



Grassland translocation – successes and solutions

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Grendon and Doddershall Meadows Local Wildlife Site (LWS) is located just over 1km west of Quainton in Aylesbury, Buckinghamshire. The LWS citation states that the 24.5 hectare (ha) area was designated due to its large complex of lowland meadow habitat supporting plant species unusual in Buckinghamshire, namely sneezewort (*Achillea ptarmica*) and fen bedstraw (*Galium uliginosum*). The LWS was also designated for supporting a range of farmland birds and species of butterfly [1].

The Environmental Statement [2] for the HS2 scheme between London and the West Midlands identified the loss of 11.6 ha within the LWS due to construction of the scheme. Part of the proposed mitigation in the Environmental Statement, to maintain the conservation status of lowland meadow, was translocation of the soils and plants within the LWS. This was carried out by HS2 Enabling Works Contractors during 2019 and 2020.

There are several good practice measures and solutions for challenges that arose during the translocation work which are shared in this paper for use on other projects.

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Resource type

[Good Practice Document](#)

Intended audience

Contractors

Background and industry context

Through the Project Environmental Minimum Requirements ^[3], HS2 Ltd seeks to further reduce the impacts of the Scheme. Where effects on ecological receptors cannot be reasonably avoided then HS2 Ltd has committed to provide a range of mitigation and compensation measures, one of which is habitat translocation, the process of moving soils and associated vegetation to rescue habitats that would otherwise be lost due to development.

Habitat translocation is associated with habitats of significant nature conservation value where a decision has been made to move them rather than lose them. Official best practice guidance in Great Britain is that habitat translocation should be regarded, for all sites of high nature conservation value, as very much a last resort when all other alternative avenues (avoidance and mitigation) have been explored and are not feasible^[4].

Grendon and Doddershall Meadows LWS (hereafter referred to as the donor site) was designated due to its large complex of lowland meadow habitat (neutral unimproved grassland) supporting plant species unusual in Buckinghamshire, as well as supporting a range of farmland birds and species of butterfly. There are also records of heath spotted orchid and bottle sedge within the LWS, which are county rare and county scarce plant species respectively. The LWS supports a mix of damp and drier grassland, subject to hay cut during the summer months and grazed over winter by sheep.

The LWS has high conservation value and translocation of the grassland habitat was considered a suitable option, following feasibility studies which included the suitability of receptor sites.

As well as the translocation of existing grassland, further compensation for the losses at Grendon and Doddershall Meadows LWS will be restoration of damp neutral grassland on areas within the LWS temporarily affected during construction, and creation of approximately 30ha of additional species-rich grassland on landscape earthworks nearby. This work is to be delivered by HS2 Main Works Contractors in the future and is currently in design.

Approach

HS2 Contractors designed and planned the translocation work in line with HS2 standards and best practice ^[5]. Feasibility studies and methodologies were produced by specialists and several studies were carried out prior to the translocation works including baseline surveys of both the donor and receptor site for soil conditions, topography, botanical features, protected species, and archaeology. Natural England were engaged in the process of translocation, and they provided comment on the proposals in advance of works.

The nearby receptor site, where the soils and vegetation from the donor site were translocated to, is situated immediately north of the A41 and west of the village of Quinton, centred around OS grid reference SP 72688 19991. The receptor site has two sections either side of the existing Aylesbury Link Railway Line. The receptor site is approximately 7.8 ha and was assessed as suitable due to similar topography, hydrology, and soils to the donor site. The locations of the donor and receptor site are shown in the accompanying Figure 1 'Grendon and Doddershall Meadows LWS Grassland Translocation' supporting document below.

The objective of the grassland translocation was to maintain a lowland meadow priority habitat at the receptor site in accordance with the Priority Habitats description^[6].

Translocation methodology

In the absence of constraints, the translocation methodologies would have been uniform across the site. However, there were several challenges to overcome during the translocation including archaeological constraints, adverse weather, the presence of sensitive animals, and interfaces with utilities and Public Rights of Way (PRoW). The following sections highlight the translocation methodologies and how these were modified to solve some of the key challenges.

