

# 6.Energy & Water

# 6 Energy and Water

This revised chapter adopts one clear technical schedule for the application. It follows a simple hierarchy: reduce demand first through fabric performance, passive design, efficient services and water-saving fixtures; then meet the remaining demand from on-site renewable electricity, an air source heat pump, a small resilience woodfuel allowance, rainwater harvesting, source-separated sanitation and natural greywater treatment. The result is a single auditable basis for planning, delivery and annual OPD monitoring. [129][130][131]

**Table 6-1: Adopted technical schedule**

| Component | Adopted planning-stage schedule |
|---|---|
| Solar PV | approximately 20.9 kWp roof-mounted array, indicatively 36 high-output modules at around 580 W each |
| Battery bank | 50 kWh nominal $LiFePO_4$ battery bank, approx. 40 kWh usable |
| Inverter / charger | 8-10 kW class inverter / charger |
| Primary heating | 6-8 kW air source heat pump |
| Thermal storage | Approx. 600 litre thermal store (within the 500-800 litre allowance in the energy strategy) |
| Resilience heat | Room-sealed Ecodesign-ready boiler stove, sized for low-solar event mode only |
| Potable rainwater storage | 40 $m^3$ / 40,000 L underground storage, indicatively 2 × 20,000 L tanks, filtered and UV-polished before domestic use |
| Non-potable water | Separate clean-water harvested-rainwater catchments for irrigation and ancillary outdoor uses, including two 10 m diameter clean-water irrigation reserve / attenuation ponds, polytunnel roof catchment and small header storage |
| Greywater treatment | 15 $m^2$ horizontal subsurface-flow reedbed discharging to 6 m diameter polishing pond / infiltration / non-edible planting only |

## 6.1 Electricity

### 6.1.1 Adopted building fabric and passive measures

The electricity system is sized against a low-energy building rather than a conventional rural house. For this chapter, the application adopts one fabric schedule and uses that same schedule to explain the energy demand, the heating strategy and the PV/battery sizing. The adopted values come from the WikiHouse Skylark 250 Plus fabric table and the related technical specification. [132][133]

**Table 6-2: Adopted building fabric and ventilation schedule**

| Element | Adopted specification | Performance / target |
|---|---|---|
| External walls | WikiHouse Skylark 250 Plus wall build-up with 250 mm insulation, 60 mm external woodfibre board, vapour control layer, breather membrane, ventilated rainscreen cladding and internal lining | U-value = 0.123 W/$m^2$K |
| Roof | WikiHouse Skylark 250 Plus roof build-up with 250 mm insulation, 100 mm external woodfibre board, vapour control layer, breather membrane, ventilated roof finish and internal lining | U-value = 0.108 W/$m^2$K |
| Floor | WikiHouse Skylark 250 Plus floor build-up with 250 mm nsulation, 60 mm external woodfibre board, vapour control layer, breather membrane, floor build-up and internal lining | U-value = 0.128 W/$m^2$K |
| Windows | High-performance triple-glazed units | Target Uw = 0.80 W/$m^2$K |
| Airtightness | Continuous internal vapour / airtightness layer with sealed service penetrations | Target 0.15 AC/H background infiltration (equivalent to 3 AC/H @ 50 Pa) |
| Ventilation | Balanced whole-house MVHR | 0.6 AC/H with 80% heat recovery |

The WikiHouse thermal-modelling study found that triple glazing and, especially, low infiltration rates materially improve the heat-transfer coefficient of this lightweight construction system; it selected 0.15 AC/H as a practical as-built airtightness target. The same study concluded that WikiHouse Skylark can reach heat-loss performance comparable to Passivhaus dwellings when triple glazing and very low infiltration are combined. [133][134]

In practical terms this means the renewable system is not being asked to compensate for a weak envelope. South-oriented passive solar design, high insulation, good airtightness and balanced MVHR reduce the electrical input required for heating before the PV and battery system is sized. [131][132][133][134]

### 6.1.2 Annual electrical input demand

For clarity, this chapter distinguishes useful energy demand from electrical input demand. The off-grid PV and battery system is sized against electrical input. Useful heat delivered by the heat pump is described separately in Section 6.3. This distinction keeps the schedule clear and auditable. [131]

**Table 6-3: Annual electrical input demand**

| Category | kWh/year | Notes |
|---|---|---|
| Domestic base electrical loads | 1,550 | Lighting, refrigeration, ICT, controls, water treatment / pumps and domestic appliance allowance |
| Cooking | 1,000 | Induction hob, electric oven and microwave |
| Enterprise / ancillary electrical loads | 650 | Fermentation temperature control, low-tech mushroom microclimate and small tools / chargers |
| ASHP input electricity | 1,970 | Approximate annual input required to deliver about 5,900 kWh of useful heat at SCOP ~3.0 |
| Total annual electrical input | 5,170 | Planning-stage electrical demand to be met by PV, battery storage and load management |

The split between domestic and enterprise direct electrical loads is deliberate. It allows domestic consumption to be reported clearly in the OPD monitoring return, while enterprise and ancillary consumption can be logged separately as part of wider operational monitoring. The enterprise allowance is kept modest because the mushroom room is designed as a low-tech space using high-humidity microclimates, passive vents and only very small intermittent electrical loads rather than whole-room humidification and continuous fan operation. [131]

### 6.1.3 Seasonal operation and battery resilience

**Table 6-4: Representative daily electrical demand by operating mode**

| Operating mode | Daily electrical demand | Notes |
|---|---|---|
| Summer representative day | 12.2 kWh/day | High PV availability; ASHP and cooking scheduled in daylight where possible |
| Winter normal representative day | 16.5 kWh/day | PV-led heat banking plus ordinary household operation |
| Winter low-solar event mode | 10.6 kWh/day | ASHP heavily curtailed; biomass stove charges thermal store; discretionary loads reduced |

On the adopted schedule, a 50 kWh nominal battery bank with about 40 kWh usable storage provides roughly 2.4 days of autonomy at the representative winter-normal load, and about 3.8 days in low-solar event mode. Critical loads are placed on a separate board so that MVHR, water pumps, refrigeration / freezer capacity, controls, communications and essential lighting are protected even when discretionary loads are curtailed. [131]

### 6.1.4 Monitoring and control

The system will include inverter monitoring, battery state-of-charge logging and sub-metering of domestic and enterprise circuits. Monthly records will distinguish: (1) PV generation, (2) domestic electrical use, (3) enterprise / ancillary electrical use, (4) low-solar event periods and (5) any biomass firing days. This keeps the energy section directly auditable and makes annual OPD reporting straightforward. [130][131]

**Figure 6-1: Energy System and Low-Solar Resilience Strategy**

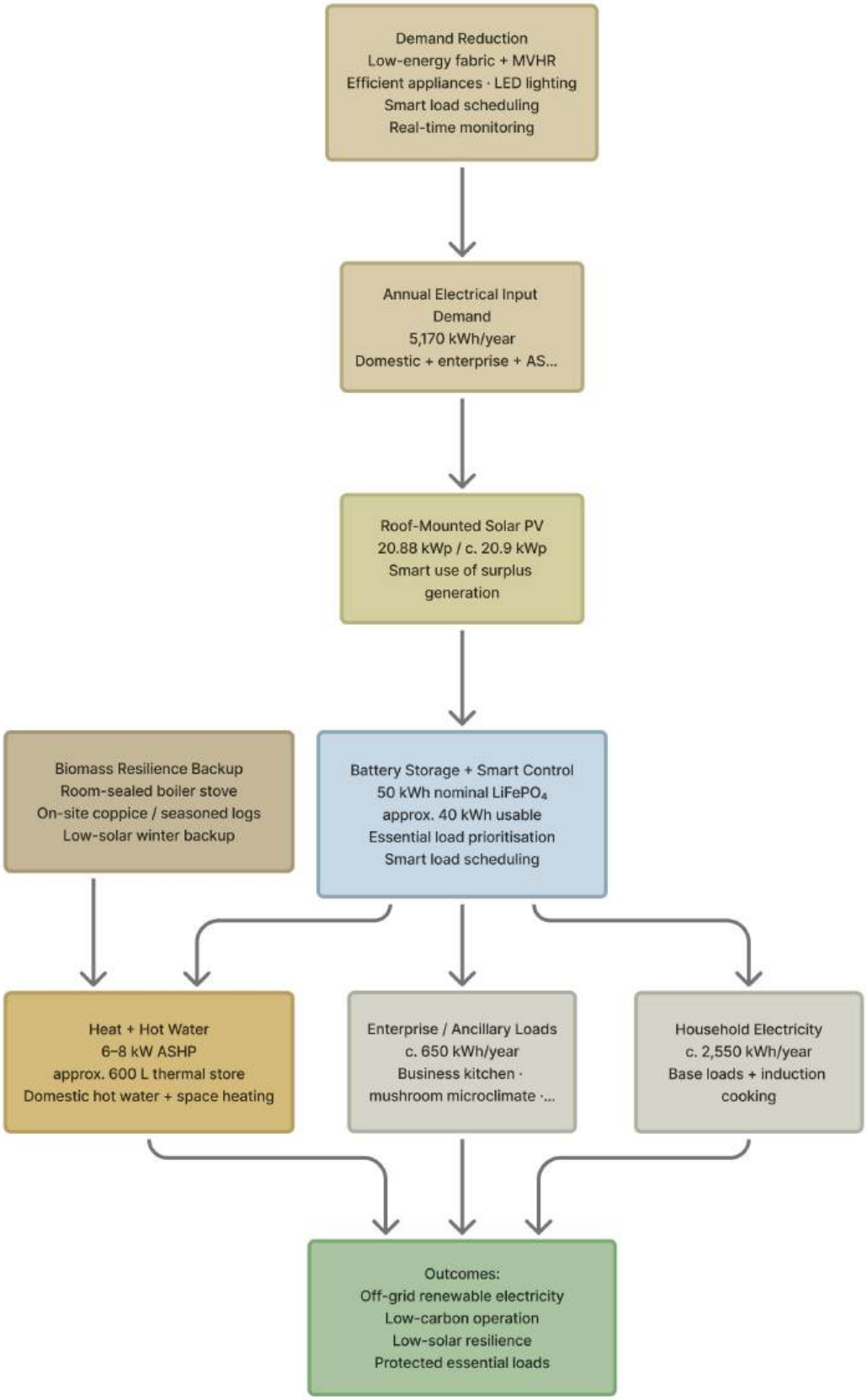



Figure 6-1: Energy System and Low-Solar Resilience Strategy. The diagram shows the reduce-first energy hierarchy, annual electrical input demand, roof-mounted PV generation, battery storage, smart load control, ASHP-led heat and hot water, and biomass resilience backup for low-solar winter periods.

### 6.1.5 Compliance with policy

This reduce-first, off-grid electricity strategy is consistent with TAN 6 and the OPD Practice Guidance because the development first minimises demand and then meets that demand from renewable sources arising directly from the site. It also aligns with the WikiHouse technical recommendation for a high-airtightness, MVHR-led envelope rather than relying on oversized equipment to compensate for heat loss. [129][130][133]

## 6.2 Biomass (Coppice)

Biomass is treated here as a resilience measure, not the primary annual heating source. The main system is ASHP-led, while woodfuel is reserved for prolonged dull winter periods, technical downtime or short periods when preserving battery autonomy becomes the priority. [131]

### 6.2.1 Projected biomass requirement

**Table 6-5: Resilience biomass schedule**

| Parameter | Adopted allowance | Notes |
|---|---|---|
| Useful heat contribution | Approx. 1,200 kWh/year | Resilience heat delivered to the thermal store in low-solar event mode |
| Raw wood energy required | Approx. 1,500 kWh/year | Assumes around 80% seasonal stove efficiency |
| Approximate wood mass | Approx. 375 kg/year | Assumes about 4 kWh per kg for seasoned hardwood |
| Indicative stacked-log volume | Typically under 1 m³/year | Small enough to be met from a fraction of an acre of managed coppice |
| Dedicated new coppice rotation | 2,250 m² / 0.225 ha | New coppice blocks managed separately from existing woodland |
| Indicative annual coupe | Approx. 321 m²/year | Based on an indicative 7-year rotation |

This is intentionally a small allowance. By using the ASHP for the bulk of the year, particulate emissions and woodland demand are kept low while still maintaining deep-winter resilience. Covered on-site storage will hold 2-3 years of seasoned logs so that the small annual allowance can be dried properly and used efficiently. [131]

### 6.2.2 Sustainable harvest and establishment years

The dedicated new coppice rotation is quantified at approximately 2,250 m² (0.225 ha), managed separately from the existing woodland and arranged as several practical blocks. On an indicative 7-year rotation this equates to about 321 m² cut per year. The revised energy requirement remains modest: approximately 375 kg/year of seasoned wood, equivalent to about 1.7 t/ha/year across the new coppice area. During the establishment years, before the on-site coppice cycle reaches useful output, any low-solar resilience woodfuel will be supplied from lawful sustainable off-site sources or small arisings, with on-site coppice phased in as the rotation matures.

### 6.2.3 Role in the integrated system

The boiler stove is room-sealed and plumbed to the thermal store rather than acting as the everyday heating appliance. That arrangement is important because it allows the system to prioritise whole-house heat and domestic hot water while avoiding the over-heating of a single room during low-solar periods. Its role is therefore supportive and strategic rather than primary. [131]

## 6.3 Heat and Hot Water

The adopted heating strategy is a hybrid ASHP-led system with thermal storage and a small biomass resilience allowance. The heat distribution system is low temperature throughout so that the heat pump can operate efficiently and the fabric can do most of the work. [131][132][133]

### 6.3.1 Useful heat demand

**Table 6-6: Useful heat demand and supply**

| Category | kWh/year | Notes |
|---|---|---|
| Space heating | 4,600 | The space-heating allowance is principally for the dwelling. Any ancillary frost-protection, commissioning, or exceptional short-duration comfort use in workspace areas will be logged as enterprise energy use and kept within the adopted energy allowance; no dedicated routine space-heating system is proposed for the enterprise building. |
| Domestic hot water (DHW) | 2,500 | Four occupants with efficient fittings and no WC flushing |
| Total useful heat demand | 7,100 | Delivered through ASHP + thermal store in normal mode, with biomass support in low-solar periods |
| ASHP useful heat contribution | 5,900 | Approx. 1,970 kWh electrical input × SCOP ~3.0 |
| Biomass useful heat contribution | 1,200 | Resilience contribution to complete the annual heat schedule |

The thermal schedule in this chapter uses the final hybrid ASHP-led energy strategy as the basis for thermal performance. [131]

### 6.3.2 Heating and hot-water schedule

The application assumes a 6-8 kW air source heat pump feeding an approximately 600 litre thermal store located in the Technical Room. The store serves low-temperature underfloor heating at ground floor level and low-temperature emitters upstairs, and it also provides domestic hot water. This arrangement enables daylight ASHP operation when PV output is strongest and provides stored heat for evening and night-time use. [131]

### 6.3.3 Winter operating modes

Normal winter operation. The heat pump runs preferentially in daylight hours so that PV generation can be turned into stored heat rather than only into battery cycling. This is the default winter mode whenever solar availability is ordinary rather than exceptionally poor. [131]

Low-solar event mode. During prolonged dull periods, the ASHP can be curtailed to near-zero while the room-sealed boiler stove charges the thermal store. At the same time discretionary electrical loads are reduced through the critical-load board. This preserves battery autonomy without sacrificing whole-house heating or domestic hot water. [131]

### 6.3.4 Ventilation and combustion safety

The dwelling uses balanced MVHR to maintain air quality while recovering heat from exhaust air. Because the resilience stove is room-sealed and supplied with dedicated external combustion air, it can be operated safely alongside MVHR. The final energy strategy also requires a fireplace override / positive-pressure mode or equivalent control strategy. [131][133]

### 6.3.5 Monitoring

Monitoring will record ASHP run-hours, thermal-store temperatures, low-solar event days and annual biomass use. This makes it possible to see whether the building fabric, the thermal store and the control logic are performing as intended, rather than only measuring annual electricity totals. [130][131]

## 6.4 Renewable Generation

Renewable generation is designed from the roof first. This avoids unnecessary landscape impact and makes use of the large south-facing roof area identified in the final energy strategy. [131]

**Figure 6-2: Monthly Energy Demand and Renewable Availability**

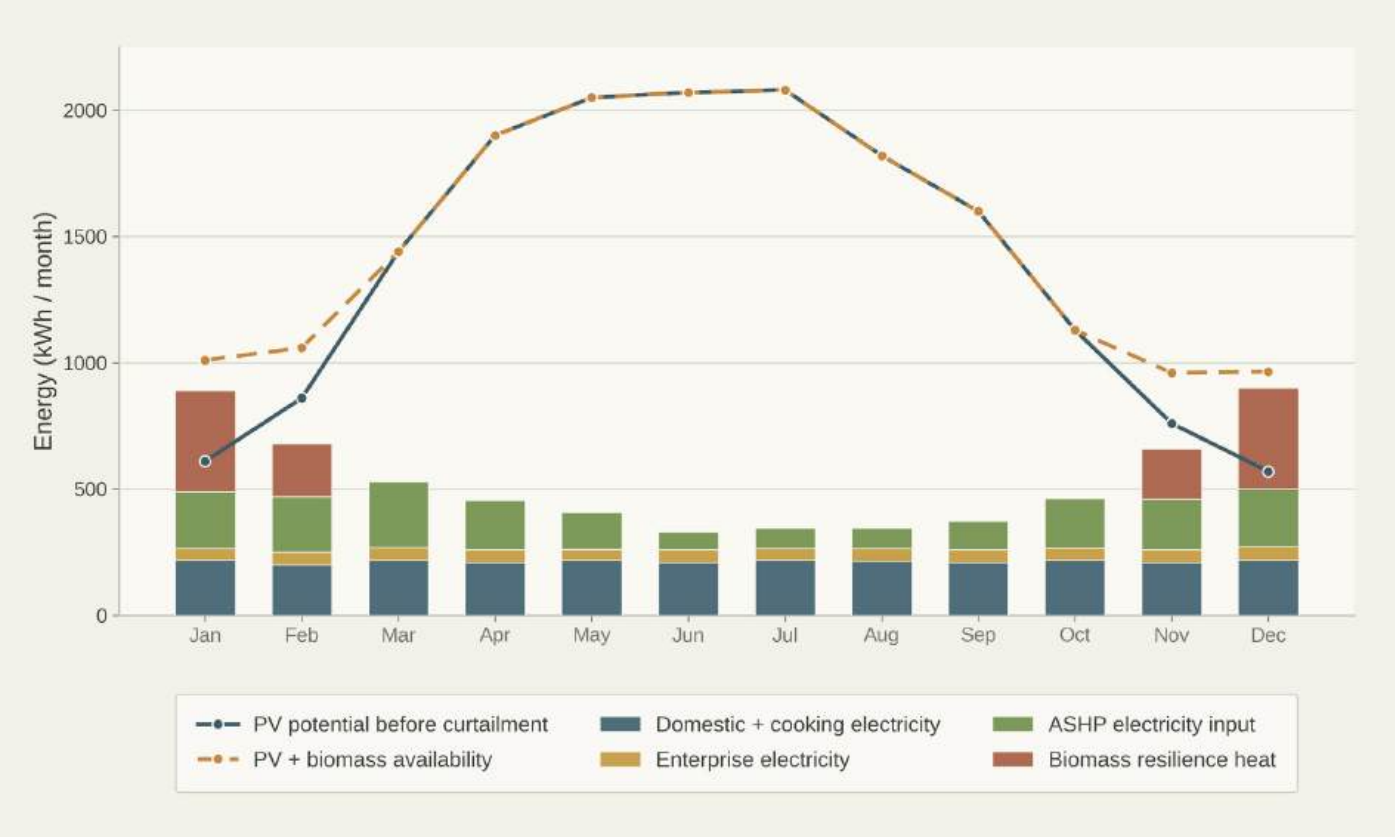



Figure 6-2: Monthly Energy Demand and Renewable Availability. The stacked bars show the modelled monthly demand for domestic and cooking electricity, enterprise electricity, ASHP input and biomass resilience heat. The lines compare roof-mounted PV potential before curtailment with combined PV and biomass availability. The chart demonstrates the strong annual renewable-energy resource while identifying the winter months as the principal resilience period, managed through battery storage, thermal storage, load control and limited biomass backup.

### 6.4.1 Solar PV and inverter schedule

**Table 6-7: Renewable generation schedule**

| Parameter | Adopted figure | Notes |
|---|---|---|
| Available south-facing roof area | Approx. 276 m² | Energy strategy figure used for the roof-first design |
| PV array size | 20.88 kWp | Winter-resilient roof-mounted off-grid array |
| Indicative module count | 36 high-output modules | At around 580 W each, subject to final module selection |
| Roof area required for PV | Approx. 93 m² panel surface; approx. 95-100 m² roof zone | Based on 36 × 580 W modules at 2.278 m × 1.134 m each = approx. 93.0 m² panel surface; final roof layout remains subject to mounting gaps, edge clearances and installer design |
| Battery bank | 50 kWh nominal / approx. 40 kWh usable | |
| Inverter / charger | 8-10 kW class | Sized to manage cooking peaks, pumps and workshop loads |

This is therefore a roof-mounted system with ample physical room to expand or reconfigure without resorting to prominent ground-mounted frames. The adopted approximately 20.9 kWp schedule is both physically realistic and visually modest relative to the available roof area. [131][137]

### 6.4.2 Annual generation and balance

**Table 6-8: Annual generation and operating balance**

| Item | Value | Notes |
|---|---|---|
| Annual PV generation | Approx. 17,000-20,000 | kWh/year gross roof-array resource before curtailment, subject to final module selection, exact orientation and site conditions |
| Annual electrical input demand | Approx. 5,170 | kWh/year from Table 6-3 |
| Gross annual electrical surplus | Approx. 11,800-14,800 | kWh/year before seasonal storage, curtailment and operational losses are considered |
| Useful heat from ASHP | 5,900 | kWh/year |
| Useful heat from biomass | 1,200 | kWh/year resilience contribution |

The annual balance should not be read as a claim that every kilowatt-hour generated in summer can simply be carried into winter. This is an off-grid system and the sizing driver is winter resilience, not only annual yield. That is why battery storage, thermal storage, daylight-first ASHP operation and low-solar event load shedding are all integral parts of the strategy. [131]

PVGIS off-grid modelling: 20.88 kWp PV, 50 kWh nominal battery, 20% cutoff and 14.164 kWh/day annual-average load. The model reports the battery reaching full charge on 80.18% of days and reaching the empty/cutoff condition on 2.72% of days annually, equivalent to about 10 modelled cutoff days per year. December and January remain the critical months at 12.9% and 15.2% battery-empty/cutoff days respectively, so low-solar event mode remains part of the design rather than a fallback afterthought. [140]

### 6.4.3 Use of surplus generation

Where generation exceeds immediate electrical demand, surplus electricity is first directed to essential charging and ordinary battery storage, and then to an immersion element in the thermal store through a smart PV diverter. Only after those priorities are met is surplus used for secondary loads such as seasonal processing, charging tools or future low-carbon transport uses. This order of priority keeps the system focused on self-sufficiency rather than on avoidable discretionary demand. [131]

### 6.4.4 Operational carbon and whole-life accounting

Operational carbon is materially reduced because the annual electrical input is met from on-site PV and the limited resilience heat allowance is supplied from site-derived biomass. Whole-life carbon, including the embodied impacts

of PV, batteries and building materials, should be reported once only in the project-wide carbon schedule and the Zero Carbon Buildings chapter so that the submission uses one consistent calculation. This chapter therefore focuses on operational performance. [131][133][134]

## 6.5 Water Supply, Wastewater & Greywater

The revised water strategy is built on three principles: first, reduce demand; second, separate clean rainwater, greywater and human-waste streams so they are not mixed unnecessarily; third, keep the irrigation and sanitation strategy conservative and easy to audit. In particular, treated greywater is not proposed for edible-crop irrigation. Edible crops, including wasabi and other productive growing areas, are supplied from harvested rainwater only. [130][131][135][136]

**Figure 6-3: Integrated Water and Sanitation Cycle**

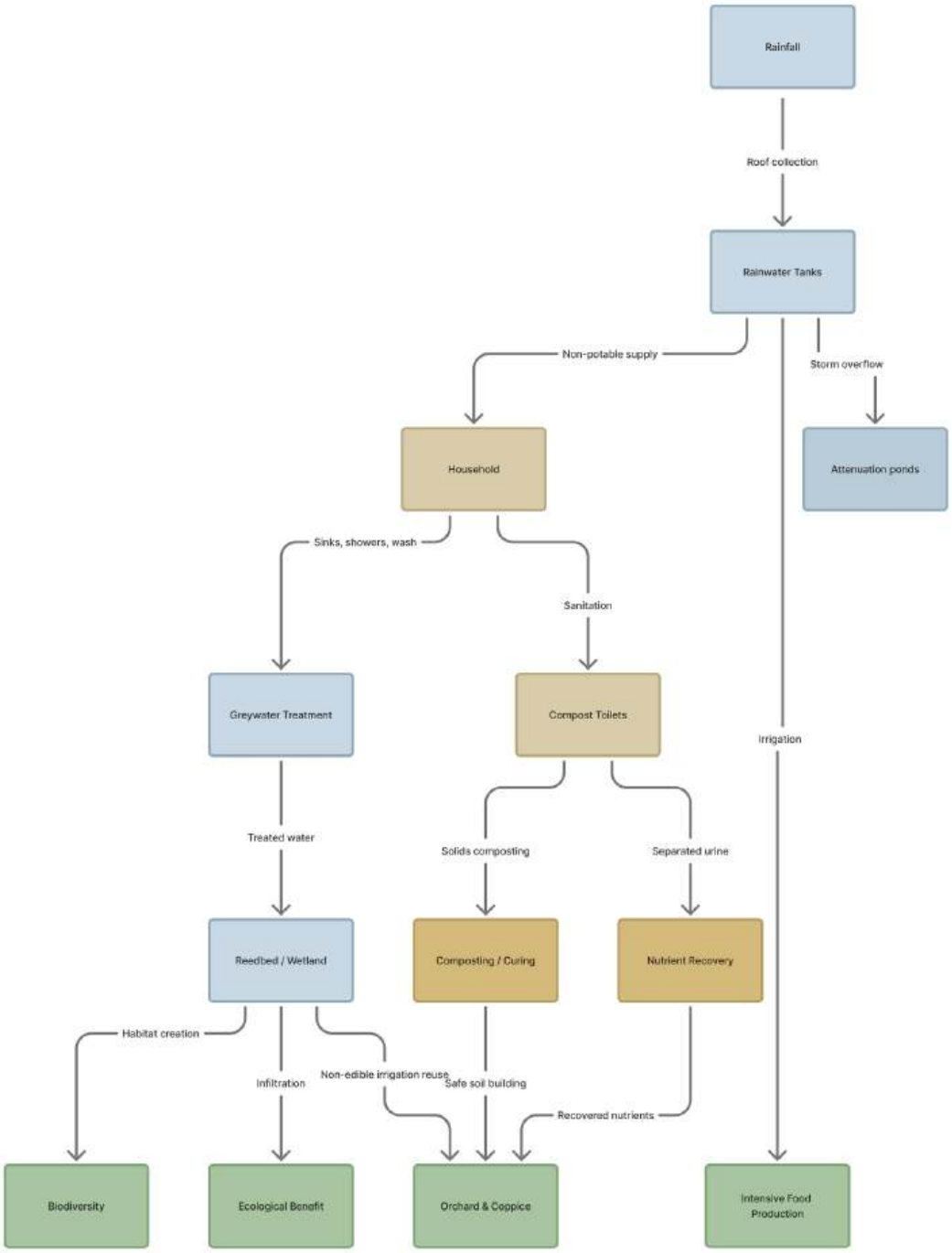



Figure 6-3: Integrated Water and Sanitation Cycle. The diagram shows the separation of harvested rainwater, household greywater, urine-diverting dry-toilet solids and source-separated urine. Treated greywater is routed to reedbed / infiltration / non-edible planting only, while clean harvested water supports edible-crop irrigation.

### 6.5.1 Water demand and rainwater supply

Domestic water demand is reduced by eliminating WC flushing through urine-diverting dry toilets / composting sanitation, using efficient showers and taps, selecting efficient appliances and monitoring use. For this chapter the domestic design target is aligned with Appendix J.1: 70 litres per person per day for four occupants, equivalent to 102.2 m³/year. Enterprise irrigation and wash-down are not loaded onto the potable domestic store because they are supplied from separate non-potable clean-water catchments, including polytunnel roof catchment and the two clean-water irrigation reserve / attenuation ponds. This keeps the domestic water balance transparent and prevents edible-crop irrigation from depending on potable storage.

**Table 6-9: Conservative domestic water balance**

| Item | Adopted figure | Notes |
|---|---|---|
| Roof catchment area | 259 m² | Standing seam / sloped roof catchment 143 m² + EPDM flat-roof catchment 116 m², as set out in Appendix J.1. The separate 44 m² green roof is excluded from potable rainwater harvesting and drains to landscape attenuation / swales. |
| Rainfall basis for design | 682.53 mm/year | Shawbury 1991–2020 mean, adopted as conservative planning figure |
| Dry-year stress | 510 mm/year | Approx. 25% below Shawbury mean, rounded conservatively |
| Weighted collection efficiency | 0.878, rounded to 0.88 | 143 m² at 0.90 plus 116 m² at 0.85 |
| Mean-year harvest | 155.1 m³/year | 155,139 L/year |
| Dry-year harvest | 115.9 m³/year | 115,923 L/year |
| Domestic demand target | 102.2 m³/year | 70 lppd × 4 occupants × 365 days |
| Potable storage | 40 m³ / 40,000 L | Indicatively 2 × 20,000 L tanks; approx. 143 days at 280 L/day before in-season replenishment |
| Mean-year annual balance | +52.9 m³/year | Positive balance using the Appendix J.1 conservative design basis |
| Dry-year annual balance | +13.7 m³/year | Positive balance under 510 mm dry-year stress |

This is intentionally conservative and follows Appendix J.1 as the master domestic water evidence. The mean-year surplus of approximately 52.9 m³/year and dry-year surplus of approximately 13.7 m³/year demonstrate that the potable rainwater strategy remains positive even under the adopted dry-year stress. Potable water will be filtered and UV-polished before domestic use. Non-potable irrigation water will be collected separately from polytunnel and ancillary clean-water catchments so that productive growing does not undermine the domestic water balance. [131] [136]

**Figure 6-4: Potable Water Use / Availability — Average Rainfall**

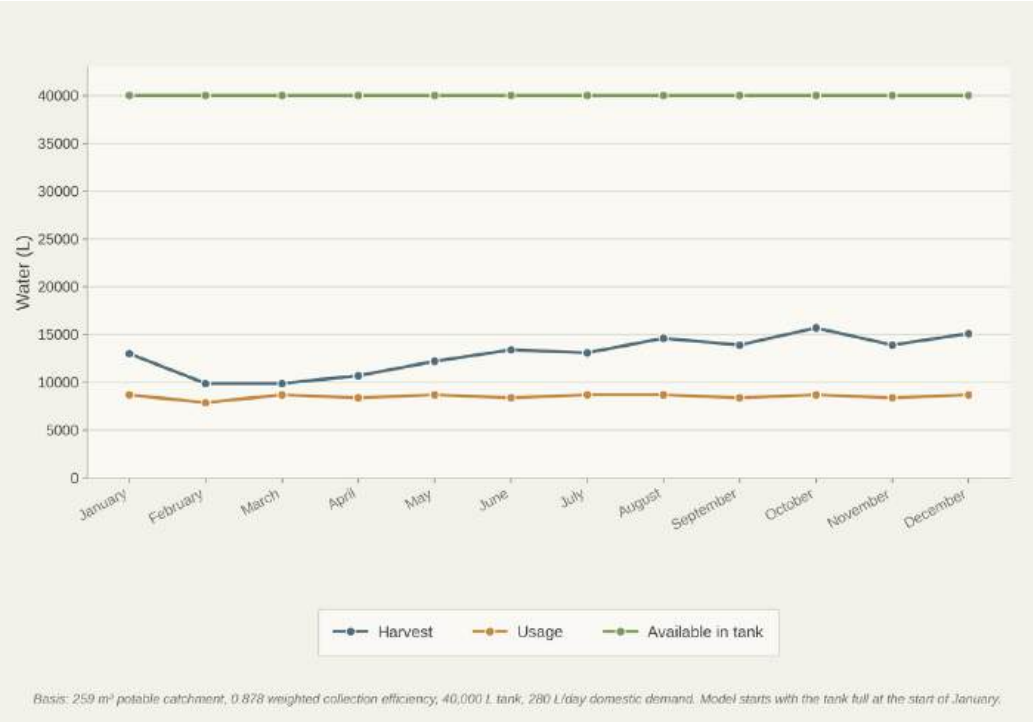



Figure 6-4: Average-rainfall model using the Appendix J.1 potable water basis: 259 m² potable roof catchment, 0.878 weighted collection efficiency, 40,000 L potable storage and 280 L/day domestic demand. The model starts with the tank full at the start of January, reflecting the winter-fill / spring-use storage strategy. This figure shows domestic potable water only; non-potable irrigation water is assessed separately.

**Figure 6-5: Potable Water Use / Availability — Dry-Year Stress Test**

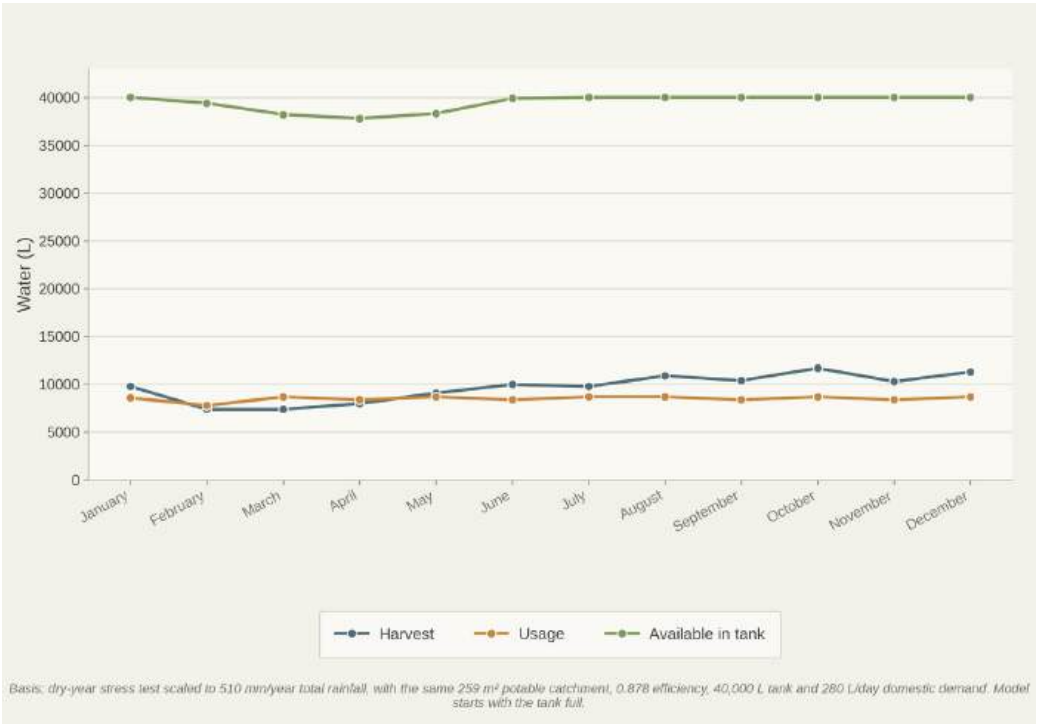



Figure 6-5: Dry-year stress model using the Appendix J.1 design floor of 510 mm/year rainfall, with the same 259 m² potable roof catchment, 0.878 weighted collection efficiency, 40,000 L potable storage and 280 L/day domestic demand. The graph shows that the domestic potable water balance remains positive under the modelled dry-year stress test. It is not a named historic rainfall year.

