SITE:	Land adjacent to Lewis Way, Peterchurch, Herefordshire
TYPE:	Planning Permission
DESCRIPTION:	The erection of 25 no. dwellings and associated works including the creation of a new access, open space, landscaping, and drainage infrastructure.
APPLICATION NO:	232431
GRID REFERENCE:	OS 334471 - 238906
APPLICANT:	Mrs E Morgan & Messrs G & D Morgan
AGENT:	Matt Tompkins

Our knowledge of the development proposals has been obtained from the additional sources provided following our previous consultation responses in September 2023, January 2024 and November 2024:

- Drainage Letter – January 2025.

This review focusses on the principles of the drainage strategy and flood management measures to demonstrate compliance with planning policy and does not provide a detailed review of input or output data. It is assumed that the design of the drainage strategy and flood management measures has been undertaken by a competent engineer and therefore the liability for the proposed design lies with the applicant and not Herefordshire Council.

Site Location

Figure 1: Environment Agency Flood Map for Planning (Rivers and Sea), September 2023.

Overview of the Proposal

The Applicant proposes the construction of a residential development for 25 dwellings. The site covers an area of approx. 0.95ha and is currently a range of modern agricultural buildings and remains of older buildings with the remaining area as an arable field. River Dore flows approx. 200m to the southwest of the site. The topography of the site slopes down from the northeast to the southwest by approx. 4m. It should be noted that a significantly large hill is located to the northeast of the site. The hill steeply slopes down towards the site, in a south-westerly direction.

Flood Risk

Fluvial Flood Risk

Review of the Environment Agency's Flood Map for Planning (Figure 1) indicates that the site is located within the low probability Flood Zone 1.

As the proposed development is located within Flood Zone 1 and is less than 1ha, in accordance with Environment Agency standing advice, the planning application does not need to be supported by a Flood Risk Assessment (FRA). This is summarised in Table 1:

Table 1: Scenarios requiring a FRA

	Within Flood Zone 3	**Within Flood Zone 2**	**Within Flood Zone 1**
Site area less than 1ha	FRA required	FRA required	FRA not required*
Site area greater than 1ha	FRA required	FRA required	FRA required

**except for changes of use to a more vulnerable class, or where they could be affected by other sources of flooding*

Surface Water Flood Risk

Review of the EA's Risk of Flooding from Surface Water map indicates that the site is not located within an area at significant risk of surface water flooding.

We are aware that a nearby school flooded extensively in October 2024. This flooding occurred due to surface water runoff from the adjacent land. There is a steeply sloping area of land to the northeast of the site. Shallow surface water flows are not mapped on the SW Flood Map.

Due to this, **the finished floor levels of the proposed dwellings should be raised** to mitigate potential runoff from the sloping land. If the application is approved, then the site layout will need to consider the route that surface water will take as it drains off the hillside (this includes risk to properties alongside Chapel Lane).

At Reserved Matters stage, a drawing will need to be issued identifying the **surface water flow routes** and reviewing the impact of changes to ground level resulting from the development

Review of the EA's Groundwater map indicates that the site is not located within a designated Source Protection Zone or Principal Aquifer.

Surface Water Drainage

Infiltration testing has been undertaken at the site whereby three trial holes were excavated to 1.5mBGL. Although some soakage was observed, all three holes failed to adequately drain enough to establish an infiltration rate. Therefore, a surface water discharge to ground is not viable. No groundwater was encountered at 2.6mBGL.

The Applicant has expressed that an attenuation basin would reduce the land area available for development, however this reiterates the need to consider SuDS at an earlier stage. We have reviewed the following major housing developments in rural areas (with similar dwellings) and note that these all did include provision for SuDS off the highway.

181384 – Chestnut Avenue Kimbolton

214321 – Gilberts Wood Ewyas Harold

221923 – Perry Field, Bury Lane Wigmore

Following our comments regarding the lack of green SuDS, a ‘supplementary swale’ has been shown alongside the highway. This was a reactive measure taken by the applicant. Instead of allocating a patch of ground for a green SuDS feature (either in the main plot or nearer the River Dore), a strip of land alongside the highway has been presented.

A ‘supplementary swale’ is in fact a shallow attenuation basin; a swale is a conveyance feature where water moves through for treatment, but this appears to be an offline storage feature. The southern end of the “swale” is extremely narrow and becomes more similar to a ditch.