Phasing plan

The area of grassland available for translocation was approximately 8.0 ha. However, the receptor site was approximately 7.8 ha. To help plan the work around various constraints and ensure the best quality grassland could be translocated in preference, a Phasing Plan was produced based on the grassland quality (grade) of the donor site.

Botanical surveys were carried out in July, August, September, and October 2018 using the National Vegetation Classification (NVC) methodology^[7]. A hay cut was carried out by the landowner in summer 2018 when botanical surveys would usually be carried out and therefore the surveys in September and October were carried out to survey the regrowing vegetation. The first surveys identified over 34 plant species within unimproved and semi-improved neutral grassland at the donor site. The highest-grade grassland was identified as MG4 *Alopecurus pratensis* – *Sanguisorba officinalis* grassland based on the species composition. This grassland was predominantly found to the north of the existing rail line. Other areas of the LWS had lower-quality grassland with a higher frequency of weeds, such as thistle and docks, and showing signs of significant agricultural improvement in places due to frequency of hay cut and grazing pressure. Using the results of the botanical surveys, grassland at the donor site was categorised from Grade 1 grassland (most botanically diverse with abundant target species) to Grades 4a and 4b (lowest botanical diversity with limited to no target species).

The accompanying Figure 1 'Grendon and Doddershall Meadows LWS Grassland Translocation', (see supporting document), shows the locations of the different grassland grades within the donor site plots and Table 1 below shows the translocation methodology applied to the different grassland grades, based on protecting the higher-grade grassland using turf cutting whilst moving the lower grade as soils and enhancing using hay spreading and seeding. Plots A to J from the donor area were translocated to corresponding Plots A to J in the receptor area.

Grassland Grade	Translocation Method
Grade 1 – 1.86 ha	Turves lifted using a grid pattern and transported for direct translocation. Translocation to ensure grassland communities are moved to suitable microtopography and fragmentation within rarer communities to be avoided. Areas A & B – turf translocation was completed by spring 2020. Areas C & J – translocated last due to constraints such as flooding and archaeology, completed by spring 2020. Area D – Turf translocation was completed by spring 2020.
Grade 2 – 4.19 ha	Mainly lifted as turves using a grid pattern and transported for direct translocation. Translocation to ensure grassland communities are moved to suitable microtopography and fragmentation within rarer communities to be avoided. Area F – Translocation of soil rather than whole turves and then chain harrowed to provide a level seed bed for germination as there were too many cracks in the soil to allow successful turf lifting. Areas G – Turf translocation completed in 2019. Area H – Turf translocation completed by Spring 2020
Grade 3 – 0.89 ha	Turves lifted using a grid pattern and transported for direct translocation. Translocation to ensure grassland communities are moved to suitable microtopography and fragmentation within rarer communities to be avoided. Turf selected according to grassland quality. This was determined by the percentage coverage of weeds, with only sections of turf with <5% coverage of weeds translocated. Area E – Turf translocation was completed by winter 2019.
Grade 4a – 0.2 ha	Targeted turf removal of key areas identified and/or selective seed removal by hand in 2019. Turf was selected according to grassland quality. This was determined by the percentage coverage of weeds, with only sections of turf with <5% coverage of weeds translocated. Turf was not translocated from archaeological sensitive areas. Area I – Turf translocation completed in 2019.
Grade 4b – 0.9 ha	Targeted turf removal of key areas identified and/or selective seed removal by hand in 2019. Turf was selected according to grassland quality. This was determined by the percentage coverage of weeds, with only sections of turf with <5% coverage of weeds

Grassland Grade	Translocation Method
	translocated. Turf was not translocated from archaeological sensitive areas. Area I – Turf translocation completed in 2019.

Table 1: Translocation methodology applied to the different grassland grades recorded on the donor site.

The receptor site was ploughed and stripped in preparation for the translocation works; at one point six tractors and eight excavators were working on the receptor site at the same time, stripping and temporarily stockpiling the soils which were then used to backfill the donor site once the meadow soil had been translocated to the receptor area.

The vegetation present at the donor site was cut to 50-75mm above ground level and the arisings removed prior to translocation commencing. The donor soils were then either removed as turves or as loose soil depending on ground conditions. Turves were lifted using a grid pattern and transported for direct translocation on the same day. Translocation aimed to ensure grassland communities were moved to suitable microtopography with fragmentation within rarer communities to be avoided.