### 6.5.2 Sanitation and blackwater elimination

The dwelling uses twin urine-diverting dry toilets. That means no blackwater is sent to the greywater treatment system, and toilet flushing does not appear in the domestic water demand calculation. Separated solids and urine are handled under the waste-management strategy; the only point relevant here is that sanitation is source-separated and does not enter the greywater line. [136]

**Figure 6-6: Water system schematic**

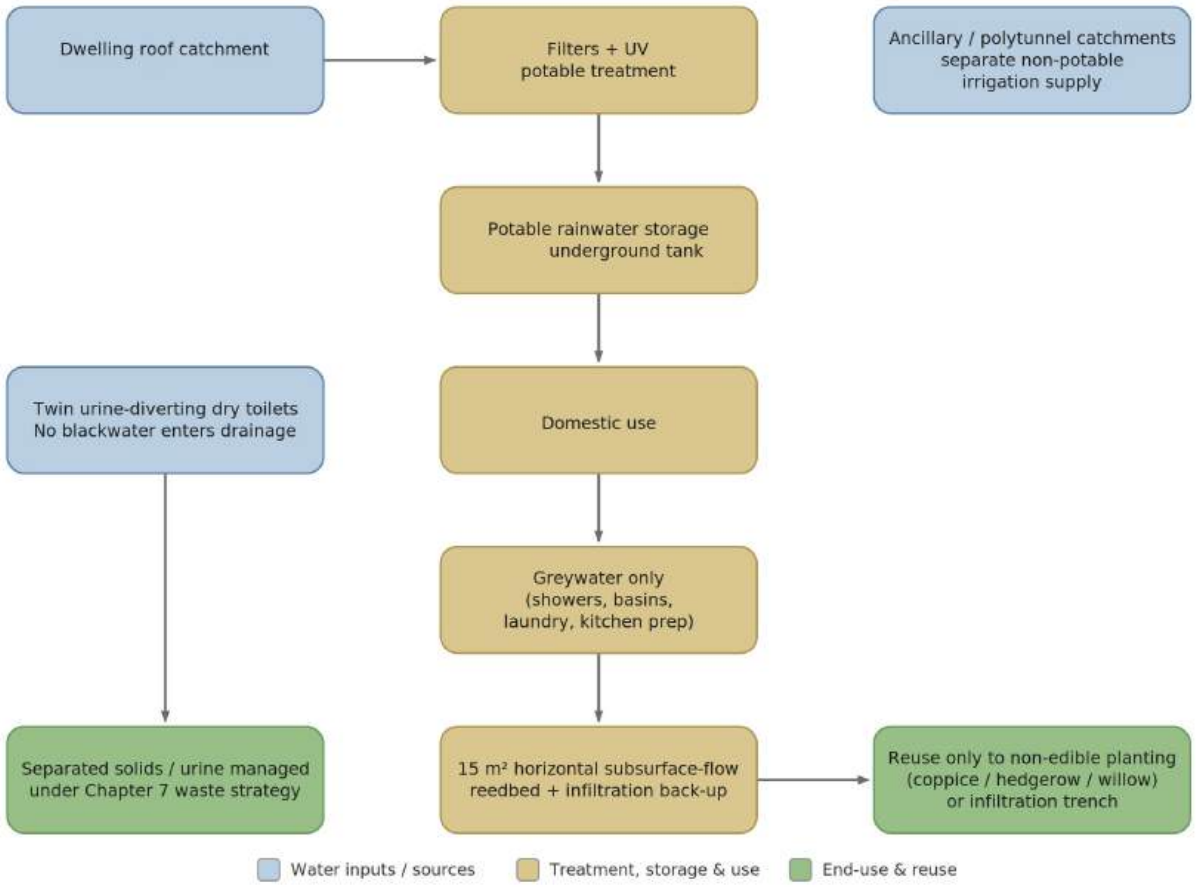
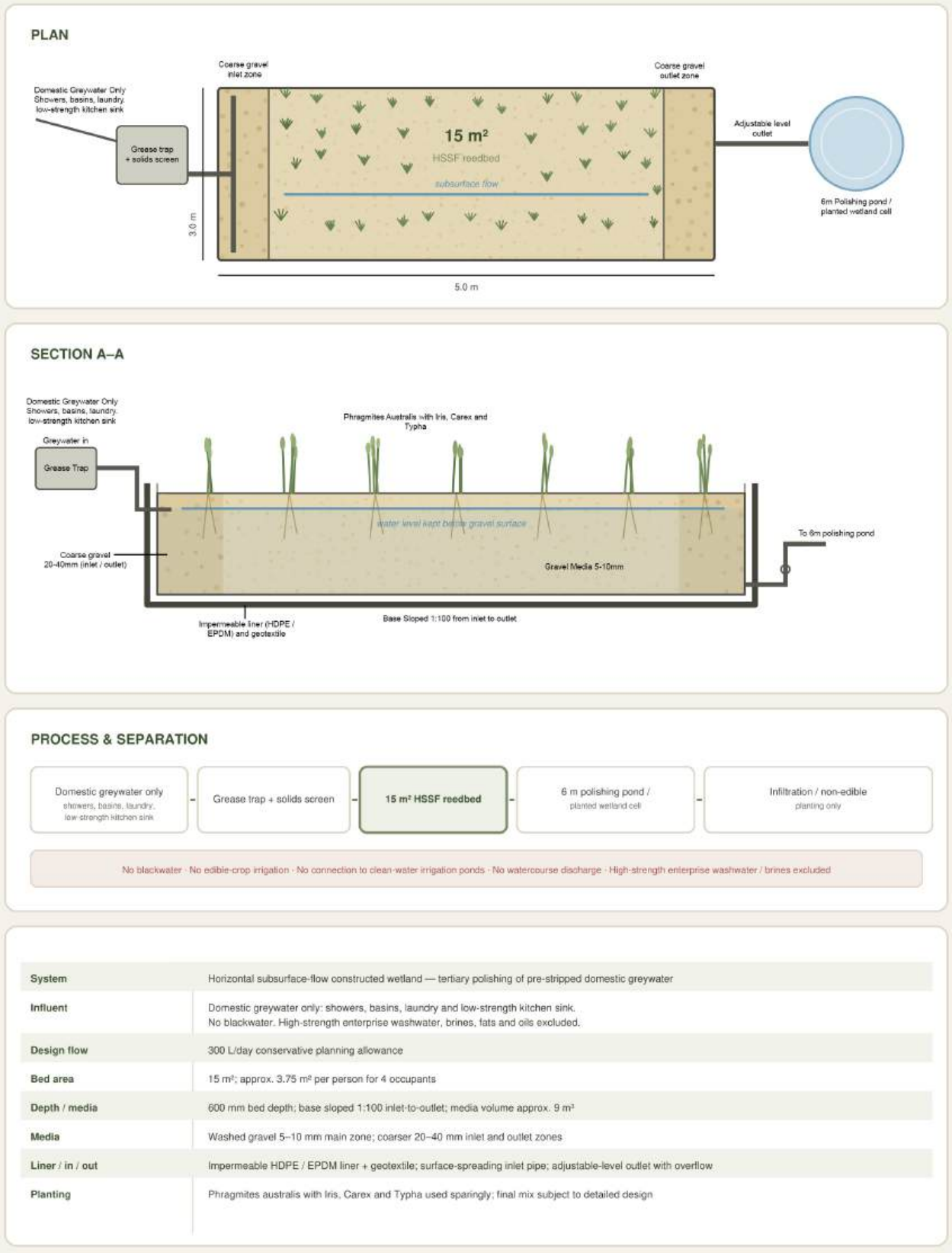



Figure 6-6: Integrated Water and Sanitation Cycle. The diagram shows the separation of harvested rainwater, household greywater, urine-diverting dry-toilet solids and source-separated urine. Treated greywater is routed to reedbed / infiltration / non-edible planting only, while clean harvested water supports edible-crop irrigation.

**Figure 6-7: Greywater Reedbed Treatment Design**




| | |
|---|---|
| **System** | Horizontal subsurface-flow constructed wetland — tertiary polishing of pre-stripped domestic greywater |
| **Influent** | Domestic greywater only: showers, basins, laundry and low-strength kitchen sink.<br>No blackwater. High-strength enterprise washwater, brines, fats and oils excluded. |
| **Design flow** | 300 L/day conservative planning allowance |
| **Bed area** | 15 m²; approx. 3.75 m² per person for 4 occupants |
| **Depth / media** | 600 mm bed depth; base sloped 1:100 inlet-to-outlet; media volume approx. 9 m³ |
| **Media** | Washed gravel 5–10 mm main zone; coarser 20–40 mm inlet and outlet zones |
| **Liner / in / out** | Impermeable HDPE / EPDM liner + geotextile; surface-spreading inlet pipe; adjustable-level outlet with overflow |
| **Planting** | Phragmites australis with Iris, Carex and Typha used sparingly; final mix subject to detailed design |

Figure 6-7: Greywater Reedbed Treatment Design. Indicative schematic showing domestic greywater routed through a grease trap / solids screen and 15 m² horizontal subsurface-flow reedbed before discharge to a 6 m polishing pond / planted wetland cell and infiltration / non-edible planting only. Blackwater is avoided through urine-diverting dry toilets, and treated greywater is not used for edible-crop irrigation.

### 6.5.3 Greywater treatment

**Table 6-10: Greywater treatment schedule**

| Parameter | Adopted allowance | Notes |
|---|---|---|
| Influent type | Greywater only | Showers, basins, laundry and kitchen preparation water; no blackwater |
| Design flow | 300 L/day | Conservative planning allowance |
| Treatment type | Horizontal subsurface-flow reed-bed | Single adopted design for the application |
| Area | 15 m² | Adopted to keep the treatment schedule conservative and easy to audit |
| Depth / media volume | 0.6 m / approx. 9 m³ | As per the earlier worked sizing table re-tained in revised form |
| Back-up route | 6 m polishing pond / infiltration / non-edible planting | For maintenance periods, exceptional under-performance or seasonal polishing / infiltration management |
| Reuse route | Non-edible planting only | Coppice, willow, hedgerow or equivalent non-food planting; no edible-crop irriga-tion and no connection to the two 10 m clean-water ponds |
| Polishing pond / planted wetland cell | 6 m diameter | Only open-water feature receiving treated greywater after the reedbed; not used for edible-crop irrigation |

The application therefore adopts one greywater treatment route: a 15 m² horizontal subsurface-flow reedbed fol-lowed by a 6 m polishing pond / planted wetland cell, infiltration and/or non-edible planting. Kitchen grease control, inspection points and quarterly checks are part of the maintenance regime. The important planning point is that treated greywater is not used for edible-crop irrigation and is not routed to the two 10 m clean-water irrigation re-serve / attenuation ponds.

### 6.5.4 Water quality, resilience and use restrictions

The system keeps clean rainwater, greywater and human-waste streams separate, which simplifies treatment and re-duces risk. Treated greywater is not proposed for edible-crop irrigation. Edible crops and productive enterprise areas, including wasabi and protected cropping, are supplied from harvested rainwater, clean runoff, clean-water irrigation ponds, mulched beds and efficient drip distribution. Greywater, once treated, is reserved for the reedbed / polishing pond route, infiltration and non-edible planting only.

**Figure 6-8: Dry-Spell Irrigation Resilience**

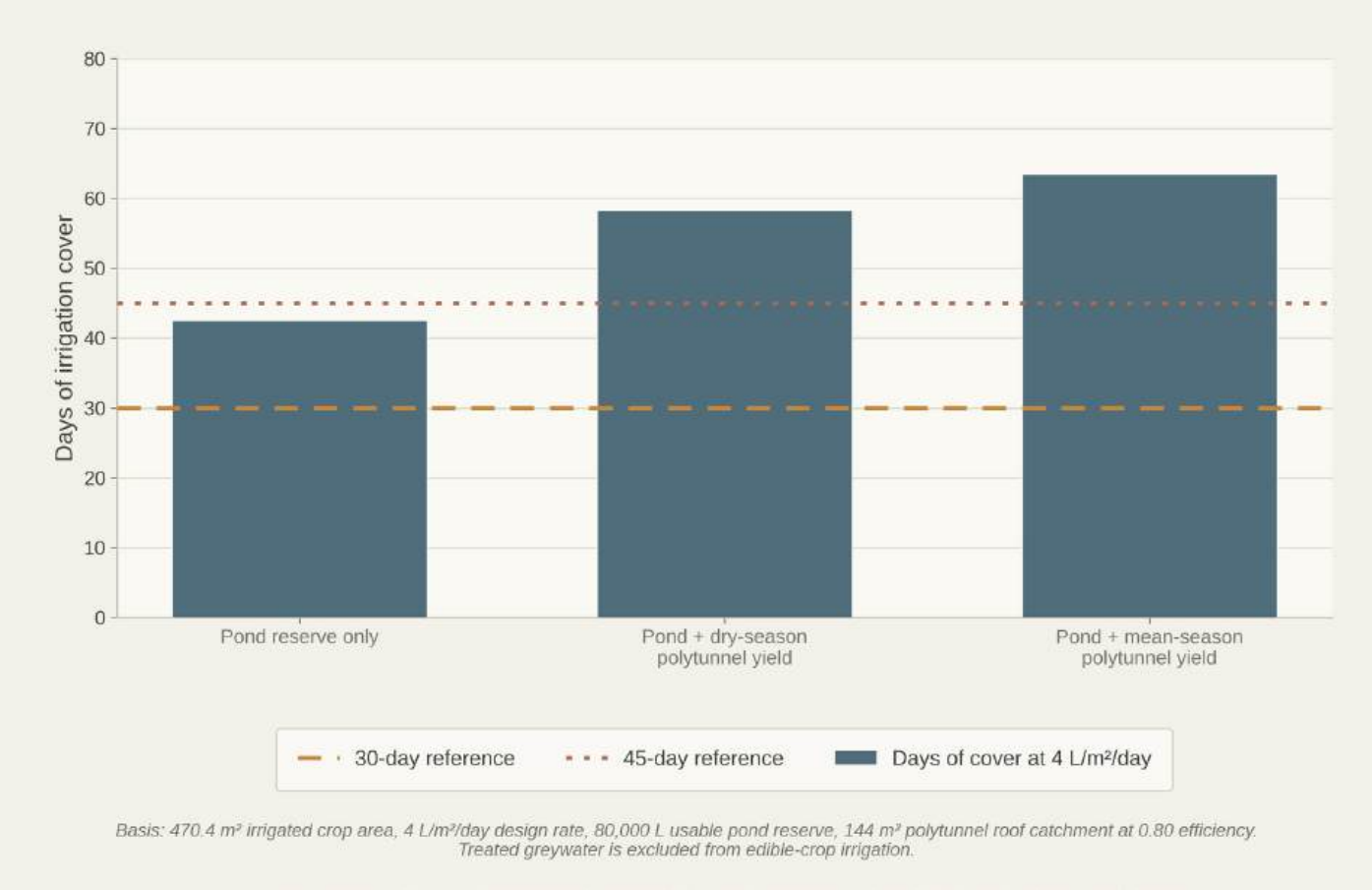



Figure 6-8: Dry-Spell Irrigation Resilience. The chart compares the number of days of irrigation cover available to the 470.4 m² annual vegetable and protected-crop area at the adopted design rate of 4 L/m²/day. The approximately 80 m³ usable pond reserve provides around 43 days of cover; adding the dry-season polytunnel rainwater yield increases this to around 58 days, and adding the mean-season polytunnel yield increases it to around 63 days. The 30-day and 45-day reference lines demonstrate that the combined clean-water storage and harvesting strategy provides resilience through a prolonged dry spell. Treated greywater is not included in these calculations and is not used for edible-crop irrigation.

## 6.6 Surface Water and Flood Risk

The site falls gently northwards and the surface-water strategy is therefore based on slowing, spreading, storing and infiltrating runoff on site rather than concentrating it and exporting it quickly. [135][137]

### 6.6.1 Surface-water management strategy

**Table 6-11: Surface-water management features**

| Feature | Function |
|---|---|
| Rainwater harvesting | Removes a large proportion of clean roof runoff from the surface-water system at source |
| Permeable access and parking surfaces | Allow direct infiltration and reduce fast overland flow from hard surfaces |
| Shallow contour swales / rain-garden features | Slow and spread runoff from productive areas and tracks |
| Clean-water irrigation / attenuation ponds and greywater polishing pond | Two 10 m clean-water ponds provide irrigation reserve and clean runoff attenuation; the separate 6 m polishing pond receives treated greywater only |
| Vegetated infiltration areas | Ensure any excess clean water is dispersed within the site rather than discharged untreated to a watercourse |

The strategy is intentionally simple: harvest clean roof water first, keep hard surfaces permeable, slow overland flow

with shallow vegetated features, and store / infiltrate any excess water within the site. That combination is more robust than relying on one engineered end-of-pipe feature. [135][137]

### 6.6.2 Climate resilience

The design must cope with wetter winters, heavier short-duration rainfall events and longer dry spells. The 40 m³ potable store, two 10 m clean-water irrigation reserve / attenuation ponds, separate non-potable irrigation catchments, conservative roof-yield assumptions and on-site attenuation / infiltration together create resilience to both drought and intense rainfall. In effect, the same system that reduces dependence on off-site water also reduces the rate and volume of runoff leaving the developed area.

### 6.6.3 Maintenance

Surface-water maintenance is straightforward: keep gutters and downpipes clear, inspect permeable surfaces for clogging, cut back excessive growth in swales / wetland margins where needed, and record the performance of the system after notable storm events. The annual monitoring table in Section 6.7 turns those actions into an auditable routine rather than an aspiration.

## 6.7 Monitoring & Reporting

OPD monitoring is strongest when the figures used in the management plan can be recorded easily in practice. The table below is intended to function both as a monitoring schedule and as the basis for the annual Chapter 6 return. [130]

**Table 6-12: Annual monitoring template for Chapter 6**

| Parameter | Frequency | Primary record | Reported in |
|---|---|---|---|
| PV generation (kWh) | Monthly | Inverter portal / spreadsheet | Annual OPD return |
| Domestic electrical use (kWh) | Monthly | Sub-meter / spreadsheet | Annual OPD return |
| Enterprise / ancillary electrical use (kWh) | Monthly | Sub-meter / spreadsheet | Annual OPD return |
| Battery low-SOC events and low-solar mode days | Event log | Operations diary | Annual OPD return |
| Annual biomass use | Each heating season | Fuel log | Annual OPD return |
| Potable rainwater harvested and consumed | Monthly | Water meter / tank log | Annual OPD return |
| Non-potable irrigation-water use | Monthly in growing season | Tank / pump log | Annual OPD return |
| Dry-toilet chamber changes / resting periods | Event log | Sanitation log | Annual OPD return |
| Greywater reedbed inspection | Quarterly | Maintenance checklist | Annual OPD return |
| Potable water quality check | Annually | Test certificate / file note | Annual OPD return |
| Surface-water features after major storms | As events occur | Farm diary with photographs | Annual OPD return |
| Clean-water pond levels and irrigation drawdown | Weekly in growing season | Pond staff gauge / irrigation log | Annual OPD return |
| Greywater polishing pond inspection | Quarterly | Maintenance checklist / photographs | Annual OPD return |

### 6.7.1 Reporting timetable

The first Chapter 6 monitoring return should be prepared 12 months after first habitation of the dwelling and annually on that anniversary thereafter. This aligns the chapter with the standard OPD monitoring logic of measuring actual operation over complete years of occupation. [130]

### 6.7.2 Adaptive management triggers

If domestic water use rises materially above the design target, the first response is demand reduction: shower-flow

checks, leak checks, fixture replacement and behaviour review. If the domestic roof yield under-performs, gutter efficiency and first-flush performance are checked before any system expansion is considered. If the reedbed shows standing water, odour or poor vegetation performance, flow can be diverted temporarily to the infiltration back-up while the bed is inspected and restored. If low-solar event days become more frequent than anticipated, the operational response is to review winter load scheduling before increasing equipment size. These triggers keep the chapter practical and measurable. [131][136]

## 6.8 Conclusion

This revised chapter gives Lower Wych one clear energy and water story. The building envelope is fixed to a single WikiHouse fabric schedule; the electrical system is fixed to an approximately 20.9 kWp roof-mounted PV array, 50 kWh battery bank and critical-load control; the heat system is fixed to an ASHP-led thermal-store strategy with a small resilience woodfuel allowance; and the water system is fixed to Appendix J.1's conservative 40 $m^3$ potable rainwater strategy, separate non-potable clean-water irrigation ponds, source-separated sanitation and a 15 $m^2$ greywater reedbed discharging to a separate 6 m polishing pond / infiltration / non-edible planting route.

Just as importantly, the chapter separates domestic and enterprise energy demand, separates potable water from non-potable clean-water irrigation supply, and separates greywater from human-waste and edible-crop irrigation streams. That makes the scheme easier to build, easier to monitor and easier for the Local Planning Authority to audit. On the figures adopted here, the system remains robust in winter, remains positive under the Appendix J.1 dry-year domestic water scenario, and provides a practical basis for long-term operation and annual reporting.

## References

[129] Welsh Government (2010). Technical Advice Note 6: Planning for Sustainable Rural Communities.

[130] Welsh Government / Land Use Consultants / Positive Development Trust (2012). One Planet Development Practice Guidance.

[131] Lower Wych OPD. 2026. Final Energy Strategy - figures to use, controlled planning-stage energy schedule.

[132] Lower Wych OPD. 2026. Building Fabric Table - WikiHouse Skylark 250 Plus, controlled fabric-performance source table.

[133] WikiHouse / Open Systems Lab. 2024. Technical Specifications: WikiHouse Skylark version 1.0.

[134] Parker, J., Glew, D., Rakhshanbabanari, K. and Gorse, C. 2021. WikiHouse Thermal Performance Modelling and Life Cycle Assessment. Leeds Beckett University / Innovate UK Project 77084.

[135] Lower Wych OPD Management Plan. 2026. Section 2: Baseline, current cross-chapter.

[136] Lower Wych OPD Management Plan. 2026. Section 7: Waste Management, current cross-chapter.

[137] Lower Wych OPD. 2026. Submitted Proposed Floor Plans and Elevations.

[138] Lower Wych OPD. 2026. Appendix J.1 - Domestic Potable Rainwater Report.

[139] Lower Wych OPD. 2026. Appendix J.3 - Market Garden and Polytunnel Irrigation Strategy.

[140] European Commission Joint Research Centre. 2026. PVGIS-5 off-grid PV system performance report for Lower Wych coordinates, 20.88 kWp PV / 50 kWh battery / 14.164 kWh/day load, generated 12 May 2026.



# 7.Waste Management

# 7. Waste Management

**Essential criteria (OPD Practice Guidance - Waste, paras. 3.69-3.74): [141]** *One Planet Developments must minimise waste, assimilate biodegradable waste on site wherever practical, and export only very small quantities of non-biodegradable or hazardous material where this is the most sustainable option. Waste performance also feeds directly into the Ecological Footprint Analysis and annual monitoring requirements. [141][142]*

The waste strategy responds directly to the OPD requirements in TAN 6 paragraphs 4.17 to 4.22 and the supporting OPD Practice Guidance on waste assimilation, alongside Planning Policy Wales Edition 12 [143], TAN 21 Waste [146], and the Welsh Government Beyond Recycling circular economy strategy [144]. It is also designed to be compatible with food hygiene, animal by-product, veterinary-medicine and NRW small-sewage-discharge regulatory requirements, with final registrations, exemptions or permits confirmed before the relevant systems are brought into use.

The Lower Wych strategy is therefore based on a simple hierarchy: prevent waste first; keep reusable containers and materials in circulation; compost and recover nutrients safely on site; treat greywater through a separate natural treatment chain; and send only residual, non-reusable or hazardous materials off site through lawful collection, recycling or household waste routes.

This section applies to the four-person household, land-based enterprises, food-production areas and small community activities on the 5.12-acre / 2.07 ha holding. It aligns with the Section 6 water strategy: clean-water irrigation reserve / attenuation ponds are kept separate from the greywater reedbed and polishing pond; treated greywater is not used for edible-crop irrigation; and no blackwater is generated because WC flushing is avoided through urine-diverting dry toilets.

By Year 5 the management target is to reduce residual non-recyclable waste to below 100 kg/year, with an aspirational stretch target of 30 kg/year where monitoring shows this is achievable in practice. The lower figure is treated as a performance stretch target rather than a fixed planning assumption, so that the annual monitoring system remains credible for a family household and working smallholding.

## 7.1. Waste Hierarchy, Governance and Audit Method

### 7.1.1. Waste hierarchy and circular metabolism

The waste strategy follows the legally recognised waste hierarchy: prevent, reduce, re-use, recycle, recover and dispose only as a last resort. [146][147]

Prevention is delivered through bulk purchasing, refillable containers, durable tools, repair before replacement, minimal packaging, digital paperwork where practical, and on-site food production that reduces bought-in food packaging. Re-use is delivered through Kilner-style jar-deposit systems (£1 deposit per jar), reusable crates for CSA distribution, 40-litre HDPE totes for wholesale / restaurant deliveries collected on return trips, HDPE bucket circulation, cardboard sheet-mulch, repairable equipment and local redistribution of surplus materials. Recycling and recovery are used only where prevention and re-use are not available.

The strategy is designed to be auditable. Each significant waste stream has a named management route and a simple monitoring record, so that annual OPD reporting can be based on logs, weights, volumes, receipts and visual inspections rather than broad aspiration.

### 7.1.2. Waste stream inventory and source analysis

Waste generation at Lower Wych arises from four linked activities: the domestic household; the productive holding and livestock / poultry systems; the small fermentation, mushroom, microgreen, wasabi and CSA enterprises; and occasional managed community or educational visits. Table 7-1 identifies the principal waste streams, approximate quantities and the planned management route for each.

**Table 7-1: Waste stream inventory and on-site management routes**

| Waste stream | Approx. quantity / source | Management route and monitoring |
|---|---|---|
| Kitchen peelings and plate scrapings | c. 400 kg/year from household food preparation and meals | Layered into hot-compost bays and wormeries with sufficient dry carbon. Recorded in the compost log by bay, date and approximate volume. |
| Human faeces and cover material from urine-diverting dry toilets | c. 150 L/year solids, plus dry cover material | Collected in sealed containers, hot-composted where suitable, then cured for at least 12 months before use around trees, coppice or other non-annual edible areas. Recorded in the sanitation log. |
| Source-separated human urine | c. 2,000 L/year from UDDTs | Stored separately, with struvite recovery / nutrient capture used where installed. Residual liquid is applied only to willow, coppice or other non-edible nutrient strips at recorded rates. Not discharged to reedbed, ponds, watercourse or edible annual beds. |
| Paper, cardboard, glass, metal, HDPE and domestic residual waste | c. 60 kg paper/cardboard, 50 kg glass, 5 kg metal lids, 10 kg HDPE, and target residual waste below 100 kg/year by Year 5 | Re-used first, then recycled. Residuals and small hazardous items are taken to Wrexham HWRC or other lawful route on combined supply trips. Weights / bag volumes and receipts are retained where available. |
| Crop residues, weeds and spoiled produce | Variable, seasonal, from no-dig beds and polytunnels | Chopped and composted, used as surface mulch where appropriate, or fed into worm systems. Persistent weeds are hot-composted or excluded if seed risk is high. |
| Woody prunings from orchard, coppice and hedgerows | c. 1-2 $m^3$/year | Chipped for paths, mulch and compost carbon; retained as habitat piles where appropriate; or dried for kindling / small woodfuel if suitable. Recorded in annual land-management notes. |
| Deep-litter bedding and manures from poultry / small livestock | Several barrows/year, depending on stocking levels | Composted in hot bays with dry carbon and returned to productive land only at appropriate rates, informed by soil monitoring. No runoff route to ponds, ditches, woodland edge or the LWS. |
| Veterinary medicines, sharps and packaging | Low - occasional from goat / poultry health management | Sharps stored in BS 7320 / UN3291 sharps containers and collected by registered clinical-waste contractor on combined trips. Veterinary medicine packaging separated; some categories require hazardous-waste disposal. Records of medicine use, batch numbers and disposal route retained as required by Veterinary Medicines Regulations 2013 [158]. |
| Fallen stock (goats / poultry) | Rare; goat as required, poultry occasional | Fallen goats and poultry mortalities are stored securely, protected from access by animals and birds, and removed without undue delay by a registered fallen-stock collector, incinerator or other approved route in accordance with assimilated Regulation (EC) 1069/2009 and the Animal By-Products (Enforcement) (Wales) Regulations 2014 [160]. On-site burial or burning of fallen stock is not proposed. Records retained. |
| Spent mushroom substrate | c. 300 kg/year from log, block and woodchip systems | Reused as compost bulking material, mulch around non-sensitive areas, or additional carbon in human-waste composting. Recorded in the enterprise log. |

| Waste stream | Approx. quantity / source | Management route and monitoring |
|---|---|---|
| Kitchen peelings and plate scrapings | c. 400 kg/year from household food preparation and meals | Layered into hot-compost bays and wormeries with sufficient dry carbon. Recorded in the compost log by bay, date and approximate volume. |
| Fermentation brines, lees and wash-down residues | c. 200 L/year at small-enterprise scale | Food-safe residues are reused as ingredients where appropriate. Non-food residues are captured and composted / worm-processed in small, diluted batches where suitable. Strong brines, fats, oils and cleaning chemicals are not discharged to the reedbed and are not fed to livestock unless confirmed compliant with animal-feed and animal by-product requirements. |
| Wasabi stems, leaf off-cuts, microgreen root mats and trimmings | c. 50 kg/year | Used as food products where safe, dehydrated or fermented where appropriate, or composted. Microgreen mats are composted rather than treated as residual waste. |
| Domestic greywater | c. 1.05 kg P/year as a conservative planning allowance | Treated through the 15 m² horizontal subsurface-flow reedbed described in Section 6, then routed to the 6 m polishing pond / planted wetland cell, infiltration and / or non-edible planting only. |
| Enterprise wash-water | Small-scale wash-water from produce handling and processing | Minimised at source. Solids are screened before any treatment route. Only domestic-equivalent wash-water is routed to the reedbed. |
| Community / educational visit waste | Low volume from pre-booked small events only | Reusable cups, plates and crates are used. Any visitor waste is separated, recorded and removed through the same recycling / residual routes as household waste. |

**Figure 7-1: Circular Waste and Nutrient Cycle**

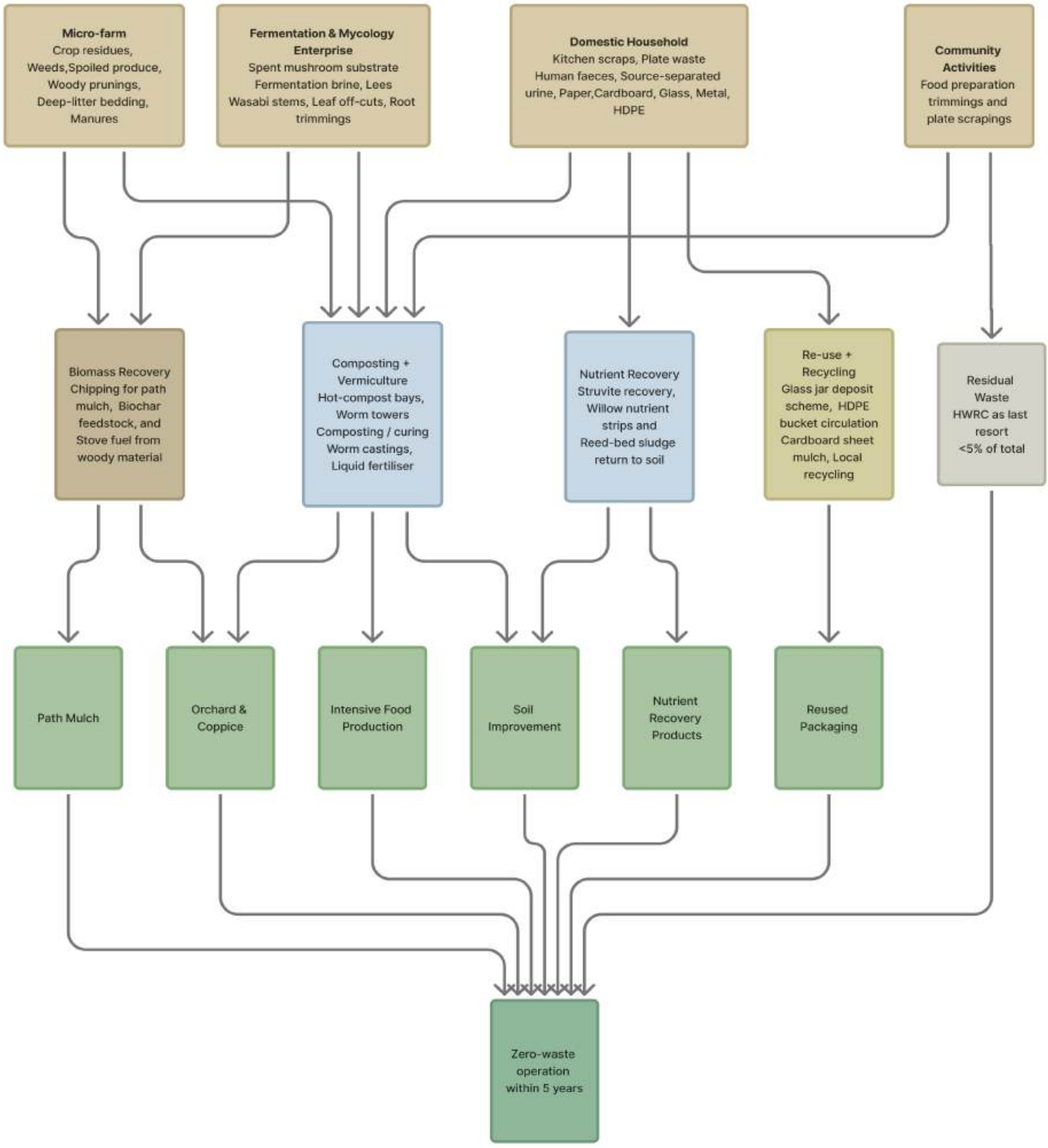



Figure 7-1: Circular Waste and Nutrient Cycle. The diagram shows the main household, enterprise and land-management waste streams and how they are reused through composting, vermiculture, biomass recovery, nutrient capture, recycling and residual off-site disposal.

## 7.2. Organic Waste Processing Systems and Nutrient Recovery

### 7.2.1. Composting infrastructure and thermophilic processing

The organic waste system is based on covered hot-compost bays, vermiculture and carbon-rich mulching. The composting area will be located away from the woodland edge, ponds and any direct surface-water pathway, with a stable working surface, dry-carbon storage and no uncontrolled leachate route. Food scraps, crop residues, poultry bedding, spent mushroom substrate and suitable paper / cardboard are combined to maintain a balanced carbon-to-nitrogen ratio in the working range of approximately 25-30:1, adjusted by adding more dry carbon (sawdust, shredded cardboard, woodchip or spent mushroom substrate) if the bay shows signs of nitrogen excess (ammonia smell, slumping or fly activity), or more nitrogen-rich material if heating is inadequate.

The normal composting protocol is: build each bay with alternating green and brown layers; maintain adequate moisture without waterlogging; use dry carbon to prevent odour and flies; monitor temperature during the active phase; turn or rebuild if heating is inadequate; and cure finished compost before soil application. The target hot phase follows WHO Safe Use guidelines [150]: at least 55 °C for 3 or more days, 60 °C for 2 or more days, or 65 °C for 1 or more day, where sanitation or weed-seed control is needed. The hot phase is followed by a curing phase of at least 12 months for sanitation compost before any application around trees, coppice or other non-annual edible areas, in line with WHO non-edible-use guidance.

Compost produced from ordinary kitchen and garden materials may be used on annual vegetable beds once mature. Compost that has incorporated humanure or sanitation residues will be kept in a separate batch record and used only around trees, coppice, hedgerows or other non-annual edible areas.

### 7.2.2. Vermiculture, mulching and woody biomass reuse

Vermiculture provides a low-energy route for suitable kitchen scraps, soft crop residues and small quantities of diluted fermentation residues. Worm systems will be kept covered, shaded and protected from excess liquid. Finished vermicompost is used as a soil conditioner and potting-mix component in small quantities.

Woody prunings and hedge/coppice arisings are retained within the holding wherever practical. Chipped material is used for paths, compost carbon, mulch, habitat piles and, where suitable, small-scale biochar production. Any ash or biochar used in soil will be applied conservatively and recorded, avoiding over-application of potassium or phosphorus.

## 7.3. Human Waste Management and Sanitation Systems

### 7.3.1. Urine-diverting dry toilet design and operation

The dwelling will use urine-diverting dry toilets rather than flush WCs. This avoids blackwater production, substantially reduces water demand, and separates the highest-nutrient urine fraction from faecal solids at source. As a result, there is no WC effluent discharge to the greywater reedbed, polishing pond or any surface-water pathway.

The toilets will be selected and installed as a system suitable for a permanent dwelling, with fly-proof containers, urine diversion, dry cover material, ventilation and accessible container exchange. Cover material will be based on dry shredded carbon such as sawdust, shredded cardboard and spent mushroom substrate where suitable.

Indicative UDDT specification. The dwelling will be fitted with two manufactured urine-diverting dry-toilet systems meeting the design intent below; final equipment selection is confirmed at Building Regulations stage in line with Approved Document Part G / Part H and with regard to BS ISO 30500 [149].

**Table 7-2: Indicative urine-diverting dry toilet specification**

| Parameter | Specification |
|---|---|
| System pattern | Urine-diverting dry toilet, gravity solids-collection chamber model (e.g. NatSol Compact, Kildwick FreeLoo, Separett Tiny, or equivalent). |
| Number installed | Two - primary household WC plus secondary, as shown on the proposed floor plans. |
| Urine diversion | Front-to-rear porcelain or composite separator with gravity drain to sealed urine storage. |

| Parameter | Specification |
|---|---|
| Solids container | Sealed, fly-proof, easily exchanged container (typically 60-80 L), with secondary spare for rotation. |
| Cover material | Dry shredded carbon (sawdust, shredded cardboard, spent mushroom substrate where suitable); cover after each use. |
| Ventilation | Continuous low-volume extract from solids chamber to external roof / wall vent, fan-assisted, with isolation provision for maintenance. |
| Container exchange | Indicative 6-8 weeks for a four-person household; actual interval based on filling rate. |
| Composting period | Minimum 12 months active composting plus curing in a separate, labelled batch system. |
| Use restriction | Cured humanure compost applied only around trees, coppice, hedgerows or other non-annual edible areas; never on annual edible crop beds. |
| Standards reference | WHO Safe Use guidelines [150], BS ISO 30500 [149], Building Regulations Part G / Part H. |
| Records | Container change date, batch identity, active composting period, curing period, approximate volume and final application location retained in the sanitation log. |

Faecal solids and cover material will be handled as a controlled sanitation stream rather than ordinary garden compost. Containers will be exchanged before overfilling, moved to the designated composting area, and composted / cured in labelled batches.

### 7.3.2. Urine storage, struvite recovery and nutrient-strip use

Source-separated urine is expected to be approximately 2,000 L/year for the four-person household. Typical household urine phosphorus is of the order of 1-2 g/person/day, giving a planning-stage gross phosphorus load of approximately 2 kg P/year for four residents.

Urine will be stored in sealed tanks or containers with secondary containment where practical. The preferred management route is nutrient recovery, including struvite precipitation where installed, followed by controlled use of the remaining liquid only on willow, coppice or other non-edible nutrient strips at recorded rates. Urine will not be discharged to the greywater reedbed, polishing pond, clean-water irrigation ponds, watercourse, ditches or edible annual crop beds.

Loading capacity check. The 2 kg P/year urine load is sense-checked against the receiving-area strategy. The 2,250 m² (0.225 ha) of new coppice provides the primary mature receiving area once established, but urine-derived nutrient application will not be concentrated on new coppice during establishment. Application will instead be distributed across approved non-edible receiving zones rather than concentrated in one location:

- new coppice (2,250 m² / 0.225 ha) - primary receiving area once established;

- hedgerow base / boundary planting strips along non-edible boundaries, where buffered from drainage routes;

- dedicated nutrient-strip planting, such as willow or comfrey strips, where established;

- struvite recovery, where installed, reducing residual phosphorus load before any liquid application.

Application locations and dates will be recorded, and soil-test results will determine whether any receiving zone is paused or avoided. Any area accessible to goats or poultry will observe relevant organic-fertiliser grazing restrictions and will be excluded from livestock access as required before re-entry. If monitoring shows soil or vegetation phosphorus approaching upper limits in any receiving zone, application will be paused, distributed more widely, or routed through enhanced struvite recovery before further use.

## 7.4. Greywater and Enterprise Wash-Water

### 7.4.1. Domestic greywater treatment route

Domestic greywater will arise from showers, basins, laundry and ordinary kitchen-preparation water. It is separate from toilet waste because the UDDTs avoid blackwater entirely. Greywater will be treated through the same system

described in Section 6: a 15 m² horizontal subsurface-flow reedbed discharging to a separate 6 m diameter polishing pond / planted wetland cell, infiltration and / or non-edible planting only.

