Draft Assessment Report

Evaluation of Active Substances

Plant Protection Products

Prepared according to **assimilated Regulation No 1107/2009**
as it applies in Great Britain

Inpyrfluxam

Volume 3 – B.8 (S-2399 60 g/L EC)

Environmental Fate & Behaviour

Great Britain

March 2026

Version History

When	What
November 2025	Initial DAR
March 2026	Updates made after ECP

Contents

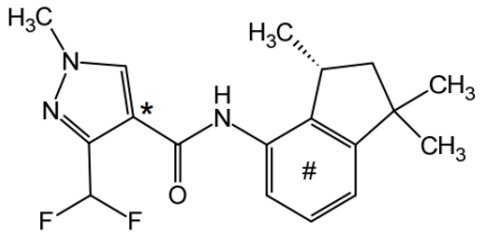
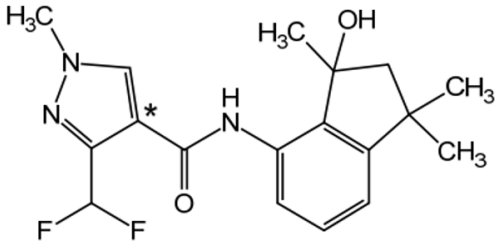
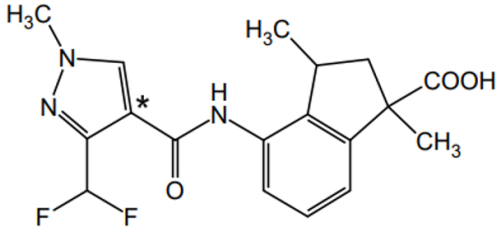
B.8. Environmental Fate and Behaviour

Inpyrfluxam (CAS-No. 1352994-67-2) is a new fungicidal active substance developed by Sumitomo.

This Volume 3 CP B8 evaluates the submission for regulatory approval of inpyrfluxam in Great Britain under assimilated Regulation (EU) 1107/2009. Inpyrfluxam is a novel succinate dehydrogenase inhibitor fungicide, with application to winter and spring cereal crops (wheat, triticale, rye, barley and oats) evaluated as part of this submission. Inpyrfluxam is to be used as the active substance in the emulsifiable concentrate plant protection product S-2399 60 g/L EC. S-2399 60 g/L EC contains 60 g/L inpyrfluxam.

Throughout the development of inpyrfluxam the synonym S-2399 has been used by the applicant in individual study reports to refer to the active substance. Both inpyrfluxam and S-2399 refer to the same chemical and structural formula. For this evaluation the term inpyrfluxam is used. Structural formulae are presented in table B.8-1 for S-2399 and its main environmental metabolites 3'-OH-S-2840 and 1'-COOH-S-2840.

Table B.8-1: Structural formula of the main compounds investigated in the environment.

Structural formula & labelling positions		Environmental compartment assesed in:
Structural formula of inpyrfluxam: #: ^{14}C-labeling position of the **phenyl-label** = [phenyl-^{14}C] inpyrfluxam * : ^{14}C-labeling position of the **pyrazolyl-label** = [pyrazolyl-4-^{14}C] inpyrfluxam		Soil, groundwater and surface water-sediment and air
Structural formula of 3'-OH-S-2840 * : ^{14}C-labeling position of the **pyrazolyl-labelled** 3'-OH-S-2840 = [pyrazolyl-4-^{14}C] 3'-OH-S-2840		Soil, groundwater and surface water-sediment
Structural formula of 1'-COOH-S-2840 * : ^{14}C-labeling position of the **pyrazolyl-labelled** 1'-COOH-S-2840 = [pyrazolyl-4-^{14}C] 1'-COOH-S-2840		Soil, groundwater and surface water-sediment

Revised calculations were required to be performed by HSE as the endpoints proposed by the applicant were different to those selected by HSE in the Section B.8 CA document. The representative use of S-2399 60 g/L EC is presented in table B.8-2.

Table B.8-2: Summary of representative uses of S-2399 60 g/L EC

	F G or I	Method / Kind	Timing / Growth stage of crop & season	Max. number	Crop interception (%)	g a.s./ha a) max. rate per appl. b) max. total rate per crop/season	Max dose to soil (g a.s/ha)
Winter & spring wheat, barley triticale rye & oat	F[(a)]	Foliar spray	BBCH 30-71 Spring	1	80	a) 90 b) 90	18

a) F: professional field use

B.8.1 Fate and behaviour in soil

B.8.1.1 Route and rate of degradation in soil

For full details of the assessment of degradation in soil see the associated CA.B.8 document. Endpoints from the CA assessment for use in PEC calculations are listed in tables for each compartment below.

B.8.1.2 Mobility in soil

For full details of the assessment of mobility in soil see the associated CA.B.8 document. Endpoints from the CA assessment for use in PEC calculations are listed in tables for each compartment below.

B.8.2 Predicted environmental concentrations in soil (PEC_{soil})

For the calculation of PECsoil, DT_{50} values derived in the CA document of this assessment are listed in table B.8.2-2. The longest soil degradation values resulting from the field dissipation and laboratory degradation studies are listed for inpyrfluxam and its metabolites 3'-OH-S-2840 and 1'-COOH-S-2840.

For inpyrfluxam, the longest DT_{50} was described by SFO kinetics, with a non-normalised DT_{50} of 383 days from field studies (Italy site). The HSE PECsoil calculator was therefore used to calculate PECsoil values for applications during a single growing season using this

SFO value. PECsoil accumulation however was found to be worse-case with the endpoints derived from the DFOP model with a DT_{50} of 254 days and DT_{90} > 1000 d (laboratory value, 20°C, pF2). The PECsoil calculator was used to determine PECsoil accumulation calculated over consecutive growing seasons, using the worst-case DFOP model. As laboratory values were determined at 20°C and pF2, normalisation was not required.

The longest soil DT_{50} values for the metabolites were described by SFO kinetics from the laboratory studies, and were 369 d for 3'-OH-S-2840 and 840 d for 1'-COOH-S-2840. Since the DT_{90} values of all substances were in excess of 1 year, soil accumulation calculation were performed for all substances.

Using the HSE PECsoil calculator, inpyrfluxam reached a plateau in 18 years. For the purposes of a conservative first tier metabolite assessment, the parent accumulated soil load was taken as the starting application rate for the metabolite calculations, with these application rates then allowed to accumulate based on the individual metabolite DT_{50} values.

The GAP assessed is listed in table B.8.2-1, where all crops give the same dosing to soil, and therefore constitute the critical use. Assessments have been made assuming soil density of 1.5 g/cm^3 and a 5 cm incorporation depth for applications; this is to reflect an assessment of potential accumulation in soil under minimum/shallow tillage practice. A 5 cm incorporation depth has also been assumed for accumulation over a multi-year period. PECsoil accumulation for metabolites has been calculated accounting for plateau concentration of the parent in soil also degrading to form the metabolites.

