TITLE

Comparison of WISPE Scenarios to FOCUS SWASH Scenarios

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COMPLETION DATE

February 25, 2021

PERFORMING LABORATORY

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LABORATORY STUDY IDENTIFICATION

Waterborne Environmental Report Number: 667.01

SPONSOR

Norwegian Institute of Bioeconomy Research (NIBIO)

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1.0 EXECUTIVE SUMMARY

The objective of this study was to compare the surface water results from simulations with Norwegian scenarios in WISPE with simulations from FOCUS SWASH scenarios. WISPE includes the Pesticide Root Zone Model (PRZM) to simulate runoff, erosion, and pesticide mass fluxes in a field and the Exposure Analysis Modeling System (EXAMS) to simulate the dissipation in a waterbody. SWASH also uses the PRZM model but TOXSWA (TOXic substances in Surface Waters) is used to simulate the pesticide concentrations in a waterbody. The simulations were made with a generic chemical with varying the adsorption coefficient (10 L/kg, 1000 L/kg, and 10000 L/kg). A single pre-emergent application of 0.1 kg/ha with no drift and 100% efficiency was modeled using the winter cereal and potato scenarios. Other comparisons were also part of this study such as predicted environmental concentrations (PECs) from EXAMS versus TOXSWA and the impact of Norway weather compared to EU weather.

Overall, the WISPE PECs were within the range of the SWASH PECs. An analysis of EXAMS versus TOXSWA showed that the pond values matched better than the stream values. This could be attributed to EXAMS having constant volume and only receiving mass without changing the flow of the waterbody causing higher PECs than in TOXSWA which has variable flow and volume. SWASH scenarios with the Norway weather tended to produce lower PECs. However, it should be noted that the simulations with the Norway weather kept the SWASH application date that was determined by the Pesticide Application Timing (PAT) calculator within SWASH based on the EU scenario rainfall. PAT was not available to use with the Norway weather. Additionally, when determining sensitivity, it is better to isolate the impact of one change at a time (i.e., different weather).

2.0 INTRODUCTION

The World Integrated System for Pesticide Exposure (WISPE) model was originally developed by Waterborne Environmental, Inc. for the Norwegian Food Safety Authority (NFSA) in a project cooperation with Professor Ole Martin Eklo and Randi Bolli at Bioforsk (since 2015 NIBIO) and Roger Holten (at the Norwegian Food Safety Authority at the time). WISPE is a computer modelling tool that predicts pesticide exposure in surface water and groundwater associated with pesticide use in Norwegian conditions. WISPE includes the Pesticide Root Zone Model (PRZM) to simulate runoff, erosion, and pesticide mass fluxes in a field and the Exposure Analysis Modeling System (EXAMS) to simulate the dissipation in a waterbody. For surface water, WISPE results consist of predicted environmental concentrations (PECs) in the water column and the benthic zone at different exposure durations. For groundwater, PECs at a certain depth are calculated by PRZM and the ADAM model is included that predicts the exposure in an aquifer. Norwegian crop scenarios were developed to simulate the most common crops in Norway using Norwegian weather, soils and crop timing (planting, emergence, harvest dates). This report focuses on two of the surface water crop scenarios (winter cereals and potatoes).

Currently, NFSA is using the full set of FOCUS surface water scenarios in FOCUS SWASH (SWASH) for the registration of pesticides to the Norwegian market instead of WISPE. However, the EU scenarios for surface runoff may not be relevant for Norwegian conditions. Therefore, the objective of this study was to compare the surface water results from simulations with Norwegian scenarios in WISPE with simulations from SWASH EU scenarios and to document the results.

3.0 MODELS

3.1 Introduction

The WISPE framework includes the Pesticide Root Zone Model (PRZM) which is a model to generate runoff, erosion and chemical movement in runoff and erosion from a field. The mass chemical loadings generated from PRZM are transferred into the Exposure Analysis Modelling System (EXAMS) to predict environmental concentrations (PECs). WISPE includes standard crop scenarios that were developed specifically for Norway using Norwegian soils, weather, and cropping practices. The FOCUS SWASH (Surface Water Scenarios Help) tool also utilizes the PRZM model but it is linked to the TOXSWA (TOXic substances in Surface Waters) model to calculate PECs in standard water bodies using standard EU crop scenarios.

3.2 PRZM model

PRZM was developed by the USEPA for use in regulatory risk assessment (Carousel, et al., 2005). The version of the PRZM in WISPE and SWASH is an updated version: winPRZM (version 4.5.2, 2013). WinPRZM includes non-linear Freundlich type sorption as well as temperature/moisture dependent degradation in the soil. PRZM is a dynamic, compartmental model for use in simulating water and chemical movement in unsaturated soil systems within and below the plant root zone. The model simulates time-varying hydrologic behavior on a daily time step, including physical processes of runoff, infiltration, erosion, and evapotranspiration. The chemical transport component of PRZM calculates pesticide uptake by plants, surface runoff, erosion, decay, vertical movement, foliar loss, dispersion and retardation. PRZM includes the ability to simulate metabolites, irrigation, and hydraulic transport below the root zone.

Each PRZM modelling scenario represents a unique combination of climatic conditions, crop specific management practices, soil specific properties, site specific hydrology, and pesticide specific application and dissipation processes. Each PRZM simulation is conducted using multiple years of daily rainfall data to cover year-to-year variability in runoff. Daily edge-of-field loadings of pesticides dissolved in runoff waters and sorbed to sediment, as predicted by PRZM, are discharged into a standard waterbody.

3.3 EXAMS model

To calculate PECs in surface water bodies in the WISPE model, the Exposure Analysis Modelling System, EXAMS (Burns, 2004) is used in conjunction with PRZM. EXAMS is also a numerical process model, but it simulates the processes that occur in the waterbody rather than on the agricultural field. EXAMS receives the runoff and erosion (off-target mass loadings) and spray drift loading from PRZM transfer files and estimates the concentration in the waterbody on a day-to-day time step.

EXAMS can be used to assess the fate, exposure, and persistence of synthetic organic chemicals in aquatic ecosystems. It accounts for volatilization, sorption, hydrolysis, biodegradation, and photolysis of the pesticide. Since EXAMS is a steady-state model, the water bodies are modelled as having constant volume. Multiple-year (26 years in WISPE) pesticide time-weighted average concentrations are calculated from the simulations as the maximum annual 24-hour, maximum annual 96-hour average, maximum annual 21-day average, maximum annual 60-day average, maximum annual 90-day average and annual average. Peak concentrations are also calculated for each year. The version of EXAMS used in WISPE is version 2.98.04, April 2005.

3.4 TOXSWA

SWASH uses the TOXSWA model to simulate water and chemical fluxes from surface runoff and erosion from PRZM. TOXSWA also receives the spray drift loadings from PRZM transfer files. The model is able to simulate varying flows and water depths. Therefore, the volume and depth in the waterbody changes over time. Four processes are considered in TOXSWA: transport, transformation, sorption, and volatilization (Beltman, et. al., 2018). Pesticides in the water layer are transported by advection and dispersion. Diffusion is included in the sediment layer. In the SWASH surface water scenarios, transport across the water-sediment interface only takes place by diffusion. Sorption to suspended sediments, sediment and macrophytes is simulated.

The TOXSWA model performs on an hourly time step for a one-year simulation. PECs are generated for a global maximum, 1-day, 2-day, 3-day, 4-day, 7-day, 14-day, 21-day, 28-day, 42-day, 50-day and 100-day. Maximum time-weighted average concentrations are also calculated for these same duration periods.

4.0 MODEL SIMULATIONS

4.1 Introduction

To compare the WISPE and SWASH model results, two standard crop scenarios were selected from WISPE and SWASH (winter cereals and potatoes). A generic chemical was created with varying Kocs (10, 1000, and 10000 L/kg) to test variation in the model results with respect to adsorption properties of chemicals. Example WISPE PRZM and EXAMS input files for a Koc of 10 L/kg are shown in Appendix A. This appendix shows an example of a pond and a stream environment for EXAMS. Appendix B has examples of the PRZM input files for a Koc of 10 L/kg for SWASH and includes example TOXSWA input files for a pond and stream.

4.2 Physical and Chemical Properties

A generic chemical was created for the model simulations. To determine if there is a difference in the variation of concentrations between the models with adsorption, three Koc were run: 10, 1000, and 10000 L/kg. The physical and chemical properties used in the modeling are shown in Table 1. The soil metabolism half-life, aerobic aquatic metabolism half-life and anaerobic aquatic half-life were assumed to be 100 days with stable hydrolysis and aquatic photolysis.

Table 1 Chemical Properties and Environmental Fate Parameters

Parameter	Value
Molecular weight	250 g/mol
Vapor pressure (25 °C)	1.0 x 10^{-12} torr
Aqueous solubility (25°C)	30.0 mg/L
Hydrolysis half-life (25°C)	Stable
Aqueous photolysis half-life (25°C)	Stable
Aerobic soil metabolism half-life (25°C)	100 days
Aerobic aquatic metabolism half-life (20°C)	100 days
Anaerobic aquatic metabolism half-life (25°C)	100 days
Partition coefficients (Koc)	10, 1000, and 10000 L/kg
1/n	0.9

4.3 Crop Scenarios and Pesticide Use Pattern

Winter cereal and potato standard crop scenarios from WISPE and SWASH were selected for the comparison analysis. A single application of 0.1 kg/ha as a pre-emergent with no drift

(0%) and 100% efficiency was simulated. Table 2 lists the crops and timing of application. The WISPE model had application one day prior to emergence, the same date for all 26 years. SWASH uses PAT (Pesticide Application Timing calculator) to determine the application date for the 20-year PRZM run. PAT selects an application date that has at least 10 mm of precipitation within ten days following application. However, only one year of PRZM output data is passed onto the TOXSWA model. The table shows the application range and the date selected for the one-year TOXSWA simulation.

The WISPE model included a new (2020) scenario for winter cereals (Heia) that is modeled with a 3-ha field and a 100-m hydraulic length. However, for this analysis, the field size was set to the actual field trial plots since the other scenarios use the field plot size. Therefore, the WISPE winter cereal crop scenario for Heia was changed from a 3-ha field to a 0.024-ha field plot (24 m x 10 m). The hydraulic length was changed from 100 m to 24.5 m.

Table 2 Crop Scenarios for Aquatic Exposure Modelling

Model	Crop Scenario	Application Date[1]	Application Range[2]
WISPE	Bjornebekk – Winter Cereals	14-Sept	--
WISPE	Syverud – Winter Cereals	14-Sept	--
WISPE	Heia – Winter Cereals	14-Sept	--
WISPE	Bjornebekk – Potatoes	9-June	--
WISPE	Syverud - Potatoes	9-June	--
SWASH	Weiherbach, Germany-R1 – Winter Cereals	12-Oct-78	12-Oct to 11-Nov
SWASH	Bologna, Italy–R3 – Winter Cereals	15-Nov-80	31-Oct to 30-Nov
SWASH	Roujan, France–R4 – Winter Cereals	18-Oct-79	10-Oct to 9-Nov
SWASH	Weiherbach, Germany-R1 – Potatoes	26-Apr-84	4-Apr to 4-May
SWASH	Porto, Portugal–R2 – Potatoes	6-Mar-78	12-Feb to 14-Mar
SWASH	Bologna, Italy–R3 - Potatoes	10-Mar-80	10-Mar to 9-Apr

[1]WISPE uses the same date for all 26 years, SWASH date is the year used in TOXSWA.
[2]Application date range used in SWASH, not applicable to WISPE.

5.0 WISPE – SWASH COMPARISON

5.1 Mass Loadings

The winter cereal and potato scenarios were simulated in WISPE and in SWASH. In WISPE, PRZM ran a 26-year simulation and the PRZM model was run for 20 years in SWASH. The annual total runoff mass (RFLX) and erosion mass (EFLX) were calculated for each year and also the entire simulation. As indicated in Table 2, the WISPE PRZM simulations had the same application date for every year. The SWASH PRZM simulations had different application dates each year. Table 3 summarizes the minimum and maximum annual total mass loadings (RFLX+EFLX) for each crop scenario and Koc. In general, the annual mass loadings are within the same range when comparing WISPE to SWASH. The table also shows how the total mass (minimum and maximum) change with the varied Koc value. Appendix C, Appendix D, and Appendix E present the annual mass loads from the WISPE scenarios with a Koc of 10 L/kg, 1000 L/kg, and 10000 L/kg, respectively. Appendix F thru Appendix H present the annual mass loadings from SWASH for the three Koc values (10, 1000, 10000 L/kg), respectively. The appendices show the runoff mass and erosion mass separately for each year for each scenario. As expected, as the Koc increases, the mass in the dissolved runoff decreases and the mass in the eroded sediment increases. The mass is presented in kg/ha to normalize the comparison. The scenarios have different field areas and the mass is multiplied by the field area for a total mass into the waterbody.

Table 3 Summary of Minimum and Maximum Annual Total Loadings

		Total Annual Mass, kg/ha					
		koc=10		koc=1000		koc=10000	
Model	Scenario	min	max	min	Max	min	max
WISPE	Bjornebekk_WCereal_SW	9.77E-06	2.70E-03	5.71E-04	3.07E-03	6.64E-04	2.53E-03
WISPE	Syverud_WCereal_SW	5.86E-05	3.26E-03	6.93E-04	3.08E-03	9.77E-04	4.02E-03
WISPE	Heia_Wcereal_SW	3.12E-05	2.83E-03	5.82E-04	2.77E-03	1.29E-04	7.90E-04
SWASH	Weiherbach, Germany -R1_WC	7.82E-09	1.10E-03	7.30E-05	6.95E-04	1.80E-05	7.28E-04
SWASH	Bologna, Italy – R3_WC	4.48E-06	4.64E-03	1.06E-04	2.67E-03	3.50E-05	1.70E-03
SWASH	Roujan, France – R4_WC	1.56E-06	8.82E-03	3.56E-04	5.45E-03	1.07E-04	2.44E-03
WISPE	Bjornebekk_Potatoes_SW	3.11E-06	4.19E-03	6.67E-04	3.21E-03	5.94E-04	3.31E-03
WISPE	Syverud_Potatoes_SW	4.54E-06	5.02E-03	6.31E-04	3.61E-03	9.65E-04	3.97E-03
SWASH	Weiherbach, Germany -R1_Potatos	9.21E-09	3.82E-03	1.95E-04	2.65E-03	2.22E-04	2.07E-03
SWASH	Porto, Portugal – R2_Potatoes	2.25E-07	2.29E-03	1.72E-04	1.96E-03	1.97E-04	2.12E-03
SWASH	Bologna, Italy – R3_Potatoes	6.82E-06	5.53E-03	3.20E-04	2.41E-03	2.58E-04	1.66E-03

5.2 Predicted Environmental Concentrations

A comparison of the PECs running WISPE versus SWASH as reported per the model output (90^{th} percentile time-weighted average [TWA] exposure duration concentrations for a WISPE 26-year run and one-year TWA exposure concentrations for SWASH). SWASH also reports the global maximum concentration; so for comparison purposes, a maximum overall simulation peak concentration from the 26 year simulation is provided from the WISPE runs. This value isn't typically included in the PEC evaluation of risk in WISPE. Also, only pond and stream water bodies are modeled in SWASH using PRZM for runoff/erosion. The ditch waterbody in SWASH is only used for MACRO drainage simulations. Therefore, Table 4 shows the PECs in the water column for the two models for winter cereal and potato crop scenarios. The table highlights the water bodies and crops. For example, all the winter cereal with a pond waterbody are highlighted in blue so it is easier to compare “like” scenarios between WISPE and SWASH. It can be seen that the PECs from WISPE compared to SWASH that they are within the same range for Koc=1000 for pond and stream environments. The WISPE winter cereal and potato pond PECs are higher than the SWASH PECs for Koc=10 L/kg but fall in between range of PECs for the streams. For Koc=10000 L/kg, the PECs for WISPE were within the range of SWASH PECs with the exception of potato stream PECs which were higher for WISPE. The table below only shows the maximum, 1-day, 4-day and 21-day PECs. Appendix I shows all the exposure duration PECs for WISPE and Appendix J shows all the exposure duration PECs for SWASH as would be reported in a risk assessment.

Table 4 includes the field size for the WISPE scenarios and the SWASH scenarios. The waterbody surface areas are the same (pond = 0.09 ha, stream = 0.01 ha). The mass loading in kg/ha is multiplied by field area for the total mass loading transported into the waterbody. The field to waterbody surface areas ratios ranged from 0.02:0.09 to 0.04:09 for WISPE pond scenarios. The field to waterbody surface area ratio for SWASH pond scenarios if 0.45:0.09. For the stream scenarios in WISPE, the field to waterbody surface area ratio ranges from 0.02:0.01 to 0.04:0.01. The ratio is SWASH is 1:0.01 for streams.

Table 4 WISPE and SWASH PECs for winter cereal and potato crop scenarios

Koc	WISPE Scenario	Field area, ha	Crop	Water-body	26-Yr Max	90th %ile TWA PECs, ug/L 1 day	4 days	21 days	SWASH Scenario	Field area, ha	Global Max, ug/L	TWA PECs, ug/L 1 day	4 days	21 days
10	Bjornebekk_WC	0.02	Winter cereal	Pond	0.073	0.065	0.064	0.063	Weiherbach-R1	0.45	0.018	0.017	0.017	0.016
10	Syverud_WC	0.04	Winter cereal	Pond	0.180	0.161	0.161	0.158						
10	Heia_WC	0.024	Winter cereal	Pond	0.099	0.087	0.086	0.085						
10	Bjornebekk_WC	0.02	Winter cereal	Stream	1.800	0.526	0.173	0.037	Weiherbach-R1	1	0.808	0.320	0.080	0.017
10	Syverud_WC	0.04	Winter cereal	Stream	3.570	1.458	0.441	0.089	Bologna–R3	1	7.234	3.783	1.217	0.232
10	Heia_WC	0.024	Winter cereal	Stream	2.160	0.806	0.252	0.051	Roujan–R4	1	6.735	2.887	0.737	0.141
10	Bjornebekk_P	0.02	Potatoes	Pond	0.096	0.065	0.064	0.063	Weiherbach-R1	0.45	0.007	0.007	0.007	0.007
10	Syverud_P	0.04	Potatoes	Pond	0.231	0.137	0.137	0.134						
10	Bjornebekk_P	0.02	Potatoes	Stream	2.490	0.631	0.161	0.031	Weiherbach-R1	1	1.318	0.568	0.142	0.028
10	Syverud_P	0.04	Potatoes	Stream	5.350	1.154	0.312	0.062	Porto–R2	1	6.266	1.644	0.537	0.102
10									Bologna-R3	1	8.711	3.592	1.161	0.227
1000	Bjornebekk_WC	0.02	Winter cereal	Pond	0.048	0.040	0.039	0.036	Weiherbach-R1	0.45	0.068	0.067	0.065	0.057
1000	Syverud_WC	0.04	Winter cereal	Pond	0.085	0.075	0.073	0.067						
1000	Heia_WC	0.024	Winter cereal	Pond	0.049	0.041	0.040	0.037						
1000	Bjornebekk_WC	0.02	Winter cereal	Stream	0.396	0.196	0.077	0.029	Weiherbach-R1	1	0.710	0.280	0.120	0.023
1000	Syverud_WC	0.04	Winter cereal	Stream	0.568	0.281	0.121	0.045	Bologna–R3	1	0.875	0.714	0.413	0.097
1000	Heia_WC	0.024	Winter cereal	Stream	0.352	0.173	0.073	0.026	Roujan–R4	1	1.210	0.836	0.490	0.119
1000	Bjornebekk_P	0.02	Potatoes	Pond	0.048	0.032	0.031	0.029	Weiherbach-R1	0.45	0.055	0.055	0.053	0.047
1000	Syverud_P	0.04	Potatoes	Pond	0.101	0.073	0.072	0.067						
1000	Bjornebekk_P	0.02	Potatoes	Stream	0.454	0.183	0.054	0.017	Weiherbach-R1	1	0.543	0.281	0.071	0.038
1000	Syverud_P	0.04	Potatoes	Stream	0.842	0.310	0.100	0.036	Porto–R2	1	0.213	0.126	0.056	0.023
1000									Bologna-R3	1	0.880	0.437	0.200	0.085
10000	Bjornebekk_WC	0.02	Winter cereal	Pond	0.011	0.008	0.006	0.005	Weiherbach-R1	0.45	0.014	0.014	0.013	0.010
10000	Syverud_WC	0.04	Winter cereal	Pond	0.027	0.020	0.017	0.014						
10000	Heia_WC	0.024	Winter cereal	Pond	0.005	0.003	0.003	0.002						
10000	Bjornebekk_WC	0.02	Winter cereal	Stream	0.143	0.070	0.033	0.012	Weiherbach-R1	1	0.089	0.051	0.026	0.005
10000	Syverud_WC	0.04	Winter cereal	Stream	0.383	0.163	0.076	0.029	Bologna–R3	1	0.079	0.071	0.042	0.012
10000	Heia_WC	0.024	Winter cereal	Stream	0.074	0.034	0.014	0.005	Roujan–R4	1	0.129	0.129	0.079	0.020
10000	Bjornebekk_P	0.02	Potatoes	Pond	0.018	0.013	0.010	0.007	Weiherbach-R1	0.45	0.013	0.013	0.013	0.011
10000	Syverud_P	0.04	Potatoes	Pond	0.044	0.030	0.025	0.018						
10000	Bjornebekk_P	0.02	Potatoes	Stream	0.311	0.143	0.048	0.017	Weiherbach-R1	1	0.077	0.054	0.014	0.006
10000	Syverud_P	0.04	Potatoes	Stream	0.751	0.373	0.125	0.044	Porto–R2	1	0.020	0.016	0.008	0.003
10000									Bologna-R3	1	0.080	0.062	0.021	0.009

6.0 SWASH PRZM/TOXSWA VERSUS PRZM/EXAMS COMPARISON

6.1 Mass Loadings

The PRZM file generated in SWASH was run with the PRZM and EXAMS versions in WISPE. In SWASH, PRZM simulations are 20 years but TOXSWA is only one year. The mass loadings from the PRZM .zts file from SWASH was compared to the PRZM .zts file running the SWASH scenarios with PRZM and EXAMS (WISPE versions). Appendix K thru Appendix M shows the total loads from runoff and erosion for each year for Koc of 10, 1000, and 10000 L/kg, respectively. If compared to Appendix F thru Appendix H, the mass loadings are almost identical. However, there are a couple of scenarios that have a slightly different mass for the first year.

The full 20-year simulation for SWASH crop scenarios was run with PRZM/EXAMS. Then EXAMS was rerun with the 2 years that matched the TOXSWA simulation. EXAMS has mass transfer files that contain runoff and erosion mass that may have occurred from January 1 to December 31. Mass loads in the transfer files were removed if they occurred before or after the TOXSWA run. For example, the Weiherbach, Germany – R1 winter cereals TOXSWA file started with loads on 1-October-1978 and ended on 30-September-1979. If the EXAMS mass transfer file for 1978 had mass runoff or erosion loads before 1-October-1978, the loads were removed. The 1979 mass transfer file was adjusted to remove any runoff or erosion loads after 30-September.

6.2 Predicted Environmental Concentrations

The 20-year maximum PEC and the 90th percentile PECs were compared to the 1-year TOXSWA PECs in Table 5 . SWASH only reports one year of PECs but the 20-year EXAMS simulation reports PECs for all 20 years and the 90th percentile PEC is used in risk assessments. The table shows the comparions of PECs that would be reported in a risk assessment for exposure durations. The PRZM/EXAMS peak PEC is the instantaneous concentration for the 90th percentile year and the 20-year maximum PEC is the highest peak PEC over the 20-year simulation. The SWASH model reports a global maximum PEC for the one-year simulation. The PRZM/EXAMS PECs are higher than the SWASH PECs especially the stream waterbody. This is not surprising since the year that is selected for the TOXSWA simulation is not necessarily the year producing the highest maximum annual PECs over 20 years. Appendix N has all the exposure duration PECs for each scenario for all three Kocs.

Table 5 Comparison of SWASH PECs with 20-year PRZM/EXAMS PECs

Koc	FOCUS Scenario	Crop	Water-body	SWASH Global Max, ug/L	SWASH Time-weighted Average PECs, ug/L 1 day	4 days	21 days	100 days	PRZM/EXAMS 20-Yr Max, ug/L	PRZM/EXAMS 90th% Time-weighted Average PECs, ug/L Peak	1 day	4 day	21 days	90 days
10	WG -R1	W cereal	Pond	0.0176	0.0175	0.0172	0.0158	0.0115	0.5770	0.5682	0.5672	0.5644	0.5521	0.4566
10	WG-R1	W cereal	Stream	0.8075	0.3196	0.0800	0.0167	0.0036	36.7000	31.9800	16.1700	4.2690	0.8234	0.1918
10	BI – R3	W cereal	Stream	7.2340	3.7830	1.2170	0.2321	0.0488	154.0000	131.6000	66.5500	17.5700	3.3570	0.7832
10	RF–R4	W cereal	Stream	6.7350	2.8870	0.7365	0.1407	0.0296	294.0000	127.9000	64.7200	17.2900	3.2870	0.7681
10	WG-R1	Potatoes	Pond	0.0073	0.0072	0.0071	0.0066	0.0044	1.9300	0.8902	0.8892	0.8855	0.8708	0.8245
10	WG-R1	Potatoes	Stream	1.3180	0.5684	0.1422	0.0277	0.0058	110.0000	43.0400	21.7500	7.0010	1.3340	0.3119
10	PP–R2	Potatoes	Stream	6.2660	1.6440	0.5365	0.1022	0.0215	65.2000	52.6400	26.6700	8.0270	1.6760	0.3909
10	BI–R3	Potatoes	Stream	8.7110	3.5920	1.1610	0.2273	0.0478	176.0000	95.6200	48.3000	13.2800	2.5370	0.5919
1000	WG-1	W cereal	Pond	0.0685	0.0675	0.0651	0.0572	0.0452	0.2910	0.2631	0.2591	0.2482	0.2121	0.1612
1000	WG-R1	W cereal	Stream	0.7097	0.2801	0.1198	0.0231	0.0102	12.8000	11.5200	5.8280	1.7350	0.4004	0.1040
1000	BI – R3	W cereal	Stream	0.8745	0.7140	0.4128	0.0972	0.0264	42.9000	42.0700	21.2800	6.0790	1.3630	0.3503
1000	RF–R4	W cereal	Stream	1.2100	0.8362	0.4904	0.1186	0.0282	135.0000	111.2000	56.2000	14.4400	2.9480	0.7450
1000	WG-R1	Potatoes	Pond	0.0553	0.0547	0.0532	0.0467	0.0367	1.1000	0.5427	0.5343	0.5128	0.4306	0.3520
1000	WG-R1	Potatoes	Stream	0.5433	0.2813	0.0706	0.0377	0.0140	33.0000	17.1200	8.6660	3.8150	0.7683	0.2345
1000	PP–R2	Potatoes	Stream	0.2132	0.1260	0.0564	0.0229	0.0081	32.3000	21.1800	10.7800	2.9670	1.0340	0.2919
1000	BI–R3	Potatoes	Stream	0.8800	0.4374	0.1998	0.0854	0.0296	35.3000	32.3600	16.3300	5.2840	1.0790	0.3001
10000	WG-1	W cereal	Pond	0.0141	0.0138	0.0131	0.0103	0.0071	0.1790	0.0771	0.0677	0.0488	0.0279	0.0200
10000	WG-R1	W cereal	Stream	0.0887	0.0511	0.0260	0.0050	0.0019	7.3200	4.4720	2.2650	0.6609	0.1885	0.0644
10000	BI – R3	W cereal	Stream	0.0790	0.0715	0.0416	0.0120	0.0045	18.6000	17.1400	8.6760	2.5560	0.6442	0.1773
10000	RF–R4	W cereal	Stream	0.1293	0.1293	0.0787	0.0200	0.0057	33.4000	27.6300	13.9700	3.9520	1.0450	0.3181
10000	WG-R1	Potatoes	Pond	0.0134	0.0133	0.0129	0.0114	0.0095	0.3500	0.1730	0.1517	0.1153	0.0597	0.0462
10000	WG-R1	Potatoes	Stream	0.0771	0.0542	0.0137	0.0060	0.0027	13.6000	7.2290	3.6590	1.6020	0.3743	0.1344
10000	PP–R2	Potatoes	Stream	0.0196	0.0158	0.0076	0.0030	0.0013	23.6000	16.0800	8.1780	2.2930	0.8834	0.2588
10000	BI–R3	Potatoes	Stream	0.0802	0.0617	0.0211	0.0088	0.0040	14.2000	12.7300	6.4240	2.0130	0.4748	0.1462

WG = Weiherbach, Germany; BI = Bologna, Italy; RF = Roujan, France; PP = Porto, Portugal

Table 6 presents the EXAMS TWA PECs for a 1-year run comparison with the TOXSWA TWA PECs for 1-day,4-day, and 21-day exposure durations (Appendix O shows all exposure durations for EXAMS). The table also shows the date of the maximum PEC. The maximum PECs occurred on the same dates for the Koc=10 L/kg simulations but did not always match for the other two Kocs. When looking at the table, it can be seen that the pond PECs are comparable. For example, with Koc of 1000 L/kg for potatoes (Weiherbach, Germany-R1 pond) the TOXSWA global max PEC is 0.055 µg/L, and the EXAMS peak PEC is 0.052 µg/L. However, the stream PECs in EXAMS tend to be higher. For example,for potatoes (Weiherbach, Germany- R1 stream) with Koc of 1000 L/kg, the TOXSWA global max is 0.543 µg/L while the EXAMS peak is 1.82 µg/L. Another way to look at the results is calculating multiplier factors (MFs) to express the potential magnitude of difference in the EXAMS concentration compared to the TOXSWA concentration. The concept is simple: the EXAMS PEC is compared to the corresponding value for the TOXSWA scenario and exposure duration. The resulting multiplier effect is determined as shown in Equation 1. An MF =1 means that the PECs match. An MF >1 means that the EXAMS PEC is higher than the TOXSWA PEC and an MF <1 means that the EXAMS PEC is lower than the TOXSWA PEC.

$$Multiplier\ factor\ (MF)\ \text{for PEC} = \frac{EXAMS\ PEC}{TOXSWA\ PEC}$$

Equation 1: Derivation of the multiplier factor.

