

Appendix 6.2

Dellmore Mitigation Plan

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1 Introduction

1.1 Purpose

- 1.1.1 This Mitigation Plan has been prepared to document specific measures that will be undertaken at Dellmore of Kingussie (hereafter referred to as the ‘Dellmore Site’), to mitigate potential ecological impacts identified through the Ecological Impact Assessment (EclA) of Project 9 - Crubenmore to Kincaig, part of the A9 Dualling Programme (hereafter referred to as the ‘Proposed Scheme’).
- 1.1.2 More specifically, the Dellmore Site is required to provide mitigation for loss of habitat and disturbance/ displacement from habitats used by breeding waders surrounding the A9 River Spey crossing at Kingussie. This Mitigation Plan primarily focuses on impacts within the Ruthven North and South compartments of the Insh Marshes National Nature Reserve (NNR), hereafter collectively referred to as the ‘Ruthven compartment’, as this area surrounds the existing A9 and is subject to the most significant impacts. However, the Mitigation Plan also considers other NNR compartments where impacts could extend beyond the Ruthven compartment (i.e. operational noise). NNR compartments in proximity to the A9 River Spey crossing also encompass land associated with the River Spey – Insh Marshes Site of Special Scientific Interest (SSSI).
- 1.1.3 Further details of the Proposed Scheme are presented in **Chapter 5 in Volume 1**, and findings of the accompanying EclA are presented in **Chapter 12 in Volume 1**.
- 1.1.4 The Dellmore Site has been purchased by the Scottish Government, and this Mitigation Plan identifies the design elements required for the Dellmore Site to provide suitable mitigation for the potential impacts; these elements will be taken forward to detailed design.
- 1.1.5 The Mitigation Plan also includes principles of management for the Dellmore Site to be further developed by the Contractor within a Habitat Management Plan (HMP) prior to the commencement of construction. The HMP will contain, as required, updated baseline information and working methods to achieve success criteria for mitigation. Prior to construction, the HMP and management objectives will be agreed in writing with the Cairngorms National Park Authority (CNPA), Scottish Natural Heritage (SNH) and Scottish Environment Protection Agency (SEPA).
- 1.1.6 Monitoring against the agreed management objectives is essential for evaluating effective habitat creation and species mitigation, as well as identifying the need to undertake adaptive management. On this basis, the agreed HMP will function as a live document where success criteria and management prescriptions may be subject to revision based on monitoring findings.

1.2 Guidance and Data Sources

- 1.2.1 Guidance documents and relevant design and management related documents applied in the development of this Mitigation Plan comprise:
- Crofts A & Jefferson RG. 1999. *The Lowland Grassland Management Handbook*, 2nd Edition. English Nature/The Wildlife Trusts

- Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA & Gregory RD. 2015. Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds* **108**, 708–746.
- Robson B & Allcorn R I. 2006. Rush cutting to create nesting patches for lapwings *Vanellus vanellus* and other waders, Lower Lough Erne RSPB reserve, County Fermanagh, Northern Ireland. *Conservation Evidence* **3**, 81-83
- RSPB. 2005. Wetland Grassland Practical Manual: Breeding Birds
- RSPB, 2010. Vane Farm, Kinross Stage 3: Advanced Design of Wetland Restoration Proposals
- RSPB. Insh Marshes Management Plan 2010/11-2015/16
- RSPB, 2016. Insh Marshes National Nature Reserve: River Restoration Feasibility Study
- Smart M & Coutts K. 2004. Footdrain management to enhance habitat breeding waders on lowland wet grassland at Buckenham and Cantley Marshes, Mid-Yare RSPB Reserve, Norfolk, England. *Conservation Evidence* **1**, 16-19.

1.2.2 Several baseline surveys were undertaken to inform this Mitigation Plan, the results of which can be found in **Annex 6.2.1**; initial feasibility studies and a detailed hydrological options appraisal have also been considered.

1.2.3 Ground investigations and ground water monitoring are ongoing at the Site. Further development of the detailed design of mitigation measures will be possible as further data is received.

1.3 Scope

1.3.1 This Mitigation Plan relates to the Dellmore Site only. The scope of mitigation across the entire Project 9 area is addressed within individual topic chapters and collated into a mitigation schedule for the Project which is detailed in **Chapter 21 (Volume 1)**; mitigation is described more generally in **section 6.2 of Chapter 6 (Volume 1)**.

1.3.2 The Dellmore Site has been identified as appropriate to accommodate ecological mitigation in relation to breeding wader populations and their associated habitats, that are likely to be impacted at the Insh Marshes NNR surrounding the River Spey crossing, primarily within the Ruthven compartment.

1.3.3 The Dellmore Site has also been identified to have capacity to:

- Improve the existing features of Dellmore (grassland, marsh, pools and ditches, ancient woodland, water vole population, bird population)
- Formalise community and visitor use of the Site through access improvements

1.3.4 The scope of the Mitigation Plan is to detail the measures for provision of the above mitigation and to set out principles of management for the Dellmore Site.

2 Dellmore Site Description

- 2.1.1 The Scottish Government owned Dellmore Site is approximately 52 ha and located to the west of Kingussie and the Spey Crossing, as shown on **Drawing 6.2.1** in **Volume 3. Annex 6.2.1** and **Drawings 6.2.2** to **6.2.23**, detail the hydrological, geomorphological, ecological, geological, historical and current use baselines for the Dellmore Site, drawing on a number of data sources and walkover surveys; these are summarised below.
- 2.1.2 The Dellmore Site is located on a section of the alluvium-covered River Spey floodplain on the left bank of the River Spey. The Site is divided by two main southwest to northeast drains and a number of minor channels. An agricultural flood embankment containing several breaches is present along the river bank on the left-hand bank of the River Spey, and the Pitmain Burn flows along the eastern boundary of the Site. Hydraulic modelling of the River Spey has been undertaken and its output shows that frequency of flooding of the Dellmore Site is similar to that of the Ruthven North and South compartments, with the entire Dellmore Site predicted to flood in the 200-year event. Further analysis of the flood modelling data suggests that low-lying parts of the site would typically be subject to flooding from the Spey several times annually.
- 2.1.3 The majority of the Dellmore Site is unmanaged grassland with a dense tussocky sward. An area of Ancient Woodland is present in the south, and parts of the Dellmore Site support trees (mostly alder) and some scrub, particularly along the ditches.
- 2.1.4 A national vegetation classification survey (NVC) has been undertaken for the Dellmore Site and shows that the northern and eastern parts of the Site support marshy grassland and swamp. The south of the Site towards the River Spey is more uniformly dry, semi-improved in nature and of a neutral grassland type. Watercourses within the Site support abundant submerged and emergent vegetation. The dominant NVC community across the Dellmore Site is MG1 *Arrhenatherum elatius* grassland (MG1a *Festuca rubra* and MG1c *Filipendula ulmaria* sub-communities). There are also large areas of MG9 *Holcus lanatus* – *Deschampsia cespitosa* grassland, MG9b *Arrhenatherum elatius* sub-community. Other NVC types are more restricted in distribution and include MG10a *Holcus lanatus* – *Juncus effusus* rush-pasture typical sub-community, M23 *Juncus effusus/acuteiflorus* – *Galium palustre* rush pasture, M27 *Filipendula ulmaria* – *Angelica sylvestris* tall-herb fen, W3 *Salix pentandra* – *Carex rostrata* woodland, W7 *Alnus glutinosa* – *Fraxinus excelsior* – *Lysimachia nemorum* woodland, S9 *Carex rostrata* swamp, OV24 *Urtica dioica* – *Galium aparine* community, and OV27 *Chamerion angustifolium* open vegetation community. The higher value, wetter habitats are largely confined to the eastern boundary adjacent to Ruthven Road, the Dellmore Site peripheries, particularly adjacent to the River Spey to the south, and the Site’s burns and ditches to the north.
- 2.1.5 Findings of an assessment of Ground Water Dependent Terrestrial Ecosystems (GWDTEs) within the Dellmore Site confirm that there are no highly dependent ecosystems present within the Site.
- 2.1.6 Wintering bird surveys recorded 38 bird species within, adjacent to or flying over the Dellmore Site. While modest numbers of snipe *Gallinago gallinago*, mallard *Anas platyrhynchos* and woodcock *Scolopax rusticola*, were reported within the Site boundary, most notable wintering species comprising waders and wildfowl such as lapwing *Vanellus vanellus* and oystercatcher *Haemotopus australis*, were reported in land outside the Site boundary, often associated with the River Spey. A single, large group of curlew *Numenius arquata* were reported within the Site on a single occasion in March and were likely to be part of a migratory event during spring. Greylag goose *Anser anser* were routinely reported overflying the Site and utilising habitats

west of Dellmore. Passerines were mainly restricted to the woodland at the east of the Site and along the River Spey, with only wren *Troglodytes troglodytes* and reed bunting *Emberiza schoeniclus* typically observed in grassland areas. Corvids (potential predators of chicks of ground nesting birds) were almost exclusively comprised of jackdaw *Corvus monedula*, though raven *Corvus corax* were reported moving through the Site in groups of up to five.

- 2.1.7 Breeding bird surveys showed that of wader's present, snipe were considered to be breeding within the Site boundary and curlew are also considered possibly breeding there. Oystercatcher and lapwing were present and confirmed breeding outside the Site boundary in adjacent fields. Wildfowl – teal *Anas crecca*, mallard *Anas platyrhynchos* and goldeneye *Bucephala clangula* – were also breeding within the Dellmore Site and nest sites are associated with the watercourses. In addition to waders and wildfowl, 29 further bird species were recorded breeding or possibly breeding on the Dellmore Site, of which seven are red list Birds of Conservation Concern (BoCC) (Eaton *et al.*, 2015).
- 2.1.8 A number of mature trees within the Site have bat roost potential and a minor roost was located at 1.5 m height in a decaying alder at Ordnance Survey grid reference NN75079946. Evidence of otter *Lutra lutra*, brown hare *Lepus europaeus* and roe deer *Capreolus capreolus* has been confirmed on the Dellmore Site and possible evidence found of badger *Meles meles*, pine marten *Martes martes* and American mink *Neovison vison*. A small population of water vole *Arvicola amphibius* were identified on the Pitmain Burn and possibly on the Caochan a'Mhanaich (burrows but no corroborating evidence).
- 2.1.9 As detailed in **Section 6.3 of Annex 6.2.1**, the combined desk-based assessment and walkover survey identified that a rifle range and associated earthworks are the only visible sites of archaeological or cultural heritage interest within the Site.
- 2.1.10 The remains of the rifle range comprise a large, oblong target mound at the southwest end of the Site which is now covered by a large amount of modern detritus, including rusting iron girders, corrugated sheeting and broken-up reinforced concrete. The series of four shooting butts at 90 m intervals to the northeast, previously low mounds between 7 m and 8 m in length and from 2 m to 2.5 m in breadth, are obscured by vegetation cover, though it is also possible that these features are no longer present.
- 2.1.11 The Dellmore Site is currently used by the local community for walking and dog walking, with regular pony trekking taking place during the summer months. There is evidence of some angling on the River Spey, however the extent of this permitted activity is unknown.

3 Impacts to be Mitigated

3.1 Introduction

3.1.1 The potential impacts identified in **Chapter 12**, to be mitigated for within the Dellmore Site are:

- Temporary direct habitat loss within the Insh Marshes NNR Ruthven compartment (Proposed Scheme footprint)
- Permanent direct habitat loss within the Insh Marshes NNR Ruthven compartment (Proposed Scheme footprint)
- Construction disturbance/ displacement of breeding waders within the NNR Ruthven compartment (noise, vibration, presence of people, visual)
- Operational disturbance/ displacement of breeding waders within the Insh Marshes NNR east of the A9 River Spey crossing (noise, avoidance of Proposed Scheme embankment)

3.1.2 Mitigation requirements associated with the Dellmore Site are focussed on breeding wader species, as they are associated with open grassland habitat types which are subject to direct habitat loss as a result of the Proposed Scheme and are more vulnerable to disturbance than other receptors such as breeding wildfowl. Grant *et al.* (2000) reports visible disturbance of breeding curlew on human approach at 100 to 200 m; similarly, Pearce-Higgins *et al.* (2007) report disturbance of ground nesting wading birds at distances of up to 200 m.

3.1.3 Other species present within the Ruthven compartment, notably a range of wildfowl including goldeneye, mallard, teal, greylag goose, are considered less vulnerable to disturbance due to breeding distribution and likely lower levels of reaction. For example, disturbance affecting Goldeneye as a result of human approach, which leads to flushing from nest sites, is unlikely to occur as a result of the presence of people at ranges as close as 10 m (Ruddock and Whitfield 2007). Similarly, Ringelman *et al.* (2013) report flushing typically at <5 m distances on approach from humans, for a range of dabbling ducks, including teal and American wigeon.

3.1.4 While the mitigation within the Site will be tailored toward breeding waders, the habitats will not exclude use by breeding wildfowl and any increase in the extent of open water is likely to benefit wildfowl while breeding. Similarly, vegetation management targeted for breeding waders is likely to increase suitability of habitats at Dellmore for wildfowl during winter periods.

3.1.5 The SSSI and Strathspey breeding waders that co-exist within the Ruthven compartment, and that are considered likely to be impacted by the Proposed Scheme, are:

- Lapwing
- Redshank
- Curlew
- Snipe
- Oystercatcher

3.1.6 Habitats that currently support these species are:

- semi-improved neutral grassland

- marsh/ marshy grassland
- ponds
- rush pasture
- Ballochbuie Island (semi-improved grassland that does not flood).

3.2 Habitat Loss

3.2.1 Direct habitat loss as a result of the Proposed Scheme will result in the permanent loss of 3.73 ha of the Insh Marshes NNR, the majority of which occurs as a result of the Scheme crossing the River Spey and floodplain through Insh Marshes. Temporary habitat loss will occur over 2.76 ha.

3.2.2 Estimates of the number of wader pairs likely to be affected by both permanent and temporary habitat loss in the Ruthven compartment (based on a review of breeding registrations) are presented in **Table 3-1** below.

Table 3-1: Estimate of breeding wader numbers affected by habitat loss in the Ruthven compartment

Species	Number of breeding pairs within temporary habitat loss	Number of breeding pairs within permanent habitat loss
Lapwing	0	5
Redshank	1	2
Curlew	0	1
Snipe	0	1
Oystercatcher	1	2

3.3 Construction disturbance/ displacement

3.3.1 It is assumed that birds within close proximity to construction activities associated with the Spey crossing will be displaced from the Ruthven compartment. The exact reaction of breeding birds to construction disturbance is likely to vary between species, however for the purposes of the impact assessment detailed in **Chapter 12**, the zone of influence of displacement is considered to be 100 m from the Proposed Scheme (temporary and permanent works areas) within the Ruthven compartment.

3.3.2 A detailed review of breeding registrations collected between 2015 to 2017 by RSPB has been undertaken to estimate the number of breeding pairs potentially displaced during construction works within the Ruthven compartment. The estimated number of breeding wader pairs potentially affected are:

- Lapwing – 7 pairs
- Redshank – 3 pairs
- Curlew – 3 pairs
- Snipe – 3 pair
- Oystercatcher – 4 pairs

3.4 Operational disturbance/ displacement

3.4.1 An estimate of effects of operational disturbance has been developed taking into account a study by Reijnen (1996), who analysed the effect of traffic on the breeding density of grassland birds. Disturbance distances varied between the species studied and the paper presents the estimated reduction in breeding birds for roads with traffic movements of 5,000 vehicles per day and roads with 50,000 vehicles per day. From this study, an overview of the approximate reduction in density for species which are present within the Insh Marshes NNR is set out in **Table 3-2**; data for a third breeding wader species (black-tailed godwit) is also applied for reference.