Table B.8.2-1: Representative uses assessed for PECsoil

	F G or I	Method / Kind	Timing / Growth stage of crop & season	Max. number	Crop interception (%)	g a.s./ha a) max. rate per appl. b) max. total rate per crop/season	Max dose to soil (g a.s/ha)
Winter & spring wheat, barley triticale rye & oat	F[(a)]	Foliar spray	BBCH 30-71 Spring	1	80	a) 90 b) 90	18

a) F: professional field use

Table B.8.2.-2: Endpoints used in the assessment of PECsoil for inpyrfluxam

Endpoint		
Inpyrfluxam		
Molecular weight (g/mol)		333.38
Model	SFO	DFOP
DT_{50} soil (days) (SFO: maximum field, not-normalised, DFOP: maximum laboratory, 20°C, pF2, normalisation not required)	383 (parent dosed field studies, SFO, Italy)	254 (parent dosed laboratory study, DFOP, Penn)
DT_{90} soil [days] (maximum field, not-normalised)	>1,000	> 1,000
k_1 (DT_{50})	0.00181 (383)	0.00861 (80.5)
k_2 (DT_{50})	-	0.000693 (1000)
g value	-	0.465
3'-OH-S-2840		
Molecular weight (g/mol)		349.38
DT_{50} soil (days) (maximum lab, not-normalised)	369 (metabolite dosed laboratory study, SFO, Speyer 5M)	
Max. occurrence in soil [%] (lab)		20.7
Application rate accounting for parent accumulation[(a)] (g/ha)		11.23
1'-COOH-S-2840		
Molecular weight [g/mol]		363.36
DT_{50} soil [days] (maximum lab., not-normalised)	840 (parent dosed laboratory study, SFO, Woodside)	
Max. occurrence in soil [%] (lab)		30.1
Application rate accounting for parent accumulation[(b)] (g/ha)		16.98

a) Application rate calculated as: (accumulated parent concentration in soil) x 750 x maximum occurrence in soil) x (metabolite molar mass / parent molar mass):
= 0.069 x 750 x 0.207 x (349.38 / 333.38)

b) = 0.069 x 750 x 0.301 x (363.36 / 333.38)

PECsoil values

Table B.8.2-3: PECsoil values all uses, inpyrfluxam

Time	PECactual (mg/kg)	PECtwa (mg/kg)
Initial	0.024	-
Short term 24h	0.024	0.024
2d	0.024	0.024
4d	0.024	0.024
Long term 7d	0.024	0.024
14d	0.023	0.024
21d	0.023	0.024
28d	0.023	0.023
48d	0.022	0.023
100d		0.020
Accumulation[(a)]	0.069 (18 years)	

a) peak concentration in soil, directly after application, once the plateau concentration has been reached (time taken to reach plateau).

Table B.8.2-4: PECsoil values all uses, 3'-OH-S-2840.

Time (Days)	PECactual (mg/kg)
0 (initial)	0.015
Accumulation[(a)]	0.030

a) peak concentration in soil, directly after application, once the plateau concentration has been reached.

Table B.8.2-5: PECsoil values all uses, 1'-COOH-S-2840.

Time (Days)	PECactual (mg/kg)
0 (initial)	0.023
Accumulation[(a)]	0.087

a) peak concentration in soil, directly after application, once the plateau concentration has been reached.

PECsoil formulation was calculated for S-2399 60 g/L EC, based on an application rate of 1.5 L/ha and a density of 0.9273 g/mL (KCP 2.6 physical chemical properties dossier). This gives an application rate of 1391 g/ha. As components are assumed to degrade at individual rates, only an initial value is presented. PECsoil for the formulation is given in Table B.8.2-6.

Table B.8.2-6: PECsoil values all uses, S-2399 60 g/L EC formulation. Worst case concentration in soil.

Time (Days)	PECactual (mg formulation/kg)
0 (initial)	0.371

Table B.8.2-7: Summary of PECsoil values to be used in the ecotoxicology assessment

	Inpyrfluxam	3'-OH-S-2840	1'-COOH-S-2840	Formulation
PECinitial (mg/kg)	0.024	0.015	0.023	0.371
Accumulation (mg/kg)	0.069	0.030	0.087	-

Rotational crop studies

The active substance equivalent application rates for inpyrfluxam, 3'-OH-S-2840 and 1'-COOH-S-2840 have been calculated. Calculations assume a single annual application with 0 % crop interception as a worst case in line with the OECD Guidance on Residues in

Rotational Crops. The use pattern assessed is a single application of 90 g a.s./ha as shown in Table B.8.2-1.

Substance specific input parameters used are presented below.

Table B.8.2-8: Input parameters used in the calculation of equivalent application rates for use in rotational crop studies

	Inpyrfluxam	3'-OH-S-2840	1'-COOH-S-2840
Molecular weight (g/mol)	333.38	349.38	363.36
DT_{50} in days (origin)	383 (longest non-normalised value from parent dosed field studies, SFO, Italy)	313.7 (field data not available, normalised geometric mean from laboratory studies)	228.6 (field data[(a)] not available, normalised geometric mean from laboratory studies)
Formation fraction	Not applicable	1 (maximum value)	0.612[(b)]

a) Field data should be the longest best fit non-normalised $DissT_{50}$ values. Non-normalised FOCUS Kinetics were conducted for parent but only normalised DT_{50} values are available for metabolites. Hence, laboratory data is used here.

b) Most conservative formation fraction from parent applied studies as other degradation parameters are from metabolite applied studies from which no formation fraction could be derived (it is incorrect to allocate a formation fraction of 1 to these soils by default).

For metabolite 3'-OH-S-2840 3 laboratory DT_{50} values were available from metabolite applied studies and the geometric mean was calculated. For 1'-COOH-S-2840 2 values were available from parent applied studies and a further 3 values from metabolite applied studies. All 1'-COOH-S-2840 values were SFO with the exception of the metabolite applied study on the Newhaven soil, for which the best fit was provided by the DFOP model. As the DT_{90} (623 days) exceeded the study duration, a pseudo SFO DT_{50} value was calculated using $ln2/k_2=DT_{50}$ for use in the calculation of the geometric mean DT_{50}. All laboratory studies were conducted at 20 ºC and pF 2 and so no normalisation was needed.

Results are shown below:

Table B.8.2-9: Parent and metabolite application rates from rotational crops

	Inpyrfluxam	3'-OH-S-2840	1'-COOH-S-2840
Application rate corresponding to total soil residues from long term use and crop failure (g a.s./ha)	186.2	Not applicable	Not applicable
Relevant parent application rate (g/ha)	Not applicable	359.2	304.4
Day of metabolite maximum in first year	Not applicable	>365	>365

At the request of HSE Residues, further values were calculated incorporating crop interception of 80 % to refine the calculation. These are presented below.

Table B.8.2-9: Parent and metabolite application rates from rotational crops with 80 % crop interception

	Inpyrfluxam	3'-OH-S-2840	1'-COOH-S-2840
Application rate corresponding to total soil residues from long term use and crop failure (g a.s./ha)	141.7	Not applicable	Not applicable
Relevant parent application rate (g/ha)	Not applicable	71.9	60.9

Day of metabolite maximum in first year	Not applicable	>365	>365

B.8.3 Predicted environmental concentrations in ground water (PEC_{gw})

The models PEARL, PELMO and MACRO were used. The degradation scheme, captured in the PELMO software, is given below in Figure B.8.3-1.

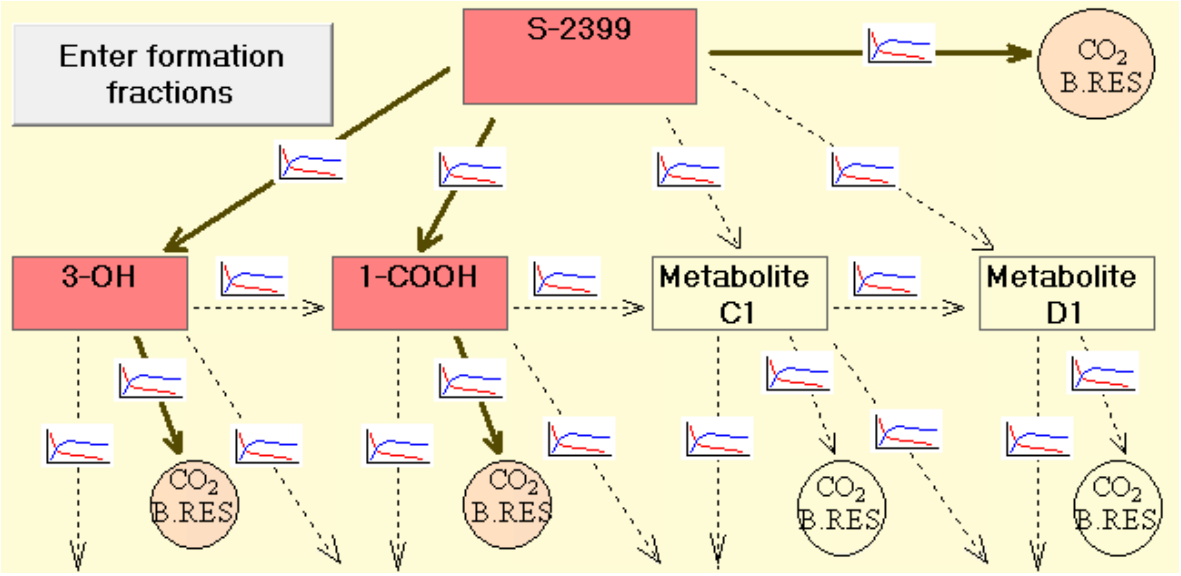


Figure B.8.3-1: Degradation scheme considered in PECgw modelling.