Looking at the MFs in Table 7, it is easier to see the magnitude of EXAMS PECs higher or lower than the SWASH PECs. It shows that the pond PECs match fairly well for all crops and Koc values (0.9 to 1.5). The Bologna, Italy-R3 winter cereal stream scenarios produced the highest variation (e.g., the EXAMS PEC for the Koc=10000 L/kg was 168.4 times higher). The EXAMS PECs for the potato stream scenarios for Koc=10 L/kg showed lower or matching PECs compared to SWASH.

A reason for the higher EXAMS stream scenarios is that the TOXSWA model has varying volume and flow. Therefore, a big rainfall event causing a high amount of runoff/erosion mass can be diluted by the amount of runoff water added to the stream and higher flow. The EXAMS stream has a baseflow but the volume and flow remain constant but still has the same amount of mass coming in as the TOXSWA run. This can cause the the EXAMS PECs to be higher because only the mass is input into the waterbody and it does not include the additional runoff water which would reduce the concentration.

Table 6 1-Year Simulation Comparison of TOXSWA and EXAMS PECs

					TOXSWA results					EXAMS Results				
							TWA PECs, ug/L					TWA PECs, ug/L		
Koc	SWASH scenario	Crop	Water-body	Year	Max day	Global Max, ug/L	1 day	4 days	21 days	Max day	Peak, ug/L	1 day	4 days	21 days
10	WG-R1	W cereal	Pond	1978	25-Oct-78	0.0176	0.0175	0.0172	0.0158	25-Oct-78	0.0176	0.0176	0.0175	0.0171
10	WG-R1	W cereal	Stream	1978	25-Oct-78	0.8075	0.3196	0.0800	0.0167	25-Oct-78	1.1700	0.5930	0.1500	0.0286
10	BI-R3	W cereal	Stream	1980	26-Nov-80	7.2340	3.7830	1.2170	0.2321	26-Nov-80	73.8000	37.3000	14.6000	2.7900
10	RF-R4	W cereal	Stream	1979	22-Oct-79	6.7350	2.8870	0.7365	0.1407	22-Oct-79	20.7000	10.4000	2.7200	0.5260
10	WG-R1	Potatoes	Pond	1984	7-May-84	0.0073	0.0072	0.0071	0.0066	7-May-84	0.0073	0.0073	0.0073	0.0072
10	WG-R1	Potatoes	Stream	1984	7-May-84	1.3180	0.5684	0.1422	0.0277	7-May-84	0.4880	0.2470	0.0624	0.0124
10	PP-R2	Potatoes	Stream	1977	14-Mar-78	6.2660	1.6440	0.5365	0.1022	14-Mar-78	3.6300	1.8400	0.6430	0.1230
10	BI-R3	Potatoes	Stream	1980	15-Mar-80	8.7110	3.5920	1.1610	0.2273	15-Mar-80	3.9900	2.0200	0.8470	0.1900
1000	WG-R1	W cereal	Pond	1978	31-Dec-78	0.0685	0.0675	0.0651	0.0572	31-Dec-78	0.0704	0.0691	0.0636	0.0515
1000	WG-R1	W cereal	Stream	1978	25-Oct-78	0.7097	0.2801	0.1198	0.0231	31-Dec-78	3.2200	1.6200	0.5240	0.0999
1000	BI-R3	W cereal	Stream	1980	26-Nov-80	0.8745	0.7140	0.4128	0.0972	27-Nov-80	33.8000	17.1000	6.1200	1.2300
1000	RF-R4	W cereal	Stream	1979	22-Oct-79	1.2100	0.8362	0.4904	0.1186	26-Oct-79	31.8000	16.1000	7.8300	1.6200
1000	WG-R1	Potatoes	Pond	1984	21-Jun-84	0.0553	0.0547	0.0532	0.0467	30-May-84	0.0519	0.0509	0.0483	0.0427
1000	WG-R1	Potatoes	Stream	1984	20-May-84	0.5433	0.2813	0.0706	0.0377	30-May-84	1.8200	0.9210	0.2350	0.0974
1000	PP-R2	Potatoes	Stream	1977	14-Mar-78	0.2132	0.1260	0.0564	0.0229	29-Apr-78	1.8400	0.9270	0.2780	0.1130
1000	BI-R3	Potatoes	Stream	1980	15-Mar-80	0.8800	0.4374	0.1998	0.0854	22-Mar-80	4.4100	2.2300	0.5870	0.1610
10000	WG-R1	W cereal	Pond	1978	31-Dec-78	0.0141	0.0138	0.0131	0.0103	31-Dec-78	0.0187	0.0160	0.0079	0.0036
10000	WG-R1	W cereal	Stream	1978	25-Oct-78	0.0887	0.0511	0.0260	0.0050	31-Dec-78	1.0600	0.5370	0.1670	0.0320
10000	BI-R3	W cereal	Stream	1980	26-Nov-80	0.0790	0.0715	0.0416	0.0120	27-Nov-80	13.3000	6.7500	2.3400	0.5520
10000	RF-R4	W cereal	Stream	1979	17-Oct-79	0.1293	0.1293	0.0787	0.0200	26-Oct-79	8.9500	4.5200	2.3300	0.5330
10000	WG-R1	Potatoes	Pond	1984	2-Feb-85	0.0134	0.0133	0.0129	0.0114	22-Nov-84	0.0199	0.0176	0.0150	0.0092
10000	WG-R1	Potatoes	Stream	1984	20-May-84	0.0771	0.0542	0.0137	0.0060	22-Nov-84	1.0400	0.5270	0.1750	0.0449
10000	PP-R2	Potatoes	Stream	1977	16-Mar-78	0.0196	0.0158	0.0076	0.0030	7-Dec-77	0.8780	0.4490	0.1760	0.0817
10000	BI-R3	Potatoes	Stream	1980	16-Mar-80	0.0802	0.0617	0.0211	0.0088	22-Mar-80	1.4000	0.7080	0.1940	0.0554

WG = Weiherbach, Germany; BI = Bologna, Italy; RF = Roujan, France; PP = Porto, Portugal. TWA = Time-weighted Average

Table 7 Multiplier Factors Comparing the 1-Year Simulations

Koc	SWASH scenario	Crop	Waterbody	Multiplier Factor			
				Maximum	1 day	4 day	21 day
10	WG-R1	WC	Pond	1.0	1.0	1.0	1.1
10	WG-R1	WC	Stream	1.4	1.9	1.9	1.7
10	BI-R3	WC	Stream	10.2	9.9	12.0	12.0
10	RF-R4	WC	Stream	3.1	3.6	3.7	3.7
10	WG-R1	PO	Pond	1.0	1.0	1.0	1.1
10	WG-R1	PO	Stream	0.4	0.4	0.4	0.4
10	PP-R2	PO	Stream	0.6	1.1	1.2	1.2
10	BI-R3	PO	Stream	0.5	0.6	0.7	0.8
1000	WG-R1	WC	Pond	1.0	1.0	1.0	0.9
1000	WG-R1	WC	Stream	4.5	5.8	4.4	4.3
1000	BI-R3	WC	Stream	38.7	23.9	14.8	12.7
1000	RF-R4	WC	Stream	26.3	19.3	16.0	13.7
1000	WG-R1	PO	Pond	0.9	0.9	0.9	0.9
1000	WG-R1	PO	Stream	3.3	3.3	3.3	2.6
1000	PP-R2	PO	Stream	8.6	7.4	4.9	4.9
1000	BI-R3	PO	Stream	5.0	5.1	2.9	1.9
10000	WG-R1	WC	Pond	1.3	1.2	0.6	0.3
10000	WG-R1	WC	Stream	11.9	10.5	6.4	6.4
10000	BI-R3	WC	Stream	168.4	94.5	56.3	45.8
10000	RF-R4	WC	Stream	69.2	35.0	29.6	26.7
10000	WG-R1	PO	Pond	1.5	1.3	1.2	0.8
10000	WG-R1	PO	Stream	13.5	9.7	12.8	7.5
10000	PP-R2	PO	Stream	44.8	28.5	23.0	27.3
10000	BI-R3	PO	Stream	17.5	11.5	9.2	6.3

7.0 20-YEAR SIMULATIONS WITH NORWAY WEATHER

7.1 Weather

In order to see the impact of the weather, the SWASH crop scenarios were simulated with the Norway weather. Norway weather files have data from 1965 to 1990. The SWASH weather files have data for 20 years from 1975 to 1994. The SWASH input files years were changed to match the Norway weather but only the first 20 years were run (1965 to 1984) because the application dates in SWASH were selected with the PAT tool and there weren't dates given for an additional six years. The two weather files for Norway (Bjornebekk and Syverud) both have the same weather data. The winter cereals scenarios in SWASH (R1, R3, R4) use the R1noirr.met, R3noirr.met, and R4noirr.met files. The potato scenarios in SWASH (R1, R2, R3) use the R1potato.met, R2noirr.met, and R3potato.met, resepectively. Table 8 and Table 9 show the annual total precipitation and annual average temperatures, respectively. Overall, Norway has colder average temperatures. The average annual total rainfall in Norway is most like R1noirr and R1potat SWASH weather files.

Table 8 Summary of Annual Total Precipitaion for SWASH and Norway Weather

			Annual Total Precipitation, cm					
Year	Norway	Year	R1noirr	R2noirr	R3noirr	R4noirr	R1potat	R3potat
1965	61.42	1975	82.03	112.66	81.55	70.20	88.03	108.55
1966	60.06	1976	64.83	143.44	80.19	102.38	85.83	107.19
1967	72.63	1977	69.99	190.57	69.67	99.53	75.99	90.67
1968	61.11	1978	96.25	170.66	76.66	72.00	96.25	100.66
1969	81.20	1979	69.57	171.21	73.19	84.17	81.57	103.19
1970	76.22	1980	83.30	124.08	72.40	49.71	83.30	93.40
1971	70.93	1981	101.45	135.42	54.57	62.29	101.45	78.57
1972	94.96	1982	91.34	130.19	63.29	64.85	91.34	93.29
1973	72.55	1983	71.19	137.72	46.11	55.10	86.19	82.11
1974	90.76	1984	82.94	183.89	72.69	81.17	85.94	93.69
1975	90.60	1985	69.58	150.53	42.28	57.49	72.58	75.28
1976	74.41	1986	90.30	158.69	96.96	95.05	96.30	117.96
1977	104.73	1987	81.02	186.73	45.10	117.16	81.02	78.10
1978	102.54	1988	93.52	125.65	49.63	95.95	99.52	73.63
1979	75.16	1989	63.23	136.86	69.24	44.40	78.23	87.24
1980	89.24	1990	62.36	116.14	55.80	58.26	77.36	85.80
1981	74.65	1991	51.84	130.92	48.75	50.00	63.84	81.75
1982	81.41	1992	59.05	80.66	111.82	99.79	74.05	144.82
1983	72.84	1993	62.81	105.34	83.28	65.99	74.81	116.28
1984	83.50	1994	40.93	112.61	70.54	85.87	67.93	103.54
1985	85.08							
1986	69.21							
1987	65.39							
1988	79.96							
1989	105.89							
1990	120.57							
Avg	81.42[1]		74.38	140.20	68.19	75.57	83.08	95.79
Min	60.06[1]		40.93	80.66	42.28	44.4	63.84	73.63
Max	120.57[1]		101.45	190.57	111.82	117.16	101.45	144.82

[1]Based on 26 years (1965 to 1990), 20 year (1965 to 1984) average = 79.55 cm, minimum = 60.06 cm, maximum = 104.73 cm

Table 9 Summary of Annual Average Temperature for SWASH and Norway Weather

			Annual Average Temperature, °C					
Year	Norway	Year	R1noirr	R2noirr	R3noirr	R4noirr	R1potat	R3potat
1965	7.11	1975	9.58	14.31	13.78	13.54	9.58	13.78
1966	5.44	1976	10.08	14.44	12.98	13.59	10.08	12.98
1967	5.28	1977	10.22	14.37	13.59	13.61	10.22	13.59
1968	4.87	1978	8.80	14.56	12.18	13.26	8.80	12.18
1969	4.16	1979	9.24	14.56	12.64	13.97	9.24	12.64
1970	4.80	1980	9.43	14.56	12.84	13.37	9.43	12.84
1971	4.74	1981	9.38	15.23	13.20	14.07	9.38	13.20
1972	5.88	1982	9.88	14.82	14.24	14.87	9.88	14.24
1973	6.59	1983	10.11	14.95	13.62	14.30	10.11	13.62
1974	6.24	1984	9.35	14.58	12.41	13.47	9.35	12.41
1975	3.79	1985	8.59	15.04	12.83	13.28	8.59	12.83
1976	5.05	1986	9.45	14.69	13.90	13.84	9.45	13.90
1977	3.97	1987	9.15	14.77	13.77	13.60	9.15	13.77
1978	6.06	1988	10.75	15.31	14.27	14.12	10.75	14.27
1979	7.02	1989	10.73	15.81	13.82	14.89	10.73	13.82
1980	7.29	1990	11.56	14.94	14.27	14.68	11.56	14.27
1981	6.17	1991	9.60	14.34	13.58	14.01	9.60	13.58
1982	6.62	1992	10.96	14.47	14.47	14.40	10.96	14.47
1983	5.68	1993	10.85	15.17	14.01	14.37	10.85	14.01
1984	5.86	1994	11.58	14.85	14.77	15.57	11.58	14.77
1985	5.82							
1986	4.73							
1987	6.78							
1988	5.99							
1989	6.32							
1990	7.26							
Avg	5.75[1]		9.96	14.79	13.56	14.04	9.96	13.56
Min	3.79[1]		8.59	14.31	12.18	13.26	8.59	12.18
Max	7.29[1]		11.58	15.81	14.77	15.57	11.58	14.77

[1]Based on 26 years (1965 to 1990), 20 year (1965 to 1984) average = 5.63 °C, minimum = 3.79 °C, maximum = 7.29 °C

7.2 Mass Loadings

A summary table of the 20-year total mass comparison is shown in Table 10. For most scenarios and Kocs, the 20-year total runoff is higher with the SWASH scenarios. However, when looking at the annual runoff and erosion tables in Appendix P thru Appendix R compared to the mass annual tables with the SWASH weather, the mass varies annually as to which weather file produces the highest runoff.

Table 10 20-Year Total Mass from PRZM/EXAMS for SWASH and Norway Weather

Weather	Scenario	20-Year Total Mass, kg/ha		
		koc=10	koc=1000	koc=10000
SWASH	Weiherbach, Germany -R1_WC	3.66E-03	6.62E-03	4.81E-03
Norway	Weiherbach, Germany -R1_WC	1.50E-02	1.45E-02	1.06E-02
SWASH	Bologna, Italy – R3_WC	2.67E-02	2.30E-02	1.40E-02
Norway	Bologna, Italy – R3_WC	1.66E-02	1.24E-02	1.07E-02
SWASH	Roujan, France – R4_WC	2.57E-02	4.18E-02	2.07E-02
Norway	Roujan, France – R4_WC	1.03E-02	1.39E-02	8.92E-03
SWASH	Weiherbach, Germany -R1_Potatos	6.93E-03	1.26E-02	1.12E-02
Norway	Weiherbach, Germany -R1_Potatos	6.91E-03	1.08E-02	1.33E-02
SWASH	Porto, Portugal – R2_Potatoes	1.25E-02	1.41E-02	1.62E-02
Norway	Porto, Portugal – R2_Potatoes	4.53E-03	5.96E-03	8.88E-03
SWASH	Bologna, Italy – R3_Potatoes	1.68E-02	1.60E-02	1.11E-02
Norway	Bologna, Italy – R3_Potatoes	2.07E-02	1.39E-02	1.36E-02

7.3 Predicted Environmental Concentrations

Table 11 presents the PRZM/EXAMS PECs for 20 year simulations of SWASH scenarios comparing SWASH weather and Norway weather. The winter cereal pond PECs were higher with the Norway weather for all three Kocs while the potato pond scenario had lower PECs. The Weiherbach, Germany-R1winter cereals scenario with the stream environment had higher PECs with the Norway weather. The other stream scenarios generated lower PECs with Norway weather or about the same (Bologna, Italy-R3 potatoes). However, the application dates were selected based on the SWASH weather station precipitation occurring within ten days off application. This may not have occurred using the Norway weather. Additionally, runoff does not occur until the temperature is above freezing.

Table 11 Comparison of 20-Year PECs from PRZM/EXAMS for SWASH scenarios using SWASH and Norway Weather

				SWASH Weather					Norway Weather				
				20-year	90th% Time-weighted Average PECs, ug/L				20-yea Max,	90th% Time-weighted Average PECs, ug/L			
Koc	SWASH scenario	Crop	Waterbody	Max, ug/L	Peak	1 day	4 day	21 day	ug/L	Peak	1 day	4 day	21 day
10	WG-R1	W cereal	Pond	0.577	0.568	0.567	0.564	0.552	2.010	1.803	1.794	1.793	1.773
10	WG-R1	W cereal	Stream	36.700	31.980	16.170	4.269	0.823	88.000	79.330	40.140	10.450	1.995
10	BI-R3	W cereal	Stream	154.000	131.600	66.550	17.570	3.357	81.300	80.740	40.860	10.770	2.046
10	RF-R4	W cereal	Stream	294.000	127.900	64.720	17.290	3.287	76.400	68.450	34.650	8.879	1.698
10	WG-R1	Potatoes	Pond	1.930	0.890	0.889	0.886	0.871	1.340	0.758	0.757	0.753	0.734
10	WG-R1	Potatoes	Stream	110.000	43.040	21.750	7.001	1.334	45.600	42.020	21.200	5.534	1.058
10	PP-R2	Potatoes	Stream	65.200	52.640	26.670	8.027	1.676	25.400	23.230	11.710	2.970	0.582
10	BI-R3	Potatoes	Stream	176.000	95.620	48.300	13.280	2.537	122.000	71.790	36.290	10.310	1.964
1000	WG-R1	W cereal	Pond	0.291	0.263	0.259	0.248	0.212	0.809	0.624	0.614	0.587	0.504
1000	WG-R1	W cereal	Stream	12.800	11.520	5.828	1.735	0.400	24.400	22.010	11.150	4.313	0.863
1000	BI-R3	W cereal	Stream	42.900	42.070	21.280	6.079	1.363	23.800	21.070	10.680	3.105	0.943
1000	RF-R4	W cereal	Stream	135.000	111.200	56.200	14.440	2.948	27.100	26.790	13.500	5.299	1.196
1000	WG-R1	Potatoes	Pond	1.100	0.543	0.534	0.513	0.431	0.421	0.354	0.350	0.341	0.299
1000	WG-R1	Potatoes	Stream	33.000	17.120	8.666	3.815	0.768	16.900	9.271	4.690	1.376	0.477
1000	PP-R2	Potatoes	Stream	32.300	21.180	10.780	2.967	1.034	6.870	5.158	2.608	0.872	0.179
1000	BI-R3	Potatoes	Stream	35.300	32.360	16.330	5.284	1.079	38.000	22.790	11.590	5.096	1.192
10000	WG-R1	W cereal	Pond	0.179	0.077	0.068	0.049	0.028	0.286	0.202	0.177	0.129	0.071
10000	WG-R1	W cereal	Stream	7.320	4.472	2.265	0.661	0.189	12.100	9.379	4.763	1.677	0.410
10000	BI-R3	W cereal	Stream	18.600	17.140	8.676	2.556	0.644	13.200	10.010	5.108	1.862	0.553
10000	RF-R4	W cereal	Stream	33.400	27.630	13.970	3.952	1.045	11.100	9.335	4.726	1.664	0.466
10000	WG-R1	Potatoes	Pond	0.350	0.173	0.152	0.115	0.060	0.177	0.146	0.128	0.100	0.056
10000	WG-R1	Potatoes	Stream	13.600	7.229	3.659	1.602	0.374	9.260	7.356	3.731	1.180	0.324
10000	PP-R2	Potatoes	Stream	23.600	16.080	8.178	2.293	0.883	5.960	3.246	1.661	0.677	0.181
10000	BI-R3	Potatoes	Stream	14.200	12.730	6.424	2.013	0.475	17.600	12.520	6.325	2.350	0.668

WG = Weiherbach, Germany; BI = Bologna, Italy; RF = Roujan, France; PP = Porto, Portugal. TWA = Time-weighted Average

8.0 CONCLUSIONS

The objective of this study was to compare the surface water results from simulations with Norwegian scenarios in WISPE with simulations from SWASH scenarios. Other comparisons were also part of this study such as PECs from EXAMS versus TOXSWA and the impact of Norway weather to PECs.

Overall, the WISPE PECs were within the range of the SWASH PECs. An analysis of EXAMS versus TOXSWA showed that the pond values matched better than the stream values. Only receiving mass without changing the flow or volume of the waterbody causes the higher PECs in EXAMS. SWASH scenarios with the Norway weather tended to produce lower PECs. However, it should be noted that the simulations with the Norway weather kept the SWASH application date that was determined by the Pesticide Application Timing (PAT) calculator within SWASH based on the EU scenario rainfall. PAT was not available to use with the Norway weather. Additionally, when determining sensitivity, it is better to isolate the impact of one change at a time (i.e., different weather).

Some other differences between EXAMS and TOXSWA besides variable flow should be noted:

- EXAMS is run for multiple years and comparing the 90th percentile PEC from a 20 - year run isn't always the same year as the SWASH simulation.
- TOXSWA handles leap years differently than PRZM. Therefore, the date of application in PRZM produces runoff/erosion mass if there is rainfall isn't the same day as drift in TOXSWA. For example, R3-ps-.inp has application on March 11, 1980. The TOXSWA file has drift on March 10, 1980.
- EXAMS uses daily air temperatures for water and sediment. TOXSWA uses monthly water and sediment temperatures. The aquatic aerobic and aerobic degradation changes with temperature. In colder climates, this would mean slower degradation in water/sediment.

9.0 REFERENCES

Beltman, W.H.J., M.M.S. ter Horst, P.I. Adriaanse & A. de Jong. 2018. Manual for FOCUS_TOXSWA v5.5.3 and for expert use of TOXSWA kernel v3.3; User's Guide version 5. The Statutory Research Tasks Unit for Nature & the Environment (WOT Natuur & Milieu). WOt-technical report 126. 148 p.

Bolli, R.I, Eklo, O.M., Holten, R., and P. Mulder. 2013. National Scenarios – Norway. Development of WISPE for surface- and groundwater modelling of pesticides in major crops. Bioforsk Report, Vol. 8, Nr. 172 2013.

Burns, Lawrence. 2004. Exposure Analysis Modeling System (EXAMS): User Manual and System Documentation. Version 2.98.04.06: EPA/600/R-00/081. Ecologist, Ecosystems Research Division U.S. Environmental Protection Agency, Athens, GA, pp 206. May 2004 (Revision G).

Carousel, R. F., J. C. Imhoff, P.R. Hummel, J.M. Cheplick, A.S. Donigian, Jr., and L.A.Suárez, 2005. PRZM_3, A Model for Predicting Pesticide and Nitrogen Fate in the Crop Root and Unsaturated Soil Zones: Users Manual for Release 3.12.2, National Exposure Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Athens, Georgia.

FOCUS. 2015. Generic Guidance for FOCUS Surface Water Scenarios. Version 1.4. May 2015.

FOCUS. 2003. FOCUS Surface Water Scenarios in the EU Evaluation Process under 91/414/EEC. Report of the FOCUS Working Group on Surface Water Scenarios, EC Document Reference SANCO/4802/2001-rev.2. 245 pp. Appendix K – PRZM in FOCUS User Manual.