The 15 m² reedbed equates to approximately 3.75 m²/PE for four occupants, within the typical 3-5 m²/PE range for horizontal subsurface-flow reedbeds operating downstream of source separation. Because the largest organic load (WC blackwater) is removed at source through urine-diverting dry toilets, the reedbed is designed for tertiary polishing of pre-stripped greywater rather than for primary BOD removal of mixed wastewater.

**Table 7-3: Domestic greywater reedbed and polishing pond specification**

| Parameter | Specification |
|---|---|
| System type | Horizontal subsurface-flow (HSSF) constructed wetland. |
| Surface area | 15 m² (3.75 m²/PE for 4 PE). |
| Indicative dimensions | 3 m × 5 m, with length-to-width ratio approximately 5:3 to maintain plug-flow hydraulics. |
| Bed depth | 600 mm typical; sloped approximately 1:100 from inlet to outlet. |
| Primary media | Washed gravel 5-10 mm in main treatment zone; coarser 20-40 mm at inlet and outlet zones. |
| Liner | Impermeable liner (HDPE or EPDM) with protective geotextile above and below; full perimeter containment. |
| Inlet | Surface-spreading distribution pipe across full bed width, fed from a primary settlement / grease trap. |
| Outlet | Adjustable-level outlet with overflow protection, discharging to the 6 m polishing pond. |
| Planting | Mixed native marginal species, with Phragmites australis dominant and Iris pseudacorus, Carex spp. and Typha latifolia used sparingly for habitat diversity. |
| Pre-treatment | Solids screen and grease trap upstream; serviced before each year's growing season and as required. |
| Hydraulic design basis | Planning-stage greywater design flow per Section 6; hydraulic retention confirmed by final flow calculation in Section 6 / Appendix J.1; tertiary polishing role. |
| Receiving water route | 6 m polishing pond to infiltration / non-edible planting; no direct discharge to watercourse. |

This is deliberately separate from the clean-water irrigation reserve / attenuation ponds. Those clean-water ponds receive rainwater and clean surface-water runoff only; they do not receive greywater or reedbed effluent. Treated greywater is not used for edible-crop irrigation and is not directed to the market garden or polytunnel drip-irrigation system.

The planning-stage commitment is that the system will avoid blackwater discharge, avoid direct discharge to the River Dee SAC catchment, and maintain a physically separate chain between greywater treatment and edible-crop irrigation.

The final greywater discharge route will be designed to meet NRW's small sewage effluent discharge exemption criteria, with the system registered as exempt before use. Where any exemption criterion cannot be met, an environmental permit will be obtained before the system is brought into use. The design intent is to keep discharge volume below the relevant threshold, use discharge to ground through percolation, and provide treatment through an appropriate system [153].

### 7.4.2. Enterprise wash-water controls

A distinction is made between ordinary domestic-equivalent wash-water and higher-strength enterprise wash-water. Light produce-washing water, after solids screening, may be treated through the greywater system if its strength is comparable to domestic greywater.

Food-processing residues will be minimised at source through dry scraping, solids capture, careful batch sizes and low-toxicity cleaning products.

### 7.4.3. Greywater maintenance and inspection

The greywater system will be maintained through simple, regular checks: grease and solids traps checked frequently; inlet and outlet points inspected for blockage; reedbed vegetation checked during the growing season; polishing pond level and clarity observed after heavy rainfall; and any ponding, odour, backing-up or unusual discharge treated as an immediate maintenance trigger.

Annual monitoring will record inspections, maintenance actions, any sampling results, and any operational changes made in response to performance issues. Reed cuttings and wetland vegetation arisings will be composted only where suitable and will not be allowed to create a concentrated nutrient pathway to ponds, ditches or the woodland edge.

## 7.5. Enterprise Waste, Packaging and Residual Waste

### 7.5.1. Enterprise resource loops

The enterprise strategy is designed so that most by-products remain useful resources. Mushroom substrate becomes compost carbon or mulch; microgreen mats and crop trimmings are composted; wasabi leaves and stems are used as food products where safe or otherwise composted; and clean cardboard is reused as sheet mulch before decomposition.

Fermentation residues are managed cautiously. Food-safe residues may be reused as ingredients, seasoning bases or compost inputs. They will not be fed to livestock unless confirmed compliant with animal-feed and animal by-product requirements. Strong brines and high-salt residues will be kept out of the reedbed and used only in small, controlled quantities where they will not harm soil biology.

Animal by-products regulation. Catering waste, kitchen scraps, plate residues and any food residues that have entered the kitchen environment will not be fed to poultry, livestock or any farmed animal on the holding, in compliance with the appropriate. Poultry and goat feed will be sourced as compliant feedstuffs. Uncooked plant material that has never entered the kitchen environment - for example weeds, garden trimmings and surplus crop residues taken directly from the field - may be offered as forage where compatible with the rotational grazing management. All kitchen-origin organic residues are routed exclusively to compost.

### 7.5.2. Packaging elimination and local distribution

Packaging is reduced by selling locally, using reusable crates for CSA distribution, retaining Kilner-style jars with a £1 deposit per jar for preserves and ferments, using 40-litre HDPE totes for wholesale / restaurant deliveries collected on return trips, and avoiding postal sales where this would create disproportionate packaging and transport impacts. Customers will be encouraged to return jars, boxes, crates, insulated carriers and totes. Return rates will be recorded through a simple deposit / container ledger so the system can be adjusted if container losses become material.

Any packaging that cannot be reused will be recycled where possible. Residual packaging waste forms part of the residual-waste monitoring target: below 100 kg/year by Year 5, with a stretch target of 30 kg/year if monitoring shows that this is achievable.

### 7.5.3. Veterinary and livestock-related waste

The dairy goat, poultry and beekeeping enterprises generate three small-volume but regulated waste streams: veterinary medicines and packaging; sharps from vaccination and worming routines; and fallen stock.

Veterinary medicines are sourced and used in accordance with the holding's animal health plan and the Veterinary Medicines Regulations 2013 [158]. Used sharps are stored in BS 7320 / UN3291 sharps containers [161] and collected by a registered clinical-waste contractor on combined supply trips. Veterinary medicine packaging is sorted by waste classification: most packaging is recyclable or general waste, but residue-bearing containers and certain medicine categories are managed as hazardous waste under WM3 [148] and disposed of through specialist routes. Records of medicine use, batch numbers and disposal route are retained as required.

Fallen stock is managed in accordance with assimilated Regulation (EC) 1069/2009, Commission Regulation (EU) 142/2011 and the Animal By-Products (Enforcement) (Wales) Regulations 2014 [160]. Fallen goats, poultry mortalities and any larger mortality are stored securely and removed from site without undue delay by a registered

fallen-stock collector, knacker, incinerator or other approved route. On-site burial or burning of fallen stock is not proposed.

Apiary by-products such as wax cappings, frame residues and dead bees are managed within the beekeeping enterprise as compostable material or, in the case of suspect-disease colony residues, in accordance with National Bee Unit inspection guidance [157].

## 7.6. Water Pollution Prevention Plan

The ecological evidence for Lower Wych identifies on-site and nearby sensitive habitats, including the adjacent-north-western lowland mixed deciduous woodland section, the on-site pond P1, native hedgerows, scattered mature trees, and the wider Wych Brook / River Dee SAC catchment. The waste and greywater systems are therefore designed to prevent nutrient, sediment, organic-matter or chemical pathways to any of these sensitive receptors.

**Table 7-4: Water pollution hazards, probability of occurrence and mitigation strategy**

| Hazard | Potential incident | Probability | Mitigation / response |
|---|---|---|---|
| Greywater reedbed blockage or backing-up | Inlet, grease trap or distribution pipe blocks and causes local ponding | Low | Fit solids / grease traps, inspect inlet and outlet points, keep a maintenance log, stop discharge to the affected part of the system until cleared. |
| Polishing pond / infiltration overload | High rainfall or maintenance failure causes water to exceed normal design level | Low | Maintain freeboard, route overflow only to vegetated infiltration / non-edible planting, inspect after storms, and adjust inflow or maintenance if persistent. |
| Compost or humanure leachate escape | Compost becomes saturated or is located where runoff can leave the working area | Low | Use covered bays, adequate dry carbon, stable working surface, no location on direct drainage lines, and inspect after heavy rain. |
| Urine storage leak | Tank, pipe or container failure releases stored urine | Low | Use sealed containers, secondary containment where practical, monthly inspection and immediate transfer / cleanup if leakage is observed. |
| Fermentation brine or high-strength wash-water enters reedbed | Incorrect disposal of salt-rich or cleaning residues | Low | Label containers, dry scrape first, keep strong brines / oils / fats / cleaners out of the reedbed, and capture separately. |
| Fuel, lubricants or cleaning chemicals | Small spill from tools, pumps or maintenance activities | Low | Store in sealed and bunded containers, keep spill kit on site, avoid storage near ponds / ditches / reedbed and record any incident. |
| Construction sediment or material runoff | Groundworks or deliveries create silt-laden runoff | Low with CEMP | Use staged construction, avoid wet-soil trafficking, keep materials away from drainage routes, and install temporary silt controls if required. |
| Off-site residual / hazardous waste | Incorrect storage or delayed disposal of batteries, electronics, ceramics or other residuals | Low | Store securely under cover and remove through lawful HWRC / specialist routes on combined trips. Keep receipts or trip notes where available. |

### 7.6.1. Odour, pests and amenity control

No activity proposed is expected to generate significant odour if managed correctly. Composting, humanure handling and fermentation will be managed through dry carbon cover, sealed containers, covered bays, adequate aeration, small batch sizes and regular inspections. Any odour, fly nuisance or pest activity will trigger immediate correction:

adding dry carbon, rebalancing moisture, turning or rebuilding the batch, sealing containers.

Waste-processing areas will be positioned and screened so that they remain part of the working holding rather than a visible or odorous feature for neighbours or visitors.

### 7.6.2. Emergency response and notification

If a pollution incident occurs, the immediate response will be to stop the source, contain the material, protect any drainage pathway, assess the environmental risk and document the event. If there is any risk to a watercourse, protected habitat, the reedbed / pond system or public health, Natural Resources Wales and the Local Planning Authority will be notified as required.

The incident record will include date, cause, material involved, estimated quantity, containment actions, notification, remediation and the system change made to prevent recurrence.

## 7.7. River Dee Phosphorus Pathway Control

### 7.7.1. Catchment context and management objective

The holding drains within the wider Wych Brook / River Dee catchment. The management objective is therefore not simply to reduce waste in general, but to prevent any credible phosphorus or nutrient pathway from sanitation, greywater, composting or enterprise activity to the River Dee Special Area of Conservation.

The design achieves this by avoiding blackwater discharge, source-separating urine, treating greywater through a dedicated reedbed and polishing / infiltration route, excluding treated greywater from edible-crop irrigation, preventing compost leachate escape, and applying organic nutrients only at appropriate rates informed by soil monitoring.

The source-pathway-receptor evidence assembled in this section, the Section 6 water strategy and the Section 5 land-management prescriptions provides the technical basis for the Habitats Regulations Assessment screening position set out in Section 2 (Baseline) and the supporting HRA Screening Report. The waste-system controls are framed so that no credible nutrient or chemical pathway exists from the holding to the qualifying features of the River Dee SAC, the Fenn's, Whixall, Bettisfield, Wem and Cadney Mosses SAC, or the Doley Wood and Meadows LWS woodland section. Within the holding, the adjacent LWS woodland section is treated as an additional sensitive receptor: no compost, humanure, urine, livestock manure or greywater outputs are routed into, applied within the woodland section.

**Figure 7-2: Phosphorus Pathway Control and Nutrient Capture**

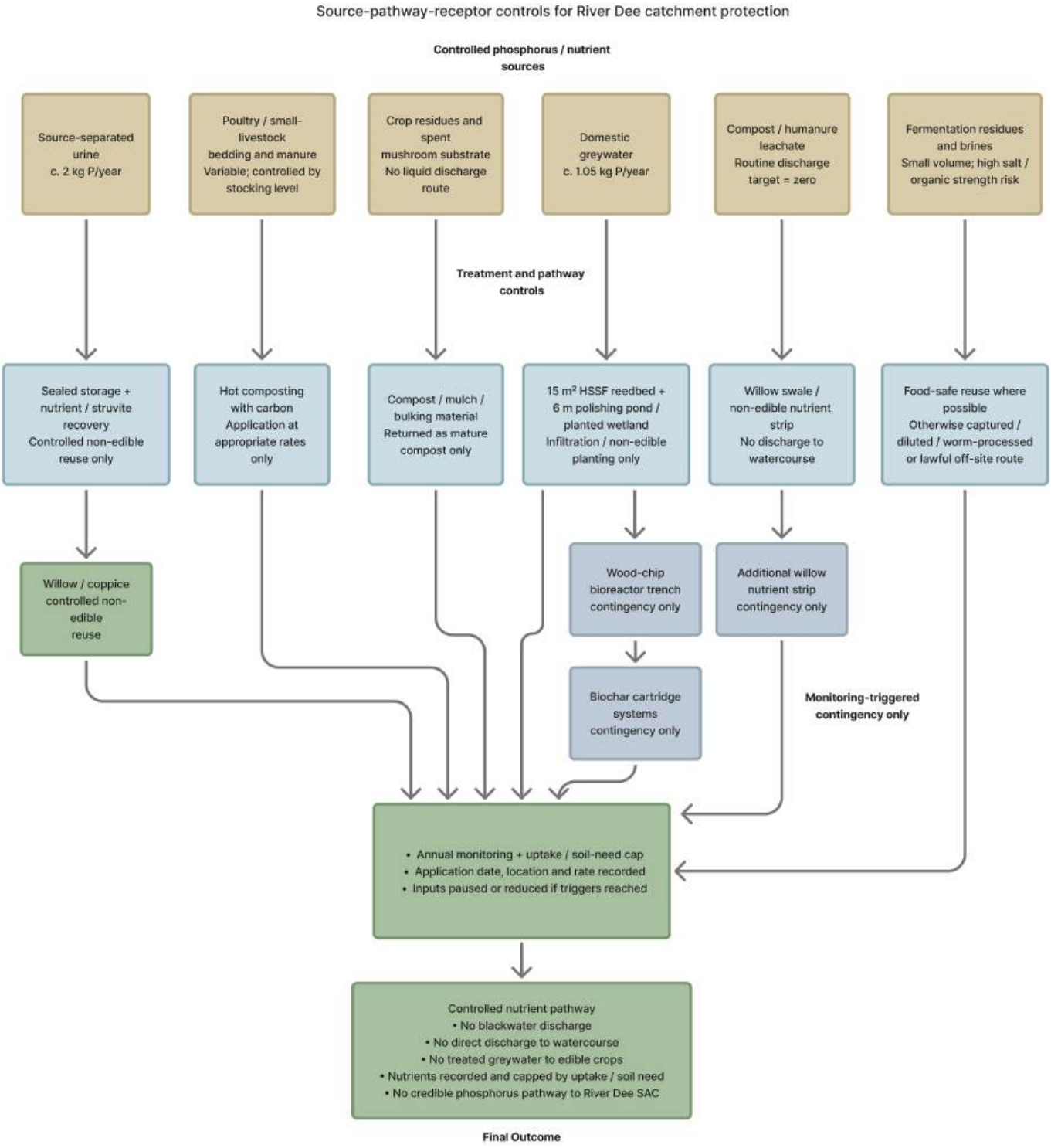



Figure 7-2: Phosphorus Pathway Control and Nutrient Capture. The diagram shows the main phosphorus-bearing streams, the treatment or barrier applied to each, and the monitored residual route. The strategy avoids blackwater discharge, separates greywater from edible-crop irrigation, prevents compost leachate escape, and applies organic nutrients only at recorded rates informed by soil monitoring.

### 7.7.2. Phosphorus control register

**Table 7-5 is a nutrient-pathway control register rather than a claim of precise chemical neutrality. It identifies the gross source, the treatment / barrier and the residual management route for each stream, with the source-separated urine stream using a planning-stage gross phosphorus load of approximately 2 kg P/year for the four-person household.**

**Table 7-5: Phosphorus pathway control register**

| Source / stream | Planning-stage gross P or risk basis | Treatment / barrier | Residual pathway and monitoring |
|---|---|---|---|
| Source-separated urine | c. 2 kg P/year from c. 2,000 L/year urine | Stored separately; struvite recovery / nutrient capture used where installed; no discharge to reedbed, ponds or watercourse | Residual liquid used only on willow, coppice or non-edible nutrient strips at recorded rates. Soil / vegetation response reviewed annually. |
| Domestic greywater | c. 1.05 kg P/year as a conservative planning allowance | 15 m² horizontal subsurface-flow reedbed, followed by 6 m polishing pond / planted wetland cell, infiltration and / or non-edible planting | No use on edible crops. Reedbed and polishing pond inspected; any ponding, odour or poor performance triggers maintenance and review. |
| Compost / humanure leachate | Routine discharge target = zero; precautionary risk allowance c. 0.10 kg P/year | Covered bays, dry carbon, stable working area, no direct runoff route, batch separation for sanitation compost | No uncontrolled runoff. Any leachate risk triggers extra carbon, cover, relocation or system repair. |
| Poultry / small livestock bedding and manure | Variable; controlled by stocking level and bedding volume rather than discharge volume | Hot composted with carbon and applied at agronomic rates | Application locations and quantities recorded. Soil tests guide whether inputs are reduced, paused or redirected. |
| Crop residues and spent mushroom substrate | Nutrients retained in plant / fungal biomass | Composted, mulched or used as bulking material | Returned to productive soils as mature compost / mulch. No liquid discharge route. |
| Fermentation residues and brines | Small volume but potentially high salt / organic strength | Food-safe reuse where possible; otherwise captured and composted / worm-processed only in suitable diluted quantities | Not discharged to reedbed or ponds. Not fed to livestock unless animal-feed compliance is confirmed. |
| Clean-water irrigation reserve / attenuation ponds | No greywater or sanitation input | Receive only clean rainwater / clean surface-water runoff | Physically separate from greywater chain. Used for irrigation reserve / attenuation and wildlife margins only. |

The final detailed drainage design and any required NRW permit or exemption position will be confirmed before installation. If annual monitoring identifies rising soil phosphorus, poor reedbed performance, nutrient-enriched runoff risk or pond water-quality concerns, nutrient application will be reduced or paused and the relevant system repaired or redesigned before further loading.

## 7.8. Monitoring, Triggers and Annual Reporting

Waste monitoring will be simple enough to maintain but detailed enough to satisfy annual OPD review. Records will be kept in a site logbook or spreadsheet and summarised in the annual monitoring return.

**Table 7-6: Waste and nutrient monitoring ledger**

| System / stream | Record kept | Year-5 target | Trigger and corrective action |
|---|---|---|---|
| Residual waste | Weight, bag volume or HWRC trip record | Below 100 kg/year; stretch target 30 kg/year | If above target, review procurement, packaging, repair and reuse routes. |
| Compost bays | Bay build date, inputs, temperature checks, turning, curing date and final use | All suitable organic waste processed on site | Odour, flies, saturation or failure to heat triggers extra carbon, turning, cover or batch rebuild. |
| Humanure / sanitation compost | Container change dates, batch identity, composting / curing period and final application area | No blackwater discharge; full curing before use | Any handling issue triggers pause in use, extended curing or system adjustment. |
| Urine storage / nutrient recovery | Approximate volume, storage, struvite recovery if used, application date / location / rate | No discharge to reedbed, ponds, ditches or edible annual beds | Storage nearing capacity or application-rate concern triggers pause and review. |
| Greywater reedbed | Visual inspections, grease / solids trap cleaning, maintenance and any sampling results | No odour, blockage, ponding or untreated bypass | Any failure triggers maintenance and temporary reduction of inflow if required. |
| Polishing pond / infiltration area | Water level, clarity, vegetation health and storm observations | Stable levels and no nutrient pathway to edible crops or watercourse | Persistent high levels, algal growth or odour triggers design / maintenance review. |
| Enterprise wash-water | Activity, solids removed, disposal route and any captured high-strength liquids | Only domestic-equivalent wash-water to reedbed | High-strength stream identified: capture separately and confirm lawful treatment route. |
| Packaging / reusable containers | Kilner-style jar issue / return and £1 deposit ledger; CSA crate log; 40-litre HDPE wholesale / restaurant tote issue / return log | High return rate; minimal single-use packaging; HDPE totes collected on return trips | Low return rate triggers deposit adjustment, container reminders or alternative packaging system |
| Off-site recycling / hazardous waste | Trip notes, receipts or photo records where available | Combined with existing supply trips wherever practical | Unplanned trips or growing volumes trigger procurement review. |

## 7.9. Implementation Timeline and Conclusion

### 7.9.1. Construction-phase waste management

Construction-phase waste arises from the WikiHouse Skylark 250 Plus dwelling assembly, the workshop / business building, polytunnel installation, fencing, paddock infrastructure, ponds, reedbed and associated landscape works. The construction strategy minimises arisings at source through:

- dry-assembled timber-cassette dwelling construction, with limited cut-offs by design and CNC cutting to maximise sheet utilisation;

- off-site fabrication of cassettes and components, reducing on-site cut waste;

- reuse of subsoil from pond and reedbed excavations as berms, landscape forming and habitat features, with no off-site soil export expected;

- reuse of suitable construction off-cuts as kindling, sheet-mulch or future-build store stock;

- local / regional sourcing of materials where practical to reduce packaging and transport impacts;

- selection of material types with established recycling routes, including timber, OSB3, woodfibre, sheep's wool, EPDM and metal roofing.

A simple Site Waste Management approach is implemented for the construction phase: estimate arisings by stream before works; record arisings against estimate during construction; segregate streams on site (timber, woodfibre / wool insulation off-cuts, plasterboard, metal and residual); reuse on site where possible; recycle through compliant Wrexham-area facilities; and landfill only as a last resort [162].

An indicative diversion-from-landfill target of at least 90% by mass is set for the construction phase. Records of arisings, reuse and disposal route are retained for the duration of the construction works and presented in the first annual OPD monitoring return after first occupation.

Before first occupation, the dry-toilet system, composting area, urine storage, greywater reedbed, polishing pond / infiltration route and clean-water irrigation ponds will be installed or clearly phased so that no uncontrolled waste or wastewater stream is created.

In Years 1-2, the focus will be on establishing reliable household routines, container-return systems, compost logs and greywater inspections. In Year 3, waste, nutrient and greywater performance will be reviewed alongside the wider OPD mid-term monitoring. By Year 5, the target is a stable, auditable waste system that assimilates biodegradable streams on site, avoids blackwater discharge, keeps greywater away from edible-crop irrigation, and exports only small residual or hazardous fractions through lawful routes.

The strategy satisfies the OPD waste-assimilation requirement by combining waste prevention, source separation, on-site composting, nutrient recovery, conservative greywater treatment and annual monitoring.

## References

[141] Welsh Government (2012). One Planet Development Practice Guidance: Technical Advice Note 6 - Planning for Sustainable Rural Communities. Welsh Government, Cardiff.

[142] Welsh Government (2010). Technical Advice Note 6: Planning for Sustainable Rural Communities. Welsh Government, Cardiff.

[143] Welsh Government (2024). Planning Policy Wales, Edition 12. Welsh Government, Cardiff.

[144] Welsh Government (2021). Beyond Recycling: A Strategy to Make the Circular Economy in Wales a Reality. Welsh Government, Cardiff.

[145] National Assembly for Wales (2010). Waste (Wales) Measure 2010. Welsh Government, Cardiff.

[146] Welsh Government (2014). Technical Advice Note 21: Waste. Welsh Government, Cardiff.

[147] Welsh Government (2014). Waste Planning Practice Guide (Support Document to TAN 21: Waste). Welsh Government, Cardiff.

[148] Environment Agency (2015, updated). Waste Classification: Guidance on the Classification and Assessment of Waste (Technical Guidance WM3). Environment Agency, Bristol.

[149] British Standards Institution / ISO (2025). BS ISO 30500:2025, Non-sewered sanitation systems - Prefabricated integrated treatment units - General safety and performance requirements for design and testing. BSI, London.

[150] World Health Organization (2006). Guidelines for the Safe Use of Wastewater, Excreta and Greywater. Volume 4: Excreta and Greywater Use in Agriculture. WHO, Geneva.

[151] Natural Resources Wales (2021). Phosphorus Compliance Assessment of Welsh River SACs. NRW Evidence Report.

[152] Natural Resources Wales (2025). Updated Phosphorus Compliance and Actions for SAC Rivers in Wales (briefing note, March 2025).

[153] Natural Resources Wales (ongoing). Registration of small sewage effluent discharges: guidance on exemptions, permits and operation of septic tanks and small sewage treatment systems. NRW online guidance.

[154] Arden, S. & Ma, X. (2018). Constructed wetlands for greywater recycle and reuse: A review. Science of the Total Environment, 630, 587-599.

[155] Zamora, P., Georgieva, T., Salcedo, I. et al. (2017). Long-term operation of a pilot-scale reactor for phosphorus recovery as struvite from source-separated urine. Journal of Chemical Technology and Biotechnology, 92(5), 1035-1045.

[156] Welsh Government (2007). Technical Advice Note 18: Transport. Welsh Government, Cardiff.

[157] National Bee Unit (ongoing). Bee health inspection guidance for England and Wales. APHA / Welsh Government.

[158] Veterinary Medicines Directorate (2013, updated). Veterinary Medicines Regulations 2013 - guidance for users and

record-keeping requirements. VMD.

[159] GOV.UK / DEFRA (ongoing). Fallen stock: guidance for keepers on storage, collection and disposal routes. DEFRA.

[160] Welsh Government (2014, as amended). Animal By-Products (Enforcement) (Wales) Regulations 2014; assimilated Regulation (EC) 1069/2009 and Commission Regulation (EU) 142/2011.

[161] BSI Group. BS 7320 - Specification for sharps containers. BSI.

[162] Health and Safety Executive / Welsh Government (ongoing). Construction waste management and waste hierarchy guidance for construction projects.



# 8.Zero Carbon Buildings

# 8. Zero Carbon Buildings

**Essential criteria (OPD Practice Guidance §3.105): [163]** *Domestic and ancillary buildings will be 'zero carbon' in construction and use as explained in the guidance and using the up-to-date Welsh definition of zero carbon.*

This section demonstrates how the proposed buildings at Lower Wych satisfy that test. It provides one auditable planning-stage schedule covering the proposed structures, the WikiHouse specification, the operational-energy strategy, embodied-carbon evidence, Building Regulations route, monitoring and exit strategy.

## 8.1 Purpose and OPD Zero-Carbon Test

TAN 6 and the OPD Practice Guidance require One Planet Development buildings to be very low carbon in both construction and use. The Practice Guidance also makes clear that this is a specified carbon-reduction standard rather than a claim that a building has no physical carbon impact at all. The planning question is therefore whether the buildings are low-impact, materially evidenced, efficient in operation, capable of meeting the relevant zero-carbon standard, and tied to monitoring and an exit strategy. [163][164]

This chapter sits within TAN 6 paragraphs 4.15 to 4.22 and the OPD Practice Guidance zero-carbon buildings criteria. PPW 12 paragraph 3.59 frames One Planet Development as development that, through its low impact, either enhances or does not significantly diminish environmental quality. The development-plan context is Future Wales 2040 and the residual Wrexham Unitary Development Plan 1996-2011 (adopted 2005), with particular relevance to PS1, PS2, GDP1 and EC6 where they address sustainable design, landscape fit and buildings in the countryside. [164][180][181][182]

For this section, the up-to-date Welsh zero-carbon test is treated through three connected routes: the OPD Practice Guidance requirement for a specified carbon-reduction standard rather than literal zero physical carbon; the current / transitional Approved Document L (Wales) Building Regulations route for regulated operational energy and carbon compliance; and a project-specific materials / whole-life-carbon schedule that records construction impact transparently. [163][166][175]

The planning and Building Control evidence will be anchored to the SAP / Part L Wales outputs and the as-built commissioning records.

The Lower Wych response is based on six linked commitments:

- use a high-performance timber cassette construction system with low embodied impact and dry assembly;
- minimise concrete through ground screw piles and lightweight demountable structures;
- use a single locked fabric and services schedule that aligns with Section 6;
- meet operational energy demand through the roof-first renewable system described in Section 6;
- verify construction impact through a Materials report and whole-life-carbon schedule; and
- make every principal structure capable of lawful conversion, reuse, removal or restoration if the OPD no longer complies.

## 8.2 Building and Structure Schedule

Table 8-1 identifies every principal building or structure that forms part of the planning-stage zero-carbon and reversibility case. The dwelling is proposed to the full domestic WikiHouse Skylark 250 Plus fabric standard. The enterprise building uses the same low-impact, reversible timber-cassette construction logic, with fabric and services differentiated by use, and is also treated as requiring Building Regulations approval. The root cellar, polytunnels and open barn are not proposed to require Building Regulations approval, with the position recorded at detailed design / Building Control stage.

**Table 8-1: Proposed buildings and structures**

| Building / structure | Planning and Building Regulations status | Zero-carbon, servicing and exit approach |
|---|---|---|
| WikiHouse dwelling | Domestic building and sole residence for the named OPD occupants. Building Regulations approval required. | WikiHouse Skylark 250 Plus on screw piles. High-performance fabric, MVHR, ASHP-led heat and hot water, thermal store, roof-mounted PV and battery storage. Capable of removal or conversion if residential use must cease. |
| Enterprise building: workshop, business kitchen, packing / processing, mushroom room and smallholding office / dry store | Ancillary land-based enterprise building. Building Regulations approval required. | Same low-impact, reversible timber-cassette construction logic as the dwelling, with fabric strategy differentiated by use. The mushroom room, business kitchen / hygiene areas and any temperature-sensitive spaces are insulated and serviced only to the level required for product quality, hygiene and condensation control. The workshop, packing, dry store and general maintenance areas remain unheated, lightly serviced enterprise spaces. Hygienic hot water, extract ventilation and small electrical loads are supplied within the Section 6 energy budget. Capable of continuing as an agricultural / enterprise building or being dismantled. |
| Root cellar / passive cold store | Agricultural / storage structure for produce preservation. Not proposed to require Building Regulations approval. | Low-impact passive storage with no routine heating or mechanical cooling. Retained only if lawful and useful for agricultural storage; otherwise removed and land restored. |
| Two polytunnels | Protected cropping structures, 2 no. 6 m x 12 m. Not proposed to require Building Regulations approval. | Lightweight, unheated, demountable crop-production structures. Roof runoff contributes to the separate clean-water irrigation strategy. Can be removed with very low ground impact. |
| Open barn / tool stores | Agricultural support structures. Not proposed to require Building Regulations approval. | Simple timber / demountable agricultural storage, unheated and repairable. Retained for agriculture or removed under the exit strategy. |
| Access track, parking and turning areas | Landscape / access infrastructure rather than zero-carbon buildings. | Permeable / grass-reinforced construction. Designed to support emergency access while minimising soil sealing. Removal or narrowing can be secured through the exit strategy if required. |
| PV, battery, tanks and service infrastructure | Operational infrastructure linked to the approved buildings. | Roof-first renewable generation and modular plant. Components are replaceable and removable; performance is recorded through the annual monitoring regime. |

**Table 8-2: Storey count and area schedule**

| Structure / area | Planning-stage area / form | Use in zero-carbon assessment |
|---|---|---|
| Dwelling | Part Single-storey / part double WikiHouse dwelling. 136 m2 GEA / approximately 115 m2 GIA, as shown on the floor plans and elevations. | Domestic zero-carbon building assessed through SAP / Part L Wales, fabric schedule, operational energy strategy. |
| Enterprise building | Single-storey WikiHouse enterprise building. 141 m2 GEA / approximately 114 m2 GIA, including the 18 m2 GIA indoor mushroom growing room. | Ancillary low-carbon enterprise building assessed through the same reversible timber-cassette construction logic, with fabric and services differentiated by use rather than treated as a fully domestic-standard heated building. |
| Open barn / tool store allowance | Simple unheated agricultural support structure; size shown on supporting plans. | Low-impact ancillary agricultural structure; no routine operational heating or cooling. |
| Combined built footprint | 313 m2 / 0.031 ha / 0.077 acres, equal to approximately 1.51% of the 5.12-acre holding. | Demonstrates that built form remains compact and that the majority of the holding remains in productive, ecological or land-management use. [183] |

The floor plan separates domestic accommodation from business and land-management functions. The business kitchen, hygiene functions and packing area support the land-based food enterprise; the mushroom room is a low-energy controlled microclimate space; and the workshop / office / dry store supports maintenance, records and small-scale processing.

**Table 8-3: Domestic and enterprise room logic**

| Space | Use classification | Servicing and heating assumption |
|---|---|---|
| Kitchen / dining, living, bedrooms, bathroom, porch and domestic circulation | Domestic dwelling | Served by the dwelling MVHR, ASHP / thermal store and domestic hot water system. |
| Technical room | Shared building-services space | Houses energy, water-treatment and control equipment. Monitored as part of Section 6. |
| Workshop | Land-based enterprise / maintenance | No dedicated space heating. Small intermittent electrical tools and chargers only. |
| Business kitchen and hygiene room | Food preparation / hygiene support for enterprise products | No dedicated space heating. Hygienic hot water and extract ventilation provided within the adopted energy schedule. |
| Packing area and fermentation storage | Enterprise processing, storage and packing | No dedicated space heating. Temperature-sensitive loads remain modest and are recorded as enterprise energy use. |
| Mushroom growing area | Low-energy mycology production | No whole-room heating. Designed around passive buffering, humidity management, shelving and small intermittent electrical loads rather than continuous mechanical conditioning. |
| Smallholding office + dry store | Enterprise administration and dry storage | No dedicated space-heating system is proposed. Any future temporary frost or humidity protection would be logged as enterprise energy use and kept within the Section 6 allowance. |

## 8.3 WikiHouse Skylark 250 Plus Specification

The dwelling adopts the locked domestic WikiHouse Skylark 250 Plus specification. The enterprise building uses the same low-impact, reversible timber-cassette construction logic, while its fabric and servicing are differentiated by use so that structural, fire, embodied-carbon and Building Regulations evidence can be assessed consistently without implying a fully heated domestic-standard enterprise envelope. [169][171]

**Table 8-4: Locked construction specification for the principal buildings**

| Element | Specification | Planning significance |
|---|---|---|
| Structural system | WikiHouse Skylark 250 Plus domestic specification for the dwelling: CNC-cut 18 mm OSB3 interlocking timber-cassette chassis with external woodfibre over-insulation: 60 mm to walls and floor, and 100 mm to the roof, matching the Section 6 fabric schedule. Enterprise building uses the same reversible timber-cassette logic with fabric varied by use. | Dry, lightweight, engineered timber system; suitable for rapid assembly, material efficiency and end-of-life disassembly. |
| Foundations | Ground screw piles with timber base plates / ring beam. | Avoids poured concrete foundation; reduces excavation and enables removal without contaminated demolition arisings. |
| Wall insulation | Sheep's wool insulation within the Skylark cassette cavity. | Natural-fibre insulation with low embodied impact, humidity buffering and local / UK supply-chain. |
| External over-insulation | Steico woodfibre board to the Section 6 fabric schedule: 60 mm to external walls and floor; 100 mm to roof. | Improves U-values, reduces thermal bridging and adds biogenic material mass. |
| Airtightness / vapour control | Continuous INTELLO PLUS or equivalent vapour / airtightness layer with sealed penetrations. | Supports the 0.15 AC/H design target and controlled MVHR-led ventilation. |
| Internal lining and fire strategy | Plasterboard retained as the fire-tested lining route, with two layers of 15 mm fire board where required and standard plasterboard elsewhere. | Preserves the tested fire-performance logic and avoids relying on untested material substitutions. |
| Internal finish | Lime-plaster skim on plasterboard surfaces. | Breathable, repairable finish consistent with approved Welsh low-impact building practice. |
| External cladding | Welsh-sawn larch weatherboard, with board profile selected at detailed design stage. | Natural, recessive rural finish that weathers down and supports local sourcing. |
| Sloped roof areas | Standing seam metal sheet, with profile and colour selected at detailed design stage. | Durable roof finish, suitable for rainwater harvesting and roof-mounted PV. |
| Flat roof areas / green roof | EPDM single-ply membrane to potable flat-roof catchment areas. Separate green-roof area over suitable waterproofing as shown on the roof layout. | Durable clean-water catchment forming part of Appendix J.1 roof-yield assumptions; green-roof runoff excluded from potable rainwater harvesting and routed to landscape attenuation / swales. |
| Floor finish | Cork flooring on the WikiHouse floor cassette and deck. | Low-impact, comfortable, repairable finish with biogenic material content. |

| Element | Specification | Planning significance |
|---|---|---|
| Windows and doors | FSC-certified hardwood timber frames with high-performance triple glazing. | Supports the low-heat-loss fabric strategy and durable natural-material palette. |
| Services | MVHR, ASHP, thermal store, roof-mounted PV, LiFePO4 battery storage and room-sealed boiler stove for low-solar resilience. | Matches Section 6 and keeps operational carbon performance auditable. |

The roof strategy uses standing seam metal to the sloped roof areas, EPDM to the potable flat-roof catchment areas, and a separate green-roof area excluded from potable harvesting, coordinated with the rainwater-harvesting evidence and the roof-first PV strategy. [173][176]

The sheep's wool insulation, external woodfibre board and INTELLO PLUS vapour-control / airtightness layer are treated as one building strategy. The natural-fibre insulation and woodfibre provide vapour-open, hygroscopic buffering, while the intelligent internal membrane controls interstitial condensation risk and provides the airtightness line. Detailed condensation-risk checks and junction drawings will be completed at Building Regulations stage.

The preferred external cladding is Welsh-sawn larch through a Coed Cymru / Welsh sawmill supply chain where available. If local larch supply is constrained, an equivalent UK-grown durable cladding species such as larch, Douglas fir or sweet chestnut will be used, with the substitution recorded in the materials schedule and selected to maintain durability, low embodied impact and a recessive rural appearance.

