# LMP-0094 - Soil Assessment of land where soil erosion and run off lead to flooding of Harberton Village on 17th September 2023

## Introduction

This report presents the findings of a soil structure assessment undertaken on 20th September 2023 at land to the north of Harberton Village, near Totnes, Devon.

The purpose of the soil assessment of the fields in question was to determine the contribution of runoff and soil erosion from these fields to the flooding of Harberton Village and pollution of a tributary of the Harbourne River.

The incident was reported to the EA via Devon County Council and a site visit undertaken to determine whether there was any breach of regulations and to work with the land owner, providing options to prevent this incident occurring in the future.

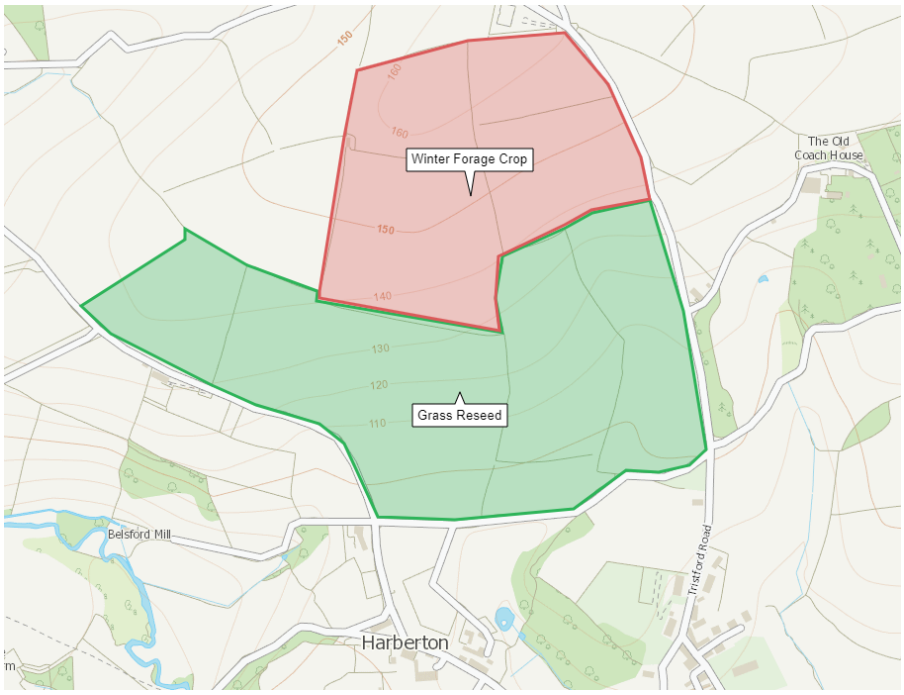


Fig.1 Map of fields showing different crops

## Soil Assessment

(i) Land use

The fields inspected were part of a cereal/grass/forage crop rotation system. The fields to the north had been sown to a forage crop on the 25th August and the fields to the south were sown to grass, two days prior to the extreme weather event. Both followed a cereal crop. The Land Manager uses a minimum tillage method to establish his crops and has been doing so on these fields for the previous 4 years. Some of the planting has been undertaken across the slope but where there was

little room to do this on the fields on the east side of the block, so the planting was undertaken down the slope. The fields are bordered by some permanent pasture and on 2 sides are country lanes.

(ii) Soil type

Soils examined were of the Denbeigh 1 and Trusham associations.

Denbeigh soils are well drained deep fine loamy and fine silty and stony soils over slate bedrock. There are also shallow soils with slate bedrock near the surface and have some bare rock locally. Denbigh association soils are freely draining and most accept winter rain. Soils in the association can be vulnerable to capping where the silt content is high.

Trusham soils are well drained (Wetness Class I) and readily absorb surplus winter rainfall even on the steepest slopes.

(iii) Soil Surface

Fig. 2 – Forage crop surface

Fig 3. – Grass reseed surface

The soil surface in the forage crop showed signs of capping due to the heavy rainfall experienced. The soil surface in the grass reseed was capped and smeared probably due in part to the heavy rainfall but also due to the rolling that was undertaken when the grass was sown. Surface capping reduces the ability of the soil to absorb rainfall and effectively seal the surface thereby generating enhanced runoff and causing subsequent soil erosion. The forage crop on the day of survey had established across the fields, however the grass had not. Gullies and rills were evident across all parts of the slope leading down to the bottom of the fields.