APPENDICES SECTION

Appendix A - Example input files (PRZM and EXAMS) for KOC = 10 L/kg

Winter Cereals – CW003b.inp (PRZM file)

```
WISPE - Norway v 1.00.00  (Jul 31, 2013)
*** Title of input file
Short description of file
    1.00    0.20       0   10.00       1       1
       4
   0.350   0.150   1.000   0.020               3   13.00    5.00
       1
       1    0.16   95.00   90.00       1   0   0   0    0.00  100.00
       1       5
0101 0508 1508 0109 1509
.900 .900 .200 .500 1.00
.017 .017 .017 .017 .017
  90   84   76   90   90
      26
  15 965   5 866  15 866       1
  15 966   5 867  15 867       1
  15 967   5 868  15 868       1
  15 968   5 869  15 869       1
  15 969   5 870  15 870       1
  15 970   5 871  15 871       1
  15 971   5 872  15 872       1
  15 972   5 873  15 873       1
  15 973   5 874  15 874       1
  15 974   5 875  15 875       1
  15 975   5 876  15 876       1
  15 976   5 877  15 877       1
  15 977   5 878  15 878       1
  15 978   5 879  15 879       1
  15 979   5 880  15 880       1
  15 980   5 881  15 881       1
  15 981   5 882  15 882       1
  15 982   5 883  15 883       1
  15 983   5 884  15 884       1
  15 984   5 885  15 885       1
  15 985   5 886  15 886       1
  15 986   5 887  15 887       1
  15 987   5 888  15 888       1
  15 988   5 889  15 889       1
  15 989   5 890  15 890       1
  15 990   5 891  15 891       1
Chemical Input Data:
      26       1       0       0
Parent Chemical_Koc1
  14 965  0 1 4.00 .1000 1.00 .000
  14 966  0 1 4.00 .1000 1.00 .000
  14 967  0 1 4.00 .1000 1.00 .000
  14 968  0 1 4.00 .1000 1.00 .000
  14 969  0 1 4.00 .1000 1.00 .000
  14 970  0 1 4.00 .1000 1.00 .000
  14 971  0 1 4.00 .1000 1.00 .000
  14 972  0 1 4.00 .1000 1.00 .000
  14 973  0 1 4.00 .1000 1.00 .000
  14 974  0 1 4.00 .1000 1.00 .000
  14 975  0 1 4.00 .1000 1.00 .000
  14 976  0 1 4.00 .1000 1.00 .000
  14 977  0 1 4.00 .1000 1.00 .000
  14 978  0 1 4.00 .1000 1.00 .000
  14 979  0 1 4.00 .1000 1.00 .000
  14 980  0 1 4.00 .1000 1.00 .000
  14 981  0 1 4.00 .1000 1.00 .000
  14 982  0 1 4.00 .1000 1.00 .000
  14 983  0 1 4.00 .1000 1.00 .000
  14 984  0 1 4.00 .1000 1.00 .000
  14 985  0 1 4.00 .1000 1.00 .000
  14 986  0 1 4.00 .1000 1.00 .000
```

```
  14 987  0 1 4.00 .1000 1.00 .000
  14 988  0 1 4.00 .1000 1.00 .000
  14 989  0 1 4.00 .1000 1.00 .000
  14 990  0 1 4.00 .1000 1.00 .000
     0.       1    0.50
Brief description of soil properties
  500.00          0   0   2   0   0   0   2   1   0   0
 4300.00 .46E-12   22.70
  0.9000
 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.95 20.0
 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6
    2.58   20.00
       2    0.70    1.00
       5
       1  10.000   1.500   0.362   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           0.100   0.362   0.164   1.200   0.120
           12.60   45.00   25.00    0.00    0.00
       2  10.000   1.600   0.382   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           5.000   0.382   0.160   0.700   0.070
           12.60   45.00   25.00    0.00    0.00
       3  30.000   1.600   0.382   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.382   0.160   0.400   0.040
           12.60   45.00   25.00    0.00    0.00
       4  50.000   1.600   0.382   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.382   0.160   0.400   0.040
           12.60   45.00   25.00    0.00    0.00
       5 400.000   1.600   0.382   0.000   0.000   0.000
         0.00000 0.00000 0.00000
           5.000   0.382   0.160   0.400   0.040
           12.60   45.00   25.00    0.00    0.00
       0
    WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   1
      11    DAY
    PRCP    TSER   1   1   1.0
    TCON1   TAVE   1 101   1.0E3
    TCON1   TAVE 102 104   1.0E3
    TCON1   TAVE 105 107   1.0E3
    RFLX1   TSER 100 100   1.0E5
    EFLX1   TSER 100 100   1.0E5
    RUNF    TSER 100 100   1.0
    ESLS    TSER 100 100   1.0E3
    AFLX1   TSER 100 100   1.0E5
    DFLX1   TSER 100 100   1.0E5
    INFL    TSER 100 100   1.0
```

Winter Cereals – CW004b.inp (PRZM file)

```
WISPE - Norway v 1.00.00  (Jul 31, 2013)
*** Title of input file
Short description of file
    1.00    0.20       0   10.00       1       1
       4
   0.380   0.190   1.000   0.040               3   13.00   12.00
       1
       1    0.16   95.00   90.00       1   0   0   0    0.00  100.00
       1       5
0101 0508 1508 0109 1509
.900 .900 .200 .500 1.00
.017 .017 .017 .017 .017
  90   84   76   90   90
      26
  15 965   5 866  15 866       1
  15 966   5 867  15 867       1
  15 967   5 868  15 868       1
  15 968   5 869  15 869       1
  15 969   5 870  15 870       1
  15 970   5 871  15 871       1
  15 971   5 872  15 872       1
  15 972   5 873  15 873       1
  15 973   5 874  15 874       1
  15 974   5 875  15 875       1
  15 975   5 876  15 876       1
  15 976   5 877  15 877       1
  15 977   5 878  15 878       1
  15 978   5 879  15 879       1
  15 979   5 880  15 880       1
  15 980   5 881  15 881       1
  15 981   5 882  15 882       1
  15 982   5 883  15 883       1
  15 983   5 884  15 884       1
  15 984   5 885  15 885       1
  15 985   5 886  15 886       1
  15 986   5 887  15 887       1
  15 987   5 888  15 888       1
  15 988   5 889  15 889       1
  15 989   5 890  15 890       1
  15 990   5 891  15 891       1
Chemical Input Data:
      26       1       0       0
Parent Chemical_Koc1
  14 965  0 1 4.00 .1000 1.00 .000
  14 966  0 1 4.00 .1000 1.00 .000
  14 967  0 1 4.00 .1000 1.00 .000
  14 968  0 1 4.00 .1000 1.00 .000
  14 969  0 1 4.00 .1000 1.00 .000
  14 970  0 1 4.00 .1000 1.00 .000
  14 971  0 1 4.00 .1000 1.00 .000
  14 972  0 1 4.00 .1000 1.00 .000
  14 973  0 1 4.00 .1000 1.00 .000
  14 974  0 1 4.00 .1000 1.00 .000
  14 975  0 1 4.00 .1000 1.00 .000
  14 976  0 1 4.00 .1000 1.00 .000
  14 977  0 1 4.00 .1000 1.00 .000
  14 978  0 1 4.00 .1000 1.00 .000
  14 979  0 1 4.00 .1000 1.00 .000
  14 980  0 1 4.00 .1000 1.00 .000
  14 981  0 1 4.00 .1000 1.00 .000
  14 982  0 1 4.00 .1000 1.00 .000
  14 983  0 1 4.00 .1000 1.00 .000
  14 984  0 1 4.00 .1000 1.00 .000
  14 985  0 1 4.00 .1000 1.00 .000
  14 986  0 1 4.00 .1000 1.00 .000
  14 987  0 1 4.00 .1000 1.00 .000
  14 988  0 1 4.00 .1000 1.00 .000
  14 989  0 1 4.00 .1000 1.00 .000
```

```
  14 990  0 1 4.00 .1000 1.00 .000
      0.       1    0.50
Brief description of soil properties
  500.00          0   0   2   0   0   0   2   1   0   0
 4300.00 .46E-12   22.70
  0.9000
 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.95 20.0
 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6
    2.58   20.00
       2    0.70    1.00
       6
       1  10.000   1.400   0.407   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           0.100   0.407   0.120   3.200   0.320
           12.60   45.00   25.00    0.00    0.00
       2  15.000   1.400   0.407   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           5.000   0.407   0.120   3.200   0.320
           12.60   45.00   25.00    0.00    0.00
       3  25.000   1.690   0.330   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.330   0.160   0.400   0.040
           12.60   45.00   25.00    0.00    0.00
       4  20.000   1.690   0.311   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.311   0.180   0.630   0.063
           12.60   45.00   25.00    0.00    0.00
       5  30.000   1.690   0.311   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.311   0.180   0.630   0.063
           12.60   45.00   25.00    0.00    0.00
       6 400.000   1.690   0.311   0.000   0.000   0.000
         0.00000 0.00000 0.00000
           5.000   0.311   0.180   0.630   0.063
           12.60   45.00   25.00    0.00    0.00
       0
    WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   1
      11    DAY
    PRCP    TSER   1   1   1.0
    TCON1   TAVE   1 101   1.0E3
    TCON1   TAVE 102 104   1.0E3
    TCON1   TAVE 105 107   1.0E3
    RFLX1   TSER 100 100   1.0E5
    EFLX1   TSER 100 100   1.0E5
    RUNF    TSER 100 100   1.0
    ESLS    TSER 100 100   1.0E3
    AFLX1   TSER 100 100   1.0E5
    DFLX1   TSER 100 100   1.0E5
    INFL    TSER 100 100   1.0
```

Winter Cereals – WC004b.inp (PRZM file)

```
WISPE - Norway v 1.00.00  (Jul 31, 2013)
*** Title of input file
Short description of file
    1.00    0.20       0   10.00       1       1
       4
   0.240   0.010   0.600   3.000               2    0.10 100.00  -- Changed to .024 and 24.5
       1
       1    0.16   95.00   90.00       1   0   0   0    0.00  100.00
       1       5
0101 0508 1508 0109 1509
.900 .900 .200 .500 1.00
.017 .017 .017 .017 .017
  90   84   76   90   90
      26
  15 965   5 866  15 866       1
  15 966   5 867  15 867       1
  15 967   5 868  15 868       1
  15 968   5 869  15 869       1
  15 969   5 870  15 870       1
  15 970   5 871  15 871       1
  15 971   5 872  15 872       1
  15 972   5 873  15 873       1
  15 973   5 874  15 874       1
  15 974   5 875  15 875       1
  15 975   5 876  15 876       1
  15 976   5 877  15 877       1
  15 977   5 878  15 878       1
  15 978   5 879  15 879       1
  15 979   5 880  15 880       1
  15 980   5 881  15 881       1
  15 981   5 882  15 882       1
  15 982   5 883  15 883       1
  15 983   5 884  15 884       1
  15 984   5 885  15 885       1
  15 985   5 886  15 886       1
  15 986   5 887  15 887       1
  15 987   5 888  15 888       1
  15 988   5 889  15 889       1
  15 989   5 890  15 890       1
  15 990   5 891  15 891       1
Chemical Input Data:
      26       1       0       0
Parent Chemical_Koc1
  14 965   0 1 4.00 .1000 1.00 .000
  14 966   0 1 4.00 .1000 1.00 .000
  14 967   0 1 4.00 .1000 1.00 .000
  14 968   0 1 4.00 .1000 1.00 .000
  14 969   0 1 4.00 .1000 1.00 .000
  14 970   0 1 4.00 .1000 1.00 .000
  14 971   0 1 4.00 .1000 1.00 .000
  14 972   0 1 4.00 .1000 1.00 .000
  14 973   0 1 4.00 .1000 1.00 .000
  14 974   0 1 4.00 .1000 1.00 .000
  14 975   0 1 4.00 .1000 1.00 .000
  14 976   0 1 4.00 .1000 1.00 .000
  14 977   0 1 4.00 .1000 1.00 .000
  14 978   0 1 4.00 .1000 1.00 .000
  14 979   0 1 4.00 .1000 1.00 .000
  14 980   0 1 4.00 .1000 1.00 .000
  14 981   0 1 4.00 .1000 1.00 .000
  14 982   0 1 4.00 .1000 1.00 .000
  14 983   0 1 4.00 .1000 1.00 .000
  14 984   0 1 4.00 .1000 1.00 .000
  14 985   0 1 4.00 .1000 1.00 .000
  14 986   0 1 4.00 .1000 1.00 .000
  14 987   0 1 4.00 .1000 1.00 .000
  14 988   0 1 4.00 .1000 1.00 .000
  14 989   0 1 4.00 .1000 1.00 .000
```

```
  14 990  0 1 4.00 .1000 1.00 .000
      0.       1    0.50
Brief description of soil properties
  500.00           0   0   2   0   0   0   2   1   0   0
 4300.00 .46E-12   22.70
  0.9000
 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.95 20.0
 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6
    2.58   20.00
       2    0.70    1.00
       6
       1  10.000   1.400   0.417   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           0.100   0.417   0.149   2.200   0.220
           12.60   45.00   25.00    0.00    0.00
       2  20.000   1.400   0.417   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           5.000   0.417   0.149   2.200   0.220
           12.60   45.00   25.00    0.00    0.00
       3  10.000   1.690   0.361   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.361   0.069   0.300   0.030
           12.60   45.00   25.00    0.00    0.00
       4  20.000   1.680   0.365   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.365   0.093   0.100   0.010
           12.60   45.00   25.00    0.00    0.00
       5  40.000   1.730   0.346   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.346   0.068   0.100   0.010
           12.60   45.00   25.00    0.00    0.00
       6 400.000   1.730   0.346   0.000   0.000   0.000
         0.00000 0.00000 0.00000
           5.000   0.346   0.068   0.100   0.010
           12.60   45.00   25.00    0.00    0.00
       0
    WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   1
      11    DAY
    PRCP    TSER   1   1    1.0
    TCON1   TAVE   1 101    1.0E3
    TCON1   TAVE 102 104    1.0E3
    TCON1   TAVE 105 107    1.0E3
    RFLX1   TSER 100 100    1.0E5
    EFLX1   TSER 100 100    1.0E5
    RUNF    TSER 100 100    1.0
    ESLS    TSER 100 100    1.0E3
    AFLX1   TSER 100 100    1.0E5
    DFLX1   TSER 100 100    1.0E5
    INFL    TSER 100 100    1.0
```

Potatoes – PS003b.inp (PRZM file)

```
WISPE - Norway v 1.00.00  (Jul 31, 2013)
*** Title of input file
Short description of file
    1.00    0.20       0   10.00       1       1
       4
   0.350   0.150   1.000   0.020               3   13.00    5.00
       1
       1    0.15   60.00   80.00       1   0   0   0    0.00   50.00
       1       5
0101 1006 1009 2009 1910
.900 .900 .200 .500 1.00
.017 .017 .017 .017 .017
  91   91   89   89   91
      26
  10 665  10 965  20 965       1
  10 666  10 966  20 966       1
  10 667  10 967  20 967       1
  10 668  10 968  20 968       1
  10 669  10 969  20 969       1
  10 670  10 970  20 970       1
  10 671  10 971  20 971       1
  10 672  10 972  20 972       1
  10 673  10 973  20 973       1
  10 674  10 974  20 974       1
  10 675  10 975  20 975       1
  10 676  10 976  20 976       1
  10 677  10 977  20 977       1
  10 678  10 978  20 978       1
  10 679  10 979  20 979       1
  10 680  10 980  20 980       1
  10 681  10 981  20 981       1
  10 682  10 982  20 982       1
  10 683  10 983  20 983       1
  10 684  10 984  20 984       1
  10 685  10 985  20 985       1
  10 686  10 986  20 986       1
  10 687  10 987  20 987       1
  10 688  10 988  20 988       1
  10 689  10 989  20 989       1
  10 690  10 990  20 990       1
Chemical Input Data:
      26       1       0       0
Parent Chemical_Koc1
   9 665  0 1 4.00 .1000 1.00 .000
   9 666  0 1 4.00 .1000 1.00 .000
   9 667  0 1 4.00 .1000 1.00 .000
   9 668  0 1 4.00 .1000 1.00 .000
   9 669  0 1 4.00 .1000 1.00 .000
   9 670  0 1 4.00 .1000 1.00 .000
   9 671  0 1 4.00 .1000 1.00 .000
   9 672  0 1 4.00 .1000 1.00 .000
   9 673  0 1 4.00 .1000 1.00 .000
   9 674  0 1 4.00 .1000 1.00 .000
   9 675  0 1 4.00 .1000 1.00 .000
   9 676  0 1 4.00 .1000 1.00 .000
   9 677  0 1 4.00 .1000 1.00 .000
   9 678  0 1 4.00 .1000 1.00 .000
   9 679  0 1 4.00 .1000 1.00 .000
   9 680  0 1 4.00 .1000 1.00 .000
   9 681  0 1 4.00 .1000 1.00 .000
   9 682  0 1 4.00 .1000 1.00 .000
   9 683  0 1 4.00 .1000 1.00 .000
   9 684  0 1 4.00 .1000 1.00 .000
   9 685  0 1 4.00 .1000 1.00 .000
   9 686  0 1 4.00 .1000 1.00 .000
   9 687  0 1 4.00 .1000 1.00 .000
   9 688  0 1 4.00 .1000 1.00 .000
   9 689  0 1 4.00 .1000 1.00 .000
```

```
   9 690  0 1 4.00 .1000 1.00 .000
      0.       1    0.50
Brief description of soil properties
  500.00           0   0   2   0   0   0   2   1   0   0
 4300.00 .46E-12   22.70
  0.9000
 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.95 20.0
 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6
    2.58   20.00
       2    0.70    1.00
       5
       1  10.000   1.500   0.362   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           0.100   0.362   0.164   1.200   0.120
           12.60   45.00   25.00    0.00    0.00
       2  10.000   1.600   0.382   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           5.000   0.382   0.160   0.700   0.070
           12.60   45.00   25.00    0.00    0.00
       3  30.000   1.600   0.382   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.382   0.160   0.400   0.040
           12.60   45.00   25.00    0.00    0.00
       4  50.000   1.600   0.382   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.382   0.160   0.400   0.040
           12.60   45.00   25.00    0.00    0.00
       5 400.000   1.600   0.382   0.000   0.000   0.000
         0.00000 0.00000 0.00000
           5.000   0.382   0.160   0.400   0.040
           12.60   45.00   25.00    0.00    0.00
       0
    WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   1
      11    DAY
    PRCP    TSER   1   1   1.0
    TCON1   TAVE   1 101   1.0E3
    TCON1   TAVE 102 104   1.0E3
    TCON1   TAVE 105 107   1.0E3
    RFLX1   TSER 100 100   1.0E5
    EFLX1   TSER 100 100   1.0E5
    RUNF    TSER 100 100   1.0
    ESLS    TSER 100 100   1.0E3
    AFLX1   TSER 100 100   1.0E5
    DFLX1   TSER 100 100   1.0E5
    INFL    TSER 100 100   1.0
```

Potatoes – PS004b.inp (PRZM file)

```
WISPE - Norway v 1.00.00  (Jul 31, 2013)
*** Title of input file
Short description of file
    1.00    0.20       0   10.00       1       1
       4
   0.380   0.190   1.000   0.040               3   13.00   12.00
       1
       1    0.15   60.00   80.00       1   0   0   0    0.00   50.00
       1       5
0101 1006 1009 2009 1910
.900 .900 .200 .500 1.00
.017 .017 .017 .017 .017
  91   91   89   89   91
      26
  10 665  10 965  20 965       1
  10 666  10 966  20 966       1
  10 667  10 967  20 967       1
  10 668  10 968  20 968       1
  10 669  10 969  20 969       1
  10 670  10 970  20 970       1
  10 671  10 971  20 971       1
  10 672  10 972  20 972       1
  10 673  10 973  20 973       1
  10 674  10 974  20 974       1
  10 675  10 975  20 975       1
  10 676  10 976  20 976       1
  10 677  10 977  20 977       1
  10 678  10 978  20 978       1
  10 679  10 979  20 979       1
  10 680  10 980  20 980       1
  10 681  10 981  20 981       1
  10 682  10 982  20 982       1
  10 683  10 983  20 983       1
  10 684  10 984  20 984       1
  10 685  10 985  20 985       1
  10 686  10 986  20 986       1
  10 687  10 987  20 987       1
  10 688  10 988  20 988       1
  10 689  10 989  20 989       1
  10 690  10 990  20 990       1
Chemical Input Data:
      26       1       0       0
Parent Chemical_Koc1
   9 665  0 1 4.00 .1000 1.00 .000
   9 666  0 1 4.00 .1000 1.00 .000
   9 667  0 1 4.00 .1000 1.00 .000
   9 668  0 1 4.00 .1000 1.00 .000
   9 669  0 1 4.00 .1000 1.00 .000
   9 670  0 1 4.00 .1000 1.00 .000
   9 671  0 1 4.00 .1000 1.00 .000
   9 672  0 1 4.00 .1000 1.00 .000
   9 673  0 1 4.00 .1000 1.00 .000
   9 674  0 1 4.00 .1000 1.00 .000
   9 675  0 1 4.00 .1000 1.00 .000
   9 676  0 1 4.00 .1000 1.00 .000
   9 677  0 1 4.00 .1000 1.00 .000
   9 678  0 1 4.00 .1000 1.00 .000
   9 679  0 1 4.00 .1000 1.00 .000
   9 680  0 1 4.00 .1000 1.00 .000
   9 681  0 1 4.00 .1000 1.00 .000
   9 682  0 1 4.00 .1000 1.00 .000
   9 683  0 1 4.00 .1000 1.00 .000
   9 684  0 1 4.00 .1000 1.00 .000
   9 685  0 1 4.00 .1000 1.00 .000
   9 686  0 1 4.00 .1000 1.00 .000
   9 687  0 1 4.00 .1000 1.00 .000
   9 688  0 1 4.00 .1000 1.00 .000
   9 689  0 1 4.00 .1000 1.00 .000
```

```
   9 690  0 1 4.00 .1000 1.00 .000
      0.       1    0.50
Brief description of soil properties
  500.00           0   0   2   0   0   0   2   1   0   0
 4300.00 .46E-12   22.70
  0.9000
 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.20 0.95 20.0
 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6 12.6
    2.58   20.00
       2    0.70    1.00
       6
       1  10.000   1.400   0.407   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           0.100   0.407   0.120   3.200   0.320
           12.60   45.00   25.00    0.00    0.00
       2  15.000   1.400   0.407   0.000   0.000   0.000
         0.00693 0.00693 0.00000
           5.000   0.407   0.120   3.200   0.320
           12.60   45.00   25.00    0.00    0.00
       3  25.000   1.690   0.330   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.330   0.160   0.400   0.040
           12.60   45.00   25.00    0.00    0.00
       4  20.000   1.690   0.311   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.311   0.180   0.630   0.063
           12.60   45.00   25.00    0.00    0.00
       5  30.000   1.690   0.311   0.000   0.000   0.000
         0.00139 0.00139 0.00000
           5.000   0.311   0.180   0.630   0.063
           12.60   45.00   25.00    0.00    0.00
       6 400.000   1.690   0.311   0.000   0.000   0.000
         0.00000 0.00000 0.00000
           5.000   0.311   0.180   0.630   0.063
           12.60   45.00   25.00    0.00    0.00
       0
    WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   1
      11    DAY
    PRCP    TSER   1   1   1.0
    TCON1   TAVE   1 101   1.0E3
    TCON1   TAVE 102 104   1.0E3
    TCON1   TAVE 105 107   1.0E3
    RFLX1   TSER 100 100   1.0E5
    EFLX1   TSER 100 100   1.0E5
    RUNF    TSER 100 100   1.0
    ESLS    TSER 100 100   1.0E3
    AFLX1   TSER 100 100   1.0E5
    DFLX1   TSER 100 100   1.0E5
    INFL    TSER 100 100   1.0
```

Winter Cereals – CW003b.exa (EXAMS file)

```
SET OUTFIL(1) = YES
SET OUTFIL(6) = YES
SET OUTFIL(7) = YES
!
CHEM NAME IS Parent Chemical_Koc1
SET MWT(1)=    250.00
SET SOL(1,1)= 30.00
SET MP(1)=-99.00
SET KOC(1)=     10.00
SET VAPR(1)= 0.000
SET KBACS(*,1,1)=0.2888E-03
SET QTBTS(*,1,1)= 25.00
SET QTBAS(*,1,1)=  2.000
SET KBACW(*,1,1)=0.2888E-03
SET QTBTW(*,1,1)= 25.00
SET QTBAW(*,1,1)= 2.000
SET KDP(1,1)= 0.000
SET KBH(1,1,1)= 0.000
SET KNH(1,1,1)= 0.000
SET KAH(1,1,1)= 0.000
!
!
!
READ ENV eupond.exv
READ METEOROLOGY BJORNBK1.MET
SET YEAR1 = 1965
ECHO OFF
!
READ PRZM C1CW003b.D65
SET CLOUD(*)=0.0
SET EVAP(*,*)=0.0
SET RAIN(*)=0.0
SET NPSFL(*,*)=0.0
SET NPSED(*,*)=0.0
RUN
!
READ PRZM C1CW003b.D66
SET CLOUD(*)=0.0
SET EVAP(*,*)=0.0
SET RAIN(*)=0.0
SET NPSFL(*,*)=0.0
SET NPSED(*,*)=0.0
CONTINUE
!
**** lines removed for years 1967 to 1989 for brevity
!
READ PRZM C1CW003b.D90
SET CLOUD(*)=0.0
SET EVAP(*,*)=0.0
SET RAIN(*)=0.0
SET NPSFL(*,*)=0.0
SET NPSED(*,*)=0.0
CONTINUE
!
QUIT
```

Winter Cereals – CW003c.exa (EXAMS file)

```
SET OUTFIL(1) = YES
SET OUTFIL(6) = YES
SET OUTFIL(7) = YES
!
CHEM NAME IS Parent Chemical_Koc1
SET MWT(1)=    250.00
SET SOL(1,1)= 30.00
SET MP(1)=-99.00
SET KOC(1)=     10.00
SET VAPR(1)= 0.000
SET KBACS(*,1,1)=0.2888E-03
SET QTBTS(*,1,1)= 25.00
SET QTBAS(*,1,1)=  2.000
SET KBACW(*,1,1)=0.2888E-03
SET QTBTW(*,1,1)= 25.00
SET QTBAW(*,1,1)= 2.000
SET KDP(1,1)= 0.000
SET KBH(1,1,1)= 0.000
SET KNH(1,1,1)= 0.000
SET KAH(1,1,1)= 0.000
!
!
!
READ ENV eustream.exv
READ METEOROLOGY BJORNBK1.MET
SET YEAR1 = 1965
ECHO OFF
!
READ PRZM C1CW003b.D65
SET CLOUD(*)=0.0
SET EVAP(*,*)=0.0
SET  RAIN(*)=0.0
SET NPSFL(*,*)=0.0
SET NPSED(*,*)=0.0
SET STFLO(1,*)=5.60
RUN
!
READ PRZM C1CW003b.D66
SET CLOUD(*)=0.0
SET EVAP(*,*)=0.0
SET  RAIN(*)=0.0
SET NPSFL(*,*)=0.0
SET NPSED(*,*)=0.0
SET STFLO(1,*)=5.60
CONTINUE
!
**** lines removed for years 1967 to 1989 for brevity
!
READ PRZM C1CW003b.D90
SET CLOUD(*)=0.0
SET EVAP(*,*)=0.0
SET  RAIN(*)=0.0
SET NPSFL(*,*)=0.0
SET NPSED(*,*)=0.0
SET STFLO(1,*)=5.60
CONTINUE
!
QUIT
```

Appendix B - Example input files (PRZM and TOXSWA) for Koc = 10 L/kg

Winter Cereals – R1-CW-.inp (PRZM file)

```
FOCUS_PRZM_SW_4.3.1, 27 Apr. 2015                       PRZM 4.63 Apr. 2015
                    Simulation Location: R1Crop: Cereals, Winter
    0.84    0.20       0   15.00       1       1
       4
    0.42    0.33    0.50    0.45               3    3.00   20.00
       1
       1    0.15   99.00   90.00       3   0   0   0    0.00  100.00
       1       4
1211 1006 3107 0111
0.20 0.20 0.40 0.90
0.10 0.10 0.10 0.10
  81   81   86   91
      20
  121175  100676  310776       1
  121176  100677  310777       1
  121177  100678  310778       1
  121178  100679  310779       1
  121179  100680  310780       1
  121180  100681  310781       1
  121181  100682  310782       1
  121182  100683  310783       1
  121183  100684  310784       1
  121184  100685  310785       1
  121185  100686  310786       1
  121186  100687  310787       1
  121187  100688  310788       1
  121188  100689  310789       1
  121189  100690  310790       1
  121190  100691  310791       1
  121191  100692  310792       1
  121192  100693  310793       1
  121193  100694  310794       1
  121194  100695  310795       1
Chemical Input Data:
      20       1       0       0
NIBIO_10
  261075  0 1 4.000.1000 1.00 0.00
  231076  0 1 4.000.1000 1.00 0.00
  141077  0 1 4.000.1000 1.00 0.00
  121078  0 1 4.000.1000 1.00 0.00
  241079  0 1 4.000.1000 1.00 0.00
  201080  0 1 4.000.1000 1.00 0.00
  251081  0 1 4.000.1000 1.00 0.00
  171082  0 1 4.000.1000 1.00 0.00
  121083  0 1 4.000.1000 1.00 0.00
  151084  0 1 4.000.1000 1.00 0.00
  251085  0 1 4.000.1000 1.00 0.00
  121086  0 1 4.000.1000 1.00 0.00
   31187  0 1 4.000.1000 1.00 0.00
  151088  0 1 4.000.1000 1.00 0.00
  181089  0 1 4.000.1000 1.00 0.00
  171090  0 1 4.000.1000 1.00 0.00
  251091  0 1 4.000.1000 1.00 0.00
  181092  0 1 4.000.1000 1.00 0.00
  301093  0 1 4.000.1000 1.00 0.00
  191094  0 1 4.000.1000 1.00 0.00
      0.       1    0.50
Soil Series:         R1          36
  100.00           0   0   2   0   0   0   2   1   0
 4300.00 .45E-12   22.70
  0.9000
 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.96 10.0
 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0
    2.58   20.00
       2    0.70    1.00
```

```
   4
   1  10.000   1.350   0.338   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       0.100   0.338   0.141   1.200   0.120
       10.00    5.00   13.00    0.00    0.00
   2  20.000   1.350   0.338   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.338   0.141   1.200   0.120
       10.00    5.00   13.00    0.00    0.00
   3  30.000   1.450   0.286   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.286   0.111   0.300   0.030
       10.00    6.00   11.00    0.00    0.00
   4  40.000   1.480   0.277   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.277   0.108   0.100   0.010
       10.00    5.00   11.00    0.00    0.00
   0
WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   0
   7    DAY
RUNF    TSER   0   0  10.0
ESLS    TSER   0   0  1.E3
PRCP    TSER   0   0  10.0
INFL    TSER 118 118  10.0
RFLX1   TSER   0   0  1.E7
EFLX1   TSER   0   0  1.E7
TPAP    TSER   0   0  1.0
```

