APPENDIX C version control 2.0 (updated with release of FOCUS_MACRO 5.5.4)

PARAMETERIZATION OF DRAINAGE INPUT

The MACRO model has been parameterised to calculate drainage inputs to surface water bodies for the six drainage scenarios, D1 to D6. Parameters in the model are listed in the following tables, sub-divided into sections on crop parameters, and soil and site parameters. The actual parameter names used in the model are given in parentheses.

Crop parameters

Some cropping parameters are considered as crop-specific and not site-specific, and are therefore given a common value for all drainage scenarios where the particular crop is grown (see Table 4.2.1-1). The remaining parameters, mostly concerning root depth and the crop development phases, are considered as site-specific and are therefore given different values for each scenario.

Table C.1. Crop-specific MACRO parameters for all drainage scenarios: perennial crops

	Crop/crop grouping		
Input parameter	Grass+ Alfalfa	Citrus	Olives
Leaf area index (LAIC)	5	5	3
[a]Root distribution	Medium	Deep	Deep
Crop height (m) (HCROP)	0.2	3.0	3.0
[b]Drought tolerance	Medium	Medium	Medium
Max. Interception capacity (mm) (CANCAP)	2.0	2.0	1.0
Ratio evaporation of intercepted water to transpiration (ZALP)	1.0	2.0	2.0
Radiation attenuation factor (ATTEN)	0.6	0.45	0.3
Stomatal resistance (s m^{-1}) (RSURF)	50	150	200

[a] % roots in top 25% of root depth (RPIN): shallow = 75%, medium = 67%, deep = 60%
[b] transpiration adaptability factor (BETA): low = 0.5, medium = 0.2, high = 0.1; critical tension for transpiration reduction (WATEN) is calculated from the known soil properties together with the % of available water exhausted before reduction in transpiration occurs: low = 50%, medium = 65%, high = 80%

Table C.2. Crop-specific MACRO parameters for all drainage scenarios : annual crops

Input parameter	Crop /crop grouping									
	Cereals, winter	Cereals, spring	Oilseed rape, winter	Oilseed rape, spring	Sugar beets	Potatoes	Field beans	Veg., root	Veg., leafy	Veg., bulb
Maximum leaf area index (LAIMAX)	6	4	5	4	5	4	4	3	3	3
Green leaf area index at harvest (LAIHARV)	2	2	2	2	5	2	3	3	3	3
[a]Root distribution	Deep	Deep	Deep	Deep	Medium	Shallow	Medium	Shallow	Shallow	Shallow
Max. Crop height (m) (HMAX)	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.3	0.3	0.3
[b]Drought tolerance	High	Medium	High	High	Medium	Low	Low	Low	Low	Low
Leaf development factor, growth (CFORM)	2.0	2.0	2.0	1.7	1.7	1.7	1.7	1.5	1.5	1.5
Leaf development factor, senescence (DFORM)	0.2	0.3	0.2	0.2	1.0	0.3	0.3	1.0	1.0	1.0
Leaf area index on specified day[d] (LAIMIN)	1.0	0.01	1.0	0.01	0.01	0.01	[e]1.0/0.01	0.01	0.01	[c]0.01
Crop height on specified day[d] (m) (ZHMIN)	0.2	0.01	0.2	0.01	0.01	0.01	[e]0.1/0.01	0.01	0.01	[c]0.01
Root depth on specified day[d] (m) (ROOTINIT)	0.2	0.01	0.2	0.01	0.01	0.01	[e]0.1/0.01	0.01	0.01	[c]0.01
Max. Interception capacity (mm) (CANCAP)	3	2	3	2	2	2	2	2	2	2
Ratio evaporation of intercepted water to transpiration (ZALP)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Radiation attenuation factor (ATTEN)	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
The vapour pressure deficit that reduces stomatal conductance by 50% (Pa) (VPD50)	50	50	50	50	50	50	50	50	50	50
The solar radiation that reduces stomatal conductance by 50% (W/m^2) (RI50)	50	50	50	50	50	50	50	50	50	50
Maximum interception fraction for pesticide	0.9	0.9	0.9	0.9	0.9	0.8	0.85	0.7	0.7	0.7
Min. stomatal resistance ($s\ m^{-1}$) (RSMIN)	50	50	40	40	40	40	40	40	40	40