The model versions used are listed below in Table B.8.3-1.

Table B.8.3-1: Models used in the calculation of PECgw values

Assessment / model	Model version
FOCUS ground water modelling PEARL	v. 5.5.5
FOCUS ground water modelling PELMO	v. 6.6.4
FOCUS ground water modelling MACRO	v. 5.5.4
AppDate	v. 3.06

Table B.8.3-2: Representative uses assessed for PECgw

Crop and/ or situation	F, G, or I[(a)]	Application				Application rate	
		Method / Kind	Timing / Growth stage of crop & season	Max. number	Crop interception (%)	g a.s./ha a) max. rate per appl. b) max. total rate per crop/season	Max dose to soil (g a.s/ha)
Winter & spring wheat, barley triticale rye & oat	F	Foliar spray	BBCH 30-71 Spring	1	80	a) 90 b) 90	18

a) F: professional field use

Biphasic kinetics were needed to describe the degradation of inpyrfluxam for the purposes of modelling endpoint selection and this is described in detail in the CA document. Comparison of laboratory and field data in line with the EFSA degT_{50} guidance (EFSA Journal 2014;12(5):3662) resulted in solely field data being used for the selection of parent degradation parameters. The averaged degradation from the field data was found to be approximated well with a single first order (SFO) model, with an SFO DT_{50} determined from the average DFOP DT_{90} / 3.32. This allowed for the use of SFO kinetics in the exposure modelling to greatly simplify modelling in SFO based exposure models such as the FOCUS tools.

Substance endpoints used by HSE are listed in table B.8.3-3 and GAP details are listed in table B.8.3-2. HSE notes that as metabolite formation fractions have been given in a per-molar basis, a conversion fraction for MACRO modelling has been implemented. HSE notes that the applicant did not provide water solubility or vapour pressure values for metabolites. HSE considers that the low parent vapour pressure is suitable for the metabolites, as the metabolites have a greater molecular mass, and contain additional hydrogen-bonding functional groups when compared to inpyrfluxam. Both properties are expected to reduce vapour pressure of the metabolites in relation to inpyrfluxam. HSE does not consider parent water solubility as suitably conservative for metabolites, due to the additional hydrogen-bonding groups of the metabolites, which is expected to increase water solubility relative to the parent. HSE has therefore used a conservative default value of 1000 mg/L for metabolite solubility. Due to the very low vapour pressure of the parent, loss via volatilisation is expected to be negligible in the groundwater modelling.

Metabolite 1'-COOH-S-2840 consists of two enantiomeric pairs, 1'-COOH-S-2840A and 1'-COOH-S2840B. 1'-COOH-S-2840A and 1'-COOH-S2840B are then diastereomers of

each other. GB Guidance, ‘Guidance on the environmental fate and behaviour of plant protection products that include stereoisomers’ provides recommendations for consideration of adsorption studies for diastereomers to be used alongside the EFSA Guidance document, ‘Guidance of EFSA on risk assessments for active substance of plant protection products that have stereoisomers as components and impurities and for transformation products of active substances that may have stereoisomers’ (2019). The need for including both diastereomers separately or using mean values of the adsorption parameters of 1’-COOH-S-2840A and B in the exposure assessment has been considered in line with this guidance. The guidance recommends that both the individual K_{foc} values and supporting information on the mobility of the substance as a whole are taken into account. The K_{foc} value, degradation rate and overall leaching potential are taken into account in order to determine the appropriateness of an exposure assessment based on average sorption behaviour relative to separate exposure assessments based on the sorption behaviour of each diastereomer. PEC values were therefore calculated by HSE in which worst-case (most prone to groundwater leaching) 1’-COOH-S-2840 values for Koc and 1/n were used, and then again in which arithmetic mean values of the two diastereomers together were used. It was later determined that the use of PEC values determined from conservative or mean parameters did not have an impact on subsequent areas of the risk assessment, as both sets of endpoints lead to the same regulatory outcome. To ensure simplicity and consistency for future products, HSE recommends that it will not be required to conduct modelling with both sets of parameters, but modelling can just be based on average substance parameters.

Table B.8.3-3: Endpoints used in the PEC groundwater assessment.

Parameter	Inpyrfluxam	3'-OH-S-2840	1'-COOH-S-2840 (mean sorption parameters)	1'-COOH-S-2840 (conservative sorption parameters)
molecular Weight (g/mol)	333.38	349.38	363.36	363.36
Water solubility 20°C (mg/L)	16.4	1000	1000	1000
Vapour pressure 20°C (Pa)	3.81×10^{-8}	3.81×10^{-8}	3.81×10^{-8}	3.81×10^{-8}
Koc (mL/g)	647	410	24.4	20.8
Kom (mL/g)	375	238	14.15	12.1
1/n	0.960	0.936	0.946	0.950
Degradation kinetic model	SFO	SFO	SFO	SFO
DT_{50} (days)	121.4 (SFO approximation of DFOP Field $DegT_{50}$ geomean)	131 (Field $DegT_{50}$ geomean)	74.7 (Field $DegT_{50}$ geomean)	74.7 (Field $DegT_{50}$ geomean)
Degradation rate constant (1/day) (to 3'-OH-S-2840)	0.001312	-	-	-
Degradation rate constant (1/day) (to 1'-COOH-S-2840)	0.0030261	-	-	-
Degradation rate constant (1/day) (to sink)	0.0013703	0.0052912	0.0092791	0.0092791
Molar formation fraction	-	0.23	0.53	0.53
FCONVERT MACRO conversion factor[(a)]	-	0.241	0.577	0.577
Plant uptake factor	0	0	0	0

a) (Metabolite molar mass / parent molar mass) x formation fraction

Application dates were selected using AppDate v. 3.06 software, using the dates corresponding to the minimum and maximum BBCH codes in the summary of representative uses. An early and late date were selected due to the wide application window. It is noted that the 80 % crop interception value used for modelling is the most conservative value reached within the possible treatment window of BBCH 30-71.

Table B.8.3-4: Application dates used in the groundwater assessment.

Individual crop	Winter cereals, early	Winter cereals, late	Spring cereals, early	Spring cereals, late
Repeat interval for app. events	Every Year	Every Year	Every Year	Every Year
Application technique	Spray	Spray	Spray	Spray
Absolute / Relative to	Absolute	Absolute	Absolute	Absolute
BBCH code	30	71	30	71
Scenario	app. date (Julian day)	app. date (Julian day)	app. date (Julian day)	app. date (Julian day)
Chateaudun	15 April (105)	17 June (168)	16 April (106)	25 June (176)
Hamburg	04 May	27 June	28 April	03 July
Kremsmuenster	24 April	29 June	27 April	03 July
Okehampton	21 April	13 June	22 April	24 June

PEC groundwater assessment.

Compounds breaching a 0.1 µg/L trigger value are shown in bold.