To reduce the risk of turf slump to the cut edge on the donor site a tractor mounted mole plough disk was deployed. This cut 1.5m parallel rows mapped using a tractor-mounted GPS and created a crisp edge to keep soil crumb to a minimum during lifting. This also allowed the turf cutters to lift more evenly sized turves between the parallel cut lines.

Modified turf cutters (13t excavator with a specially designed and manufactured grass lifting bucket) were used to take grassland and topsoil from the donor and receptor site (Figure 2). Turves were then stacked flat on a trailer or flatbed CAT730, ready to be transferred to the receptor site on the same day. Two different types of modified buckets were used, one for cutting turves at the donor site and placing them on a flatbed trailer for transport and another for lifting the turves from the trailer into the receptor site. The bucket at the receptor site was open sided so the driver could see through and had a 'roof' which reduced turves pushing up and crumbling during movement. The base of the bucket was flat and used to tamp down the turves once in place. The 46-foot trailers had a central spine added to make lifting the turves safer, so the digger driver removing the turfs from the flatbed could push against the central spine without risk of turfs crumbling or being pushed over the opposite side of the trailer.

The turf was moved with dimensions of 1.80m² (1.57m x 1.15m) and a maximum depth of 300mm, depending on root structure. To maintain the integrity of the soil, it was planned not to translocate turves of less than 150mm deep. Each turf was laid at the receptor site with a spacing of no more than 50mm between each turf. Handling was kept to a minimum to prevent materials from separating and maintaining

moisture levels. The soil from broken turves was utilised for gapping up as it contained both plants with their roots and seed bank.

Using the Phasing Plan, areas within the receptor site were laid in alphabetical order to minimise trampling over the laid turves and reduce the distance the turves were moved. To limit the extent of trampling of turves, operatives used a single access route.

All works were completed under the full-time supervision of a suitably experienced ecologist. Daily technical notes were produced during the translocation, to document methods implemented on site with justifications for decisions made. A suitably experienced ecologist also reviewed site conditions at the receptor site immediately following translocation at least once per week to check conditions such as presence / absence of weeds, vegetation height and condition and structure in accordance with the establishment, maintenance, and management plans.

Zoom Figure 2



Figure 2: Modified bucket cutting turves at donor site.

Zoom Figure 2a



Figure 2a; Modified trailer holding turfs; central spine of trailer visible behind turves.

Zoom Figure 2b



Figure 2b: Modified turf cutter used for taking turves from the trailer and placing at the receptor site.

Zoom Figure 2c



Figure 2c: Modified turf cutter used for taking turves from the trailer and placing at the receptor site.

Seed collection

Over-seeding and green hay spreading were carried out at the receptor site to provide greater botanical diversity of lower grade turves (Figure 3). Mass seed collection prior to translocation was not possible as the donor had been cut by the landowner for hay in July 2018. However, seed collection activities included:

- A green hay crop from a retained northern part of the donor which was spread to areas of loose sipped soil on the southern receptor site post translocation in July 2019.

- Green hay was collected from a local meadow 1.4km west southwest and spread to areas of loose sipped soil on the northern receptor site in July 2020 (Figure 3).
- A botanist carried out targeted collection of seed from the donor site within Area A – C for rare species such as narrow leaf dropwort (Figure 4) and the rayed form of black knapweed (*Centaurea nigra*) in July / August 2020. A total of 1,750 wildflower plugs were planted in the receptor site (Areas A, B & F) in 2021.

The only commercial seed mix purchased for use on the receptor site was for a small area where soil from Area F had been spread (5% of the southern receptor which is less than 2.5% of the total receptor site). Overseeding was carried out here as seedbank germination had been poor due to weather. Weed species had also colonised this area and exceeded 75% coverage so required removal. Seed was sown at a standard rate of 4gms/m².