**Figure 8-1: WikiHouse Construction System and Dry-Assembly Method**

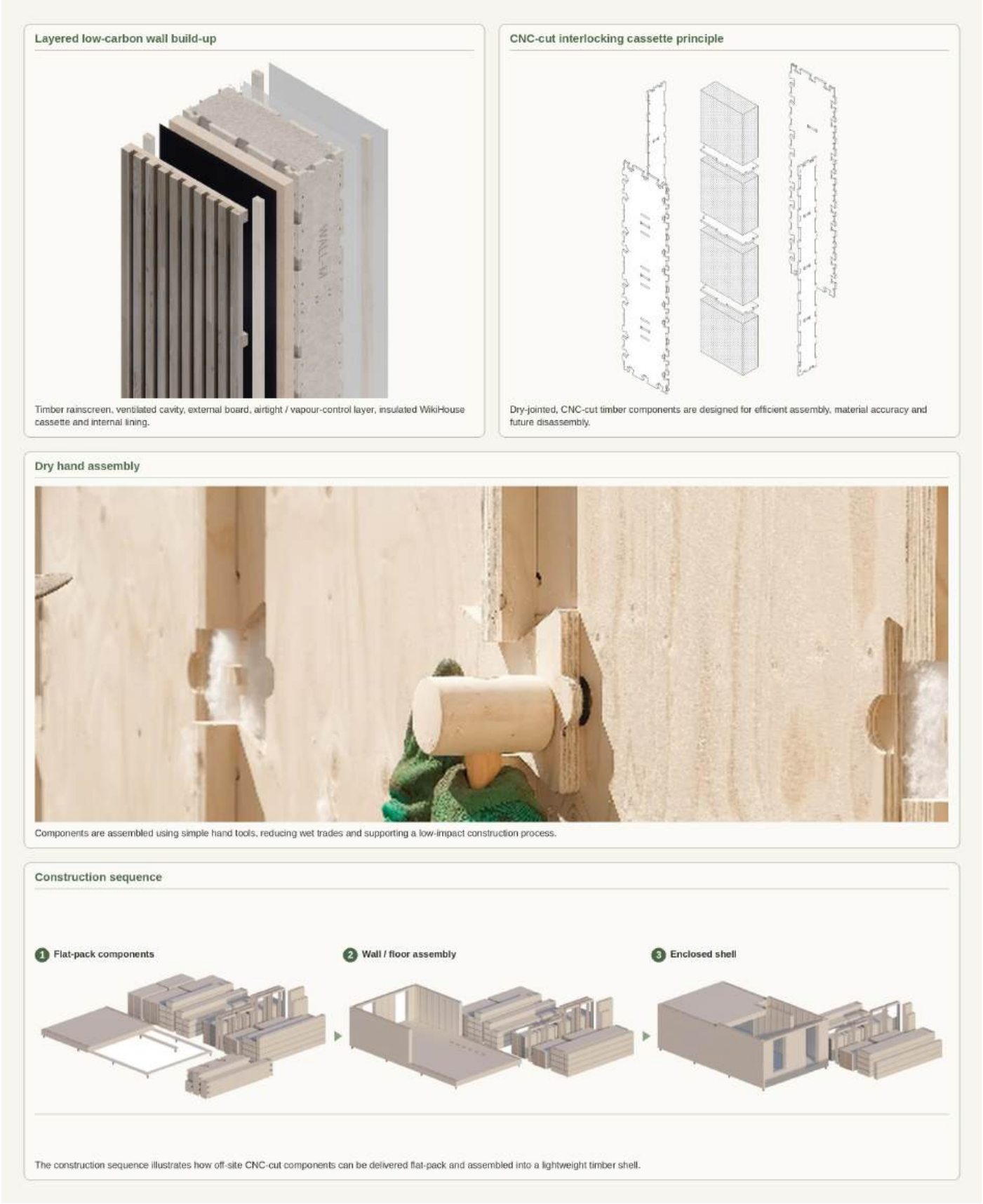
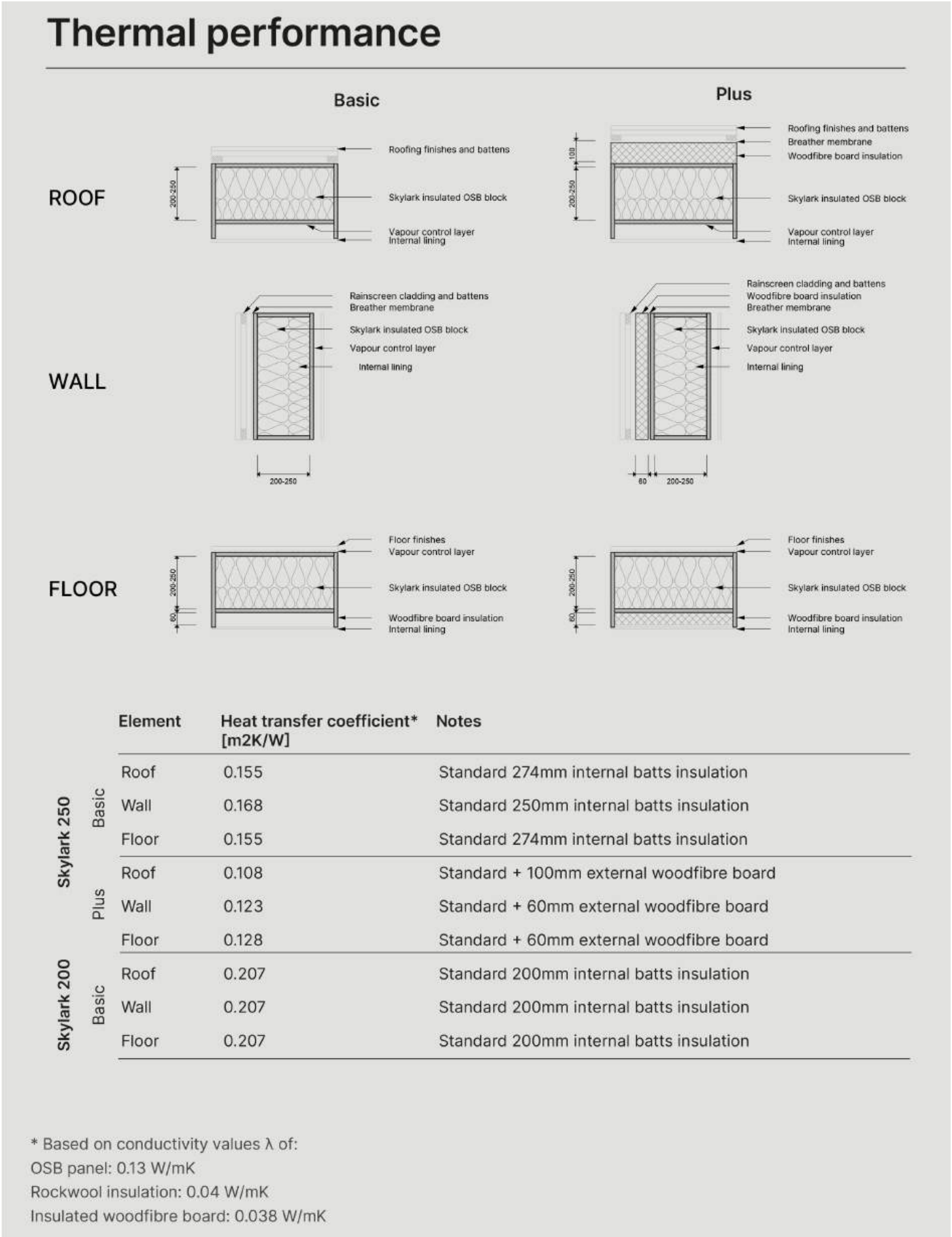



Figure 8-1: WikiHouse Construction System and Dry-Assembly Method. The figure illustrates the proposed timber-cassette construction approach, including layered wall build-up, CNC-cut interlocking cassette logic, hand assembly and flat-pack construction sequencing.

**Figure 8-2: WikiHouse Construction System and Dry-Assembly Method**




| | | Element | Heat transfer coefficient* [m2K/W] | Notes |
|---|---|---|---|---|
| Skylark 250 | Basic | Roof | 0.155 | Standard 274mm internal batts insulation |
| | | Wall | 0.168 | Standard 250mm internal batts insulation |
| | | Floor | 0.155 | Standard 274mm internal batts insulation |
| | Plus | Roof | 0.108 | Standard + 100mm external woodfibre board |
| | | Wall | 0.123 | Standard + 60mm external woodfibre board |
| | | Floor | 0.128 | Standard + 60mm external woodfibre board |
| Skylark 200 | Basic | Roof | 0.207 | Standard 200mm internal batts insulation |
| | | Wall | 0.207 | Standard 200mm internal batts insulation |
| | | Floor | 0.207 | Standard 200mm internal batts insulation |

* Based on conductivity values λ of:
OSB panel: 0.13 W/mK
Rockwool insulation: 0.04 W/mK
Insulated woodfibre board: 0.038 W/mK

Figure 8-2: WikiHouse Construction System and Dry-Assembly Method. The figure illustrates the proposed timber-cassette construction approach, including layered wall build-up, CNC-cut interlocking cassette logic, hand assembly and flat-pack construction sequencing.

**Figure 8-2: Selected WikiHouse Construction-System Precedents**

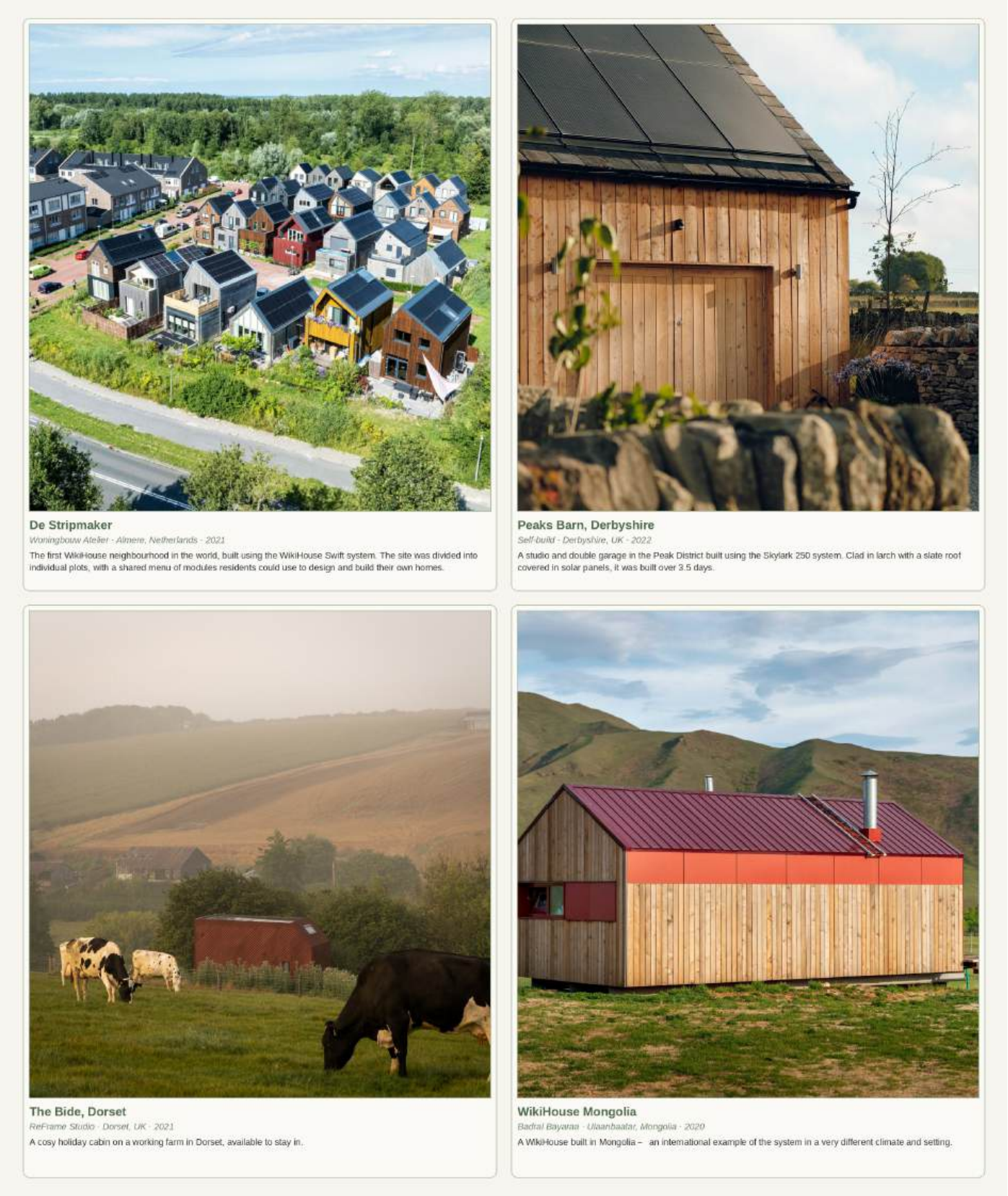



Figure 8-2: Selected WikiHouse Construction-System Precedents. The images show completed WikiHouse projects in rural, domestic, neighbourhood-scale and international contexts. They are included as construction-system precedents only; the Lower Wych design, landscape response, carbon strategy and OPD compliance are assessed separately in this Management Plan.

## 8.4 Fabric Performance and Operational Energy Link to Section 6

Section 8 relies on the same fabric and services schedule as Section 6. This ensures that the PV, battery, heat-pump and U-value figures are presented consistently across the Management Plan. Detailed equipment selection may change at building-services design stage, but the installed system will meet or exceed the planning-stage schedule in Table 8-5. [172][173]

**Table 8-5: Adopted fabric and energy schedule**

| Component | Adopted planning-stage value | Use in Section 8 |
|---|---|---|
| External walls | U-value = 0.123 W/m2K | Primary domestic fabric standard for the dwelling. Enterprise spaces use a differentiated fabric / servicing strategy according to product quality, hygiene, condensation-control and operational needs. |
| Roof | U-value = 0.108 W/m2K | Supports low heat demand and winter resilience. |
| Floor | U-value = 0.128 W/m2K | Limits ground-floor heat loss and supports low-temperature heating. |
| Windows | Target Uw = 0.80 W/m2K | High-performance triple glazing. |
| Airtightness | Target 0.15 AC/H background infiltration, equivalent to 3 AC/H @ 50 Pa | To be verified by airtightness testing before occupation. |
| Ventilation | Balanced MVHR, modelling basis 0.6 AC/H with 80% heat recovery | Maintains air quality while reducing winter ventilation losses. |
| Solar PV | approximately 20.9 kWp roof-mounted array, indicatively 36 high-output modules at around 580 W each | Roof-first renewable generation with minimal landscape impact. |
| Battery storage | 50 kWh nominal LiFePO4 bank, approx. 40 kWh usable | Supports off-grid operation and low-solar resilience. |
| Inverter / charger | 8-10 kW class | Sized for critical domestic and enterprise loads. |
| Primary heat and hot water | 6-8 kW ASHP feeding approx. 600 litre thermal store | Low-temperature, renewable-led dwelling heat and domestic hot water. |
| Resilience heat | Room-sealed Ecodesign-ready boiler stove, used for low-solar event mode only | Charges the thermal store during prolonged dull winter periods while protecting battery autonomy. |
| Enterprise rooms | No routine dedicated space heating for the workshop, packing, dry store and general maintenance areas. Mushroom, business kitchen / hygiene and other temperature-sensitive spaces are serviced only as required for product quality, hygiene and condensation control. | Enterprise energy use remains modest and separately monitorable; any product-quality, hygiene, frost or humidity protection is recorded as an enterprise load. |

The dwelling is to be built to the full domestic WikiHouse Skylark 250 Plus fabric standard. The enterprise building uses the same low-impact, reversible timber-cassette construction logic, but its internal fabric strategy is differentiated by use: the mushroom room, business kitchen / hygiene areas and any temperature-sensitive spaces are insulated and serviced only to the level required for product quality, hygiene and condensation control, while the workshop, packing, dry store and general maintenance areas remain unheated, lightly serviced enterprise spaces. [173]

The WikiHouse thermal modelling evidence supports the reduce-first approach. Triple glazing and very low infiltration materially reduce the heat-transfer coefficient, and the selected 0.15 AC/H target is a practical as-built airtightness target rather than a laboratory-only assumption. [170][172]

For clarity, Table 8-6 summarises the operational-energy evidence that will sit behind the Section 8 zero-carbon-in-use claim. These are planning-stage targets and evidence routes rather than commissioned values; the as-built figures will be verified through SAP, Building Control testing and annual OPD monitoring.

**Table 8-6: Operational performance targets and verification route**

| Metric | Planning-stage target / position | Evidence and verification route |
|---|---|---|
| SAP / Part L Wales | Design-stage SAP records DER, TER, DFEES, regulated energy demand and predicted SAP rating. | SAP / Part L Wales report before occupation; updated if material specifications change. |
| Space-heating demand | Low space-heating demand targeted in the range of 20-30 kWh/m2/year, for SAP / detailed design verification. | SAP output and heat-loss calculation; reported as a target range until modelling is finalised. |
| ASHP seasonal performance | Minimum seasonal performance factor / SCOP of 3.0, with a design target of >=3.5 where MCS / SAP design shows this is achievable. | MCS design information, heat-loss calculation, commissioning data and electricity monitoring. |
| MVHR performance | Heat recovery >=80%; specific fan power target <=0.8 W/l/s based on selected unit and duct design. | MVHR design schedule, commissioning certificate and measured flow rates. |
| Airtightness | 0.15 AC/H background infiltration as the modelling basis; approximately 3 AC/H @ 50 Pa as the pressure-test target. | Airtightness test before occupation and defect-remediation record if target is missed. |
| Overheating / Part O | Passive shading, purge ventilation, roof overhangs, careful glazing and night ventilation to control summer overheating. | Part O / SAP overheating assessment and final window / shading schedule. |
| Annual electrical input | Section 6 planning-stage total = approximately 5,170 kWh/year, met by approximately 20.9 kWp PV, 50 kWh nominal battery storage and load management. | PV / battery monitoring, annual electricity log and OPD monitoring return. |
| Enterprise rooms | No routine dedicated space heating for the workshop, packing, dry store and general maintenance areas. Mushroom, business kitchen / hygiene and other temperature-sensitive spaces are serviced only as required for product quality, hygiene and condensation control. | Enterprise energy use remains modest and separately monitorable; any product-quality, hygiene, frost or humidity protection is recorded as an enterprise load. |

The airtightness figures refer to different conditions. The 0.15 AC/H figure is the background infiltration assumption used in thermal modelling; the 3 AC/H @ 50 Pa figure is the pressurised airtightness-test target used at completion. This target is substantially better than the Welsh Building Regulations backstop but stops short of certified Passivhaus. Certified Passivhaus airtightness is not pursued because the 3 AC/H target, combined with the locked fabric build-up, MVHR, ASHP-led heating and renewable-led services, is sufficient to meet the OPD zero-carbon-in-use test while remaining realistic for a self-build delivery route.

## 8.5 Construction Carbon and CfSH Category 3 Materials

The construction-carbon case will be reported transparently. Gross embodied carbon and biogenic carbon storage will be shown separately rather than being blended into one net figure. This avoids overstating the benefit of timber sequestration and allows the Local Planning Authority to see both the carbon cost of materials and the carbon stored in long-life timber, woodfibre, sheep's wool, cork and larch components. [163][175]

The published WikiHouse evidence provides a quantitative planning benchmark rather than only a methodology. The figures below are not a substitute for the final project-specific Whole Life Carbon schedule, but they give the Local Planning Authority a clear answer to the question of whether the building system is genuinely low embodied carbon

at planning stage.

**Table 8-7: Planning-stage embodied-carbon benchmark**

| Metric | Planning-stage figure / benchmark | How it will be treated in the final evidence |
|---|---|---|
| WikiHouse chassis product-stage carbon | Leeds Beckett / WikiHouse evidence reports the Skylark chassis as storing approximately 350 kgCO2e/m2 of biogenic carbon while emitting approximately 75 kgCO2e/m2 in production and delivery, giving an indicative net product-stage balance of about -275 kgCO2e/m2 for the chassis alone. [170] | Reported as gross emissions and biogenic storage separately, not hidden as a single optimistic net value. |
| Indicative whole-building A1-A5 embodied-carbon benchmark | The WikiHouse evidence case identifies approximately 100 kgCO2e/m2 for the realistic project total over A1-A5 once non-timber elements are included. [170][171] | Used as a planning-stage benchmark; product-specific figure recorded by the CfSH Category 3 / WLC schedule. |
| Conventional comparison | The same evidence base records a conventional brick cavity baseline materially higher, including a product-stage figure of approximately +268 kgCO2e/m2 GIA for brick cavity construction. [170] | Used as a context comparison only; the application will rely on the project-specific WLC schedule for final numbers. |
| Biogenic storage | Timber chassis, woodfibre, sheep's wool, larch and cork all store biogenic carbon for the life of the building. | Recorded separately, with assumptions about service life, end-of-life and reuse made explicit. |
| Battery and services carbon | PV, battery, ASHP, MVHR and water-treatment equipment are treated as a separate services category. | Included in Modules A and B so that renewable-energy equipment is not ignored in the carbon account. |

**Table 8-8: Whole-life carbon modules to be reported**

| RICS / BS EN 15978 module | Lower Wych reporting approach | Key risk or evidence item |
|---|---|---|
| A1-A3 Product stage | Report gross product emissions for structure, insulation, cladding, roof, windows, finishes and services; report biogenic carbon separately. | Manufacturer EPDs, ICE data or supplier data, with no unsupported double-counting. |
| A4 Transport | Record delivery distances for WikiHouse components, larch, wool, woodfibre, roof materials, batteries and plant. | Materials provenance table and delivery notes. |
| A5 Construction / installation | Record offcuts, packaging, waste, plant use and low-waste CNC fabrication benefits. | Construction waste records linked to Section 7. |
| B1-B5 Use, maintenance, repair and replacement | Account for replacement of batteries, inverter, ASHP components, MVHR components, filters, membranes or finishes over the assessment period. | Battery service life is expected to be materially shorter than the building chassis and must be included as a Module B event. |
| B6 Operational energy | Use SAP / Part L Wales and annual metered data to report regulated and actual operational energy. | PV generation, battery, ASHP and electricity-use monitoring. |
| C1-C4 End of life | Model dismantling, transport, reuse, recycling and disposal of timber chassis, screw piles, cladding, services and finishes. | Exit strategy and waste-transfer / recycling records. |

**Table 8-9: Construction-carbon accounting schedule**

| Element | Material / quantity basis | Carbon accounting approach |
|---|---|---|
| WikiHouse chassis | OSB3 / plywood cassette components measured from the manufacturer cutting schedule. | A1-A3 product-stage carbon and biogenic storage reported separately; transport and assembly added as A4-A5 where known. |
| Foundations | Number and size of ground screw piles, caps and base plates. | Steel product carbon reported gross; avoided concrete foundation noted qualitatively and, where possible, compared against a conventional baseline. |
| Insulation | Sheep's wool batts and woodfibre over-insulation by m2 / thickness / mass. | Material emissions and biogenic storage reported separately using EPDs, ICE or supplier data. |
| Internal linings and finishes | Fire-rated plasterboard where required, standard plasterboard elsewhere, lime skim and cork floor finish. | Gross material emissions recorded; cork biogenic storage reported separately if supported by supplier data. |
| External envelope | Welsh larch cladding, standing seam roof, EPDM roof, green-roof build-up where shown, membranes, battens and fixings. | Durability and repairability recorded alongside A1-A5 carbon; larch biogenic carbon treated separately. |
| Windows and doors | FSC hardwood triple-glazed units. | Product EPD / supplier data used where available; operational heat-loss benefit explained separately from embodied carbon. |
| Services | PV array, battery, ASHP, MVHR, thermal store, pumps, controls and water-treatment equipment. | Reported as a separate services category so renewable-energy equipment is not hidden inside fabric totals. |

| Element | Material / quantity basis | Carbon accounting approach |
|---|---|---|
| End of life | Dry-jointed structure, screw piles and replaceable envelope layers. | Scenario records whether elements are reused, recycled, retained for agriculture or removed; benefits not double-counted unless evidenced. |

The materials evidence will be carried into the CfSH Category 3 Materials / Mat 1 style report. At planning stage, the material strategy is expected to perform strongly because the principal elements are timber-based, dry-assembled, repairable, and specified with natural or low-impact finishes. The detailed materials report will record the rating or justified equivalent for each relevant element. [163][169][171][175]

**Table 8-10: CfSH Category 3 Materials evidence route**

| CfSH / Mat 1 element | Proposed specification | Evidence route |
|---|---|---|
| Roof | WikiHouse roof cassette with 100 mm woodfibre over-insulation, standing seam metal to sloped roof areas, EPDM to potable flat-roof catchment areas, and a separate green-roof area as shown on the roof layout. | Green Guide / Mat 1 analogue and supplier EPDs used to record the adopted roof build-up. |
| External walls | WikiHouse Skylark 250 Plus timber cassette, sheep's wool, 60 mm woodfibre over-insulation to walls, larch rainscreen and lime-finished interior. | High-performance timber / natural-fibre assembly; Mat 1 report records rating or equivalent evidence. |
| Internal walls | Plasterboard fire-tested lining route with lime skim, plus timber partitions where appropriate. | Fire compliance preserved while using a breathable low-impact finish. |
| Floors | WikiHouse timber floor cassette with insulation, 60 mm external woodfibre board to the floor build-up and cork finish. | Biogenic and repairable floor build-up; Mat 1 / EPD evidence to be recorded. |
| Windows | FSC hardwood triple-glazed units. | Supplier data / EPD and FSC chain-of-custody evidence; operational heat-loss benefit cross-referenced to Section 6. |

**Table 8-11: Materials provenance and substitution controls** records the preferred provenance route for the principal materials. The purpose is not to freeze every supplier at planning stage, but to show that the low-carbon specification is deliverable through realistic UK / Welsh supply chains and that any substitutions will preserve or improve the environmental performance.

| Material / component | Preferred source or route | Controlled fallback if preferred route is unavailable |
|---|---|---|
| WikiHouse OSB / plywood chassis | Approved WikiHouse / Open Systems Lab manufacturing route using structural-grade certified board. | Equivalent approved WikiHouse-compatible structural board and fabricator, with engineer and Building Control acceptance. |
| Sheep's wool insulation | UK-sourced sheep's wool, with Welsh supply such as Black Mountain Insulation preferred where available. | UK natural-fibre insulation of equal or better thermal and embodied-carbon performance. |
| Woodfibre over-insulation | Steico woodfibre board or equivalent breathable woodfibre system. | Equivalent woodfibre board with comparable lambda value, density, vapour performance and EPD evidence. |
| External cladding | Welsh-sawn larch through Coed Cymru / Welsh sawmill supply chain where available. | UK-grown larch, Douglas fir or sweet chestnut, selected for durability, repairability and recessive weathering. |

| Material / component | Preferred source or route | Controlled fallback if preferred route is unavailable |
|---|---|---|
| Lime skim | Ty-Mawr Lime, Brecon, or equivalent Welsh / UK lime supplier. | Equivalent breathable lime-based finish compatible with the fire-tested plasterboard lining. |
| Cork flooring | Certified cork tile or sheet flooring with supplier environmental data. | Equivalent low-impact natural flooring with durable repairable finish. |
| Standing seam roof | Durable standing seam metal roof finish suitable for PV clamp fixings and rainwater harvesting. | Steel preferred over higher-carbon metals where durability, colour and rainwater quality can be maintained. |
| EPDM flat roof / green-roof area | Durable EPDM membrane forming part of the clean-water roof catchment. The separate green-roof area is treated as landscape / attenuation roofscape and is not counted in the potable catchment. | Equivalent potable-compatible or clean-water-compatible membrane with equal durability and maintenance profile for catchment areas; green-roof build-up to preserve waterproofing, biodiversity and runoff-control performance. |
| Ground screw piles | Proprietary galvanised steel ground screw system such as Screw Pile UK, Platipus, Krinner or engineer-approved equivalent. | Equivalent removable pile system designed to Eurocode 7 / structural engineer requirements; no concrete strip or raft foundation unless separately justified. |

## 8.6 Building Regulations Strategy

The zero-carbon case does not rely on avoiding regulation. The dwelling and the WikiHouse enterprise building will be submitted through the normal Building Regulations process. The root cellar, polytunnels and open barn are treated as structures outside Building Regulations approval for this planning-stage schedule, with the position recorded before construction in the compliance file. [165][166][167][168]

**Table 8-12: Building Regulations compliance route**

| Building Regulations area | Planning-stage response | Evidence before construction / occupation |
|---|---|---|
| Part A - Structure | WikiHouse Skylark 250 Plus design, screw piles and timber base structure designed by competent professionals. | Structural engineer calculations; foundation design; manufacturer / designer information; Building Control approval. |
| Part B - Fire safety | Fire-tested plasterboard lining route retained; means of escape, alarms, compartmentation and fire separation designed conventionally. | Detailed fire strategy and Building Control sign-off; product data for fire-rated boards and penetrations. |
| Part C - Site preparation and moisture | Raised screw-pile floor, ventilated rainscreen, breather membranes, VCL / airtightness layer and moisture-safe detailing. | Detailed junction drawings, condensation risk checks where required, inspection records. |
| Part F - Ventilation | Balanced MVHR to the dwelling; appropriate extract ventilation to kitchen, bathroom, business kitchen and hygiene spaces. | MVHR design, commissioning certificate and flow-rate testing. |
| Part G - Sanitation, hot water safety and water efficiency | Water-efficient fixtures, filtered / UV-polished rainwater potable supply and hygienic hot water provision. | Building Control review, water-treatment specification, commissioning and maintenance schedule. |
| Part H - Drainage and waste disposal | Source-separated sanitation, greywater reedbed / polishing pond route and clean-water separation cross-referenced to Sections 6 and 7. | Drainage drawings, Pollution Prevention Plan and any required regulatory consents. |

| Building Regulations area | Planning-stage response | Evidence before construction / occupation |
|---|---|---|
| Part J - Combustion appliances | Single room-sealed Ecodesign-ready boiler stove with dedicated external combustion air and thermal-store connection. | HETAS / competent-person installation, flue design, MVHR interaction check and spillage testing. |
| Part K - Protection from falling / stairs / guarding | Detailed design to comply for access steps, decks, plant areas and any raised thresholds. | Building Control details and site inspection. |
| Part L - Conservation of fuel and power | Low-heat-loss fabric, ASHP, PV, battery storage and efficient services aligned with Section 6. | SAP / Part L assessment, as-built evidence, commissioning and completion certificate. |
| Part M - Access to and use of buildings | Accessible approach, ground-floor domestic accommodation and emergency vehicle access shown on drawings. | Detailed access drawings and Building Control approval. |
| Part O - Overheating | High-performance lightweight construction supported by shading, openable windows, cross-ventilation strategy and MVHR summer bypass. | Overheating assessment / SAP evidence and final window-shading details. |
| Electrical safety / Part P | PV, batteries, inverter, pumps, water treatment and domestic / enterprise circuits designed and installed by competent persons. | Electrical certificates, MCS / equivalent documentation where applicable, commissioning records. |

## 8.7 Construction Method, Phasing and Low-Impact Site Works

Construction will follow a low-disturbance sequence. The access and working areas will be set out first so that deliveries, emergency access and material storage are controlled. Ground conditions and ecology constraints will govern timing: heavy trafficking will be avoided during wet soil conditions and works will avoid sensitive ecological periods where required by the Construction Environmental Management Plan. [177]

The screw-pile foundations are installed before the WikiHouse chassis is assembled. This avoids excavation for strip or raft foundations, substantially reduces wet trades, and preserves reversibility. The timber chassis is then delivered as precision-cut components and assembled by a small team with ordinary tools. This reduces site time, noise, waste and the need for large plant.

At planning stage the screw-pile design is fixed in principle but not as a final foundation schedule. The number, depth, diameter and spacing of piles will be set by the structural engineer following ground assessment.

**Table 8-13: Planning-stage screw-pile foundation controls**

| Item | Planning-stage control | Evidence before construction |
|---|---|---|
| Pile type | Removable galvanised steel ground screws supporting timber base plates / ring beams. | Manufacturer technical data and structural engineer foundation schedule. |
| Pile number and spacing | Not fixed in the Management Plan; to be calculated from final GIA, chassis grid, ground bearing and structural loads. | Foundation plan, pile schedule and engineer calculations. |
| Pile depth / ground bearing | Determined by ground assessment and supplier / engineer design. | Ground investigation / bearing assessment and Eurocode 7 design note where required. |
| Moisture and ventilation | Raised floor and ventilated undercroft to protect the timber chassis and avoid damp bridging. | Junction details and Building Control inspection. |

| Item | Planning-stage control | Evidence before construction |
|---|---|---|
| Reversibility | Piles mechanically removed or capped / made safe by agreement if the building is dismantled. | Exit-strategy record, removal certificate or photographic reinstatement evidence. |

Once the chassis is erected, the envelope is completed with the locked insulation, airtightness, cladding and roof build-up. The sloped roof areas are standing seam metal; the potable flat-roof catchment areas are EPDM; the separate green-roof area is routed to landscape attenuation rather than potable harvesting; and roof-mounted PV is integrated as part of the renewable-energy strategy. [171][173][176]

Fit-out and services are then commissioned in a measurable sequence: airtightness layer and service penetrations checked; MVHR installed and balanced; ASHP, thermal store and water treatment commissioned; PV / battery / inverter system commissioned; and as-built information lodged for OPD monitoring. The enterprise building follows the same reversible construction logic, but its fabric and services are differentiated by use and it does not include a routine dedicated space-heating system.

Construction waste will be managed through the Section 7 waste hierarchy: prevent first through CNC nesting and off-site manufacture; reuse offcuts where practical; segregate recyclable packaging and timber; and record any residual construction waste. This links the zero-carbon building strategy to the wider circular-resource commitments of the Management Plan. [177]

## 8.8 Drawings, Landscape Integration and Visual Recessiveness

Landscape and visual impact is assessed in Section 9, but Section 8 records the building-specific design response. The principal buildings are clustered, low profile, naturally clad and positioned within existing hedgerow and woodland enclosure. The development avoids a scattered domestic appearance and keeps the productive infrastructure legible as part of a working holding.

**Table 8-14: Drawing evidence to accompany Section 8**

| Drawing / evidence item | Purpose | Status in submission package |
|---|---|---|
| Included in the submitted plan set through the Proposed Site Plan, Landscape Plan and Proposed Floor Plans and Elevations. | Shows the dwelling, enterprise building, root cellar, polytunnels, open barn, access, parking and service areas as one compact group. | To be provided in the supporting plan set; no in-text gap is retained in this chapter. |
| Domestic / enterprise floor-plan annotation | Distinguishes residential rooms from business kitchen, hygiene, packing, mushroom, workshop and office / dry-store spaces. | Coordinated with the floor plans and Section 4 enterprise evidence. |
| Roof and rainwater plan | Shows standing seam, EPDM, green-roof exclusion, PV, gutters, rainwater harvesting and clean-water catchment logic. | Coordinated with Section 6 and Appendix J.1. |
| Typical wall / roof / floor build-up details | Demonstrates the domestic WikiHouse Skylark 250 Plus fabric, insulation, airtightness, cladding and roof strategy, and identifies differentiated enterprise-building fabric where applicable. | See figure 8-2. |

## 8.9 Commissioning, Monitoring and As-Built Evidence

The zero-carbon commitment is only credible if it can be checked after construction. Table 8-15 sets out the records that will be kept for Building Control, OPD monitoring and the Year 3 / Year 5 reviews. [163][173][179]

**Table 8-15: Commissioning and monitoring evidence**

| Evidence item | When recorded | Purpose |
|---|---|---|
| As-built fabric specification | Before occupation and updated after any material substitution. | Confirms that the constructed building matches or improves on the planning-stage fabric schedule. |
| Airtightness test | Before occupation. | Verifies progress against the 0.15 AC/H / 3 AC/H @ 50 Pa target. |
| MVHR commissioning certificate | Before occupation. | Confirms balanced ventilation, design flow rates and heat-recovery performance. |
| SAP / Part L compliance report | Before occupation. | Demonstrates regulatory energy compliance and supports the OPD zero-carbon-in-use case. |
| PV / battery / inverter commissioning records | Before occupation and annually through monitoring. | Confirms renewable system capacity and records generation, storage and use. |
| ASHP, thermal store and boiler-stove commissioning | Before occupation. | Confirms safe and efficient operation, including MVHR / combustion safety checks. |
| Material delivery notes and EPDs / supplier data | During construction. | Supports the CfSH Category 3 Materials / Mat 1 and embodied-carbon evidence. |
| Construction waste records | During construction and completion. | Shows waste prevention, reuse, recycling and off-site disposal routes. |
| Enterprise energy sub-metering | Monthly / annually. | Separates dwelling use from business kitchen, workshop, packing, mushroom and office / dry-store loads. |
| Annual OPD monitoring return | 12 months after first habitation and annually thereafter. | Reports actual building performance, energy use, maintenance, substitutions and corrective actions. |
| Whole Life Carbon / CfSH Materials report | Before construction and updated at completion if substitutions occur. | Confirms embodied-carbon benchmark, Mat 1 / Category 3 evidence, product data and biogenic-carbon treatment. |
| Annual operational energy balance | Annually after occupation. | Compares PV generation, battery performance, ASHP input, domestic loads and enterprise loads against Section 6 assumptions. |
| Module B replacement log | Whenever major plant is replaced. | Records battery, inverter, ASHP, MVHR or other services replacement so whole-life carbon does not ignore future equipment impacts. |
| Materials provenance log | During procurement and construction. | Records actual source, supplier and substitution decisions for larch, wool, woodfibre, OSB, roof materials and finishes. |

If monitoring shows that any part of the building system is underperforming, the first response will be demand reduction and commissioning review: check controls, leaks, ventilation balance, user settings and maintenance before adding new equipment. Any significant equipment change will be reported through annual monitoring.

## 8.10 Exit Strategy for Structures

The exit strategy is designed into the buildings rather than added at the end. If the OPD fails to meet the essential characteristics and cannot be brought back into compliance, residential use of the dwelling would cease. Any retention of a structure for agricultural use would require agreement with the Local Planning Authority or a lawful plan-

ning basis; otherwise the relevant structure would be removed and the land restored. [163][179]

**Table 8-16: Structure-specific exit strategy**

| Element | Exit action | Restoration / evidence |
|---|---|---|
| WikiHouse dwelling | Residential occupation ceases. Domestic fixtures can be removed and the dry-jointed structure dismantled or, only with LPA agreement, converted to non-residential agricultural / enterprise use. | Screw piles removed or capped as agreed; service connections made safe; ground reinstated and seeded / planted. |
| Enterprise building | Continues only if lawful as an agricultural / enterprise building, or is dismantled using the same WikiHouse dry-assembly logic. | Materials reused, recycled or removed; ground restored if building removed. |
| Root cellar | Retained only if lawful and useful for agricultural storage; otherwise removed or infilled with clean material as agreed. | Landform reinstated and stabilised. |
| Polytunnels | Dismantled and removed if no longer required or if required by enforcement / exit process. | Fixings removed; growing area returned to grassland, horticulture or habitat use. |
| Open barn / tool stores | Retained for agriculture only where lawful; otherwise dismantled. | Timber reused or recycled; ground repaired. |
| PV, batteries and plant | Removed, sold, reused or recycled through appropriate producer-take-back / WEEE / specialist battery and electrical-waste routes, with any major replacement already recorded as a Module B carbon event. | Electrical systems isolated and certified safe; batteries and plant transferred through appropriate reuse or recycling records. |
| Access track and permeable areas | Retained only if needed for agricultural management or emergency access; otherwise narrowed, decompacted or removed. | Aggregate / grid removed where required; soil restored and revegetated. |
| Ecological enhancements | Meadow, hedgerow, woodland-edge and pond enhancements are retained unless a specific safety or regulatory reason requires alteration. | Ecological benefit maintained beyond the development life. |

This approach is stronger than a conventional rural dwelling exit strategy because the main building system is designed for disassembly, the foundations are removable, the polytunnels are demountable, and the business building is functionally agricultural rather than purely domestic.