The applicant has only provided a drainage layout drawing, there are no drawings showing the levels of the respective attenuation features. The maximum swale depth is 1200mm. Without cross sectional drawings we can only guess how the attenuation works. It is however reasonable to assume that the base of the crates will be lower than the base of the swale. Accordingly we assume that in day to day rainfall, the crates will fill first. This means that water will only start to backflow into the swale during intense storms. The purpose of any online green SuDS is to capture the ‘first flush’ of silt and hydrocarbons.

A submission of this scale would normally include proposed topographical levels and assumed levels for the respective assets, but this information is lacking.

The land alongside the highway is very flat in this area, there is no evidence to suggest that the water could be retained in this feature as no level information was submitted. The future ownership of this land is not openly discussed but it is inferred that a Management Company may be set up.

The surface water design calculations are based on the impermeable area within the development. The provision of the long ‘supplementary swale’ along the lower edge of the site will lead to land drainage flow being captured. A localised basin could have been bunded to avoid inflows of land drainage water The extra land drainage water was not considered during the design and accordingly the attenuation features are incorrectly sized.

As explained above the ‘supplementary swale’ does not convey water from the development and so does not facilitate any water cleanliness features. The applicant presented this feature reactively, without considering it’s purpose.

HC Ecology have commented as follows :-

> *The applicant is suggesting a direct discharge to the River Dore but no plans have been submitted in regards to the system to be installed. As this is a direct discharge to a watercourse we would require evidence of how pollution from vehicles, silt measures, etc, will be mitigated to ensure there is no likely significant effect on the SAC.*

In response to this comment, a drawing of an Oil Interceptor has been presented.

The SuDS Manual identifies that “compared to other SuDS, these facilities rely heavily on frequent routine maintenance to prevent pollution…if this does not occur then experience shows that they quickly start to convey pollution downstream”

An oil interceptor will not address the risk associated with conveying silt into the River Dore SAC. Some provision of green SuDS on the path taken by water, will be required. We note the comments form Ecology, the design should follow the guidance in section 7.8 of the Herefordshire SuDS Handbook (which is based on the SuDS Manual)

The current surface water drainage strategy, which comprises a crate system with an offsite discharge to the River Dore, via an easement.

We have reviewed the calculations presented to support the surface water design. A detailed audit is rarely completed, but we have noticed the following issues that would need to be corrected in any subsequent submission.

- The surface water strategy has been developed on the basis that runoff rates from the site can mimic a 1 in 100 year + 40% CC rainstorm. The Environment Agency climate change projection for Herefordshire is 45% (upper End Allowance)
- There is no allowance for Urban Creep (refer to item 8.11 of the Herefordshire SuDS Handbook)
- The fundamental concept of SuDS is to mimic all rainstorms (volume and flow rate should be the same in all storms). This is identified in the National Standards S2 and S3, referenced in item 8.11 of the Herefordshire SuDS Handbook. This normally means that the flow control is selected to pass the flow from a 1 in 1 year storm, with attenuation sized for all storms based on the 1 in 1 year flow rate. This process has not been followed. The design has been presented on the assumption that flow rates and retained volumes can be the same as the 100 year + 40% climate change rainstorm. Normally the applicant presents proposals for the flow control size and then the LLFA identifies a suitable orifice size based on the maintenance regime.

A drainage layout drawing has now been provided; however, it is clear that the surface water drainage arrangements for the site are an afterthought and have not been considered earlier in the site design process. Two attenuation crates are proposed and appear to be located underneath the main site access road/entrance and the access road to Plots 13-19.

Our inital commentary (28th September) highlighted the risk that a collapse of the geocellular crates could occur (refer to the image below). The system layout should be designed so that, should this occur, access to the development would not be inhibited. Furthermore, access for future maintenance of the infrastructure will compromise access to the development.

Loss of use of car park spaces due to tank collapse

The applicant's designer has said that attenuation crates can be installed below roads. The following commentary on testing is taken from a technical review of geocellular drainage systems by the British Plastics Federation.