[a] % roots in top 25% of root depth (RPIN): shallow = 75%, medium = 67%, deep = 60%
[b] transpiration adaptability factor (BETA): low = 0.5, medium = 0.2, high = 0.1; critical tension for transpiration reduction (WATEN) is calculated from the known soil properties together with the % of extractable micropore water exhausted before reduction in transpiration occurs: low = 50%, medium = 65%, high = 80%
[c] except scenario D6, 2nd bulb vegetable crop: LAIMIN = 0.5, ZHMIN = 0.1, ROOTINIT = 0.1
[d] ZDATEMIN (see Tables C3 to C8)
[e] autumn sown/spring sown

Table C.2 contd. : : Crop-specific MACRO parameters for all drainage scenarios : annual crops

Input parameter	Crop /crop grouping						
	Legumes	Veg., fruiting	Maize	Vines	Pome/ stone fruit	Sunflowers	Cotton
Maximum leaf area index (LAIMAX)	4	3	5	5	4	4	5
Green leaf area index at harvest (LAIHARV)	2	3	2	0.01	0.01	1	3
[a]Root distribution	Medium	Shallow	Medium	Deep	Deep	Deep	Medium
Max. Crop height (m) (HMAX)	0.6	0.6	1.8	1.8	5.0	1.8	1.2
[b]Drought tolerance	Low	Low	Medium	Medium	Medium	Medium	Medium
Leaf development factor, growth (CFORM)	2.0	1.5	1.7	1.5	1.5	1.7	1.7
Leaf development factor, senescence (DFORM)	0.3	1.0	0.3	0.7	0.7	0.3	0.3
Leaf area index on specified day[c] (LAIMIN)	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Crop height on specified day[c] (m) (ZHMIN)	0.01	0.01	0.01	1.79	4.99	0.01	0.01
Root depth on specified day[c] (m) (ROOTINIT)	0.01	0.01	0.01	0.99	0.79	0.01	0.01
Max. Interception capacity (mm) (CANCAP)	2	2	3	3	2	2	2
Ratio evaporation of intercepted water to transpiration (ZALP)	1.0	1.0	1.5	1.5	2.0	1.5	1.0
Radiation attenuation factor (ATTEN)	0.6	0.6	0.6	0.45	0.45	0.6	0.6
Maximum interception fraction for pesticide	0.85	0.8	0.9	0.9	0.9	0.9	0.9
Min. stomatal resistance (s m^{-1}) (RSMIN)	40	40	60	80	80	60	60

[a] % roots in top 25% of root depth (RPIN): shallow = 75%, medium = 67%, deep = 60%

[b] transpiration adaptability factor (BETA): low = 0.5, medium = 0.2, high = 0.1 ; critical tension for transpiration reduction (WATEN) is calculated from the known soil properties together with the % of extractable micropore water exhausted before reduction in transpiration occurs: low = 50%, medium = 65%, high = 80%

[c] ZDATEMIN (see Tables C3 to C8)

Table C.3. MACRO scenario-specific crop input parameters for Scenario D1

Input variable	Crop /crop grouping			
	Grass + alfalfa	Cereals, winter	Cereals, spring	Oilseed rape, spring
Root depth (m) (ROOTMAX/ROOTDEP[a])	1.3	1.3	1.3	1.3
Emergence (IDSTART)	-	25/9	5/5	19/5
Intermediate crop development (ZDATEMIN)	-	25/3	6/5	20/5
Max. leaf area development (IDMAX)	-	23/6	28/6	4/7
Harvest (IHARV)	-	26/8	4/9	8/9