Zoom Figure 3

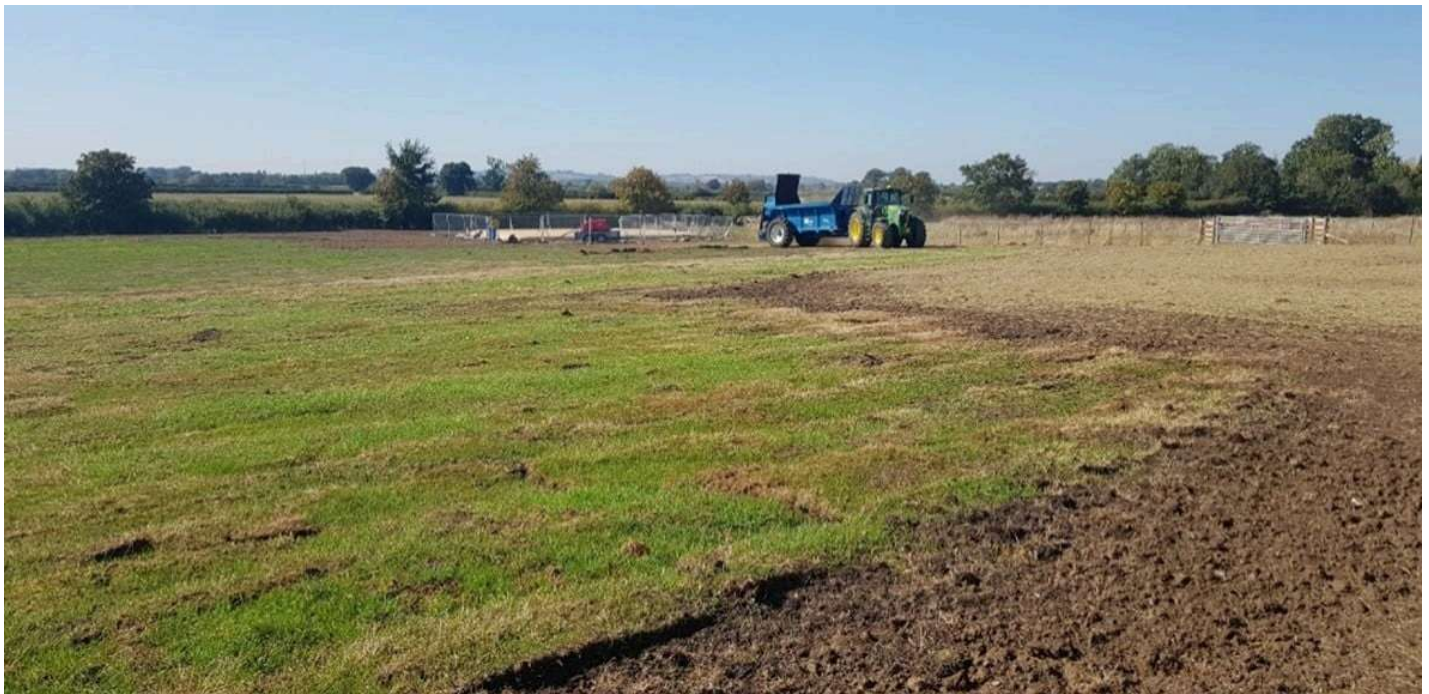


Figure 3: Green hay spreading process at the receptor site on loose tipped soils at edge of turves.

Zoom Figure 3a



Figure 3a: Green hay spreading process at the receptor site on lower grade curves.

Zoom Figure 4



Figure 4: Narrow-leaved water dropwort (*Oenanthe silaefolia*) germinated from seed collected from site before being hand planted at the receptor site.

Archaeology

As a result of archaeological investigation, a deserted medieval village was identified at the donor site and archaeological features were identified at the receptor site at shallow depths.

In areas of shallow archaeology, the depth of the turf excavations was adjusted in agreement with a specialist archaeological team. The shallowest depth within archaeological areas that would be possible for translocation was generally 150mm, although depending on the composition of the soils a depth down to 100mm was necessary. Works in archaeological sensitive areas were supervised on site by an archaeological Clerk of Works.

Seasonality of works and weather

CIRIA C600^[6] is recognised by practising ecologists as the main document to inform the habitat translocation process and is currently considered best practice. The document states that “*All translocations should take place in the dormant season for terrestrial habitats...*” HS2 Ltd considers the dormant season as October to February, inclusive.