Table 3-2: Overview of effects of roads on breeding wader density presented by Reijnen et al (1996)

Vehicle movements/ day	Lapwing		Oystercatcher		Black-tailed Godwit	
	100m	500m	100m	500m	100m	500m
5,000	<40%	<10%	~55%	~44%	~55%	22%
50,000	>50%	<35-40%	~57%	~50%	65-70%	44%

3.4.2 The predicted traffic flows for the Proposed Scheme on the opening year are 12,774 vehicles per day, increasing to 13,275 by 2041. For the purposes of the impact assessment detailed **Chapter 12**, a 50% reduction in breeding density is predicted within 100 m and a further 10% reduction applied up to 500 m; this predicted reduction factors in the existing exposure of breeding birds to operational road noise where the existing A9 crosses the Insh Marshes.

3.4.3 Studies of operational effects on breeding birds typically focus on displacement as a result of road noise, however, in the context of the Proposed Scheme, road noise is likely to produce a displacement effect alongside displacement as a result of the embankment and bridge structure.

3.4.4 The extent of both effects are likely to vary to some degree between species and the estimates below are undertaken on a precautionary basis. Figures below have been estimated after consideration of reduction in breeding pairs within the Proposed Scheme footprint. An overview of the potential effects of operational disturbance/ displacement is summarised in **Table 3-3**. As the impact of operational noise is considered up to 500 m east of the existing A9, this overview considers waders within the Ruthven, Pitmain and Gordonhall compartment.

Table 3-3: Predicted effects of operational disturbance east of the A9 River Spey crossing

Species	A	B	C	D	Total number of breeding pairs potentially affected (B + D)
	Breeding pairs utilising habitats within 100 m of Proposed Scheme	50% reduction in breeding within 100 m (A x 0.5)	Breeding pairs utilising habitats within 500 m of Proposed Scheme	10% reduction in breeding within 500 m (C x 0.1)	
Lapwing	7	3.5	12	1.2	4.7
Redshank	3	1.5	13	1.3	2.8
Curlew	3	1	5	0.5	1.5
Snipe	3	1.5	15	1.5	3
Oystercatcher	4	2	15	1.5	3.5

3.5 Overview of Breeding Wader Mitigation Requirements

3.5.1 As can be seen in **Table 3-4**, the extent of displacement during operation is similar to, or in some cases less than, predicted temporary construction effects. It is therefore expected that applying the number of breeding pairs potentially affected during construction (**paragraph 3.3.2**) to calculate the requirements for habitat provision within the Dellmore Site, will also provide sufficient alternative habitat for birds displaced as a result of the Proposed Scheme during operation.

Table 3-4: Overview of effects on breeding waders

Species	Number of breeding pairs within temporary habitat loss	Number of breeding pairs within permanent habitat loss	Number of breeding pairs potentially affected by displacement during construction	Number of breeding pairs potentially affected by operational effects
Lapwing	0	5	7	4.7
Redshank	1	2	3	2.8
Curlew	0	1	3	1.5
Snipe	0	1	3	3
Oystercatcher	1	2	4	3.5

3.5.2 **Table 3-5** shows how estimates of breeding habitat required at Dellmore of Kingussie have been derived.

3.5.3 Although not all the habitats within the Ruthven compartment are currently used by, or suitable for, breeding wader species, the whole compartment is used in order to calculate breeding wader density. The Ruthven compartment is approximately 36 ha; this is made up of Ruthven North at approximately 11 ha, and Ruthven South (including Ballochbuie Island) totalling around 25 ha.

Table 3-5: Overview of breeding wader mitigation requirements

	A	B	C	D	E	F	
Species	Total number of breeding pairs within Ruthven	Current breeding density Ruthven (A/ 36 ha)	Number of breeding pairs within temporary habitat loss	Number of breeding pairs within permanent habitat loss	Number of breeding pairs potentially affected by construction displacement	Total number of breeding pairs affected by dualling (C + D + E)	Mitigation habitat requirement (ha) (F/ B)
Lapwing	19	0.53	0	5	7	12	22.6
Redshank	11	0.31	1	2	3	6	19.4
Curlew	4	0.11	0	1	3	4	36.4
Snipe	14	0.28	0	1	3	4	14.3
Oystercatcher	17	0.47	1	2	4	7	14.9

3.5.4 **Table 3-5** illustrates that lapwing are predicted to be affected in greatest number as a result of the Proposed Scheme within the Ruthven compartment. The Ruthven compartment supports approximately one third of the NNR population of lapwing, and impacts are likely to affect the highest proportion (21%) of this species. Curlew, snipe and redshank are all more widespread within the wider Insh Marshes NNR and proportions of the NNR population potentially displaced during construction are 4%, 2.3%, and 5.8% respectively. Oystercatcher, similar to lapwing, are

well represented in Ruthven and displacement during construction could affect up to 19% of the NNR population.

- 3.5.5 Based on the figures above, a minimum requirement of 36.4 ha of breeding wader habitat is required to offset temporary and permanent impacts.
- 3.5.6 The area of mitigation habitat required for curlew identified in **Table 3-5** is notably higher than for other species, based on the breeding density for the species calculated as it is, using the total area of the Ruthven compartment. However, curlew are widespread within the wider Insh Marshes NNR and are known to breed at higher densities within other areas. For example, breeding densities are estimated to be 0.2/ha in Gordonhall, and up to 0.3/ha in Balavil North.
- 3.5.7 Providing an area of breeding wader habitat of 36 ha, as set out above, will deliver a significant uplift in habitat availability for all species, other than curlew, as calculated using densities present within Ruthven compartment.

4 Mitigation Design

4.1 Design Vision and Philosophy

- 4.1.1 The guiding vision for the design within the Dellmore Site is to create wet grassland and marshy grassland habitat with seasonal shallow surface water pools. The habitat will be actively managed by cattle grazing at a range of intensities across grazing units, resulting in a range of habitats suitable for different bird species and plant communities. The water regime will be managed to provide slow and controlled drawdown of pooled surface water through the wader breeding season, revealing soft ground from March to July for chicks to feed on by probing into the mud. This management will create an optimised extent of habitat which will support breeding waders associated with the River Spey – Insh Marshes SSSI breeding bird assemblage and the Strathspey breeding wader assemblage to mitigate impacts on these ornithological features surrounding the A9 River Spey crossing. This design vision is based on ‘RSPB Wetland Grassland Practical Manual: Breeding Birds’ guidance (2005).
- 4.1.2 The philosophy of the design vision is that the Dellmore Site is already analogous in many physical attributes to the Ruthven compartments and only differs in existing species assemblage due to a current lack of vegetation management and control of water regime. Therefore, with a suitable water supply, management of water regime in relation to existing and manipulated Site topography and vegetation management, the Site can mitigate impacts within the NNR Ruthven compartments identified within the EclA.
- 4.1.3 Further, the vision for the mitigation to be undertaken at the Dellmore Site is considered compatible with the existing habitats and species present, and offers an opportunity to enhance the Dellmore Site without compromising the current value of existing features.
- 4.1.4 Several other sources of information were taken into consideration when developing mitigation plans. The mitigation proposed for the Dellmore Site could help realise RSPB Scotland’s Vision and Management Objectives set out in the ‘Insh Marshes Management Plan’. The Vision states that “Insh Marshes is an integral part of a strategic approach to breeding waders in Badenoch and Strathspey, and key to our vision is to create a network of inter-related sites along the floodplain of the River Spey, including demonstration sites for wildlife friendly farming, semi-natural and newly created wetlands all supporting the nationally important population of breeding waders. This landscape work will involve expanding the existing Insh marshes landholding through a network of owned and managed wetland sites that target breeding waders and help halt and grow the wader population in Strathspey” (RSPB, 2010, pp. 55).
- 4.1.5 The Dellmore Site falls within the Cairngorms National Park Authority (CNPA) and their Partnership Plan 2017-2022 (2017) aligns with what Dellmore can achieve. The Plan states that it “will help deliver our national ambitions for land use, biodiversity, rural development and tourism. It will also help the communities in and around the Cairngorms make the most of the available opportunities”. The plan reinforces CNPA’s key aim of working “with partners, business, land owners and communities to develop long term plans for the Park, in order to achieve our collective aims” (CNPA, 2015).
- 4.1.6 Finally, Scottish Natural Heritage’s Strategy and Priorities (2012), sets out how SNH fulfil their purpose, including by advising “how best to meet Scotland’s international obligations as well as legal requirements to protect and enhance Scotland’s nature and landscapes”, by “surveillance

and monitoring, sharing good practice, championing the value of nature and encouraging people to enjoy the outdoors” and “targeting action to protect and enhance nature and landscapes, working in partnership with others” (SNH, 2012, pp.3). The Dellmore Site has the potential to realise these qualities and they have been taken into account when preparing this Mitigation Plan.

4.2 Target Habitat Specification

- 4.2.1 The soils and hydrology of the Dellmore Site are analogous to those of the NNR Ruthven compartment, with similar geomorphological development, alluvial soils and a similar fluvial flooding regime.
- 4.2.2 The existing differences in habitats between the Ruthven compartment and the Dellmore Site are attributable to vegetation and water level management. The Dellmore Site does not have any internal water level control infrastructure and has not undergone any vegetation management for some considerable time. The Ruthven compartment is subject to regular management (targeted at breeding waders) through cutting and grazing predominantly by highland ponies.
- 4.2.3 The target species and their numbers for the Dellmore Site require the following general conditions associated with high water levels in ditches for successful breeding (Crofts & Jefferson, 1999):
- soft, damp soil with higher invertebrate densities
 - a number of shallow surface flashes or ‘pools’
 - low intensity grazing and late cutting operations, i.e. post 1st July
- 4.2.4 The general annual water level management regime required for waders is noted in **Table 4-1**.

Table 4-1: Water Level Management Regime for Waders (adapted from Crofts & Jefferson, 1999)

Season	Water Level Management	Target Conditions for Waders
Spring	Ditch water dropped to field-surface level, retaining scattered shallow pools in lower parts of fields. Flooded areas may be retained.	Damp, soft ground and the margins of shallow pools have higher invertebrate densities and are easier to probe. The margins of floods and gently shelving ditch edges are especially important on clay sites which dry rapidly when surface water is removed.
Summer	Ditch water levels and any shallow pools kept wet for as long as practicable. Wet areas allowed to progressively dry into July and then grazed at low intensity or cut as late as possible.	As above.
Autumn	Any remaining inundated areas are allowed to partly dry. Later in the autumn, ditch water levels reinstated to field surface level.	Topping/cutting management to create an appropriate sward structure for waders can be undertaken after the breeding season while the site is most accessible. The muddy remains of previously flooded areas are attractive to passage waders.
Winter	Ditches allowed to overtop and flood lowest lying fields. A mosaic of floods and grass is ideal. Water at a range of depths to 30 cm.	Winter floods providing feeding and roosting areas.

- 4.2.5 Lapwing are the most numerous species to be affected both around the A9 River Spey crossing. As such, mitigation within the Site will principally target conditions suitable for lapwing.
- 4.2.6 Redshank are also present in significant numbers around the River Spey crossing. Specific habitat requirements for lapwing and redshank are compatible and are summarised in **Table 4-2**.

Table 4-2: Habitat requirements for Lapwing and Redshank (adapted from RSPB, 2005)

Season	Water Level Management	Vegetation Management
Spring (March to late June)	Keep water level to within 30 cm of the surface to create shallow pools in natural hollows in the ground surface. Maintain 'brimming' pools of water for feeding chicks, especially Redshank.	Maintain a short sward (less than 5 cm). Maintain scattered tussocks across the field up to 15 cm in height.
Summer (from late June)	Allow water levels to draw down to allow agricultural operations to take place, e.g. hay cutting.	Maintain a short sward (5- 10 cm). Maintain scattered tussocks across the field up to 15 cm in height.
Autumn/ winter	Keep water level at field surface level to create extensive shallow pools in natural hollows in the ground surface.	Graze sward (where possible) and undertake rush management if required, to ensure that optimal sward heights (which vary depending on bird species) by the start of the following year's grazing season. *On rush dominated uneven/sloping sites, strimming patches of rushes in midwinter has been found to benefit breeding success of both lapwing and redshank at sites in Northern Ireland (Robson & Allcorn, 2006).

- 4.2.7 Snipe are also relatively numerous within the Ruthven compartment, along with lapwing and redshank. However, they are considered possibly less vulnerable to the effects of the Proposed Scheme based on their numbers and distribution throughout the wider Insh Marshes complex.
- 4.2.8 Habitat requirements for snipe and curlew are compatible, however they require differing vegetation management through the year compared to lapwing and redshank. Specific habitat requirements for snipe and curlew are summarised in **Table 4-3**.

Table 4-3: Habitat requirements for Snipe and Curlew (adapted from RSPB, 2005)

Season	Water Level Management	Vegetation Management
Spring (March to late June)	Keep water level near field surface level to create shallow pools in natural hollows in the ground surface. Maintain pools of water for feeding chicks, especially for snipe.	Maintain a medium/long sward (15-30 cm) interspersed by shorter areas of sward (5 cm).
Summer (from late June)	Allow water levels to draw down to allow agricultural operations to take place, e.g. hay cutting.	Maintain a medium/long sward (15-30 cm) interspersed by shorter areas of sward (5 cm).
Autumn/ winter	Keep water level at field surface level to create extensive shallow pools in natural hollows in the ground surface.	Graze sward (where possible) and undertake rush management if required, to ensure that optimal sward heights (which vary depending on bird species) by the start of the following year's grazing season.

- 4.2.9 Both snipe and curlew currently breed at the Dellmore Site in low numbers and any changes in management will seek to retain the existing breeding population on the Site.
- 4.2.10 The differences in management between these two groups of birds relates to vegetation management operations, therefore inclusion of areas for snipe and curlew can potentially be accommodated by varying vegetation management locally within the Dellmore Site. All four wader species (in addition to oystercatcher) co-exist in habitats within the Ruthven compartment, therefore, provided habitats are managed appropriately, they will also co-exist at the Dellmore Site.
- 4.2.11 Katzenberger (2014) presents empirical data illustrating that breeding wader species show a negative reaction to the presence of both trees and man-made structures. They also reported an increased probability of wader use of habitats >100 m from trees. Similar reactions are reported by Katzenberger (2014) for boundary features such as hedgerows.

- 4.2.12 Some avoidance may be expected within 100 m of the Highland Main Line railway at the northern extent of the Site, where infrastructure is located on embankment. Similarly, the boundary fence and trees to the western edge of the Site, and the SSE overhead power lines and associated poles, are considered likely to be sources of predation risk and unfavourable within breeding wader habitat. However, RSPB breeding wader data shows relevant wader species are able to utilise habitats within 100 m of such features within both Ruthven North and Ruthven South compartments to some extent.

4.3 Design Elements

- 4.3.1 **Tables 4-4 to Table 4-8** detail the proposed mitigation element for the Dellmore Site. Each table describes the sub-elements required, providing a description, reasoning and considerations which should be taken into account at the detailed design stage.
- 4.3.2 Together, the mitigation proposed will provide replacement habitat features and an attractive and suitable alternative habitat for breeding waders impacted by the Proposed Scheme.
- 4.3.3 The measures also seek to enhance the existing features of the Dellmore Site for wildlife and members of the public by improving riparian habitats and the condition of ancient woodland present, and improving visitor experience with measures to promote accessibility and understanding of the Dellmore Site.