Winter Cereals – R3-CW-.inp (PRZM file)

```
FOCUS_PRZM_SW_4.3.1, 27 Apr. 2015                      PRZM 4.63 Apr. 2015
                    Simulation Location: R3Crop: Cereals, Winter
    0.84    0.20       0   25.00       1       1
       4
    0.25    0.66    0.50    0.45               3    5.00   20.00
       1
       1    0.15  120.00   90.00       3   0   0   0    0.00  100.00
       1       4
0112 1005 0107 0111
0.20 0.20 0.40 0.90
0.10 0.10 0.10 0.10
  81   81   86   91
      20
  011275  100576  010776       1
  011276  100577  010777       1
  011277  100578  010778       1
  011278  100579  010779       1
  011279  100580  010780       1
  011280  100581  010781       1
  011281  100582  010782       1
  011282  100583  010783       1
  011283  100584  010784       1
  011284  100585  010785       1
  011285  100586  010786       1
  011286  100587  010787       1
  011287  100588  010788       1
  011288  100589  010789       1
  011289  100590  010790       1
  011290  100591  010791       1
  011291  100592  010792       1
  011292  100593  010793       1
  011293  100594  010794       1
  011294  100595  010795       1
Chemical Input Data:
      20       1       0       0
NIBIO_10
  201175  0 1 4.000.1000 1.00 0.00
  161176  0 1 4.000.1000 1.00 0.00
   31177  0 1 4.000.1000 1.00 0.00
  151178  0 1 4.000.1000 1.00 0.00
   11179  0 1 4.000.1000 1.00 0.00
  161180  0 1 4.000.1000 1.00 0.00
  211181  0 1 4.000.1000 1.00 0.00
  311082  0 1 4.000.1000 1.00 0.00
  261183  0 1 4.000.1000 1.00 0.00
   91184  0 1 4.000.1000 1.00 0.00
   61185  0 1 4.000.1000 1.00 0.00
  101186  0 1 4.000.1000 1.00 0.00
  311087  0 1 4.000.1000 1.00 0.00
  121188  0 1 4.000.1000 1.00 0.00
  151189  0 1 4.000.1000 1.00 0.00
  191190  0 1 4.000.1000 1.00 0.00
   41191  0 1 4.000.1000 1.00 0.00
   51192  0 1 4.000.1000 1.00 0.00
  241193  0 1 4.000.1000 1.00 0.00
  311094  0 1 4.000.1000 1.00 0.00
      0.       1    0.50
Soil Series:          R3          38
  160.00          0   0   2   0   0   0   2   1   0
 4300.00 .45E-12   22.70
  0.9000
 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.96 10.0
 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5
    2.58   20.00
       2    0.70    1.00
       5
       1  10.000   1.460   0.370   0.000   0.000   0.000
         0.00693 0.00693 0.00000
```

```
       0.100   0.370   0.220   1.000   0.100
       13.50   23.00   34.00    0.00    0.00
   2  35.000   1.460   0.370   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.370   0.220   1.000   0.100
       13.50   23.00   34.00    0.00    0.00
   3  30.000   1.490   0.350   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.350   0.210   1.000   0.100
       13.50   25.00   33.00    0.00    0.00
   4  70.000   1.520   0.360   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.360   0.210   0.350   0.035
       13.50   17.00   35.00    0.00    0.00
   5  15.000   1.540   0.360   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.360   0.220   0.290   0.029
       13.50   14.00   36.00    0.00    0.00
   0
WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   0
   7    DAY
RUNF    TSER   0   0  10.0
ESLS    TSER   0   0  1.E3
PRCP    TSER   0   0  10.0
INFL    TSER 118 118  10.0
RFLX1   TSER   0   0  1.E7
EFLX1   TSER   0   0  1.E7
TPAP    TSER   0   0  1.0
```

Winter Cereals – R4-CW-.inp (PRZM file)

```
FOCUS_PRZM_SW_4.3.1, 27 Apr. 2015                       PRZM 4.63 Apr. 2015
                    Simulation Location: R4Crop: Cereals, Winter
    0.84    0.20       0   25.00       1       1
       4
    0.26    0.66    0.50    0.45               2    5.00   20.00
       1
       1    0.15  120.00   90.00       3   0   0   0    0.00  100.00
       1       4
1011 1505 1507 0111
0.20 0.20 0.40 0.90
0.10 0.10 0.10 0.10
  81   81   86   91
      20
  101175  150576  150776       1
  101176  150577  150777       1
  101177  150578  150778       1
  101178  150579  150779       1
  101179  150580  150780       1
  101180  150581  150781       1
  101181  150582  150782       1
  101182  150583  150783       1
  101183  150584  150784       1
  101184  150585  150785       1
  101185  150586  150786       1
  101186  150587  150787       1
  101187  150588  150788       1
  101188  150589  150789       1
  101189  150590  150790       1
  101190  150591  150791       1
  101191  150592  150792       1
  101192  150593  150793       1
  101193  150594  150794       1
  101194  150595  150795       1
Chemical Input Data:
      20       1       0       0
NIBIO_10
  101075  0 1 4.000.1000 1.00 0.00
  151076  0 1 4.000.1000 1.00 0.00
  101077  0 1 4.000.1000 1.00 0.00
  101078  0 1 4.000.1000 1.00 0.00
  181079  0 1 4.000.1000 1.00 0.00
  131080  0 1 4.000.1000 1.00 0.00
   61181  0 1 4.000.1000 1.00 0.00
  271082  0 1 4.000.1000 1.00 0.00
  101083  0 1 4.000.1000 1.00 0.00
  151084  0 1 4.000.1000 1.00 0.00
  151085  0 1 4.000.1000 1.00 0.00
   21186  0 1 4.000.1000 1.00 0.00
  311087  0 1 4.000.1000 1.00 0.00
  301088  0 1 4.000.1000 1.00 0.00
  101089  0 1 4.000.1000 1.00 0.00
  141090  0 1 4.000.1000 1.00 0.00
  161091  0 1 4.000.1000 1.00 0.00
  161092  0 1 4.000.1000 1.00 0.00
  221093  0 1 4.000.1000 1.00 0.00
  121094  0 1 4.000.1000 1.00 0.00
      0.       1    0.50
Soil Series:          R4          40
  300.00           0   0   2   0   0   0   2   1   0
 4300.00 .45E-12   22.70
  0.9000
 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.96 10.0
 14.0 14.0 14.0 14.0 14.0 14.0 14.0 14.0 14.0 14.0 14.0 14.0
    2.58   20.00
       2    0.70    1.00
       5
       1  10.000   1.520   0.260   0.000   0.000   0.000
         0.00693 0.00693 0.00000
```

```
      0.100   0.260   0.160   0.600   0.060
      14.00   53.00   25.00    0.00    0.00
   2  20.000   1.520   0.260   0.000   0.000   0.000
    0.00693 0.00693 0.00000
      5.000   0.260   0.160   0.600   0.060
      14.00   53.00   25.00    0.00    0.00
   3  30.000   1.500   0.270   0.000   0.000   0.000
    0.00693 0.00693 0.00000
      5.000   0.270   0.160   0.600   0.060
      14.00   53.00   25.00    0.00    0.00
   4 110.000   1.490   0.145   0.000   0.000   0.000
    0.00693 0.00693 0.00000
      5.000   0.145   0.060   0.080   0.008
      14.00   69.00    7.00    0.00    0.00
   5 130.000   1.500   0.160   0.000   0.000   0.000
    0.00693 0.00693 0.00000
      5.000   0.160   0.070   0.080   0.008
      14.00   65.00    8.00    0.00    0.00
   0
WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   0
   7    DAY
RUNF    TSER   0   0  10.0
ESLS    TSER   0   0  1.E3
PRCP    TSER   0   0  10.0
INFL    TSER 118 118  10.0
RFLX1   TSER   0   0  1.E7
EFLX1   TSER   0   0  1.E7
TPAP    TSER   0   0  1.0
```

Potatoes – R1-PS-.inp (PRZM file)

```
FOCUS_PRZM_SW_4.3.1, 27 Apr. 2015                       PRZM 4.63 Apr. 2015
                    Simulation Location: R1Crop: Potatoes
    0.94    0.20       0   15.00       1       1
       4
    0.42    0.33    0.50    0.45               3    3.00   20.00
       1
       1    0.15   70.00   80.00       3   0   0   0    0.00  100.00
       1       4
0505 2506 0809 0111
0.20 0.20 0.40 0.90
0.10 0.10 0.10 0.10
  82   82   87   91
      20
  050575  250675  080975       1
  050576  250676  080976       1
  050577  250677  080977       1
  050578  250678  080978       1
  050579  250679  080979       1
  050580  250680  080980       1
  050581  250681  080981       1
  050582  250682  080982       1
  050583  250683  080983       1
  050584  250684  080984       1
  050585  250685  080985       1
  050586  250686  080986       1
  050587  250687  080987       1
  050588  250688  080988       1
  050589  250689  080989       1
  050590  250690  080990       1
  050591  250691  080991       1
  050592  250692  080992       1
  050593  250693  080993       1
  050594  250694  080994       1
Chemical Input Data:
      20       1       0       0
NIBIO_10
  10 475  0 1 4.000.1000 1.00 0.00
  14 476  0 1 4.000.1000 1.00 0.00
   4 477  0 1 4.000.1000 1.00 0.00
  14 478  0 1 4.000.1000 1.00 0.00
   5 479  0 1 4.000.1000 1.00 0.00
  14 480  0 1 4.000.1000 1.00 0.00
  15 481  0 1 4.000.1000 1.00 0.00
  18 482  0 1 4.000.1000 1.00 0.00
  21 483  0 1 4.000.1000 1.00 0.00
  27 484  0 1 4.000.1000 1.00 0.00
  18 485  0 1 4.000.1000 1.00 0.00
   5 486  0 1 4.000.1000 1.00 0.00
   5 487  0 1 4.000.1000 1.00 0.00
   5 488  0 1 4.000.1000 1.00 0.00
  29 489  0 1 4.000.1000 1.00 0.00
   4 490  0 1 4.000.1000 1.00 0.00
  19 491  0 1 4.000.1000 1.00 0.00
   5 492  0 1 4.000.1000 1.00 0.00
   6 493  0 1 4.000.1000 1.00 0.00
   3 594  0 1 4.000.1000 1.00 0.00
      0.       1    0.50
Soil Series:         R1          42
  100.00           0   0   2   0   0   0   2   1   0
 4300.00 .45E-12   22.70
  0.9000
 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.96 10.0
 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0 10.0
    2.58   20.00
       2    0.70    1.00
       4
       1  10.000   1.350   0.338   0.000   0.000   0.000
         0.00693 0.00693 0.00000
```

```
      0.100   0.338   0.141   1.200   0.120
      10.00    5.00   13.00    0.00    0.00
   2  20.000   1.350   0.338   0.000   0.000   0.000
    0.00693 0.00693 0.00000
      5.000   0.338   0.141   1.200   0.120
      10.00    5.00   13.00    0.00    0.00
   3  30.000   1.450   0.286   0.000   0.000   0.000
    0.00693 0.00693 0.00000
      5.000   0.286   0.111   0.300   0.030
      10.00    6.00   11.00    0.00    0.00
   4  40.000   1.480   0.277   0.000   0.000   0.000
    0.00693 0.00693 0.00000
      5.000   0.277   0.108   0.100   0.010
      10.00    5.00   11.00    0.00    0.00
   0
WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   0
   7    DAY
RUNF    TSER   0   0  10.0
ESLS    TSER   0   0  1.E3
PRCP    TSER   0   0  10.0
INFL    TSER 118 118  10.0
RFLX1   TSER   0   0  1.E7
EFLX1   TSER   0   0  1.E7
TPAP    TSER   0   0  1.0
```

Potatoes – R2-PS-.inp (PRZM file)

```
FOCUS_PRZM_SW_4.3.1, 27 Apr. 2015                       PRZM 4.63 Apr. 2015
                    Simulation Location: R2Crop: Potatoes
    0.94    0.20       0   25.00       1       1
       4
    0.19    0.66    0.50    0.45               2    5.00   20.00
       1
       1    0.15   70.00   80.00       3   0   0   0    0.00  100.00
       1       4
1503 3005 1506 0111
0.20 0.20 0.40 0.90
0.10 0.10 0.10 0.10
  78   78   83   88
      20
  150375  300575  150675       1
  150376  300576  150676       1
  150377  300577  150677       1
  150378  300578  150678       1
  150379  300579  150679       1
  150380  300580  150680       1
  150381  300581  150681       1
  150382  300582  150682       1
  150383  300583  150683       1
  150384  300584  150684       1
  150385  300585  150685       1
  150386  300586  150686       1
  150387  300587  150687       1
  150388  300588  150688       1
  150389  300589  150689       1
  150390  300590  150690       1
  150391  300591  150691       1
  150392  300592  150692       1
  150393  300593  150693       1
  150394  300594  150694       1
Chemical Input Data:
      20       1       0       0
NIBIO_10
  18 275  0 1 4.000.1000 1.00 0.00
  26 276  0 1 4.000.1000 1.00 0.00
   1 377  0 1 4.000.1000 1.00 0.00
   6 378  0 1 4.000.1000 1.00 0.00
  24 279  0 1 4.000.1000 1.00 0.00
  24 280  0 1 4.000.1000 1.00 0.00
  12 281  0 1 4.000.1000 1.00 0.00
  13 282  0 1 4.000.1000 1.00 0.00
   4 383  0 1 4.000.1000 1.00 0.00
  12 284  0 1 4.000.1000 1.00 0.00
  19 285  0 1 4.000.1000 1.00 0.00
   3 386  0 1 4.000.1000 1.00 0.00
   2 387  0 1 4.000.1000 1.00 0.00
  14 288  0 1 4.000.1000 1.00 0.00
  12 289  0 1 4.000.1000 1.00 0.00
  15 290  0 1 4.000.1000 1.00 0.00
  12 291  0 1 4.000.1000 1.00 0.00
  10 392  0 1 4.000.1000 1.00 0.00
   1 393  0 1 4.000.1000 1.00 0.00
  23 294  0 1 4.000.1000 1.00 0.00
      0.       1    0.50
Soil Series:         R2          44
  100.00           0   0   2   0   0   0   2   1   0
 4300.00 .45E-12   22.70
  0.9000
 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.96 10.0
 14.8 14.8 14.8 14.8 14.8 14.8 14.8 14.8 14.8 14.8 14.8 14.8
    2.58   20.00
       2    0.70    1.00
       5
       1  10.000   1.150   0.360   0.000   0.000   0.000
         0.00693 0.00693 0.00000
```

```
       0.100   0.360   0.180   4.000   0.400
       14.80   67.00   14.00    0.00    0.00
   2  10.000   1.150   0.360   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.360   0.180   4.000   0.400
       14.80   67.00   14.00    0.00    0.00
   3  25.000   1.290   0.270   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.270   0.140   2.400   0.240
       14.80   72.00   12.00    0.00    0.00
   4  20.000   1.360   0.190   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.190   0.100   0.800   0.080
       14.80   75.00   12.00    0.00    0.00
   5  35.000   1.410   0.170   0.000   0.000   0.000
     0.00693 0.00693 0.00000
       5.000   0.170   0.080   0.500   0.050
       14.80   74.00   10.00    0.00    0.00
   0
WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   0
   7    DAY
RUNF    TSER   0   0  10.0
ESLS    TSER   0   0  1.E3
PRCP    TSER   0   0  10.0
INFL    TSER 118 118  10.0
RFLX1   TSER   0   0  1.E7
EFLX1   TSER   0   0  1.E7
TPAP    TSER   0   0  1.0
```

Potatoes – R3-PS-.inp (PRZM file)

```
FOCUS_PRZM_SW_4.3.1, 27 Apr. 2015                       PRZM 4.63 Apr. 2015
                    Simulation Location: R3Crop: Potatoes
    0.94    0.20       0   25.00       1       1
       4
    0.25    0.66    0.50    0.45               3    5.00   20.00
       1
       1    0.15   60.00   80.00       3   0   0   0    0.00  100.00
       1       4
1004 3005 0109 0111
0.20 0.20 0.40 0.90
0.10 0.10 0.10 0.10
  82   82   87   91
      20
  100475  300575  010975       1
  100476  300576  010976       1
  100477  300577  010977       1
  100478  300578  010978       1
  100479  300579  010979       1
  100480  300580  010980       1
  100481  300581  010981       1
  100482  300582  010982       1
  100483  300583  010983       1
  100484  300584  010984       1
  100485  300585  010985       1
  100486  300586  010986       1
  100487  300587  010987       1
  100488  300588  010988       1
  100489  300589  010989       1
  100490  300590  010990       1
  100491  300591  010991       1
  100492  300592  010992       1
  100493  300593  010993       1
  100494  300594  010994       1
Chemical Input Data:
      20       1       0       0
NIBIO_10
  19 375  0 1 4.000.1000 1.00 0.00
   4 476  0 1 4.000.1000 1.00 0.00
  21 377  0 1 4.000.1000 1.00 0.00
  12 378  0 1 4.000.1000 1.00 0.00
  10 379  0 1 4.000.1000 1.00 0.00
  11 380  0 1 4.000.1000 1.00 0.00
  20 381  0 1 4.000.1000 1.00 0.00
  22 382  0 1 4.000.1000 1.00 0.00
  10 383  0 1 4.000.1000 1.00 0.00
  20 384  0 1 4.000.1000 1.00 0.00
   1 485  0 1 4.000.1000 1.00 0.00
  15 386  0 1 4.000.1000 1.00 0.00
  28 387  0 1 4.000.1000 1.00 0.00
  17 388  0 1 4.000.1000 1.00 0.00
  10 389  0 1 4.000.1000 1.00 0.00
  14 390  0 1 4.000.1000 1.00 0.00
  25 391  0 1 4.000.1000 1.00 0.00
  13 392  0 1 4.000.1000 1.00 0.00
   6 493  0 1 4.000.1000 1.00 0.00
  21 394  0 1 4.000.1000 1.00 0.00
      0.       1    0.50
Soil Series:         R3          46
  160.00           0   0   2   0   0   0   2   1   0
 4300.00 .45E-12   22.70
  0.9000
 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.18 0.96 10.0
 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5 13.5
    2.58   20.00
       2    0.70    1.00
       5
       1  10.000   1.460   0.370   0.000   0.000   0.000
         0.00693 0.00693 0.00000
```

```
      0.100   0.370   0.220   1.000   0.100
      13.50   23.00   34.00    0.00    0.00
   2  35.000   1.460   0.370   0.000   0.000   0.000
     0.00693 0.00693 0.00000
      5.000   0.370   0.220   1.000   0.100
      13.50   23.00   34.00    0.00    0.00
   3  30.000   1.490   0.350   0.000   0.000   0.000
     0.00693 0.00693 0.00000
      5.000   0.350   0.210   1.000   0.100
      13.50   25.00   33.00    0.00    0.00
   4  70.000   1.520   0.360   0.000   0.000   0.000
     0.00693 0.00693 0.00000
      5.000   0.360   0.210   0.350   0.035
      13.50   17.00   35.00    0.00    0.00
   5  15.000   1.540   0.360   0.000   0.000   0.000
     0.00693 0.00693 0.00000
      5.000   0.360   0.220   0.290   0.029
      13.50   14.00   36.00    0.00    0.00
   0
WATR    YEAR      10    PEST    YEAR      10    CONC    YEAR      10   0
   7    DAY
RUNF    TSER   0   0  10.0
ESLS    TSER   0   0  1.E3
PRCP    TSER   0   0  10.0
INFL    TSER 118 118  10.0
RFLX1   TSER   0   0  1.E7
EFLX1   TSER   0   0  1.E7
TPAP    TSER   0   0  1.0
```