Table B.8.3-5: PECgw for winter cereals early (1'-COOH-S-2840 conservative sorption endpoints)

Model	**PEARL 5.5.5**			**PELMO 6.6.4**		
Compound	**Inpyrfluxam**	**1'-COOH-S-2840**	**3'-OH-S-2840**	**Inpyrfluxam**	**1'-COOH-S-2840**	**3'-OH-S-2840**
Scenario	**PECgw (µg/L)**					
Châteaudun	< 0.001	**0.919**	< 0.001	< 0.001	**0.947**	< 0.001
Hamburg	0.003	**1.616**	0.008	< 0.001	**1.634**	0.003
Kremsmünster	0.002	**1.004**	0.006	< 0.001	**1.172**	0.002
Okehampton	0.003	**0.991**	0.009	< 0.001	**1.132**	0.004
Model	**MACRO 5.5.4**					
Compound	**Inpyrfluxam**	**1'-COOH-S-2840**	**3'-OH-S-2840**			
Scenario	**PECgw (µg/L)**					
Châteaudun	< 0.001	**0.841**	< 0.001			

Table B.8.3-6: PECgw for winter cereals early (1'-COOH-S-2840 mean sorption parameters)

Model	PEARL 5.5.5			PELMO 6.6.4		
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.795**	< 0.001	< 0.001	**0.821**	< 0.001
Hamburg	0.003	**1.431**	0.008	< 0.001	**1.405**	0.003
Kremsmünster	0.002	**0.896**	0.006	< 0.001	**1.023**	0.002
Okehampton	0.003	**0.907**	0.009	< 0.001	**1.010**	0.004
Model	MACRO 5.5.4					
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840			
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.720**	< 0.001			

Table B.8.3-7: PECgw for winter cereals late (1'-COOH-S-2840 conservative sorption endpoints)

Model	PEARL 5.5.5			PELMO 6.6.4		
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.940**	< 0.001	< 0.001	**1.003**	< 0.001
Hamburg	0.003	**1.662**	0.009	< 0.001	**1.686**	0.003
Kremsmünster	0.002	**1.013**	0.006	< 0.001	**1.183**	0.002
Okehampton	0.003	**1.008**	0.009	< 0.001	**1.163**	0.004
Model	MACRO 5.5.4					
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840			
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.880**	< 0.001			

Table B.8.3-8: PECgw for winter cereals late (1'-COOH-S-2840 mean sorption parameters)

Model	PEARL 5.5.5			PELMO 6.6.4		
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.813**	< 0.001	< 0.001	**0.871**	< 0.001
Hamburg	0.003	**1.458**	0.009	< 0.001	**1.448**	0.003
Kremsmünster	0.002	**0.905**	0.006	< 0.001	**1.037**	0.002
Okehampton	0.003	**0.927**	0.009	< 0.001	**1.063**	0.004
Model	MACRO 5.5.4					
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840			
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.758**	< 0.001			

Table B.8.3-9: PECgw for spring cereals early (1'-COOH-S-2840 conservative sorption endpoints)

Model	PEARL 5.5.5			PELMO 6.6.4		
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.848**	< 0.001	< 0.001	**0.808**	< 0.001
Hamburg	0.003	**2.039**	0.009	< 0.001	**1.668**	0.003
Kremsmünster	0.002	**1.085**	0.006	< 0.001	**1.226**	0.002
Okehampton	0.003	**1.036**	0.009	< 0.001	**1.079**	0.003
Model	MACRO 5.5.4					
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840			
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.744**	< 0.001			

Table B.8.3-10: PECgw for spring cereals early (1'-COOH-S-2840 mean sorption parameters)

Model	PEARL 5.5.5			PELMO 6.6.4		
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.733**	< 0.001	< 0.001	**0.697**	< 0.001
Hamburg	0.003	**1.777**	0.009	< 0.001	**1.440**	0.003
Kremsmünster	0.002	**0.973**	0.006	< 0.001	**1.059**	0.002
Okehampton	0.003	**0.947**	0.008	< 0.001	**0.993**	0.003
Model	MACRO 5.5.4					
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840			
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.641**	< 0.001			

Table B.8.3-11: PECgw for spring cereals late (1'-COOH-S-2840 conservative sorption endpoints)

Model	PEARL 5.5.5			PELMO 6.6.4		
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.882**	< 0.001	< 0.001	**0.862**	< 0.001
Hamburg	0.004	**2.063**	0.010	< 0.001	**1.735**	0.003
Kremsmünster	0.002	**1.102**	0.006	< 0.001	**1.236**	0.002
Okehampton	0.003	**1.051**	0.008	< 0.001	**1.125**	0.003
Model	MACRO 5.5.4					
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840			
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.784**	< 0.001			

Table B.8.3-12: PECgw spring cereals late (1'-COOH-S-2840 mean sorption parameters)

Model	PEARL 5.5.5			PELMO 6.6.4		
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.760**	< 0.001	< 0.001	**0.743**	< 0.001
Hamburg	0.004	**1.802**	0.010	< 0.001	**1.502**	0.003
Kremsmünster	0.002	**0.984**	0.006	< 0.001	**1.085**	0.002
Okehampton	0.003	**0.965**	0.008	< 0.001	**1.016**	0.003
Model	MACRO 5.5.4					
Compound	Inpyrfluxam	1'-COOH-S-2840	3'-OH-S-2840			
Scenario	PECgw (µg/L)					
Châteaudun	< 0.001	**0.677**	< 0.001			

Summary of groundwater modelling results

Late (BBCH 71) treatment of spring cereals resulted in the highest PECgw values for parent and both metabolites.

The PECgw for inpyrfluxam parent compound was < 0.1 µg/L in all GB relevant FOCUS scenarios for both winter and spring cereals, with a maximum value of 0.004 µg/L determined for late treatment of spring cereals in the Hamburg scenario, using the PEARL model.

Metabolite 1'-COOH-S-2840 (modelled with mean sorption values) exceeded the 0.1 µg/L trigger in all scenarios. Of the 36 scenarios modelled (16 in PELMO & 16 in PEARL, plus 4 in MACRO) it exceeded the 0.75 µg/L trigger in 30 scenarios. The highest value determined was 1.802 µg/L, for late application to spring cereals for Hamburg, using PEARL.

Metabolite 1'-COOH-S-2840 (modelled with the most conservative sorption values) exceeded the 0.1 µg/L trigger in all scenarios. Of the 36 scenarios modelled (16 in PELMO & 16 in PEARL, plus 4 in MACRO) it exceeded the 0.75 µg/L trigger in 35 scenarios. The highest value determined was 2.063 µg/L, for late application to spring cereals for Hamburg, using PEARL. See Volume 3 – B.6 (AS) for the toxicological assessment of 1'-COOH-S-2840.

Use of mean or most conservative sorption endpoints does not change the regulatory outcome, with 80th percentile PECgw values exceeding both the 0.1 µg/L trigger value and 0.75 µg/L in some scenarios. HSE therefore recommends that it will not be required to

conduct modelling with both sets of parameters, but modelling can just be based on average substance parameters in future assessments.

Metabolite 3'-OH-S-2840 was < 0.1 µg/L in all FOCUS scenarios for both winter and spring cereals, with a maximum value of 0.010 µg/L determined for late application to spring cereals in the Hamburg scenario, using the PEARL model.

Table B.8.3-13: Summary of maximum values determined for groundwater modelling by crop

Crop	Inpyrfluxam	1'-COOH-S-2840 (mean)	1'-COOH-S-2840 (worst-case)	3'-OH-S-2840
	PECgw (µg/L) (scenario & model)			
winter cereals, early	0.003 (Hamburg & Okehampton, PEARL)	1.431 (Hamburg, PEARL)	1.634 (Hamburg, PELMO)	0.009 (Okehampton, PEARL)
winter cereals, late	0.003 (Hamburg & Okehampton, PEARL)	1.458 (Hamburg, PEARL)	1.686 (Hamburg, PELMO)	0.009 (Hamburg & Okehampton, PEARL)
Spring cereals, early	0.003 (Hamburg & Okehampton, PEARL)	1.777 (Hamburg, PEARL)	2.039 (Hamburg, PEARL)	0.009 (Hamburg & Okehampton, PEARL)
spring cereals, late	0.004 (Hamburg, PEARL)	1.802 (Hamburg, PEARL)	2.063 (Hamburg, PEARL)	0.010 (Hamburg, PEARL)

B.8.4 Fate and behaviour in water and sediment

B.8.4.1 Aerobic mineralisation in surface water

For full details of the assessment of aerobic mineralisation in surface water see the associated CA document.