Table 4-4: Proposed design elements for grassland habitat

Grassland habitat			
Sub-element	Description	Reasoning	Considerations
Grassland preparation	<p>Initial clearance of rank grass cover. Machine cutting (mowing/ flailing) and raking, followed by cattle grazing.</p> <p>Necessary to meet habitat requirements.</p> <p>Quickest and most effective method of preparing the Site within the timescale (i.e. two seasons prior to constructing the Proposed Scheme).</p>	<p>Cutting results in initial reduction in sward height and control of rushes.</p> <p>Raking and removal of arisings will also remove accumulated plant litter to benefit wader feeding and propagation of more diverse plant species.</p> <p>Grazing will create structural diversity (tussocks for waders to nest among, habitat for invertebrate prey), dung (to increase invertebrate prey) and poaching (plant propagation opportunities, bare ground for wader feeding) following light trampling.</p>	<p>Requires hay cutting contractor.</p> <p>Requires machinery access to the Site.</p> <p>Requires machinery access across the Site.</p> <p>Requires contracted grazier.</p> <p>Requires stock fencing and loading pens.</p> <p>Requires access to remove stock/refuges for flood events.</p> <p>Requires animal welfare infrastructure (watering, feeding location).</p>
On-going grassland management	<p>Combination of cattle grazing and machine cutting (mowing/ flailing) and raking.</p> <p>Most effective method of vegetation management to meet objectives as demonstrated within Insh Marshes NNR (RSPB. Insh Marshes Management Plan 2010/11-2015/16).</p>	<p>Cutting/ topping will manage sward height and species composition where required.</p> <p>Grazing will create structural diversity (tussocks for waders to nest among, habitat for invertebrate prey), dung (to increase invertebrate prey) and poaching (plant propagation opportunities, bare ground for wader feeding) following light trampling.</p> <p>Some low-density grazing is compatible with ground nesting birds in breeding season to keep sward height in check.</p> <p>Some low-density grazing may be compatible with wet ground conditions to keep sward height in check.</p>	<p>Requires hay cutting contractor.</p> <p>Requires contracted grazier.</p> <p>Requires stock fencing and loading pens.</p> <p>Requires access to remove stock/refuges for flood events.</p> <p>Requires animal welfare infrastructure (watering, feeding location).</p>

Table 4-5: Proposed design elements for wetland habitat creation

Wetland habitat creation			
Sub-element	Description	Reasoning	Considerations
Drain management	Clearance/ management of emergent vegetation in existing drains. Ditch reprofiling/ water vole habitat improvement.	Increases area of open water to attract target bird species. Improves potential for water level control and water storage capacity. Rotational management will provide a range of ditch habitats for birds, invertebrates, mammals such as water vole, and plant species.	May impact water levels and therefore water regime in adjacent land parcels. CAR consent may be required. Disposal of arisings. An ongoing programme of ditching work (likely to be every 5 to 10 years) would be required as part of the Site management.
Pond/ scrape excavation	To excavate a range of permanent ponds, open water with seasonal drawdown and splash/ marsh areas – the latter two habitats achieved by maintaining ground water to within 30 cm of the surface on permeable soils or brimming, drawing down to shallow splashes from March/ April through to July. Modelling indicates that the Dellmore Site can achieve an area equivalent to that lost to the Proposed Scheme, with approximately 4,000m of water edge of shallow pools (during maximum water levels in spring) where located through topographic analysis. See Drawing 6.2.24 for details of scrape locations, areas and perimeter lengths.	Increases habitat diversity on the Site. Provides wet surface conditions on less permeable soils. Increases visual attraction of the Site to migratory bird species. Increases area of potential nesting and feeding areas for waders. Significant benefits for bird species with minimal excavation. Creating shallow sloped footdrains can increase the potential feeding areas for breeding waders and chicks with minimal arisings and the benefit of avoiding extensive flooding which can be to the detriment of invertebrate prey (Smart & Coutts, 2004).	Disturbance/ impacts of excavation (including those associated with rifle range e.g. cultural heritage/ contaminated land). Ground conditions for excavation machinery. Access for machinery into and across the Site. Disposal of arisings. Compatibility with vegetation management/ stock grazing.
Water supply from Site drain catchments	Utilisation of existing flows within Site drains to wet-up soils within the Site. Surface water within the Site would be retained through installation of sluices/ stop logs. Flow assessment of 1 in 200-year flows and mean flows for Drain A and B demonstrate there is sufficient supply to create the target hydrological regime. See Drawing 6.2.25 for details of sluice locations and resulting mean flow scenarios.	Allows control of water levels within the Site making it feasible to achieve the target hydrological regime with minimal engineering works.	As part of the detailed design phase, undertake a comprehensive analysis of potential evapotranspiration and Infiltration to confirm sufficient water supply. This should inform a Water Management Plan, which should be cognisant of other potential Management Plans. A CAR licence would be required. Requires active management to manage water levels through the installation of sluices/ stop logs. An ongoing programme of ditching work (likely to be every 5 to 10 years) would be required as part of the Site management.

Wetland habitat creation			
Sub-element	Description	Reasoning	Considerations
Water supply from groundwater	<p>Groundwater within the Site would be retained through installation of sluices/ impoundments.</p> <p>Utilise surface scrapes to bring the surface ground level within 30cm of the water table.</p> <p>Groundwater levels at DL-BH1 and DL-BH5 indicate that water levels are at/ near the desired target depth of 0 – 30 cm bgl.</p> <p>Further monitoring is required to assess groundwater conditions during April – July before groundwater supply can be considered a feasible supply option.</p> <p>See Drawing 6.2.25 for details of sluice locations and resulting mean flow scenarios.</p>	<p>Potentially stable source of water with no impact on watercourses.</p> <p>If groundwater supply is suitable, surface scrapes and ponds can be isolated from the drainage network.</p> <p>It is considered that this option would not require a CAR authorisation.</p>	<p>Continued borehole monitoring is required to better understand the groundwater conditions and inform the detailed design phase.</p> <p>The data collated over the coming months may not necessarily be indicative of the typical annual conditions.</p> <p>Without engineered control measures, the target hydrological regime cannot be achieved.</p> <p>Scrape locations should be scrutinised and optimised take advantage of higher groundwater levels if these are shown by future borehole data and take account of topographical wetness index during detailed design phase, which should inform a Water Management Plan, that should be which be cognisant of other potential Management Plans.</p>
Water Management through internal flow control structures	<p>Small sluices on Site drains.</p> <p>Target is for water levels to stay within 30 cm of the field surfaces from March/ April thought to July.</p> <p>Initial design levels are proposed as 222.7 m AOD. This will be optimised at the detailed design stage.</p> <p>See Drawing 6.2.25 for details of sluice locations and resulting mean flow scenarios.</p>	<p>Control of internal water levels.</p>	<p>CAR consent required.</p> <p>Requires management and maintenance.</p> <p>May impact water regime/ flood risk in adjacent land.</p> <p>May require associated small bunds to be effective.</p> <p>May increase sedimentation in drains.</p> <p>Alteration of within Site water flows.</p> <p>The Construction (Design and Management) Regulations.</p> <p>Sluice structure, construction and materials should be designed in line with potential presence of cattle and ponies within the Site.</p>

Table 4-6: Proposed design elements for predator perch removal

Predator perch removal			
Sub-element	Description	Reasoning	Considerations
Trees	Removal of scattered trees across the Site (outside ancient woodland area and River Spey banks) and along internal watercourses and boundaries; see Drawing 6.2.26 for potential areas. Necessary part of Site preparation in order to meet habitat requirements.	Reduces risk of bird predation. Increases sightlines (attractiveness) for wildfowl and waders.	Reduced shelter and species diversity for passerine species and non-avian species. Change to landscape. Felling licence may be required. Access for machinery into and across the Site. Survey isolated trees for bat roost potential
Fences	Removal of internal fences. Not all fencing necessarily required to be removed.	Reduces risk of bird predation. Increases sightlines for birds.	Limited compatibility with grazing management. Access for machinery into and across the Site.
Overhead power lines	Liaison with SSE regarding potential undergrounding of existing sections of power lines within the Site. See Drawing 6.2.23 for details of power line locations.	Reduces risk of bird predation.	SSE plans and timescales. SSE maintenance and access requirements.

Table 4-7: Proposed design elements for woodland management

Woodland management			
Sub-element	Description	Reasoning	Considerations
Woodland planting	Planting to fill gaps along the banks of the River Spey and increase extent of woodland at the western extent and by the B970 to the east. See Drawing 6.2.26 for details of planting areas.	Enhances cover for otter, bats and tree-roosting birds. Additional screening of the Site from the B970. Future supply of large wood to initiate dynamic river habitats.	Visual constraints. Flood conveyance constraints. Potential conflicts with bird habitat due to reduction in sightlines. Appropriate amount planting along river bank which would not reduce visibility and views over the river over time.
Ancient woodland restoration	Managed use of conservation measures including succession planting, tree preservation measures, protection of soils and groundflora. See Drawing 6.2.26 for details of planting areas.	Opportunity to conserve and enhance existing ancient woodland.	-

Table 4-8: Proposed design elements for wetland habitat creation

Public use of the site			
Sub-element	Description	Reasoning	Considerations
Track/ path improvement	<p>The existing track and public access along the River and perimeter of the higher ground in the southern part of the Site to be retained and improved. The track to be continued in order to create a loop around the meander of the River Spey.</p> <p>Low-level, dense scrub should be planted along the edge of any tracks; fencing will be required in the short term.</p> <p>Screening and access management will also be required.</p> <p>See Drawing 6.2.26 for details of path improvements and screening locations.</p> <p>See Figures 4-1 and 4-2 and Photograph 4-1 for examples.</p>	<p>Creating a circular enhanced walk to enable continued use of the Site by the public, whilst reducing disturbance to all wildlife, including birds, using Site.</p> <p>Screening and access management required to prevent dog access to wetland areas and partly screen humans (below waist level) allowing vegetation, and the intended route of the track, to be established.</p>	<p>Track/ path to be floodproof and long-lasting.</p> <p>Path design to be in keeping with the informal river corridor.</p> <p>Option to use scrub for screening could take many years to establish and could act as a refuge for predators.</p> <p>Accessible to all, complying with Equalities Act 2010.</p>
Hides/ viewing areas	<p>Provision of sites with interpretation boards to view the Dellmore Site, including the wader habitat and the Monadhliath mountains to the north and the River Spey to the south.</p> <p>See Drawing 6.2.26 for details of potential viewing locations.</p>	<p>Opportunities to learn about species using the Site, and the surrounding River Spey and Monadhliath mountains, maximising the visitor experience.</p>	<p>Should structures be used, they should be flood proof.</p> <p>Consideration of other types of viewing areas using bushes or simple screens.</p>
Orientation area	<p>Visitor information at the entrance to the Site, possibly including links to smartphones.</p> <p>See Drawing 6.2.26 for details of potential orientation location and Figure 4-3 for an example.</p>	<p>Opportunities to learn about species using the Site, and the surrounding River Spey and Monadhliath mountains.</p>	<p>Site access agreement required.</p> <p>Structures to be flood proof.</p> <p>Panels, or possibly near field communication chips or tags which link to smartphones, could provide details on:</p> <ul style="list-style-type: none"> • breeding waders • importance of wetland sites and the species present within them • flora and fauna within the Site in general • the historic use of the Site • the area in general • local stakeholders such as RSPB, SNH and CNPA



Figure 4-1: Example of improved track or path with waist level scrub as screening



Photograph 4-1: Falls of Clyde walkway example



Figure 4-2: Example of improved track or path through riparian woodland



Figure 4-3: Example of orientation area at entrance to Dellmore

4.4 Considerations for Mitigation Design

Potential Contamination

- 4.4.1 As described in **Section 5.2 of Annex 6.2.1**, the results of the chemical testing available indicate that metal contaminant concentrations recorded in soil (lead) and soil leachate (antimony, copper, lead and nickel) around the former target mound have the theoretical potential to represent risks to human health (current and future Site users) and the water environment (groundwater and surface water) at the Site. However, this is based on an initial screening risk assessment using conservative published generic assessment criteria, which means the potential for these risks may be over-stated.
- 4.4.2 Additional detailed assessment of the results is ongoing at the time of writing, to further determine the actual risk levels. This is planned to be supplemented with further investigative works (hand excavation pits, shallow boreholes, groundwater and surface water chemical testing) and the development of a site-specific conceptual site model and risk assessment on the basis of these, to determine if remedial action is necessary.
- 4.4.3 Should actual risks be identified, this could be readily mitigated through remedial action – which, may involve excavation and removal, capping or treatment of the above ground former target mound material and associated spent bullets and bullet fragments, together with a portion of the impacted soil in the immediate vicinity, followed by verification testing and/ or monitoring. Other techniques such as soil washing, stabilisation, solidification and phytoremediation could also be considered, should a wider proportion of soil materials surrounding the mound require attention. The precise nature and extent of any works required, together with appropriate construction and working methods, will be informed by the ongoing assessment works and will be documented in a remediation strategy. This remediation strategy will be prepared and implemented as part of the mitigation designs for the Site, in consultation and agreement with The Highland Council, Scottish Environment Protection Agency and other stakeholders as necessary.
- 4.4.4 In the interim and as a precautionary measure while the additional assessment and investigation works are being completed, the former target mound area will be covered and secured by temporary fencing, to prevent current Site user access/ exposure in the area. Consultation with The Highland Council and Scottish Environment Protection Agency will also be initiated.

Cultural Heritage Assets

- 4.4.5 It is anticipated that there will be some degree of ground disturbance as a result of the mitigation plan for the Dellmore Site, both through removal or treatment of potentially contaminated land and through wetland habitat creation; this is likely to have an adverse effect on the preservation of the target mound and associated features.
- 4.4.6 It is therefore recommended that a detailed topographic survey of the rifle range target mound and the earthworks in its immediate environs (cultural heritage site ORCA 01 described in detail in **Section 6.3 of Annex 6.2.1**), should be undertaken by means of instrument survey. The purpose of this survey would be to fully map out and define the extent and form of the features in order to ensure their preservation in record and aid in their interpretation.
- 4.4.7 In addition to the instrument survey, it is recommended that a more detailed archival investigation of records associated with the use of the rifle range should be undertaken. This

would be in order to place the physical remains within their historic context on a national and local scale.

- 4.4.8 It is also recommended, where possible, to create an exclusion zone around the features associated with the target mound, potentially creating an island of preservation within the proposed mitigation plan. This would ensure the long-term preservation of the site, as well as providing a focal point for visitors to the Dellmore Site.
- 4.4.9 It is possible that the development of the habitat could potentially damage or destroy as-yet unknown cultural heritage assets present within the footprint of the development. However, despite the vegetation cover at the time of the walkover, it was possible to ascertain that there are no significant topographic indicators for any further sites of archaeological or cultural heritage interest; examination of the Lidar data for the area supports this assessment.
- 4.4.10 Due to the nature of flood plain formation, it is very unlikely that early prehistoric sites are likely to be preserved in-situ within the development area. The nature of the Site's vegetation cover and modern disturbance to the ground conditions by its use as a firing range mean the application of geophysical prospection techniques cannot be recommended in this instance.
- 4.4.11 Further archaeological investigation and mitigation shall be undertaken in consultation with The Highland Council planning archaeologist.

Habitats Regulations Appraisal (HRA) Screening

- 4.4.12 Although the mitigation design for the Dellmore Site will not directly overlap with any internationally designated sites for nature conservation, there are four within close proximity and are hydrologically connected; these are:
- River Spey - Insh Marshes Ramsar
 - River Spey - Insh Marshes Special Protection Area (SPA)
 - River Spey Special Area of Conservation (SAC)
 - Insh Marshes SAC
- 4.4.13 SACs are designated under Council Directive 92/43/EEC on the conservation of natural habitats of wild fauna and flora (hereafter referred to as the 'Habitats Directive'), and SPAs are designated under Council Directive 2009/47/EC (the 'Birds Directive'). SACs and SPAs collectively form a coherent ecological network known as Natura 2000.
- 4.4.14 Article 6(3) of the Habitats Directive states that:
- "...any project not directly connected with or necessary to the management of a Natura 2000 site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the Natura 2000 site in view of the Natura 2000 site's conservation objectives".
- 4.4.15 Article 6(3) states that the competent, national authorities shall agree to the plan or project only after having ascertained (in the Appropriate Assessment) that it will not adversely affect the integrity of the site, unless, as specified in Article 6(4), there are imperative reasons of over-riding public interest (IROPI).

4.4.16 HRA screening for the mitigation proposed at the Dellmore Site has been carried out and a summary of the findings are reported in **Table 4-9**. No Likely Significant Effect (LSE) is concluded for the qualifying features of Natura sites considered within the assessment.