## 8.11 Conclusion

Section 8 rests on one clear proposition: the buildings are low-impact, reversible, materially evidenced, Building-Regulations-compliant where required, very low energy in use, and tied to an auditable monitoring and exit framework. The dwelling uses the full domestic WikiHouse Skylark 250 Plus fabric standard; the enterprise building uses the same reversible timber-cassette construction logic with fabric and servicing differentiated by use; the energy numbers match Section 6; construction carbon is to be reported transparently; and the root cellar, polytunnels and open barn are treated as low-impact ancillary structures outside the Building Regulations approval route.

## References

[163] Welsh Government / Land Use Consultants / Positive Development Trust (2012). One Planet Development Practice Guidance.

[164] Welsh Government (2010). Technical Advice Note 6: Planning for Sustainable Rural Communities.

[165] Welsh Government (2026). Building Regulations: Approved Documents for Wales collection, including 7 April 2026

updates to Approved Documents L and F and the transitional provisions for 4 March 2027.

[166] Welsh Government (2026). Approved Document L: Conservation of fuel and power and minimisation of greenhouse gas emissions (Wales), 2026 volumes 1 and 2, with transitional provisions; 2022 edition remains relevant where transitional arrangements apply.

[167] Welsh Government (2026). Approved Document F: Ventilation (Wales), Volume 1, with transitional provisions; related Approved Documents for Wales as applicable.

[168] Welsh Government (2023-2026). Building Regulations Approved Documents A, B, C, G, H, J, K, M, O and P for Wales, as applicable to the final Building Control application.

[169] WikiHouse / Open Systems Lab (2024). Technical Specifications: WikiHouse Skylark version 1.0.

[170] Parker, J., Glew, D., Rakhshanbabanari, K. and Gorse, C. (2021). WikiHouse Thermal Performance Modelling and Life Cycle Assessment. Leeds Beckett University / Innovate UK Project 77084.

[171] Lower Wych OPD. 2026. Dwelling specification - locked material specification for the Lower Wych OPD dwelling, dwelling_specification.md, locked 23 April 2026.

[172] Building Fabric Table - WikiHouse Skylark 250 Plus, Lower Wych source table.

[173] Section 6 Energy and Water and Final Energy Strategy - figures to use.

[174] EFECTIS UK & Ireland (2025). WikiHouse Skylark fire-resistance test evidence, fire-rated wall and floor assemblies.

[175] RICS (2023). Whole Life Carbon Assessment for the Built Environment, 2nd edition.

[176] Appendix J.1 - Domestic Potable Rainwater Report and Appendix J.3 - Market Garden and Polytunnel Irrigation Strategy.

[177] Section 7 Waste Management and construction waste / nutrient management evidence.

[178] Submitted Proposed Site Plan, Proposed Floor Plans and Elevations, and Landscape Plan.

[179] Section 13 Phasing, Monitoring and Exit Strategy.

[180] Welsh Government. 2024. Planning Policy Wales Edition 12.

[181] Welsh Government. 2021. Future Wales: The National Plan 2040.

[182] Wrexham County Borough Council. 2005. Wrexham Unitary Development Plan 1996-2011, adopted 2005, residual policies including PS1, PS2, GDP1 and EC1-EC6.

[183] Lower Wych OPD. 2026. Land-Use Area Audit Table, Revision E.

[184] LETI. 2020. Climate Emergency Design Guide; RIBA. 2021. RIBA 2030 Climate Challenge, used only as non-statutory low-carbon benchmark references where relevant.



# 9.Landscape and Visual Impact

# 9. Landscape and Visual Impact

## 9.1. Introduction

This section describes the landscape setting of Lower Wych, the visual relationship between the site and its surroundings, and how the proposed One Planet Development integrates into this landscape. It provides a proportionate landscape and visual assessment for a single-household OPD, demonstrating that the development is carefully located, low in visual mass and designed to sit quietly within the Wych Brook valley.

The aim is not to make the development visually invisible from every angle, but to ensure that any change is localised, recessive, consistent with the existing field pattern, and outweighed by long-term landscape restoration, habitat creation and improved land management.

Our aim has been to create a place that restores and enhances the local landscape rather than altering it. That aim is delivered through a retained hedgerows and woodland, low and recessive building forms, muted materials, limited external lighting, and a land-management strategy based on meadow, coppice, orchard, ponds and scrub-grassland habitat.

## 9.2. Methodology

Our approach follows the same principles used throughout the plan: observation, evidence, proportionate assessment and sensitive design. The assessment considers two related aspects:

Landscape character - the features and qualities that define the area, such as landform, vegetation, field pattern, woodland, hedgerows, water features and land use.

Visual amenity - how the site and proposed development are seen or experienced from nearby viewpoints and receptors.

We used desk studies including OS mapping[195], aerial photography and NRW LANDMAP data[187][191], together with site observation, supporting plans and representative photographic viewpoints to understand the likely visual envelope. This chapter should be read alongside the viewpoint location plan, annotated viewpoint photographs, visual-envelope / ZTV plan, proposed site plan, floor plans, elevations, landscape plan and landscape sections identified in Box 9-1.

This is a proportionate landscape and visual assessment for a single-household One Planet Development. It is not presented as a full standalone professional LVIA, but it adopts the core GLVIA3 logic of identifying landscape and visual receptors, judging receptor sensitivity, judging the magnitude of change, and deriving a transparent significance judgement. Effects are considered for the Year 1 establishment period, including winter leaf-off conditions where screening is least effective, and again after the first five-year establishment period when hedgerow reinforcement, coppice, orchard and habitat planting have begun to provide a stronger landscape structure.

**Table 9-1: Landscape and visual evidence schedule**

| Evidence item | Purpose | How it is used in this assessment |
|---|---|---|
| Location plan, proposed site plan and landscape plan | Confirm site boundary, building cluster, access, planting, ponds and productive land uses. | Provides the fixed layout evidence for the landscape assessment. |
| Visual-envelope / ZTV plan | Map the theoretical and practical area from which the site may be visible using terrain, OS mapping and site observation. | Tests the claim that the site is visually contained and identifies where photographic verification is needed. |
| Viewpoint location plan and viewpoint schedule | Number each representative public, private, elevated and heritage-related viewpoint with grid reference, distance, bearing and receptor type. | Links photographs, photomontages and receptor judgements back to a traceable evidence base. |
| Existing annotated photographic viewpoint sheet | Record existing views from the lane, gateway, nearby routes, elevated checks and heritage-setting checks. | Demonstrates existing enclosure, seasonal filtering and the limited visual envelope. |

| Evidence item | Purpose | How it is used in this assessment |
|---|---|---|
| Location plan, proposed site plan and landscape plan | Confirm site boundary, building cluster, access, planting, ponds and productive land uses. | Provides the fixed layout evidence for the landscape assessment. |
| Visual-envelope / ZTV plan | Map the theoretical and practical area from which the site may be visible using terrain, OS mapping and site observation. | Tests the claim that the site is visually contained and identifies where photographic verification is needed. |
| Annotated gateway / lane view or photomontage | Show the most open likely view of the scheme at Year 1 and after planting establishment. | Tests the worst localised visual effect rather than relying on narrative alone. |
| Lighting and dark-corridor plan | Identify any required fittings and protected dark routes along woodland, hedgerows and ponds. | Confirms that lighting will not undermine tranquillity or ecological connectivity. |

## 9.3. Planning Context

The One Planet Development framework in TAN 6[185] requires OPDs in the open countryside to demonstrate a low-impact, land-based and monitored form of development. The wider TAN 6 OPD tests in §§4.17-4.22 are relevant to the landscape assessment because the visual form of the proposal must be read together with its land-based activity, resource management, reversibility and binding five-year monitoring structure.

The OPD Practice Guidance gives the landscape test more specific form. §3.43 requires the Management Plan to identify the location of proposed buildings, polytunnels, tracks, access points and visibility splays so that they are not obtrusive in the landscape. §3.47 expects OPDs to enhance landscape through features such as hedges, orchards, woodland, copses and meadows. §3.51 sets the essential criterion that buildings, structures and access tracks are located where they can be recessed into the landscape and do not stand out in views from public vantage points.[197]

Planning Policy Wales Edition 12 is also relevant. PPW §3.59 defines OPD as a distinct low-impact form of rural development, while the landscape, placemaking and biodiversity provisions in PPW §§6.3-6.4 require landscape character, ecosystem resilience and local distinctiveness to be conserved and enhanced.[186]

As set out in Sections 1 and 2, following the High Court quashing of the Wrexham Local Development Plan and the subsequent Welsh Ministers' withdrawal notice, the operative development plan comprises Future Wales 2040 and the residual Wrexham Unitary Development Plan 1996-2011. For this chapter the most relevant residual UDP policies are PS2 and GDP1, together with the countryside, landscape and ecological policies in the EC policy group where applicable.[198][199]

Section 2 confirms that the site is not within a Special Landscape Area, Area of Outstanding Natural Beauty, Conservation Area, Registered Historic Landscape, SSSI, Ramsar site or Scheduled Monument.

The proposal responds to this policy context by retaining the existing woodland, hedgerows, mature trees and field structure; locating the dwelling, enterprise building, root cellar, open barn, polytunnels, ponds, access and parking on ground that lies below the level of the adjacent road and roadside hedgerow, where the falling landform visually contains them; and adding new coppice, orchard, meadow, pond, wetland and pollinator habitats.

## 9.4. Site Context

The site lies within the Wych Brook valley, close to the Welsh-English border. It occupies approximately 5.12 acres / 2.07 hectares, comprising open grassland, retained hedgerows, mature scattered trees and approximately 3,829 m² / 0.946 acres of existing broadleaved woodland on the northern / north-western part of the holding. Land falls gently from the southern boundary towards the woodland edge and the wider Wych Brook catchment.

The field is enclosed by well-established, mixed-species hedgerows containing hawthorn, blackthorn, oak and ash, with occasional field maple and elder. The northern woodland forms a dense backdrop of native deciduous species including oak, birch, ash and hazel. The surrounding landscape is characterised by small pastures, mature field boundaries, scattered farms and wooded valley edges. There are no public rights of way across the holding. Visual receptors are therefore mainly limited to local lane users, nearby dwellings with filtered or oblique views, and any wider public routes from which the site is screened by intervening hedgerows, trees, landform and woodland.

The site is not within a Special Landscape Area or any nationally designated landscape. The assessment therefore focuses on local landscape character, visual containment, the relationship with the Doley Wood and Meadows LWS corridor, and the contribution of the proposal to the hedged-field and wooded-valley character identified by LANDMAP and Section 2.

The proposed dwelling, enterprise building, root cellar, two 6 m x 12 m polytunnels, open barn, access, parking / turning area, two clean-water irrigation / attenuation ponds and separate greywater polishing pond / planted wetland cell are kept in a compact working-holding arrangement (see Proposed Plan 1:500 and Landscape Plan). The root cellar is a low-visibility / earth-sheltered element; the open barn and polytunnels are read as agricultural structures; and the ponds and wetland cells are graded as landscape features rather than ornamental domestic features.

Building height and massing are controlled by the submitted floor plans, elevations and landscape sections. On the submitted elevation drawing, the maximum overall roofline is approximately 6.0 m, with lower roof elements and ancillary structures stepping down around the cluster. The assessment does not rely on the building being invisible; it relies on the building cluster being viewed against field-boundary vegetation and woodland rather than as a skyline feature.

## 9.5. Landscape Character

The character of the landscape around Lower Wych is defined by two overlapping LANDMAP areas[187][191]:

the English Maelor Open Rolling Lowlands, and
the Wych Valley Wooded Lowland Valleys.

Together, these describe an intimate pastoral landscape of hedged fields, scattered trees, enclosed wooded valleys, tranquil lanes and a strong sense of place. Within this setting, the site forms a small, well-contained parcel typical of the local pattern. Its existing woodland, hedgerows, mature trees and ponds are key components of this character.

The proposal has therefore been designed to strengthen rather than dilute these characteristics, keeping built form low, materials natural and muted, and new planting consistent with local species and management patterns. The landscape strategy uses retained woodland and hedgerows, new coppice blocks, orchard and soft fruit, managed meadow / scrub-grassland mosaic, wildflower meadow, pollinator strips and naturalistic pond margins to reinforce the local field pattern.

## 9.6. LANDMAP Summary

Table 9-1 summarises the verified LANDMAP findings for the site and its immediate setting. [187][191]

**Table 9-1: LANDMAP summary for the site and immediate setting**

| Aspect | LANDMAP Area | Evaluation | Key Characteristics |
|---|---|---|---|
| Visual & Sensory | English Maelor (WRXHMVS040) / Wych Valley (WRXHMVS048) | Moderate–High / High | Rolling pastoral farmland enclosed by wooded valley slopes; tranquil and largely unlit. |
| Landscape Habitats | Hanmer Grassland (WRXHMLH055) | High / Outstanding | Small fields with hedges, ponds and woodland providing habitat for bats, amphibians and pollinators. |
| Geological Landscape | Three Fingers to Drury Lane / Wych Brook – Iscoyd Brook (WRXHMGL123/104) | Moderate | Glacial till plain over sandstone with active fluvial processes along Wych Brook. |
| Historic & Cultural Landscape | Iscoyd Irregular Fieldscapes / Wych Valley (WRXHMHL030 / WRXHMCLS104) | Moderate – High | Medieval field pattern, mature hedges, long agricultural continuity, high scenic quality. |

Together, these evaluations confirm[189] that the site sits within a high-quality, well-managed rural landscape where small-scale, low-impact development can integrate successfully when design respects local character, landform, vegetation structure and tranquillity.

## 9.7. Visual Assessment

A proportionate GLVIA3-informed visual assessment has been undertaken from surrounding lanes, public routes, nearby dwellings, elevated checks, heritage-setting checks and wider landscape receptors within a 2 km study area. Representative photographs and annotated viewpoint sheets form the supporting visual evidence. The assessment deliberately tests the most open localised view at the existing gateway.

**Table 9-2: Viewpoint schedule for final photographic evidence**

| VP | Location / receptor | Distance / bearing | Purpose in the assessment |
|---|---|---|---|
| VP1 | South-western lane approach to the site | Short-range lane approach from the south-west, looking north-east toward the site frontage. | Tests the approach view from the south-west. Existing hedgerows, roadside vegetation and landform screen views into the site before reaching the gateway. |
| VP2 | Lane frontage / road corridor near the site | Short-range view along the lane, close to the site frontage. | Tests whether road users experience open views into the site from the lane. The photograph shows that roadside hedgerows and falling site topography prevent open views into the field. |
| VP3 | Existing gateway / immediate lane frontage | Close-range view through the existing gateway into the site. | Principal localised public view. This is the main point at which the interior of the site can be seen from the lane and is therefore the key view for assessing access, building set-back and Year 5 planting / screening. |
| VP4 | Lane view east / south-east of the site | Short-range view along the lane from the east / south-east, looking along the roadside hedgerow. | Tests views from the eastern lane approach and the effect of the roadside hedge. The site is screened by existing hedgerow and trees, with no open view into the main field. |
| VP5 | Wider lane view from the east | Wider approach view from the eastern lane corridor. | Tests whether the site is visible from the wider local road approach. The view is contained by roadside hedgerow, existing trees and landform, with no direct view into the site. |
| VP6 | North-east  rising landform and hedge line | Wider north-east approach view, looking toward the landform and roadside hedge context. | Tests whether the site is visible from the north-east approach. Rising landform and the intervening hedge line screen views toward the site. |

The field and woodland enclosure mean that the proposed dwelling, enterprise building, root cellar, open barn and polytunnels are unlikely to be readily visible from public rights of way. Due to way the land falls away from the adjacent road, the most open localised view is expected to remain the existing gateway. The visual assessment therefore treats this as the principal worst-case public view and requires a final annotated Year 1 / Year 5 image for that viewpoint.

For nearby residential receptors, the combination of distance, intervening hedgerows, oblique viewing angles, landform and existing woodland means that no material change in outlook is expected.

**Figure 9-1: Viewpoint Location Plan**




Figure 9-1: Viewpoint Location Plan. The plan identifies the representative viewpoint locations used for the existing visual baseline photographs and visibility assessment.

**Figure 9-2: Representative Existing Viewpoint Photographs**



VP1: Approach from south-west; site screened by hedgerow and landform



VP2: View along lane; no open views into site



VP3: Existing gateway view; localised filtered visibility only



VP4: View along lane; site screened by roadside hedgerow



VP5: Wider lane view from east; no direct view into site



VP6: Rising landform and hedge screen views from the north-east approach

Figure 9-2: Representative Existing Viewpoint Photographs. The photographs show the existing visual baseline from the lane and gateway approaches. Views are generally screened or filtered by existing hedgerows, mature trees and falling topography, with the principal localised view occurring through the existing gateway.

**Figure 9-3: Existing Local Visibility Assessment Plan**

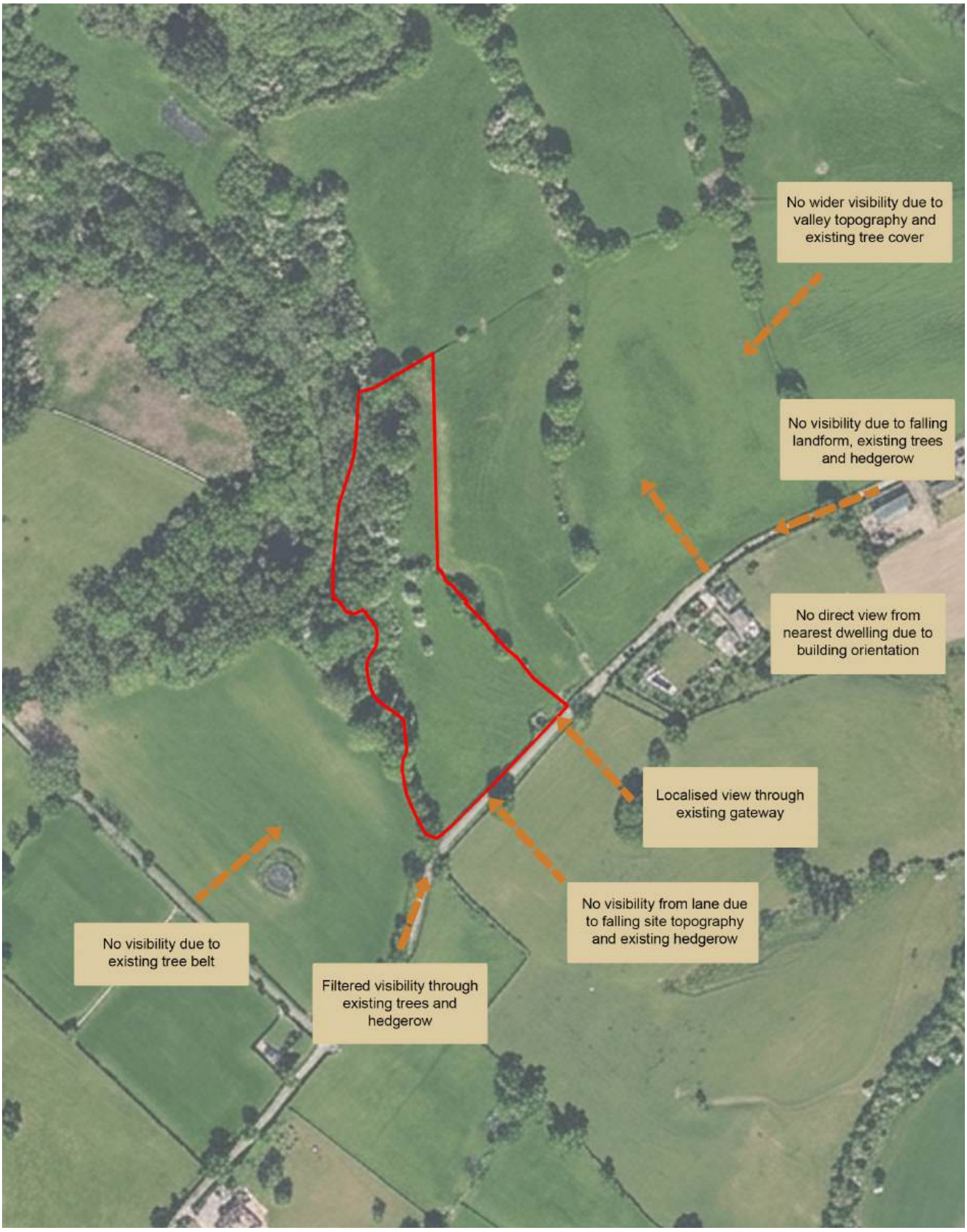



Figure 9-3: Existing Local Visibility Assessment Plan. The plan identifies the principal existing visibility conditions around the site. Views are generally screened or filtered by existing hedgerows, mature trees, woodland and falling topography, with the only localised open view occurring through the existing gateway from the lane.

**Table 9-3: GLVIA3-informed visual receptor assessment matrix**

| Receptor | Sensitivity | Year 1 magnitude and significance (winter / establishment worst case) | Year 5 residual magnitude and significance |
|---|---|---|---|
| Local lane users at existing gateway (VP3) | Medium - transient local road users, but close to the site. | Slight to moderate localised magnitude. Possible filtered view of access, low rooflines, roof PV, young planting and polytunnels. Minor adverse, localised and short duration; not significant in GLVIA terms. | Slight to negligible magnitude as hedgerow reinforcement, orchard and coppice establish. Negligible to minor residual effect; not significant. |
| Local lane users away from gateway (VP1, VP2, VP4) | Low to medium - transient road users with oblique views. | Slight or negligible magnitude through hedgerow gaps, mainly in winter. Negligible to minor effect; not significant. | Negligible magnitude once boundary planting and management mature. Negligible residual effect; not significant. |
| Nearby residential receptors / farmsteads (no dedicated viewpoint; assessed through oblique views and the visual envelope at Figure 9-3) | Medium to high - private receptors have higher sensitivity to outlook, although views are filtered and oblique. | Slight magnitude at most; no direct or open view of the cluster expected. Minor or negligible effect; not significant. | Negligible magnitude with maintained hedgerows and new planting. Negligible residual effect; not significant. |
| Public rights of way and recreational routes | Medium - recreational receptors are more sensitive, but no public right of way crosses the holding. | Negligible magnitude because the site is screened by intervening field boundaries, landform and woodland. Negligible effect; not significant. | Negligible magnitude and residual effect; not significant. |
| Wider landscape / elevated viewpoints | Medium - wider rural landscape receptors, with potential sensitivity to skyline change. | Negligible to slight magnitude. | Negligible magnitude as the cluster is behind and read against retained woodland and reinforced planting. Negligible to minor effect; not significant.” |
| Doley Wood and Meadows LWS / woodland-edge receptor | High as a local landscape and ecological receptor. | Negligible direct magnitude because no built form, storage or lighting is located within the LWS; possible temporary edge awareness during construction. Negligible to minor temporary effect; not significant. | Neutral to minor beneficial residual effect as woodland edge, dark corridor and habitat structure are retained and managed. |
| Heritage setting receptors: Castle Hill Scheduled Monument, Lower Wych Bridge and Iscoyd Park wider context (no dedicated viewpoint) | High, because designated heritage assets are sensitive to setting change. | Negligible magnitude where no intervisibility is confirmed. Negligible effect; not significant. | Negligible magnitude and residual effect; no setting harm predicted. |

| Receptor | Sensitivity | Year 1 magnitude and significance (winter / establishment worst case) | Year 5 residual magnitude and significance |
|---|---|---|---|
| Local lane users at existing gateway (VP3) | Medium - transient local road users, but close to the site. | Slight to moderate localised magnitude. Possible filtered view of access, low rooflines, roof PV, young planting and polytunnels. Minor adverse, localised and short duration; not significant in GLVIA terms. | Slight to negligible magnitude as hedgerow reinforcement, orchard and coppice establish. Negligible to minor residual effect; not significant. |
| Night-time receptors and dark rural landscape | Medium to high due to rural tranquillity and ecological corridor sensitivity. | Negligible magnitude if lighting strategy is followed: no floodlighting, warm shielded fittings only where essential. Negligible effect; not significant. | Negligible magnitude and residual effect, with lighting kept time-limited, downward-facing and away from woodland, hedgerows, ponds and Wych Brook corridor. |

## 9.8. Design and Mitigation

The design process has been guided by the principle of avoidance first, followed by reduction and enhancement. The main design choices that reduce landscape and visual effects are:

- **Compact siting:** the dwelling, enterprise building, root cellar, open barn, polytunnels, access and water-management features are clustered outside the retained woodland, root protection areas and sensitive habitat edges, following existing contours and field structure rather than spreading across the holding.
- **Use of existing enclosure:** retained hedgerows, mature trees and the northern woodland provide the primary landscape framework and immediate visual containment.
- **Low, simple massing:** the building cluster uses simple, recessive forms with lower ancillary roofs and agricultural / productive structures grouped around the dwelling.
- **Muted materials and weathering:** Welsh larch / timber cladding, muted non-reflective roof finishes, dark-framed roof-mounted PV and natural external tones reduce glare and visual prominence. The timber will weather toward a softer silver-grey / muted brown finish over time, helping the buildings settle into the hedged-field and woodland-edge setting.
- **Roof-mounted PV rather than field-mounted solar:** the adopted PV array is located on the roof, not in a separate field array. Panels will be arranged as a coherent dark roof-plane element, using dark frames and low-glare / anti-reflective glass where available, with low-profile or integrated mounting aligned to the roof pitch. This avoids a separate infrastructure feature within the field and keeps the renewable-energy element visually tied to the building envelope.
- **Polytunnel visual treatment:** the two 6 m x 12 m polytunnels are located within the productive enclosure rather than on an exposed field edge. They will use neutral / clear UV-stabilised covers kept taut and replaced when degraded, with no routine night-time internal lighting. Boundary hedgerows, orchard, coppice and productive planting will filter views so that the tunnels read as small horticultural structures within the holding rather than as isolated reflective objects.
- **Low-impact access:** the existing gateway is retained, with permeable / grass-reinforced surfaces used wherever practical so that access and parking read as part of a working rural holding.
- **Water features:** the two clean-water irrigation / attenuation ponds and the separate greywater polishing pond / planted wetland cell will be graded with naturalistic margins so they read as landscape and habitat features.
- **Dark-skies approach:** there will be no external floodlighting; only low-level, warm-spectrum (< 3000 K), downward-facing, fully shielded, motion-controlled and time-limited lighting will be used where essential, with no spill to woodland, hedgerows, trees, ponds or dark corridors.
- **Landscape reinforcement:** new coppice, orchard / soft fruit, managed meadow / scrub-grassland mosaic, pollinator strips, wildflower meadow and pond margins will strengthen the existing rural character over time.

Taken together, these measures avoid the main sources of landscape and visual harm at the design stage. Any remaining effects are expected to be short-range and localised during the establishment period, reducing as hedgerow reinforcement, coppice, orchard, meadow and scrub-grassland habitats mature.

Construction-phase visual effects will be temporary and managed through the same low-impact approach. Screw-pile foundations reduce excavation and spoil movement; the WikiHouse components are delivered flat-packed and

assembled within a shorter construction window than conventional masonry construction; and materials will be stored within a defined working area close to the building cluster. No construction lighting will be used except where essential for health and safety, and disturbed ground will be reinstated or brought into productive / habitat use as soon as practicable.

Heritage-setting receptors have also been considered. Section 2 identifies no designated heritage assets within the site and records no material intervisibility with the Castle Hill Scheduled Monument area, the listed Lower Wych Bridge context or the Iscoyd Park wider historic setting. On the basis of the enclosed field pattern, woodland back-drop, distance and lack of direct visibility, no harm to designated heritage setting is predicted.

**Table 9-4: Year 1 and Year 5 screening / integration logi**

| Landscape element | Existing / Year 1 role | Year 5 role | Assessment implication |
|---|---|---|---|
| Southern and eastern hedgerows | Existing immediate filtering from lane and neighbouring field edges; gap planting where needed. | Denser, more continuous native boundary structure. | Provides the main immediate visual containment and long-term rural field character. |
| Northern woodland | Existing dense backdrop and ecological constraint retained in full. | Managed woodland edge and dark corridor maintained. | Prevents the building cluster being read against open sky and protects valley character. |
| New coppice blocks | Establishing whips / guards initially visible but low in height. | Substantial productive screening and habitat structure. | Reduces any short-range Year 1 glimpses and supports the working-holding landscape character. |
| Orchard and soft fruit | Young trees and supports add a recognisably rural productive layer. | Maturing orchard forms a soft mid-ground screen and seasonal landscape feature. | Helps the development read as land-based agriculture rather than isolated housing. |
| Meadow, pollinator strips and scrub-grassland mosaic | Softens the foreground and avoids manicured domestic character. | Creates a more textured, species-rich field matrix. | Strengthens LANDMAP character, biodiversity and landscape distinctiveness. |
| Ponds and wetland planting | New earthworks and planting establish clean-water / wetland functions. | Naturalised pond margins and wetland vegetation integrated into the productive landscape. | Creates habitat and visual interest without introducing suburban forms. |

## 9.9. Embedding into the Landscape

From the outset, the intention has been to make the new dwelling and associated buildings read as part of a modest rural working holding rather than as a standalone countryside dwelling. The combination of retained woodland, existing hedgerows, new coppice, orchard planting, managed meadow / scrub-grassland mosaic, pollinator strips and naturalistic ponds creates a layered landscape setting that softens the built cluster and reinforces the field pattern.

The built and access footprint remains small in landscape terms. The current land-use audit identifies approximately 313 m² of built footprint for the dwelling, enterprise building and open barn, equal to about 1.51% of the 20,700 m² / 5.12-acre site. Access, parking, turning and paths account for approximately 256 m², or about 1.24% of the site. The combined built / access footprint is therefore about 569 m², or 2.75% of the holding, with the remaining land retained for productive agriculture, woodland, meadow, orchard, coppice, ponds and ecological enhancement.

**Figure 9-4: Proposed Site Visibility and Year 5 Screening Plan**

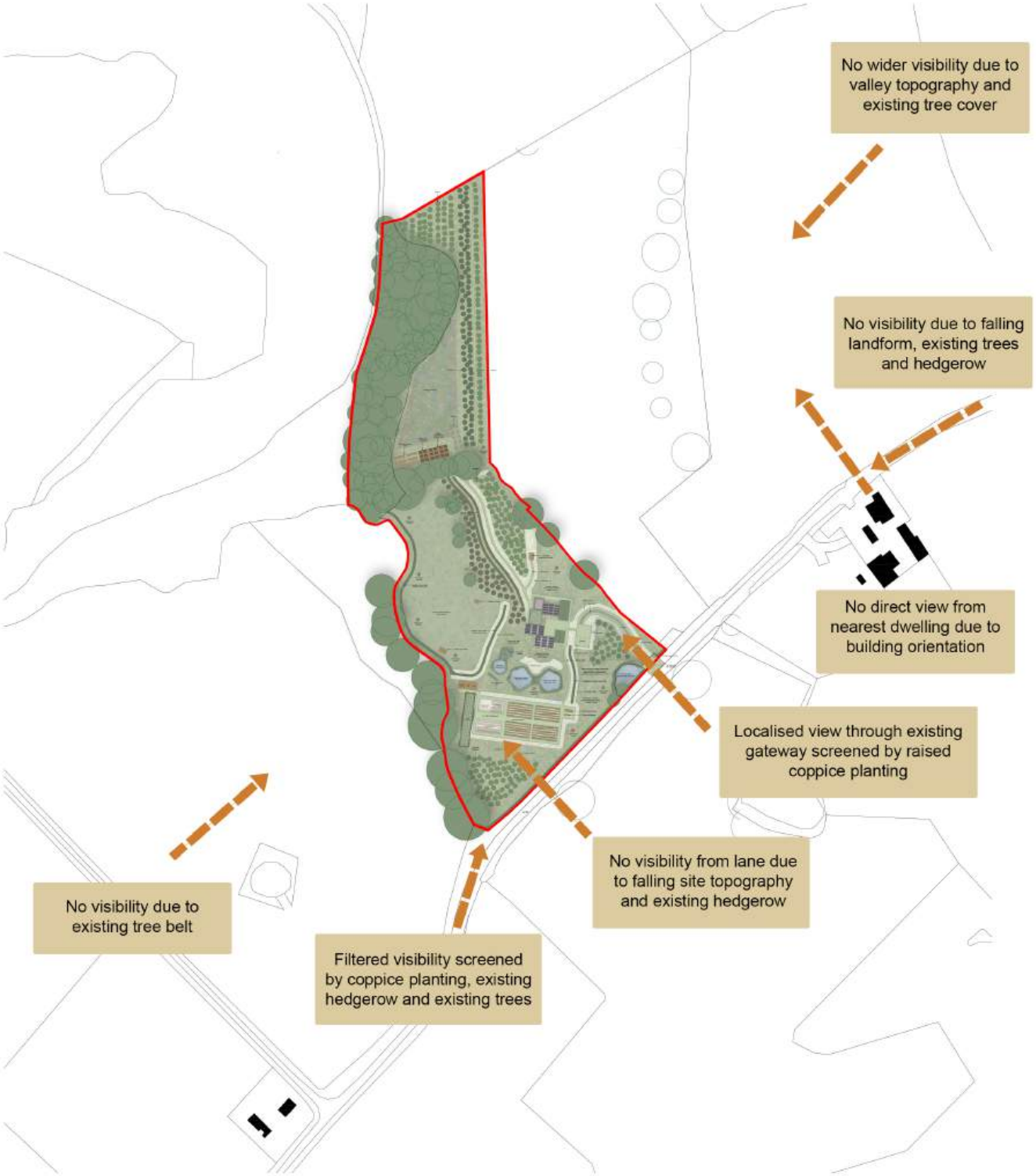



Figure 9-4: Proposed Site Visibility and Year 5 Screening Plan. The plan shows the proposed building and landscape strategy in relation to existing view directions. By Year 5, localised and filtered views are further contained by retained hedgerows, existing trees, orchard / food-forest planting, coppice and the woodland backdrop.

**Figure 9-5a: Indicative view from the site entrance (VP3) at first habitation**



Figure 9-5a: Computer-generated indicative visualisation from Viewpoint VP3 (camera position shown on Figure 9-1), at approximately 1.6 m eye level from the existing gateway. The dwelling roofline is visible above the intervening vegetation at first habitation.

**Figure 9-5b: Indicative view from the site entrance (VP3) with planting established (Year 5–10)**



Figure 9-5b: The same viewpoint and camera position as Figure 9-5a, showing the effect of the coppice planting set out in the Landscape Plan as it establishes over approximately Years 5–10.

**Table 9-5: Landscape footprint summary**

| Element | Area | % of site | Landscape interpretation |
|---|---|---|---|
| Built footprint: dwelling, business building and open barn | 313 m² | 1.51% | Low built proportion for the holding; compact cluster rather than dispersed development. |
| Access, parking, turning and paths | 256 m² | 1.24% | Permeable / grass-reinforced surfaces wherever practical, avoiding suburban hardstanding character. |
| Combined built / access footprint | 569 m² | 2.75% | Small physical intervention within a wider productive and habitat-managed landscape. |
| Remaining productive and ecological land | c. 20,131 m² | 97.25% | Retained for woodland, orchard, meadow, grazing, horticulture, coppice, ponds, wetland and wildlife refugia. |

## 9.10. Lighting and Tranquillity

LANDMAP identifies this area as having very low night-time light levels and a high tranquillity value.[188][190] Maintaining this character is essential to the landscape assessment and to the ecological function of woodland, hedgerows, ponds and the wider Wych Brook corridor.

For the purposes of the visual assessment, day-time effects are driven mainly by built form, PV, polytunnels and access; night-time effects are driven by whether lighting changes the dark rural character. The day-time receptor matrix in Table 9-3 therefore needs to be read with this lighting section: the predicted night-time effect remains negligible only if fittings are limited, warm, shielded, motion-controlled and directed away from woodland, hedgerows, ponds and the Wych Brook corridor.

Lighting will be avoided unless needed for safe access, servicing or animal welfare. Where required, fittings will use warm-spectrum lamps (< 3000 K), be fully shielded, face downward, operate on motion sensors / timers, and be located close to doors or working areas rather than on poles or boundary edges.[193][194][196] No light spill will be permitted towards the retained woodland, hedgerows, mature trees, ponds, dark corridors or the Wych Brook corridor. No floodlighting, decorative garden lighting, uplighting or continuously lit yard lighting is proposed. Day-to-day activity will remain quiet and rural in character, with no external noise sources beyond normal domestic and smallholding use. As a result, the existing sense of peace, darkness and natural soundscape will be preserved.

## 9.11. Conclusion

The Lower Wych landscape is of High to Moderate-High quality, defined by small fields, mature hedgerows, wooded valley edges and a tranquil rural setting. The proposal has been developed around those constraints and opportunities rather than imposed upon them.

The dwelling, enterprise building, root cellar, open barn, polytunnels, ponds and access are compact, clustered and visually contained by retained hedgerows, the Doley Wood and Meadows LWS woodland backdrop and new productive planting.

- LANDMAP data confirms the site's habitat, visual and cultural value, and the scheme retains and strengthens the features that create that value.

- No significant adverse landscape or visual effects are predicted; any Year 1 effects are expected to be short-range, localised and minor at most, reducing as planting establishes.

- New coppice, orchard, meadow, pollinator strips, managed scrub-grassland mosaic, clean-water ponds and wetland planting will reinforce the traditional field pattern and improve landscape structure.

- The lighting strategy preserves dark skies, tranquillity and ecological corridors along woodland, hedgerows and

water features.

- The roof-mounted PV array, polytunnels and construction phase have been considered as specific visual elements rather than omitted from the assessment. Their effects are capable of being kept localised and non-significant through roof-first PV, neutral polytunnel treatment, compact siting, retained hedgerows, limited lighting and a short, controlled construction sequence.

