = 1
AND PUMP PUMPE_RÜB2 SETTING = 1

RULE STEUERUNG2_3
IF NODE RÜB1 DEPTH < 1.78
AND NODE RÜB2 DEPTH < 2.63
THEN PUMP PUMPE_RÜB1 SETTING = 1
AND PUMP PUMPE_RÜB2 SETTING = 1

3. Advanced Quality Based Control Rule

RULE STEUERUNG3_1
IF NODE ÜBERLAUF_RÜB1 DEPTH > 0
THEN PUMP PUMPE_RÜB1 SETTING = TIMESERIES RÜB1_KONZENTRATIONSSTEUERUNG
AND PUMP PUMPE_RÜB2 SETTING = TIMESERIES RÜB2_KONZENTRATIONSSTEUERUNG

RULE STEUERUNG3_2
IF NODE ÜBERLAUF_RÜB2 DEPTH > 0
THEN PUMP PUMPE_RÜB1 SETTING = TIMESERIES RÜB1_KONZENTRATIONSSTEUERUNG
AND PUMP PUMPE_RÜB2 SETTING = TIMESERIES RÜB2_KONZENTRATIONSSTEUERUNG
ELSE PUMP PUMPE_RÜB1 SETTING = 1
AND PUMP PUMPE_RÜB2 SETTING = 1

4. Additional Figures

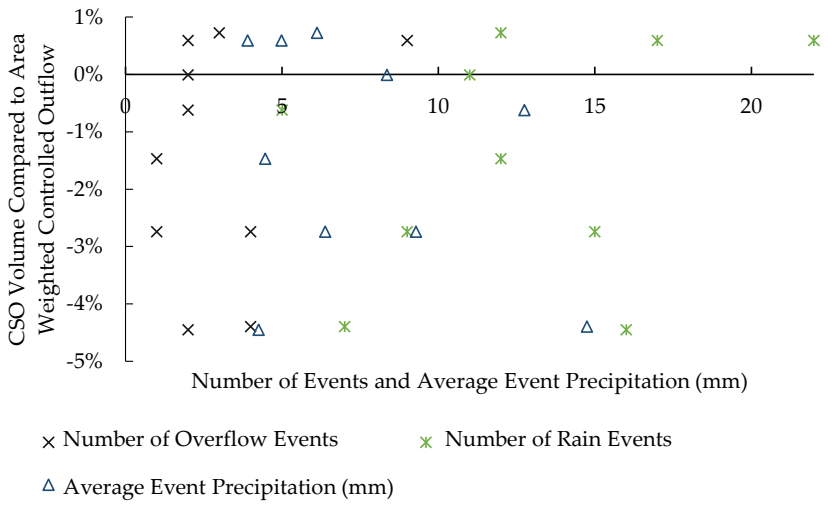

Figure S1. Influence of the number of rain and overflow events and average event precipitation on optimization results

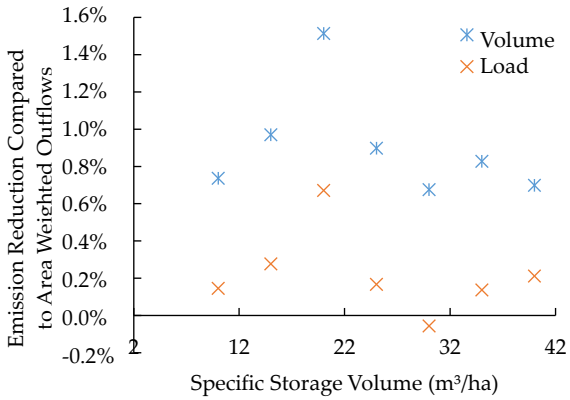

Figure S2. Influence of (evenly distributed) specific storage volume on volume based optimization potential compared to area weighted controlled outflows