[a] for grass + alfalfa (perennial crop)

Table C.4. MACRO scenario-specific crop input parameters for Scenario D2

Input variable	Crop /crop grouping			
	Grass + alfalfa	Cereals, winter	Oilseed rape, winter	Field beans
Root depth (m) (ROOTMAX/ROOTDEP[a])	0.6	0.6	0.6	0.6
Emergence (IDSTART)	-	25/10	15/9	12/11
Intermediate crop development (ZDATEMIN)	-	4/4	10/3	10/4
Max. leaf area development (IDMAX)	-	30/6	15/6	29/6
Harvest (IHARV)	-	7/8	15/7	15/9

[a] for grass + alfalfa (perennial crop)

Table C.5. MACRO scenario-specific crop input parameters for Scenario D3

Input variable	Crop /crop grouping													
	Grass + alfalfa	Cereals, winter	Cereals, spring	Oilseed rape, winter	Oilseed rape, spring	Sugar beets	Potatoes	Field beans	Veg., root	Veg.,[a] leafy	Veg., bulb	Legumes	Maize	Pome/stone fruit
Root depth (m) (ROOTMAX/ROOTDEP[b])	0.6	0.6	0.6	0.6	0.6	0.6	0.4	0.6	0.4	0.4	0.4	0.6	0.6	0.8
Emergence (IDSTART)	-	21/11	1/4	2/9	10/4	25/4	10/5	30/4	25/4	25/4 5/8	25/4	15/4	5/5	15/4
Intermediate crop development (ZDATEMIN)	-	16/4	2/4	21/2	11/4	26/4	11/5	1/5	26/4	26/4 6/8	26/4	16/4	6/5	16/4
Max. leaf area development (IDMAX)	-	24/7	5/6	25/5	15/6	25/7	20/7	15/7	30/6	5/6 10/9	30/6	15/6	10/8	1/7
Harvest (IHARV)	-	15/8	20/8	20/7	25/8	18/10	15/9	10/9	15/8	20/7 20/10	1/9	10/8	20/9	30/10

[a] 2 crops per season
[b] for grass + alfalfa (perennial crop)

Table C.6. MACRO scenario-specific crop input parameters for Scenario D4

Input variable	Crop /crop grouping												
	Grass + alfalfa	Cereals, winter	Cereals, spring	Oilseed rape, winter	Oilseed rape, spring	Sugar beets	Potatoes	Field beans	Veg., leafy	Veg., bulb	Legumes	Maize	Pome/stone fruit
Root depth (m) (ROOTMAX/ROOTDEP[a])	1.0	1.0	1.0	1.0	1.0	0.8	0.6	0.8	0.8	0.4	0.8	1.0	1.0
Emergence (IDSTART)	-	22/9	26/4	3/9	1/5	4/5	22/5	15/4	10/5	23/4	23/4	10/5	20/4
Intermediate crop development (ZDATEMIN)	-	18/3	27/4	1/3	2/5	5/5	23/5	16/4	11/5	24/4	24/4	11/5	21/4
Max. leaf area development (IDMAX)	-	21/6	19/6	5/6	17/6	28/7	21/8	10/7	20/7	10/7	20/6	18/8	5/7
Harvest (IHARV)	-	21/8	26/8	9/8	31/8	25/10	23/9	25/8	26/9	13/9	10/8	12/9	30/10

[a] for grass + alfalfa (perennial crop)