Table 4-9: HRA Screening Summary

Site Name (Designation)	Qualifying Interest	Screening Conclusion	Justification for Screening Conclusion
River Spey (SAC)	Atlantic salmon (<i>Salmo salar</i>)	No LSE	<p>Proposed works will not require any in channel operations within the River Spey SAC. The Pitmain Burn and drainage channels within the Dellmore Site are outwith the River Spey SAC, however they are hydrologically connected to the SAC. These watercourses do not provide suitable habitat for Atlantic salmon, sea lamprey or FWPM, therefore no habitat loss/ alteration will occur.</p> <p>The proposed works will be undertaken in accordance with the relevant Oil Storage Regulations, Controlled Activities Regulations (CAR) and best practice (e.g. pollution prevention measures, spill kits, sediment control) therefore, no pollution to the water environment will occur.</p> <p>Evidence of otter activity was recorded within the Dellmore Site, however no otter resting places have been identified within the Site. Active otter (foraging and commuting) may be affected during works; however, disturbance will be localised and of limited duration, and alternative foraging and commuting habitat is widespread throughout the wider River Spey/ Insh Marshes floodplain.</p> <p>Implementation of works will be overseen by a suitably qualified Environmental or Ecological Clerk of Works (ECoW) in accordance with a management plan agreed in consultation with SNH and other key stakeholders.</p>
	Freshwater Pearl Mussel (<i>Margaritifera margaritifera</i>)		
	Sea lamprey (<i>Petromyzon marinus</i>)		
	Otter (<i>Lutra lutra</i>)		
Insh Marshes (SAC)	Transition Mires and quaking bogs	No LSE	<p>No transition mires and quaking bogs or oligotrophic to mesotrophic standing water have been recorded within the Dellmore Site, although these habitats are present downstream of the Site.</p> <p>SAC qualifying alluvial forest was identified within the Dellmore Site during 2017 NVC surveys. This woodland will not be affected by direct habitat loss, however there is potential for pollution to affect the habitat within/ downstream of the Site.</p> <p>The proposed works will be undertaken in accordance with the relevant Oil Storage Regulations, Controlled Activities Regulations (CAR) and best practice (e.g. pollution prevention measures, spill kits, sediment control) therefore, pollution will not affect downstream habitats.</p> <p>Evidence of otter activity was recorded within the Dellmore Site, however no otter resting places have been identified within the Site. Active otter (foraging and commuting) may be affected during works; however, disturbance will be localised and of limited duration, and alternative foraging and commuting habitat is widespread throughout the wider River Spey/ Insh Marshes floodplain.</p> <p>Implementation of works will be overseen by a suitably qualified Environmental or Ecological Clerk of Works (ECoW) in accordance with a management plan agreed in consultation with SNH and other key stakeholders.</p>
	Oligotrophic to mesotrophic standing water		
	Alluvial forests		
	Otter		
River Spey-Insh Marshes (SPA)	Osprey <i>Pandion haliaetus</i> , breeding	No LSE	<p>No visible evidence of SPA breeding or overwintering bird species was noted within the Dellmore Site during 2017 breeding bird and wintering bird surveys. Nevertheless, there is still potential for the loss of foraging habitat (outside of the SPA) or disturbance to SPA breeding/ overwintering bird species during the works.</p> <p>The proposed works will be undertaken in accordance with the relevant Oil Storage Regulations, Controlled Activities Regulations (CAR) and best practice (e.g. pollution prevention measures, spill kits, sediment control) therefore, no pollution to the water environment (osprey foraging habitat) will occur.</p> <p>Implementation of works will be overseen by a suitably qualified Environmental or Ecological Clerk of Works (ECoW) in accordance with a management plan agreed in consultation with SNH and other key stakeholders.</p>
	Osprey <i>Pandion haliaetus</i> , foraging		
	Wigeon <i>Anas penelope</i> , breeding		
	Wood sandpiper <i>Tringa glareola</i> , breeding		
	Spotted crake <i>Prozana porzana</i> , breeding		
	Hen harrier <i>Circus cyaneus</i> , non-breeding		

Site Name (Designation)	Qualifying Interest	Screening Conclusion	Justification for Screening Conclusion
	Whooper swan, non-breeding		Unless the site ECoW advises otherwise based on up to date information, proposed works will be undertaken outwith the breeding bird season (March to August inclusive) and will not be undertaken during hours of darkness between September to February inclusive. No likely significant increased risk – to whooper swan – of collision with overhead powerlines is predicted should any lines be retained.

4.5 Conclusion

- 4.5.1 The data and modelling available to date confirm that it will be possible to provide sufficient quality and extent of habitat on the Dellmore Site to mitigate for impacts on breeding waders within the Ruthven compartment impacted by the Proposed Scheme.
- 4.5.2 Higher ground that will not be wetted up along the southern part of the Dellmore Site provides opportunities for enhancing visitor experience without compromising mitigation functions of the central and northern parts of the Dellmore Site.
- 4.5.3 As shown in **Drawing 6.2.26**, the amount of breeding wader habitat created is approximately 36 ha. While some avoidance of boundary features outwith the control of the Scottish Government is possible, such as the Highland Main Line railway to the north and the boundary fence to the west of the Dellmore Site, current data for other areas within the NNR illustrate that where grazing is in place, both oystercatcher and lapwing breed in proximity to such features.
- 4.5.4 With the successful implementation of construction-stage mitigation and monitoring of habitat creation and species mitigation (followed by appropriate adaptive management), no significant adverse residual effects of the Proposed Scheme on breeding waders displaced from the Ruthven compartment are predicted in the long-term.

5 Next Steps

5.1 Indicative Delivery Programme

5.1.1 An indicative programme is presented in **Table 5-1** to illustrate a timeframe that could be applied to deliver both pre-construction and construction activities (indicated by green blocks). At this stage, this is for information only and provided for the key issues identified above.

5.1.2 It should be noted that although the timing of the works within the Dellmore Site are sensitive in that suitable breeding wader habitat cannot be created more than one bird breeding season ahead of the construction (i.e. to avoid an influx of target species from the wide Strathspey area), there may be scope to carry out advanced works on the areas for public use.

Table 5-1: Indicative delivery programme for the Dellmore Site

Dellmore Task	Project 9 Phase			
	EIA	Statutory Process	Detailed Design	Construction
Preliminary consultation				
Preliminary environmental studies				
Draft management plan/ objectives				
Engagement with potential graziers				
Incorporation of mitigation/ compensation identified through EIA/ HRA/ FRA/ CAR/ GI				
Finalise management plan/ objectives				
Acquire regulatory consents/ approvals				
Undertake pre-construction management works				
Prepare habitats within Dellmore Site				
Post-construction monitoring requirements will be determined				

5.2 Consultation

5.2.1 Preliminary consultation with the statutory environmental bodies CNPA, HES, SNH, SEPA and THC was sought through their review and comment of a preliminary feasibility study for the Dellmore Site. The study was also shared with RSPB and all feedback has been considered in preparing this Mitigation Plan. This early engagement with key stakeholders has enabled the development of a better understanding of any pre-existing concerns/ opportunities for the Dellmore Site.

5.2.2 Engagement with landowners will seek to develop a robust management strategy using, where possible, local knowledge and resource. **Table 5-2** below suggests the key stakeholders in which to commence consultation with and details significant topics which might be covered.

Table 5-2: Stakeholder consultation topics for Dellmore

Stakeholder	Consultation Topics
RSPB Scotland	<p>Ongoing consultation with RSPB Scotland has highlighted that they have extensive relevant experience of site management, local conditions and community interest; therefore, they may be well placed to understand demands associated with on-going management, in terms of:</p> <ul style="list-style-type: none"> • management techniques for ecological benefit • the requirements for a warden • community engagement <p>Engage with RSPB Scotland to better understand local management techniques and to inform the development of an outline habitat management plan that would maximise the potential for successful pre-A9 construction works mitigation.</p> <p>Maintain open communication with RSPB to determine appetite/ requirements for entering into a longer term site management agreement.</p>
Scottish Natural Heritage (SNH)	<p>Maintain open communication with SNH to determine appetite/ requirements for entering into a longer term site management agreement.</p>
Cairngorms National Park Authority (CNPA)	<p>This Site falls within the Cairngorms National Park and CNPA may wish to provide advice on the development of any management plan, to ensure general compliance with current policies outlined in the Cairngorms Nature Action Plan and Cairngorms National Park Local Development Plan.</p> <p>Maintain open communication with CNPA to determine appetite/ requirements for entering into a longer term site management agreement.</p>
Scottish Environment Protection Agency (SEPA)	<p>Discussions are required with SEPA to confirm the scope of any hydraulic/ morphological assessments required.</p> <p>There is an agricultural flood bund that is breached adjacent to the River Spey at the south west side of the Site. There is a potential medium to long term morphological change scenario issue associated with the breach, where the River Spey could begin to cut across the Site.</p> <p>The breached bund is not within the Site area purchased by the Scottish Government and may be more of a management rather than regulatory issue; however, discussion with SEPA would inform flood modelling requirement for scenarios showing the base case (with the existing breach) and alternative scenarios with the breach repaired, to determine SEPA's view on the arguments for and against altering the existing situation.</p> <p>The potential requirements for any CAR applications should also be discussed with SEPA, as well as potential requirements for Water Framework Directive/ River Basin Management Planning assessments and compliance.</p>
The Highland Council	<p>This Site falls within The Highland Council area, who may also wish to provide advice and support to management works, as identified in the Highland-wide Local Development Plan.</p>
Neighbouring landowners (e.g. Mr. Ormiston, Pitmain Estate)	<p>Meet with neighbouring landowners adjoining Dellmore to identify their short, medium and long-term management aspirations.</p> <p>Discussions may need to outline the Scottish Government's high-level management intentions for Dellmore, highlighting the EIA/ HRA processes (need for mitigation) as well as any relevant views expressed by statutory environmental bodies (i.e. SNH, SEPA, planning authorities) such as wildlife protection, re-wetting/ habitat management, community access including interpretation, etc.</p> <p>Clearance/ maintenance of existing boundary drains and access/ repairs to the breached flood bund require a more detailed understanding of (shared) responsibilities (change to boundary drainage may affect the level of re-wetting that can be achieved).</p>
Local graziers (e.g. Ormiston Ltd., Cowan Grazing, McCormack Grazing)	<p>Potential for local graziers to support any habitat management plan aspirations for Dellmore need to be better understood. It is known that local graziers help support RSPB habitat management on the Insh Marshes Reserve.</p> <p>Explore opportunities to utilise local resources with interest and capacity to undertake short-term and long-term vegetation control, including mechanical cutting, tree clearance, stock-fencing and grazing.</p>
Kingussie Community Development Company	<p>Engage with local community to investigate current community use, the potential to support community uses going forward, and develop citizen science initiatives/ training opportunities to increase access to knowledge on environmental management and conservation, with a view to long term community inclusion and understanding of the aims for the Site.</p>
Spey District Fisheries Board (SFB)	<p>Given that community access to the Site will enable access to the River Spey, it is considered worthwhile discussing any proposals with SFB to understand whether any specific restrictions/ notices would apply/ be required.</p>
Learning Centres	<p>Engage through the Academy9 initiative with local learning centres such as Kingussie High School to develop outreach programs that align with the objectives for Dellmore to grow young people's interests in environmental management and conservation.</p>

5.3 Principles of Habitat Management

Introduction

- 5.3.2 The following principles of habitat management will be incorporated into the Habitat Management Plan (HMP) for the Dellmore Site by the Contractor, during Planning, Construction, Ongoing Management and Monitoring phases.

Planning

- 5.3.3 Pre-construction surveys will be undertaken to validate the current extent of existing habitat and species features of the Dellmore Site.
- 5.3.4 The Contractor will prepare method statements for all construction works within the Site in line with BS 42020:2013: Code of practice for biodiversity in planning and development and appoint an Ecological Clerk of Works (ECoW).
- 5.3.5 The Contractor shall plan to minimise works/ access within sensitive habitats and at more sensitive times of year. Appropriate ground-protection measures will be used to minimise disruption to surface vegetation, hydrology and compaction of soils.

Construction

- 5.3.6 The Contractor shall avoid non-essential works/ access within sensitive habitats/ disturbance to existing wildlife within the Dellmore Site, through use of appropriate methods and timing of works, to be agreed with the ECoW. This also applies land adjacent to the Site, including the downstream designated sites of international importance.
- 5.3.7 The ECoW shall monitor habitats and species populations within the works area for signs of disturbance; and liaise with the Contractor to undertake appropriate remediation to ameliorate habitat disturbance.
- 5.3.8 Vegetation arising from the Site preparation works will be disposed or reused in a sustainable manner.
- 5.3.9 In channel works will be undertaken following appropriate agreed pollution prevention and sediment capture methods.
- 5.3.10 Soils and turves shall be excavated, stored and re-used in line with Construction Code of Practice for the Sustainable Use of Soils on Construction Sites (DEFRA 2009). Excavated soils and turves will be used to reinstate disturbed ground.
- 5.3.11 Construction requisite (e.g. imported stone/ material to create temporary access tracks) will be removed from Site upon the completion of works to facilitate habitat reinstatement/ restoration.

Ongoing Management

- 5.3.12 The habitat management plan will divide the Site into management units as required.
- 5.3.13 Appropriate grazing densities and timings will be set out for each grassland management unit.
- 5.3.14 A rotational program of ditch management, woodland management and other vegetation management such as scrub cutting and topping will be undertaken, taking into account sensitivities of species present.

5.3.15 A sluice operating plan/water level management plan will be included within the HMP.

Monitoring

5.3.16 Post-construction monitoring of the development of the habitats of the Site shall be carried out from fixed-point quadrats of an appropriate scale at timescales agreed between the Scottish Government, the statutory consultees and relevant landowners.

5.3.17 Post-construction monitoring of breeding waders at the Site shall be carried out annually through appropriate survey methods agreed between the Scottish Government, the statutory consultees and relevant landowners.

5.3.18 As required, the Scottish Government will be responsible for securing any additional longer-term monitoring and adaptive management of wet grassland and breeding wader habitats.

5.4 References

- Crofts A & Jefferson RG. 1999. *The Lowland Grassland Management Handbook*, 2nd Edition. English Nature/The Wildlife Trusts
- Defra (2009). Construction Code of Practice for the Sustainable Use of Soils on Construction Sites.
- Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA & Gregory RD. 2015. Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds* **108**, 708–746.
- Grant, M., Lodge, C., Moore, N., Easton, J., Orsman, C. and Smith, M. (2000). Estimating the abundance and hatching success of breeding Curlew *Numenius arquata* using survey data. *Bird Study*, 47(1), pp.41-51.
- Katzenberger J. (2014). Habitat Parameters Affecting the Distribution of Breeding Meadow Birds in Grasslands of Bremen. BSc Thesis. Hochschule Bremen – University of Applied Sciences.
- Pearce-Higgins J.W, Finney S.K, Yalden. D.W, & Langston R.H.W, (2007). Testing the Effects of Recreational Disturbance on Two Upland Breeding Waders. *Ibis* 149. 45-55.
- Reijnen et al. (1996) - Reijnen, R., Foppen, R. and Meeuwsen, H. (1996). The effects of traffic on the density of breeding birds in Dutch agricultural grasslands. *Biological Conservation* 75, 255-260
- Ringelman J.K, Longcore J.R, and Owen R.B Jr. (1982). Nest and brood attentiveness in female black ducks. *Condor* 84:110-116.
- Robson B & Allcorn R I. 2006. Rush cutting to create nesting patches for lapwings *Vanellus* and other waders, Lower Lough Erne RSPB reserve, County Fermanagh, Northern Ireland. *Conservation Evidence* **3**, 81-83
- RSPB, 2010. Vane Farm, Kinross Stage 3: Advanced Design of Wetland Restoration Proposals
- RSPB, 2016. Insh Marshes National Nature Reserve: River Restoration Feasibility Study
- RSPB. 2005. Wetland Grassland Practical Manual: Breeding Birds
- RSPB. Insh Marshes Management Plan 2010/11-2015/16
- Ruddock M, and Whitfield D.P. (2007). A Report From Natural Research (Projects) Ltd to Scottish Natura Heritage.
- Smart M & Coutts K. 2004. Footdrain management to enhance habitat breeding waders on lowland wet grassland at Buckenham and Cantley Marshes, Mid-Yare RSPB Reserve, Norfolk, England. *Conservation Evidence* **1**, 16-19.