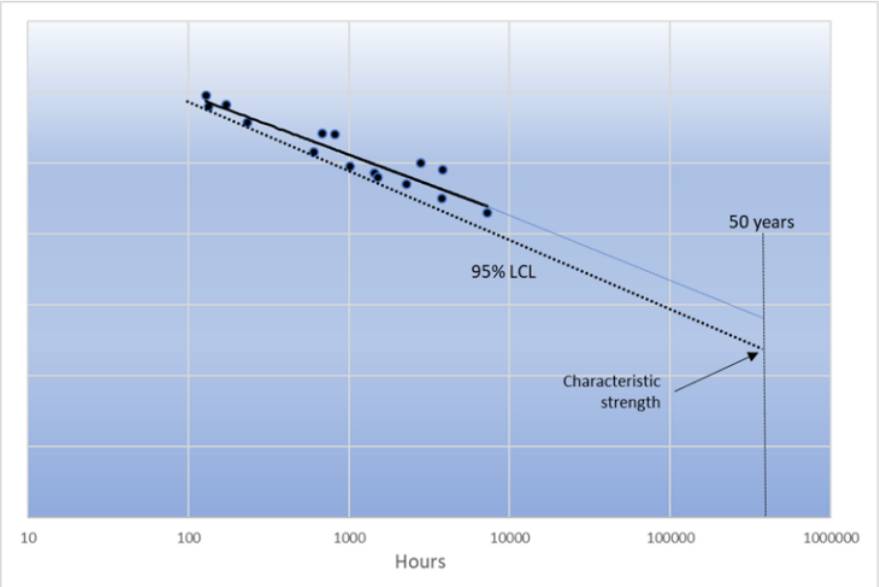
Testing procedures to achieve design life

By virtue of being installed underground, geocellular systems can be considered as geotechnical structures. The general principles of designing structures to withstand long-term loads are well established. However, their application is generally for rigid structures such as concrete bridges[4].

The behaviour of thermoplastics is more complex and the reaction to both short term loading (such as vehicular traffic) and long term loading (typically soil surcharge) need to be considered.

BS EN 17152-1 "*Specifications for storm water boxes made of PP and PVC-U*"[5], along with material tests, requires **product** testing to determine characteristic short term strength[6] and characteristic long term strength[7]. In the case of the latter, a series of creep rupture tests is carried out to determine when failure occurs at different loading.

A regression analysis is then carried out to extrapolate the results to 50 years and a 95% Lower Confidence Limit (LCL) is declared as the characteristic strength at 50 years (see Figure 1). This determines the long term load that can be applied **without failure** over the **design life** of the installation. Note that, 50 years is a design point, common across many products, and is not the same as the expected lifespan.



A designer can compare the characteristic strengths with the expected loads (with many safety factors included) to ensure that the installation does not fail either by collapse or by deflecting more than allowed at the surface.

Depending on the intended land use above the tank, a box with additional testing outside of the European Standards may be required. A prime example being cyclic or fatigue testing for boxes that are installed under highways or heavily trafficked areas. However, as these types of installations are generally avoided, most boxes are not tested to such a level.

Once the design has been made to ensure no failure within the design life, steps can be taken to maximise the lifespan of the installation.

The article identifies the following key points :-

- The design of rigid structures for long term loading is generally well understood
- Thermoplastics are not rigid structures, so the same principles cannot be applied.
- Creep rupture tests are completed to assess the long term loading from soil surcharge. This gives a design strength (projected to 50 years), with 95% confidence
- The model assumes that long term design strength from soil surcharge reduces with time, due to plastic fatigue
- Dynamic pounding from traffic is regarded as short term loading. As explained in the commentary, most boxes are not tested to such a level.

There is limited field data for thermoplastic crates and accordingly the manufacturers are not committing to a service life much beyond 50 years. It is worth noting that the Water Companies do not adopt Geocellular Crates located below highways.

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Durability — the system will have a service life in excess of 50 years when installed in accordance with this Certificate (see section 11).

Polystorm

- 50 years creep limited life expectancy

Permavoid identify the risk of collapse and reduced service life under HGV loading

Performance

The structural load bearing capacity of the Permavoid units have been tested in accordance with the following European Standard: BS 7533-13:2009. The system's structural design life expectancy, based upon creep test data (tested in accordance with CIRIA guidelines) is as follows; for lightly loaded areas such as car parks a design life of 50 years is achievable. For areas with prolonged HGV loading a typical design life may only be 25 years, depending on the design of the pavement surfacing and structural layers over the tank.

The Environment Agency require surface water drainage systems to be designed in accordance with the projected Upper End Climate Change tranche. For the 1 in 100 year storm this is 45%. The guidance says "Use the 2070s epoch for development with a lifetime between 2061 and 2125."