Best practice guidance on conducting work within the dormant season is largely due to reducing impact on plants. From a soils perspective, soil stripping for translocation would ideally start in September when soils are warm, toward the end of the plant growing season but before winter months. This reduces the risk of waterlogged and frozen ground conditions which can reduce the effectiveness of translocation operations and introduce the need for additional controls such as water management and track matting.

The original programme of translocation works was planned in autumn 2019 with demobilisation before winter. However, due to several challenges (many discussed here) and the area of habitat to be translocated the programme was extended through winter and into March 2020. As the translocation was carried out over a long time there were some issues of turves drying out in hot dry conditions and difficult handling in wetter conditions during winter and spring 2020.

All turves assessed to be of the highest grade (Grade 1) were only translocated during the optimum translocation season (Figure 5). However, lower grade turves (Grades 4b, 4a, 3 and 2) were translocated in a managed way outside of the optimal translocation season to allow sufficient programme for the donor area to be investigated for archaeological features and meet the Main Works Civils Construction programme. The weather did impact the translocation process and there were some instances where works had to stop due to extreme or prolonged weather, particularly where this posed a health and safety risk. There were many days and whole weeks during the winter where translocation was not possible due to the site conditions; it could take many days of dry weather and additional tasks to tidy the site before having conditions suitable for translocation work to recommence. Mitigation measures to reduce the effects of translocating habitats outside of the dormant season varied depending on weather conditions.

Zoom Figure 5



Figure 5 : Difference between turves taken in good weather conditions (top) and those taken in less ideal conditions (bottom) showing the effect on the integrity of the soil and root systems.

Dry weather solutions

The southern area of the donor site (Grade 4b grassland from Area I) was moved in late summer 2019 in generally good conditions although hot, windy weather resulted in temporary drying of soil (Figure 6 and 7)).

The thresholds for determining if field capacity of turves was conducive to successful translocation were identified by a suitably qualified soil scientist. The thresholds were determined by assessing the moisture data collected during pre-works soil samples which ranged from 12.1% to 27.5%. Moisture levels of turves prior and post translocation were recorded daily by the Site Manager using a calibrated digital moisture meter. Turves in a healthy condition, as assessed by a suitability experienced ecologist and that held more than 15% moisture content were translocated.

Where moisture levels fell below 15% additional watering was undertaken before and after lifting. Works ceased where it was not possible to maintain moisture levels of turves above 15% over a period of five consecutive days and where there was no foreseeable rainfall forecast at the site. At this time a soil specialist inspected the ground conditions to determine clay plasticity and therefore risk of desiccation and

damage to the turves. The specialist advised whether works should proceed in accordance with the objective of protecting the condition of the turves.

Irrigation specialists were consulted, and a site and task specific irrigation system was implemented to ensure that during periods of dry and / or hot weather the successfully translocated turves did not desiccate. A tractor mounted tanker was used to spray water at the donor site and a 250,000-litre water bladder was used at the receptor attached to three high-powered, low-pressure sprinklers each able to cover a 150m radius (300m reach). The water source was a rain filled agricultural lake on site (Figures 8 and 9).

Damp hessian was laid over the top of the turves to keep them wet during transportation. Turf edges were protected in both the receptor and donor site during hot and windy conditions to protect the roots and slow the drying process. During this time, at the end of each day and before every weekend hessian was rolled against the exposed edges on both donor and receptor site turf and pinned in place where necessary.

The receptor area did have large cracks opening between adjacent turves in drier conditions. These cracks were filled by hand using loose soil from lower grade areas of the donor site; a subsoiler was pulled through these areas at 300mm depth to allow lifting of the loose soil (Figures 10 and 11).

Zoom Figure 6



Figure 6: Receptor site during hot conditions in June/July 2019. Vegetation on turves in foreground look brown due to drying.

Zoom Figure 7



Figure 7: Turves at donor site immediately after translocation in dry conditions.

Zoom Figure 8



Figure 8: Tractor-mounted water tank spraying donor site to improve translocation conditions.

Zoom Figure 9



Figure 9: Sprinkler system at receptor site keeping recently moved turves moist.

Zoom Figure 10



Figure 10: Manual filling of cracks between turves due to earlier drying out, using loose soil from donor. site

Zoom Figure 11



Figure 11: Receptor site following hand filling between turves.