Annex 6.2.1

Dellmore Baseline

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1 Introduction

- 1.1.1 The Dellmore Site is an area of 52 hectares located immediately south of the town of Kingussie on the left bank of the River Spey. Reference to the left and right bank of rivers throughout this report are stated assuming the downstream direction of the river (i.e. facing the direction the river flows).
- 1.1.2 The Scottish Government owned area (shown by the red line in **Drawing 6.2.1 in Volume 3**) is bound by the Highland Main Line (HML) railway and the Pitmain Burn to the north and northeast respectively.
- 1.1.3 The eastern extent of the Site is bordered by the B970 Ruthven Road to the point at which it meets the Kingussie Camanachd Club shinty pitch car park; the track to the shinty pitch also leads to the Site's entrance gate.
- 1.1.4 The boundary then lies directly southwest until it meets the River Spey, which forms the southern extent. The Site boundary follows the centre line of the River Spey along three meanders and then extends directly north along an existing field boundary fence.
- 1.1.5 The Dellmore Site covers a section of the River Spey floodplain on the left bank side and is bisected by two main southwest to northeast drains; Drain A is the drain furthest north, and Drain B is in the centre of the Site. A number of minor channels also cross the Site and there is an agricultural flood embankment to the south west extent; this lies on the left bank of the River Spey and contains several breaches.
- 1.1.6 The majority of the Dellmore Site contains dense, tussocky grassland and trees (mostly alder) scattered along boundary features. Scrub and saplings are present, having presumably self-seeded, with no obvious signs of grazing or cutting in recent years.

1.2 Structure of this Report

- 1.2.1 **Sections 2 to 7** set out the hydrological, geomorphological, ecological, geological, historical and current use baselines for the Dellmore Site, drawing on a number of data sources and walkover surveys.
- 1.2.2 Detailed tables and references for each of the sections are presented at the end of the report.

2 Hydrology

2.1 Approach

- 2.1.1 The hydrological baseline has been established following a site walkover on 24th January 2017, where the weather was dry with occasional showers and antecedent conditions had been relatively dry for the time of year. It should be noted that the site visit also extended to parts of the RSPB Ruthven compartments which are known to experience similar hydrological conditions.
- 2.1.2 The walkover of Dellmore extended from the left bank of the River Spey on the southern boundary of the Site, to the Highland Main Line railway to the north. The Pitmain Burn was walked from the railway line to its confluence with the River Spey, although wet ground conditions made the area around the B970 inaccessible. Key Site features are illustrated in **Drawing 6.2.2 in Volume 3**.
- 2.1.3 A desk study review of mapping, aerial photography and online resources was also undertaken; Light Detection and Ranging (LiDAR) digital elevation data was used.
- 2.1.4 Detailed topographic survey data captured in March 2017 also informed the baseline. The survey covered the full extent of the purchased Site, including ground contours, River Spey boundary features, accesses, tracks and pathways, buildings and structures, drainage (up and downstream of Site) and other boundary features. A cross section survey of watercourses and drains recorded data at approximately 50 m centres, including details of features i.e. culverts/ bridges and ponds etc.
- 2.1.5 To provide context, a desk study was undertaken to review available reports and research on the wider River Spey catchment. This review, which considers aerial photographs and elevation data is included in **Chapter 11, Road Drainage and the Water Environment** and associated appendices.

2.2 Baseline Conditions

River Spey

- 2.2.1 The River Spey flows for 157 km from its source in the Monadhliath Mountains to the Moray Firth. Geology comprises low permeability bedrock with mixed permeability superficial deposits. Land cover in the upper catchment is primarily moorland heath and bog, with some woodland and grassland. Catchment runoff response is influenced by diversions and storage for hydroelectric power schemes. Many of its tributaries have sources in the steeper upper catchment within the Cairngorms Mountains; more detail on the River Spey catchment is included in **annex 11.4.4 of Appendix 11.4, Volume 2**.
- 2.2.2 Flow conditions were in the normal range for the River Spey at the time of the site visit and the bed material was visible across all but the deepest pool sections. Wrack marks and flattened grasses along the banks of the river indicated that water levels had recently reached 1-1.5 m above conditions observed at the time of the walkover.
- 2.2.3 A low bund is visible along parts of the western edge of the Site within the Spey meander, and there are several breach locations along the river bank on this western edge of the Site. Water

was ponding in the scour holes behind the breach locations, and erosion and deposition behind the scour holes highlights that the breach locations will act as preferential flow routes during flood events.

- 2.2.4 A further substantial scour hole lies to the west of the Site boundary. The bank of the river channel itself appears intact, with the edge of the scour hole set back several metres. Granular deposits extend more than 50 m from the scour hole towards the centre of Dellmore. Wrack marks on fencing indicate relatively recent flow beyond the scour hole of around 0.5 m above ground levels.
- 2.2.5 A River Spey flood model was constructed for Project 9. The 1 in 200-year flows for the Spey were estimated using the Flood Estimation Handbook (FEH) statistical method for gauged data obtained from the Invertrium gauging station, which is located around 8.5 km upstream of the Site. The 1 in 200-year flood flow estimate is 280 m³/sec. Further details of the hydrology and hydraulic modelling approach are provided in **Appendix 11.3, Volume 2**.
- 2.2.6 Output from the River Spey flood model can be used to illustrate some of the issues in relation to flooding at the Dellmore Site; frequency of flooding of Dellmore is similar to that of the Ruthven north and south compartments.
- 2.2.7 DMRB Stage 2 hydraulic modelling of the River Spey was carried out for flows approximately equivalent to the *median* annual flood; this is a flood with a return period of two years. As shown in **Figure 2-1**, the majority of the Dellmore Site is subject to flooding in even this relatively frequent event and further analysis of the flood modelling data suggests that low-lying parts of the Site would typically be subject to flooding from the Spey several times in one year.

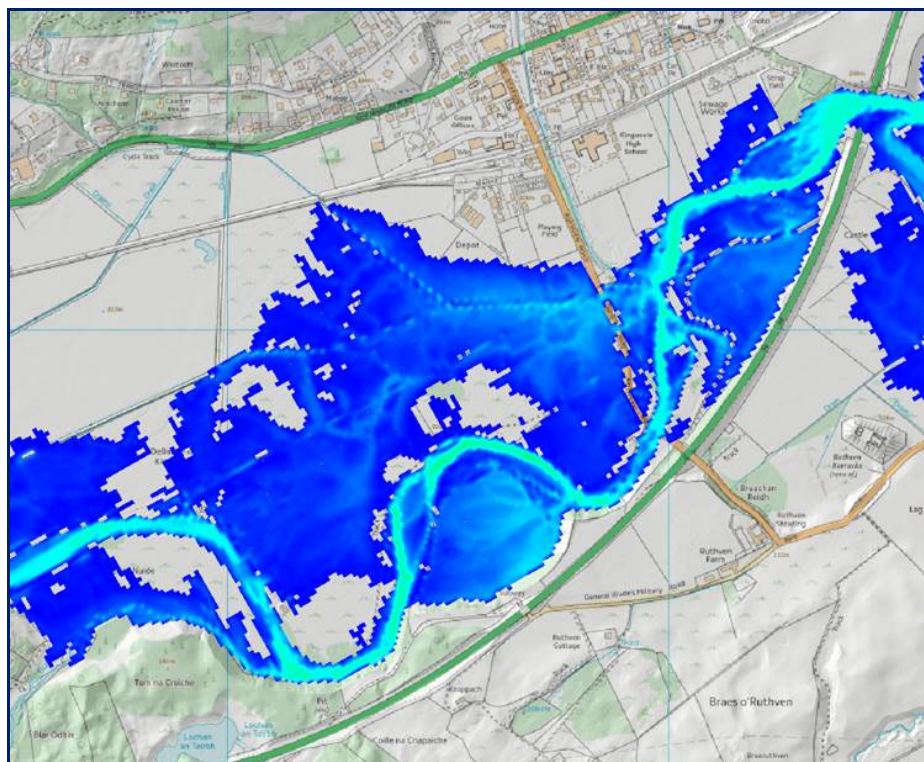


Figure 2-1: Extract of DMRB Stage 2 Flood Model for Project 9

2.2.8 Low flow estimates for the River Spey were estimated using the Institute of Hydrology (IoH) Report 108 (Gustard et al., 1992) methodology for gauged watercourses. The mean flow and exceedance values for the River Spey along with the watercourses within the Site are shown in **Table 2.2.1**.

Site Drainage Network and Catchments

2.2.9 The existing drainage network within the Site consists of a system of linear ditches which appear to have been excavated for land management purposes. The Site, and wider drainage catchments, display complex hydraulic connectivity resulting from historic interventions. Refer to **Drawing 6.2.2 (Volume 3)** for drainage network and catchments and **Table 2.2.2** for catchment areas.

2.2.10 The Site is located within four surface water catchments, and the key baseline information is provided below:

- Pitmain Burn (excluding Caochan a' Mhanaich)
- Caochan a' Mhanaich
- Drain A
- Drain B

2.2.11 The Pitmain Burn has a total catchment of approximately 4 km² at its confluence with the River Spey (Grid ref: NH 759 001), which includes Drain A, B and Caochan a' Mhanaich. For the purposes of defining clear baseline conditions at the Site, its catchment has been separated from Drain A, B and the Caochan a' Mhanaich, and consequently its catchment is 1.9 km². The gradient of the channel is very slack/ slight, limiting conveyance potential, however water levels are also controlled to some extent by the presence of debris dams downstream of the B970 crossing.

2.2.12 The straight morphology of the channel implies that it has been modified historically, particularly as there are also no bed forms within the channel. The Pitmain Burn has intermittent low bunds along the banks of the ditches within the Site which suggest that periodic silt management and clearance has been undertaken in the past to maintain conveyance.

2.2.13 Several channel features extend into the Site from the Pitmain Burn, to the north-east of the Site. These were largely dry at the time of the visit, however could be wet during high flows. A parallel channel, separated from the Pitmain Burn by a bund feature, is also situated within the Site.

2.2.14 Drain A has a west-east orientation through the Site. It is the downstream reach of a series of drains to the west of the Site, within the Pitmain Burn catchment. Drain A has a catchment of 1.01km².

2.2.15 Drain B's catchment is the southern section of the Site. The upstream reach of Drain B was largely dry at the time of the site visit although areas of ponding were observed at low points along the base of the channel. The areas of ponding could reflect collection of surface waters or the locally exposed groundwater table. No source of incoming flow was visible during typical flow conditions although Drain B will receive water from the Spey in flood conditions.

2.2.16 The Caochan a' Mhanaich watercourse originates on the hills north east of Newtonmore and flows in a south easterly direction towards the Site. Flow within the watercourse splits to the north-west of the Site into two separate channels:

- The first channel routes under the Highland Main Line Railway via a culvert and discharges to the Pitmain Burn to the north of the Site
- The second channel flows west to east adjacent to the Highland Main Line Railway before flowing south and discharging to Drain A at grid reference NN 749 999.

Surface Hydrology

2.2.17 The 1 in 200-year flows and mean flows were derived for minor watercourses. The FEH rainfall runoff method was used to estimate (high/flood) fluvial flows around, and through, the Site. The loH Report No. 108 was used to estimate the (mean) flows within each of the four minor watercourses and the Spey. Details are provided in **Table 2.2.1** and **Table 2.2.2** below.

Table 2.2.1: 1 in 200-year flows and mean flow estimates for watercourses within the Site and catchment areas

	Pitmain Burn (excluding Caochan a' Mhanaich)	Caochan a' Mhanaich	Drain A	Drain B
Easting	274597	273771	273850	275271
Northing	800802	800344	799982	799667
Catchment Area (km ²)	1.9	1.4	1.01	0.3
1 in 200 Year Flow (m ³ / sec)	4.366	3.414	2.617	0.511
loH 108 Mean Flow Estimate (m ³ / sec)	0.023	0.017	0.012	0.003
loH Mean Flow Estimate (m ³ / day)	1,987	1,469	1,037	260

Table 2.2.2: Flow estimates for relevant watercourse catchments

% of Time Flow is Exceeded	Spey at Invertruim Gauge (m ³ / sec)	Pitmain Burn (m ³ / sec)	Caochan a' Mhanaich (m ³ / sec)	Drain A (m ³ / sec)	Drain B (m ³ / sec)
95% exceedance	1.5	0.004	0.003	0.001	0.0002
90% exceedance	1.9	0.005	0.004	0.002	0.0003
80% exceedance	2.4	0.007	0.005	0.003	0.0005
50% exceedance	3.7	0.014	0.010	0.006	0.002
5% exceedance	18.8	0.06	0.044	0.037	0.011
2% exceedance	40.0	0.08	0.059	0.053	0.017
1% exceedance	64.4	N/A	N/A	N/A	N/A
Mean Flow	6.6	0.023	0.017	0.012	0.003

Topography and land use

2.2.18 The Site is broadly flat with small undulations, as shown in **Drawing 6.2.3, Volume 3**, and it mainly consists of dense, tussocky grassland with mature trees located in a line along the southern boundary with the River Spey. There is an obvious absence of grazing and grassland management, therefore, the Site has seemingly not had any particular recent land use as it has not been grazed nor has been used for arable, or other, purposes.

Hydrological Climate

2.2.19 The FEH web service has compiled a series of catchment descriptors for watercourse catchments throughout the UK. Catchment descriptors were purchased for the Pitmain Burn catchment, of

which Caochan a' Mhanaich is a tributary. The catchment descriptors value the Standard Annual Average Rainfall (SAAR) at 923 mm per year.

Groundwater

- 2.2.20 Five boreholes were installed across the Site in October 2017, as shown in **Drawing 6.2.4**. An assessment of the groundwater level readings has indicated that groundwater flows towards the River Spey and generally in a downstream direction towards DL-BH1.
- 2.2.21 Initial water depth data from borehole logs has also informed this report and are shown in **Table 2.2.3**.

Table 2.2.3: Groundwater depths and m AOD levels

Borehole Location	Water Depth Range (m BGL)	Water Level Range (m AOD)
DL-BH1	0.17 – 0.42	221.77 – 221.52
DL-BH2	1.23 – 1.89	222.23 – 221.57
DL-BH3	1.41 – 1.52	222.68 – 222.57
DL-BH4	0.54 – 0.65	222.55 – 222.44
DL-BH5	0.33 – 0.46	222.41 – 222.28

- 2.2.22 The River Basin Management Plan (RBMP) classification for groundwater under the Site is 'Good' status (SEPA, 2017).

Existing CAR Licences and Private Water Supplies

- 2.2.23 No private water supplies were identified with the study area, however three CAR licences exist, as shown in **Drawing 6.2.2**, which include a public water and foul drainage asset.
- 2.2.24 The following CAR licences are considered to be notable, based on proximity and potential hydrological connectivity:
- Scottish Water, Combined Sewage Overflow (CSO) at 275223, 800283 on the Pitmain Burn (CAR/L/1026412)
 - Dell Shinty Club septic tank at 275740, 799810 (CAR/R/1087798)
 - Pitmain Farm septic tank at 274610, 800360 (CAR/R/1013788).

Flooding

- 2.2.25 As previously mentioned, a flood model was constructed for the River Spey as part of the Project 9 flood risk assessment. The model was constructed with a 1D watercourse channel linked to a 2D floodplain. The 1D watercourse channel was modelled in the industry standard software Flood Modeller, using cross sections constructed from survey information. The 2D floodplain was represented in the industry standard software, Tuflow, using purchased LiDAR information for the River Spey corridor.
- 2.2.26 The outputs of this model show that the entire Site is predicted to flood from the River Spey in the 1 in 200-year event, as shown in **Drawing 6.2.5, Volume 3**.
- 2.2.27 Flooding of only the catchments within the Site has also been assessed for a 1 in 200-year event under existing conditions (see **Drawing 6.2.6, Volume 3**). In line with the River Spey flood model, this was represented through 1D representation of watercourse channels linked to a 2D

representation of the floodplain. The 1D watercourses were modelled in the industry standard software, Flood Modeller, with cross sections constructed from topographic survey information. The 2D floodplain was modelled using the industry standard software, Tuflow, using purchased LiDAR information for the Site and the surrounding area.