Winter Cereals R1 Pond Example – 96.txw (TOXSWA file)

```
*-----------------------------------------------------------------------------------------
* Input file for TOXSWA
*
* This file is intended to be used by expert users.
*
* E-mail: toxswa@pesticidemodels.nl
*-----------------------------------------------------------------------------------------
* (c) Wageningen University & Research
*

* Section 0: Run identification
* Section 1: Control
* Section 2: Waterbody
* Section 3: Hydrology
* Section 4: Sediment
* Section 5: Weather
* Section 6: Temperature
* Section 7: Substance
* Section 8: Loadings
* Section 9: Initial and boundary conditions for mass balance equations
* Section 10: Output control

* This input file considers the current scenario. Input that is not needed for
* this scenario is omitted. For a description of the full input file, see the
* user manual for the FOCUS & ascii version or in your TOXSWA download package.

*-----------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------
* Section 0: Run identification
*
*-----------------------------------------------------------------------------------------

R1_Pond                   Location          ! Name of the location [1|25 characters]
R1_POND                   WaterbodyID       ! ID of the water body [1|25 characters]
FOCUS                     SedimentTypeID    ! Name of sediment type [1|25 characters]
NIBIO_10                  SubstanceName     ! Name of parent substance [1|25 characters]
FOCUS_EXAMPLE             ApplicationScheme ! Name of the application scheme [1|25
characters]


*-----------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------
* Section 1: Control
*
*-----------------------------------------------------------------------------------------

FOCUS       CallingProgram        ! Release type of scenario [FOCUS]
5.5.3       CallingProgramVersion ! Version numbers for model, interface and database,
                                  ! respectively

01-Oct-1978 TimStart   ! Start date of simulation [01-Jan-1900 – 31-Dec-9999]
30-Sep-1979 TimEnd     ! End date of simulation [01-Jan-1900 – 31-Dec-9999]

Hourly      OptInp     ! Option for hourly or daily input data of lateral entries [Hourly,
Daily]

* OptHyd: options for hydrology simulation
* Only      Simulate only hydrology
* OnLine    Simulate hydrology and substance
* OffLine   Assumption hydrology has been simulated, runID.hyd file must be present
* Automatic TOXSWA checks if hydrology file (runID.hyd) exists; so, hydrology
*           simulation is skipped
OnLine      OptHyd     ! Option selected for hydrology simulation
                       ! [Only, OnLine, OffLine, Automatic]

600.        TimStpHyd (s)    ! Calculation time step for hydrology [0.001|3600]

* OptTem: options for temperature simulation
```

```
* Only      Simulate only temperature
* OnLine    Simulate temperature and substance
* OffLine   Assumption temperature has been simulated, runID.tem file must be present
* Automatic TOXSWA checks if the temperature file (runID.tem) exists; so, temperature
*           simulation is skipped
OnLine      OptTem    ! Option selected for temperature simulation
                       ! [Only, OnLine, OffLine, Automatic, ExtModel]

Calc        OptTimStp        ! Time step substance simulation options (Input, Calc)
Yes         OptCalcStabilityWater ! Option for check of stability of the numerical solution
for
                                     ! the water layer
Yes         OptCalcStabilitySediment ! Option for check of stability of the numerical
solution for
                                     ! the sediment [Yes, No]
                                     ! Yes = Full check on stability
                                     ! No = Check on positivity

    * If OptTimStp is 'Calc' then specify
    600.        MaxTimStpWat (s) ! Maximum calculation time step in water layer [0.001|3600]
    600.        MaxTimStpSed (s) ! Maximum calculation time step in sediment [0.001|3600]

*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------
* Section 2: Waterbody
*
*-----------------------------------------------------------------------------------------------

* WaterBody table: description of waterbody
* Len           Length [0.05|]
* NumSeg        Number of segments [1|]
* WidWatSys     Width of the bottom of water system [0.05|100]
* SloSidWatSys  Side slope  of the water system [0|10]
* DepWatDefPer  Water depth defining perimeter for exchange between water layer
*               and sediment [0|lowest water depth]

table WaterBody
Len       NumSeg    WidWatSys SloSidWatSys DepWatDefPer
(m)       (-)       (m)       (-)          (m)
30.       1         30.       1E-005       0.01
end_table

15.         ConSus (g.m-3)       ! Concentration of suspended solids [0|100000]
0.09        CntOmSusSol (g.g-1)  ! Mass ratio of organic matter in suspended solids [0|1]
0.          AmaMphWatLay (g.m-2) ! Dry mass of macrophyte biomass per m2 bottom [0|1000]

*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------
* Section  3: Hydrology: general
*   Section 3a: General
*-----------------------------------------------------------------------------------------------

Transient           OptFloWat             ! Option for water flow (Constant, Transient)
    * If OptFloWat is 'Transient' then specify
    Pond        OptWaterSystemType  ! Water system type [Pond, WaterCourse]


*-----------------------------------------------------------------------------------------------
* Section 3b: Constant water flow
*
* If OptFloWat is 'Constant'
*-----------------------------------------------------------------------------------------------


*-----------------------------------------------------------------------------------------------
* Section 3c: Variable water flow: pond
*
* If OptFloWat is 'Transient' and OptWaterSystemType is 'Pond'
*-----------------------------------------------------------------------------------------------
```

```
0.45        AreaSurPndInp (ha)  ! Size of surrounding area discharging excss water into the
pond
                               ! [0|100]
5.754       QBasPndInp (m3.d-1) ! Base flow, i.e. inflow into pond [0|50]
1.          HgtCrePnd (m)       ! Height of the weir crest at outflow [0.1|5]
0.5         WidCrePnd (m)       ! Width of the weir crest at outflow [0.01|10]

    * If application option OptLoa is 'PRZM' then specify
    0.06        AreaErsSurPndInp (ha)  ! Size of the eroding area around the pond [0|100]

*-----------------------------------------------------------------------------------------------
* Section 3d: Variable water flow: watercourse
*
* If OptFloWat is 'Transient' and OptWaterSystemType is 'WaterCourse'
*-----------------------------------------------------------------------------------------------


*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------
* Section 4: Sediment
*
*-----------------------------------------------------------------------------------------------
*SedimentProfile table: thickness and number of layers in horizon
* ThiHor  Thickness of horizon [0.0001|-]
* NumLay  Number of layers in horizon [1|500]
table SedimentProfile
ThiHor    NumLay
(m)
0.004     4
0.006     3
0.01      2
0.03      3
0.02      1
0.03      1
end_table

Input       OptSedProperties   ! Sediment properties for ThetaSat and CofDifRel [Input, Calc]

* SedimentProperties table: properties for each horizon:
* Nr        Number horizon [1|500]
* Rho       Bulk density [10|3000]
* CntOm     Organic matter mass content [0|1]
* If OptSedProperties 'Input' then specify ThetaSat and CofDifRel
* ThetaSat  Saturated water content [0.001|0.999]
* CofDifRel Relative diffusion coefficient [0|1]
table  horizon SedimentProperties
Nr        Rho       CntOm     ThetaSat  CofDifRel
          (kg.m-3)  (kg.kg-1) (m3.m-3)  (-)
1         800.      0.09      0.6       0.6
2         800.      0.09      0.6       0.6
3         800.      0.09      0.6       0.6
4         800.      0.09      0.6       0.6
5         800.      0.09      0.6       0.6
6         800.      0.09      0.6       0.6
end_table

0.          FlwWatSpg (m3.m-2.d-1) ! Percolation rate through the sediment [-0.01|0.01]

* DispersionLength table: dispersion length for each horizon
* Nr            Horizon number [1|500]
* LenDisSedLiq  Dispersion length of solute in liquid phase (m) [0.01|1]
table  horizon DispersionLength
Nr        LenDisSedLiq
          (m)
1         0.015
2         0.015
3         0.015
4         0.015
5         0.015
6         0.015
end_table
```

```
*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------

* Section 5: Weather section
*
*-----------------------------------------------------------------------------------------------

Weiherbach                       MeteoStation  MeteoStation   ! Name of file with meteo data
(*.met)

Monthly            OptMetInp ! Input data [Monthly]

*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------

* Section 6: Temperature
*
*-----------------------------------------------------------------------------------------------

*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------

* Section  7: Substance
*   Section 7a: general
*-----------------------------------------------------------------------------------------------

* Compounds table: first entry is parent, next entries are metabolites [1|15 characters]
table compounds                      ! List of substances
NIBIO_10
end_table

* FraPrtDauWat table: parent-daughter relationships transformation in water
* Column 1: fraction formed from parent into daughter [0|]
* Column 2: name of parent
* Column 3: name of daughter
table FraPrtDauWat (mol.mol-1)
end_table

* FraPrtDauSed table: parent-daughter relationships transformation in sediment
* Column 1: fraction formed from parent into daughter [0|]
* Column 2: name of parent
* Column 3: name of daughter
table FraPrtDauSed (mol.mol-1)
end_table

*-----------------------------------------------------------------------------------------------
* Section 7b: Substance properties for parent NIBIO_10
* (note extension of parameter name is substance code)
*-----------------------------------------------------------------------------------------------

250.        MolMas_NIBIO_10 (g.mol-1)         ! Molar mass of parent substance [10.0 - 10000]

* Volatilization from water layer
1.33E-10    PreVapRef_NIBIO_10 (Pa)           ! Saturated vapour pressure of substance
[0|2e5]
20.         TemRefVap_NIBIO_10 (C)            ! Reference temperature for saturated vapour
pressure
                                                    ! [0|40]
95.         MolEntVap_NIBIO_10 (kJ.mol-1)     ! Molar enthalpy of vaporization [-200|200]
30.         SlbWatRef_NIBIO_10 (mg.L-1)       ! Water solubility of substance [0.001|1e6]
25.         TemRefSlb_NIBIO_10 (C)            ! Reference temperature for water solubility
[0|40]
27.         MolEntSlb_NIBIO_10 (kJ.mol-1)     ! Molar enthalpy of dissolution  [-200|200]

* Diffusion in liquid phase
4.3E-5      CofDifWatRef_NIBIO_10 (m2.d-1)    ! Reference diffusion coefficient in water
[0|2E-3]

* Sorption
5.8         KomSed_NIBIO_10 (L.kg-1)          ! Freundlich coefficient of  equilibrium
sorption for
```

```
                                                    ! sediment [0|1e7]
1.          ConLiqRefSed_NIBIO_10 (mg.L-1)    ! Reference concentration in liquid phase for
                                                    ! Freundlich coefficient for sediment
[0.001|100]
0.9         ExpFreSed_NIBIO_10 (-)            ! Freundlich exponent  in sediment [0.1|1.5]
5.8         KomSusSol_NIBIO_10 (L.kg-1)       ! Freundlich coefficient of  equilibrium
sorption
                                                    ! for suspended solids [0|1e7]
1.          ConLiqRefSusSol_NIBIO_10 (mg.L-1) ! Reference concentration in liquid phase
                                                    ! for Freundlich sorption coefficient
for
                                                    ! suspended solids [0.001|100]
0.9         ExpFreSusSol_NIBIO_10 (-)         ! Freundlich exponent suspended solids
[0.1|1.5]
0.          CofSorMph_NIBIO_10 (L.kg-1)       ! Coefficient for linear sorption on
                                                    ! macrophytes [0|1e7]

* Transformation in water
100.        DT50WatRef_NIBIO_10 (d)           ! Half-life transformation in water at
reference
                                                    ! temperature [0.1|1e5]
20.         TemRefTraWat_NIBIO_10 (C)         ! Reference temperature for half-life measured
in
                                                    ! water [5|30]
65.4        MolEntTraWat_NIBIO_10 (kJ.mol-1)  ! Molar activation enthalpy of transformation
in
                                                    ! water [0|200]

* Transformation in sediment
100.        DT50SedRef_NIBIO_10 (d)           ! Half-life transformation in sediment at
reference
                                                    ! temperature [0.1|1e5]
20.         TemRefTraSed_NIBIO_10 (C)         ! Reference temperature for half-life in
sediment
                                                    ! [5|30]
65.4        MolEntTraSed_NIBIO_10 (kJ.mol-1)  ! Molar activation enthalpy of transformation
in
                                                    ! sedment [0|200]


*--------------------------------------------------------------------------------------------
*--------------------------------------------------------------------------------------------
* Section 8: Loadings
*
*--------------------------------------------------------------------------------------------
* OptLoa options for loading type
* DriftOnly  spray drift only entry route
* MACRO      drainage calculated by MACRO
* PRZM       runoff and erosion calculated by PRZM
PRZM        OptLoa         ! Loading option [DriftOnly, PEARL, MACRO, PRZM, GEM]

* Loadings table: details on spray drift, and stretch for all loading types
* Column 1  Date and time of application, relevant if OptLoa is 'DriftOnly', otherwise
*           the date is a dummy value
* Column 2  Type of loading [Drift]
* Column 3  Drift deposition (mg.m-2) [0|]
* Column 4  Start of stretch of watercourse loaded by all loading types (m) [0|1e4]
* Column 5  End of stretch of watercourse loaded by all loading types (m) [0|1e4]
table Loadings
30-Dec-1899    drift     0.0000E+000  0.        30.
end_table

    * If OptLoa is 'PRZM' then specify details of runoff
    0.          WidFldRnf (m)       ! Width of field contributing runoff [0|1000]
    0.          WidFldErs (m)       ! Width of field contributing erosion [0|1000]
    0.1         RatInfDir (-)       ! Ratio of infiltraton water added to runoff water [0|1]
    0.01        ThiLayErs (m)       ! Thickness of upper sediment layer to which erosion mass
                                    ! is added [1e-5|1]

    * If OptLoa is 'MACRO' or OptLoa is 'PRZM' then specify path and file names of files
    * Table lateral entries files of soil substances, including metabolites (path+name)
```

```
    table Soil Substances
    D:\SWASH\Projects\NIBIO_10\PRZM\cereals_winter\00040-C1.p2t
    end_table

    * If OptHyd is 'transient' then specify details of catchment
    No          OptUpsInp           ! Upstream catchment treated [Yes, No]
    0.          RatAreaUpsApp (-)   ! Ratio of upstream catchment treated [0|1]

*-----------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------
* Section 9: Initial and boundary conditions for mass balance equations
*
*-----------------------------------------------------------------------------------

* Initial conditions

0.          ConSysWatIni (g.m-3)  ! Initial total concentration in water layer [0|-]

* CntSysSedIni table: initial total substance content in sediment
* If metabolites are included then initail contents for these substances are set to zero
* Column 1  Depth in sediment (m) [0|-]
* Column 2  Substance content (mg.kg-1) [0|-]
table interpolate CntSysSedIni (mg.kg-1)
end_table

* Boundary conditions
0.          ConAir (g.m-3)        ! Concentration  in air [0|-]

0.          ConWatSpg (g.m-3)     ! Concentration in incoming seepage water [0|-]

*-----------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------
* Section  10: Output control
*   Section 10a: General
*-----------------------------------------------------------------------------------

No          OptDelOutFiles   ! Remove *.out file after simulation [Yes|No]
* DateFormat: options for format of date and time in the output file
* DaysFromSta   Print number of days since start of simulation
* DaysFrom1900  Print number of days since 1900
* Years         Print years
DaysFromSta           DateFormat       DateFormat [DaysFromSta, DaysFrom1900, Years]

* RealFormat: format of the ordinary output - use FORTRAN notation:
* e is scientific notation, g  is general notation,
* then the number of positions, then the number of digits
e14.6                 RealFormat       ! Format of ordinary output

* OptDelTimPrn: options for output time step
* Hour,Day,Decade,Month,Year  Time step for output
* Automatic                   Length of simulation period
* Other                       User defined
Hour        OptDelTimPrn  ! Output time step [Hour|Day|Decade|Month|Year|
                          ! Automatic|Other]

0.05        ThiLayTgt (m)    ! Depth defining the thickness of the target sediment layer
                             ! for output of (averaged) content [1e-5|1]

All       OptOutputDistances ! Options for distances of water layer grid points at which
                             ! output can be obtained[None, All, table]

table      OptOutputDepths  ! Options for depths of sediment grid poinst at which
                            ! output can be obtained [None, All, table]

    * If OptOutputDepths is 'table' then specify
    * OutputDepths-table: depths of sediment nodes at which output can be obtained
    * Column 1   Depth (m) [0|-]
    table OutputDepths (m)
    end_table
```

```
* Specify dates for output of additional profiles; options set via OptOutputDistances and
* OptOutputDepths are used
* HorVertProfiles table: profiles in horizontal direction for water layer and in vertical
* direction for sediment are given; values given are:
* Water layer: output distance, water depth, total and dissolved concentration,
* Sediment: output node water layer, output depth, pore volume, total and dissolved
* concentration.
table HorVertProfiles
end_table

* Specify type of summary report
FOCUS                OptReport        ! [FOCUS]
Yes                  ExposureReport   ! Exposure report [Yes|No]

*-----------------------------------------------------------------------------------------------
* Section 10b: Additional options for Dutch registration report
*
* If OptReport is 'DutchRegistration'
*-----------------------------------------------------------------------------------------------

*-----------------------------------------------------------------------------------------------
* Section 10c: Print variables in *.out file
* State variables, fluxes and rates given as momentary values.
* Volume,energy and mass changes given as cumulative values.
*-----------------------------------------------------------------------------------------------

* Specify for all print variables whether output is wanted [Yes, No]
* When print variable is not in file; TOXSWA assumes 'No'

* PrintCumulatives: options for printing cumulatives of volume, energy and mass fluxes
* Yes   : cumulative terms have been summed up from start of simulation and have been
*         allocated to the last moment of the period considered
* No    : cumulative terms have been summed up from start of user defined output time step
*         OptDelTimPrn and have been allocated to the last moment of the period
*         considered
No          PrintCumulatives ! [Yes, No]

* Hydrology
No          print_DepWat             ! Water depth (m)
No          print_QBou               ! Discharge  (m3.s-1)
No          print_VelWatFlw          ! Flow velocity (m.d-1)
No          print_VolErrWatLay       ! Volume error in waterbody (m3)

* Lateral entries (expressed per m2 adjacent field)
    * If OptLoa is 'PRZM'
    No          print_VvrLiqRnf           ! Runoff (+ infiltration) water flow (m3.m-2.hr-1)
    No          print_FlmRnf              ! Runoff substance flux (g.m-2.hr-1)
    No          print_FlmErs              ! Erosion substance flux (g.m-2.hr-1)

* Concentrations and contents in water layer segments as specified by
* OptOutputDistances
Yes         print_ConLiqWatLay       ! Concentration dissolved in water (g.m-3)
No          print_CntSorMph          ! Content sorbed to macrophytes (g.kg-1)
No          print_CntSorSusSol       ! Content sorbed to suspended solids (g.kg-1)
No          print_ConSysWatLay       ! Total concentration in water (g.m-3)

* Concentrations and contents in sediment below water layer segments as specified by
* OptOutputDistances and OptOutputDepths
No          print_ConLiqSed          ! Concentration in pore water sediment (g.m-3)
No          print_CntSorSed          ! Content sorbed to sediment (g.kg-1)
No          print_ConSysSed          ! Total content in sediment (g.m-3)
Yes         print_CntSedTgt          ! Total content in target layer sediment  (g.kg-1)
No          print_ConLiqSedTgt       ! Concentration in pore water in target layer
                                     ! sediment (g.m-3)
No          print_CntSorSedTgt       ! Content sorbed in target layer sediment (g.kg-1)

* Distribution in entire water layer
Yes         print_MasLiqWatLay       ! Mass in liquid phase in water layer (g)
Yes         print_MasSorSusSol       ! Mass sorbed to suspended solids in water layer (g)
Yes         print_MasSorMph          ! Mass sorbed to macrophytes in water layer (g)
```

```
* Distribution in entire sediment
Yes         print_MasLiqSed          ! Mass in liquid phase in sediment (g)
Yes         print_MasSorSed          ! Mass sorbed in sediment (g)

* Mass balance for entire water layer
Yes         print_MasWatLay          ! Mass in water layer (g)
Yes         print_MasDrfWatLay       ! Mass entered in water layer by spray drift (g)
Yes         print_MasDraWatLay       ! Mass entered in water layer by drainage (g)
Yes         print_MasRnfWatLay       ! Mass entered in water layer by runoff (g)
Yes         print_MasSedInWatLay     ! Mass penetrated into sediment from water layer (g)
Yes         print_MasSedOutWatLay    ! Mass transferred from sediment into water layer (g)
Yes         print_MasDwnWatLay       ! Mass flowed across downstream boundary out of
                                     ! water layer (g)
Yes         print_MasUpsWatLay       ! Mass flowed across upstream boundary into water
                                     ! layer (g)
Yes         print_MasTraWatLay       ! Mass transformed in water layer (g)
Yes         print_MasForWatLay       ! Mass formed in water layer (g)
Yes         print_MasVolWatLay       ! Mass volatilised from water layer (g)
No          print_MasErrWatLay       ! Mass error in water layer (g)

* Mass balance sediment
Yes         print_MasSed             ! Mass in sediment (g)
Yes         print_MasTraSed          ! Mass transformed in sediment (g)
Yes         print_MasForSed          ! Mass formed in sediment (g)
Yes         print_MasWatLayInSed     ! Mass transfered into water layer from sediment
                                     ! layer (g)
Yes         print_MasWatLayOutSed    ! Mass transfered from water layer into sediment
                                     ! layer (g)
Yes         print_MasDwnSed          ! Mass leaving sediment across lower boundary (g)
Yes         print_MasErsSed          ! Mass entering sediment by erosion (g)
No          print_MasErrSed          ! Mass error in sediment (g)

*-----------------------------------------------------------------------------------------
* End of TOXSWA input file
*-----------------------------------------------------------------------------------------
```

Winter Cereals R1 Stream Example – 97.txw (TOXSWA file)

```
*-----------------------------------------------------------------------------------------
* Input file for TOXSWA
*
* This file is intended to be used by expert users.
*
* E-mail: toxswa@pesticidemodels.nl
*-----------------------------------------------------------------------------------------
* (c) Wageningen University & Research
*

* Section 0: Run identification
* Section 1: Control
* Section 2: Waterbody
* Section 3: Hydrology
* Section 4: Sediment
* Section 5: Weather
* Section 6: Temperature
* Section 7: Substance
* Section 8: Loadings
* Section 9: Initial and boundary conditions for mass balance equations
* Section 10: Output control

* This input file considers the current scenario. Input that is not needed for
* this scenario is omitted. For a description of the full input file, see the
* user manual for the FOCUS & ascii version or in your TOXSWA download package.

*-----------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------
* Section 0: Run identification
*
*-----------------------------------------------------------------------------------------

R1_Stream                 Location          ! Name of the location [1|25 characters]
R1_STREAM                 WaterbodyID       ! ID of the water body [1|25 characters]
FOCUS                     SedimentTypeID    ! Name of sediment type [1|25 characters]
NIBIO_10                  SubstanceName     ! Name of parent substance [1|25 characters]
FOCUS_EXAMPLE             ApplicationScheme ! Name of the application scheme [1|25
characters]


*-----------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------
* Section 1: Control
*
*-----------------------------------------------------------------------------------------

FOCUS       CallingProgram        ! Release type of scenario [FOCUS]
5.5.3       CallingProgramVersion ! Version numbers for model, interface and database,
                                  ! respectively

01-Oct-1978 TimStart   ! Start date of simulation [01-Jan-1900 - 31-Dec-9999]
30-Sep-1979 TimEnd     ! End date of simulation [01-Jan-1900 - 31-Dec-9999]

Hourly      OptInp     ! Option for hourly or daily input data of lateral entries [Hourly,
Daily]

* OptHyd: options for hydrology simulation
* Only      Simulate only hydrology
* OnLine    Simulate hydrology and substance
* OffLine   Assumption hydrology has been simulated, runID.hyd file must be present
* Automatic TOXSWA checks if hydrology file (runID.hyd) exists; so, hydrology
*           simulation is skipped
OnLine      OptHyd     ! Option selected for hydrology simulation
                       ! [Only, OnLine, OffLine, Automatic]

600.        TimStpHyd (s)    ! Calculation time step for hydrology [0.001|3600]

* OptTem: options for temperature simulation
```

```
* Only      Simulate only temperature
* OnLine    Simulate temperature and substance
* OffLine   Assumption temperature has been simulated, runID.tem file must be present
* Automatic TOXSWA checks if the temperature file (runID.tem) exists; so, temperature
*           simulation is skipped
OnLine      OptTem    ! Option selected for temperature simulation
                       ! [Only, OnLine, OffLine, Automatic, ExtModel]

Calc        OptTimStp        ! Time step substance simulation options (Input, Calc)
Yes         OptCalcStabilityWater ! Option for check of stability of the numerical solution
for
                                     ! the water layer
Yes         OptCalcStabilitySediment ! Option for check of stability of the numerical
solution for
                                     ! the sediment [Yes, No]
                                     ! Yes = Full check on stability
                                     ! No = Check on positivity

    * If OptTimStp is 'Calc' then specify
    600.        MaxTimStpWat (s) ! Maximum calculation time step in water layer [0.001|3600]
    600.        MaxTimStpSed (s) ! Maximum calculation time step in sediment [0.001|3600]

*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------

* Section 2: Waterbody
*
*-----------------------------------------------------------------------------------------------

* WaterBody table: description of waterbody
* Len           Length [0.05|]
* NumSeg        Number of segments [1|]
* WidWatSys     Width of the bottom of water system [0.05|100]
* SloSidWatSys  Side slope  of the water system [0|10]
* DepWatDefPer  Water depth defining perimeter for exchange between water layer
*               and sediment [0|lowest water depth]

table WaterBody
Len       NumSeg    WidWatSys SloSidWatSys DepWatDefPer
(m)       (-)       (m)       (-)          (m)
100.      20        1.        1E-005       0.01
end_table

15.         ConSus (g.m-3)       ! Concentration of suspended solids [0|100000]
0.09        CntOmSusSol (g.g-1)  ! Mass ratio of organic matter in suspended solids [0|1]
0.          AmaMphWatLay (g.m-2) ! Dry mass of macrophyte biomass per m2 bottom [0|1000]

*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------

* Section  3: Hydrology: general
*   Section 3a: General
*-----------------------------------------------------------------------------------------------

Transient           OptFloWat             ! Option for water flow (Constant, Transient)
    * If OptFloWat is 'Transient' then specify
    WaterCourse OptWaterSystemType  ! Water system type [Pond, WaterCourse]

    * If OptWaterSystemType is 'WaterCourse' then specify
    Fischer     OptDis   ! Dispersion calculation method [Input, Fischer]


*-----------------------------------------------------------------------------------------------
* Section 3b: Constant water flow
*
* If OptFloWat is 'Constant'
*-----------------------------------------------------------------------------------------------


*-----------------------------------------------------------------------------------------------
* Section 3c: Variable water flow: pond
```

```
*
* If OptFloWat is 'Transient' and OptWaterSystemType is 'Pond'
*-----------------------------------------------------------------------------------------

*-----------------------------------------------------------------------------------------
* Section 3d: Variable water flow: watercourse
*
* If OptFloWat is 'Transient' and OptWaterSystemType is 'WaterCourse'
*-----------------------------------------------------------------------------------------

100.        AreaUpsWatCrsInp (ha)  ! Area of upstream catchment [0|1e4]
191.8       QBasWatCrsInp (m3.d-1) ! Base flow from upstream catchment [0|1e4]
0.001       SloBotRepCha (-)       ! Slope bottom representative channel [0|0.01]
0.5         HgtCreRepCha (m)       ! Height of the weir crest [0.01|5]
0.5         WidCreRepCha (m)       ! Width of the weir crest [0.01|10]
110.        LenRepCha (m)          ! Length representative channel [10|2000]
1.          WidBotRepCha (m)       ! Width bottom representative channel [0.1 - 10]
11.         CofRghRef (s-1)        ! Value Manning coefficient for bottom roughness at 1 m
                                   ! water depth in water body [1|100]
1.2         CofVelHea (m.s-1)      ! Energy coefficient due to non-uniform distribution of
                                   ! flow velocities in cross section [1.1|1.5]

*-----------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------

* Section 4: Sediment
*
*-----------------------------------------------------------------------------------------

*SedimentProfile table: thickness and number of layers in horizon
* ThiHor  Thickness of horizon [0.0001|-]
* NumLay  Number of layers in horizon [1|500]
table SedimentProfile
ThiHor    NumLay
(m)
0.004     4
0.006     3
0.01      2
0.03      3
0.02      1
0.03      1
end_table

Input       OptSedProperties   ! Sediment properties for ThetaSat and CofDifRel [Input, Calc]

* SedimentProperties table: properties for each horizon:
* Nr        Number horizon [1|500]
* Rho       Bulk density [10|3000]
* CntOm     Organic matter mass content [0|1]
* If OptSedProperties 'Input' then specify ThetaSat and CofDifRel
* ThetaSat  Saturated water content [0.001|0.999]
* CofDifRel Relative diffusion coefficient [0|1]
table  horizon SedimentProperties
Nr        Rho       CntOm     ThetaSat  CofDifRel
          (kg.m-3)  (kg.kg-1) (m3.m-3)  (-)
1         800.      0.09      0.6       0.6
2         800.      0.09      0.6       0.6
3         800.      0.09      0.6       0.6
4         800.      0.09      0.6       0.6
5         800.      0.09      0.6       0.6
6         800.      0.09      0.6       0.6
end_table

0.          FlwWatSpg (m3.m-2.d-1) ! Percolation rate through the sediment [-0.01|0.01]

* DispersionLength table: dispersion length for each horizon
* Nr            Horizon number [1|500]
* LenDisSedLiq  Dispersion length of solute in liquid phase (m) [0.01|1]
table  horizon DispersionLength
Nr        LenDisSedLiq
          (m)
```

```
1         0.015
2         0.015
3         0.015
4         0.015
5         0.015
6         0.015
end_table

*-----------------------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------------------

* Section 5: Weather section
*
*-----------------------------------------------------------------------------------------------------------

Weiherbach                       MeteoStation  MeteoStation   ! Name of file with meteo data
(*.met)

Monthly            OptMetInp ! Input data [Monthly]

*-----------------------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------------------

* Section 6: Temperature
*
*-----------------------------------------------------------------------------------------------------------

*-----------------------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------------------

* Section  7: Substance
*   Section 7a: general
*-----------------------------------------------------------------------------------------------------------

* Compounds table: first entry is parent, next entries are metabolites [1|15 characters]
table compounds                      ! List of substances
NIBIO_10
end_table

* FraPrtDauWat table: parent-daughter relationships transformation in water
* Column 1: fraction formed from parent into daughter [0|]
* Column 2: name of parent
* Column 3: name of daughter
table FraPrtDauWat (mol.mol-1)
end_table

* FraPrtDauSed table: parent-daughter relationships transformation in sediment
* Column 1: fraction formed from parent into daughter [0|]
* Column 2: name of parent
* Column 3: name of daughter
table FraPrtDauSed (mol.mol-1)
end_table

*-----------------------------------------------------------------------------------------------------------
* Section 7b: Substance properties for parent NIBIO_10
* (note extension of parameter name is substance code)
*-----------------------------------------------------------------------------------------------------------

250.        MolMas_NIBIO_10 (g.mol-1)         ! Molar mass of parent substance [10.0 - 10000]

* Volatilization from water layer
1.33E-10    PreVapRef_NIBIO_10 (Pa)           ! Saturated vapour pressure of substance
[0|2e5]
20.         TemRefVap_NIBIO_10 (C)            ! Reference temperature for saturated vapour
pressure
                                                     ! [0|40]
95.         MolEntVap_NIBIO_10 (kJ.mol-1)     ! Molar enthalpy of vaporization [-200|200]
30.         SlbWatRef_NIBIO_10 (mg.L-1)       ! Water solubility of substance [0.001|1e6]
25.         TemRefSlb_NIBIO_10 (C)            ! Reference temperature for water solubility
[0|40]
27.         MolEntSlb_NIBIO_10 (kJ.mol-1)     ! Molar enthalpy of dissolution  [-200|200]
```

```
* Diffusion in liquid phase
4.3E-5      CofDifWatRef_NIBIO_10 (m2.d-1)    ! Reference diffusion coefficient in water
[0|2E-3]

* Sorption
5.8         KomSed_NIBIO_10 (L.kg-1)          ! Freundlich coefficient of  equilibrium
sorption for
                                                    ! sediment [0|1e7]
1.          ConLiqRefSed_NIBIO_10 (mg.L-1)    ! Reference concentration in liquid phase for
                                                    ! Freundlich coefficient for sediment
[0.001|100]
0.9         ExpFreSed_NIBIO_10 (-)            ! Freundlich exponent  in sediment [0.1|1.5]
5.8         KomSusSol_NIBIO_10 (L.kg-1)       ! Freundlich coefficient of  equilibrium
sorption
                                                    ! for suspended solids [0|1e7]
1.          ConLiqRefSusSol_NIBIO_10 (mg.L-1) ! Reference concentration in liquid phase
                                                    ! for Freundlich sorption coefficient
for
                                                    ! suspended solids [0.001|100]
0.9         ExpFreSusSol_NIBIO_10 (-)         ! Freundlich exponent suspended solids
[0.1|1.5]
0.          CofSorMph_NIBIO_10 (L.kg-1)       ! Coefficient for linear sorption on
                                                    ! macrophytes [0|1e7]

* Transformation in water
100.        DT50WatRef_NIBIO_10 (d)           ! Half-life transformation in water at
reference
                                                    ! temperature [0.1|1e5]
20.         TemRefTraWat_NIBIO_10 (C)         ! Reference temperature for half-life measured
in
                                                    ! water [5|30]
65.4        MolEntTraWat_NIBIO_10 (kJ.mol-1)  ! Molar activation enthalpy of transformation
in
                                                    ! water [0|200]

* Transformation in sediment
100.        DT50SedRef_NIBIO_10 (d)           ! Half-life transformation in sediment at
reference
                                                    ! temperature [0.1|1e5]
20.         TemRefTraSed_NIBIO_10 (C)         ! Reference temperature for half-life in
sediment
                                                    ! [5|30]
65.4        MolEntTraSed_NIBIO_10 (kJ.mol-1)  ! Molar activation enthalpy of transformation
in
                                                    ! sedment [0|200]


*-----------------------------------------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------------------------------------

* Section 8: Loadings
*
*-----------------------------------------------------------------------------------------------------------------------------

* OptLoa options for loading type
* DriftOnly  spray drift only entry route
* MACRO      drainage calculated by MACRO
* PRZM       runoff and erosion calculated by PRZM
PRZM        OptLoa         ! Loading option [DriftOnly, PEARL, MACRO, PRZM, GEM]

* Loadings table: details on spray drift, and stretch for all loading types
* Column 1  Date and time of application, relevant if OptLoa is 'DriftOnly', otherwise
*           the date is a dummy value
* Column 2  Type of loading [Drift]
* Column 3  Drift deposition (mg.m-2) [0|]
* Column 4  Start of stretch of watercourse loaded by all loading types (m) [0|1e4]
* Column 5  End of stretch of watercourse loaded by all loading types (m) [0|1e4]
table Loadings
30-Dec-1899    drift     0.0000E+000  0.        100.
end_table
```

```
    * If OptLoa is 'PRZM' then specify details of runoff
    100.        WidFldRnf (m)       ! Width of field contributing runoff [0|1000]
    20.         WidFldErs (m)       ! Width of field contributing erosion [0|1000]
    0.1         RatInfDir (-)       ! Ratio of infiltraton water added to runoff water [0|1]
    0.01        ThiLayErs (m)       ! Thickness of upper sediment layer to which erosion mass
                                    ! is added [1e-5|1]

    * If OptLoa is 'MACRO' or OptLoa is 'PRZM' then specify path and file names of files
    * Table lateral entries files of soil substances, including metabolites (path+name)

    table Soil Substances
    D:\SWASH\Projects\NIBIO_10\PRZM\cereals_winter\00040-C1.p2t
    end_table

    * If OptHyd is 'transient' then specify details of catchment
    Yes         OptUpsInp           ! Upstream catchment treated [Yes, No]
    0.2         RatAreaUpsApp (-)   ! Ratio of upstream catchment treated [0|1]

*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------

* Section 9: Initial and boundary conditions for mass balance equations
*
*-----------------------------------------------------------------------------------------------

* Initial conditions

0.          ConSysWatIni (g.m-3)  ! Initial total concentration in water layer [0|-]

* CntSysSedIni table: initial total substance content in sediment
* If metabolites are included then initail contents for these substances are set to zero
* Column 1  Depth in sediment (m) [0|-]
* Column 2  Substance content (mg.kg-1) [0|-]
table interpolate CntSysSedIni (mg.kg-1)
end_table

* Boundary conditions
0.          ConAir (g.m-3)        ! Concentration  in air [0|-]

0.          ConWatSpg (g.m-3)     ! Concentration in incoming seepage water [0|-]

*-----------------------------------------------------------------------------------------------
*-----------------------------------------------------------------------------------------------

* Section  10: Output control
*   Section 10a: General
*-----------------------------------------------------------------------------------------------

No          OptDelOutFiles   ! Remove *.out file after simulation [Yes|No]
* DateFormat: options for format of date and time in the output file
* DaysFromSta   Print number of days since start of simulation
* DaysFrom1900  Print number of days since 1900
* Years         Print years
DaysFromSta           DateFormat       DateFormat [DaysFromSta, DaysFrom1900, Years]

* RealFormat: format of the ordinary output - use FORTRAN notation:
* e is scientific notation, g  is general notation,
* then the number of positions, then the number of digits
e14.6                 RealFormat       ! Format of ordinary output

* OptDelTimPrn: options for output time step
* Hour,Day,Decade,Month,Year  Time step for output
* Automatic                  Length of simulation period
* Other                      User defined
Hour        OptDelTimPrn  ! Output time step [Hour|Day|Decade|Month|Year|
                          ! Automatic|Other]

0.05        ThiLayTgt (m)    ! Depth defining the thickness of the target sediment layer
                             ! for output of (averaged) content [1e-5|1]
```

```
All       OptOutputDistances ! Options for distances of water layer grid points at which
                             ! output can be obtained[None, All, table]

table      OptOutputDepths  ! Options for depths of sediment grid poinst at which
                            ! output can be obtained [None, All, table]

    * If OptOutputDepths is 'table' then specify
    * OutputDepths-table: depths of sediment nodes at which output can be obtained
    * Column 1   Depth (m) [0|-]
    table OutputDepths (m)
    end_table

* Specify dates for output of additional profiles; options set via OptOutputDistances and
* OptOutputDepths are used
* HorVertProfiles table: profiles in horizontal direction for water layer and in vertical
* direction for sediment are given; values given are:
* Water layer: output distance, water depth, total and dissolved concentration,
* Sediment: output node water layer, output depth, pore volume, total and dissolved
* concentration.
table HorVertProfiles
end_table

* Specify type of summary report
FOCUS                 OptReport        ! [FOCUS]
Yes                   ExposureReport   ! Exposure report [Yes|No]

*-----------------------------------------------------------------------------------------
* Section 10b: Additional options for Dutch registration report
*
* If OptReport is 'DutchRegistration'
*-----------------------------------------------------------------------------------------

*-----------------------------------------------------------------------------------------
* Section 10c: Print variables in *.out file
* State variables, fluxes and rates given as momentary values.
* Volume,energy and mass changes given as cumulative values.
*-----------------------------------------------------------------------------------------

* Specify for all print variables whether output is wanted [Yes, No]
* When print variable is not in file; TOXSWA assumes 'No'

* PrintCumulatives: options for printing cumulatives of volume, energy and mass fluxes
* Yes   : cumulative terms have been summed up from start of simulation and have been
*         allocated to the last moment of the period considered
* No    : cumulative terms have been summed up from start of user defined output time step
*         OptDelTimPrn and have been allocated to the last moment of the period
*         considered
No          PrintCumulatives ! [Yes, No]

* Hydrology
No          print_DepWat             ! Water depth (m)
No          print_QBou               ! Discharge  (m3.s-1)
No          print_VelWatFlw          ! Flow velocity (m.d-1)
No          print_VolErrWatLay       ! Volume error in waterbody (m3)

* Lateral entries (expressed per m2 adjacent field)
    * If OptLoa is 'PRZM'
    No          print_VvrLiqRnf           ! Runoff (+ infiltration) water flow (m3.m-2.hr-1)
    No          print_FlmRnf              ! Runoff substance flux (g.m-2.hr-1)
    No          print_FlmErs              ! Erosion substance flux (g.m-2.hr-1)

* Concentrations and contents in water layer segments as specified by
* OptOutputDistances
Yes         print_ConLiqWatLay       ! Concentration dissolved in water (g.m-3)
No          print_CntSorMph          ! Content sorbed to macrophytes (g.kg-1)
No          print_CntSorSusSol       ! Content sorbed to suspended solids (g.kg-1)
No          print_ConSysWatLay       ! Total concentration in water (g.m-3)

* Concentrations and contents in sediment below water layer segments as specified by
* OptOutputDistances and OptOutputDepths
No          print_ConLiqSed          ! Concentration in pore water sediment (g.m-3)
```

```
No          print_CntSorSed          ! Content sorbed to sediment (g.kg-1)
No          print_ConSysSed          ! Total content in sediment (g.m-3)
Yes         print_CntSedTgt          ! Total content in target layer sediment  (g.kg-1)
No          print_ConLiqSedTgt       ! Concentration in pore water in target layer
                                     ! sediment (g.m-3)
No          print_CntSorSedTgt       ! Content sorbed in target layer sediment (g.kg-1)

* Distribution in entire water layer
Yes         print_MasLiqWatLay       ! Mass in liquid phase in water layer (g)
Yes         print_MasSorSusSol       ! Mass sorbed to suspended solids in water layer (g)
Yes         print_MasSorMph          ! Mass sorbed to macrophytes in water layer (g)

* Distribution in entire sediment
Yes         print_MasLiqSed          ! Mass in liquid phase in sediment (g)
Yes         print_MasSorSed          ! Mass sorbed in sediment (g)

* Mass balance for entire water layer
Yes         print_MasWatLay          ! Mass in water layer (g)
Yes         print_MasDrfWatLay       ! Mass entered in water layer by spray drift (g)
Yes         print_MasDraWatLay       ! Mass entered in water layer by drainage (g)
Yes         print_MasRnfWatLay       ! Mass entered in water layer by runoff (g)
Yes         print_MasSedInWatLay     ! Mass penetrated into sediment from water layer (g)
Yes         print_MasSedOutWatLay    ! Mass transferred from sediment into water layer (g)
Yes         print_MasDwnWatLay       ! Mass flowed across downstream boundary out of
                                     ! water layer (g)
Yes         print_MasUpsWatLay       ! Mass flowed across upstream boundary into water
                                     ! layer (g)
Yes         print_MasTraWatLay       ! Mass transformed in water layer (g)
Yes         print_MasForWatLay       ! Mass formed in water layer (g)
Yes         print_MasVolWatLay       ! Mass volatilised from water layer (g)
No          print_MasErrWatLay       ! Mass error in water layer (g)

* Mass balance sediment
Yes         print_MasSed             ! Mass in sediment (g)
Yes         print_MasTraSed          ! Mass transformed in sediment (g)
Yes         print_MasForSed          ! Mass formed in sediment (g)
Yes         print_MasWatLayInSed     ! Mass transfered into water layer from sediment
                                     ! layer (g)
Yes         print_MasWatLayOutSed    ! Mass transfered from water layer into sediment
                                     ! layer (g)
Yes         print_MasDwnSed          ! Mass leaving sediment across lower boundary (g)
Yes         print_MasErsSed          ! Mass entering sediment by erosion (g)
No          print_MasErrSed          ! Mass error in sediment (g)

*-----------------------------------------------------------------------------------------------
* End of TOXSWA input file
*-----------------------------------------------------------------------------------------------
```