Table C.7. MACRO scenario-specific crop input parameters for Scenario D5

Input variable	Crop /crop grouping								
	Grass + alfalfa	Cereals, winter	Cereals, spring	Oilseed rape, winter	Oilseed rape, spring	Legumes	Sunflowers	Maize	Pome/stone fruit
Root depth (m) (ROOTMAX/ROOTDEP[a])	0.9	0.9	0.7	0.9	0.7	0.7	0.9	0.7	0.9
Emergence (IDSTART)	-	10/11	15/3	20/9	15/3	15/3	1/5	10/5	1/4
Intermediate crop development (ZDATEMIN)	-	15/3	16/3	1/3	16/3	16/3	2/5	11/5	2/4
Max. leaf area development (IDMAX)	-	15/5	15/5	10/5	25/5	30/5	10/7	15/7	31/5
Harvest (IHARV)	-	15/7	20/7	5/7	30/7	15/7	31/8	15/9	10/10

[a] for grass + alfalfa (perennial crop)

Table C.8. MACRO scenario-specific crop input parameters for Scenario D6

Input variable	Crop /crop grouping												
	Citrus	Olives	Maize	Cereals, winter	Potatoes	Field beans[a]	Veg., root	Veg., leafy	Veg., bulb	Legumes	Veg., fruiting	Vines	Cotton
Root depth (m) (ROOTMAX/ROOTDEP[b])	1.0	1.0	0.8	0.8	0.5	0.6	0.4	0.6	0.4	0.5	0.6	1.0	0.8
Emergence (IDSTART)	-	-	20/4	30/11	10/4 5/8	1/4 8/7	25/2	15/8	10/5 20/10	20/4	10/4	1/2	20/4
Intermediate crop development (ZDATEMIN)	-	-	21/4	16/2	11/4 6/8	2/4 9/7	26/2	16/8	11/5 30/1	21/4	11/4	2/2	21/4
Max. leaf area development (IDMAX)	-	-	15/6	30/3	30/5 30/9	1/5 8/8	15/4	30/9	30/6 10/3	20/5	30/5	1/5	10/6
Harvest (IHARV)	-	-	15/9	30/6	15/7 25/11	15/6 30/9	13/5	30/11	31/7 10/4	25/6	10/8	10/11	15/9

[a] 2 crops per season
[b] for citrus & olive (perennial crops)

Soil and site parameters

As with crop parameters, some soil and site parameters in MACRO have been set to the same value for all scenarios (e.g. dispersion length), while others are specific to each scenario (e.g. water retention curve parameters). In the scenario-specific parameter tables, each MACRO parameter is classified into one of four groups depending on how the value was obtained (known or based on measured data, calibrated against field data, default or assumed value, estimated from pedo-transfer functions). MACRO parameter names are given in parentheses.

Water retention parameters for the van Genuchten water retention relationship, N and α, were derived as follows:

- N was set to 1 + the previously derived Brooks-Corey's pore size distribution index
- α was set constant to 0.1 for all scenarios

Table C.9 MACRO soil parameters assumed constant for all scenarios

Parameter	Value
Dispersivity (cm) (DV)	5
[a,b]Mixing depth (mm) (ZMIX)	0.1
Slope of shrinkage characteristic (ZP)	0
Geometry factor (ZA)	1
Fraction of sorption sites in macropores (FRACMAC)	0.02
Initial soil temperature (^{o}C) (TEMPINI)	10
Initial pesticide concentration (mg m^{-3}) (SOLINIT)	0
Pesticide concentration at bottom boundary (mg m^{-3}) (CONCIN)	0
Critical air content for transpiration reduction (m^3 m^{-3}) (CRITAIR)	0.05
Excluded pore volume (m^3 m^{-3}) (AEXC)	0
van Genuchten's α (1/cm)	0.1
Stone content (%) (STONE)	0

[a] with the exception of D2, where ZMIX is set to 0.02 mm. See FERA report "Re-alignment of version 4.4.2 and 5.5.3 of the MACRO model" by S. Beulke. For application method "incorporated" ZMIX is set to 0.0001.

[b]values of mixing depth of 0.02 and 0.1 mm are smaller than those usually reported in the literature. This is probably because literature values have mostly been derived from runoff plot experiments carried out under very high intensity rainfall which promotes aggregate breakdown and thus excessive mixing.