3 Geomorphology

3.1 Approach

- 3.1.1 A walkover of the River Spey and Pitmain Burn, as well as the other floodplain ditches within the Dellmore Site, was undertaken on the 24th January 2017. Flows were considered low for the time of year meaning the bed of the River Spey was visible along much of the survey area.
- 3.1.2 During this walkover, morphological mapping of the River Spey was undertaken to provide an overview of baseline conditions and a series of georeferenced photographs (see **Table A. 1**) was taken to provide a record of features and processes, within the River Spey, Pitmain Burn and floodplain ditches.
- 3.1.3 As stated in **paragraph 2.1.1, annex 11.4.4 of Appendix 11.4, Volume 2**, contains information about the wider context of the River Spey catchment. This provides an overview of the physical characteristics of the catchment, as well as an outline of the modifications that have been made within the catchment, and how these impact on the fluvial geomorphology to give the current form and processes we see today. Historical analysis of the River Spey and the channels on the Site has also been undertaken based on a review of historical mapping onscreen.

3.2 Baseline Conditions

River Spey Floodplain

- 3.2.1 The River Spey floodplain through Dellmore is wide (1.2 km) and open with little infrastructure or development, allowing good channel floodplain coupling and regular inundation. **Drawing 6.2.7** in **Volume 3** shows that the floodplain is crossed by a series of drains and ditches that are draining the floodplain, increasing the speed of runoff to the River Spey channel.
- 3.2.2 The railway line bisects the floodplain and the Ruthven Road embankment alters the high flow behaviour of the Site by impounding upstream flows across the floodplain and then acting as a weir as it is overtopped. A series of flood relief culverts were added to the road before the existing A9 was built, to improve downstream flood conveyance.
- 3.2.3 The land initially rises away from the river in some areas, and then slopes down away from the river, with lower, wetter areas to the north and east, see **Drawing 6.2.7** in **Volume 3**. The south west part of Dellmore, which lies within a large meander of the river, is the highest part. In the south west corner, an embankment, which includes several breaches, runs approximately 350 m along the east bank of the river.
- 3.2.4 The network of ditches across the Dellmore Site, as well as the Pitmain Burn which borders the Site to the north east, carries varying volumes of water; details are described in **Section 2.2**. A number of old channels – palaeochannels – were noted on the ground, and are clear from the LiDAR data, see **Drawing 6.2.7**. The water levels in the ditches varied at the time of survey,

however were estimated to be no more than 0.5 m lower than the field level, and the ditches were generally shallow and wide.

River Spey Channel through the Dellmore Site

- 3.2.5 The River Spey through Dellmore is a single thread channel with a meandering planform. There is some historical evidence from the analysis of historical mapping which suggests the channel is narrowing. This adjustment may be in response to the regulation of flows due to hydropower upstream. There is also a bund upstream on the right bank that will reduce the frequency of flooding to the Site, however this is not thought to have a significant impact due to its level and several breaches.
- 3.2.6 The channel banks are steep and generally stable; on the right bank side the bank is higher than the surrounding floodplain. The banks are frequently tree lined, adding to their stability, though there are areas of active erosion. These areas are adding sediment (fines and gravels) to the channel, which appear to be deposited relatively locally to form a series of vegetated (with trees) islands in the channel, as well as vegetated and unvegetated gravel bars. Visible bed substrate is predominantly gravels, with bed armouring in some areas. Flows are varied, with areas of deeper glide flow and shallow riffle flow in steeper sections.

Pitmain Burn

- 3.2.7 The Pitmain Burn flows along the eastern boundary of Dellmore and has been historically modified to create a straight and uniform channel. Banks are low and there is a low embankment along the right bank side of the channel, probably comprised of the arisings from past channel dredging.
- 3.2.8 Over time the channel has adjusted to historic straightening and is creating a smaller more sinuous channel, helped by vegetation establishing in the channel, collecting sediment. There are no bed forms within the channel.

4 Ecology and Nature Conservation

4.1 Approach and Methods

Designated Sites

4.1.1 A desktop study was carried out to identify notable ecological features within the Dellmore Site. Baseline information was gathered using the following data sources:

- Scottish Natural Heritage (SNH) datasets
- SNH Information Services (e.g. SiteLink, iMap and Natural Spaces)
- Forestry Commission National Forestry Inventory (NFI) 2014 dataset
- BLOM aerial imagery from 2013

Habitats

4.1.2 A National Vegetation Classification (NVC) survey was undertaken on 16th August 2017 during favourable weather conditions. The survey was carried out using a revised version of the NVC survey guidelines in Rodwell (2006) and the NVC scheme (Rodwell, 1991-2000). The NVC scheme provides a standardised system for classifying and mapping semi-natural habitats and ensures that surveys are carried out to a consistent level of detail and accuracy.

4.1.3 The NVC communities of homogenous stands and mosaics were mapped and drawn as polygons on aerial field maps. The NVC communities within each stand were identified by taking quadrat samples from representative stands and recording the dominant species within other similar stands.

4.1.4 Vascular plant identification and nomenclature follows Stace (2010), except for sedges, where Rose (1989) was used, with Atherton *et al.* (2010) used for bryophyte identification.

Wintering Birds

4.1.5 A series of winter bird surveys were undertaken between the 6th January 2017 and the 24th March 2017. Walkover surveys were undertaken using an adapted version of the Common Birds Census (CBC) methodology as described by Gilbert *et al.* (1998); the methods involved surveying the Site using a look-see methodology.

4.1.6 The distribution of birds on and around the Dellmore Site was mapped on Site and the information digitized for further desk-based analysis. Vantage point observations were taken periodically during surveys to increase the potential to capture use/ overflying of the Site by various species.

4.1.7 Survey dates, times and weather conditions are presented in **Table 4.1.1**. Water level data for the River Spey was taken from the nearest SEPA gauging station at Kincaig; water levels under normal conditions range from approximately 0.2 m to 2 m.

Table 4.1.1: Wintering bird survey metadata

Site Visit	Date	Time	Temperature (°C)	Cloud Cover (x/8)	Precipitation	Wind (bf)	Water Level (m)
1	06/01/17	13:00 – 16:25	7	6	Nil	West force 2-3	0.6
2	20/01/17	09:00 – 12:00	4	6	Nil	West force 1	0.8
3	03/02/17	09:00 – 12:30	6	6	Occasional light rain	West force 3	0.8
4	23/02/17	13:30 – 15:30	1-2	8	Nil – followed heavy snow	North west force 1	1.0
5	24/03/17	13:00 – 16:15	5	7	Nil	West force 3	0.6

Breeding Birds

- 4.1.8 A series of breeding bird surveys were undertaken between the 27th April 2017 and 9th June 2017. Methods deployed to undertake surveys of breeding birds throughout the Dellmore Site applied a combination of methods described by Brown and Shepherd (1993) identified for undertaking surveys of breeding waders (a target group within the study), and CBC surveys. In both methods, species' point records were plotted on each survey visit to determine the presence/ abundance of breeding birds and locate breeding territories.
- 4.1.9 Surveys were adapted to collect survey data for a wider range of species than can be recorded using traditional methods. This method applied an adapted version of the CBC methodology, as described by Gilbert et al. (1998), to map the identity of breeding birds encountered by sight and/ or sound. Full common birds census recommends 10 survey visits to provide a good representation of breeding bird territories. However, in this case the survey was restricted to three visits to simply identify the range of species, their abundance, and broad distribution of species present on Site.
- 4.1.10 The distribution of birds on and around the Dellmore Site was mapped on Site and the information digitized so that estimation of breeding pairs/ territories could be undertaken. Vantage point observations were taken periodically during surveys to increase the potential to capture use/ overflying of the Site by various species.
- 4.1.11 Survey dates times and weather conditions are presented in **Table 4.1.2**.

Table 4.1.2: Overview of breeding bird survey meta data

Visit	Date	Personnel	Time	Temperature (°C)	Cloud Cover (x/8)	Precipitation	Wind (bf)	Glare
1	27/04/17	John Thompson MCIEEM Scott Mackenzie Grad CIEEM	09:00 – 12:00	5-6	5-8	Light shower after 11:00	2, west	Nil
2	16/05/17	John Thompson MCIEEM April Park Grad CIEEM	09:10 – 12:00	11	4-8	Dry	3- 4 occ 5 south west	Nil
3	09/06/17	Mark Middleton Krzysztof Dabrowski Grad CIEEM	09:00 – 12:00	12°	8	Dry	1-2, south west	Nil

A number of criteria were applied to establish the existing ornithological value of the Site. These include where bird species are listed in the following designations:

- Schedule 1 of the Wildlife and Countryside Act
- A qualifying interest of a nearby SPA or SSSI
- The Scottish Biodiversity List
- The Cairngorms National Park Priority Species List
- Red or amber listed in the Birds of Conservation Concern.

Protected and Notable Species

4.1.12 Although incidental sightings of protected and/ or notable species were recorded during any ecology surveys carried out within the Dellmore Site, a specific walkover survey for protected and/ or notable species was undertaken on the 23/ 24th March 2017. The walkover survey focussed on identifying the presence/ likely absence of habitat features that could support protected or notable species currently using the Dellmore Site. Considering the nature of the habitats present, this survey focussed on the following species/ groups:

- Bats
- Badger
- Otter
- Water vole
- Brown hare
- Pine marten
- Red squirrel

4.1.13 Following completion of the walkover survey, further survey requirements were identified to determine presence or absence of water vole and bats.

Water Vole

4.1.14 In line with Strachan *et al.* (2011)¹, all accessible watercourses (Pitmain Burn, Drain A and Drain B) were surveyed for signs of water vole including latrines, feeding lawns, caches and burrows.

4.1.15 The date when water vole survey was undertaken is included in **Table 4.1.3**.

Table 4.1.3: Water Vole survey meta data

Date	Personnel	Temperature (°C)	Precipitation	Wind (bf)	Cloud Cover (x/8)
12/09/17	Scott Mackenzie Grad CIEEM Dan Wales Grad CIEEM Laura Linsley	12	Dry	1/2	7/8

¹ Strachan and Moorhouse (2011) Water Vole Conservation Handbook (3rd Edition)

Bat Roost Potential Survey

- 4.1.16 Following the walkover surveys, a series of trees considered to support some bat roost potential were identified in the south-east part of the Site north of the shinty field.
- 4.1.17 In line with guidance by Collins *et al.* (2016)² all trees within the main body of the Site were assessed in relation to their potential to support roosting bats. In accordance with the guidelines, trees have been classified with ratings of low, medium and high potential to support roosting bats. All inspections were undertaken from ground level using close focussing binoculars.
- 4.1.18 Details of the bat roost potential survey undertaken are included in **Table 4.1.4**.

Table 4.1.4: Bat roost potential survey meta data

Date	Personnel	Temperature (°C)	Precipitation	Wind (bf)	Cloud Cover (x/8)
27/04/17	Scott Mackenzie Grad CIEEM John Thompson CIEEM	5-6	Nil	1-2 W	7/8

4.2 Limitations

Water Vole

- 4.2.2 Given the transient nature of wildlife, absence of field signs does not always mean absence of a particular species. Therefore, surveys have been carried out in line with current professional guidance using suitably qualified ecologists to determine the presence or likely presence of species.
- 4.2.3 Given that the suitability of water vole habitat can change throughout the season, water vole survey guidance has been updated (Dean *et al.* 2016) and advocates one early visit (between mid-April to June inclusive) and one late visit (between July and September inclusive). Given that high-altitude habitats are likely to change significantly throughout the season, a single visit was carried out for consistency with methods applied in **Chapter 12** in **Volume 1**.

Breeding Birds

- 4.2.4 All surveys were undertaken in generally dry conditions and within temperature ranges characteristic for the locality and avoided periods of high wind. Although some rain and wind (>BF4) was recorded during surveys, it is not considered that this had a significant effect on the ability of surveyors to detect birds or, based on the observations which were made, the behaviour of birds in response to weather conditions. As such, conditions are not considered to represent a significant limitation on the validity of the survey findings.
- 4.2.5 CBC instructions often recommend dusk survey visits to detect crepuscular species. While this may have limited detection of some species which are particularly active at dusk such as Song Thrush or Woodcock, the absence of dusk survey data is not considered likely to influence the overall assessment of the Site.

² Bat Surveys for Professional Ecologists. Good Practice Guidelines. (3rd Edition). The Bat Conservation Trust, London.

NVC Survey

- 4.2.6 The NVC survey was undertaken at the optimal time of year and access to all parts of the survey area was possible. Early flowering species may no longer be evident in August, however the dominant species for each community were readily identifiable.

4.3 Baseline Conditions

Designated Sites

- 4.3.1 As shown in **Drawing 6.2.8** in **Volume 3**, the River Spey bounding the Site is designated as River Spey-Insh Marshes Ramsar, SPA and SSSI and Insh Marshes SAC and River Spey SAC. The qualifying features of these sites are listed in **Table 4.3.1**.

Table 4.3.1: Qualifying features of statutory designated sites of the River Spey in the Dellmore Site

Designated Site	Importance	Qualifying Features
Ramsar River Spey-Insh Marshes	International	Whooper swan, non-breeding Breeding bird assemblage Flood-plain fen Trophic range river/stream Mesotrophic loch
SPA River Spey-Insh Marshes	International	Wigeon, breeding Spotted crane, breeding Wood sandpiper, breeding Osprey, breeding Whooper swan, non-breeding Hen harrier, non-breeding
SAC Insh Marshes	International	Alder woodland on floodplains Very wet mire often identified by an unstable 'quaking' surface Otter Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrients levels
SAC River Spey	International	Sea lamprey Atlantic salmon Otter Freshwater pearl mussel
SSSI River Spey-Insh Marshes	National	Osprey, breeding Whooper swan, non-breeding Breeding bird assemblage Flood-plain fen Arctic charr Otter Invertebrate assemblage Mesotrophic loch Vascular plant assemblage

- 4.3.2 It is recognised that qualifying/ notified features will not always be found within the affected area/ overlapped boundaries of statutory designated sites; there will also be seasonal variations in species presence (e.g. migratory species).
- 4.3.3 The ancient woodland inventory has highlighted the presence of category 2a woodland within the southern extent of the Dellmore Site, see **Drawing 6.2.8**. When verified against the Forestry Commission National Forestry Inventory (NFI) 2014 dataset and 2013 BLOM aerial imagery, it is clear that this is an area of scattered trees as opposed to dense woodland.

- 4.3.4 Flora is an important feature of ancient woodland as certain species are associated with soils that have been undisturbed for a notable period of time. The current assemblage of vascular plants located within the southern extent of the Dellmore Site was captured within the NVC survey.

Overview of Habitats

- 4.3.5 An overview of broad habitats types, based on indicator species and the criteria outlined in current professional standard (JNCC 2010), is shown in **Drawing 6.2.9** in **Volume 3**, and the majority of the Site is covered in dense, tussocky grassland, with numerous vole burrows. Parts of the Site, especially along the ditches, support trees (mostly alder) and some scrub. A number of mature trees, some with bat roost potential, are also scattered across the Site, and saplings are present that have presumably self-seeded owing to neglect, and lack of grazing or cutting, in recent years.
- 4.3.6 The Land Capability for Agriculture still classes this Site as land capable of supporting mixed agriculture (Class 4.2), however as noted above, the Site has not been managed for this purpose in quite some time.
- 4.3.7 Some limited evidence of current management can be seen on the banks of the River Spey where alder scrub/ trees continue to be cut and cleared; this is considered likely to be associated with angling interests.

Woodland

- 4.3.8 There is almost a continuous line of mature trees between the Dellmore Site and the River Spey, which may provide important riparian habitat, with stable bankside vegetation likely to support natural river morphology processes. Tree species include alder *Alnus glutinosa* with many stands over-mature and in decay. Mature ash *Fraxinus excelsior* is present; as is bird cherry *Prunus padus* in various stages of maturity.
- 4.3.9 Riparian areas of watercourses within Dellmore are typically encroached by alder scrub with more mature stands of woodland present in adjacent areas, particularly in the eastern extent.