Appendix C – WISPE 26-Year Mass Totals from Field (Koc = 10)

	Bjornebekk_WCereal_SW		Syverud_WCereal_SW		Heia_Wcereal_SW		Bjornebekk_Potatoes_SW		Syverud_Potatoes_SW	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1965	1.16E-03	1.40E-06	1.58E-03	5.37E-06	1.38E-03	2.90E-08	8.16E-05	3.04E-08	4.11E-05	1.94E-08
1966	5.68E-04	3.74E-05	1.00E-03	7.33E-05	8.09E-04	5.46E-07	4.20E-06	6.01E-13	3.05E-05	4.21E-11
1967	2.19E-04	1.97E-08	4.12E-04	1.33E-07	3.42E-04	3.00E-09	4.34E-04	1.58E-07	6.31E-04	8.64E-07
1968	5.58E-04	1.35E-08	8.30E-04	1.28E-07	7.45E-04	2.17E-09	3.32E-04	8.21E-09	6.33E-04	1.10E-07
1969	1.07E-04	2.23E-09	1.90E-04	1.82E-08	1.52E-04	3.37E-10	1.64E-05	9.77E-11	2.33E-05	9.81E-10
1970	6.79E-04	2.81E-08	1.18E-03	2.80E-07	9.68E-04	4.48E-09	8.62E-04	1.28E-04	1.01E-03	2.32E-04
1971	6.14E-04	1.31E-08	7.32E-04	9.35E-08	6.80E-04	1.76E-09	2.43E-03	4.37E-06	2.53E-03	1.81E-05
1972	4.86E-04	3.87E-08	8.37E-04	2.74E-07	6.99E-04	5.00E-09	1.67E-03	1.17E-06	1.44E-03	4.31E-06
1973	2.22E-03	3.74E-07	3.26E-03	2.39E-06	2.83E-03	4.97E-08	3.98E-05	7.59E-10	7.22E-05	6.30E-09
1974	4.84E-04	3.13E-08	7.30E-04	2.10E-07	6.53E-04	4.13E-09	5.35E-05	1.35E-10	9.95E-05	2.22E-09
1975	4.80E-04	4.00E-05	6.93E-04	8.29E-05	5.95E-04	6.00E-07	8.48E-05	2.55E-07	9.84E-05	7.96E-08
1976	9.77E-06	2.81E-12	5.86E-05	2.11E-10	3.12E-05	1.55E-12	9.03E-05	3.42E-09	1.40E-04	1.79E-08
1977	1.51E-04	8.83E-10	4.25E-04	1.88E-08	2.94E-04	2.21E-10	1.03E-03	1.92E-04	9.00E-04	3.06E-04
1978	2.34E-04	1.18E-08	4.15E-04	1.00E-07	3.46E-04	2.02E-09	3.96E-04	4.90E-08	4.54E-04	2.12E-07
1979	9.69E-05	5.32E-09	1.92E-04	1.45E-08	1.49E-04	4.37E-10	2.31E-04	8.99E-07	2.19E-04	9.68E-07
1980	1.96E-03	4.74E-07	2.28E-03	1.96E-06	2.19E-03	4.22E-08	1.23E-04	4.89E-09	2.66E-04	2.96E-08
1981	4.66E-04	4.42E-05	5.68E-04	4.49E-05	4.82E-04	4.64E-07	5.48E-04	1.76E-07	5.43E-04	7.75E-07
1982	1.35E-03	6.25E-07	1.46E-03	3.08E-06	1.42E-03	5.59E-08	3.35E-05	8.42E-10	8.10E-05	8.68E-09
1983	7.98E-05	6.24E-10	1.75E-04	4.71E-09	1.26E-04	7.58E-11	4.06E-04	7.08E-08	5.24E-04	3.68E-07
1984	2.70E-03	1.59E-06	2.68E-03	6.71E-06	2.71E-03	1.53E-07	1.96E-04	1.66E-08	2.95E-04	7.10E-08
1985	7.57E-04	1.90E-08	1.34E-03	2.17E-07	1.11E-03	3.65E-09	4.18E-03	1.46E-05	4.97E-03	4.72E-05
1986	2.28E-03	7.57E-05	2.77E-03	1.50E-04	2.61E-03	1.25E-06	2.65E-04	1.06E-07	2.19E-04	3.04E-07
1987	2.86E-04	5.93E-07	7.53E-04	2.40E-06	5.46E-04	2.11E-08	7.57E-04	1.04E-07	8.84E-04	6.10E-07
1988	1.60E-03	3.70E-06	1.95E-03	1.05E-05	1.82E-03	2.86E-07	1.16E-03	5.84E-06	1.63E-03	9.96E-06
1989	2.01E-04	2.13E-09	4.74E-04	2.35E-08	3.43E-04	3.28E-10	1.03E-03	1.45E-04	9.24E-04	2.52E-04
1990	1.49E-03	4.33E-07	1.73E-03	1.99E-06	1.68E-03	4.04E-08	3.11E-06	2.81E-11	4.54E-06	3.00E-11
Total	2.12E-02	2.07E-04	2.87E-02	3.87E-04	2.57E-02	3.57E-06	1.64E-02	4.93E-04	1.87E-02	8.74E-04

Appendix D – WISPE 26-Year Mass Totals from Field (Koc = 1000)

	Bjornebekk_WCereal_SW		Syverud_WCereal_SW		Heia_Wcereal_SW		Bjornebekk_Potatoes_SW		Syverud_Potatoes_SW	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1965	1.27E-03	1.22E-04	6.88E-04	4.14E-04	9.15E-04	1.01E-05	6.26E-04	4.14E-05	4.08E-04	2.22E-04
1966	2.28E-03	1.63E-04	1.53E-03	6.14E-04	1.90E-03	1.60E-05	1.23E-03	7.11E-05	9.89E-04	4.03E-04
1967	8.12E-04	3.34E-05	8.17E-04	1.88E-04	8.56E-04	4.00E-06	1.14E-03	2.86E-04	8.82E-04	8.47E-04
1968	5.44E-04	2.74E-05	5.72E-04	1.22E-04	5.80E-04	2.35E-06	1.16E-03	3.99E-04	8.03E-04	1.11E-03
1969	1.74E-03	5.20E-05	1.44E-03	4.31E-04	1.61E-03	8.50E-06	8.34E-04	3.94E-05	9.10E-04	2.74E-04
1970	1.79E-03	8.74E-05	1.47E-03	4.42E-04	1.64E-03	1.09E-05	1.32E-03	5.41E-04	1.14E-03	1.20E-03
1971	1.44E-03	6.18E-05	1.26E-03	2.96E-04	1.37E-03	6.30E-06	1.37E-03	4.22E-04	1.04E-03	1.04E-03
1972	1.53E-03	4.82E-05	1.54E-03	2.81E-04	1.60E-03	5.45E-06	1.10E-03	3.30E-04	1.12E-03	7.13E-04
1973	1.61E-03	1.34E-04	1.20E-03	4.65E-04	1.37E-03	1.47E-05	9.04E-04	8.18E-05	8.09E-04	3.68E-04
1974	1.54E-03	5.94E-05	1.35E-03	3.42E-04	1.49E-03	7.45E-06	1.31E-03	1.65E-04	1.13E-03	7.07E-04
1975	7.94E-04	1.03E-04	8.84E-04	2.94E-04	8.71E-04	5.01E-06	1.44E-03	1.29E-04	1.26E-03	7.75E-04
1976	1.07E-03	2.83E-05	8.87E-04	2.36E-04	9.91E-04	4.39E-06	7.46E-04	1.71E-04	6.62E-04	5.92E-04
1977	2.98E-03	8.45E-05	2.49E-03	5.91E-04	2.75E-03	1.55E-05	1.66E-03	5.46E-04	1.76E-03	1.16E-03
1978	6.59E-04	2.43E-05	9.80E-04	1.33E-04	8.82E-04	2.78E-06	1.75E-03	2.76E-04	1.46E-03	9.93E-04
1979	8.93E-04	1.77E-05	8.16E-04	1.67E-04	8.87E-04	2.70E-06	1.12E-03	2.12E-04	8.32E-04	7.60E-04
1980	1.77E-03	9.44E-05	1.49E-03	4.07E-04	1.65E-03	9.53E-06	1.18E-03	2.07E-04	1.11E-03	7.18E-04
1981	1.98E-03	1.52E-04	1.62E-03	4.67E-04	1.82E-03	1.08E-05	1.27E-03	2.64E-04	1.14E-03	7.29E-04
1982	1.37E-03	6.08E-05	1.16E-03	3.19E-04	1.27E-03	7.44E-06	1.11E-03	1.41E-04	1.02E-03	6.32E-04
1983	1.52E-03	5.87E-05	1.18E-03	3.52E-04	1.35E-03	9.04E-06	1.27E-03	2.35E-04	1.03E-03	7.83E-04
1984	1.56E-03	8.05E-05	1.58E-03	3.39E-04	1.63E-03	8.05E-06	1.61E-03	2.73E-04	1.49E-03	1.00E-03
1985	9.27E-04	6.54E-05	1.13E-03	2.34E-04	1.12E-03	5.88E-06	2.34E-03	8.72E-04	1.57E-03	2.05E-03
1986	1.95E-03	2.27E-04	1.47E-03	6.47E-04	1.71E-03	1.34E-05	1.08E-03	9.21E-05	9.77E-04	3.90E-04
1987	1.31E-03	9.74E-05	1.00E-03	3.93E-04	1.14E-03	1.07E-05	1.16E-03	3.26E-04	9.02E-04	8.39E-04
1988	1.09E-03	6.80E-05	9.74E-04	2.93E-04	1.06E-03	6.54E-06	1.30E-03	4.11E-04	1.02E-03	1.10E-03
1989	2.60E-03	1.12E-04	2.14E-03	5.87E-04	2.37E-03	1.71E-05	1.54E-03	4.57E-04	1.45E-03	1.08E-03
1990	2.12E-03	7.59E-05	2.02E-03	4.03E-04	2.15E-03	9.42E-06	1.20E-03	7.05E-05	1.37E-03	4.14E-04
Total	3.91E-02	2.14E-03	3.37E-02	9.45E-03	3.70E-02	2.24E-04	3.27E-02	7.06E-03	2.83E-02	2.09E-02

Appendix E – WISPE 26-Year Mass Totals from Field (Koc = 10000)

	Bjornebekk_WCereal_SW		Syverud_WCereal_SW		Heia_Wcereal_SW		Bjornebekk_Potatoes_SW		Syverud_Potatoes_SW	
Year	**RFLX, kg/ha**	**EFLX, kg/ha**	**RFLX, kg/ha**	**EFLX, kg/ha**	**RFLX, kg/ha**	**EFLX, kg/ha**	**RFLX, kg/ha**	**EFLX, kg/ha**	**RFLX, kg/ha**	**EFLX, kg/ha**
1965	1.53E-04	5.11E-04	6.43E-05	9.13E-04	9.36E-05	3.50E-05	9.38E-05	5.01E-04	4.10E-05	9.24E-04
1966	3.80E-04	1.02E-03	1.64E-04	1.93E-03	2.41E-04	7.96E-05	2.45E-04	9.67E-04	1.13E-04	1.81E-03
1967	2.67E-04	6.20E-04	1.24E-04	1.47E-03	1.80E-04	4.16E-05	2.76E-04	1.68E-03	1.24E-04	2.60E-03
1968	2.04E-04	5.74E-04	1.00E-04	1.43E-03	1.42E-04	3.19E-05	2.58E-04	1.80E-03	1.18E-04	2.69E-03
1969	4.52E-04	1.16E-03	2.18E-04	2.47E-03	3.08E-04	8.09E-05	3.29E-04	9.28E-04	1.65E-04	1.78E-03
1970	5.03E-04	1.20E-03	2.38E-04	2.61E-03	3.41E-04	8.21E-05	4.14E-04	1.89E-03	1.98E-04	3.09E-03
1971	4.53E-04	1.02E-03	2.14E-04	2.17E-03	3.08E-04	6.78E-05	3.85E-04	1.78E-03	1.79E-04	2.66E-03
1972	5.74E-04	9.75E-04	2.92E-04	2.31E-03	4.09E-04	7.56E-05	4.53E-04	1.49E-03	2.36E-04	2.45E-03
1973	4.23E-04	8.04E-04	2.09E-04	1.76E-03	2.94E-04	7.10E-05	3.02E-04	9.22E-04	1.61E-04	1.67E-03
1974	4.82E-04	1.03E-03	2.39E-04	2.29E-03	3.41E-04	7.16E-05	4.25E-04	1.73E-03	2.10E-04	2.83E-03
1975	3.70E-04	6.99E-04	1.95E-04	1.75E-03	2.71E-04	5.22E-05	4.82E-04	2.07E-03	2.40E-04	3.33E-03
1976	3.09E-04	7.99E-04	1.52E-04	1.69E-03	2.15E-04	5.78E-05	2.58E-04	1.04E-03	1.31E-04	1.59E-03
1977	9.10E-04	1.62E-03	4.37E-04	3.58E-03	6.28E-04	1.62E-04	7.11E-04	2.19E-03	3.55E-04	3.61E-03
1978	4.90E-04	5.27E-04	2.65E-04	1.35E-03	3.70E-04	5.91E-05	5.97E-04	2.06E-03	3.06E-04	3.01E-03
1979	3.00E-04	7.48E-04	1.52E-04	1.66E-03	2.12E-04	4.84E-05	2.99E-04	1.55E-03	1.47E-04	2.25E-03
1980	4.98E-04	1.03E-03	2.46E-04	2.28E-03	3.46E-04	8.63E-05	4.02E-04	1.48E-03	2.03E-04	2.46E-03
1981	5.31E-04	1.13E-03	2.58E-04	2.33E-03	3.65E-04	8.57E-05	4.06E-04	1.47E-03	2.01E-04	2.37E-03
1982	3.90E-04	8.14E-04	1.98E-04	1.88E-03	2.76E-04	5.99E-05	3.61E-04	1.52E-03	1.85E-04	2.58E-03
1983	3.83E-04	8.89E-04	1.85E-04	1.87E-03	2.63E-04	5.93E-05	3.47E-04	1.64E-03	1.67E-04	2.57E-03
1984	5.97E-04	1.04E-03	3.00E-04	2.37E-03	4.23E-04	1.02E-04	5.51E-04	1.97E-03	2.77E-04	3.01E-03
1985	5.14E-04	9.19E-04	2.61E-04	2.12E-03	3.80E-04	8.93E-05	5.65E-04	2.74E-03	2.67E-04	3.69E-03
1986	4.45E-04	1.10E-03	2.17E-04	2.17E-03	3.05E-04	7.07E-05	3.36E-04	1.10E-03	1.68E-04	1.83E-03
1987	3.32E-04	7.99E-04	1.60E-04	1.68E-03	2.28E-04	5.22E-05	3.11E-04	1.62E-03	1.50E-04	2.47E-03
1988	3.32E-04	7.72E-04	1.69E-04	1.80E-03	2.38E-04	5.04E-05	3.50E-04	1.88E-03	1.71E-04	2.91E-03
1989	7.72E-04	1.39E-03	3.75E-04	3.11E-03	5.34E-04	1.31E-04	5.93E-04	1.78E-03	2.95E-04	2.88E-03
1990	7.69E-04	1.15E-03	3.85E-04	2.61E-03	5.44E-04	1.07E-04	6.00E-04	1.38E-03	3.08E-04	2.46E-03
Total	1.18E-02	2.43E-02	5.82E-03	5.36E-02	8.25E-03	1.91E-03	1.03E-02	4.12E-02	5.12E-03	6.55E-02

Appendix F – SWASH 20 -Year Mass Totals from Field (Koc = 10)

	Weiherbach,Ger-R1_WC		Bologna, Italy – R3_WC		Roujan, France – R4_WC		Weiherbach,Ger-R1_PO		Porto, Portugal – R2_PO		Bologna, Italy – R3_PO	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1975	8.31E-06	1.07E-11	5.55E-04	1.69E-07	1.27E-04	7.13E-11	9.21E-09	1.06E-16	2.75E-04	1.44E-08	1.07E-05	2.21E-12
1976	3.52E-07	1.71E-13	9.86E-04	1.74E-07	6.59E-04	6.36E-08	1.79E-03	2.27E-07	5.72E-04	1.09E-07	1.54E-04	2.84E-09
1977	3.24E-05	7.85E-11	2.80E-03	1.05E-06	9.64E-04	1.93E-08	3.41E-07	4.69E-13	5.95E-04	4.60E-08	5.53E-03	4.14E-06
1978	3.62E-05	1.07E-10	9.69E-04	8.50E-08	1.56E-06	1.16E-10	8.72E-05	3.94E-10	1.51E-04	5.57E-08	4.20E-04	1.39E-08
1979	3.86E-04	6.48E-09	4.21E-03	5.94E-07	6.47E-04	3.88E-08	1.67E-04	3.45E-09	1.44E-03	2.29E-06	1.11E-03	3.07E-08
1980	1.67E-04	3.17E-08	3.43E-03	7.36E-07	1.70E-04	1.77E-09	1.10E-05	1.11E-11	4.55E-05	3.68E-09	2.34E-04	1.34E-08
1981	7.82E-09	4.47E-16	6.18E-06	4.49E-12	1.75E-04	9.36E-10	3.82E-03	2.08E-06	4.97E-04	1.40E-08	5.27E-05	6.63E-10
1982	1.10E-03	1.49E-07	4.64E-03	2.22E-06	2.35E-03	2.73E-07	9.55E-05	6.48E-10	2.04E-03	1.12E-04	2.95E-04	2.18E-08
1983	1.17E-04	4.50E-09	3.88E-05	1.31E-10	8.82E-03	1.05E-06	6.61E-05	4.75E-10	2.87E-06	9.03E-13	7.24E-04	6.99E-08
1984	1.13E-05	7.07E-11	2.47E-04	1.08E-08	1.98E-04	1.34E-09	1.52E-05	3.14E-11	1.81E-04	2.99E-08	1.47E-05	1.14E-10
1985	1.08E-03	2.46E-08	3.17E-04	8.51E-08	3.46E-06	1.30E-12	6.13E-05	1.82E-08	1.08E-04	1.12E-08	6.82E-06	1.16E-11
1986	6.92E-05	8.83E-10	9.34E-04	6.81E-08	1.56E-03	4.53E-08	1.08E-04	3.16E-09	1.58E-03	1.69E-06	1.75E-04	3.91E-08
1987	5.02E-05	1.44E-09	1.75E-03	3.52E-07	1.04E-03	4.79E-08	5.81E-05	2.77E-12	1.18E-05	9.01E-11	1.99E-05	1.77E-10
1988	5.47E-05	2.92E-10	1.36E-03	2.38E-07	8.28E-04	5.06E-08	1.58E-04	7.17E-09	1.95E-04	7.50E-08	1.64E-04	4.81E-08
1989	5.59E-05	2.85E-10	6.35E-06	8.05E-10	8.17E-04	8.51E-08	8.14E-06	5.04E-12	1.45E-03	7.84E-07	6.90E-04	1.70E-07
1990	1.01E-04	7.78E-10	1.73E-03	7.35E-08	3.77E-04	4.87E-09	2.58E-05	5.48E-12	3.60E-04	6.74E-08	2.64E-03	1.08E-06
1991	7.67E-06	2.01E-11	6.34E-04	4.06E-08	7.24E-04	6.74E-08	6.72E-05	1.83E-09	2.29E-03	4.10E-06	1.52E-04	7.73E-09
1992	2.91E-04	3.67E-09	6.05E-04	3.37E-08	1.58E-04	6.10E-09	8.70E-06	5.40E-10	2.05E-05	1.08E-10	3.17E-03	1.78E-06
1993	8.45E-05	3.25E-08	4.48E-06	3.80E-11	4.24E-03	4.72E-07	2.28E-05	2.28E-11	2.25E-07	1.10E-12	5.96E-04	6.78E-08
1994	9.96E-09	1.83E-16	2.00E-03	2.36E-07	1.93E-03	7.20E-08	3.60E-04	3.81E-08	5.37E-04	1.28E-07	5.84E-04	1.38E-07
Total	3.66E-03	2.57E-07	2.72E-02	6.17E-06	2.58E-02	2.30E-06	6.93E-03	2.38E-06	1.24E-02	1.21E-04	1.67E-02	7.62E-06

Appendix G – SWASH 20 -Year Mass Totals from Field (Koc = 1000)

	Weiherbach,Ger-R1_WC		Bologna, Italy – R3_WC		Roujan, France – R4_WC		Weiherbach,Ger-R1_PO		Porto, Portugal – R2_PO		Bologna, Italy – R3_PO	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1975	7.72E-05	1.53E-06	1.23E-04	1.23E-05	3.46E-04	1.03E-05	6.61E-04	6.76E-06	1.89E-04	2.48E-05	4.32E-04	6.50E-06
1976	1.42E-04	9.16E-07	7.09E-04	6.93E-05	2.61E-03	3.13E-05	7.51E-04	1.13E-04	5.50E-04	1.58E-04	3.98E-04	8.38E-06
1977	3.05E-04	5.13E-05	2.24E-03	4.25E-04	3.82E-03	6.40E-05	2.36E-04	1.68E-06	5.51E-04	2.02E-04	1.42E-03	3.63E-04
1978	5.16E-04	3.66E-06	1.53E-03	2.16E-04	9.92E-04	3.06E-06	2.47E-03	1.78E-04	4.23E-04	1.85E-05	6.51E-04	2.45E-05
1979	3.72E-04	5.55E-05	1.57E-03	4.22E-04	2.08E-03	3.63E-05	4.69E-04	5.48E-05	6.11E-04	1.13E-04	7.27E-04	9.97E-05
1980	1.23E-04	2.12E-06	1.36E-03	3.43E-04	1.36E-03	8.73E-05	4.79E-04	6.04E-05	2.24E-04	2.23E-05	4.00E-04	2.77E-05
1981	3.13E-04	2.25E-06	1.06E-04	4.69E-07	8.96E-04	7.77E-06	1.31E-03	2.50E-04	1.10E-03	8.59E-04	3.76E-04	5.44E-06
1982	5.59E-04	2.17E-05	1.14E-03	2.49E-04	3.11E-03	2.72E-04	7.54E-04	1.37E-04	5.46E-04	4.09E-04	4.90E-04	2.50E-05
1983	1.37E-04	3.13E-06	1.89E-04	1.90E-06	3.65E-03	2.43E-04	4.84E-04	2.96E-05	4.18E-04	2.20E-05	1.01E-03	1.07E-04
1984	3.35E-04	4.44E-06	6.95E-04	6.92E-05	3.66E-03	1.61E-04	3.01E-04	4.14E-06	6.66E-04	1.55E-04	4.92E-04	1.05E-05
1985	5.64E-04	1.14E-04	2.00E-04	1.43E-05	5.91E-04	2.40E-06	2.90E-04	5.04E-06	3.42E-04	8.71E-05	3.86E-04	1.12E-05
1986	6.60E-04	3.48E-05	1.27E-03	1.62E-04	1.48E-03	2.79E-05	5.69E-04	3.10E-05	5.09E-04	1.37E-04	5.47E-04	3.11E-05
1987	7.23E-05	6.97E-07	1.42E-03	1.55E-04	1.91E-03	4.29E-05	2.08E-04	2.30E-05	4.33E-04	1.98E-05	9.98E-04	2.75E-05
1988	4.47E-04	8.04E-06	2.43E-04	4.44E-05	9.22E-04	5.76E-05	1.90E-04	5.07E-06	3.26E-04	5.23E-05	4.09E-04	4.71E-06
1989	5.30E-04	5.40E-05	6.13E-04	2.43E-06	1.34E-03	2.14E-05	3.52E-04	7.27E-06	9.18E-04	6.38E-04	1.20E-03	7.87E-05
1990	1.90E-04	9.28E-06	1.93E-03	2.52E-04	8.07E-04	2.70E-05	3.60E-04	7.13E-06	3.03E-04	6.45E-05	2.12E-03	2.89E-04
1991	9.98E-05	1.49E-06	1.54E-03	1.44E-04	5.65E-04	2.36E-05	3.74E-04	6.45E-06	1.08E-03	8.31E-04	3.15E-04	5.30E-06
1992	5.57E-04	3.63E-05	1.76E-03	2.19E-04	1.88E-03	5.96E-06	6.94E-04	1.71E-05	4.38E-04	5.89E-05	1.07E-03	1.67E-04
1993	1.28E-04	1.94E-06	1.09E-04	5.80E-07	3.19E-03	1.30E-04	2.32E-04	3.86E-06	1.66E-04	5.88E-06	3.92E-04	7.04E-06
1994	8.21E-05	7.08E-07	1.19E-03	2.57E-04	5.27E-03	1.82E-04	4.24E-04	1.42E-05	3.62E-04	8.25E-05	8.00E-04	4.59E-05
Total	6.21E-03	4.07E-04	1.99E-02	3.06E-03	4.05E-02	1.44E-03	1.16E-02	9.55E-04	1.02E-02	3.96E-03	1.46E-02	1.35E-03