Wet weather solutions

The northern area of the donor site (Areas A – E and H) were translocated in winter 2019 – 2020 during periods of high rainfall, with 39.2mm of rainfall recorded on one single night during works. The habitat was flood meadows which became wet very quickly and was slow to drain (Figure 12). The heavy machinery risked damaging the donor soils and the wet conditions interfered with being able to lift soil in turves. During periods of excessive rain translocation works ceased and recommence when conditions become conducive to successful translocation.

Track matting had to be used for access routes due to poor ground conditions (Figure 13). The site management teams identified and planned access routes, traffic management (including turning areas), and PRow in advance of the start of works. In some areas Type-1 stone with terram geosynthetic material was used beneath aluminium track matting to reinforce soft spots. A pump was also used to move water away from working areas to a low spot in the field. As site conditions deteriorated during the winter months the axels, wheels and tires of the trailers used to move turves and soil were upgraded from the standard wheel and tire combination to a large rim and off-road tire to improve with ground clearance in muddy conditions and safe movement across the work site.

Once trackway was removed within the receptor area these areas received loose tipped soil from the donor site, this was later spread with green hay when collected in July.

Zoom Figure 12



Figure 12: Water logging of the site access areas during winter 2019/20.

Zoom Figure 13



Figure 13: Double track matting used to improve winter access.

Ecologically sensitive species

The donor and receptor sites overlapped with two great crested newt metapopulations, habitat with the potential for reptiles and nesting birds. The translocation work had to be managed using a combination of watching briefs by Ecological Clerk of Works and habitat manipulation techniques to keep the donor and receptor sites unsuitable for great crested newt, reptiles, and nesting birds during the work.

Barn owls were identified as using both a barn and a barn owl nest box after the work had started. An initial 150m buffer zone around the nests were set up to avoid disturbance although this blocked the proposed entrance route onto the donor site, requiring a reprogramming of the phasing plan, working on the southern areas of the donor site first. This caused a delay during bird nesting season which doubled the time required for the translocation operation, resulting in encountering wetter conditions during winter (see below).

Access restrictions

Several PRow crossed the donor and receptor site. A Construction Logistics Plan was prepared for site movements taking public routes into account. Construction traffic crossings were subject to a highways consent and management of crossings was covered with site specific Risk Assessment and Method Statement (RAMS). To allow the PRow to remain open a system of simple crossing point was implemented, pedestrian movements through fields kept along a single route with signage and operating a 15-minute delay and a banks-person overseeing vehicle movements.

Buried services did not affect the translocation works. However, there were high voltage lines and pylons which crossed the receptor site, and no turf could be placed under the 11Kv powerlines due to the restricted use of machinery in these areas. Compact plant and equipment were used in this zone to loose tipped and spread soil rather than translocating turves. Local green hay was then spread over the soils (following Health and Safety Executive Guidance) [8].

Experienced machinery operators

Carefully stripping separate layers within the topsoil as directed by specialists on site requires precision and only skilled and experienced machinery operators should be used in soil translocation works. The translocation work and site conditions made for challenging conditions requiring both a high level of experience but also a pragmatic attitude. Many drivers were considered too inexperienced for the precise excavator work or lacked the agricultural background needed for the fleet of large tractors, long trailers or specialist attachments required for the project.

The site team secured a farm unit close to the project that could serve as a static base for equipment and deliveries, which lead to partnership with a local agricultural contractor. The team worked with this contractor to support the upskilling of his team and to allow them to get the right cards to operate plant and equipment on the site. This turned out to be key as they not only had the right skills for works but also had a local labour force helping deliver this work. Thanks to this local network the team were able to get sheep from the previous grazer back on the translocated meadow, following a full year of post-translocation establishment, to continue the traditional management of the meadow.

Monitoring outcomes

The 2020 and 2021 botanical (NVC) monitoring results showed that the vegetation community in receptor areas A and B, the higher-grade turf translocation areas, had remained stable with high similarity to the floodplain grassland community MG4b *Alopecurus pratensis* – *Sanguisorba officinalis* grassland typical sub-community. Despite the absence of one of the community constants, meadow foxtail (*Alopecurus pratensis*), the notable species sneezewort and narrow-leaved water dropwort appear to remain stable; the latter

recorded as small seedlings germinating from bare ground between cracks in turves. Meadow foxtail is an early flowering species and could have been under recorded due to the timing of the survey.