B.8.4.2 Water/sediment study

For full details of the assessment of degradation in water/sediment systems see the associated CA document. Endpoints from the CA assessment for use in PEC calculations are listed in tables for each compartment below.

B.8.4.3 Irradiated water/sediment study

For full details of the assessment of degradation in irradiated water/sediment studies see the associated CA document. Endpoints from the CA assessment for use in PEC calculations are listed in tables for each compartment below.

B.8.5 Predicted environmental concentrations in surface water and sediment (PECsw, PECsed)

The predicted environmental concentrations in surface water (PECsw) were calculated by the applicant for inpyrfluxam, for metabolites 1'-COOH-S-2840 (soil and water) and 3'-OH-S-2840 (soil and water), and for the formulation based on a first tier approach. The applicant also calculated predicted environmental concentrations in sediment (PECsed) for inpyrfluxam, but not PECsed accumulation values. These were therefore calculated by HSE.

As the first tier drainflow PECsw for inpyrfluxam exceeded the aquatic regulatory acceptable concentration (RAC), a MACRO higher tier drainflow assessment was conducted by HSE and individual exceedance years were examined to demonstrate an acceptable risk. The metabolites demonstrated an acceptable risk at the first tier and no further refinement was required.

The applicant assessed the use of inpyrfluxam for winter and spring cereals using the GAP in Table B.8.5-1 below.

Table B.8.5-1 GAP table and scenarios assessed

Crop and/ or situation	F G or I[(a)]	Application			Application rate		
		Method / Kind	Timing / Growth stage of crop & season	Max. number	g a.s./ha a) max. rate per appl. b) max. total rate per crop/season	Crop interception (%)	Soil loading (g a.s./ha)
Winter & spring wheat, barley, triticale, rye, & oat	F	Foliar spray	BBCH 30-71 Spring	1	a) 90 b) 90	80	18

a) F: professional field use

Endpoints used by HSE are listed in Tables B.8.5-2 and B.8.5-8 below. Some of the endpoints presented by HSE in Volume 3CA – B.8 section B.8.2.2.3 with regard to the water-sediment studies were different to those proposed by the applicant. HSE has therefore independently calculated PECsw and PECsed values and these exposure values are presented in this document and should be used in the risk assessment.

For inpyrfluxam, there is no evidence of a decline phase in the water/sediment study and therefore HSE has considered a sediment accumulation factor and a conservative 1000 d default DT_{50} in sediment as a first tier approach.

Two modelling runs were conducted by HSE to support the drainflow assessment for 1'-COOH-S-2840. The first run used mean K_{foc} values derived from both isomers (A and B). A second run was performed using the lower (i.e. worst-case) K_{foc} value identified among the two isomers. In both cases, the maximum occurrence of the sum of isomers in water and sediment was used. This reflects a conservative scenario in which all of the metabolite is assumed to exhibit the worst-case properties, rather than a representative mixture. A decision was made to use the mean K_{foc} value in the risk assessment, as both mean and worst case values for 1'-COOH-S-2840 resulted in identical first-tier PECs. To ensure consistency for future products, evaluators are not required to conduct modelling using both values.

SPRAY DRIFT ASSESSMENT

The applicant supplied standard 1st tier spray drift assessments using Rautmann drift values for a single application to field crops for inpyrfluxam and the metabolites 1'-COOH-S-2840 and 3'-OH-S-2840. The applicant provided PECsw values for the parent and metabolites, and PECsed values for the parent only. HSE agrees with this approach, as HSE Ecotoxicology confirmed that PECsed and PECsed accumulation values for the metabolites would not be required in a risk assessment. This is because the following relevant triggers are not met in accordance with the EFSA Aquatic Guidance (2013):

- No sediment studies were submitted with the metabolites as a test item, and the studies are not required unless a sediment risk assessment is triggered.
- The metabolites do not reach the 10% trigger threshold in sediment (i.e. >10% AR) at or on day 14.
- A chronic Daphnia NOEC value of 0.13 mg/L has been estimated based on a conservative 1:1 read-across from the parent. As this is above the sediment trigger threshold of 0.1 mg/L, no further sediment risk assessment is required.

HSE agreed with most of the input parameters used by the applicant for spraydrift calculations, but disagreed with some key values including the $DissT_{50}$ of inpyrfluxam in water, and the maximum % of 1'-COOH-S-2840 and 3'-OH-S-2840 observed in water (as the applicant had instead used the % in total system) – see discussion in volume 3CA – B.8, sections B.2.2.3.1 and B.2.2.3.2 (Water-Sediment study 1 and 2, Kinetic Analysis). Where the relevant input parameters were the same, HSE verified and confirmed the PEC values provided by the applicant. However, where differences in input parameters affected the PEC modelling, HSE conducted its own calculations and has presented revised values accordingly. For the metabolites, the parent application rate was adjusted based on maximum metabolite formation in water and the molecular weight correction.

For metabolite 3'-OH-S-2840, the maximum occurrence in the water phase of the water-sediment studies was 2.9% with a generally decreasing trend as the study progressed. However, in the aqueous indirect photolysis study, 3'-OH-S-2840 was formed at higher levels, reaching a maximum of 8.6 % with an increasing trend at study end, suggesting that indirect photolysis represents an additional formation pathway in natural surface waters when exposed to sunlight. Since this first tier assessment is to represent a realistic worst-case formation in surface water, and given that photolysis is expected to contribute somewhat to the degradation of inpyrfluxam alongside biotic degradation, the photolysis study is considered a conservative data source for deriving the maximum % in water and the value of 8.6 % is used in the exposure assessment.

Table B.8.5-2: Input parameters for inpyrfluxam and its metabolites for PECsw and PECsed calculations via spray drift

Compound	Inpyrfluxam	1'-COOH-S-2840 A & B	3'-OH-S-2840
Molecular weight [g/mol]	333.38	363.36	349.38
$DissT_{50}$ water [d]	34.28 (maximum)	1000 (b)	1000 (b)
$DissT_{50}$ sediment [d]	1000 (maximum) (b)	- (c)	- (c)
Maximum occurrence observed [%] in water	- (a)	10.0 (water-sediment study, Golden Lake PY label, DAT 112) (d)	8.6 (indirect photolysis, Lake Tuckahoe water, PH label) (e)
Maximum occurrence observed [%] in sediment, parent dosed laboratory study	84.6 (w/s study, Taunton River PY label, DAT 112)	- (c)	- (c)

a) Not relevant for parent compound
b) Worst-case default value
c) Not required. PECsed values not needed for risk assessment.
d) Mean value of the two duplicate samples analysed at the time point. Values for isomers are combined (1'-COOH-S-2840 A + B).
e) Value based on max formation of metabolite in indirect photolysis study.

The PECsw,ini values for inpyrfluxam at different spray buffer distances were consistent with those reported by the applicant. Similarly, the PECsed values at various days after application were also consistent.

However, the PECsw values at different days after application for inpyrfluxam and both metabolites showed some differences.

Additionally, the applicant did not provide PECsed values at different spray buffer distances for the parent. These have been calculated by HSE.

Table B.8.5-3: PECsw of inpyrfluxam, 1'-COOH-S-2840 and 3'-OH-S-2840 via drift on field cereals

Distance (m)	Spray Drift (%)	1x 90 g a.s./ha PECsw,ini (µg/L)		
		S-2399	1'-COOH-S-2840	3'-OH-S-2840
1	2.77	0.831	0.091	0.075
5	0.57	0.171	0.019	0.015
6	0.48	0.144	0.016	0.013
7	0.41	0.123	0.013	0.011
8	0.36	0.108	0.012	0.010
9	0.32	0.096	0.010	0.009
10	0.29	0.087	0.009	0.008
11	0.27	0.081	0.009	0.007
12	0.24	0.072	0.008	0.006
13	0.23	0.069	0.008	0.006
14	0.21	0.063	0.007	0.006
15	0.20	0.060	0.007	0.005
16	0.18	0.054	0.006	0.005
17	0.17	0.051	0.006	0.005
18	0.16	0.048	0.005	0.004
19	0.16	0.048	0.005	0.004
20	0.15	0.045	0.005	0.004

Table B.8.5-4: PECsed of inpyrfluxam via drift on field cereals.