Appendix H – SWASH 20 -Year Mass Totals from Field (Koc = 10000)

	Weiherbach,Ger-R1_WC		Bologna, Italy – R3_WC		Roujan, France – R4_WC		Weiherbach,Ger-R1_PO		Porto, Portugal – R2_PO		Bologna, Italy – R3_PO	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1975	8.42E-06	9.56E-06	1.16E-05	2.34E-05	4.63E-05	6.05E-05	1.45E-04	4.17E-04	2.17E-05	1.75E-04	1.19E-04	2.29E-04
1976	5.03E-05	8.58E-05	1.17E-04	2.58E-04	6.85E-04	7.08E-04	1.73E-04	4.31E-04	8.14E-05	8.03E-04	1.10E-04	1.84E-04
1977	6.68E-05	2.19E-04	2.91E-04	1.41E-03	1.03E-03	9.86E-04	8.88E-05	1.56E-04	1.04E-04	6.93E-04	2.26E-04	9.19E-04
1978	3.55E-04	3.73E-04	2.22E-04	8.06E-04	4.41E-04	1.94E-04	5.65E-04	1.50E-03	8.96E-05	6.34E-04	1.72E-04	2.47E-04
1979	6.84E-05	1.58E-04	2.01E-04	9.73E-04	4.67E-04	5.28E-04	1.35E-04	2.91E-04	1.04E-04	5.83E-04	1.63E-04	4.09E-04
1980	7.39E-05	7.41E-05	1.60E-04	8.53E-04	2.57E-04	5.99E-04	1.50E-04	4.68E-04	4.02E-05	2.51E-04	1.01E-04	1.85E-04
1981	1.86E-04	1.68E-04	3.30E-05	7.84E-05	2.43E-04	1.15E-04	3.53E-04	9.03E-04	1.34E-04	1.87E-03	9.20E-05	1.92E-04
1982	2.01E-04	1.97E-04	1.32E-04	5.56E-04	5.27E-04	1.11E-03	2.78E-04	7.25E-04	7.63E-05	9.68E-04	1.08E-04	2.63E-04
1983	8.42E-05	6.09E-05	5.47E-05	8.79E-05	5.62E-04	8.62E-04	1.62E-04	3.02E-04	7.24E-05	4.60E-04	1.84E-04	5.44E-04
1984	9.74E-05	9.21E-05	1.34E-04	3.79E-04	8.12E-04	1.28E-03	1.36E-04	2.24E-04	1.20E-04	8.23E-04	1.39E-04	2.86E-04
1985	1.01E-04	3.12E-04	2.96E-05	5.88E-05	2.22E-04	8.94E-05	1.07E-04	1.85E-04	6.59E-05	5.18E-04	8.33E-05	1.75E-04
1986	1.96E-04	3.14E-04	2.15E-04	6.55E-04	5.08E-04	2.32E-04	2.43E-04	4.00E-04	8.04E-05	6.93E-04	1.52E-04	3.06E-04
1987	3.94E-05	2.77E-05	2.09E-04	8.02E-04	7.54E-04	3.81E-04	8.06E-05	1.53E-04	8.55E-05	5.01E-04	1.84E-04	4.51E-04
1988	1.00E-04	8.47E-05	5.26E-05	1.28E-04	5.24E-04	3.20E-04	1.41E-04	1.93E-04	5.19E-05	3.64E-04	1.09E-04	2.14E-04
1989	8.60E-05	2.08E-04	1.57E-04	3.21E-04	2.51E-04	2.11E-04	1.22E-04	2.34E-04	1.18E-04	1.71E-03	2.54E-04	5.38E-04
1990	5.52E-05	8.59E-05	2.74E-04	8.58E-04	1.38E-04	1.39E-04	1.25E-04	2.01E-04	4.86E-05	3.86E-04	3.60E-04	1.30E-03
1991	4.94E-05	8.97E-05	1.92E-04	1.02E-03	1.04E-04	1.11E-04	1.06E-04	2.18E-04	1.24E-04	2.00E-03	1.03E-04	1.72E-04
1992	9.78E-05	1.77E-04	2.51E-04	8.98E-04	6.62E-04	3.64E-04	1.70E-04	3.51E-04	5.59E-05	4.60E-04	2.47E-04	5.91E-04
1993	3.99E-05	5.05E-05	5.23E-05	5.73E-05	6.79E-04	1.03E-03	7.99E-05	1.42E-04	2.78E-05	2.06E-04	1.53E-04	2.01E-04
1994	2.23E-05	4.12E-05	1.70E-04	7.93E-04	1.01E-03	1.43E-03	9.87E-05	2.00E-04	5.20E-05	4.87E-04	1.99E-04	4.30E-04
Total	1.98E-03	2.83E-03	2.96E-03	1.10E-02	9.92E-03	1.08E-02	3.46E-03	7.70E-03	1.55E-03	1.46E-02	3.26E-03	7.84E-03

Appendix I - WISPE Crop Scenarios 26-year Maximum and 90th percentile PECs

Koc	WISPE Scenario	Field area, ha	Crop	Water-body	Max PEC in Water, ug/L	90th %ile Time-weighted Average PECs in Water, ug/L						
						Peak	1-day	4-day	21-day	60-day	90-day	Annual
10	Bjornebekk_WCereal_SW	0.02	Winter cereal	Pond	0.07250	0.06461	0.06451	0.06435	0.06342	0.06156	0.06028	0.04228
10	Syverud_WCereal_SW	0.04	Winter cereal	Pond	0.18000	0.16110	0.16080	0.16080	0.15820	0.15400	0.15070	0.10550
10	Heia_Wcereal_SW	0.024	Winter cereal	Pond	0.09900	0.08665	0.08652	0.08618	0.08468	0.08217	0.08042	0.05706
10	Bjornebekk_WCereal_SW	0.02	Winter cereal	Stream	1.80000	1.03900	0.52560	0.17290	0.03661	0.01281	0.00855	0.00211
10	Syverud_WCereal_SW	0.04	Winter cereal	Stream	3.57000	2.88300	1.45800	0.44130	0.08869	0.03120	0.02082	0.00513
10	Heia_Wcereal_SW	0.024	Winter cereal	Stream	2.16000	1.59200	0.80610	0.25150	0.05130	0.01801	0.01202	0.00296
10	Bjornebekk_Potatoes_SW	0.02	Potatoes	Pond	0.09640	0.06487	0.06477	0.06444	0.06278	0.05843	0.05529	0.04193
10	Syverud_Potatoes_SW	0.04	Potatoes	Pond	0.23100	0.13690	0.13690	0.13660	0.13430	0.12820	0.12340	0.09024
10	Bjornebekk_Potatoes_SW	0.02	Potatoes	Stream	2.49000	1.24700	0.63070	0.16050	0.03079	0.01078	0.00719	0.00177
10	Syverud_Potatoes_SW	0.04	Potatoes	Stream	5.35000	2.27800	1.15400	0.31170	0.06182	0.02176	0.01447	0.00357
1000	Bjornebekk_WCereal_SW	0.02	Winter cereal	Pond	0.04810	0.04084	0.04024	0.03872	0.03573	0.03197	0.02982	0.02132
1000	Syverud_WCereal_SW	0.04	Winter cereal	Pond	0.08480	0.07526	0.07455	0.07257	0.06735	0.06333	0.06128	0.04510
1000	Heia_Wcereal_SW	0.024	Winter cereal	Pond	0.04860	0.04185	0.04134	0.04007	0.03665	0.03379	0.03261	0.02345
1000	Bjornebekk_WCereal_SW	0.02	Winter cereal	Stream	0.39600	0.38730	0.19580	0.07746	0.02942	0.01196	0.00822	0.00237
1000	Syverud_WCereal_SW	0.04	Winter cereal	Stream	0.56800	0.55260	0.28050	0.12100	0.04456	0.02107	0.01482	0.00456
1000	Heia_Wcereal_SW	0.024	Winter cereal	Stream	0.35200	0.34280	0.17290	0.07316	0.02602	0.01231	0.00856	0.00256
1000	Bjornebekk_Potatoes_SW	0.02	Potatoes	Pond	0.04750	0.03183	0.03150	0.03051	0.02855	0.02692	0.02608	0.02180
1000	Syverud_Potatoes_SW	0.04	Potatoes	Pond	0.10100	0.07373	0.07324	0.07172	0.06708	0.06339	0.06124	0.05297
1000	Bjornebekk_Potatoes_SW	0.02	Potatoes	Stream	0.45400	0.36290	0.18330	0.05357	0.01681	0.00799	0.00591	0.00189
1000	Syverud_Potatoes_SW	0.04	Potatoes	Stream	0.84200	0.61010	0.31010	0.10010	0.03579	0.01701	0.01229	0.00442
10000	Bjornebekk_WCereal_SW	0.02	Winter cereal	Pond	0.01070	0.00858	0.00769	0.00641	0.00475	0.00430	0.00414	0.00320
10000	Syverud_WCereal_SW	0.04	Winter cereal	Pond	0.02700	0.02231	0.02035	0.01741	0.01392	0.01329	0.01264	0.01030
10000	Heia_Wcereal_SW	0.024	Winter cereal	Pond	0.00494	0.00367	0.00327	0.00276	0.00185	0.00171	0.00165	0.00120
10000	Bjornebekk_WCereal_SW	0.02	Winter cereal	Stream	0.14300	0.13780	0.06972	0.03266	0.01155	0.00596	0.00441	0.00170

Koc	WISPE Scenario	Field area, ha	Crop	Water-body	Max PEC in Water, ug/L	90th %ile Time-weighted Average PECs in Water, ug/L						
						Peak	1-day	4-day	21-day	60-day	90-day	Annual
10000	Syverud_WCereal_SW	0.04	Winter cereal	Stream	0.38300	0.32030	0.16330	0.07554	0.02872	0.01571	0.01182	0.00480
10000	Heia_Wcereal_SW	0.024	Winter cereal	Stream	0.07430	0.06750	0.03423	0.01397	0.00523	0.00251	0.00184	0.00078
10000	Bjornebekk_Potatoes_SW	0.02	Potatoes	Pond	0.01760	0.01387	0.01258	0.00981	0.00680	0.00584	0.00561	0.00461
10000	Syverud_Potatoes_SW	0.04	Potatoes	Pond	0.04430	0.03371	0.03031	0.02470	0.01792	0.01589	0.01536	0.01206
10000	Bjornebekk_Potatoes_SW	0.02	Potatoes	Stream	0.31100	0.28330	0.14330	0.04757	0.01665	0.00898	0.00703	0.00217
10000	Syverud_Potatoes_SW	0.04	Potatoes	Stream	0.75100	0.73280	0.37260	0.12460	0.04379	0.02376	0.01803	0.00547

Appendix J - SWASH Crop Scenarios run in SWASH - 1-year PECs

Koc	SWASH Scenario	Field area, ha	Crop	Water-body	Year	Global Max in Water, ug/L	Time-weighted Average PECs in Water, ug/L										
							1 day	2 days	3 days	4 days	7 days	14 days	21 days	28 days	42 days	50 days	100 days
10	WG -R1	0.45	W cereal	Pond	1978	0.01759	0.01747	0.01736	0.01727	0.01717	0.01690	0.01635	0.01584	0.01537	0.01458	0.01412	0.01147
10	WG-R1	1	W cereal	Stream	1978	0.80750	0.31960	0.15990	0.10660	0.07996	0.04570	0.02498	0.01665	0.01249	0.00867	0.00728	0.00364
10	BI – R3	1	W cereal	Stream	1980	7.23400	3.78300	2.37400	1.61300	1.21700	0.69560	0.34790	0.23210	0.17410	0.11610	0.09749	0.04875
10	RF–R4	1	W cereal	Stream	1979	6.73500	2.88700	1.44400	0.96270	0.73650	0.42220	0.21110	0.14070	0.10560	0.07037	0.05912	0.02956
10	WG-R1	0.45	Potatoes	Pond	1984	0.00727	0.00722	0.00717	0.00713	0.00708	0.00696	0.00675	0.00656	0.00633	0.00589	0.00565	0.00439
10	WG-R1	1	Potatoes	Stream	1984	1.31800	0.56840	0.28430	0.18960	0.14220	0.08126	0.04155	0.02770	0.02078	0.01385	0.01163	0.00582
10	PP–R2	1	Potatoes	Stream	1977	6.26600	1.64400	0.82240	0.71520	0.53650	0.30660	0.15330	0.10220	0.07666	0.05111	0.04293	0.02147
10	BI–R3	1	Potatoes	Stream	1980	8.71100	3.59200	2.31900	1.54700	1.16100	0.66350	0.34090	0.22730	0.17050	0.11370	0.09550	0.04776
1000	WG-1	0.45	W cereal	Pond	1978	0.06847	0.06749	0.06662	0.06584	0.06513	0.06330	0.05991	0.05716	0.05476	0.05339	0.05284	0.04516
1000	WG-R1	1	W cereal	Stream	1978	0.70970	0.28010	0.17340	0.15950	0.11980	0.06862	0.03437	0.02306	0.01744	0.01740	0.01463	0.01018
1000	BI – R3	1	W cereal	Stream	1980	0.87450	0.71400	0.58600	0.45510	0.41280	0.23990	0.12270	0.09723	0.07380	0.05643	0.04784	0.02637
1000	RF–R4	1	W cereal	Stream	1979	1.21000	0.83620	0.74370	0.64180	0.49040	0.35440	0.17770	0.11860	0.08905	0.05946	0.04999	0.02821
1000	WG-R1	0.45	Potatoes	Pond	1984	0.05526	0.05469	0.05416	0.05365	0.05317	0.05185	0.04914	0.04669	0.04510	0.04499	0.04393	0.03673
1000	WG-R1	1	Potatoes	Stream	1984	0.54330	0.28130	0.14090	0.09403	0.07058	0.06814	0.05072	0.03765	0.03388	0.02493	0.02411	0.01396
1000	PP–R2	1	Potatoes	Stream	1977	0.21320	0.12600	0.07901	0.06449	0.05639	0.05029	0.02982	0.02288	0.01717	0.01417	0.01372	0.00813
1000	BI–R3	1	Potatoes	Stream	1980	0.88000	0.43740	0.34760	0.23280	0.19980	0.11520	0.10790	0.08542	0.06710	0.05643	0.04750	0.02959
10000	WG-1	0.45	W cereal	Pond	1978	0.01406	0.01381	0.01358	0.01334	0.01312	0.01250	0.01126	0.01026	0.00945	0.00898	0.00882	0.00707
10000	WG-R1	1	W cereal	Stream	1978	0.08873	0.05114	0.03890	0.03463	0.02599	0.01488	0.00747	0.00499	0.00377	0.00331	0.00318	0.00194
10000	BI – R3	1	W cereal	Stream	1980	0.07897	0.07145	0.05640	0.04464	0.04159	0.02522	0.01424	0.01204	0.00960	0.00794	0.00701	0.00454
10000	RF–R4	1	W cereal	Stream	1979	0.12930	0.12930	0.12690	0.10300	0.07874	0.05259	0.02773	0.01998	0.01574	0.01085	0.00924	0.00574
10000	WG-R1	0.45	Potatoes	Pond	1984	0.01342	0.01327	0.01313	0.01298	0.01285	0.01246	0.01167	0.01138	0.01103	0.01019	0.00969	0.00952
10000	WG-R1	1	Potatoes	Stream	1984	0.07709	0.05423	0.02732	0.01825	0.01371	0.01047	0.00811	0.00601	0.00516	0.00435	0.00402	0.00265
10000	PP–R2	1	Potatoes	Stream	1977	0.01962	0.01576	0.01083	0.00823	0.00764	0.00666	0.00380	0.00299	0.00228	0.00183	0.00172	0.00125
10000	BI–R3	1	Potatoes	Stream	1980	0.08015	0.06171	0.03382	0.02268	0.02114	0.01224	0.01071	0.00877	0.00700	0.00637	0.00542	0.00404

WG = Weiherbach, Germany; BI = Bologna, Italy; RF = Roujan, France; PP = Porto, Portugal

Appendix K – SWASH Scenario PRZM/EXAMS 20 -Year Mass Totals from Field (Koc = 10)

	Weiherbach,Ger-R1_WC		Bologna, Italy – R3_WC		Roujan, France – R4_WC		Weiherbach,Ger-R1_PO		Porto, Portugal – R2_PO		Bologna, Italy – R3_PO	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1975	8.31E-06	1.07E-11	2.58E-05	8.61E-11	4.18E-06	3.62E-13	9.21E-09	1.06E-16	2.75E-04	1.45E-08	1.07E-05	2.22E-12
1976	3.52E-07	1.71E-13	9.86E-04	1.75E-07	6.59E-04	6.40E-08	1.79E-03	2.28E-07	5.72E-04	1.10E-07	1.54E-04	2.85E-09
1977	3.24E-05	7.85E-11	2.80E-03	1.06E-06	9.65E-04	1.94E-08	3.41E-07	4.69E-13	5.95E-04	4.63E-08	5.53E-03	4.16E-06
1978	3.62E-05	1.07E-10	9.69E-04	8.55E-08	1.56E-06	1.17E-10	8.72E-05	3.94E-10	1.51E-04	5.60E-08	4.20E-04	1.40E-08
1979	3.87E-04	6.48E-09	4.21E-03	5.98E-07	6.47E-04	3.91E-08	1.68E-04	3.45E-09	1.44E-03	2.31E-06	1.11E-03	3.09E-08
1980	1.67E-04	3.17E-08	3.43E-03	7.40E-07	1.70E-04	1.78E-09	1.10E-05	1.11E-11	4.55E-05	3.70E-09	2.34E-04	1.35E-08
1981	7.82E-09	4.47E-16	6.18E-06	4.51E-12	1.75E-04	9.41E-10	3.82E-03	2.08E-06	4.97E-04	1.41E-08	5.27E-05	6.67E-10
1982	1.10E-03	1.49E-07	4.64E-03	2.23E-06	2.35E-03	2.75E-07	9.55E-05	6.48E-10	2.04E-03	1.12E-04	2.95E-04	2.20E-08
1983	1.17E-04	4.50E-09	3.88E-05	1.32E-10	8.82E-03	1.05E-06	6.61E-05	4.75E-10	2.87E-06	9.09E-13	7.24E-04	7.03E-08
1984	1.13E-05	7.07E-11	2.47E-04	1.08E-08	1.98E-04	1.35E-09	1.52E-05	3.15E-11	1.81E-04	3.01E-08	1.47E-05	1.15E-10
1985	1.08E-03	2.46E-08	3.17E-04	8.56E-08	3.46E-06	1.31E-12	6.13E-05	1.82E-08	1.08E-04	1.13E-08	6.82E-06	1.17E-11
1986	6.92E-05	8.83E-10	9.34E-04	6.85E-08	1.56E-03	4.55E-08	1.08E-04	3.16E-09	1.58E-03	1.70E-06	1.75E-04	3.93E-08
1987	5.02E-05	1.44E-09	1.75E-03	3.54E-07	1.04E-03	4.82E-08	5.81E-05	2.78E-12	1.18E-05	9.06E-11	2.00E-05	1.78E-10
1988	5.47E-05	2.92E-10	1.36E-03	2.39E-07	8.28E-04	5.09E-08	1.58E-04	7.17E-09	1.95E-04	7.55E-08	1.64E-04	4.84E-08
1989	5.59E-05	2.85E-10	6.35E-06	8.09E-10	8.17E-04	8.56E-08	8.14E-06	5.04E-12	1.45E-03	7.88E-07	6.90E-04	1.71E-07
1990	1.01E-04	7.78E-10	1.73E-03	7.39E-08	3.77E-04	4.90E-09	2.58E-05	5.48E-12	3.60E-04	6.78E-08	2.64E-03	1.09E-06
1991	7.67E-06	2.01E-11	6.34E-04	4.08E-08	7.24E-04	6.78E-08	6.72E-05	1.83E-09	2.29E-03	4.12E-06	1.52E-04	7.77E-09
1992	2.91E-04	3.67E-09	6.05E-04	3.40E-08	1.58E-04	6.13E-09	8.70E-06	5.40E-10	2.05E-05	1.08E-10	3.17E-03	1.79E-06
1993	8.45E-05	3.25E-08	4.48E-06	3.82E-11	4.24E-03	4.75E-07	2.28E-05	2.28E-11	2.25E-07	1.11E-12	5.96E-04	6.82E-08
1994	9.96E-09	1.83E-16	2.00E-03	2.37E-07	1.93E-03	7.24E-08	3.60E-04	3.81E-08	5.37E-04	1.29E-07	5.84E-04	1.39E-07
Total	3.66E-03	2.57E-07	2.67E-02	6.04E-06	2.57E-02	2.31E-06	6.93E-03	2.38E-06	1.24E-02	1.22E-04	1.67E-02	7.67E-06

Appendix L – SWASH Scenario 20 -Year PRZM/EXAMS Mass Totals from Field (Koc = 1000)

	Weiherbach,Ger-R1_WC		Bologna, Italy – R3_WC		Roujan, France – R4_WC		Weiherbach,Ger-R1_PO		Porto, Portugal – R2_PO		Bologna, Italy – R3_PO	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1975	7.72E-05	1.53E-06	8.41E-05	2.65E-06	1.93E-04	5.85E-07	6.62E-04	6.76E-06	1.89E-04	2.50E-05	4.32E-04	6.54E-06
1976	1.42E-04	9.17E-07	7.07E-04	6.97E-05	2.61E-03	3.14E-05	7.51E-04	1.13E-04	5.50E-04	1.59E-04	3.98E-04	8.43E-06
1977	3.06E-04	5.13E-05	2.24E-03	4.27E-04	3.82E-03	6.44E-05	2.36E-04	1.68E-06	5.51E-04	2.03E-04	1.42E-03	3.65E-04
1978	5.16E-04	3.66E-06	1.53E-03	2.17E-04	9.92E-04	3.07E-06	2.47E-03	1.78E-04	4.23E-04	1.86E-05	6.51E-04	2.46E-05
1979	3.72E-04	5.55E-05	1.57E-03	4.24E-04	2.08E-03	3.65E-05	4.69E-04	5.48E-05	6.11E-04	1.14E-04	7.27E-04	1.00E-04
1980	1.23E-04	2.12E-06	1.36E-03	3.45E-04	1.36E-03	8.78E-05	4.79E-04	6.04E-05	2.24E-04	2.25E-05	4.00E-04	2.79E-05
1981	3.13E-04	2.25E-06	1.06E-04	4.72E-07	8.96E-04	7.82E-06	1.31E-03	2.50E-04	1.10E-03	8.63E-04	3.77E-04	5.47E-06
1982	5.59E-04	2.17E-05	1.14E-03	2.51E-04	3.11E-03	2.74E-04	7.54E-04	1.37E-04	5.46E-04	4.12E-04	4.90E-04	2.52E-05
1983	1.37E-04	3.13E-06	1.89E-04	1.92E-06	3.65E-03	2.45E-04	4.84E-04	2.96E-05	4.18E-04	2.22E-05	1.01E-03	1.07E-04
1984	3.35E-04	4.44E-06	6.96E-04	6.96E-05	3.66E-03	1.62E-04	3.01E-04	4.14E-06	6.66E-04	1.56E-04	4.92E-04	1.06E-05
1985	5.64E-04	1.14E-04	2.01E-04	1.44E-05	5.91E-04	2.41E-06	2.91E-04	5.04E-06	3.42E-04	8.76E-05	3.86E-04	1.13E-05
1986	6.60E-04	3.48E-05	1.27E-03	1.63E-04	1.48E-03	2.80E-05	5.69E-04	3.10E-05	5.09E-04	1.38E-04	5.47E-04	3.13E-05
1987	7.23E-05	6.97E-07	1.42E-03	1.56E-04	1.91E-03	4.31E-05	2.08E-04	2.30E-05	4.33E-04	1.99E-05	9.98E-04	2.76E-05
1988	4.47E-04	8.04E-06	2.43E-04	4.47E-05	9.22E-04	5.79E-05	1.90E-04	5.07E-06	3.26E-04	5.26E-05	4.09E-04	4.74E-06
1989	5.30E-04	5.40E-05	6.13E-04	2.44E-06	1.34E-03	2.15E-05	3.52E-04	7.27E-06	9.18E-04	6.41E-04	1.20E-03	7.91E-05
1990	1.90E-04	9.28E-06	1.93E-03	2.53E-04	8.07E-04	2.71E-05	3.60E-04	7.13E-06	3.03E-04	6.49E-05	2.12E-03	2.91E-04
1991	9.98E-05	1.49E-06	1.54E-03	1.45E-04	5.65E-04	2.38E-05	3.74E-04	6.45E-06	1.08E-03	8.35E-04	3.15E-04	5.33E-06
1992	5.57E-04	3.63E-05	1.77E-03	2.21E-04	1.88E-03	5.99E-06	6.94E-04	1.72E-05	4.38E-04	5.93E-05	1.07E-03	1.68E-04
1993	1.28E-04	1.94E-06	1.09E-04	5.84E-07	3.19E-03	1.31E-04	2.32E-04	3.86E-06	1.66E-04	5.91E-06	3.92E-04	7.08E-06
1994	8.21E-05	7.09E-07	1.19E-03	2.59E-04	5.27E-03	1.83E-04	4.24E-04	1.43E-05	3.62E-04	8.30E-05	8.00E-04	4.62E-05
Total	6.21E-03	4.07E-04	1.99E-02	3.07E-03	4.03E-02	1.44E-03	1.16E-02	9.56E-04	1.02E-02	3.98E-03	1.46E-02	1.35E-03

Appendix M – SWASH Scenario 20 -Year PRZM/EXAMS Mass Totals from Field (Koc = 10000)