The other meadows showed stable grass diversity but a drop in herbaceous forbs and a deterioration in the quality of the NVC communities recorded, demonstrated by the decrease in similarity to the species-rich MG4 *Alopecurus pratensis*- *Sanguisorba officinalis* sub-communities (MG4a and MG4b) in areas G, H and I and a trend toward MG9 *Holcus lanatus*-*Deschampsia cespitosa* grassland (a grass dominated low species diversity community and not a floodplain meadow priority habitat). The grass community is likely to be more resilient to the translocation due to the generally deeper or more established root systems.

The species richness per quadrat of Area F (translocated as loose soil rather than turves) halved between the 2019 pre-translocation data and 2021 and has changed from a species-rich floodplain community MG4a *Sanguisorba officinalis*-*Alopecurus pratensis* grassland *Dactylis glomerata* sub-community to a (nearest match) MG10 *Holcus lanatus*-*Juncus effusus*, rush pasture community. This is likely due to the greater disturbance from translocation as loose soil than that undergone by the other areas of meadow. Generally, area F is showing a gradual transition that is often seen in newly created meadows where the first year is dominated by annuals, followed by biennials and quick establishing perennials in the first few years, particularly leguminous species. It can take up to 5 years of consistent management before the vegetation community starts to settle and a more stable vegetation community adapted to the conditions will establish. In this case it should become a community adapted to the waterlogged character of the receptor site. Narrow-leaved water dropwort was recorded in Area F due to the introduction of plug plants.

There is very little weed burden in the areas translocated, due to management of thistles and docks prior to and after translocation. There were fewer annual weeds in 2021 compared to 2020, particularly in areas where loose soil was translocated. However, there are frequent annual and biennial weeds, including biennial bristly ox-tongue, which are being controlled.

Future years will include hay cuts and in 2021 there was aftermath grazing after the late hay cut, following negotiations to get sheep from the previous grazer on the translocated meadow, for a more traditional management approach. This will reduce grass vigour and give variation in sward height. Grazing provides:

- Consolidation of turves and reduction of gaps between turves (through trampling);
- Reduction of grass vigour late and early in the season;
- Improvement of germination success as livestock trample seeds into the soil and create small pockets of open ground;
- Conditions for less vigorous species to compete with more competitive grasses.

Recommendations and conclusion

The key recommendations for soil translocation work are:

- Plan start dates for soil survey, preparation, and translocation within an integrated programme, considering other constraints (such as ecology and archaeology).
- Identify and prioritise better quality habitats so that these can be translocated at the optimal times of year using the best techniques to optimize outcomes.
- Current guidance on translocations is for these to take place in the dormant season for terrestrial habitats (October to February, inclusive). However, soil stripping for translocation would ideally start in autumn when soils are warm and avoiding dry conditions in mid-summer and wet conditions in winter.
- Have a design in place to cover access and translocation methods based on survey data but be flexible in the approach (within set parameters) according to site conditions. Have plans for how to deal with poor site conditions such as wet weather and poor drainage, including the use of modified equipment.
- Use a qualified and experienced team including soil scientists, ecologists and machine operators and get specialist contractors on board as soon into the process as possible (i.e. during the design and planning phase).
- Carry out daily soil checks during the translocation work and implement a rigorous recording system, include grid-based records for donor and receptor sites.

Immediately following translocation, the primary indicators of success should be similar soils depths as those at the donor site; good turf integrity (i.e. well laid with no gaps or depressions, unless this is to purposefully mirror topography at the donor site); and no significant compaction of the soil structure.

The translocation works at Grendon and Doddershall Meadows met challenging conditions, but the experienced site team found solutions to achieve the best outcomes within constraints such as programme. The receptor site was showing good signs of growth in 2020 and 2021. The receptor site will continue to be managed and monitored by HS2.

Acknowledgements

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Supporting materials

[Figure 1 Grendon and Doddershall Meadows LWS grassland translocation](#)

Peer review

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