Distance (m)	Spray Drift (%)	1x 90 g a.s./ha PECsed,ini (µg/kg) S-2399
1	2.77	3.245
5	0.57	0.668
6	0.48	0.562
7	0.41	0.480
8	0.36	0.422
9	0.32	0.375
10	0.29	0.340
11	0.27	0.316
12	0.24	0.281
13	0.23	0.269
14	0.21	0.246
15	0.20	0.234
16	0.18	0.211

17	0.17	0.199
18	0.16	0.187
19	0.16	0.187
20	0.15	0.176

Table B.8.5-5: PECsw/sed and TWA of inpyrfluxam via drift on field cereals

Crop	Spring and winter cereals							
Application	(field crops)							
Distance [m]	1				5			
Drift [%]	2.77 (1×90 g a.s./ha)				0.57 (1×90 g a.s./ha)			
Days after final application	PECsw [µg/L]		PECsed [µg/kg]		PECsw [µg/L]		PECsed [µg/kg]	
	Act	TWA	Act	TWA	Act	TWA	Act	TWA
0	0.831	-	3.245	-	0.171	-	0.668	-
1	0.814	0.823	3.242	3.244	0.168	0.169	0.667	0.667
2	0.798	0.814	3.240	3.242	0.164	0.168	0.667	0.667
4	0.766	0.798	3.236	3.240	0.158	0.164	0.666	0.667
7	0.721	0.775	3.229	3.237	0.148	0.159	0.664	0.666
14	0.626	0.724	3.213	3.229	0.129	0.149	0.661	0.664
21	0.543	0.677	3.198	3.221	0.112	0.139	0.658	0.663
28	0.472	0.635	3.182	3.213	0.097	0.131	0.655	0.661
100	0.110	0.357	3.027	3.135	0.023	0.073	0.623	0.645

Due to the lack of a decline phase observed in the sediment phase of the water/ sediment studies, the PECsed accumulation was considered for the parent using a worst-case default DT_{50} value of 1000 days.

A maximum accumulation factor was calculated, and this was applied to the initial PECsed value to derive an accumulation PECsed value. The maximum accumulation factor was

calculated using the PECsw/sed spray drift calculator (Version 2.0.1, February 2024) and is based on the following equation:

$$Maximum\ accumulation\ factor\ (MAF) = \frac{1}{1 - e^{(-0.000693\ x\ 365)}} = 4.474$$

The maximum PECsed accumulation values via spray drift are summarised in Table B.8.5-6 at 1 to 20 m buffer zones.

Table B.8.5-6: Maximum PECsed accumulation due to spray drift for inpyrfluxam

Distance (m)	Spray Drift (%)	PECsed accumulation of inpyrfluxam (µg/kg)
1	2.77	14.516
5	0.57	2.987
6	0.48	2.515
7	0.41	2.149
8	0.36	1.887
9	0.32	1.677
10	0.29	1.520
15	0.20	1.048
20	0.15	0.786

Formulated product for surface water via spray drift

The applicant also supplied a calculation of PECs for the formulation inpyrfluxam. The formulated product PECsw value was calculated from the maximum single application rate on spring and winter cereals of 1391g product/ha, calculated using a formulation density of 0.9273 g/mL (KCP 2.6 physical chemical properties dossier) and 1.5 L product/ha.

The PECsw calculated by the applicant was at a single buffer distance. HSE obtained the same result and additionally calculated PECsw values at multiple buffer distances. The results are presented in Table B.8.5-7 below.

Table B.8.5-7: PECsw for formulation S-2399 60 g/L EC for the single application of 1.5 L product/ha on field cereals.

Buffer distance (m)	Drift rate (%)	Application rate of formulation (g/ha)[a]	Formulation PECsw (µg/L)
1	2.77	1391	12.844
5	0.57		2.643
6	0.48		2.226
7	0.41		1.901
8	0.36		1.669
9	0.32		1.484
10	0.29		1.345
15	0.20		0.927
20	0.15		0.696

a) Based on an application rate of 1.5 L/ha and formulation density of 0.9273 g/mL. Density value from CP Volume 2.6

DRAINFLOW ASSESSMENT

For the drainflow assessment, the applicant provided a Tier 1 drainflow assessment, which assumes that, following a rainfall event, a proportion of inpyrfluxam in a given hectare will be lost in 10 mm of drainflow (equivalent to 100,000 L water). The proportion of the compound lost is assumed to be dependent on its soil adsorption (Koc). This water is then added to a ditch containing 30,000 L water (consistent with the standard water body used in the drift assessment), to give a final volume of 130,000 L.

In the case of inpyrfluxam, as application can commence from BBCH 30, application is assumed to occur within the drainflow period (1 October – 30 April) and thus no losses via dissipation of the active substance are considered prior to a drainflow event occurring and the calculation is based on the full amount applied.

For the metabolites 3'-OH-S-2840 and 1'-COOH-S-2840 two potential routes of surface water exposure were considered – drainage loss of parent to surface water and subsequent formation of metabolites in the water phase, and formation of metabolites in soil and subsequent loss of each metabolite in drainflow. Given the higher formation of

each metabolite in soil compared to formation in water, coupled to the greater mobility of each metabolite compared to the parent, the drainflow route following formation in the soil represented the major source of aquatic exposure and PECsw values for formation of metabolites in water following drainflow of parent are not presented. PECsed values for metabolites are not required as they are not necessary for the risk assessment, as confirmed by HSE Ecotoxicology (see justification above).

There were instances where HSE disagreed with the endpoints (i.e. use of maximum occurrence in sediment for the parent vs. the maximum in total system used by the applicant, and K_{foc} of inpyrfluxam and 1'-COOH-S-2840). Therefore HSE has re-calculated the PECsw and PECsed values. Table B.8.5-8 provides the input parameters related to S-2399 and its metabolites used by HSE for the PECsw/sed calculations for the drainage assessment.

Table B.8.5-8: Input parameters for inpyrfluxam and its metabolites for PECsw and PECsed calculations via drainflow

Compound	Inpyrfluxam	1'-COOH-S-2840 A & B (mean adsorption parameters)	1'-COOH-S-2840 (conservative adsorption parameters)	3'-OH-S-2840
Molecular weight [g/mol]	333.38	363.36	363.36	349.38
K_{foc} [mL/g]	647 (geometric mean)	24.4 (b)	20.8	410 (geometric mean)
DT_{50} soil [d] maximum, non-normalised	383 (parent dosed field studies, SFO, Italy)	- (c)	- (c)	- (c)
$DissT_{50}$ sediment [d]	1000 (maximum) (c)	- (d)	- (d)	- (d)
Maximum occurrence observed [%] in soil, parent dosed laboratory study	- (a)	30.1 (Woodside, DAT 120)	30.1 (Woodside, DAT 120)	20.7 (Atwater, DAT 120)
Maximum occurrence observed [%] in water, parent dosed laboratory study	- (a)	10.0 (w/s study, Golden Lake PY label, DAT 112) (e)	10.0 (w/s study, Golden Lake PY label, 112 DAT) (e)	8.6 (indirect photolysis, Lake Tuckahoe water, PH label)
Maximum occurrence observed [%] in sediment, parent dosed laboratory study	84.6 (w/s study, Taunton River PY label, DAT 112)	- (d)	- (d)	- (d)

a) Not relevant for parent compound
b) Mean of the two individual geometric mean values for the two isomers (1'-COOH-S-2840 A + B)
c) Not required as Higher Tier Drainflow (HTDF) not needed
d) Not required. PECsed values not needed for risk assessment.
e) Mean value of the two duplicate samples analysed at the time point. Values for isomers are combined (1'-COOH-S-2840 A + B).