Grassland

- 4.3.10 The grassland throughout the Dellmore Site varies in composition in accordance with topography and the location within the Site. Those areas further south toward the River Spey are more uniformly dry, semi-improved in nature and of a neutral grassland type. The grassland is well established and a thick tussocky structure has developed in most areas in the absence of grazing or other grassland management.
- 4.3.11 The dryer grassland areas typically include tufted hair-grass and Yorkshire fog *Holcus lanatus*, and also increasing amounts of cocksfoot *Dactylis glomerata*, timothy *Phleum pratense* and hogweed *Heracleum sphondylium*. Some areas support black knapweed *Centaurea nigra* and pignut *Conopodium majus* which indicate neutral conditions.
- 4.3.12 Within the northern and eastern parts of the Site, the grassland is generally marshy grassland, swamp and very wet alder woodland. These areas are typically dominated by tufted hair-grass *Deschampsia cespitosa*, with locally abundant meadowsweet *Filipendula ulmaria* and soft rush *Juncus effuses*. There is also lower coverage of finer grasses such as creeping bent *Agrostis stolonifera*, Yorkshire fog *Holcus lanatus*, red fescue *Festuca rubra* and herbs such as creeping buttercup *Ranunculus repens* and sorrel *Rumex acetosa*.

- 4.3.13 The areas of swamp include sedge *Carex* species beds, areas dominated by meadowsweet, patches of marsh marigold *Caltha palustris*, water forget-me-not *Myosotis* sp. and reed canary-grass *Phalaris arundinacea*.

Watercourses

- 4.3.14 As described in **section 2.2**, the watercourses and ditches present within the Dellmore Site flow in an easterly direction. Water depth is variable, however during site visits was in excess of 1 m in the lower section of Pitmain Burn, downstream of its confluence with Drain A and Drain B.
- 4.3.15 The substrate of the watercourses typically comprises finer sediment types and the water features support abundant emergent and submerged vegetation, which is likely to become even more extensive during summer months.
- 4.3.16 Pitmain Burn, Drain A, Drain B and associated ditches have an aquatic flora that includes water starwort *Callitriche* sp., floating sweet-grass *Glyceria fluitans* and watercress; dense beds of sedge *Carex* species are present within the deeper parts of many water features.

NVC Survey

- 4.3.17 Ten NVC communities were identified across the Dellmore Site and the distribution of these habitats is shown in **Drawing 6.2.10** in **Volume 3**. Summary descriptions of each community are presented below. Target notes (TNs) and photographs are presented in **Table B.1**.

MG1 Arrhenatherum elatius grassland

- 4.3.18 MG1 is the dominant NVC community across the Site, represented by MG1a *Festuca rubra* and MG1c *Filipendula ulmaria* sub-communities, of which MG1a covers the largest area. The MG1 community is dominated by false oat-grass *Arrhenatherum elatius*, with other grasses which include frequent red fescue *Festuca rubra* and common bent *Agrostis capillaris* and occasional Yorkshire fog *Holcus lanatus* and cock's-foot *Dactylis glomerata*. Tall herbs comprise occasional creeping thistle *Cirsium arvense*, common knapweed *Centaurea nigra* and common sorrel *Rumex acetosa*. Other herb species recorded as a few individuals include: meadow vetchling *Lathyrus pratensis*, germander speedwell *Veronica chaemedrys*, devil's-bit scabious *Succisa pratensis*, lady's bedstraw *Galium verum* and lesser stitchwort *Stellaria graminea*. Across the community, the difference between the two sub-communities depends on the proportion of either red fescue or meadowsweet *Filipendula ulmaria*. In the centre of the Site there is a large area of the MG1a sub-community (TN 6, **Table B.1**) where red fescue and cock's-foot are more dominant, whereas in the MG1c community, found in the large field to the north of the Site, there is more meadowsweet.

MG9 Holcus lanatus – Deschampsia cespitosa grassland

- 4.3.19 Large areas of MG9b *Arrhenatherum elatius* sub-community are found in the Site, particularly to the north and east. These areas are dominated by the grasses tufted hair-grass *Deschampsia cespitosa*, Yorkshire fog and creeping soft grass *Holcus mollis*, with abundant creeping bent *Agrostis stolonifera*, cock's-foot and occasional perennial ryegrass *Lolium perenne*. Herbaceous associates include broadleaved dock *Rumex obtusifolius*, common knapweed, meadow vetchling, ribwort plantain *Plantago lanceolata*, creeping buttercup *Ranunculus repens* and common mouse-ear *Cerastium fontanum*.

MG10 Holcus lanatus – Juncus effusus rush-pasture

- 4.3.20 One area of MG10a Typical sub-community is located to the north of the Site beside Drain A. The MG10a sub-community is a species-poor grassy sward of Yorkshire fog and creeping bent with prominent tussocks of soft rush *Juncus effusus*.

M23 Juncus effusus/acutiflorus – Galium palustre rush pasture

- 4.3.21 A narrow band of M23 is present along a ditch, running from Drain A, towards the centre of the Site. The stand is dominated by sharp-flowered rush *Juncus acutiflorus*, identified as the M23a sub-community. Other species include marsh bedstraw *Galium palustre*, greater bird's-foot-trefoil *Lotus pedunculatus* and occasional soft rush.

M27 Filipendula ulmaria – Angelica sylvestris tall-herb fen

- 4.3.22 This community occurs frequently towards the eastern end of the Site (TN 5, **Table B.1**), where the soils are particularly moist and subject to occasional inundation. The high abundance of meadowsweet is the most obvious defining feature of the community, together with frequent wild angelica *Angelica sylvestris*, common valerian *Valeriana officinalis*, marsh bedstraw, marsh thistle *Cirsium palustre*, creeping buttercup and water mint *Mentha aquatica*.

W3 Salix pentandra – Carex rostrata woodland

- 4.3.23 A small and fairly open stand of this community occurs in water-logged soils adjacent to the road and ditch which crosses the Site. Grey willow *Salix cinerea* predominates in the low canopy, with only occasional bay willow *S. pentandra*, over a field layer which bears strong affinities to the adjacent M27 meadowsweet-wild angelica mire, with abundant meadowsweet and frequent wild angelica, soft rush, bottle sedge, creeping buttercup, tufted hair-grass and water mint.

W7 Alnus glutinosa – Fraxinus excelsior – Lysimachia nemorum woodland

- 4.3.24 Narrow bands of the W7 community are present along the bank of the River Spey. Some areas are a poor fit for the community, probably due to their small size and/or recent origin (e.g. TNs 1, 3 and 4, **Table B.1**). The canopy is dominated by alder throughout, with varying amounts of grey willow, downy birch *Betula pubescens*, bird cherry *Prunus padus* and sycamore *Acer pseudoplatanus*. The ground flora is also very variable, and includes dog's-mercury *Mercurialis perennis*, hedge woundwort *Stachys sylvestris*, tufted hair-grass, broad-leaved dock, nipplewort *Lapsana communis*, creeping soft grass *Holcus mollis*, ground elder *Aegopodium podagraria*, raspberry *Rubus idaeus*, common hogweed *Heracleum sphondylium*, cock's-foot, common sorrel, false oat-grass, valerian, and melancholy thistle *Cirsium heterophyllum*. Yellow pimpernel *Lysimachia nemorum* is atypically scarce. Two sub-communities are identifiable. Along the upstream reach of the River Spey, the W7a nettle *Urtica dioica* sub-community predominates, with nettle a near constant in the field layer. Elsewhere, the field layer contains more grass species including tufted hair-grass and creeping soft grass, which is more typical of the W7c tufted hair-grass sub-community (TNs 7 and 8, **Table B.1**).

S9 Carex rostrata swamp

- 4.3.25 The S9 community is found along Drain A which runs from the western to the eastern boundary of the Site (TN 9, **Table B.1**). The dominant species is bottle sedge *Carex rostrata* with occasional

broad-leaved pondweed *Potamogeton natans* and sharp-flowered rush. This aligns with the species poor S9a *Carex rostrata* sub-community.

OV24 Urtica dioica – Galium aparine community

- 4.3.26 A small area of the open vegetation community OV24 occurs on an area of disturbed ground towards the western end of the Site. Nettle and cleavers *Galium aparine* are the over-whelming dominants, with occasional creeping thistle *Cirsium arvense* and false oat-grass.

OV27 Chamerion angustifolium open vegetation community

- 4.3.27 A small area of the rose-bay willowherb *Chamerion angustifolium* open vegetation community is present in association with W6 woodland, towards the south-eastern edge of the Site.

Wintering Birds

- 4.3.28 A total of 38 species of overwintering birds were recorded within the Dellmore Site. Whilst none are currently utilising Site habitat features, further species were regularly observed in the wider area and flying over the Dellmore Site (e.g. greylag goose, pink-footed goose and lapwing).
- 4.3.29 The following section presents a summary of the species recorded. A full account of the species present and their abundance on each visit is presented in **Table B.2**; the distribution of the species present is also shown in **Drawing 6.2.11** in **Volume 3** using British Trust for Ornithology (BTO) species codes.
- 4.3.30 The information presented in **Table 4.3.1** below shows the peak counts of overwintering birds observed within Dellmore during the baseline surveys. An overview of the habitat associations of the relevant species within and adjacent to the Site is also presented in the table.
- 4.3.31 An overview of the nature conservation status of the wintering birds is presented in the table and is based on biodiversity planning policy, namely priority species identified in the Scottish Biodiversity List (SBL) and Cairngorms Nature Action Plan (CNAP); species associated with designated sites are also shown.
- 4.3.32 Species sensitivity, based on population trends and other criterion, identified within the Birds of Conservation Concern (Eaton *et al.*, 2015) is also listed in the table with red list species being most sensitive.
- 4.3.33 It should be noted that while species associated with designated sites may be associated with the breeding season, their wintering presence in the locality is noteworthy and suggests potential year-round habitat suitability.

Table 4.3.2: Overview of wintering birds' conservation status and distribution

Species	BoCC List	SBL	CNAP	SSSI/ SPA/ Ramsar	Peak Count	Notes on Distribution
Grey heron	Green				3	Feeding along watercourses / drains on Site
Cormorant	Green				1	Flyover only
Pink footed goose	Amber				0	Flyover only - 400 recorded overflying west at sunset on 23.03.17

Species	BoCC List	SBL	CNAP	SSSI/ SPA/ Ramsar	Peak Count	Notes on Distribution
Greylag goose	Amber				0	Not reported within red line through noted immediately adjacent to Site in grazed pasture
Common buzzard	Green				3	Routinely present hunting over grassland and utilising tree perches within Site boundary
Mallard	Amber				15	Primarily on River Spey; also observed on Pitmain Burn
Goldeneye	Amber			SSSI	4	Primarily on River Spey, though also on drain
Moorhen	Green				1	Present in wet woodland
Pheasant	Amber				6	Present throughout grassland and wooded areas throughout Site
Grey partridge	Red	✓			2	Present in central drier grassland
Curlew	Red	✓		SSSI	53	Possible pre-breeding aggregation located in northern most field
Oystercatcher	Amber					Present in pasture north east of Pitmain Burn
Lapwing	Red	✓	✓		8	Located in pasture north east of Pitmain Burn Up to 50 overflying
Woodcock	Red	✓				Wet grassland in northern most field
Snipe	Amber			SSSI	19	Wetter grassland areas (northern parts of the Site))
Black headed gull	Amber	✓		Ramsar	6	Feeding in grazed pasture outside Site to north east
Raven	Green				5	Flyovers only
Jackdaw	Green				50	Distributed mainly adjacent to woodland and around shinty pitch
Blue tit	Green				9	Wooded areas
Long-tailed tit	Green				19	Wooded areas
Coal tit	Green				3	Wooded areas
Great tit	Green				2	Wooded areas adjacent to River Spey
Goldcrest	Green				2	Alder scrub adjacent to River Spey
Wren	Green				5	Wooded areas and sheltering in grass tussocks during winter
Treecreeper	Green				2	Wooded areas
Fieldfare	Red				1	Wooded areas
Mistle thrush	Red				1	Wooded areas adjacent to River Spey
Song thrush	Red	✓			3	Wooded areas
Blackbird	Green				3	Wooded areas adjacent To River Spey
Robin	Green				4	Wooded areas
Dipper	Amber				9	River Spey
Dunnock	Amber	✓			2	Wooded areas

Species	BoCC List	SBL	CNAP	SSSI/ SPA/ Ramsar	Peak Count	Notes on Distribution
Chaffinch	Green				7	Wooded areas
Siskin	Green	✓			90	Wooded areas
Lesser Redpoll	Red	✓			19	Wooded areas
Bullfinch	Amber	✓			1	Wooded areas/ scrub adjacent to drains
Goldfinch	Green				25	Wooded areas
Reedbunting	Amber	✓			13	Primarily wetter grassland areas in the northern part of the Site

Raptors

- 4.3.34 Common buzzard *Buteo buteo* was observed from within the Site boundary routinely. This is the only species of raptor recorded actively using the Site for hunting/ perching during the winter.
- 4.3.35 Golden eagle *Aquila chrysaetos* was observed overflying the Site as it travelled down the Spey valley following periods of heavy snow on the 23rd and 24th February 2017. The dense grassland cover within Dellmore supports an abundant population of voles, which provides a good foraging resource for a range of raptors or owls.

Wildfowl

- 4.3.36 Mallard *Anas platyrhynchos* were reported in small numbers occasionally on the more northern section of Pitmain Burn and in slightly higher numbers on the River Spey. Mallard were also noted along with wigeon *Anas penelope* on a pond surrounded by shooting butts immediately west of the north-west limit of the Dellmore Site.
- 4.3.37 The presence of wildfowl on open water adjacent to Dellmore indicates that any future provision within the Site is likely to be detected and utilised. Goldeneye *Bucephala clangula* were observed on the River Spey adjacent to the Site, and a single bird was also recorded actively foraging in the Drain B.
- 4.3.38 Greylag geese were routinely recorded in commuting flights over Dellmore. These are largely considered to be birds associated with the Insh Marshes which commute along the Spey valley between roosting and feeding areas. Feeding was recorded on almost all site visits in the fields immediately west of Dellmore, and also in fields to the south of the River Spey, where grazing (by cattle) has produced a sward suitable for geese to graze.
- 4.3.39 During surveys in March 2017 increased goose activity was noted. While greylag geese were the dominant species present within the wider Strathspey area during winter, several hundred pink-footed geese were also present in March and were noted overflying the Site east toward Insh Marshes at dusk.

Waders

- 4.3.40 Small numbers of snipe *Gallinago gallinago* and woodcock *Scolopax rusticola* were observed during site visits. The numbers recorded are likely to be underestimates given the close proximity at which the birds were observed, and the extent of habitat potentially suitable for the species throughout the Site. A small flock of eight lapwing *Vanellus vanellus* were observed in

fields adjacent to the north east of the Dellmore Site on a single survey visit, other flocks of lapwing were noted overflying the Site.

- 4.3.41 During walkover surveys in late March, the number of waders present within the Strathspey area had increased prior to the breeding season and during one site visit, a group of 53 curlew *Numenius arquata* were present on the Site in the area north of the Caochan a’Mhanaich.
- 4.3.42 During the same site visit, up to 16 snipe were present in this same area, and a further three present in adjacent grazed paddocks to the north east of Pitmain Burn. Small numbers of oystercatcher *Haemotopus ostralegus*, lapwing and black-headed gull *Chroicocephalus ridibundus* were also observed in those paddocks grazed by ponies north east of Pitmain Burn, immediately adjacent to Dellmore.

Passerines

- 4.3.43 A small range of passerines were recorded within the Dellmore Site. The majority of these are predominately associated with woodland at the east of the Site and along the River Spey, with only wren *Troglodytes troglodytes* and reed bunting *Emberiza schoeniclus* typically observed in grassland areas.
- 4.3.44 Specific note was made with regard to the presence of corvid (crows and allies) on the Site due to the associated predation risk to any breeding ground nesting birds. The corvid assemblage present almost exclusively comprised of jackdaw *Corvus monedula*, though raven *Corvus corax* were reported moving through the Site in groups of up to five.