Accordingly, the attenuation feature needs to be fit for purpose in 2125

Our original concern was that if the geocellular crate is installed below the site access road, it may collapse, restricting access to property. This would not only cause a nuisance to residents but would also prevent emergency access.

There is a lack of detail regarding the suggested easement for the offsite discharge to the River Dore across third party land. The red line extent should include this area. Evidence of land ownership or a Legal Easement for pipe maintenance is needed for the outfall pipeline

The applicant has advised that “the height difference from the site to the River Dore has been demonstrated in the Drainage Strategy” but we can find no such reference. The applicant has not demonstrated the fundamental design aspects of the surface water pipeline across fields. This could be achieved by means of a cross section using LIDAR. There needs to be evidence that the proposed pipeline will self-cleanse, not just a statement saying a pipe laid at a specific gradient will self cleanse.

The December letter includes commentary on the gradient of the proposed pipe.

> At present, the proposed drain is a 150mm diameter drain. The evidence suggests that this drain will be sufficient. As noted on page 30 of the Drainage Strategy, the outflow from the site will be managed to a flow rate of 4.43-litres/second. As demonstrated on the same page, a 150mm diameter drain laid at a gradient of 1:200 will accept more than 10-litres of flow. It should be noted that the graph shown in the Drainage Strategy is taken from Building Regulations Part H, and thus considers self-cleansing velocity.

Item 3.15 of the Building Regulatons identifies that 150mm dia pipes should be laid to a minimum gradient of 1:150. The design will need to consider the revised flow rate, as it has been wrongly assumed that a design discharging the equivalent flow from a 1 in 100 year storm would be acceptable. We respect that the Building Regulations 3.15 offers a developer a default design, which would be deemed to facilitate self cleansing, but most developers present a Microdrainage / Causeway simulation to demonstrate this.

The applicant goes on to suggest that a 300mm dia pipe may be considered. Any decision on the use of such a pipe would be taken by the applicant, however it may be difficult to prove that the small flow in this larger pipe would self-cleanse the pipe.

The land between the B4348 and the River Dore is very flat. We are unclear where a headwall would be built on the River Dore, our own experience suggests that the banks erode in many areas and so the headwall would need to be well built, to ensure the integrity of this asset. The EA maintain the River Dore, an Environmental Permit may be required

The outfall pipe will need to cross the adjacent B4348; the existing services in this highway need to be considered

Foul Water Drainage

Welsh Water have applied a planning condition to this application; it is stated within their consultation response that the Applicant will need to conduct a Development Impact Assessment at Peterchurch Wastewater Treatment Works to determine whether capacity exists within the public sewerage system to accommodate the additional foul flows associated with the proposed development. This assessment will determine whether any additional reinforcement works are required at the treatment works and the associated costs to the Applicant/Developer in order to facilitate the proposed foul water connection.

We strongly recommend that the Applicant addresses the above requirements as soon as possible. If Welsh Water do not discharge this condition, the Applicant must provide an alternative foul water drainage strategy. Given that poor soakage was observed during infiltration testing, alternative foul water discharge options may be very limited.

Overall Comment

OBJECTION

The current surface water drainage proposals are not acceptable because the surface water SuDS will not be sustainable for the lifetime of the development. If this site were to be built as proposed then the SuDS would not work in the longer term, leading to increased surface water runoff. Ecology have raised the issue of risks to the River Dore, the provision of an oil interceptor would not address the risks associated with mobilised silt

Our own review of similar planning applications for residential estates identified that other developers were allocating sufficient space for Sustainable Drainage features

The initial request was for the applicant to identify a localised area within the site to provide Green SuDS. The applicant subsequently presented details of a high level swale, but as explained above this does not provide the intended benefits.

We do not object to the use of geocellular crates crates, but due to the risks of access to Emergencies it Is not appropriate to install them below highways. If a solution utiising crates was presented along with off-site measures to mitigate the impact of pollution of the River Dore, then we may support such a proposal

If the Applicant does own land south of the road where the pipeline is proposed, the Applicant could alter the design to include a SuDS pond be constructed within Flood Zone 1 or 2. In their latest commentary the applicant is suggesting that there would be problems in maintaining such an asset, we do not accept that a remotely located asset could not be maintained adequately.