The PEC values calculated are shown in table B.8.5-9 below.

Table B.8.5-9: PECsw/sed values for inpyrfluxam and metabolites via drainflow.

Compound	Route of formation	Concentration in drainflow (µg/L)	Concentration in stream surface water (PECsw, µg/L)	Concentration in stream sediment (PECsed, µg/kg)	PECsed accumulation (µg/kg)
Inpyrfluxam	Soil	0.900	0.692	2.703	12.093
1'-COOH-S-2840 (mean & worst case)	Soil	1.122	0.863	- [a]	- [a]
3'-OH-S-2840	Soil	0.273	0.210	- [a]	- [a]
	Water	-	0.062	- [a]	- [a]

a) Not required. PECsed values not needed for risk assessment.

Since the use of both mean and worst case Koc values for 1'-COOH-S-2840 results in identical first-tier PECs for drainflow, due to both falling within the same 'Mobile' mobility class, adopting the mean Koc value is appropriate. This approach simplifies the assessment process and ensures consistency with groundwater modelling.

The RACs for inpyrfluxam and metabolites 1'-COOH-S-2840 and 3'-OH-S-2840 were confirmed by HSE Ecotoxicology. First-tier drainflow assessments show that the PECsw for inpyrfluxam (0.692 µg/L) exceeds the RAC of 0.660 µg/L, indicating the need for a higher tier drainflow (HTDF) evaluation. However, both 1'-COOH-S-2840 and 3'-OH-S-2840 do not exceed their respective RACs of 106.5 µg/L and 0.660 µg/L and no refinement at higher tier was required.

A summary of the PECsw/sed values for first tier drift and drainflow is shown in table B.8.5-10.

Table B.8.5-10: Summary of highest PECsw/sed values from first tier drift and drainflow.

Substance	PEC Value	Notes
PECsw (µg/L) spray drift		
Inpyrfluxam	0.831 0.171	1m Buffer 5m buffer
1'-COOH-S-2840	0.091	1m buffer

	0.019	5m buffer
3'-OH-S-2840	0.075 0.015	1m buffer 5m buffer
PECsed (µg/kg) spray drift [(a)]		
Inpyrfluxam	3.245 0.668	1m buffer 5m buffer
PECsed (accumulation) via drift (µg/kg)		
Inpyrfluxam	14.516 2.987	1m buffer 5m buffer
PECsw formulation via drift (µg/L)		
Inpyrfluxam	12.844 2.643	1m buffer 5m buffer
PECsw (µg/L) drainflow		
Inpyrfluxam	0.692	First tier, inside drainflow period.
1'-COOH-S-2840	0.863	First tier, inside drainflow period. Route of formation: soil.
3'-OH-S-2840	0.210	First tier, inside drainflow period. Route of formation: soil.
PECsed (µg/kg) drainflow [a]		
Inpyrfluxam	2.703	First tier, inside drainflow period
PECsed (accumulation) via drainflow (µg/kg)		
Inpyrfluxam	12.093	

a) PECsed for 1'-COOH-S-2840 and 3'-OH-S-2840 not calculated/ verified as they are not required for the risk assessment.

Higher Tier Drain Flow (HTDF) refinement for S-2399

The applicant did not conduct a HTDF assessment for inpyrfluxam as the initially proposed RAC was lowered following a request for additional information (RAI) by HSE

Ecotoxicology. Consequently, all results are based on HSE modelling, using the UK CRD MACRO drainflow tool v. 2.2 and based on the input parameters in Table B.8.5-11.

Table B.8.5-11: Input parameters to be used for Higher Tier Drainflow modelling

Compound	Inpyrfluxam
DT_{50} in soil (d)	121.4 (SFO approximation of DFOP Field DegT50 geomean)
K_{foc} (mL/g)	647
1/n	0.960
Exponent for temperature response (TRESP) (K^{-1})	0.095 (Q_{10} = 2.58)
Plant uptake factor (FSTAR)	0 (worst-case assumption)

The GAP used for HTDF shown in Table B.8.5-12 shows that applications can be made both within and outside the typical drainflow period. The application window starts inside the drainflow period (15 and 16 April for early applications to winter and spring cereals, respectively) and ends outside the drainflow period (29 June and 3 July for late applications to winter and spring cereals).

The application dates from the groundwater assessment, derived using AppDate v3.06, were used. Separate simulations using application dates appropriate to both early applications at BBCH 30 and late applications at BBCH 71 were included. For BBCH 30, the earliest dates from the groundwater scenarios were selected, while for BBCH 71, the latest from the groundwater scenarios were selected. The specific dates used are provided in table B.8.5-12 below.

Table B.8.5-12: GAP modelled for HTDF

Crop	Timing of application	Application date	No. applications	Application rate (g a.s./ha)	Crop interception (%)
Winter cereals - early	BBCH 30	15 April	1	90	80
Winter cereals - late	BBCH 71	29 June			
Spring cereals - early	BBCH 30	16 April			
Spring cereals - late	BBCH 71	3 July			

Winter cereals were modelled for all soil series. It was not considered necessary to include the Denchworth scenario for spring cereals. This decision is based on the LandIS description of Denchworth soils, insights into the representativeness of the FOCUS surface water D2 scenario to UK crops and conditions, soil and crop combinations parameterised on Webfram, and input from HSE efficacy.

LandIS data[1] indicates that Denchworth soils are typically heavy clay, poorly drained, and prone to winter waterlogging. While efficient under-drainage can improve the soil's capacity to support certain crops, these soils are more suited to autumn-sown crops such as winter-cereals and winter oilseed rape, as there is little opportunity to work the land in spring due to its wet and heavy nature. HSE Efficacy have also agreed that spring crops are unlikely to be sown on Denchworth soils. In contrast, Hanslope soils, while facing some spring cultivation restrictions, offer more versatility, supporting crops like spring barley, beans and potatoes with good management[2]. This greater flexibility makes Hanslope more likely to be used for spring cropping than Denchworth.

This is further supported by the FOCUSsw D2 scenario, which represents heavy clay soils in Western Europe, similar to Denchworth. Although standard FOCUSsw scenarios are not directly applied in the UK, work was previously undertaken to assess their relevance to UK conditions[3]. This work showed that the potential for spring cereals to be grown on the heaviest Denchworth-type soils was low. The FOCUS scenarios of primary relevance for spring cereals were D3 and D4, with secondary relevance considered to be D1, D5 and R3. Together, the percentage of total crop area covered by the combination of these primary and secondary scenarios is 98.9%, showing that the area cropping area for spring cereals on the D2 scenario soils is expected to be small.

In addition, Webfram (the previous HTDF modelling software used by HSE) showed the relevant combinations of crops and scenarios for HTDF and clearly excluded Denchworth soil from spring cereals. While it is no longer possible to access Webfram and reports detailing the original parameterisation of the Denchworth scenario are not available, the "Further Development of the Webfram Drainage Model"[4] project (DEFRA code PS2241) offers relevant context. This report describes the GIS-based spatial analysis used to estimate the prevalence of crops across different soil types and modelling scenarios, with the aim of incorporating additional soils. The analysis overlayed data from the DEFRA 2003 agricultural statistics survey and the Land Cover Map (LCM 2000) with soil data from LandIS (NSRI 2006), enabling accurate estimates of crop prevalence in each soil type.

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[1] Cranfield University (2025). *The Soils Guide.*
Available at: https://www.landis.org.uk/soilsguide/mapunit.cfm?mu=71202. Cranfield University, UK. Last accessed 08/09/2025.

[2] Cranfield University (2025). *The Soils Guide.*
Available at: https://www.landis.org.uk/soilsguide/mapunit.cfm?mu=41104. Cranfield University, UK. Last accessed 12/09/2025.