Table C.10. MACRO site parameters assumed constant for all scenarios

Parameter	Value
Pesticide concentration in rainfall (mg m^{-3}) (CONC)	0
Rainfall correction factor (RAINCO)	1
Snowfall correction factor (SNOWCO)	1
Rainfall intensity (mm h^{-1}) (RINTEN)	2
Snowmelt factor (mm ^{o}C d^{-1}) (SNOWMF)	4.5
Albedo (ALBEDO)	0.25

Table C.11. Scenario-specific soil and site parameters for D1

Horizon designation (FAO, 1990)	Ap	Bg1	Bg2	BCg
Depth (cm)	0-30	30-60	60-100	100-175
BASIC PROPERTIES				
Sand (%)	7	3	2	3
Silt (%)	46	41	37	31
Clay (%)	47	56	61	66
Texture (FAO, 1990; USDA, 1999)	Silty clay	silty clay	clay	Clay
Organic carbon (%)	2.0	0.8	0.3	0.2
Bulk density (g/cm^3) (GAMMA)	1.35 [a]	1.42 [a]	1.42 [a]	1.42 [c]
pH	7.2	7.4	7.4	7.6
Soil structure (FAO, 1990)	Moderate medium angular blocky	moderate fine angular blocky	strong medium angular blocky	Strong coarse angular blocky
HYDRAULIC PROPERTIES				
Saturated water content (%) (TPORV)	47 [a]	46 [a]	47 [a]	47 [b]
Wilting point (%) (WILT)	26 [a]	29 [a]	31 [a]	33 [b]
Residual water content (%) (RESID)	0 [a]	0 [a]	0 [a]	0 [c]
Water content at macro/micropore boundary (%) (XMPOR)	40 [a]	42 [a]	45 [a]	45 [b]
Water tension at macro/micropore boundary (cm) (CTEN)	10 [c]	10 [c]	10 [c]	10 [c]
van Genuchten's N (N)	1.07 [a]	1.05 [a]	1.05 [a]	1.05 [b]
Tortuosity factor micropores (ZM)	0.5 [c]	0.5 [c]	0.5 [c]	0.5 [c]
Tortuosity factor macropores (ZN)	2 [b]	2 [b]	2 [b]	2 [b]
Effective diffusion pathlength (mm) (ASCALE)	150 [b]	100 [b]	300 [b]	300 [b]
Saturated hydraulic conductivity (mm/hr) (KSATMIN)	200 [a]	50 [a]	30 [a]	20 [b]
Conductivity at macro/micropore boundary (mm/hr) (KSM)	0.1 [a]	0.3 [b]	0.2 [b]	0.1 [b]
FIELD DRAINAGE				
Drain depth (m) (DRAINDEP)	1.0 [a]			
Drain spacing (m) (SPACE)	13.5 [a]			
Transmission coefficient at bottom boundary (h^{-1}) (BGRAD)	2.0×10^{-6} [b]			

[a] derived from measured values or known.
[b] calibrated.
[c] default or assumed value.