	Weiherbach,Ger-R1_WC		Bologna, Italy – R3_WC		Roujan, France – R4_WC		Weiherbach,Ger-R1_PO		Porto, Portugal – R2_PO		Bologna, Italy – R3_PO	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1975	8.42E-06	9.56E-06	**8.41E-06**	**1.02E-05**	3.14E-05	1.99E-05	1.45E-04	4.18E-04	2.17E-05	1.76E-04	1.19E-04	2.30E-04
1976	5.03E-05	8.58E-05	1.17E-04	2.59E-04	6.85E-04	7.12E-04	1.73E-04	4.31E-04	8.14E-05	8.06E-04	1.10E-04	1.85E-04
1977	6.68E-05	2.19E-04	2.91E-04	1.42E-03	1.03E-03	9.91E-04	8.88E-05	1.56E-04	1.04E-04	6.96E-04	2.26E-04	9.23E-04
1978	3.55E-04	3.73E-04	2.22E-04	8.10E-04	4.41E-04	1.95E-04	5.65E-04	1.50E-03	8.96E-05	6.35E-04	1.72E-04	2.49E-04
1979	6.85E-05	1.58E-04	2.01E-04	9.78E-04	4.67E-04	5.31E-04	1.35E-04	2.91E-04	1.04E-04	5.86E-04	1.63E-04	4.11E-04
1980	7.39E-05	7.41E-05	1.60E-04	8.57E-04	2.58E-04	6.02E-04	1.51E-04	4.68E-04	4.02E-05	2.52E-04	1.01E-04	1.86E-04
1981	1.86E-04	1.68E-04	3.30E-05	7.88E-05	2.43E-04	1.16E-04	3.53E-04	9.03E-04	1.34E-04	1.88E-03	9.20E-05	1.93E-04
1982	2.01E-04	1.97E-04	1.32E-04	5.59E-04	5.27E-04	1.12E-03	2.78E-04	7.25E-04	7.63E-05	9.72E-04	1.08E-04	2.64E-04
1983	8.42E-05	6.09E-05	5.47E-05	8.83E-05	5.62E-04	8.66E-04	1.62E-04	3.02E-04	7.24E-05	4.62E-04	1.84E-04	5.47E-04
1984	9.74E-05	9.21E-05	1.34E-04	3.81E-04	8.12E-04	1.29E-03	1.36E-04	2.24E-04	1.20E-04	8.26E-04	1.39E-04	2.88E-04
1985	1.01E-04	3.12E-04	2.96E-05	5.91E-05	2.22E-04	8.98E-05	1.07E-04	1.85E-04	6.59E-05	5.20E-04	8.33E-05	1.76E-04
1986	1.96E-04	3.14E-04	2.15E-04	6.58E-04	5.08E-04	2.34E-04	2.43E-04	4.00E-04	8.04E-05	6.95E-04	1.52E-04	3.08E-04
1987	3.94E-05	2.77E-05	2.09E-04	8.06E-04	7.54E-04	3.83E-04	8.06E-05	1.53E-04	8.55E-05	5.02E-04	1.84E-04	4.53E-04
1988	1.00E-04	8.47E-05	5.26E-05	1.29E-04	5.24E-04	3.22E-04	1.42E-04	1.93E-04	5.19E-05	3.65E-04	1.09E-04	2.15E-04
1989	8.60E-05	2.08E-04	1.57E-04	3.23E-04	2.51E-04	2.12E-04	1.22E-04	2.34E-04	1.18E-04	1.71E-03	2.54E-04	5.40E-04
1990	5.52E-05	8.59E-05	2.74E-04	8.62E-04	1.38E-04	1.40E-04	1.25E-04	2.01E-04	4.86E-05	3.87E-04	3.60E-04	1.31E-03
1991	4.95E-05	8.97E-05	1.92E-04	1.02E-03	1.04E-04	1.12E-04	1.06E-04	2.18E-04	1.24E-04	2.01E-03	1.03E-04	1.73E-04
1992	9.78E-05	1.78E-04	2.51E-04	9.03E-04	6.62E-04	3.66E-04	1.70E-04	3.51E-04	5.59E-05	4.62E-04	2.47E-04	5.94E-04
1993	3.99E-05	5.05E-05	5.22E-05	5.75E-05	6.79E-04	1.04E-03	7.99E-05	1.43E-04	2.78E-05	2.07E-04	1.53E-04	2.03E-04
1994	2.23E-05	4.12E-05	1.70E-04	7.97E-04	1.01E-03	1.44E-03	9.87E-05	2.00E-04	5.20E-05	4.90E-04	1.99E-04	4.32E-04
Total	1.98E-03	2.83E-03	2.96E-03	1.11E-02	9.91E-03	1.08E-02	3.46E-03	7.70E-03	1.55E-03	1.46E-02	3.26E-03	7.88E-03

Appendix N— SWASH Crop Scenarios run with PRZM/EXAMS - 20-year simulation PECs

Koc	SWASH Scenario	Field area, ha	Crop	Water-body	Max Peak in Water, ug/L	90th Percentile Time-weighted Average PECs in Water, ug/L						
						Peak	1 day	4 days	21 days	60 days	90 day	Annual
10	WG -R1	0.45	W cereal	Pond	0.577	0.568	0.567	0.564	0.552	0.524	0.457	0.314
10	WG-R1	1	W cereal	Stream	36.700	31.980	16.170	4.269	0.823	0.288	0.192	0.047
10	BI – R3	1	W cereal	Stream	154.000	131.600	66.550	17.570	3.357	1.178	0.783	0.193
10	RF–R4	1	W cereal	Stream	294.000	127.900	64.720	17.290	3.287	1.156	0.768	0.189
10	WG-R1	0.45	Potatoes	Pond	1.930	0.890	0.889	0.886	0.871	0.846	0.825	0.583
10	WG-R1	1	Potatoes	Stream	110.000	43.040	21.750	7.001	1.334	0.467	0.312	0.077
10	PP–R2	1	Potatoes	Stream	65.200	52.640	26.670	8.027	1.676	0.587	0.391	0.096
10	BI–R3	1	Potatoes	Stream	176.000	95.620	48.300	13.280	2.537	0.888	0.592	0.146
1000	WG-1	0.45	W cereal	Pond	0.291	0.263	0.259	0.248	0.212	0.173	0.161	0.116
1000	WG-R1	1	W cereal	Stream	12.800	11.520	5.828	1.735	0.400	0.156	0.104	0.031
1000	BI – R3	1	W cereal	Stream	42.900	42.070	21.280	6.079	1.363	0.523	0.350	0.099
1000	RF–R4	1	W cereal	Stream	135.000	111.200	56.200	14.440	2.948	1.114	0.745	0.185
1000	WG-R1	0.45	Potatoes	Pond	1.100	0.543	0.534	0.513	0.431	0.377	0.352	0.255
1000	WG-R1	1	Potatoes	Stream	33.000	17.120	8.666	3.815	0.768	0.344	0.235	0.068
1000	PP–R2	1	Potatoes	Stream	32.300	21.180	10.780	2.967	1.034	0.429	0.292	0.078
1000	BI–R3	1	Potatoes	Stream	35.300	32.360	16.330	5.284	1.079	0.409	0.300	0.078
10000	WG-1	0.45	W cereal	Pond	0.179	0.077	0.068	0.049	0.028	0.022	0.020	0.015
10000	WG-R1	1	W cereal	Stream	7.320	4.472	2.265	0.661	0.189	0.077	0.064	0.021
10000	BI – R3	1	W cereal	Stream	18.600	17.140	8.676	2.556	0.644	0.261	0.177	0.047
10000	RF–R4	1	W cereal	Stream	33.400	27.630	13.970	3.952	1.045	0.476	0.318	0.090
10000	WG-R1	0.45	Potatoes	Pond	0.350	0.173	0.152	0.115	0.060	0.050	0.046	0.036
10000	WG-R1	1	Potatoes	Stream	13.600	7.229	3.659	1.602	0.374	0.191	0.134	0.050
10000	PP–R2	1	Potatoes	Stream	23.600	16.080	8.178	2.293	0.883	0.375	0.259	0.073
10000	BI–R3	1	Potatoes	Stream	14.200	12.730	6.424	2.013	0.475	0.196	0.146	0.044

WG = Weiherbach, Germany; BI = Bologna, Italy; RF = Roujan, France; PP = Porto, Portugal

Appendix O— SWASH Crop Scenarios run with PRZM/EXAMS - 1-year simulation PECs

Koc	SWASH Scenario	Field area, ha	Crop	Water-body	Max Date	Maximum Time-weighted Average PECs in Water, ug/L						
						Peak	1-day	4 days	21 days	60 days	90 days	Annual
10	WG -R1	0.45	W cereal	Pond	25-Oct-78	0.018	0.018	0.018	0.017	0.017	0.015	0.011
10	WG-R1	1	W cereal	Stream	25-Oct-78	1.170	0.593	0.150	0.029	0.010	0.007	0.002
10	BI – R3	1	W cereal	Stream	26-Nov-80	73.800	37.300	14.600	2.790	0.975	0.650	0.160
10	RF–R4	1	W cereal	Stream	22-Oct-79	20.700	10.400	2.720	0.526	0.184	0.123	0.030
10	WG-R1	0.45	Potatoes	Pond	7-May-84	0.007	0.007	0.007	0.007	0.007	0.006	0.003
10	WG-R1	1	Potatoes	Stream	7-May-84	0.488	0.247	0.062	0.012	0.004	0.003	0.001
10	PP–R2	1	Potatoes	Stream	14-Mar-78	3.630	1.840	0.643	0.123	0.043	0.029	0.007
10	BI–R3	1	Potatoes	Stream	15-Mar-80	3.990	2.020	0.847	0.190	0.066	0.044	0.011
1000	WG-1	0.45	W cereal	Pond	31-Dec-78	0.070	0.069	0.064	0.052	0.046	0.043	0.030
1000	WG-R1	1	W cereal	Stream	31-Dec-78	3.220	1.620	0.524	0.100	0.039	0.032	0.008
1000	BI – R3	1	W cereal	Stream	27-Nov-80	33.800	17.100	6.120	1.230	0.441	0.294	0.073
1000	RF–R4	1	W cereal	Stream	26-Oct-79	31.800	16.100	7.830	1.620	0.572	0.388	0.096
1000	WG-R1	0.45	Potatoes	Pond	30-May-84	0.052	0.051	0.048	0.043	0.038	0.037	0.026
1000	WG-R1	1	Potatoes	Stream	30-May-84	1.820	0.921	0.235	0.097	0.048	0.034	0.013
1000	PP–R2	1	Potatoes	Stream	29-Apr-78	1.840	0.927	0.278	0.113	0.046	0.038	0.011
1000	BI–R3	1	Potatoes	Stream	22-Mar-80	4.410	2.230	0.587	0.161	0.091	0.063	0.020
10000	WG-1	0.45	W cereal	Pond	31-Dec-78	0.019	0.016	0.008	0.004	0.003	0.003	0.002
10000	WG-R1	1	W cereal	Stream	31-Dec-78	1.060	0.537	0.167	0.032	0.012	0.010	0.002
10000	BI – R3	1	W cereal	Stream	27-Nov-80	13.300	6.750	2.340	0.552	0.212	0.141	0.035
10000	RF–R4	1	W cereal	Stream	26-Oct-79	8.950	4.520	2.330	0.533	0.229	0.160	0.039
10000	WG-R1	0.45	Potatoes	Pond	22-Nov-84	0.020	0.018	0.015	0.009	0.008	0.008	0.005
10000	WG-R1	1	Potatoes	Stream	22-Nov-84	1.040	0.527	0.175	0.045	0.021	0.021	0.011
10000	PP–R2	1	Potatoes	Stream	7-Dec-77	0.878	0.449	0.176	0.082	0.038	0.031	0.010
10000	BI–R3	1	Potatoes	Stream	22-Mar-80	1.400	0.708	0.194	0.055	0.031	0.023	0.012

WG = Weiherbach, Germany; BI = Bologna, Italy; RF = Roujan, France; PP = Porto, Portugal

Appendix P – SWASH Scenario 20 -Year Mass Totals from Field using Norway Weather (Koc = 10)

	Weiherbach,Ger-R1_WC		Bologna, Italy – R3_WC		Roujan, France – R4_WC		Weiherbach,Ger-R1_PO		Porto, Portugal – R2_PO		Bologna, Italy – R3_PO	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1965	6.26E-06	1.54E-12	5.52E-06	2.74E-11	3.03E-09	1.02E-16	3.84E-15	2.52E-21	1.41E-13	1.43E-19	2.99E-14	1.40E-21
1966	1.04E-03	3.02E-07	3.94E-04	1.79E-08	3.11E-03	5.37E-05	3.49E-10	5.71E-18	3.62E-07	7.49E-08	1.53E-08	1.45E-15
1967	3.60E-05	4.51E-11	2.47E-03	2.08E-06	6.83E-07	9.61E-14	3.14E-04	1.25E-07	2.43E-05	1.34E-09	1.47E-05	4.97E-10
1968	1.17E-04	3.33E-09	3.30E-04	1.83E-07	4.29E-05	3.42E-10	1.92E-04	2.55E-08	1.36E-04	4.74E-08	8.13E-04	4.02E-07
1969	2.30E-04	1.74E-09	1.25E-03	9.68E-08	4.71E-04	7.03E-08	9.60E-05	3.79E-10	6.00E-05	1.60E-08	2.44E-03	4.92E-07
1970	7.84E-04	1.72E-07	2.53E-03	1.47E-06	1.07E-03	5.97E-08	8.63E-05	4.37E-06	1.37E-10	4.39E-17	1.14E-04	1.09E-08
1971	4.78E-04	7.96E-09	1.23E-03	4.99E-05	1.53E-05	3.64E-11	3.13E-07	1.26E-11	1.76E-04	2.09E-07	2.24E-03	9.61E-07
1972	8.53E-04	1.01E-07	1.35E-04	1.05E-08	4.15E-05	7.58E-10	3.48E-04	5.58E-08	2.33E-04	4.34E-08	3.26E-04	1.85E-06
1973	7.12E-04	3.07E-08	2.45E-05	1.51E-06	8.15E-05	5.65E-10	1.91E-04	6.07E-09	1.36E-04	1.29E-08	3.91E-04	9.46E-09
1974	2.58E-03	8.34E-07	5.49E-04	1.53E-08	2.20E-03	3.70E-07	1.37E-03	1.67E-06	1.31E-04	6.99E-08	1.28E-04	2.07E-09
1975	1.26E-03	8.48E-08	1.29E-03	8.35E-05	5.26E-04	3.16E-09	1.99E-03	1.53E-05	1.08E-04	1.54E-07	9.04E-04	4.80E-07
1976	9.12E-05	1.12E-09	2.81E-04	9.39E-06	7.04E-04	6.34E-08	1.73E-04	4.23E-08	5.81E-05	5.94E-09	8.17E-04	2.50E-08
1977	9.87E-04	2.61E-08	1.30E-03	5.63E-08	2.05E-04	7.35E-10	7.27E-04	1.88E-06	8.57E-04	1.18E-07	6.00E-03	2.37E-04
1978	9.05E-04	5.81E-08	8.34E-16	3.54E-22	4.31E-06	7.42E-10	4.01E-04	9.22E-09	5.73E-04	6.63E-07	2.21E-03	1.24E-06
1979	8.75E-07	9.22E-13	2.74E-04	9.59E-09	5.81E-10	1.29E-16	8.21E-07	1.68E-13	2.03E-04	9.18E-08	2.05E-03	3.10E-06
1980	1.30E-03	1.75E-07	1.42E-05	2.59E-11	7.76E-04	2.45E-08	2.82E-04	8.29E-08	4.52E-04	5.90E-07	2.65E-04	6.42E-09
1981	3.31E-03	6.53E-07	2.54E-03	2.43E-04	9.34E-04	1.42E-07	1.86E-05	1.09E-10	2.24E-04	2.18E-08	1.33E-06	1.54E-13
1982	1.40E-04	3.19E-08	5.84E-04	2.75E-07	3.88E-05	1.67E-09	6.79E-04	2.43E-08	7.31E-04	1.86E-06	1.15E-04	4.94E-09
1983	2.12E-05	1.02E-10	8.70E-05	7.90E-09	3.31E-06	2.85E-12	1.74E-05	1.63E-10	5.08E-09	7.45E-16	1.65E-07	4.66E-14
1984	1.37E-04	9.47E-09	9.81E-04	5.68E-07	5.88E-05	1.70E-09	4.66E-06	7.13E-13	4.28E-04	3.04E-07	1.62E-03	5.30E-07
Total	1.50E-02	2.49E-06	1.63E-02	3.92E-04	1.03E-02	5.44E-05	6.89E-03	2.36E-05	4.53E-03	4.28E-06	2.04E-02	2.46E-04

Appendix Q – SWASH Scenario 20 -Year Mass Totals from Field using Norway Weather (Koc = 1000)

	Weiherbach,Ger-R1_WC		Bologna, Italy – R3_WC		Roujan, France – R4_WC		Weiherbach,Ger-R1_PO		Porto, Portugal – R2_PO		Bologna, Italy – R3_PO	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1965	3.26E-04	8.85E-06	1.81E-04	4.40E-06	3.04E-04	9.82E-07	2.84E-04	7.37E-07	1.06E-04	8.84E-06	2.02E-04	3.09E-07
1966	8.20E-04	1.12E-04	3.59E-04	3.17E-05	1.52E-03	1.86E-04	5.98E-04	3.05E-06	2.36E-04	2.02E-05	4.57E-04	2.62E-06
1967	5.29E-04	6.96E-05	4.21E-04	1.03E-04	5.39E-04	1.67E-05	4.88E-04	2.98E-05	1.68E-04	8.16E-06	2.08E-04	1.83E-06
1968	1.11E-04	3.25E-06	1.08E-04	5.97E-06	5.02E-05	1.19E-06	3.07E-04	1.44E-05	1.56E-04	2.34E-05	3.95E-04	3.80E-05
1969	8.64E-04	1.46E-04	1.04E-03	1.85E-04	9.64E-04	3.97E-05	5.92E-04	5.02E-05	2.39E-04	3.59E-05	1.16E-03	2.56E-04
1970	2.84E-04	1.22E-05	4.40E-04	9.86E-05	9.42E-04	5.25E-05	4.56E-04	1.56E-05	2.37E-04	1.09E-05	2.55E-04	5.33E-06
1971	7.52E-04	1.29E-04	3.97E-04	1.31E-04	1.70E-04	1.50E-06	4.39E-04	4.23E-06	2.28E-04	1.53E-05	6.27E-04	9.42E-05
1972	6.43E-04	2.21E-05	1.32E-03	8.23E-05	4.06E-04	2.74E-06	3.48E-04	3.61E-05	2.15E-04	3.48E-05	3.69E-04	3.57E-05
1973	1.04E-03	1.12E-04	3.46E-05	2.28E-06	1.29E-03	3.31E-05	3.79E-04	1.17E-05	1.76E-04	2.47E-05	4.38E-04	5.46E-05
1974	6.17E-04	6.55E-05	4.13E-04	3.99E-05	6.85E-04	3.62E-05	4.86E-04	1.11E-04	2.17E-04	1.11E-05	3.69E-04	1.97E-05
1975	4.98E-04	1.30E-04	3.46E-04	2.00E-04	4.72E-04	5.94E-05	8.61E-04	1.96E-04	2.43E-04	8.60E-06	3.47E-04	2.46E-05
1976	7.31E-04	1.57E-05	4.70E-04	2.78E-05	4.51E-04	1.98E-05	2.48E-04	9.42E-06	2.54E-04	5.51E-05	1.29E-03	2.71E-04
1977	7.66E-04	3.45E-05	1.64E-03	3.22E-04	9.27E-04	1.27E-05	7.60E-04	7.24E-05	4.67E-04	5.42E-05	1.16E-03	7.12E-04
1978	2.76E-04	2.00E-05	9.10E-05	3.75E-08	2.67E-05	4.37E-08	6.90E-04	6.48E-05	4.02E-04	6.44E-05	1.12E-03	1.58E-04
1979	5.79E-04	4.04E-05	2.04E-04	3.56E-06	4.13E-04	5.53E-06	3.89E-04	4.51E-06	3.13E-04	1.02E-04	6.62E-04	1.18E-04
1980	7.13E-04	4.71E-05	4.64E-04	4.18E-06	6.61E-04	2.14E-05	4.09E-04	1.56E-05	2.62E-04	5.14E-05	2.90E-04	2.54E-05
1981	1.50E-03	3.54E-04	7.69E-04	5.33E-04	1.71E-03	6.76E-05	5.31E-04	3.75E-06	3.49E-04	1.14E-04	3.72E-04	2.00E-06
1982	1.05E-03	1.17E-04	8.25E-04	5.92E-05	1.12E-03	3.45E-05	7.51E-04	1.01E-04	2.57E-04	3.86E-05	2.73E-04	1.21E-05
1983	1.49E-04	1.61E-06	1.39E-04	2.47E-06	8.58E-05	2.47E-07	3.53E-04	1.35E-05	1.99E-04	9.62E-06	2.37E-04	9.71E-07
1984	8.24E-04	1.56E-05	8.92E-04	4.02E-05	5.75E-04	4.10E-06	6.93E-04	1.81E-05	4.73E-04	7.27E-05	1.64E-03	1.59E-04
Total	1.31E-02	1.46E-03	1.06E-02	1.88E-03	1.33E-02	5.96E-04	1.01E-02	7.75E-04	5.20E-03	7.64E-04	1.19E-02	1.99E-03

Appendix R – SWASH Scenario 20 -Year Mass Totals from Field using Norway Weather (Koc = 10000)

	Weiherbach,Ger-R1_WC		Bologna, Italy – R3_WC		Roujan, France – R4_WC		Weiherbach,Ger-R1_PO		Porto, Portugal – R2_PO		Bologna, Italy – R3_PO	
Year	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha	RFLX, kg/ha	EFLX, kg/ha
1965	3.67E-05	5.38E-05	1.99E-05	2.82E-05	5.34E-05	3.26E-05	7.41E-05	2.22E-04	1.38E-05	2.26E-04	6.65E-05	1.73E-04
1966	1.56E-04	4.37E-04	1.05E-04	2.08E-04	3.78E-04	5.07E-04	1.97E-04	3.77E-04	3.27E-05	3.31E-04	1.70E-04	3.08E-04
1967	1.40E-04	3.54E-04	1.26E-04	3.01E-04	1.90E-04	1.96E-04	1.89E-04	3.45E-04	2.99E-05	2.01E-04	1.42E-04	1.95E-04
1968	6.89E-05	6.01E-05	7.76E-05	9.50E-05	8.73E-05	1.34E-05	1.23E-04	1.72E-04	2.73E-05	1.86E-04	1.27E-04	2.08E-04
1969	2.07E-04	4.90E-04	2.21E-04	5.59E-04	2.62E-04	3.45E-04	2.82E-04	4.90E-04	4.71E-05	3.40E-04	3.09E-04	8.06E-04
1970	1.72E-04	1.27E-04	1.79E-04	2.43E-04	2.69E-04	2.02E-04	2.45E-04	2.97E-04	5.65E-05	3.17E-04	2.02E-04	1.87E-04
1971	2.10E-04	4.29E-04	2.06E-04	3.63E-04	1.75E-04	3.25E-05	2.35E-04	2.97E-04	5.03E-05	3.20E-04	2.36E-04	3.73E-04
1972	2.20E-04	1.77E-04	3.33E-04	8.47E-04	2.23E-04	5.75E-05	3.33E-04	3.86E-04	6.50E-05	4.60E-04	2.93E-04	2.94E-04
1973	2.40E-04	4.40E-04	1.07E-04	4.32E-05	3.01E-04	3.11E-04	2.17E-04	2.51E-04	3.94E-05	2.24E-04	1.90E-04	2.63E-04
1974	1.99E-04	2.47E-04	1.79E-04	2.68E-04	2.31E-04	1.24E-04	2.68E-04	4.57E-04	5.27E-05	3.15E-04	2.29E-04	2.54E-04
1975	2.25E-04	4.04E-04	2.21E-04	4.37E-04	2.36E-04	1.80E-04	3.08E-04	6.25E-04	6.22E-05	3.11E-04	2.14E-04	2.37E-04
1976	1.94E-04	2.47E-04	1.63E-04	1.95E-04	2.03E-04	1.05E-04	1.63E-04	1.61E-04	4.25E-05	2.01E-04	2.63E-04	8.82E-04
1977	3.94E-04	2.47E-04	4.82E-04	1.04E-03	4.63E-04	1.26E-04	5.36E-04	6.75E-04	1.21E-04	6.40E-04	5.24E-04	1.19E-03
1978	2.83E-04	2.01E-04	2.53E-04	1.29E-04	2.81E-04	2.46E-05	3.99E-04	4.56E-04	1.06E-04	5.54E-04	4.17E-04	7.40E-04
1979	1.77E-04	4.27E-04	1.20E-04	1.74E-04	1.97E-04	1.74E-04	1.99E-04	3.17E-04	5.84E-05	4.92E-04	2.04E-04	4.08E-04
1980	2.08E-04	2.09E-04	1.61E-04	1.14E-04	2.41E-04	1.14E-04	2.95E-04	3.58E-04	6.56E-05	4.86E-04	2.40E-04	2.51E-04
1981	3.24E-04	1.04E-03	2.60E-04	8.03E-04	4.24E-04	7.06E-04	2.96E-04	4.21E-04	6.85E-05	6.46E-04	2.45E-04	3.17E-04
1982	2.64E-04	6.79E-04	2.42E-04	5.09E-04	3.22E-04	4.60E-04	3.13E-04	8.45E-04	5.78E-05	4.83E-04	2.08E-04	2.49E-04
1983	1.24E-04	9.04E-05	1.24E-04	9.37E-05	1.29E-04	1.81E-05	1.96E-04	2.48E-04	4.27E-05	2.71E-04	1.60E-04	1.63E-04
1984	3.54E-04	3.76E-04	3.15E-04	3.65E-04	4.06E-04	1.28E-04	4.28E-04	6.39E-04	1.02E-04	7.36E-04	5.30E-04	1.19E-03
Total	4.20E-03	6.74E-03	3.89E-03	6.81E-03	5.07E-03	3.86E-03	5.30E-03	8.04E-03	1.14E-03	7.74E-03	4.97E-03	8.68E-03

Appendix S— SWASH Crop Scenarios run with PRZM/EXAMS and Norway Weather - 20-year simulation PECs

Koc	SWASH Scenario	Field area, ha	Crop	Water-body	Max Peak in Water, ug/L	90th Percentile Time-weighted Average PECs in Water, ug/L						
						Peak	1 day	4 days	21 days	60 days	90 day	Annual
10	WG -R1	0.45	W cereal	Pond	2.010	1.803	1.794	1.793	1.773	1.732	1.382	1.060
10	WG-R1	1	W cereal	Stream	88.000	79.330	40.140	10.450	1.995	0.698	0.465	0.115
10	BI – R3	1	W cereal	Stream	81.300	80.740	40.860	10.770	2.046	0.717	0.478	0.118
10	RF–R4	1	W cereal	Stream	76.400	68.450	34.650	8.879	1.698	0.593	0.396	0.098
10	WG-R1	0.45	Potatoes	Pond	1.340	0.758	0.757	0.753	0.734	0.690	0.671	0.543
10	WG-R1	1	Potatoes	Stream	45.600	42.020	21.200	5.534	1.058	0.371	0.247	0.061
10	PP–R2	1	Potatoes	Stream	25.400	23.230	11.710	2.970	0.582	0.204	0.136	0.033
10	BI–R3	1	Potatoes	Stream	122.000	71.790	36.290	10.310	1.964	0.687	0.458	0.113
1000	WG-1	0.45	W cereal	Pond	0.809	0.624	0.614	0.587	0.504	0.460	0.396	0.285
1000	WG-R1	1	W cereal	Stream	24.400	22.010	11.150	4.313	0.863	0.315	0.211	0.054
1000	BI – R3	1	W cereal	Stream	23.800	21.070	10.680	3.105	0.943	0.375	0.251	0.065
1000	RF–R4	1	W cereal	Stream	27.100	26.790	13.500	5.299	1.196	0.457	0.306	0.077
1000	WG-R1	0.45	Potatoes	Pond	0.421	0.354	0.350	0.341	0.299	0.252	0.239	0.178
1000	WG-R1	1	Potatoes	Stream	16.900	9.271	4.690	1.376	0.477	0.182	0.131	0.039
1000	PP–R2	1	Potatoes	Stream	6.870	5.158	2.608	0.872	0.179	0.070	0.051	0.024
1000	BI–R3	1	Potatoes	Stream	38.000	22.790	11.590	5.096	1.192	0.424	0.284	0.078
10000	WG-1	0.45	W cereal	Pond	0.286	0.202	0.177	0.129	0.071	0.060	0.050	0.037
10000	WG-R1	1	W cereal	Stream	12.100	9.379	4.763	1.677	0.410	0.186	0.125	0.038
10000	BI – R3	1	W cereal	Stream	13.200	10.010	5.108	1.862	0.553	0.247	0.168	0.046
10000	RF–R4	1	W cereal	Stream	11.100	9.335	4.726	1.664	0.466	0.215	0.146	0.038
10000	WG-R1	0.45	Potatoes	Pond	0.177	0.146	0.128	0.100	0.056	0.046	0.044	0.038
10000	WG-R1	1	Potatoes	Stream	9.260	7.356	3.731	1.180	0.324	0.145	0.102	0.047
10000	PP–R2	1	Potatoes	Stream	5.960	3.246	1.661	0.677	0.181	0.090	0.067	0.029
10000	BI–R3	1	Potatoes	Stream	17.600	12.520	6.325	2.350	0.668	0.273	0.189	0.068

WG = Weiherbach, Germany; BI = Bologna, Italy; RF = Roujan, France; PP = Porto, Portugal