In conclusion, the proposed One Planet Development will sit comfortably within the Wych Brook valley, strengthening rather than weakening local landscape character. It meets TAN 6 requirements for a light-touch, land-based development and provides a credible landscape basis for long-term monitoring, adaptive management and ecological enhancement.

## References

[185] Welsh Government (2010) Technical Advice Note (TAN) 6: Planning for Sustainable Rural Communities. Available at: https://www.gov.wales/sites/default/files/publications/2018-09/tan6-sustainable-rural-communities.pdf (Accessed: 12 December 2025).

[186] Welsh Government (2024) Planning Policy Wales, Edition 12. Available at: https://www.gov.wales/sites/default/files/publications/2024-07/planning-policy-wales-edition-12.pdf (Accessed: 12 December 2025).

[187] Natural Resources Wales (n.d.) LANDMAP - the Welsh landscape baseline. Available at: https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/evidence-to-inform-development-planning/landmap-the-welsh-landscape-baseline/?lang=en (Accessed: 12 December 2025).

[188] Natural Resources Wales (2017) LANDMAP Methodology Overview (June 2017). Available at: https://naturalresources.wales/media/681752/landmap-methodology-overview-2017-eng.pdf (Accessed: 12 December 2025).

[189] Natural Resources Wales (n.d.) Using LANDMAP in Landscape and Visual Impact Assessments (GN46). Available at: https://naturalresources.wales/guidance-and-advice/business-sectors/planning-and-development/evidence-to-inform-development-planning/using-landmap-in-landscape-and-visual-impact-assessments-gn46/?lang=en (Accessed: 12 December 2025).

[190] Natural Resources Wales (2016) Visual and Sensory LANDMAP Methodology (v2). Available at: https://naturalresources.wales/media/677816/visual-sensory-landmap-methodology-2016-v2.pdf (Accessed: 12 December 2025).

[191] Welsh Government / DataMapWales LANDMAP Visual and Sensory dataset (inspire-nrw: NRW_LANDMAP_Visual_Sensory). Available at: https://datamap.gov.wales/layers/inspire-nrw%3ANRW_LANDMAP_Visual_Sensory (Accessed: 12 December 2025).

[192] Landscape Institute (2013) Guidelines for Landscape and Visual Impact Assessment (GLVIA3). Available at: https://landscapeinstitute.org/policy-practice/technical/assessments-standards/glvia3-panel/ (Accessed: 12 December 2025).

[193] Institution of Lighting Professionals (2021) Guidance Note 01: The Reduction of Obtrusive Light (GN01). Available at: https://theilp.org.uk/asset/D008B204-4EEC-4EC8-997B08F2BECAC6EE/ (Accessed: 12 December 2025).

[194] CIE (2017) CIE 150:2017 Guide on the Limitation of the Effects of Obtrusive Light from Outdoor Lighting Installations (2nd edition). Available at: https://cie.co.at/publications/guide-limitation-effects-obtrusive-light-outdoor-lighting-installations-2nd-edition (Accessed: 12 December 2025).

[195] Ordnance Survey (n.d.) OS OpenMap - Local (OpenData). Available at: https://www.ordnancesurvey.co.uk/products/os-open-map-local (Accessed: 12 December 2025).

[196] DarkSky International (2025) DarkSky Approved Luminaires guidelines (CCT maximum 3000 K). Available at: https://darksky.org/what-we-do/darksky-approved/darksky-approved-luminaires-program/darksky-approved-luminaires-guidelines/ (Accessed: 12 December 2025).

[197] Welsh Government (2012). One Planet Development Practice Guidance: Technical Advice Note 6 - Planning for Sustainable Rural Communities. Cardiff: Welsh Government.

[198] Welsh Government (2021). Future Wales: The National Plan 2040. Cardiff: Welsh Government.

[199] Wrexham County Borough Council (2005). Wrexham Unitary Development Plan 1996-2011. Adopted 14 February 2005.



# 10.Community Impact and Engagement

# 10. Community Impact and Engagement

**Essential criteria (OPD Practice Guidance § 3.113): [200,201]**

• *There is a thorough assessment of all impacts of the proposals on neighbouring communities. One Planet Development in the open countryside should not impact negatively on neighbouring communities.*

• *Any negative impacts are mitigated.*

## 10.1 Our Approach

This section assesses the likely community impacts of the Lower Wych One Planet Development and explains how positive effects will be delivered while potential adverse effects are avoided, capped, mitigated and monitored. The proposal is intended to be a small, family-run land-based holding, not an events venue, visitor attraction or general retail destination. Community activity will therefore be modest, pre-arranged and proportionate to the scale of the site.

The central community benefit is practical rather than promotional: local food production, ecological land management, knowledge sharing, responsible neighbour relationships and a small number of carefully managed educational or cultural activities. These benefits will be delivered without creating unacceptable traffic, parking, noise, light spill, disturbance, public-service pressure or loss of rural amenity.

Pre-application engagement has begun through direct contact with nearby landowners and neighbours in connection with ecological survey access and the explanation of the wider OPD proposal. This dialogue will continue through the planning process. Any written feedback, letters of support, no-objection responses or specific concerns will be held in a simple community engagement log and, where relevant, used to refine the event, traffic, access and neighbour-communication controls set out below.

To date, this has included direct conversations and written information to neighbouring landowners about ecological survey access, including great crested newt pond-survey matters, a simple explanation of the OPD proposal, its difference from a normal rural housing application, and the small-scale family smallholding approach. The following sections distinguish between:

- day-to-day community benefits, such as local food, neighbour contact and participation in local groups;

- remote or low-impact engagement, such as newsletters, online workshops and blog updates, which do not generate site traffic; and

- controlled on-site activity, such as small seasonal meals, school visits, seed swaps or tool-library exchanges, which is capped, pre-booked and monitored.

## 10.2 Community Benefits and Impact Controls

### 10.2.1 Local food and economy

A central aim is to enhance local food security through vegetables, fruit, mushrooms, honey and eggs produced using low-input and regenerative methods. By Year 5, subject to actual yields and the household food self-sufficiency requirement, surplus produce will support a small seasonal CSA / local box scheme or equivalent local sales route. The CSA ambition remains modest and will be capped at approximately 15 households for around 24 weeks per year. This is a small seasonal mixed-produce share, not a full weekly household vegetable replacement box. Household food needs and the land-based viability commitments in Section 4 will take priority over expansion of the customer base. [202-205]

Seasonal produce boxes may include simple recipe cards and storage notes, helping households make use of unfamiliar crops and reduce food waste. These may include occasional Welsh or borderland food references, such as cawl, bara brith, preserved orchard fruit or seasonal ferments, where this fits the produce available. Where harvests exceed household, CSA and sales requirements, small pre-arranged surplus-sharing sessions or produce-sharing arrangements may be offered to neighbours or local contacts. These will be occasional, invitation-only, supervised and counted within the visitor and event controls in Table 10-1.

***Positive community impact:***

- Fresh seasonal produce made available locally, reducing food miles and supporting household-scale food resilience.

## Routes to Market & Community Engagement

### Direct local sales model




### Example bilingual recipe-card material supporting CSA harvest box







Example bilingual recipe-card material supporting CSA harvest boxes.

These cards show how CSA customers will be helped to use seasonal produce at home. They connect fresh harvest items with shelf-stable Tyfu Pantry products, such as mushroom garum, wildflower honey and kimchi salt, helping to reduce waste, encourage repeat local sales and provide English/Welsh communication without creating additional public access to the site.

Role of recipe cards:

- Supports direct CSA sales
- Encourages low-waste seasonal cooking
- Promotes value-added pantry products
- Provides bilingual English/Welsh communication

Figure 10-1: Routes to market and community engagement model. Tyfu's proposed local sales routes combine CSA boxes, farmers' markets, pre-arranged local collections and small-scale local retail / restaurant supply. Bilingual recipe-card material supports seasonal produce use and community benefit without creating unrestricted public access to the site.

- Money spent with local trades, suppliers and collaborators supports the rural economy.

- Surplus produce may be shared, sold locally or used in small seasonal events rather than wasted.

- Recipe cards, storage notes and seasonal produce ideas can help neighbours use local food well and reduce waste.

- Occasional surplus-sharing sessions can make genuine excess harvests available locally, without creating open public access.

- The enterprise provides a practical example of small-scale land-based livelihood in the local area.

***Mitigated negative impact:***

- CSA membership will be capped and managed through a waiting list if demand exceeds production. [202-205]

- Collections and deliveries will be bundled with existing journeys, delivered locally by bike where practical, or arranged through local hubs to avoid unmanaged traffic.

- There will be no general retail parking, no unrestricted public opening hours and no invitation for casual drop-in traffic.

- Any surplus-sharing session will be pre-arranged, supervised, invitation-only and counted within the visitor controls in Table 10-1.

- Organic and low-input methods will protect soil, pollinators and adjacent habitats.

### 10.2.2 Shared resources and collaboration

Shared resources will be kept small and neighbourly. A tool library, seed swaps and informal produce or scion sharing can reduce start-up barriers for local growers and support heritage varieties such as Bardsey apple, Denbigh plum, Carmarthen leek, Llanover pea and Crimson Flowered broad bean. [206,207]

***Positive community impact:***

- Tool sharing reduces duplication and cost for local growers.

- Heritage varieties are circulated and preserved through practical use.

- Seed exchanges encourage local knowledge, storytelling and resilience.

- Collaboration with nearby producers can reduce costs, bulk-ordering impacts and unnecessary journeys.

***Mitigated negative impact:***

- Seed swaps and tool-library collections will be appointment-based or combined with other planned visits rather than run as open public events.

- Biosecurity measures will be used for seed, plant and equipment exchange to reduce pest and disease risk.

- Any small in-person exchange will fall within the event and visitor controls in Table 10-1.

### 10.2.3 Education and skills

Education and skills sharing will be modest and structured. The holding may host 2-4 physical school or educational visits annually, linked to outdoor learning, soil, ecology, food production, water management, renewable energy and low-impact construction. This physical-visit cap will apply regardless of demand; any additional demand will be met through digital packs, remote sessions or signposting to other local outdoor-learning opportunities. Adult learning will be prioritised online, with any in-person sessions kept within the small visitor limits in this chapter. [208-210]

For school or educational visits, activities may be structured around a simple “eco-passport” or activity sheet, with pupils recording tasks such as pond dipping, soil observation, seed sowing, energy monitoring or wildlife identification. This will make visits purposeful and curriculum-linked while keeping them small, supervised and pre-arranged.

Accessibility and inclusion will be considered case by case. Routes, activities and written materials will be adapted where practical for age, mobility, language and learning needs. Where on-site access, weather, ground conditions or safeguarding constraints make a visit unsuitable, the default alternative will be a digital pack, remote session or class-

room-based activity rather than increasing the number or scale of physical site visits.

***Positive community impact:***

- Low-cost, hands-on outdoor learning for small supervised groups.

- A simple eco-passport or activity sheet can give pupils a tangible record of outdoor learning and link visits to curriculum themes.

- Practical skills such as composting, seed saving, fermentation, coppicing, hedge-laying and water management are shared locally.

- Digital packs and online workshops allow wider knowledge-sharing without creating traffic.

***Mitigated negative impact:***

- School visits will be capped at 2-4 physical visits per year, regardless of demand, and must be pre-arranged.

- Visits will be supervised, risk-assessed and supported by appropriate insurance, safeguarding and PPE where required. For school groups, children will either remain under school staff supervision at all times or any host adult with a direct supervisory role will hold an appropriate enhanced DBS check. [210]

- Visits will be cancelled, adapted or moved online if weather, ground conditions, accessibility, safeguarding, ecology constraints or neighbour amenity make an on-site visit unsuitable.

### 10.2.4 Culture and heritage

The project will use Welsh language and cultural references in a practical, proportionate way. The project name Tyfu, bilingual signage and selected bilingual communications will help normalise Welsh language use without overstating the cultural role of the holding. Heritage crops, traditional food, seasonal crafts and local land-management skills will be woven into the project.

Seasonal food events will be small and controlled. By Year 3 we aim to host two small seasonal meals per year, increasing to a maximum of four per year by Year 5. These will normally involve no more than 12 attendees and will be pre-booked. They will not involve amplified music, late-night entertainment, unmanaged parking or use of the site as a wider public events venue. All on-site seasonal meals or community events will conclude by 22:00, with earlier finish times used where weather, neighbours, or seasonal light conditions make this more appropriate.

***Positive community impact:***

- Welsh language and local heritage are visible in a modest everyday way.

- Seasonal meals can build neighbourly connection around food grown on the holding.

- Traditional skills such as grafting, hedge-laying and scything remain living practices rather than abstract heritage.

***Mitigated negative impact:***

- Cultural claims will be kept proportionate and grounded in genuine practice.

- Bilingual material will be checked or co-developed with Welsh speakers where practical.

- The event cap prevents seasonal meals from becoming an unmanaged events use.

### 10.2.5 Community connections and neighbour dialogue

Everyday neighbour relationships are more important than large events. We will keep immediate neighbours informed through direct contact, occasional newsletters or short updates, and a clear feedback route. Informal contact, gifting occasional surplus produce, practical assistance and participation in local activities will help the holding become part of the local community without creating a formal visitor destination.

***Positive community impact:***

- Neighbours are kept informed and have a clear route for raising concerns.

- Everyday exchanges build trust and reciprocity.

- Community benefits arise through practical local participation rather than publicity-led activity.

***Mitigated negative impact:***

- Neighbour feedback will be recorded and responded to through the protocol in Section 10.4.

- Immediate neighbours will be informed in advance of scheduled on-site events that could generate additional vehicle movements.

- Any repeated concern about traffic, parking, noise, lighting, odour or disturbance will trigger the adaptive-management measures in Section 10.5.

### 10.2.6 Use of public services and transport

The proposal is designed to minimise avoidable travel and public-service pressure. We will walk or cycle locally where practical, bundle errands, use local suppliers, and use public transport for longer journeys when it is a reasonable alternative. The children will attend a local school, which supports integration into the community while allowing school journeys to be managed through cycling, shared lifts and the transport controls in Section 11. [211,212]

Visitor and engagement activity will be managed in line with Section 11. The visitor programme will not exceed the Transport Assessment and Travel Plan assumptions: approximately 24 visitor vehicle journeys per year for seasonal feasts, educational events and school visits, estimated at around 600 visitor miles per year, plus the separate modest family / friends visitor allowance. Visitor mileage, purpose and mode will be recorded annually, and the programme will be reduced or moved online if actual visitor travel exceeds the Section 11 allowance.

Across all controlled on-site community activity, the planning assumption is approximately 250-300 person-visits per year, spread across the capped seasonal meals, 2-4 school or educational visits, appointment-based exchanges and occasional surplus-sharing. This is a ceiling for monitoring purposes, not a target. If the pattern creates traffic, parking, neighbour-amenity or ecological impacts, the first response will be to reduce numbers, reduce frequency or move more activity online.

***Practical commitments to reduce travel impacts:***

- Maintain a simple journey log recording purpose, destination, mode and mileage.

- Consolidate deliveries, collections and errands wherever feasible.

- Prioritise local suppliers, local outlets and shared distribution hubs.

- Send visitor information in advance, including public transport options, car-share encouragement, arrival guidance and a clear no-lane-parking instruction.

- Schedule any on-site engagement to avoid peak times and reduce disturbance to neighbours.

### 10.2.7 Low-impact lifestyle knowledge sharing

Knowledge sharing will be primarily online or through low-frequency, pre-arranged activities. A project blog, newsletters or social media updates share seasonal activities, growing methods, fermentation, coppicing, energy monitoring, rainwater harvesting and low-impact construction. Online activity provides community benefit without generating traffic or disturbance.

***Positive community impact:***

- Greater local knowledge of low-impact skills such as seed saving, fermentation, composting, coppicing and renewable energy.

- Peer-to-peer learning and collaboration with established community groups.

- Wider knowledge-sharing without routine visitor pressure on the lane.

***Mitigated negative impact:***

- Technical information will signpost credible sources where appropriate.

- In-person workshops will only take place within the visitor caps in Table 10-1.

- Online resources will be used where demand exceeds the safe and proportionate on-site capacity.

### 10.2.8 Ecosystem services and green infrastructure

The holding will form part of the wider green infrastructure of the area. Hedgerows, orchards, wildflower margins, ponds, meadow, coppice and woodland-edge management will provide ecosystem services including pollination, water slowing, carbon storage, biodiversity enhancement and soil improvement. [213-215]

***Positive community impact:***

- Pollination services that support nearby gardens and food crops.

- Carbon sequestration through tree planting, hedgerow management and soil regeneration.

- Revival of traditional land-management practices such as scything, coppicing and hedge-laying.

- A genetic resource for local orchards through carefully managed scion and cutting sharing.

- Improved biodiversity and wildlife appreciation for neighbours and visitors.

***Mitigated negative impact:***

- Species sharing will focus on native or recognised heritage varieties and avoid inappropriate introductions.

- Landscape management will be timed sensitively, including hedge cutting outside the main bird-nesting season.

- Visitors will not be allowed unmanaged access to sensitive woodland, pond or wildlife areas.

### 10.2.9 Participation in local groups

We intend to participate in local groups and community life in the wider area, including events and activities organised through Tallarn Green, Malpas and the surrounding villages. This includes attending village-hall activities, seasonal fairs, orchard groups, environmental projects and local fundraising events. [216,217]

***Positive community impact:***

- Supports and strengthens existing community life rather than drawing activity away from it.

- Broadens opportunities for sharing knowledge, produce and skills.

- Helps the holding function as part of the wider community rather than as an isolated project.

***Mitigated negative impact:***

- External participation will be balanced with the core land-based work and family responsibilities.

- The proposal does not depend on creating a separate new community venue on the holding.

**Table 10-1: On-site engagement and visitor control schedule**

| Activity | Maximum frequency / scale | Management controls | Monitoring record |
|---|---|---|---|
| CSA / local food collection and surplus-sharing | Small local seasonal scheme only; capped at approx. 15 households for around 24 weeks per year if Year-5 production allows. This is a modest mixed-produce share, not a full weekly household vegetable replacement box. Occasional surplus-sharing only where harvests genuinely exceed household, CSA and sales needs. | Appointment / hub collection, bundled deliveries, cargo bike where practical, no general retail opening and no unrestricted public parking. Any surplus-sharing session is invitation-only, supervised, pre-arranged and counted within the same visitor controls. | CSA membership, delivery / collection method, mileage, surplus-sharing date if any, and any parking issues. |
| Seasonal meals / neighbour food events | Up to 2 per year by Year 3; maximum 4 per year by Year 5; normally no more than 12 attendees. | Pre-booked only; no amplified music; events conclude by 22:00; no late-night entertainment; no parking on the lane; car-share encouraged; cancelled if weather or ground conditions are unsuitable. | Date, attendees, vehicle numbers, complaints / no complaints, mitigation used. |
| School / educational visits | 2-4 physical visits per year regardless of demand; normally no more than one class group or equivalent small supervised group at a time. | Pre-arranged with school / group; risk assessment; children remain under school staff supervision or host adults with direct supervisory roles hold appropriate enhanced DBS checks; PPE where needed; travel information sent in advance; eco-passport / activity sheet used where appropriate; additional demand met by digital packs or online sessions. | Date, organisation, numbers, staff ratio, transport mode, safeguarding / safety notes and whether eco-passport / activity sheet was used. |
| Seed swaps / tool-library exchanges | Low-frequency, appointment-based local exchange. | Biosecurity checks; collections combined with other planned visits; no general public opening. | Exchange date, participants, any biosecurity or parking issues. |
| Heritage skills demonstrations | Only as part of the capped seasonal or educational programme, not as additional events. | Small groups; supervised; no amplified sound; sensitive timing around nesting season, ground conditions and ecology constraints. | Date, activity, attendees, safety / ecology notes. |
| Online workshops, newsletters and project updates | No fixed cap; remote activity only. | No visitor traffic; information signposts credible sources where technical matters are discussed. | Topic, publication date, approximate reach where known. |

## 10.3 Risks and How We Manage Them

The main potential negative impacts are small in scale but are treated seriously because the site sits within a rural lane network and close to sensitive ecological receptors. Table 10-2 sets out the principal risks, their likely scale and the mitigation that will be applied.

**Table 10-2: Community impact risk assessment and mitigation**

| Risk | Likelihood | Mitigation |
|---|---|---|
| Construction disruption | Medium | Use off-site WikiHouse prefabrication, limit noisy works to reasonable daytime hours, use dust suppression where needed, keep material storage within the working area and avoid sensitive ecological periods where practicable. |
| Extra traffic / parking | Low-Medium | No general opening, no unrestricted retail visitors, pre-booked visits only, car sharing encouraged, no parking on the lane, visitor mileage monitored against Section 11. |
| Event creep / perception of events venue | Low | Maximum of four small seasonal events per year by Year 5, normally no more than 12 attendees, no amplified music, events conclude by 22:00, no late-night entertainment and no commercial venue hire. |
| Noise and neighbour amenity | Low | Small daytime / early-evening gatherings only, no amplified music, 22:00 latest finish for seasonal events, advance notice to immediate neighbours for larger planned visits, and complaint logging. |
| Environmental disturbance | Low | No unmanaged access to woodland, ponds or habitat areas; dark-corridor lighting strategy; strict biosecurity; closed-loop waste and water systems. |
| Over-demand for produce | Medium | Cap CSA membership, use waiting list, prioritise household food self-sufficiency and Section 4 business viability, and signpost other growers where appropriate. |
| School visit demand | Medium | Limit to 2-4 physical visits per year regardless of demand; additional demand met through digital packs or online sessions; require pre-booking, supervision, risk assessment, safeguarding arrangements and travel planning. |
| Welsh language tokenism | Low-Medium | Keep bilingual commitments proportionate, use Welsh accurately, co-develop or check material with Welsh speakers where practical, and focus on everyday use rather than decorative claims. |
| Neighbour concerns | Medium | Provide a named contact route, log concerns within 48 hours, record action taken and report unresolved or repeated issues through annual monitoring. |
| Volunteer / visitor safety | Medium | Safety induction, PPE where required, supervision, insurance, clear visitor boundaries, risk assessment, appropriate DBS / school-staff supervision arrangements for children, and cancellation in poor weather or unsafe ground conditions. |
| Poor weather / unsuitable ground conditions | Medium | Cancel, postpone or move visits online where access, parking, ground conditions, ecology or neighbour amenity would be adversely affected. |

## 10.4 Monitoring and Adaptive Management

Community impact monitoring will be practical and auditable. The aim is not to generate excessive paperwork, but to ensure the Local Planning Authority, neighbours and the applicants can see whether the commitments in this chapter are being followed. The monitoring record will link to Section 11 for visitor travel and to Section 13 for annual OPD monitoring.

**Table 10-3: Community impact monitoring schedule**

| Monitoring item | Record kept | Adaptive trigger |
|---|---|---|
| On-site events and visits | Date, activity type, attendees, hours, supervision, safeguarding arrangements where relevant, and whether the event was within the Table 10-1 cap. | Frequency or attendance exceeds the cap, or neighbour / ecology constraints make repetition unsuitable. |
| Visitor travel and parking | Vehicle numbers, shared travel, public transport / cycling where used, and any parking notes. | Parking pressure, lane obstruction, avoidable car trips or visitor mileage materially above Section 11 assumptions. |
| Neighbour feedback | Comments, complaints, response date, action taken and resolution status. | Any unresolved complaint, repeated concern or substantiated amenity impact. |
| Noise, lighting and disturbance | Notes following events or construction periods where relevant. | Any evidence of disturbance to neighbours, wildlife corridors, ponds, woodland edge or dark-sky character. |
| Community benefits | Produce shared or sold locally, recipe cards / storage notes, surplus-sharing sessions, school visits, eco-passport / activity sheets, online resources, collaborations, seed / scion sharing and tool-library use. | Public-facing commitments are not being delivered or are generating disproportionate impacts. |
| Safety and safeguarding | Risk assessments, supervision arrangements, DBS / school-staff supervision arrangements where relevant, PPE, incident log if relevant. | Any incident, near miss, accessibility issue or safeguarding concern. |

If monitoring shows that community activity is creating more traffic, parking pressure, neighbour disturbance or ecological risk than expected, the first response will be to reduce the frequency or size of on-site activities and move more engagement online. This keeps the community benefits of the proposal while protecting the rural character and amenity of the area.

## 10.6 Long-term Legacy

The intended legacy is a small, well-managed holding that contributes to local food resilience, biodiversity, practical skills and neighbourly connection over the long term. The heritage orchard, seed saving, coppice, hedgerow restoration, meadow management and water-sensitive landscape will become more valuable as they mature. These benefits are cumulative and do not depend on high visitor numbers.

The community role of the holding will remain proportionate to its scale. Seasonal meals, educational visits and knowledge sharing may become familiar local activities, but they will remain capped, pre-arranged and secondary to the primary OPD purpose: a land-based family livelihood that meets its minimum needs while enhancing the environment.

## 10.7 Alignment with Policy

This section aligns with national planning and sustainability policy by demonstrating both positive community contribution and control of potential adverse effects. It should be read alongside the wider policy framework in Section 1, including the current post-LDP-quash development-plan position for Wrexham: Future Wales 2040 and the residual Wrexham UDP 1996-2011 (adopted 2005). For community impact, the most relevant UDP hooks are PS2 and GDP1, alongside the OPD-specific requirements in TAN 6 and the OPD Practice Guidance.

- TAN 6 §§4.17-4.22: supports land-based production, low-impact living, rural micro-enterprise, resource management and monitoring, while requiring impacts to be controlled through the Management Plan. [201]

- OPD Practice Guidance §3.113: provides a thorough assessment of neighbouring community impacts and identifies mitigation for potential adverse effects. [200]

- Well-being of Future Generations Act: supports a prosperous, resilient, healthier, more equal and more cohesive Wales through local food, biodiversity, practical skills and community connection. [216,217]

- Planning Policy Wales Edition 12: supports placemaking and community well-being, including the principles in §§3.16-3.17, active-travel integration in §4.4 and healthy, cohesive and resilient communities in §11.1. The chapter applies these principles at an appropriately small rural scale, without creating an unmanaged visitor use.

- Future Wales 2040 and Wrexham UDP residual policies PS2 and GDP1: support sustainable development, good design, protection of amenity and integration with the surrounding community. The proposal responds by keeping community activity modest, monitored, capped and secondary to the land-based OPD purpose.

- Welsh language and cultural commitments are proportionate and practical, and sit within the wider Welsh language policy context, including the Welsh Language (Wales) Measure 2011 and Welsh Language Standards framework. They do not rely on creating additional visitor activity.

## 10.8 Conclusion

This Community Impact and Engagement section shows that the holding is designed to be an asset to the local area without becoming a burden on neighbours, local roads or public services. The benefits are practical and proportionate: local food, ecological enhancement, small-scale learning, knowledge sharing and everyday neighbour relationships. [200-205,208-210,216,217]

The potential risks - traffic, parking, noise, neighbour concern, ecological disturbance, over-demand for produce and event creep - have been identified and controlled through caps, pre-booking, no-lane-parking requirements, visitor monitoring, a complaint protocol and annual adaptive management.

In summary, the proposal meets the OPD community-impact requirement by combining positive local contribution with clear safeguards. It is not presented as a visitor attraction or public venue, but as a monitored land-based home and smallholding that can strengthen community resilience while protecting rural amenity. [200,201,216,217]

## References

[200] Welsh Government (2012) Practice Guidance: One Planet Development. Technical Advice Note 6 - Planning for Sustainable Rural Communities. Welsh Government, Cardiff.

[201] Welsh Government (2010) Technical Advice Note 6: Planning for Sustainable Rural Communities. Welsh Government, Cardiff.

[202] Community Supported Agriculture UK (2011) The Impact of Community Supported Agriculture. CSA Network UK / Soil Association.

[203] Community Supported Agriculture Network UK (2023) Community Supported Agriculture Network UK - Written Evidence (HSI0070). Environment, Food and Rural Affairs Committee, UK Parliament.

[204] Rossi, J. et al. (2024) Placing community supported agriculture in local food systems. Journal of Rural Studies.

[205] Greater London Authority (2025) Local Food Growing - Written Evidence to the London Assembly. GLA, London.

[206] Ian Sturrock & Sons (2024) Welsh Fruit Trees - Heritage Welsh Varieties. Ian Sturrock & Sons, Bangor.

[207] Business Wales (2019) The Vale of Clwyd Denbigh Plum (PDO). Welsh Government / Welsh Geographical Indications Scheme.

[208] Natural England (2023) Children & Nature Programme: the importance of integrating time spent in nature at school. Natural England.

[209] Sustainable Food Trust (2025) Learning through the land: can farm visits help to bridge the nature gap for young people? Sustainable Food Trust.

[210] Evolved Research (2024) Supporting school visits under the Educational Access option. Evolved Research, UK.

[211] NHS (2021) Benefits of exercise. NHS Live Well Physical Activity Guidance.

[212] National Institute for Health and Care Excellence (2012) Physical activity: walking and cycling (PH41). NICE, London.

[213] UK Government (2019) Guidance: Natural environment - Green infrastructure. GOV.UK.

[214] Bailey, S. et al. (2021) Hedgerows as ecosystems: service delivery, management and restoration. Hedgelink / Annual

Review of Ecology, Evolution, and Systematics.

[215] Scotland's Rural College (2023) Harnessing the power of nature: arable edges and hedges - hedgerows, biodiversity and carbon storage. SRUC.

[216] Welsh Government (2025) The Well-being of Future Generations (Wales) Act: the essentials. Welsh Government, Cardiff.

[217] Future Generations Commissioner for Wales & Welsh Government (2024) The Well-being of Future Generations (Wales) Act 2015 - the 7 Well-being Goals.



# 11.Transport and Accessibility

# 11. Transport and Accessibility

**Essential criteria (OPD Practice Guidance § 3.131):** *The management plan must be accompanied by a Transport Assessment and Travel Plan (which may be combined. Overall the development should achieve a significant reduction in transport impacts from all activities on site (residents, enterprises and visitors) in comparison to what would be the 'norm' for such activities. There should be detailed monitoring of all trips to and from the site in terms of purposes, distances, modes, and any transport sharing.*

One Planet Developments must show that transport and accessibility arrangements minimise travel impacts while still allowing residents, visitors and businesses to reach essential services. At Lower Wych the transport strategy is to reduce the need to travel first, then to make unavoidable trips shorter, shared and lower-carbon wherever practical. This chapter therefore assesses domestic, enterprise and visitor movements together and sets out the travel plan that will be monitored after first habitation. It supports TAN 6 §4.17(g), the transport hierarchy and lower-carbon transport direction in TAN 18 on integrated transport. It does not rely on the quashed Wrexham Local Development Plan as operative policy; any local development-plan assessment should be read against the residual Wrexham UDP framework used elsewhere in this Management Plan. [220][224]

Distances in this chapter are road distances measured from the site entrance to the relevant destination or stop. The site is approximately 2.2 miles from the Eglwys Cross Farm bus stop, 2.5 miles from Malpas, around 6 miles from Whitchurch, around 12 miles from Wrexham and around 16 miles from Chester. Tallarn Green Primary School is approximately 2.8 miles away. Other relevant local centres are Penley at approximately 6 miles, Bangor-on-Dee at approximately 8 miles, Overton at approximately 9 miles and Ellesmere at approximately 10 miles. These are manageable rural distances for a combination of walking, cycling, bus, rail and limited vehicle use.

Using the definitive travel plan at Table 11-4, baseline site-related vehicle mileage is estimated at 5,628 miles per year. This comprises 2,828 domestic miles, 1,800 business miles and 1,000 visitor miles. If the targeted 30% reduction in school-run car mileage is achieved through cycling and shared travel, total annual vehicle mileage falls to approximately 4,990 miles per year. The calculation is deliberately cautious: it retains allowances for separate domestic appointments, unplanned contingencies and modest visitor travel, rather than assuming perfect trip-bundling.

All mileage claims in this chapter are taken from Table 11-4. The primary planning comparison is therefore trips and miles. Lower emissions from active travel, public transport and EV use are important additional benefits, but the case for the development does not depend on assumptions about vehicle technology alone.

We will monitor transport closely. A structured trip log will record purpose, destination, round-trip mileage, mode, occupancy and any sharing for all significant trips. Visitor travel, supplier distance and customer distance will also be summarised annually so that the plan can be adjusted if actual performance diverges from forecast.

## 11.1. Baseline Travel Analysis and Infrastructure Assessment

### 11.1.1. Site Location and Regional Connectivity Context

Lower Wych is a rural site, but it is not isolated. Malpas provides day-to-day services including food shopping, a GP surgery, dentist, bakery, pub and other community facilities within about 2.5 miles. Whitchurch provides the nearest rail station together with a wider retail, education and service offer at around 6 miles by road. Wrexham and Chester provide higher-order services including larger employment centres, hospitals and wider rail connections.

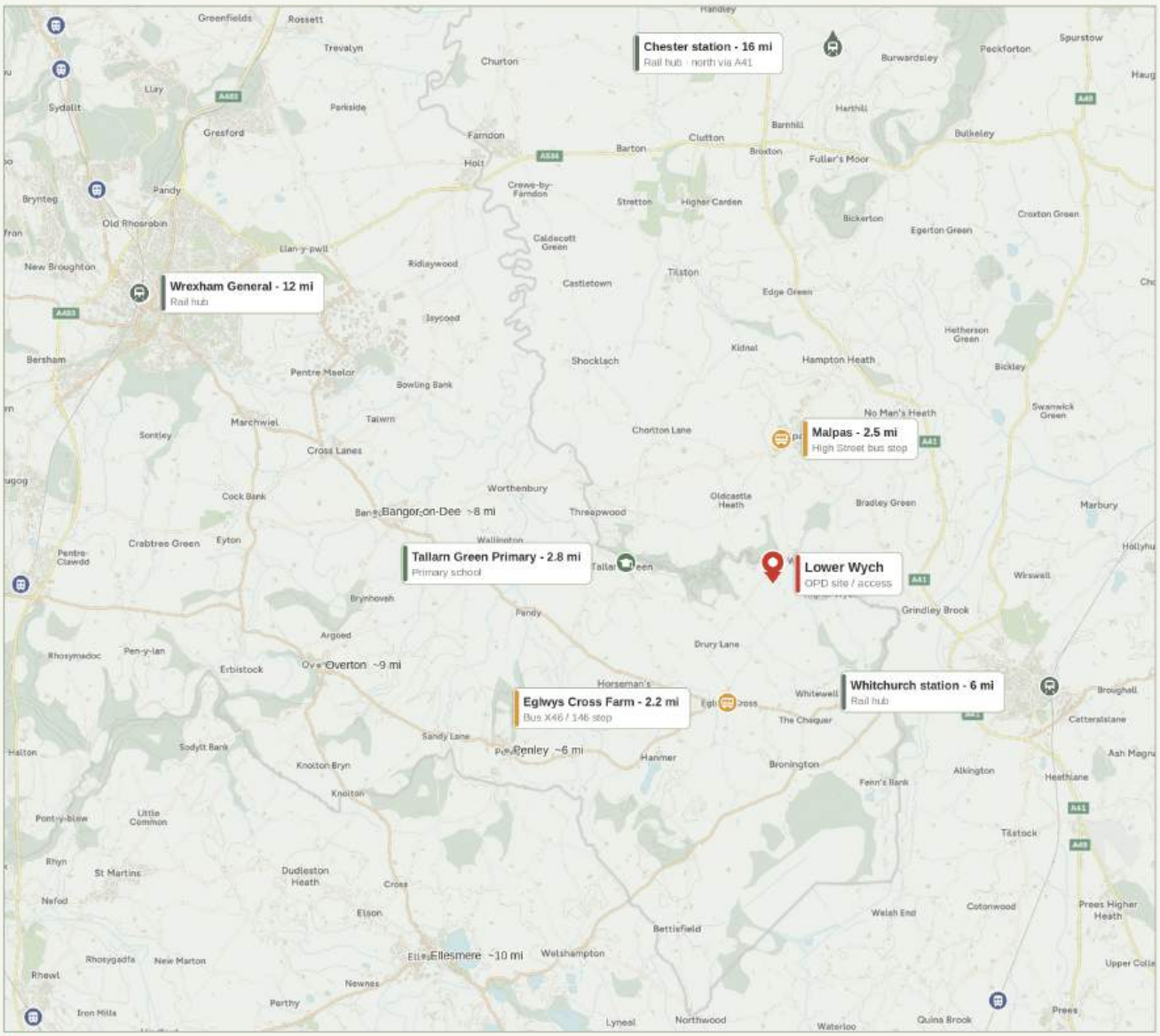
Tallarn Green Primary School is close enough to be reached by car, shared lift, cycle or e-bike in suitable conditions. The two nearest bus access points are Eglwys Cross Farm (approximately 2.2 miles from the site) and Malpas High Street (approximately 2.5 miles). This pattern of local services is important because it makes trip-chaining, active travel and bus-rail interchange realistic rather than theoretical.

The current site is undeveloped pasture and woodland with only occasional agricultural access. There is therefore no existing residential transport demand to displace. The relevant planning question is whether the proposed household and land-based enterprise will operate at a modest and well-managed level of movement, and whether those movements are materially lower than a typical rural household and business pattern.

### 11.1.2. Traffic Flow Analysis and Road Capacity Assessment

Traffic conditions on the lane serving Lower Wych have been assessed using Department for Transport data (Manual

**Figure 11-1: Local Transport and Accessibility Route Map**




## Public transport access

**Bus X46 / 146 - Eglwys Cross Farm**
- 2.2 miles from site
- Approx. 5–6 services each way per day, Monday–Saturday
- Approx. 10–20 minutes to Whitchurch
- Approx. 50–60 minutes to Wrexham

Use: Whitchurch rail hub, retail and services; Wrexham hospital, retail, employment and rail hub.

**Bus 41 - Malpas High Street**
- 2.5 miles from site
- Approx. 5–7 usable services each way per day, Monday–Saturday
- Approx. 20 minutes to Whitchurch
- Approx. 70–75 minutes to Chester

Use: Whitchurch rail hub and services; Chester rail hub, major retail, healthcare and employment.

Service levels and journey times are planning-stage checks and remain subject to timetable change.