Table C.12. Scenario-specific soil and site parameters for D2

Horizon designation (FAO, 1990)	Ap	Bg1	Bg2	Bgk	C
Depth (cm)	0-20	20-35	35-65	65-90	90-150
BASIC PROPERTIES					
Sand (%)	7	6	3	2	1
Silt (%)	39	39	37	36	37
Clay (%)	54	56	60	62	62
Texture (FAO, 1990; USDA, 1999)	clay	clay	clay	clay	Clay
Organic carbon (%)	3.3	0.8	0.7	0.6	0.6
Bulk density (g/cm^3) (GAMMA)	1.20 [a]	1.34 [a]	1.34 [a]	1.43 [a]	1.43 [c]
PH	7.0	7.5	8.0	8.5	8.5
Soil structure (FAO, 1990)	moderate medium angular blocky	Strong medium angular blocky	weak very coarse prismatic	massive	Massive
HYDRAULIC PROPERTIES					
Saturated water content (%) (TPORV)	52 [a]	48 [a]	48 [a]	44 [a]	44 [c]
Wilting point (%) (WILT)	25 [a]	25 [a]	25 [a]	25 [a]	25[c]
Residual water content (%) (RESID)	0 [a]	0 [a]	0 [a]	0 [a]	0 [c]
Water content at macro/micropore boundary (%) (XMPOR)	48 [a]	47 [a]	47 [a]	43 [a]	43 [c]
Water tension at macro/micropore boundary (cm) (CTEN)	10 [c]	10 [c]	10 [c]	10 [c]	10 [c]
van Genuchten's N (N)	1.077 [a]	1.061 [a]	1.048 [a]	1.054 [a]	1.062 [d]
Tortuosity factor micropores (ZM)	0.5 [c]	0.5 [c]	0.5 [c]	0.5 [c]	0.5 [c]
Tortuosity factor macropores (ZN)	2 [b]	2 [b]	2 [b]	2 [b]	2 [b]
Effective diffusion pathlength (mm) (ASCALE)	50 [b]	150 [b]	150 [b]	150 [b]	150 [b]
Saturated hydraulic conductivity (mm/hr) (KSATMIN)	100 [b]	20 [b]	2 [b]	1 [b]	0.5 [b]
Conductivity at macro/micropore boundary (mm/hr) (KSM)	0.05 [b]	0.05 [b]	0.05 [b]	0.05 [b]	0.05 [b]
FIELD DRAINAGE					
Drain depth (m) (DRAINDEP)	0.55 [a]				
Drain spacing (m) (SPACE)	2.0 [a]				
Transmission coefficient at bottom boundary (h^{-1}) (BGRAD)	1.0×10^{-6} [c]				

[a] derived from measured values or known.
[b] calibrated.
[c] default or assumed value.
[d] derived from pedo-transfer function.

Table C.13. Scenario-specific soil and site parameters for D3

Horizon designation (FAO, 1990)	Ap	Bw	C
Depth (cm)	0-30	30-50	50-175
BASIC PROPERTIES			
Sand (%)	91	93	96
Silt (%)	6	4	2
Clay (%)	3	3	2
Texture (FAO, 1990; USDA, 1999)	sand	sand	Sand
Organic carbon (%)	2.3	0.5	0.1
Bulk density (g/cm^3) (GAMMA)	1.35 [a]	1.46 [a]	1.67 [a]
PH	5.3	5.1	4.7
Soil structure (FAO, 1990)	single grain	single grain	single grain
HYDRAULIC PROPERTIES			
Saturated water content (%) (TPORV)	48 [a]	44 [a]	36 [a]
Wilting point (%) (WILT)	6 [a]	6 [a]	6 [a]
Residual water content (%) (RESID)	3 [a]	3 [a]	3 [a]
Water content at macro/micropore boundary (%) (XMPOR)	37 [a]	29 [a]	29 [a]
Water tension at macro/micropore boundary (cm) (CTEN)	39 [a]	45 [a]	45 [a]
van Genuchten's N (N)	1.847 [a]	2.958 [a]	2.958 [a]
Tortuosity factor micropores (ZM)	0.5 [a]	0.5 [a]	0.5 [a]
Tortuosity factor macropores (ZN)	4 [c]	4 [c]	4 [c]
Effective diffusion pathlength (mm) (ASCALE)	20 [c]	1 [c]	1 [c]
Saturated hydraulic conductivity (mm/hr) (KSATMIN)	70 [a]	110 [a]	110 [a]
Conductivity at macro/micropore boundary (mm/hr) (KSM)	0.54 [a]	1.9 [a]	1.9 [a]
FIELD DRAINAGE			
Drain depth (m) (DRAINDEP)	1.75 [a]		
Drain spacing (m) (SPACE)	76.0 [a]		
Transmission coefficient at bottom boundary (h^{-1}) (BGRAD)	0.0 [c]		

[a] derived from measured values or known.
[c] default or assumed value.