[3] Price, O.R., Hollis, J.M., Massey, A. and Syngenta Foundation for Sustainable Agriculture; Universita cattolica del Sacro Cuore (2007). 'Establishing the relevance of focus surface water scenarios for pesticide risk assessment in the UK landscape'. Simposio Chimica degli antiparassitari; Environmental fate and ecological effects of pesticides, 889-896

[4] DEFRA (2010). Further development of the WEBFRAM drainage model - PS2241
Available at: https://sciencesearch.defra.gov.uk/ProjectDetails?ProjectId=17162. Last accessed 08/09/2025.

The LCM 2000 provided a high spatial resolution of 25x25 square metre grids, which enhanced the accuracy of the modelling. Although Denchworth is not directly addressed in this report, it is likely a similar methodology was used to estimate crop suitability for this soil type. This use of a high resolution methodology in the development of Webfram supports the decision to exclude this scenario for HTDF modelling of spring cereals in this context.

As such, inclusion of the Denchworth scenario for spring cereals is not required within the context of this assessment.

Winter and spring cereals - early

The maximum PECsw for HTDF was 0.733 µg/L for Denchworth wet, winter cereals early. While this exceeds the fish RAC of 0.660 µg/L, there are only 3/30 exceedances in this scenario. In line with HSE guidance, no further assessment is required as the number of exceedances are below the threshold of concern. All other soil scenarios had zero exceedances for both winter and spring cereals.

The total percentages of safe years for early application are 99.83 % for winter cereals and 100 % for spring cereals.

Following the ECP meeting, early and late applications to spring cereals under the Denchworth scenario were re-examined. See below for further information.

The maximum PECsw for HTDF is now associated with early application to spring cereals in the Denchworth Wet scenario (0.772 µg/L). However, there are no more than 1/30 exceedances in this scenario and all other soil scenarios had zero for both spring cereals.

The total percentage of safe years for early application to spring cereals with Denchworth included is 99.94 %.

Table B.8.5-13: Number of years with maximum daily ditch concentrations of inpyrfluxam > 0.660 µg/L on at least one day following application to winter and spring cereals (early)

Soil type	Winter cereals - early (1 x 90 g a.s./ha, BBCH 30)			Spring cereals - early (1 x 90 g a.s./ha, BBCH 30)		
	Dry	Medium	Wet	Dry	Medium	Wet
Denchworth	0 out of 30 (0%)	0 out of 30 (0%)	3 out of 30 (10%)	~~NA~~ [a] 0 out of 30 (0%)	~~NA~~ [a] ~~0 out of 30 (0%)~~	~~NA~~ [a] ~~1 out of 30 (3.3%)~~
Hanslope	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)

Brockhurst	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)
Clifton	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)

NA: not analysed

a) Re-examined following ECP meeting

Table B.8.5-14: Outcome ('safe' years) for winter and spring cereals (early)

	Winter cereals – early (BBCH 30)	Spring cereals – early excluding Denchworth (BBCH 30)	Spring cereals – early including Denchworth (BBCH 30) [a]
Undrained (%)	48.84	52.93	52.93
Peat (%)	3.05	3.31	3.31
Drained but 'safe' (%)	47.94	43.75	43.69
Drained and not 'safe' (%)	0.17	0.00	0.06
Total 'safe' years (%)	**99.83**	**100.00**	**99.94**

a) Re-examined following ECP meeting

Winter and spring cereals – late

The maximum PECsw for winter cereals – late was 0.966 µg/L in the Denchworth wet scenario with 6/30 exceedance years (20 %), based on BBCH 71 with 80% crop interception. There are also 4/30 exceedance years (13.3 %) in the Denchworth medium scenario.

The maximum PECsw for spring cereals – late was 0.684 µg/L in the Hanslope wet scenario with 1/30 exceedance years, or 3.3%. There are no exceedances in any other scenario.

The total percentages of safe years for late application are 99.52 % for winter cereals and 99.94 % for spring cereals (excluding Denchworth).

Following the ECP meeting and consideration of agronomic advice, the maximum PECsw for HTDF is now associated with late applications to spring cereals in the Denchworth Wet

scenario (1.166 µg/L; 9/30 exceedance years or 30%). There are also 4/30 exceedance years (13.3 %) in the spring cereals Denchworth medium scenario.

The total percentage of safe years for late application to spring cereals with Denchworth included is 99.22 %.

Table B.8.5-15: Number of years with maximum daily ditch concentrations of inpyrfluxam > 0.660 µg/L on at least one day following application to winter and spring cereals (late)

Soil type	Winter cereals - late (1 x 90 g a.s./ha, BBCH 71)			Spring cereals - late (1 x 90 g a.s./ha, BBCH 71)		
	Dry	Medium	Wet	Dry	Medium	Wet
Denchworth	0 out of 30 (0%)	4 out of 30 (13.3%)	6 out of 30 (20%)	NA [a] 0 out of 30 (0%)	NA [a] 4 out of 30 (13.3%)	NA [a] 9 out of 30 (30%)
Hanslope	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	1 out of 30 (3.3%)
Brockhurst	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)
Clifton	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)	0 out of 30 (0%)

NA: not analysed

a) Re-examined following ECP meeting

Table B.8.5-16: Outcome ('safe' years) for winter and spring cereals (late)

	Winter cereals – late (BBCH 71)	Spring cereals – late excluding Denchworth (BBCH 71)	Spring cereals – late including Denchworth (BBCH 71) [a]
Undrained (%)	48.84	52.93	52.93
Peat (%)	3.05	3.31	3.31
Drained but 'safe' (%)	47.62	43.69	42.98
Drained and not 'safe' (%)	0.48	0.06	0.78
Total 'safe' years (%)	**99.52**	**99.94**	**99.22**

a) Re-examined following ECP meeting

As exceedances greater than the acceptability criteria were observed for the Denchworth medium and wet scenarios in winter cereals during the late application, this information was referred to HSE Ecotoxicology for consideration of exposure length and magnitude to address the risk to aquatic organisms. For further details, see Volume 3CP B-9 (Ecotoxicology).

Reassessment of the Denchworth scenario for spring cereals

Agronomist advice was sought at the ECP meeting, and it was established that while spring cereals are not typically drilled on wet, heavy Denchworth-like soils, they may occasionally be grown depending on seasonal conditions. Consequently, the Denchworth scenario was re-examined and early and late applications to spring cereals reassessed, with results presented in Tables B.8.5-13 and B.8.5-15.

For early applications, the percentage of safe years did not exceed 10%. However for late applications, exceedances above 10% were identified for Denchworth medium and wet scenarios, and have therefore been referred to HSE Ecotoxicology for further consideration of exposure duration and magnitude (see Volume 3CP B-9 [Ecotoxicology]).

It is noted that spring cropping on Denchworth-like soils is intermittent, and does not represent typical agronomic practice. The protection goal, based on the 90th percentile, is therefore appropriate, recognising that occasional scenarios may fall outside the standard assessment.

B.8.6 Fate and behaviour in air

B.8.6.1 Route and rate of degradation in air and transport via air

The transport via air of inpyrfluxam was not studied since its vapour pressure is less than the FOCUS air trigger value for short-range transport exposure assessment of 10^{-5} Pa for substances applied to plants.

The half-life for inpyrfluxam degradation by hydroxyl radicals is 0.233 days (12 hour day). This indicates that inpyrfluxam is likely to undergo rapid photochemical degradation in the troposphere, suggesting a low potential for long-range transport.

B.8.6.2 Predicted environmental concentrations from airborne transport

The transport via air of inpyrfluxam was not studied since its vapour pressure is below the FOCUS air trigger value for short-range transport exposure assessment of 10^{-5} Pa for substances applied to plants.

B.8.7 Predicted environmental concentrations from other routes of exposure

There are no other routes of exposure if the product is used according to good agricultural practice. Therefore no further estimations are considered necessary.

B.8.8. References Relied On

Modelling was submitted by the applicant, however as the endpoints proposed and those agreed were different, exposure modelling was conducted by HSE. No references were relied on.

Further information

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