(iv) Soil Structure

Fig.4 – Forage Crop Headlands

Fig 5. – Grass reseed

Figure 4 above shows that the topsoil on the forage crop headlands was compact below the first inch. This is different to the middle of the fields where the structure was good. Across the whole of the fields reseeded with grass, soil compaction was evident, below the top inch down to a depth of approximately 12-14 inches. Some earthworms were seen in the pits.

(v) Soil Structure in adjacent fields.

No soil erosion was evident in any adjacent fields therefore no inspection of the soil was undertaken.

## Conclusion

It was concluded that following heavy rainfall, some overland flow occurred on the headlands on the forage crop fields at the top of the slope. This overland flow entered the newly sown grass fields causing surface water runoff to occur, taking a significant amout of topsoil with it. All newly sown grass fields showed signs of erosion with the fields themselves adding to the amount of runoff seen. There were many gullies and rills evident.

The runoff exited the fields and was conveyed by the road and then entered a small stream and also an orchard area and then ran on into Harberton Village. The slope is steep in the fields and this would have made the runoff more severe.

The Environment Agency found that the land manager did not check the fields for soil compaction prior to the cultuvation decision being taken to establish the grass crop. When a land manager uses a minimum tillage method, as the soil is not disturbed to any real depth, soil compaction can occur, especially when the field work is undertaken on moist soil.

It is believe that the level of compaction in the fields seen was caused by the minimum tillage operations as deep level soil compaction was not identified and action was not taken to alleviate it.

When there is a sensitive receptor such as a river or a village at the bottom of this slope, any field work comes with excessive risk. This is particularly true when dealing with the ever increasing intense rainfall events we are seeing regularly here in the Westcountry. It is unclear if this event was caused by force majeure as the Environment Agency have no records of previous flooding events from these fields. However, as stated before, the condition of the soil and the slope increased the impact on the receptors below.

## Recommendations

Options considered with the land owner:

a) Soil assessment

It is recommended that soil structure is assessed before cultivation and establishment of next crop in the rotaion. This can be done by digging soil assessment pits over a representation of the fields in question to see at what depth the problems are, so that cultivations can be adjusted to need.

b) Dealing with compaction

Cultivation to loosen the soil needs to be at a depth that will eliminate any compaction and allowing infiltration of the heavy rainfall that falls often in this exposed location.

C) Complying with the regulations.

This type of incident is covered by the Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018, colloquially known as Farming Rules for Water. (FRfW)

Specifically, Regulation 10 (5) - Managing soil protection from cultivation, harvesting and livestock activity (Rule 6)

“A land manager must ensure that reasonable precautions are taken to prevent diffuse pollution from agriculture caused by land management and cultivation practices on agricultural land.”

Examples of reasonable precautions include, but are not limited to:

In relation to soil:

- Establishing crops early in the autumn months, and during dry conditions;
- Planting headland rows and beds across the base of any sloping land;
- Undersowing or sowing a cover crop to stabilise soil after harvest;
- Removing compacted soil;
- Establishing grass (buffer) strips in valleys, or along contours or slopes, or gateways.

There is no pervious evidence of any past incidents from this parcel of land, coupled with the fact that grass has been grown here before, without issue, this event could not have been foreseen. However due to the severity of impact on the village of Harberton and the Harbourne River, a breach of Rule 6 is evident.

d) Future use of the field and risk

Due to the nature of the steepness of the land and the sensitive receptors below the fields, it is suggested that the land manager reassesses how the fields in question are managed in the future taking into account timeliness of ground works, crop choice and rainfall risk.

It is suggested that parts of these fields could be sown to a long term grass crop to act as a buffer to any future events. The Land Manager could also look to split the land up into differnent crops so that one large parcel being sown to the same crop doesn’t happen again.They could also investigate what stewardship options might apply for this land to include tree planting options or Natural Flood Management measures that could also reduce the risk of future severe flooding from this land.