Table C.14. Scenario-specific soil and site parameters for D4

Horizon designation (FAO, 1990)	Ap	Eb	Ebg	Btg	BCg
Depth (cm)	0-25	25-45	45-75	75-120	120-180
BASIC PROPERTIES					
Sand (%)	51	70	67	33	73
Silt (%)	37	17	18	39	17
Clay (%)	12	13	15	28	10
Texture (FAO, 1990; USDA, 1999)	loam	Sandy loam	Sandy loam	Clay loam / loam	Sandy loam
Organic carbon (%)	1.4	0.8	0.3	0.2	0.1
Bulk density (g/cm^3) (GAMMA)	1.48 [a]	1.65 [a]	1.65 [a]	1.76 [a]	1.80 [a]
PH	6.9	7.1	7.2	7.5	7.5
Soil structure (FAO, 1990)	weak medium subangular blocky	weak medium subangular blocky	weak medium subangular blocky	moderate coarse subangular blocky	Weak coarse subangular blocky
HYDRAULIC PROPERTIES					
Saturated water content (%) (TPORV)	42 [a]	36 [a]	36 [a]	33 [a]	30 [c]
Wilting point (%) (WILT)	15 [a]	13 [a]	13 [a]	16 [a]	13 [c]
Residual water content (%) (RESID)	4 [a]	4 [a]	4 [a]	3 [a]	3 [c]
Water content at macro/micropore boundary (%) (XMPOR)	40 [a]	34 [a]	34 [a]	32 [a]	29 [c]
Water tension at macro/micropore boundary (cm) (CTEN)	10 [c]	12 [c]	12 [c]	16 [c]	16 [c]
van Genuchten's N (N)	1.15 [a]	1.15 [a]	1.15 [a]	1.15 [a]	1.12
Tortuosity factor micropores (ZM)	0.5 [c]	0.5 [c]	0.5 [c]	0.5 [c]	0.5 [c]
Tortuosity factor macropores (ZN)	3 [b]	3 [b]	3 [b]	3 [b]	3 [b]
Effective diffusion pathlength (mm) (ASCALE)	55 [b]	55 [b]	55 [b]	55 [b]	55 [b]
Saturated hydraulic conductivity (mm/hr) (KSATMIN)	30 [a]	15 [a]	8 [a]	1 [a]	0.2 [a]
Conductivity at macro/micropore boundary (mm/hr) (KSM)	0.5 [a]	1.0 [b]	0.7 [b]	0.1 [b]	0.1 [b]
FIELD DRAINAGE					
Drain depth (m) (DRAINDEP)	1.2 [a]				
Drain spacing (m) (SPACE)	10.0 [b]				
Transmission coefficient at bottom boundary (h^{-1}) (BGRAD)	3×10^{-6} [b]				

[a] derived from measured values or known.
[b] calibrated.
[c] default or assumed value.