## Rail connections

**Whitchurch Station - 6 miles**
- Regular / hourly direct services
- Approx. 20 minutes to Shrewsbury
- Approx. 20 minutes to Crewe
- Approx. 1 hour to Manchester
- Approx. 2 hours 30 minutes to Cardiff

**Wrexham General - 12 miles**
- Regular direct services
- Approx. 20 minutes to Chester
- Approx. 40 minutes to Shrewsbury
- Approx. 1 hour 10 minutes to Liverpool
- Approx. 2 hours 40 minutes to Cardiff
- Approx. 2 hours to Holyhead

**Chester Station - 16 miles**
- Frequent direct services
- Approx. 40 minutes to Liverpool
- Approx. 50 minutes to Manchester
- Approx. 2 hours to London

## Local services and trip-chaining

**Malpas - 2.5 miles**
Food shopping, GP surgery, dentist, bakery, pub and community facilities.

**Tallarn Green Primary School - 2.8 miles**
School access by car, shared lift, cycle or e-bike in suitable conditions.

**Whitchurch - 6 miles**
Railway station, wider retail, education and services.

The strategy is to reduce travel demand first, then make unavoidable trips shorter, shared and lower-carbon where practical.

Figure 11-1: Local Transport and Accessibility Route Map. The figure shows road distances from the site entrance to nearby services, bus access points and regional rail connections. It demonstrates how the Lower Wych transport strategy combines local services, active travel, bus access, rail interchange, shared journeys and limited vehicle use within a monitored Travel Plan.

Count Point 805107). This dataset covers six years of Annual Average Daily Flow (AADF), giving a reliable picture of how the road is currently used. [218]

**Table 11-1: DfT Manual Count Point 805107 – Annual Average Daily Flow (AADF)**

| Vehicle Type | 2023 | 2022 | 2021 | 2020* | 2019* | 2018 |
|---|---|---|---|---|---|---|
| Pedal cycles | 5 | 7 | 23 | 8 | 6 | 5 |
| Two-wheeled motor vehicles | 0 | 1 | 4 | 3 | 5 | 5 |
| Cars & taxis | 158 | 125 | 145 | 110 | 140 | 140 |
| Light goods vehicles (LGVs) | 41 | 44 | 30 | 34 | 39 | 40 |
| Heavy goods vehicles (HGVs) | 13 | 13 | 16 | 18 | 21 | 22 |
| All motor vehicles | 211 | 182 | 194 | 167 | 207 | 208 |

**2020–2019 values estimated by DfT. Source: Department for Transport Road Traffic Statistics.*

In 2023 the road carried an average of 211 motor vehicles per day. This is well below the level typically associated with capacity concerns on minor rural roads, showing that there is ample spare capacity on the lane. The data also show that flows have remained stable, rather than rising rapidly, over the six-year period.

Cars and taxis make up the majority of movements, with LGVs forming a modest rural service component and HGVs only a small minority of the total flow. HGV movements fell from 22 per day in 2018 to 13 per day in 2023. Pedal-cycle counts are low, but the brief increase recorded in 2021 suggests that the route is capable of accommodating more active travel if conditions and user behaviour support it.

**Table 11-2: Baseline traffic conditions (DfT Manual Count Point 805107)**

| Indicator | Value (2023) | Trend (2018–2023) | Comment |
|---|---|---|---|
| Total vehicles per day (AADF) | 211 | Stable (167–211) | Well below typical capacity concerns for a minor rural road. |
| Cars & taxis | 158 | Steady | Main traffic type, consistent with normal rural residential use. |
| Light goods vehicles (LGVs) | 41 | Stable (30–44) | Around 19% of total traffic, typical of rural service and farm activity. |
| Heavy goods vehicles (HGVs) | 13 | Down from 22 | Only about 6% of traffic, with a declining trend. |
| Pedal cycles | 5 | Peak of 23 in 2021 | Low baseline with scope to increase. |
| Two-wheeled motor vehicles | 0 | Fluctuated 0–5 | Negligible impact. |

Taken together, these baseline conditions are supportive of a small-scale OPD household and enterprise. The road is quiet, under capacity and not characterised by heavy commercial traffic.

### 11.1.3. Highway Safety and Reportable Accident Record

Highway safety has also been checked against DfT STATS19 reportable-injury collision data, accessed through Crashmap, for the 26-year period 1999-2024. The three principal routes reviewed were the route from the site to Malpas, the route to Eglwys Cross Farm bus stop, and the route to Tallarn Green Primary School. The data show no reportable accidents on the route to Malpas over the full 26-year period; one slight two-vehicle incident on the Eglwys Cross Farm route on 10 September 2003, with no further recorded incident on that route since; and two single-vehicle incidents on the route to Tallarn Green Primary School, in May 2016 and June 2023. No fatal incidents are recorded on these principal routes, and no pedestrian, child or pedal-cycle casualty is recorded on any of the three routes over the 26-year period. [218]

The accident record does not remove the need for caution on unlit rural lanes, particularly in winter, poor visibility and school-run periods. It does, however, provide a proportionate evidence base for the travel plan: the proposal is not introducing intensive traffic to a route with a known pattern of vulnerable-road-user injury collisions, and the proposed active-travel measures will be used only where conditions are suitabl

**Figure 11-2: Recorded Collision Context - Eglwys Cross · Lower Wych · Malpas Route**




Figure 11-2: Recorded Collision Context - Eglwys Cross · Lower Wych · Malpas Route. The figure shows the assessed route corridor in relation to CrashMap / DfT recorded personal-injury collision data and the 2023 DfT AADF traffic count.

### 11.1.4. Public Transport Infrastructure and Service Analysis

Although rural, Lower Wych benefits from public transport links in two directions: the Whitchurch-Wrexham bus corridor accessed at Eglwys Cross Farm and the Chester-Malpas-Whitchurch corridor accessed at Malpas. Together with rail access at Whitchurch, Wrexham General and Chester, this provides practical alternatives to driving the whole route for some shopping, leisure, school-related, regional and longer-distance journeys.

The public-transport strategy is not based on daily commuting by bus from the site, but on realistic trip substitution: cycling or walking to a bus stop where suitable, using bus-rail interchange for regional travel, and using rail for city and long-distance trips rather than driving all the way. The destinations and journey times below are therefore included to demonstrate the range of available non-car options, not as fixed service commitments.

**Table 11-3: Public transport options for Lower Wych**

| Service | Stop / station | Distance from site | Typical service level | Typical journey time | Main destinations / use |
|---|---|---|---|---|---|
| Bus - X46 / 146 | Eglwys Cross Farm | 2.2 miles | Approx. 5-6 services each way per day (Mon-Sat; varies by day and school-day / school-holiday pattern) | Approx. 10-20 mins to Whitchurch; approx. 50-60 mins to Wrexham, depending on service | Whitchurch rail hub, retail and services; Wrexham hospital, retail, employment and rail hub |
| Bus - 41 | Malpas High Street | 2.5 miles | Approx. 5-7 usable services each way per day (Mon-Sat; varies by direction and day) | Approx. 20 mins to Whitchurch; approx. 70-75 mins to Chester | Whitchurch rail hub and services; Chester rail hub, major retail, healthcare and employment |
| Rail - Whitchurch | Whitchurch (Shropshire) | Around 6 miles | Regular / hourly direct services | Approx. 20 mins to Shrewsbury; approx. 20 mins to Crewe; approx. 1 hr to Manchester; approx. 2 hr 30 mins to Cardiff | Regional services and national connections via Crewe, including London, Birmingham, Liverpool, Glasgow and Edinburgh |
| Rail - Wrexham General | Wrexham | Around 12 miles | Regular direct services | Approx. 20 mins to Chester; approx. 40 mins to Shrewsbury; approx. 1 hr 10 mins to Liverpool; approx. 2 hr 40 mins to Cardiff; approx. 2 hrs to Holyhead | North Wales, Chester, Liverpool, Midlands, Cardiff and Holyhead connections |
| Rail - Chester | Chester | Around 16 miles | Frequent direct services | Approx. 40 mins to Liverpool; approx. 50 mins to Manchester; approx. 2 hrs to London | Inter-city and regional connections including Liverpool, Manchester, London and the North Wales coast |

For a rural OPD site, this remains a good level of connectivity. The combination of two nearby bus corridors and three rail hubs means that residents can meet many essential needs locally and can reach regional and national destinations without car dependence for every journey. This supports the integrated, lower-carbon transport direction set out in Welsh and regional transport policy. [220][225]

## 11.2. Transport Assessment and Travel Plan (Including Mitigation)

This section brings together the transport assessment and the travel plan. It uses one definitive table and covers domestic, business and visitor trips together. Unless stated otherwise, vehicle journeys in Table 11-4 are counted as round trips.

**Table 11-4: Transport Assessment and Travel Plan**

| Purpose | Vehicle journeys in year | Miles to destination and back | Estimated annual vehicle miles | Management / mitigation strategy |
|---|---|---|---|---|
| **Domestic** | | | | |
| School run, Tallarn Green | 380 | 5.6 | 2,128 | Mainly EV. Lift-share with local families where possible. We aim to reduce these journeys by at least 30% by cycling in good weather, reducing annual school-run mileage to about 1,490 miles. |
| Food shopping | 6 | 12 | 72 | Mostly bundled with business deliveries and bulk-buying trips. Small allowance retained for occasional dedicated trips. |
| Healthcare / dentist / hair | 12 | 12 | 144 | Appointments timed with deliveries where possible, but modest allowance retained for unbundled family appointments and practical contingencies. |
| Family visits (Malpas / Whitchurch) | 12 | 8 | 96 | Active travel and bus used where practical, but some dedicated car journeys allowed for family life and poor weather. |
| Friends / social / leisure | 12 | 16 | 192 | Most local social trips by active travel or shared journeys, but allowance retained for occasional dedicated trips. |
| Unplanned domestic contingency | 14 | 14 | 196 | Covers realistic family contingencies such as missed shopping items, child-related needs, poor weather, and other unplanned trips. |
| Domestic total | | | 2,828 | Approx. 2,190 miles/year after a 30% reduction in school-run car trips through cycling and shared travel. |
| **Business** | | | | |
| Deliveries to Whitchurch (includes 12 monthly farmers' markets) | 50 | 12 | 600 | EV. Combined with supermarket, library and supplier collection trips where possible. |
| Deliveries to Wrexham (includes 12 markets) | 50 | 24 | 1,200 | EV. Coordinate with other producers where possible to share trips and reduce mileage. |
| CSA boxes to neighbours | 0 | 0 | 0 | Delivered by cargo bike. |
| Supplier collections / inbound goods | 0 | 0 | 0 | Assumed to be bundled into delivery trips above. |
| Business total | | | 1,800 | |
| **Visitors** | | | | |
| Seasonal feasts / educational events / school visits | 24 | c.25 (average) | 600 | Four small seasonal feasts plus around 2–4 school or educational visits annually. Public transport, shared travel and pre-booking encouraged. Mileage assumes c.25 miles round trip per visitor vehicle on average. |
| Family / friends visiting | 16 | c.25 (average) | 400 | Low-frequency visits, with car sharing and active travel encouraged where practical. Mileage assumes c.25 miles round trip per visitor vehicle on average. |
| Visitor total | | | 1,000 | Visitor mileage to be monitored annually and adjusted if actuals differ. |
| **Totals** | | | | |

| Purpose | Vehicle journeys in year | Miles to destination and back | Estimated annual vehicle miles | Management / mitigation strategy |
|---|---|---|---|---|
| Total vehicle journeys associated with site per year | 526 | | | Baseline annual estimate. |
| Estimated miles per year (baseline) | | | 5,628 | Includes domestic, business and visitor travel. |
| Estimated miles per year (with 30% school-run cycling reduction) | | | 4,990 | Rounded to about 5,000 miles/year. |

The table above is intentionally conservative. It does not assume perfect trip-bundling, year-round cycling or zero visitor traffic; instead it retains modest allowances for realistic family, enterprise and visitor movements. For visitor travel, the mileage allowances are based on a cautious working assumption of around 25 miles round trip per visiting vehicle, recognising that actual origins will vary.

The school run is the largest single transport demand. The 30% reduction in school-run car mileage is therefore treated as a monitored improvement target rather than an already-achieved starting condition. If cycling or lift-sharing does not deliver that reduction, the higher baseline figure of 5,628 miles per year remains the operative comparison until monitoring demonstrates improvement. The Welsh comparator at Table 11-5 is not a like-for-like metric: it records personal travel per person across all modes, whereas Lower Wych records site-associated vehicle round trips and vehicle miles only.

For trip numbers, Table 11-4 forecasts 526 site-associated vehicle round trips per year. In a two-adult comparison this is approximately 263 round trips per adult. Across the four-person household it is approximately 132 round trips per person. Against the Welsh average of about 967 trips per person per year, or about 483.5 round trips, this represents around 46% fewer round trips per adult and around 73% fewer round trips per person for the household as a whole. [219]

**Table 11-5: Broad comparator with Welsh travel patterns**

| Measure | Figure / planning interpretation |
|---|---|
| Welsh average trip-making [219] | 967 trips per person per year, equivalent to approximately 483.5 round trips per person per year. Contextual comparator only: Welsh data cover personal travel across all modes; Lower Wych counts site-associated vehicle round trips. |
| Lower Wych vehicle round trips | 526 site-associated vehicle round trips per year (Table 11-4), equivalent to approximately 263 round trips per adult in a two-adult comparison and approximately 132 round trips per person across the four-person household. |
| Round-trip reduction headline | Against the Welsh average of approximately 483.5 round trips per person per year, Lower Wych represents approximately 46% fewer round trips per adult and approximately 73% fewer round trips per person for the household as a whole. |
| Welsh personal travel mileage [219] | 7,483 miles per person per year: approximately 14,966 miles for two adults and approximately 29,932 miles for four people. This is a broad scale comparator, not a strict like-for-like vehicle-mile figure. |
| Lower Wych baseline mileage | 5,628 vehicle miles per year (Table 11-4), equivalent to approximately 38% of the two-adult comparator and approximately 19% of the four-person per-capita comparator. |
| Lower Wych with school-run reduction | 4,990 vehicle miles per year (Table 11-4), equivalent to approximately 33% of the two-adult comparator and approximately 17% of the four-person per-capita comparator. |

The annual-mileage comparison provides a second broad sense-check. Welsh Government data record average personal travel of 7,483 miles per person per year, which is equivalent to about 14,966 miles for a two-adult comparator and about 29,932 miles for a four-person per-capita comparator. [219]

On that broad basis, Lower Wych's conservative baseline of 5,628 vehicle miles per year is around 38% of the two-adult comparator and around 19% of the four-person per-capita comparator. If the monitored school-run reduction is achieved, the 4,990-mile figure falls to around 33% and 17% respectively. The proposal therefore represents a material reduction in travel demand even before accounting for the lower emissions associated with cycling, public transport and EV use.

### 11.2.1. Active Travel and Public Transport Strategy

The quiet-lane context around Lower Wych is suitable for cautious walking, cycling and e-bike use where weather, light and family circumstances allow. The road has no pavement or street lighting, but traffic volumes are low, HGV movements are limited, and the STATS19 review does not show a recorded pattern of pedestrian, child or pedal-cycle injury collisions on the principal routes reviewed. For short to medium trips, active travel will therefore be used as a practical mitigation measure rather than as a blanket assumption for every journey.

Bikes will be used for a proportion of school, shopping and service trips within roughly 10 miles in suitable conditions. Cargo-bike use is limited to neighbour CSA deliveries and very local shopping; it is not relied upon for longer market journeys to Wrexham or other more demanding routes. Walking and cycling will also be used to reach the bus stops at Eglwys Cross Farm and Malpas, allowing many longer journeys to be completed by bus and rail rather than by car.

For trips beyond the immediate rural area, bus and rail will normally be preferred where practical. This is particularly relevant for city visits, regional services and any longer-distance leisure travel. The combination of local bus access and rail hubs at Whitchurch, Wrexham and Chester means that complete car dependence is not necessary, even in a rural setting.

### 11.2.2. Vehicles, Journey Management and Weather Resilience

The transport assessment is driven first by reduced mileage. The management plan assumes one main household / business car and one older back-up car. As the on-site renewable energy system becomes operational, the intention is that the main vehicle is electric and charged from on-site solar generation where possible, with the petrol car retained only for exceptional or adverse-weather use. This reduces emissions further, but the mileage-based transport case remains valid even if the back-up car is used occasionally.

Business deliveries to Whitchurch and Wrexham are assumed to require the main vehicle and are explicitly counted in Table 11-4. Domestic errands are linked to these journeys where practical, but the table still retains modest allowances for separate shopping, healthcare, family and contingency trips. This is more realistic than assuming that all domestic needs can be perfectly absorbed into enterprise travel.

Travel patterns will also vary by season. Winter and poor-weather conditions will sometimes increase reliance on the car, which is why the plan includes domestic contingency mileage and does not rely on year-round active travel. If the lane is icy in January or conditions make cycling unsuitable, those journeys will revert to the car or shared lifts and are already allowed for within the contingency-based baseline. In better weather, the school run and a proportion of local service trips can shift to cycling or shared travel. Monitoring will show whether that target is being achieved in practice.

### 11.2.3. Visitor Travel Management

Visitor activity will be modest, pre-arranged and managed. The travel plan allows for four small seasonal feasts and approximately 2–4 school or educational visits annually, together with low-frequency family and friend visits. There is no assumption of general public drop-in traffic and no basis for regular high-volume visitor use.

All visitor information will be issued in advance and will include bus, rail, cycling and car-share advice. Arrival times will be managed, on-site parking will be contained within the holding, and no overspill parking will be allowed on the lane. After each event, estimated vehicle numbers, shared travel, parking issues and any neighbour concerns will be recorded as part of the monitoring system.

## 11.3. Parking, Access and Servicing

Access to the holding will use the existing lane and site entrance. The supporting site plan shows that visibility splays

of 2.4 m x 120 m can be achieved within the existing highway verge, without hedgerow removal. This means the access arrangements can be improved to an appropriate standard while keeping ecological and landscape effects very low.

Access will be gated with a timber five-bar field gate hung on timber posts, set back from the carriageway so that vehicles can stand clear of the highway while the gate is opened." This makes the gate in the visuals official.

Parking and turning will be provided within the site as part of the overall layout. This will be sufficient for residents, normal servicing and occasional pre-arranged visitors, without creating overspill or obstruction on the lane. Enterprise deliveries are expected to be made by car-sized vehicle rather than HGV, and most servicing movements will be small in scale.

Day-to-day vehicle activity will therefore remain modest and predictable. Movements will mainly relate to the school run, combined domestic errands, delivery rounds and occasional pre-arranged visitor events. This is compatible with the quiet rural character of the lane and with the low baseline traffic volumes set out in Section 11.1.

### 11.3.1. Construction and Servicing Traffic Controls

Construction-stage traffic will be temporary and proportionate to a single low-impact dwelling and associated smallholding infrastructure. The WikiHouse system and other off-site fabrication methods reduce the number and duration of construction deliveries compared with a conventional wet-build programme. Deliveries of building components, tanks, PV equipment and track materials will be pre-booked, routed to avoid unsuitable times where practical, and unloaded within the site so that the lane is not obstructed. Larger deliveries will be timed outside school-run periods and poor-weather conditions where practical. Construction parking, storage and turning will be contained within the red-line site, and no construction traffic will rely on highway verge parking or hedgerow removal.

Once operational, servicing will remain small-scale and will be contained within the holding. Delivery and collection trips associated with the land-based enterprises are counted in Table 11-4. Supplier collections will be bundled with outgoing delivery trips wherever practical, and no regular HGV movements are proposed as part of the normal operation of the holding.

## 11.4. Monitoring

Transport monitoring needs to be detailed enough to satisfy OPD guidance and simple enough to operate consistently. Lower Wych will therefore maintain three linked records: a trip log, an event / visitor log, and an annual supplier / customer locality summary. Together these will allow actual performance to be compared directly with Table 11-4 and will support corrective action where needed. [223]

**Table 11-6: Transport monitoring schedule**

| Record | What is logged | Frequency | Management response |
|---|---|---|---|
| Trip log | Date; category (domestic / business / visitor); purpose; destination; round-trip miles; mode; occupants; shared?; notes | Ongoing, summarised annually | Compare actual domestic, business and visitor miles with Table 11-4. If total or category mileage is more than 10% above forecast, review trip-bundling and route planning; if more than 20% above forecast, set corrective actions. |
| Visitor / event log | Event type; attendees; estimated vehicle numbers; shared travel; parking issues; complaints / no complaints | After each event | Reduce event size / frequency or tighten travel instructions if impacts rise. Any overspill parking or substantiated neighbour complaint triggers review before the next event. |
| Supplier / customer locality summary | Annual count and proportion of suppliers and outlets within agreed mileage bands (e.g. 5, 10 and 25 miles) | Annual | Review sourcing, delivery collaboration and route planning if locality weakens or business mileage rises above forecast. |
| Corrective action review | Variance from forecast; 10% review trigger; 20% corrective-action trigger; missed school-run reduction; any overspill parking or neighbour concerns | Annual | Set out remedial measures in the OPD annual monitoring return and carry unresolved actions into the following monitoring year. |

The first annual transport review will be produced 12 months after first habitation of the site and annually on that same date thereafter, in line with the OPD Practice Guidance. The review will compare actual performance against Table 11-4 using three headline indicators: total annual vehicle miles, category mileage (domestic / business / visitor), and the percentage reduction in school-run car mileage achieved through cycling and shared travel.

Corrective action will be triggered if total annual mileage or any main category is more than 10% above forecast in one monitoring year, if total annual mileage is more than 20% above forecast, if mileage remains above forecast for two consecutive years, if the school-run reduction is not being achieved by Year 5, or if visitor activity causes parking overspill or a substantiated neighbour complaint. Measures may include stricter trip-bundling, reducing visitor-event frequency or size, changing market routes, increasing delivery collaboration with other producers, revising school-run sharing arrangements, or moving more community engagement online.

## 11.5. Conclusion

Lower Wych is in a rural location, but it is not remote. The site is close enough to school, bus stops, Malpas and Whitchurch to support a practical lower-travel lifestyle. The DfT AADF and STATS19 evidence shows low traffic volumes, ample highway capacity for a single-household OPD, and no recorded pedestrian, child or pedal-cycle casualties on the principal local routes reviewed over the 1999-2024 period. The transport strategy therefore rests on a realistic combination of trip reduction, trip-bundling, cautious active travel, public transport for longer journeys where practical, and limited managed vehicle use.

The definitive travel plan estimates 526 site-associated vehicle round trips and 5,628 vehicle miles per year as a cautious baseline, falling to around 4,990 miles if the monitored school-run reduction is achieved. This is materially below broad Welsh travel comparators: about 46% fewer round trips per adult and about 73% fewer round trips per person on the household comparison, with baseline mileage around 38% of a two-adult Welsh comparator and around 19% of a four-person per-capita comparator.

Taken together, the baseline evidence, the travel plan, the access arrangements and the monitoring protocol demonstrate a clear and credible reduction in transport impact. The proposal therefore satisfies the OPD requirement for a combined Transport Assessment and Travel Plan while keeping Lower Wych connected to essential services, local markets and community life. Ongoing review, corrective action and any necessary adjustment to the travel plan will sit within the wider monitoring framework set out in Section 13 (Phasing, Monitoring and Exit Strategy).

## References

[218] Department for Transport (DfT) (2025). Road traffic statistics, Road Traffic Open Data and STATS19 road safety data, including manual count points on minor roads and reportable-injury collision records. London: Department for Transport. Crashmap public interface checked April 2026.

[219] Welsh Government (2013). Personal Travel in Wales 2012. Statistical Bulletin SB 120/2013. Cardiff: Welsh Government.

[220] Welsh Government (2021). Llwybr Newydd: The Wales Transport Strategy 2021. Cardiff: Welsh Government.

[221] Welsh Government (2013). Active Travel (Wales) Act 2013 (anaw 7). Cardiff: Welsh Government.

[222] Welsh Government (2021). Active Travel (Wales) Act Guidance (ATAG). Cardiff: Welsh Government.

[223] Transport for Wales (2022). Wales Transport Strategy: Monitoring and Evaluation Framework. Cardiff: Transport for Wales.

[224] Welsh Government (2007). Technical Advice Note 18: Transport. Cardiff: Welsh Government.

[225] Ambition North Wales (2023). North Wales Regional Transport Plan and Monitoring and Evaluation Plan. Ambition North Wales.

[226] Institute of Welsh Affairs (2018). Decarbonising Transport in Wales. Re-energising Wales project report. Cardiff: IWA.

[227] Senedd Research (2023). The Active Travel Act: 10 years on. Cardiff: Senedd Research.

[228] Traveline Cymru / Pat's Coaches (2026). Services 146 / X46 Whitchurch - Wrexham timetable, including Eglwys Cross Farm stopping pattern. Timetable checked May 2026.

[229] D&G Bus (2025). Service 41 Chester - Christleton - Waverton - Tattenhall - Malpas - Whitchurch timetable, effective 20 January 2025. Timetable checked May 2026.



# 12.Ecological Footprint Analysis

# 12. Ecological Footprint Analysis

**Essential criteria and policy test:** *The Ecological Footprint Analysis is the domestic per-capita footprint test for the OPD household. TAN 6 and the OPD Practice Guidance require the proposal to demonstrate an initial low-impact position, a clear ability to achieve 2.4 global hectares per person by Year 5, and clear potential to move towards 1.88 gha/person over time. The Guidance also recognises that EFA is an indicator with a typical +/-15% sensitivity band, not an absolute measure. [230][231]*

## 12.1 Purpose of this Section

This section sets out the Ecological Footprint Analysis (EFA) for the Lower Wych One Planet Development. It should be read alongside the completed Welsh Government OPD Ecological Footprint Calculator included with the application as Appendix G — Ecological Footprint Calculator and EFA Input Evidence.

This section sits within TAN 6 paragraphs 4.17-4.22 and the OPD Practice Guidance requirement for an initial ecological footprint of 2.4 gha/person or less, with clear potential to move towards 1.88 gha/person over time. PPW 12 paragraph 3.59 frames One Planet Development as low-impact development which either enhances or does not significantly diminish environmental quality. Following the quashing / withdrawal of the Wrexham Local Development Plan, the operative development-plan context is Future Wales 2040, Planning Policy Wales and the residual Wrexham UDP 1996-2011 policies, including PS1, PS2 and GDP1 where relevant to the low-impact development, design and countryside context. [230][238][239]

The purpose of the EFA is to test the domestic consumption footprint of the resident household. It does not replace the detailed evidence in the Business and Improvement Plan, Energy and Water chapter, Waste Management chapter, Zero Carbon Buildings chapter or Transport Assessment. Instead, it draws their key domestic assumptions into the Welsh Government calculator so that the household footprint can be stated in global hectares per person.

For this application the household comprises four people: Philip and Elly Handley and two dependants. All headline figures in this section are therefore per-capita results produced by the calculator from whole-household input data.

## 12.2 Method and Calculator Scope

The EFA has been prepared using the Welsh Government One Planet Development Ecological Footprint Calculator and the associated calculator guidance. The calculator is a spreadsheet tool based on household consumption. It uses annual household expenditure, travel, energy use, domestic food production inputs and household land-use entries to generate a per-capita footprint in global hectares. [231][232]

The application-stage calculator is completed in the two columns required at submission: the estimated household figures on first habitation and the estimated household figures at Year 5. The Year 3 / Year 5 actual review column is intentionally left blank at application stage because it is to be completed later from monitored actual household records. [231]

The EFA is a domestic assessment. The calculator guidance is clear that expenditure, travel and energy for domestic affairs should be separated from business activity, and that volunteers and guests should not be included in domestic figures. Enterprise-building costs, business energy, business travel, visitor travel and wider community effects are therefore addressed separately as “Other Footprints” in Section 12.7 and in the relevant technical chapters. [231]

## 12.3 Headline EFA Results

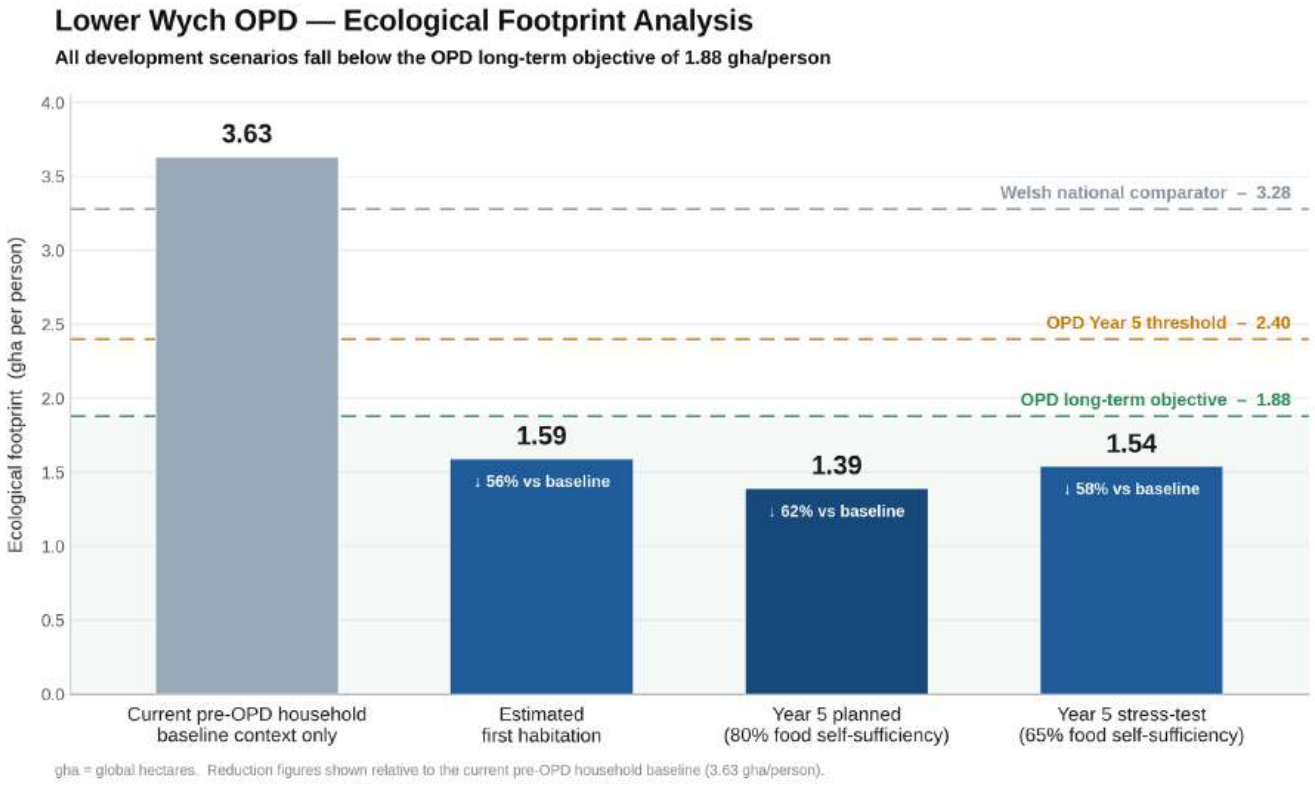
Table 12-1 gives the final application-stage results from the completed calculator. It also shows the published Welsh national comparator, the OPD 2.4 gha/person compliance threshold and the 1.88 gha/person long-term objective. The main Year 5 result is based on the Lower Wych management target of approximately 80% household food self-sufficiency. The 65% OPD food floor is presented separately as a stress-test, not as the planned Year 5 operating position.

**Table 12-1: Application-stage EFA results and sensitivity test**

| Scenario | Calculator result (gha/person) | +15% sensitivity | Compliance interpretation |
|---|---|---|---|
| Published Welsh national comparator | 3.28 | n/a | Published national per-capita ecological footprint comparator; not a project compliance test. [240] |
| OPD long-term objective | 1.88 | n/a | Welsh one-planet objective and longer-term direction of travel. |
| OPD Year 5 compliance threshold | 2.4 | n/a | Main OPD EFA compliance benchmark for Year 5. |
| Existing household baseline | 3.63 | 4.17 | Optional pre-application context only; not relied upon for OPD compliance. |
| Estimated first habitation | 1.59 | 1.83 | Below the 2.4 gha/person OPD threshold and below 1.88 gha/person even with the +15% sensitivity allowance. |
| Year 3 / Year 5 actual review | Blank | Blank | To be completed later from monitored records at the Year 3 and Year 5 reviews. |
| Estimated Year 5 - planned 80% food self-sufficiency | 1.39 | 1.60 | Main Year 5 estimate. Comfortably below the 2.4 gha/person threshold and below the longer-term 1.88 gha/person objective. |
| Year 5 stress-test - 65% food self-sufficiency floor | 1.54 | 1.77 | Robustness test only. Still below 2.4 and below 1.88 with the +15% sensitivity allowance. |

The completed calculator therefore shows a compliant first-habitation footprint and a strong Year 5 position. The proposal remains below the 2.4 gha/person OPD threshold in the main calculation, in the +15% sensitivity test and in the 65% food self-sufficiency stress-test. By Year 5 it also sits below the 1.88 gha/person long-term objective and well below the published Welsh national comparator.

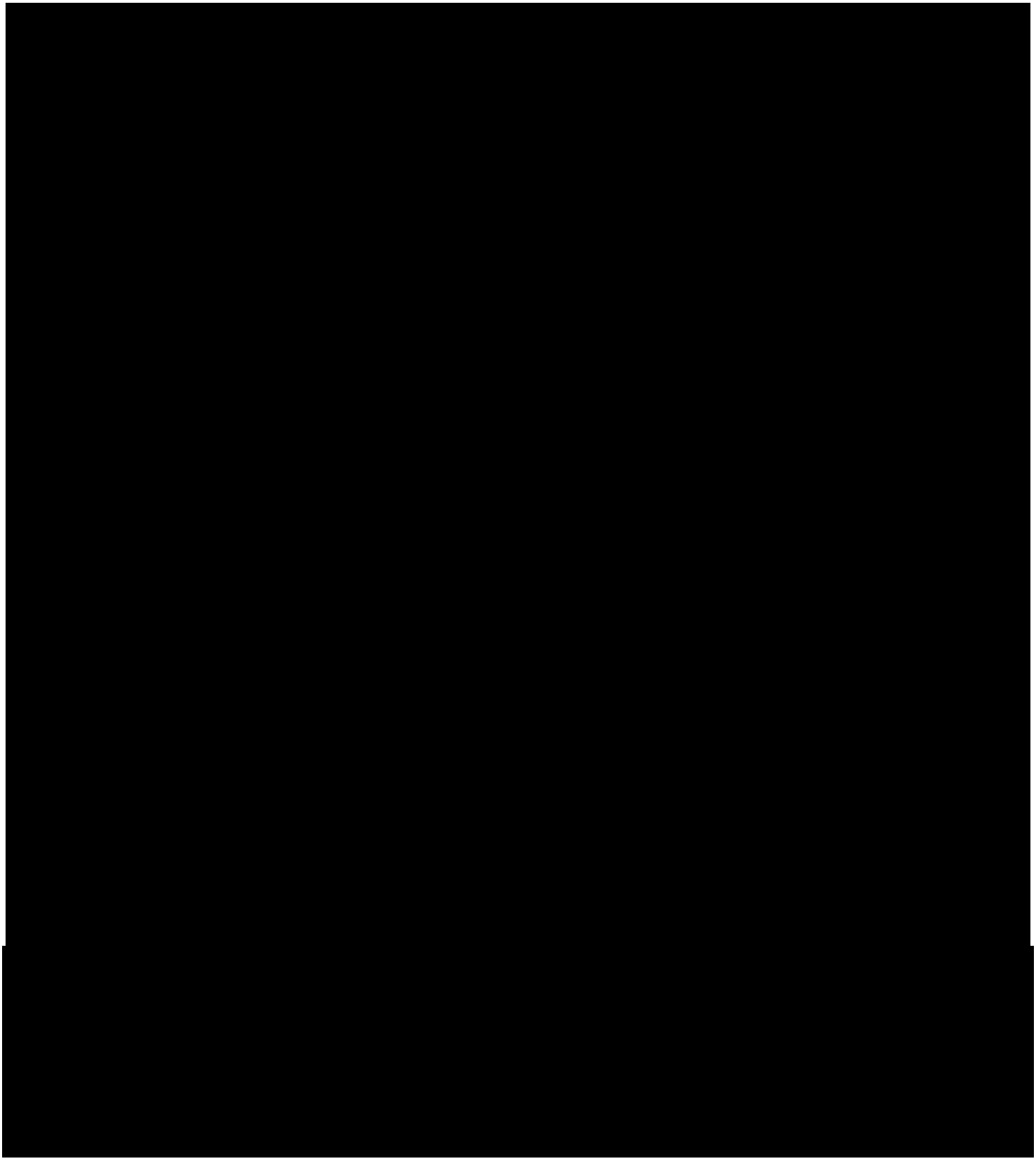
**Figure 12-1: Ecological Footprint Analysis results, showing the existing pre-OPD household baseline for context and the estimated first-habitation and Year 5 OPD scenarios against the 2.4 gha/person threshold and 1.88 gha/person long-term objective.**



## 12.4 Key Domestic Input Assumptions

The EFA uses conservative but project-specific domestic assumptions. The values below are not whole-project capital or business accounts. They are the domestic inputs required by the calculator: domestic energy, domestic travel, domestic consumption, domestic food production and the domestic share of dwelling / water / renewable infrastructure.

**Table 12-2: Main domestic EFA input assumptions**



The 3,300 m² domestic food-production land entry is an apportionment for EFA purposes only. It represents the domestic share of the dwelling / curtilage, annual vegetable and protected-cropping area, orchard / soft fruit, poultry / grazing support, household food-production areas and associated access / working margins. It does not include

enterprise-only CSA production, business processing, visitor activity or non-domestic land-based enterprise impacts, which are considered separately under the Management Plan's business and "Other Footprints" evidence.

## 12.5 Why the Result Is Low but Credible

The Year 5 result is low because the calculator is measuring the domestic consumption footprint of a low-impact household, not the whole project footprint or the market value of all works on the holding. The main reductions are explained below.

- Energy: the household has no grid electricity, gas or oil entry at Year 5. Domestic electrical demand is met by the roof-first PV and battery system, with a small resilience woodfuel allowance. [redacted] /
- [redacted] remains compliant.
- Transport: only domestic mileage is included in the domestic EFA. Business and visitor trips are not hidden; they are assessed separately in the Transport Assessment and Travel Plan.
- Housing: the calculator includes a conservative £180,000 domestic dwelling capital allowance spread over 30 years and a £75,000 domestic plant allowance spread over 15 years. The dwelling figure is not a prediction of the applicants' expected cash spend. The actual self-build route is expected to reduce cash outlay through CNC access, screw-pile foundations and applicant-led assembly, insulation and cladding. The higher allowance is retained so the EFA is not dependent on an unusually low self-build cost assumption.
- Consumption: the household model is intentionally low-consumption, with reduced new-goods purchasing, second-hand clothing / furniture / tools, modest holidays and limited paid services.
- Household size: the calculator divides whole-household entries into a per-capita figure for four residents. This is appropriate because the OPD dwelling is the sole residence for a four-person household.

