P.05768 Prevent and Limit summary

This Prevent and Limit summary provides information on the work that VSL has undertaken to meet the groundwater "prevent and limit" objectives of the legislation (Water Framework Directive and Groundwater Directive. .

VSL acknowledges that it must take all necessary and reasonable measures to:

- prevent the input of hazardous substances into groundwater; and
- limit the input of non-hazardous pollutants to ensure such inputs do not pollute groundwater.

To **"prevent"** an input into groundwater means: taking all measures deemed necessary and reasonable to avoid the entry of hazardous substances into groundwater.

VSL has tested water for 88 compounds and breakdown products combined. 21 of these are included on the 2018 list of confirmed hazardous substances published by the Joint Agency Groundwater Directive Advisory Group (JAGDAG), and 13 are listed as non-hazardous.

It must be noted that the Prevent and Limit assessment has been based on the 2022 pesticide results. Plant Product Protection Lists (PPPLs) are approved on an annual basis. See 012 Pesticide Additional Information for more detail.

To meet the **"prevent and limit"** objectives to protect groundwater, VSL has carried out the following tasks.

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Improved understanding of the final effluent quality through pesticide sampling

In 2022 VSL set about testing water to understand the quality of the final effluent water, 88 pesticides and breakdown products were detected. FERA was selected as the partner laboratory as it was capable of meeting most of the levels of detection set by the Environment Agency when compared with other laboratories. However, many of the LODs were still unable to be reached, and this was also clearly the case for the Environment Agency's own testing (based on data attained from their online database). VSL has since written to the Environment Agency to request a list of scientifically provable LODS to measure against.

Of the 88 pesticides and breakdown products tested for 19 were detected above the groundwater threshold and the Total Pesticides also exceeded the groundwater threshold.

The table below is from the HRA and shows the 19 pesticides. 1 is listed as hazardous and 5 are listed as non-hazardous on JAGDAG.

Pesticide	Number of detections	Max. Conc. ($\mu g.L^{-1}$)	Surface water threshold ($\mu g.L^{-1}$)	Ground-water threshold ($\mu g.L^{-1}$)	No. samples exceeding thresholds (SWT / GWT)	JAGDAG
Acetamiprid	11	0.1367	0.15	0.03	0 / 5	
Azadirachtin	4	0.2957	0.141	0.03	1 / 1	
Azoxystrobin	8	0.453	1.32	0.03	0 / 5	
Boscalid	20	1.239	3.75	0.03	0 / 14	
Chlorantraniliprole	12	0.77	0.075	0.03	5 / 8	
Dimethomorph	4	0.5533	1.68	0.03	0 / 2	H
Fludioxonil	20	7.7	0.15	0.03	9 / 16	
Fluopicolide	3	0.04537	4.65	0.03	0 / 1	
Fluopyram	2	0.03794	4.05	0.03	0 / 1	
Fosetyl aluminium	11	18.662	30	0.03	0 / 11	NH
Fosetyl aluminium (sum)	8	28.477	30	0.03	0 / 8	NH
Fosetyl-aluminium product; phosphonic acid	11	9.2785	-	0.03	- / 11	NH
Mandipropamid	21	4.2845	15	0.03	0 / 14	
Metalaxyl	2	0.0322	36	0.03	0 / 1	NH
Propamocarb-HCL	10	0.4051	189	0.03	0 / 8	NH
Pyraclostrobin	5	0.060577	0.12	0.03	0 / 2	
Spinosad	19	2.5	0.036	0.03	15 / 17	
Spirotetramat product: spirotetramat enol	6	0.09316	-	0.03	- / 1	
Trifloxystrobin	2	0.1182	0.09	0.03	1 / 1	
Total Pesticides	28	41.30356	-	0.15	- / 24	

However, VSL has still reviewed Prevent and Limit actions based on the pesticide data obtained. Once scientifically provable LODs are agreed, this can be re-visited.

Investigating options for salad crops - Traceability

When the Pesticide Sampling Plan (005 Pesticide Sampling Plan V6.0) was written in preparation for the sampling in 2022, VSL had believed that a traceability exercise would be beneficial to understand any pesticides detected which supplying farms these could be traced to. After attempting to run traceability on the first detection it did not prove to be a useful exercise. The pesticides detected above the LOD are ubiquitous - they are used widely across produce and cereal growing and are critical to ensuring food security on our supplying farms. As the effluent tested had not undergone any treatment, running a trace on the batched washed at the time of sampling would not yield any useful information, since VSL would not be seeking to prevent their use in the field unless they were withdrawn. And, for the same reasons VSL would not be seeking to limit the use of these detected pesticides.

VSL also undertook passive sampling in 2019 to increase the knowledge of impacts from the operation and from external sources – se 014 Passive Sampling Results 2019.

Consideration of pre-discharge treatment to remove pesticides

In 2023 VSL ran a trial to assess the efficacy of ozone the eliminate pesticides in water prior to entering the environment. All pesticides that were sampled for in 2022 were run through the ozone trial. This proved highly efficient at removing pesticides and is an option that VSL would like to take this forward as a treatment of factory effluent prior to discharge to prevent and limit pesticides entering the groundwater and surface water systems. However, this project cannot progress until a set of scientifically robust LODs are agreed. Summary results of ozone for substance detected above the groundwater threshold are shown below. The majority of substances are completely destroyed by ozone. VSL would also like to explore the use of UV for those substances that are not completely destroyed.

Pesticide	**Ozone destruction**
Acetamiprid	65%
Azadirachtin	100
Azoxystrobin	100
Boscalid	100
Chlorantraniliprole	100
Dimethomorph	100
Fludioxonil	98
Fluopicolide	65
Fluopyram	49
Fosetyl aluminium	68
Fosetyl aluminium (sum)	68
Fosetyl-aluminium product; phosphonic acid	100
Mandipropamid	100
Metalaxyl	93
Propamocarb-HCL	100
Pyraclostrobin	100
Spinosad	100
Spirotetramat product: spirotetramat enol	100
Trifloxystrobin	100

Production of a risk assessment to adequately assess the risks to groundwater
A hydrogeological risk assessment (002 V2 Hydrogeological Risk Assessment) has been completed to assess the risk to groundwater from effluent that may contain pesticides. At this stage, VSL cannot provide recommendations for numerical permit for the Environment Agency to review. This can only be done once scientifically provable LODs are agreed i.e. LODs that can be reached through laboratory analysis by both VSL and the Environment Agency.

Production of a risk assessment to adequately assess the risks to surface water
A H1 screening for surface water (003 V2 H1 Surface Water Risk Assessment) has been completed to assess the risk to surface water from effluent that may contain pesticides. As with the HRA, VSL are unable to cannot provide recommendations for numerical permit for the Environment Agency to review.

Operator self-monitoring of discharges to surface waters
VSL will continue its monthly water quality monitoring for non-pesticide substances. It will take samples from the newly permitted Inlets and Outlets once the permit is determined. Pesticides will be monitored once scientifically provable LODS are agreed and if pesticides are deemed to require monitoring.

Operator self-monitoring of groundwater quality in the shallow aquifer
VSL has been monitoring groundwater from six wells in the shallow aquifer and one deep well drilled specifically for this purpose, as well as one redundant borehole to establish baseline conditions in the secondary and Principal aquifer. Once the permit is determined VSL will continue sampling from only 2 of these wells on a quarterly basis for non-pesticide substances. These will be MW21-01 and MW21-02 downstream of the effluent discharge. Pesticides will be monitored once scientifically provable LODS are agreed and if pesticides are deemed to require monitoring.

End.