Table C.15. Scenario-specific soil and site parameters for D5

Horizon designation	Ap	Bg	BCg
Depth (cm)	0-25	25-60	60-90
BASIC PROPERTIES			
Sand (%)	42	38	59
Silt (%)	39	35	19
Clay (%)	19	27	22
Texture (FAO, 1990; USDA, 1999)	loam	loam	Sandy clay loam
Organic carbon (%)	2.1	0.8	0.2
Bulk density (g/cm^3) (GAMMA)	1.55 [a]	1.63 [a]	1.70 [a]
pH	6.5	7.0	4.9
Soil structure (FAO, 1990)	moderate medium subangular blocky	weak coarse subangular blocky	weak coarse subangular blocky
HYDRAULIC PROPERTIES			
Saturated water content (%) (TPORV)	41 [d]	38 [d]	36 [d]
Wilting point (%) (WILT)	18 [d]	21 [d]	17 [d]
Residual water content (%) (RESID)	0 [d]	0 [d]	0 [d]
Water content at macro/micropore boundary (%) (XMPOR)	39 [d]	36 [d]	32 [d]
Water tension at macro/micropore boundary (cm) (CTEN)	12 [d]	13 [d]	11 [d]
van Genuchten's N (N)	1.106 [d]	1.082 [d]	1.088 [d]
Tortuosity factor micropores (ZM)	0.5 [d]	0.5 [d]	0.5 [d]
Tortuosity factor macropores (ZN)	4 [d]	4 [d]	4 [d]
Effective diffusion pathlength (mm) (ASCALE)	20 [d]	25 [d]	25 [d]
Saturated hydraulic conductivity (mm/hr) (KSATMIN)	30 [d]	28 [d]	13 [d]
Conductivity at macro/micropore boundary (mm/hr) (KSM)	0.25 [d]	0.16 [d]	0.20 [d]
FIELD DRAINAGE			
Drain depth (m) (DRAINDEP)	0.9 [c]		
Drain spacing (m) (SPACE)	9 [c]		
Transmission coefficient at bottom boundary (h^{-1}) (BGRAD)	0.0 [c]		

[a] derived from measured values or known.
[c] default or assumed value.
[d] derived from pedo-transfer function.

Table C.16. Scenario-specific soil and site parameters for D6

Horizon designation	Ap	Bw	Bw(g)	BCg
Depth (cm)	0-30	30-60	60-90	90-165
BASIC PROPERTIES				
Sand (%)	36	37	29	27
Silt (%)	34	34	34	27
Clay (%)	30	29	37	46
Texture (FAO, 1990; USDA, 1999)	Clay loam	Clay loam	Clay loam	Clay
Organic carbon (%)	1.2	0.6	0.4	0.3
Bulk density (g/cm^3) (GAMMA)	1.43 [d]	1.37 [d]	1.55 [d]	1.59 [d]
PH	7.5	7.5	7.5	7.5
Structure (FAO, 1990)	Moderate medium subangular blocky	Moderate medium subangular blocky	Moderate coarse prismatic	Weak medium angular blocky
HYDRAULIC PROPERTIES				
Saturated water content (%) (TPORV)	45 [d]	48 [d]	41 [d]	40 [d]
Wilting point (%) (WILT)	23 [d]	22 [d]	24 [d]	25 [d]
Residual water content (%) (RESID)	0 [d]	0 [d]	0 [d]	0 [d]
Water content at macro/micropore boundary (%) (XMPOR)	42 [d]	43 [d]	39 [d]	39 [d]
Water tension at macro/micropore boundary (cm) (CTEN)	12 [d]	12 [d]	14 [d]	16 [d]
van Genuchten's N (N)	1.086 [d]	1.090 [d]	1.071 [d]	1.063 [d]
Tortuosity factor micropores (ZM)	0.5 [d]	0.5 [d]	0.5 [d]	0.5 [d]
Tortuosity factor macropores (ZN)	3 [d]	3 [d]	2 [d]	2 [d]
Effective diffusion pathlength (mm) (ASCALE)	50 [d]	20 [d]	100 [d]	10 [d]
Saturated hydraulic conductivity (mm/hr) (KSATMIN)	100 [d]	40 [d]	10 [d]	5 [d]
Conductivity at macro/micropore boundary (mm/hr) (KSM)	0.2 [d]	0.2 [d]	0.2 [d]	0.1 [d]
FIELD DRAINAGE				
Drain depth (m) (DRAINDEP)	1.0 [c]			
Drain spacing (m) (SPACE)	8.0 [c]			
Transmission coefficient at bottom boundary (h^{-1}) (BGRAD)	3.0×10^{-6} [c]			

[c] default or assumed value.
[d] derived from pedo-transfer function.