These assumptions are demanding but not arbitrary. They are tied to the land-based food strategy in Sections 4 and 5, the energy and water strategy in Section 6, the zero-carbon building strategy in Section 8, the transport plan in Section 11 and the monitoring framework in Section 13.

As a sense-check, the Lower Wych Year 5 estimate is demanding but not outside the demonstrated range of mature Welsh OPD performance. Tir y Gafel / Lammas Annual Monitoring Reports recorded site-level ecological footprints of 1.70 gha/person in 2012, 1.55 gha/person in 2014 and 1.50 gha/person in 2015. The Lower Wych result sits slightly below those site-level figures, reflecting the specific assumptions in this Management Plan: roof-first renewable energy, very low fossil-fuel reliance, high household food self-sufficiency, low domestic mileage, controlled household expenditure and a four-person household sharing fixed infrastructure impacts. The 65% food-floor stress-test and the +15% sensitivity test show that the proposal remains well within the OPD threshold even if actual performance is less strong than the main Year 5 target. [241][242][243]

Table 12-2A shows how the Year 5 result is built up across the calculator categories. Values are rounded to two decimal places, so displayed category totals may not sum exactly.

**Table 12-2A: Year 5 categorical breakdown of results**

| Category | Year 5 gha/person | Explanation |
|---|---|---|
| Energy | 0.00 | No grid electricity, gas or oil entry at Year 5; only a very small biomass allowance appears in the calculator. |
| Housing / construction / plant | 0.36 | Conservative dwelling, renewable / water plant, repair and household-maintenance allowance. |
| Transport | 0.15 | Domestic travel and vehicle inputs only; business and visitor transport are monitored separately in Section 11. |
| Bought-in food | 0.20 | Residual purchased food at the planned 80% household food self-sufficiency position. |

| Category | Year 5 gha/person | Explanation |
|---|---|---|
| Home-grown food inputs / domestic plot | 0.21 | Compost, seeds, garden equipment, domestic food-production land entry and feed for livestock for home consumption. |
| Consumables | 0.06 | Low new-goods consumption, with second-hand clothing, furniture, tools and household items where practical. |
| Services | 0.03 | Low service, holiday, education, financial and miscellaneous service expenditure. |
| Public services and national capital | 0.38 | Standard OPD calculator background contribution for public services and capital investment; this row is calculator-fixed, not user-entered. |
| Total | 1.39 | Estimated Year 5 domestic ecological footprint. |

The breakdown shows that the low headline result is not being driven by one hidden assumption. The largest remaining components are the standard public services / national capital contribution, the deliberately conservative housing / plant capital allowance, and the domestic food-production inputs / plot entry. The conventional high-footprint categories of imported domestic energy, high car mileage, flights, bought-in food and new-goods consumption are materially reduced by the OPD operating model.

## 12.6 Food Self-Sufficiency Stress-Test

The main Year 5 EFA uses the Lower Wych management target of approximately 80% household food self-sufficiency. This reflects the planned operating position set out in Sections 4, 5 and 13. However, the OPD Practice Guidance treats 65% of basic food needs grown and / or reared on site as the expected minimum for an OPD site, with the residual food requirement met from site-derived income or surplus. [230]

[redacted]

**Table 12-3: Year 5 food self-sufficiency stress-test**

| Food scenario | On-site food share | Bought-in food share | Bought-in food allowance | EFA result | +15% sensitivity |
|---|---|---|---|---|---|
| Main Year 5 management target | 80% | 20% | [redacted] | 1.39 gha/person | 1.60 gha/person |
| OPD food floor stress-test | 65% | 35% | [redacted] | 1.54 gha/person | 1.77 gha/person |

The stress-test demonstrates that the EFA is not dependent on achieving the 80% target in every year. Even if a difficult season, illness, establishment lag or crop loss reduced the household to the OPD 65% food floor, the calculated household footprint remains below 2.4 gha/person and below 1.88 gha/person with the +15% sensitivity allowance.

## 12.7 Domestic EFA Boundary and Other Footprints

The Welsh Government calculator is deliberately limited to the domestic household footprint. The OPD Practice Guidance recognises that business activities, volunteers, visitors and wider community effects may create "Other Footprints" which cannot be calculated in the same way but should still be taken into account in the planning assessment. [230][231]

**Table 12-4: Other footprints and where they are assessed**

| Other footprint area | Treatment in this Management Plan |
|---|---|
| Enterprise building and workshop / packing areas | Excluded from the domestic EFA. Addressed in Section 8 through the zero-carbon buildings, fabric distinction and reversibility evidence. The dwelling is built to the full domestic WikiHouse Skylark 250 Plus standard; the enterprise building uses the same low-impact reversible timber-cassette construction logic, with internal fabric differentiated by use. |
| Business energy and business materials | Excluded from the domestic EFA. Accounted for in the Business and Improvement Plan, the energy monitoring system and the annual enterprise records. |
| Business travel | Excluded from the domestic EFA. Separately quantified and monitored in Section 11 as part of the 5,628-mile site-associated transport baseline and the c. 4,990-mile improvement target. |
| Visitors, events and educational visits | Excluded from the domestic EFA. Capped and monitored through Sections 10 and 11, including visitor / event logs and limits on event frequency and numbers. |
| Wider community effects | Considered qualitatively. Local food supply, low-impact knowledge sharing, tool / seed exchange and produce sharing may reduce some off-site impacts, but no numerical credit is taken in the domestic EFA. |
| Carbon sequestration, biodiversity and soil improvement | Outside the EFA calculator. Addressed in Sections 5 and 8 through land management, habitat creation, coppice, orchard, meadow, woodland-edge management and whole-life carbon evidence. |

## 12.8 Monitoring, Data Collection and Corrective Action

The EFA will be monitored through ordinary household records rather than a separate abstract system. The following records will be kept from first habitation and summarised annually:

- household size and sole-residence confirmation;
- domestic energy use, PV generation, battery / inverter records, woodfuel use and any imported fuel or electricity;
- domestic water system performance and water-treatment maintenance records where relevant to household services;
- domestic vehicle mileage, domestic fuel use and domestic public-transport / travel costs;
- bought-in food expenditure by broad category, together with food self-sufficiency records from Section 4;
- domestic food-production inputs including seeds, compost, feed and equipment;
- consumable goods, second-hand purchases, services and holidays;
- domestic construction, repair, maintenance and replacement costs; and
- business / visitor records kept separately so they are not accidentally included in the domestic EFA.

The first Annual Monitoring Report will be submitted within one month of the first anniversary of habitation, in line with Section 13. A full EFA will be prepared at Year 3 and again at Year 5 using actual monitored data. The Year 5 EFA will form part of the five-year Management Plan review. [236]

If annual monitoring shows that the household footprint is drifting materially above the planned trajectory, the first corrective actions will be targeted at the largest controllable categories: bought-in food, imported energy, domestic mileage, holidays, new-goods purchasing and unplanned dwelling / infrastructure expenditure. If the Year 3 EFA indicates a risk of missing the 2.4 gha/person Year 5 threshold, a written corrective-action plan will be prepared and reported to the LPA as part of the yellow / red-card process in Section 13.

## 12.9 Conclusion

The completed Ecological Footprint Calculator demonstrates that the Lower Wych OPD meets the EFA test at application stage. The first-habitation estimate is approximately 1.59 gha/person, or 1.83 gha/person with the +15% sensitivity allowance. The Year 5 estimate is approximately 1.39 gha/person, or 1.60 gha/person with the +15% sensitivity allowance. A further 65% food-floor stress-test gives approximately 1.54 gha/person, or 1.77 gha/person with +15% sensitivity.

The proposal therefore remains below the 2.4 gha/person OPD threshold in all application-stage tests and demonstrates a clear pathway towards the longer-term 1.88 gha/person objective. The calculation is deliberately tied to auditable management commitments: on-site food production, renewable energy, low domestic mileage, conservative

self-build capital entries, low consumption, separate business accounting and annual monitoring.

The EFA will be updated from actual records at Year 3 and Year 5. If performance diverges from the forecast, the corrective-action framework in Section 13 provides the route for adjustment, review and, if necessary, escalation.

## References

[230] Welsh Government / Land Use Consultants / Positive Development Trust (2012). Practice Guidance: One Planet Development - Technical Advice Note 6 Planning for Sustainable Rural Communities. Welsh Government, Cardiff.

[231] Welsh Government (2020). Practice guidance: using the One Planet Development Ecological Footprint Calculator. Welsh Government, Cardiff.

[232] Welsh Government (2020). One Planet Development Ecological Footprint Calculator spreadsheet tool. Welsh Government, Cardiff.

[233] Lower Wych OPD Management Plan, Section 4: Business and Improvement Plan.

[234] Lower Wych OPD Management Plan, Section 5: Land Management.

[235] Lower Wych OPD Management Plan, Section 6: Energy and Water.

[236] Lower Wych OPD Management Plan, Section 13: Phasing, Monitoring and Exit Strategy.

[237] Appendix G — Ecological Footprint Calculator and EFA Input Evidence, including the completed Lower Wych OPD EFA workbook and land-use check.

[238] Welsh Government (2024). Planning Policy Wales, Edition 12. See paragraph 3.59 on One Planet Development.

[239] Wrexham County Borough Council. Wrexham Unitary Development Plan 1996-2011, including policies PS1, PS2 and GDP1 where relevant.

[240] Welsh Government / Stockholm Environment Institute / GHD (2015). Ecological and Carbon Footprint of Wales: Update to 2011. Published Welsh national ecological footprint comparator of 3.28 gha/person.

[241] Tir y Gafel Ecovillage (2013). Annual Monitoring Report for Tir y Gafel Ecovillage 2012.

[242] Tir y Gafel Ecovillage (2015). Annual Monitoring Report for Tir y Gafel Ecovillage 2014 - Year 5.

[243] Tir y Gafel Ecovillage (2016). Annual Monitoring Report for Tir y Gafel Ecovillage 2015 - Year 6.



# 13.Phasing, Monitoring and Exit Strategy

# 13 Phasing, Monitoring and Exit Strategy

## 13.1 Purpose of this Section

This section sets out the phasing, monitoring, corrective-action and exit framework for the Lower Wych One Planet Development. It is the control chapter for the Management Plan: it does not introduce separate technical assumptions, but draws together the targets and monitoring commitments set out in Sections 3 to 12. The aim is to show that the proposal is phased realistically, monitored transparently, correctable if performance slips, and reversible if the essential characteristics of One Planet Development are not achieved. [244][245]

This section should also be read in the context of the current development-plan position following the quashing of the Wrexham Local Development Plan. The operative planning framework is therefore Future Wales 2040, Planning Policy Wales and the residual Wrexham UDP 1996-2011 policies, including PS1, PS2 and GDP1, alongside TAN 6 and the OPD Practice Guidance.

For monitoring purposes, OPD Year 1 begins on the date of first habitation of the OPD dwelling. Annual Monitoring Reports will be submitted to the Local Planning Authority within one month of each anniversary of first habitation. Each report will summarise progress against this Management Plan, identify any yellow-card or red-card issues, and set out corrective actions for the following monitoring year. A full Ecological Footprint Analysis will be prepared at the Year 3 mid-term review and again at the Year 5 Management Plan review. [245][246][247]

The monitoring framework is deliberately practical. Records will be kept in ordinary operating logs, accounts, meter readings, photographs and annual summaries rather than in a separate abstract system. The same evidence base will be used to demonstrate compliance with the land-based livelihood, food, energy, water, waste, building, transport, community and ecological-footprint requirements of TAN 6 and the OPD Practice Guidance. [244][245]

## 13.2 Phasing Programme

The phasing programme below is aligned with the latest Design and Development Strategy, Land Management, Energy and Water, Community Impact, Transport and Ecological Footprint chapters. Dates may shift modestly because of weather, ecological survey windows, supply chains or construction sequencing, but the milestones and monitoring tests will remain the basis for annual reporting.

**Table 13-1: Phasing programme and monitoring milestones**

| Phase | Main actions | Monitoring milestone |
|---|---|---|
| Pre-commencement / pre-habitation | Complete pre-commencement ecological requirements, including the avoidance-led GCN RAMS, construction-phase pollution controls, tree/root-protection measures, low-impact lighting safeguards and a construction environmental management approach. Coordinate the building-services design against Section 6. Set up the monitoring file, baseline photo points, soil records, journey log, waste log and enterprise accounts. | First habitation does not occur until the dwelling is safe to occupy and the essential energy, water, sanitation and access systems are operational or covered by an agreed temporary arrangement. |
| OPD Year 1 - construction completion and early production | Complete the WikiHouse dwelling, screw-pile foundations, roof-first PV strategy, rainwater harvesting, source-separated sanitation, greywater treatment and essential internal fit-out. Establish the first market-garden beds, polytunnels, orchard / soft-fruit planting, compost systems, clean-water irrigation storage, wildlife / attenuation ponds and early mushroom, microgreens and fermentation trials. | First Annual Monitoring Report records construction completion, first-habitation date, baseline resource use, first harvests, initial enterprise income, habitat works, transport mileage and any corrective actions. |

| Phase | Main actions | Monitoring milestone |
|---|---|---|
| OPD Year 2 - system integration and production scaling | Expand annual vegetable and protected-crop production; integrate storage, processing and cold-chain arrangements; continue orchard, hedgerow, meadow, wetland, coppice and pond establishment; expand low-technology wasabi and mushroom systems; and introduce or expand low-density poultry / grazing only where welfare, registration and land-management requirements are in place. | Second Annual Monitoring Report tests whether production, income, food self-sufficiency, energy use, water performance and habitat works are moving toward the Year 5 trajectory. Food self-sufficiency is expected to be moving toward approximately 35%, subject to seasonal conditions. |
| OPD Year 3 - mid-term verification | Carry out a mid-term performance review across all OPD criteria, including a full Ecological Footprint Analysis. Review enterprise performance, food production, energy demand, water resilience, waste assimilation, biodiversity enhancement, transport mileage and community impacts. Adjust the enterprise mix if any component is underperforming or placing disproportionate pressure on labour, transport or resources. | Year 3 report includes full EFA, red/yellow-card assessment and a written corrective-action plan where needed. Food self-sufficiency is expected to be moving toward approximately 45%. |
| OPD Year 4 - optimisation and resilience building | Refine production, storage, processing, travel and community systems based on three years of records. Continue habitat maturation, coppice establishment, hedgerow management, pond maintenance, soil-building and monitoring of the Local Wildlife Site / woodland edge. Community activity remains within the caps assessed in Sections 10 and 11. | Fourth Annual Monitoring Report checks whether any previous yellow cards have been resolved and whether the site is on course for the Year 5 minimum-needs, food, EFA, waste, biodiversity and transport targets. Food self-sufficiency is expected to be moving toward approximately 55%. |
| OPD Year 5 - full target achievement and five-year review | Demonstrate the Year 5 OPD position: land-based activity meeting the household minimum-needs income test; approximately 80% household food self-sufficiency as the management target, with the OPD 65% threshold treated as the compliance floor and stress-test minimum; a compliant ecological footprint at or below the 2.4 gha/person OPD threshold with a clear trajectory toward 1.88 gha/person over time; stable water, energy, waste and transport performance; and clear evidence of land-management delivery. | Year 5 report includes full EFA, full Management Plan review, updated targets for the next five-year period, and a summary of any unresolved yellow or red cards. |
| Beyond Year 5 | Continue annual monitoring and five-year Management Plan reviews. Maintain the core land-based livelihood, resource systems, ecological management, transport controls and sole-residence commitment for as long as the OPD is occupied under the Management Plan. | Annual Monitoring Reports continue on the anniversary cycle. A refreshed Management Plan is produced every five years or sooner if required by the LPA or a material change in circumstances. |

**Figure 13-1: Five-Year Phasing, Monitoring and Review Timeline.**

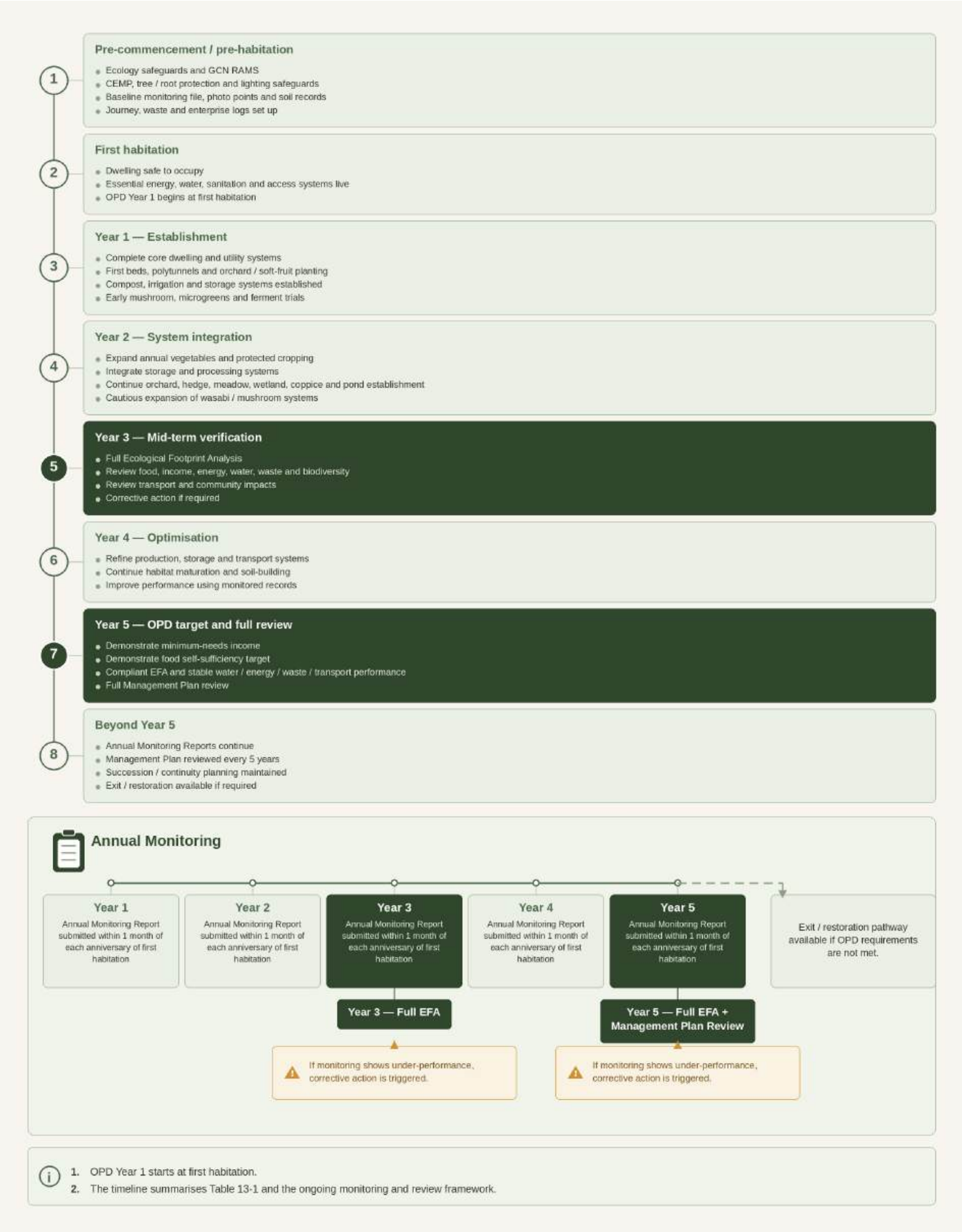



Figure 13-1: Five-Year Phasing, Monitoring and Review Timeline. The timeline summarises the transition from pre-commencement safeguards and first habitation through establishment, system integration, Year 3 EFA verification, Year 5 target review and ongoing five-year Management Plan reviews. Corrective action and exit / restoration provisions remain available if monitoring shows that OPD requirements are not being met.

## 13.3 Adopted Technical Baseline for Monitoring

The following table records the technical assumptions that Section 13 uses for monitoring. Detailed equipment selection may change at building-services design stage, but installed systems will meet or exceed the performance schedule stated in Section 6. Any later design refinement will be recorded in the Annual Monitoring Report so that monitoring remains transparent.

**Table 13-2: Adopted technical baseline for Section 13 monitoring**

| Component | Adopted planning-stage position | Monitoring evidence |
|---|---|---|
| Solar PV | approximately 20.9 kWp roof-mounted array, indicatively 36 high-output modules at around 580 W each. | PV generation log; annual comparison with electricity demand. |
| Battery storage | 50 kWh nominal LiFePO4 battery bank, approximately 40 kWh usable. | Battery state-of-charge and low-solar resilience notes. |
| Inverter / charger | 8-10 kW class inverter / charger. | Commissioning record and annual maintenance notes. |
| Primary heating | 6-8 kW air source heat pump, final size confirmed by detailed heat-loss calculation. | Annual ASHP input electricity and seasonal performance notes. |
| Thermal storage | Approximately 600 litre thermal store, within the 500-800 litre planning-stage allowance. | Annual maintenance and operational log. |
| Resilience heat | Room-sealed Ecodesign-ready boiler stove, used only for low-solar winter resilience / battery-preservation mode. | Woodfuel use log and stove-service record. |
| Potable rainwater | 40,000 L underground potable rainwater storage, indicatively 2 x 20,000 L tanks, filtered and UV-polished before domestic use. | Rainfall, tank-level, filter and UV-maintenance records. |
| Non-potable irrigation water | Separate clean-water system including two 10 m diameter clean-water irrigation reserve / attenuation ponds, polytunnel roof catchment and small header storage. | Irrigation use, pond condition and storm / drawdown observations. |
| Greywater treatment | 15 m2 horizontal subsurface-flow reedbed discharging to a 6 m diameter polishing pond / infiltration / non-edible planting only. Treated greywater is not used for edible-crop irrigation. | Reedbed inspection, maintenance and any water-quality checks required by the final drainage strategy. |
| Transport baseline | Transport will be monitored against the Section 11 baseline of 5,628 site-associated vehicle miles per year, with a monitored improvement target of approximately 4,990 miles per year if the school-run cycling / lift-share reduction is achieved. | Trip log recording purpose, distance, mode, sharing and visitor / event travel, reported annually against both the baseline and the improvement target where applicable. |

## 13.4 Annual Monitoring Framework

Annual monitoring will cover every essential OPD criterion and every material mitigation commitment relied on in the planning case. The table below identifies the minimum evidence to be collected and the triggers for corrective action. Yellow cards identify issues that require attention before the next annual report. Red cards identify issues that threaten one or more essential OPD characteristics and require urgent corrective action and engagement with the Local Planning Authority. [245][248]

**Table 13-3: Annual monitoring matrix, triggers and corrective action -** Yellow triggers are internal early-warning prompts that initiate corrective management and reporting in the AMR. Red triggers correspond to the OPD policy tests in TAN 6 and the Practice Guidance.

| Monitoring area | Evidence to collect | Yellow / red trigger and corrective response |
|---|---|---|
| Land-based income and minimum needs | Enterprise accounts, sales records, operating costs, minimum-needs comparison and evidence that off-site income is not relied upon to meet the TAN 6 minimum-needs test. | Yellow: net income is more than 25% below the Year 5 trajectory in a monitoring year, or records are incomplete. Red: there is no realistic prospect of the land-based enterprises meeting the TAN 6 minimum-needs test by the Year 5 review, or the test is not met at the Year 5 review without a credible recovery plan agreed with the LPA. Response: prioritise core enterprises, reduce optional activity, revise pricing / markets and submit a corrective business plan. |
| Food self-sufficiency | Harvest logs, preserved-food records, household food-purchase records, crop plans, livestock / egg records and annual food-self-sufficiency calculation. | Yellow: food self-sufficiency is more than 25% below the planned trajectory in a monitoring year, or records are incomplete. Red: the OPD food requirement - at least 30% of household food needs (by value) produced on the site, and 65% in total met from site produce or from income derived from the land-based activity is not met at the Year 5 review without a credible recovery plan agreed with the LPA. Response: simplify crop range, improve storage, increase staple crops and pause non-essential enterprises if labour is constrained. |
| Ecological Footprint Analysis | Annual EFA progress note, full EFA at Year 3 and Year 5, household consumption records and explanation of any material changes. | Yellow: the annual EFA progress note shows a materially worsening trend, or data gaps prevent confident assessment. Red: the full Year 3 or Year 5 EFA exceeds 2.4 gha/person without a credible recovery plan agreed with the LPA, or the development cannot show clear potential to move toward 1.88 gha/person over time. Response: immediate lifestyle, purchasing, transport, energy and enterprise adjustments, reported to the LPA. |
| Energy and low-carbon performance | PV generation logs, electricity consumption, ASHP input, battery resilience notes, stove fuel use, maintenance records and any exceptional backup-energy use. | Yellow: annual electrical demand is more than 15% above the planning-stage allowance for two consecutive years, or winter resilience repeatedly fails. Exceeding the planning-stage allowance is not of itself an OPD failure where demand continues to be met from the on-site renewable system. Red: persistent inability to meet basic energy needs from the approved renewable-led system, or routine reliance on fossil backup. Response: demand reduction, load scheduling, equipment maintenance / upgrade and revised winter operating protocol. |
| Water supply and treatment | Rainfall, tank-level records, potable treatment maintenance, irrigation use, pond observations, reedbed inspections and records of any imported water. | Yellow: repeated unplanned water import, repeated low-storage stress or maintenance gaps. Red: persistent inability to meet basic water needs from the site, potable-treatment failure or pollution risk. Response: demand reduction, repair / maintenance, additional clean-water storage within the approved strategy, and LPA / regulator engagement where required. |

| Monitoring area | Evidence to collect | Yellow / red trigger and corrective response |
|---|---|---|
| Waste and nutrient management | Residual-waste weights, recycling / HWRC records, compost temperature logs, UDDT maintenance, urine / struvite or nutrient records, reedbed maintenance and processing-waste logs. | Yellow: residual waste or exported organic material exceeds the target in a monitoring year, or compost / UDDT records are incomplete. Red: sanitation, animal by-product or pollution non-compliance; unsafe compost use; or repeated failure to assimilate waste on site. Response: pause the relevant waste stream, correct system management, seek specialist advice and report corrective action. |
| Biodiversity and land management | Fixed-point photographs, habitat-management diary, tree / hedgerow / pond / meadow records, grazing logs, invasive-species checks and any professional ecological monitoring required by condition. | Yellow: scheduled habitat work is missed, a habitat declines in condition, or a management conflict is identified. Red: damage to the Local Wildlife Site / woodland, hedgerows, pond habitats or protected-species interests. Response: stop the harmful activity, reinstate protective buffers, seek ecological advice and agree recovery measures with the LPA if required. |
| Transport and accessibility | Journey log recording purpose, distance, destination, mode, vehicle sharing, EV / active-travel use and visitor / event travel. | Yellow: annual mileage is more than 25% above the Section 11 forecast in a monitoring year, or trip records are incomplete. Red: a sustained increase in travel over two or more consecutive years that materially undermines the EFA result or the objectives of the Travel Plan, or visitor / event travel repeatedly and materially exceeding the assessed scale. Response: review trip causes, bundle journeys, reduce events / deliveries, increase cargo-bike / shared trips and revise visitor instructions. |
| Community impact and engagement | Event log, attendee numbers, visit dates, safeguarding / induction records, complaint log and record of responses to neighbours or the LPA. | Yellow: a minor breach of event controls, or visit / complaint records are incomplete. Red: repeated substantiated amenity impacts, unmanaged visitor parking, safeguarding failure or events beyond the assessed caps. Response: pause events, amend booking / transport controls, contact affected neighbours and report actions in the AMR. |
| Buildings, infrastructure and reversibility | As-built drawings, commissioning certificates, maintenance records, photographs of screw-pile / modular systems, and records of any alterations. | Yellow: a minor deviation from the approved details or an incomplete maintenance record, to be regularised. Red: irreversible works, or infrastructure preventing restoration of the site. Response: regularise or reverse the change, update drawings and agree any material amendment with the LPA before implementation. |
| Sole residence and occupation compliance | Annual applicant declaration, occupancy statement and evidence that occupation remains tied to active land management and the approved Management Plan. | Yellow: administrative information is late or incomplete. Red: the dwelling is not the sole residence of the approved occupants, or active land-based management has ceased. Response: immediate notification to the LPA, corrective plan or activation of the exit / succession procedure. |

## 13.5 Yellow and Red-Card Corrective Action Procedure

The yellow and red-card system is a self-imposed management tool informed by the OPD Practice Guidance's approach to monitoring and persistent failure. Yellow cards are internal early-warning prompts: they identify non-critical issues, initiate corrective management, and are normally expected to be remedied by the next Annual Monitoring Report. They do not of themselves indicate a breach of the Management Plan. Red cards correspond to the OPD policy tests: they are raised only where an issue threatens achievement of the essential characteristics of One Planet Development, including the ecological-footprint threshold, the land-based minimum-needs test, the waste, energy and water requirements, or compliance with the binding Management Plan itself. [245]

A yellow card will be accompanied by a clear corrective action, named responsibility, evidence source and timescale. If the same yellow-card issue recurs at the next annual monitoring point without a reasonable explanation or effective intervention, it will be reviewed for escalation, and will be escalated to a red card where the underlying issue threatens achievement of an essential characteristic of OPD. Several separate yellow cards may also be treated as a red card where, taken together, they indicate that one or more essential characteristics are not being achieved.

A red card will trigger a written corrective-action plan within three months of identification, unless a shorter period is required because of pollution, safety, protected-species, occupation or enforcement risk. The plan will identify the cause of the problem, immediate stabilisation measures, the changes required to bring the site back into compliance, and the evidence that will be submitted to the LPA at the next monitoring point. Persistent failure is defined in accordance with the Practice Guidance as failure to achieve one or more essential characteristics over a period of two years without instituting clear and effective measures to address the identified problems; a red card that is being actively and effectively addressed is therefore evidence of the corrective system working, not of persistent failure. [245]

## 13.6 Ecological Footprint Analysis and Five-Year Review

The Ecological Footprint Analysis is dealt with in detail in Section 12. Section 13 uses the EFA as a monitoring and review tool, not as a separate calculation. The development will demonstrate that the household ecological footprint is at or below the 2.4 gha/person OPD threshold and has clear potential to move toward 1.88 gha/person over time. A lower footprint may be achieved in practice, but this chapter does not rely on a specific sub-1.88 figure unless and until it is evidenced by the final Section 12 calculation and subsequent monitoring. [246][247]

The Year 3 review will test whether the development is on course across all OPD criteria and will identify any corrective action needed before Year 5. The Year 5 review will form the basis of the next five-year Management Plan. It will include the full EFA, the final minimum-needs and food-self-sufficiency position, a review of the land-management and biodiversity outcomes, updated transport and community-impact evidence, and revised targets for the next five-year period.

## 13.7 Exit Strategy

The exit strategy provides assurance that, if the OPD ceases or fails to meet the essential characteristics required by TAN 6 and the OPD Practice Guidance, the residential and operational infrastructure can be removed and the land restored or retained in an ecologically beneficial condition. The strategy is based on reversibility, material recovery, legal enforceability and ecological protection. [244][245][256][257][258]

### 13.7.1 Trigger Conditions

The exit strategy may be triggered by voluntary cessation of the OPD, permanent cessation of active land-based management, occupation no longer complying with the approved Management Plan or sole-residence requirement, two consecutive red cards for the same essential OPD issue without effective corrective action, or a sustained incapacity / succession situation where the Management Plan can no longer be delivered. Where there is uncertainty, the applicants will seek early dialogue with the LPA before any irreversible decision is made.

### 13.7.2 Reversible Construction and Material Recovery

The WikiHouse system, screw-pile foundations, modular services, roof-mounted PV and low-impact access strategy are selected partly because they support removal and material recovery. The building is assembled from mechanically fixed components rather than conventional wet construction. Screw piles can be unscrewed and removed, avoiding concrete foundations and reducing ground disturbance. PV equipment, batteries, inverters, tanks, polytunnels and small agricultural structures can be removed for resale, reuse or recycling.

Ecological features that provide lasting benefit, such as hedgerows, trees, ponds, meadow, coppice, woodland-edge improvements and soil restoration, would not be removed simply because the residential element ceased. These features would remain unless the LPA required otherwise or unless a specific feature created an environmental, safety or legal problem. Any future retention of water, access or agricultural infrastructure would be agreed with the LPA where planning control required it.

### 13.7.3 Indicative Exit and Restoration Costs

The following costs are planning-stage estimates only. They are included to show that restoration is practically and financially credible. Actual costs would depend on the timing of exit, market value of reusable materials, access

conditions, contractor availability and whether any infrastructure is agreed for retention as agricultural or ecological infrastructure.

If the Local Planning Authority requires assurance that exit and restoration costs will be available if needed, the applicants are willing for this to be secured through an appropriate Section 106 financial obligation, restoration bond, escrow arrangement or equivalent mechanism, with the final form and amount to be agreed at decision stage.

**Table 13-4: Indicative exit and restoration cost schedule**

| Item | Exit action |
|---|---|
| WikiHouse dwelling | Dismantle, catalogue and remove / reuse / recycle chassis, cladding, roof finish, windows and internal fit-out. |
| Screw-pile foundations | Unscrew and remove piles; backfill and make good local ground disturbance. |
| PV, battery, inverter and controls | Decommission through competent installer; re-use, sell or recycle equipment through approved routes. |
| Rainwater tanks and service runs | Remove or agree retention where lawful and useful for agricultural / ecological management; disconnect and make safe. |
| Tracks, parking and hardstanding | Lift geogrid / aggregate where removal is required; decompact and restore soil profile; reseed or plant. |
| Polytunnels, sheds and small agricultural structures | Dismantle and remove or transfer for agricultural reuse. |
| Greywater / sanitation infrastructure | Decommission UDDTs, reedbed and polishing pond elements where removal is required; retain planted wetland only if agreed and environmentally beneficial. |
| Land restoration and aftercare | Soil repair, reseeding, replacement planting, erosion control, aftercare and professional ecological advice if needed. |

[redacted]

### 13.7.4 Exit Timescale and LPA Oversight

If the exit strategy is triggered, a detailed decommissioning and restoration method statement will be submitted to the LPA. Unless an alternative timetable is agreed, removable residential and operational infrastructure will be dismantled and removed within 12 months of permanent OPD cessation. The method statement will confirm what is to be removed, what is proposed for retention because it is beneficial or lawfully agricultural, how pollution and protected-species risks will be controlled, and how restoration will be evidenced through photographs and final reporting.

## 13.8 Succession, Incapacity and Continuity

The Management Plan assumes delivery by the applicant household, but it also needs to remain workable during illness, family disruption or other unforeseen circumstances. If one adult is temporarily incapacitated, the priority will be to maintain household welfare, livestock welfare, water, sanitation, essential energy, core food production and ecological safeguards. Optional events, school visits, non-essential processing and lower-priority enterprise activity will be paused before core OPD duties are allowed to fail.

If both adults are temporarily unable to manage the holding, family support, local contractors or paid local help may be used to maintain essential welfare, animal-care, land-management, water, waste and safety duties for a short period, normally up to four to eight weeks. Such assistance would not replace the land-based nature of the development; it would be a continuity measure to protect welfare, habitats and compliance. If longer support is required, the yellow / red-card process will be initiated and the position reviewed with the LPA. If the household can no longer meet OPD requirements over a sustained period, the exit strategy will be activated in consultation with the LPA.

Phil and Elly commit to enter into a Section 106 agreement on terms to be agreed with the Local Planning Authority,

securing OPD-specific obligations including sole residence, Management Plan compliance, Annual Monitoring Report submission, five-year review, and the exit / restoration framework set out in this section. If household circumstances change, including separation, death, long-term illness or transfer of interest in the land, continued occupation will still need to comply with that agreement, the sole-residence commitment and the approved Management Plan. Any proposed succession or transfer will be discussed with the LPA before it is relied upon as a basis for ongoing occupation.

## 13.9 Conclusion

The phasing, monitoring, corrective-action and exit arrangements set out in this section demonstrate that the Lower Wych OPD is not an open-ended residential proposal. It is a monitored land-based development with clear milestones, annual evidence, mid-term and five-year review points, a practical yellow / red-card corrective-action system and a reversible construction strategy. If the development performs as intended, the monitoring framework will demonstrate continuing compliance. If it does not, the same framework provides a clear route for correction, review or restoration. [244][245]

## References

[244] Welsh Government (2010). Technical Advice Note 6: Planning for Sustainable Rural Communities. Welsh Government, Cardiff.

[245] Welsh Government (2012). Practice Guidance: Planning Permission for One Planet Developments in the Open Countryside. Welsh Government, Cardiff.

[246] Welsh Government (2020). Practice Guidance: Using the One Planet Development Ecological Footprint Calculator. Welsh Government, Cardiff.

[247] Welsh Government (2020). One Planet Development Ecological Footprint Calculator (spreadsheet tool). Welsh Government, Cardiff.

[248] One Planet Council (2021). One Planet Development and Yearly Monitoring Reports (OPC Position Statement 5). One Planet Council.

[249] One Planet Council (n.d.). Planning Policy and Guidance for One Planet Development (online resource). One Planet Council.

[250] Annwyl, K. & Griffiths, G. (2017). Allt Cefn Ffynnon One Planet Development Management Plan. One Planet Council copy.

[251] Jones, R. & Hughes, L. (2022). Maes Digonedd One Planet Development Management Plan. One Planet Council copy.

[252] Harris, N. (2019). One Planet Developments in Wales: Exceptional Spaces or Ordinary Policy? Town Planning Review, 90(1), 1-28.

[253] Welsh Government (2023). Review of One Planet Development in Practice (ATISN 17403). Welsh Government, Cardiff.

[254] Welsh Government (2010). Towards Zero Waste: Our Waste Strategy. Welsh Government, Cardiff.

[255] Auditor General for Wales (2019). Waste Management in Wales - Preventing Waste. Audit Wales, Cardiff.

[256] Welsh Office (1997). Circular 13/97: Planning Obligations. Welsh Office, Cardiff.

[257] National Assembly for Wales / Senedd Research (2014). The Planning Series: 13 - Section 106 Agreements. Senedd Research Service, Cardiff.

[258] Welsh Government (2022). Planning Appeals Guidance: Planning Obligations. Welsh Government, Cardiff.

[259] UK Parliament (2021). Environment Act 2021, Part 7: Conservation Covenants. UK Government, London.

[260] Department for Environment, Food & Rural Affairs (2022). Getting and Using a Conservation Covenant Agreement: Guidance. Defra, London.

[261] Environment Agency (2024). Conservation Covenants: A New Tool to Support Nature Recovery. Environment Agency.