Breeding Birds

- 4.3.45 A key focus of the study was to establish any existing use of the Dellmore Site by breeding waders. The presence of breeding waders on each visit is set out in **Table 4.3.2** below. A brief account is also provided for each wader species present. Of those waders identified on or adjacent to the Site, snipe, curlew and redshank are specifically mentioned within the SSSI citation for the River Spey – Insh Marshes SSSI. Oystercatcher and lapwing form important components of the Strathspey breeding waders assemblage. Lapwing and curlew are listed on the Birds of Conservation Concern (BoCC) red list and oystercatcher, snipe and lapwing are included on the amber list. Redshank and lapwing are also CNAP priority species.

Table 4.3.3: Breeding waders recorded on the Dellmore Site

Visit	Species				
	Curlew	Lapwing	Oystercatcher	Snipe	Common sandpiper
1	6	6	3	4	2
2	0	5	1	0	3
3	0	3	2	1	3
Estimate	2	3*	3*	1	3^

* all breeding attempts were outside Site boundary on grazed field between the Dellmore Site and Kingussie

^ all breeding activity was associated with the River Spey at the southern boundary of the Site

- 4.3.46 Of those waders present, snipe were considered to be breeding within the Site boundary. It is likely that curlew attempted to breed though may have failed/ abandoned as they were not located on Site after the first survey. Curlew are considered to be a possible breeder; this

assessment takes into account breeding timings described by Forrester and Andrews (2007) which states that almost all curlew are present on their breeding territory by early April. A curlew territory within Dellmore Site was also identified during breeding bird surveys undertaken in 2015 as part of the wider A9 Dualling environmental assessment.

- 4.3.47 Oystercatcher and lapwing were present and confirmed breeding outside the Site boundary in field units immediately adjacent to the Site (north east of Pitmain Burn), currently grazed by ponies. The presence of these species immediately adjacent indicates that ground conditions within the Dellmore Site and adjacent areas is likely to be suitable for foraging. Oystercatcher were also confirmed breeding on gravel banks on the River Spey.
- 4.3.48 Breeding wildfowl were also a priority in determining baseline conditions on the Dellmore Site. A summary of breeding/ possibly breeding wildfowl is presented in **Table 4.3.3** below.

Table 4.3.4: Breeding wildfowl recorded on the Dellmore Site

Visit	Species		
	Teal	Mallard	Goldeneye
1	2 pairs	3 pair	Group of 5
2	1 female	1 pair	1 female
3	0	2 pair	2 females
Estimate	2	3	2

- 4.3.49 Of the species of wildfowl recorded, teal were present nesting in marginal vegetation around watercourses throughout the Site. Mallard were also present breeding along watercourses throughout the Site with possible breeding located adjacent to the River Spey. Goldeneye were considered to be possible breeders and were recorded on the River Spey on all visits in proximity to wooded areas where potential nesting habitat was present.
- 4.3.50 In addition to target species of breeding waders and wildfowl a total of 29 further species have been identified during the surveys which were considered to be possibly breeding within the Site. Locations of these species recorded are presented in **Drawing 6.2.12** in **Volume 3**.
- 4.3.51 **Table 4.3.4** summarises the species recorded on the Site. Information relating to the distribution and breeding status of each species is provided, indicating:
- Breeding – Nest(s), birds carrying food, and/ or newly fledged young, family groups observed during the survey
 - Probable breeding – Relates to species observed regularly in suitable habitat displaying territorial behaviour or other behaviour indicative of breeding
 - Possible breeding – Relates to species observed in suitable habitat on isolated occasions or observed in suboptimal habitat
- 4.3.52 The estimated number of breeding pairs present for each species is also estimated in **Table 4.3.4**.
- 4.3.53 Species distribution maps indicating which birds are of greatest conservation interest (illustrating species classified as Red or Amber on the List of Birds of Conservation Concern, after Eaton *et al.*, 2015), are provided in **Drawing 6.2.12**. Colour-coding illustrates species' conservation status as of high concern (red), moderate concern (amber) and low concern (green).

Table 4.3.5: Additional species recorded considered to be breeding/ possibly breeding

Species	Estimated number	BoCC	SBL	Breeding Status	Notes on Distribution
Blackbird	2-3	Green		Confirmed	Wooded areas
Black-headed Gull	0	Amber	✓	Not breeding	Grazed pasture outside Site boundary to north east
Blue Tit	3-4	Green		Breeding	Woodland on west side of Site
Bullfinch	2	Amber		Probable	Woodland at south of Site adjacent to River Spey scrub on eastern boundary
Buzzard	-	Green		Not Breeding	Observed hunting/ searching
Chaffinch	5	Green		Probable	Woodland throughout the Site
Coal Tit	1	Green		Probable	Woodland adjacent to playing field
Cuckoo	1	Red	✓	Possible	Woodland of River Spey (off Site)
Duncock		Amber	✓	Probable	Woodland area north of playing field
Grasshopper warbler	1	Red	✓	Probable	Marshy grassland in the northern part of the Site
Garden Warbler	1	Green		Possible	Dense scrub/ woodland adjacent to River Spey
Goldcrest	1	Green		Possible	Trees along field drain
Goldfinch	1	Green		Possible	Woodland around Ruthven Road (B970)
Great Tit	1	Green		Probable	Woodland towards the south of the Site
Goldfinch		Green		Possible	Woodland on east side of the Site
Kingfisher	1	Amber	✓	Possible	River Spey
Lesser Redpoll	2	Red	✓	Breeding	North of Site along Pitmain Burn and forest on north bank of River Spey
Long-tailed Tit	1	Green		Breeding	Marshy grassland adjacent to woodland on the eastern side of Site
Meadow Pipit	Up to 10 pairs	Amber		Breeding	Throughout marshy and semi-improved grassland
Mistle thrush	2	Red		Probable	Scrub adjacent to field drains and HML
Red-legged Partridge	2-3	Green		Probable	Marshy and semi-improved grassland in central parts of the Site
Reed Bunting	3	Amber	✓	Probable	Across marshy grassland and field drains
Robin		Green		Probable	Woodland surrounding Ruthven Road (B970)
Sand Martin	Colony of 20	Green		Breeding	Colony of ~ 20 individuals on south bank of River Spey
Sedge Warbler	2-4	Green		Breeding	Along field drains and marshy grassland/ swamp areas
Siskin	2-3	Green	✓	Possible	Wooded areas around playing field/ HML at the northern end of the Site
Song thrush	2	Red	✓	Probable	
Starling	2+	Red	✓	Confirmed	Wooded areas around playing field/ HML at the northern end of the Site

Species	Estimated number	BoCC	SBL	Breeding Status	Notes on Distribution
Willow Warbler	11 -12	Amber		Breeding	Common within scrub and wooded areas especially close to Ruthven Road (B970)
Wren	5-6	Green		Breeding	Woodland and scrub adjacent to River Spey
Woodcock	1	Red		Possible	Grassland and scattered trees in the east of the Site

Protected and Notable Species

4.3.54 An overview of information on protected and notable species is described in the section below. **Table 4.3.5** presents a summary of the evidence of protected or notable species located on the Dellmore Site during all walkover surveys; targeted bat and water vole survey findings are detailed in **Tables B.3** and **Table B.4**. All protected and notable species information is presented in **Drawing 6.2.9** in **Volume 3**, apart from Bat Roost Potential results, which are shown in **Drawing 6.2.13**.

Table 4.3.6: Protected species records

Date	Observer(s)	Grid reference	Species	Detail
06/01/17	JT/ SM	NH75520005	Otter	Spraint on plank bridge over Pitmain Burn
06/01/17	JT/ SM	NH75510005	Otter	Spraint on plank bridge over tributary of Pitmain Burn
06/01/17	JT/ SM	NN74959963	Badger	Possible foraging signs in grassland close to old hay shed at far west of Site
06/01/17	JT/ SM	NN75079946	Bat	Minor roost located at 1.5 m height in decaying alder tree
06/01/17	JT/ SM	NN75389940	Otter	Predated Atlantic Salmon - part eaten On bank of River Spey
06/01/17	JT/ SM	NN75979977	Pine marten/ mink scat	Scat located on outer beams in centre of Ruthven Bridge - likely only accessible to very agile species. Lack of strong scent indicates pine marten
06/01/17	JT/ SM	NN75239981	Brown Hare	sighting x 2 around Drain B
06/01/17	JT/ SM	NN75249991	Brown Hare	sighting in open grassland
06/01/17	JT/ SM	NH75150002	Brown Hare	sighting in open grassland
06/01/17	JT/ SM	NN75489986	Brown Hare	sighting in open grassland
20/01/17	JT/ SM	NN75249990	Brown Hare	Sighting in open grassland
03/02/17	JT/ MM	NH75180007	Brown Hare	Sighting in field to the west of Pitmain Burn
03/02/17	JT/ MM	NN75209935	Brown Hare	Dead brown hare in pen grassland
23/02/17	JT/ KD	NN75239981	Brown Hare	sighting x 2 around Drain B
24/03/17	JT/ MM	NN75359950	Badger	Potential snuffle hole along pathway close to River Spey
24/03/17	JT/ MM	NN75779994	Brown Hare	Sighting in pen grassland
24/03/17	JT/ MM	NH75060020	Brown Hare	sighting x 2 in open grassland
24/03/17	JT/ MM	NN75759993	Brown Hare	Sighting in open grassland
24/03/17	JT/ MM	NN75239939	Brown Hare	Dead brown hare in open grassland

Otter

- 4.3.55 Otter *Lutra lutra* spraint was recorded on small ‘plank’ bridges which cross the Pitmain Burn at its confluence with Drain A; this included very fresh evidence on the 6th January 2017. A half-eaten Atlantic Salmon was recorded on the banks of the River Spey which, in the surveyor’s experience, was considered likely to have been an otter prey item.
- 4.3.56 Habitats along the River Spey corridor are highly suitable for otter and they are likely to use the main river corridor, as well as the tributaries running through the Site, routinely. The extent of use of the main River Spey corridor may be limited by disturbance from what appears to be an informal right of way used by the local community (e.g. dog walking and fishing). However, otter may frequent the right bank of the Spey where very steep banks rule out disturbance due to limited public access.

Bats

- 4.3.57 The Dellmore Site contains a range of habitats that are of value to bats. The semi-improved and marshy grassland mosaics throughout the Site support invertebrate prey items and provide moderate quality habitat to foraging bats such as pipistrelle *Pipistrellus* species, brown long-eared bats *Plecotus auritus* and *Myotis* species.
- 4.3.58 The trees and scrub scattered throughout the Site provide both moderate quality foraging habitat, as well as potential commuting routes for a range of bat species. The River Spey and its riparian corridor bounding the Site to the south provide good quality habitat for both foraging and commuting bat species, and are likely to be utilised by a number of species, particularly Daubenton’s bat, *Myotis daubentonii* and soprano pipistrelle *Pipistrellus pygmaeus*, due to their association with aquatic habitats as described by Dietz *et al* (2007).
- 4.3.59 Walkover surveys during March 2017 reported that Bat Roost Potential (BRP) within the majority of Dellmore is limited due to the domination of open, grassland habitat, however amongst the over-mature alder trees along the River Spey corridor, and within scattered mature trees there are abundant opportunities for roosting bats. A single roost location within a small, but highly decayed alder stump, was noted during the March survey in this area through the presence of bat droppings within a cavity; however, no bats were recorded.
- 4.3.60 More detailed assessment of scattered trees within Dellmore undertaken in April 2017 identified further mature trees which support BRP (38 trees in total). These trees are scattered within grassland and scrub extending north east from the north end of the shinty pitch. The area of scattered trees and associated scrub is illustrated on **Drawing 6.2.13** in **Volume 3**. A number of the drains through the Site are surrounded by alder scrub and trees, however these areas are generally relatively immature and lack bat roost potential.
- 4.3.61 Of the 38 trees which support bat roost potential, five support high bat roost potential, 17 support medium potential and 16 support low roost potential. **Table 4.3.6** presents photographs of some of the potential roost features. The trees are broadly grouped together in a group of veteranized alder trees in the south-east part of the Site. Where significant cavities are present a number of these are occupied by jackdaw *Corvus monedula*.
- 4.3.62 Detailed results of bat roost potential surveys are documented in **Table B.3**.

Table 4.3.7: Example Bat roost potential features

<p>Photograph 1: Mature Alder Tree with cavities and lifted bark</p>	<p>Photograph 2: Cavity/ Rot hole in Alder</p>
	
<p>Photograph 3: Crack / Split in mature Alder</p>	<p>Photograph 4: Large cavity in mature Alder</p>
	

Brown Hare

- 4.3.63 Brown hare *Lepus europaeus* were recorded on all site visits, with a peak count of five noted on any one occasion. Sightings were widespread in open grassland areas throughout the Site.

Deer

- 4.3.64 Roe deer *Capreolus capreolus* were recorded throughout the grassland on Dellmore, with a maximum count of five individuals. The grassland provides foraging habitat, and the long unmanaged nature of the sward, as well as the woodland and scrub in the surrounding areas provides suitable resting areas for this species.

Badger

- 4.3.65 No definitive signs of badger *Meles meles* were recorded during the site surveys, however some field signs indicating potential foraging presence were noted. These included recent snuffle holes (foraging activity in the ground) and a possible old burrowing wasp nest site, which may have been removed by badger in the past.

Water Vole

The Pitmain Burn, Drain A and Drain B were identified as supporting suitable bankside structure and vegetation for foraging water vole *Arvicola amphibious* during walkover surveys in March 2017. Whilst no incidental field signs were noted during these walkovers, it is possible that water vole activity was low as animals were yet to emerge from winter nests. All watercourses are noted as being susceptible to high water levels and flooding, reducing their potential suitability to support water vole burrows.

- 4.3.66 Targeted water vole surveys in September 2017 located evidence of water vole activity in riparian areas of Pitmain Burn, this included the section of watercourse downstream of the confluence with Drain A, and the section upstream of this confluence. Signs included latrines, singular droppings, runs and feeding stations; full results are detailed in **Table B.4**.
- 4.3.67 One water vole dropping, and a single burrow were recorded in the downstream confluence section of Pitmain Burn with these two records being approximately 100 m from one another. No other signs were recorded and therefore the burrow could not be confirmed to be in use by water vole. Multiple runs and latrines of field/ bank vole were recorded on this section.
- 4.3.68 The upstream confluence section of Pitmain Burn contained more signs of water vole. Multiple latrines were recorded alongside feeding stations, with one burrow recorded. It was noted that given the dense vegetation at the time of survey, more burrows are likely to be present along this stretch of watercourse. However, one dropping, which was dark in colour, could be brown rat *Rattus norvegicus*. In total, four separate records of latrines/ droppings were found along the length of this burn. Two mustelid species scats were also recorded along the watercourse, with stoat *Mustela erminea* recorded on Site during previous walkover surveys.
- 4.3.69 Drain A contained no definitive signs of water vole. Multiple burrows were recorded, however could not be verified through other field signs. Runs were present around one burrow that had potential to be water vole, however no other signs were present.
- 4.3.70 No water vole signs or potential signs were recorded on Drain B.

Red Squirrel

- 4.3.71 No signs of red squirrel *Sciurus vulgaris* were identified on Site, and overall the habitats are sub-optimal for the species, being dominated by grassland habitats. Woodland connectivity is limited to riparian woodland and along the River Spey, which is dominated by alder and considered to be relatively species-poor for red squirrel.

Pine Marten

- 4.3.72 A single scat was located on the outer ledge of Ruthven Bridge in January 2017. The scat was considered to be too large to belong to smaller mustelid species and in an area considered inaccessible to stoat or weasel. On this basis, and due to the lack of any obvious scent indicative of red fox *Vulpes vulpes* it is considered most likely to belong to pine marten *Martes martes*.

Mink (non-native)

- 4.3.73 A probable American mink *Neovison vison* scat was located within the Dellmore Site adjacent to one of the minor island features located adjacent to the left bank of the River Spey. Mink monitoring rafts were also observed on the left bank of the River Spey indicating historic management of this species. American mink is a non-native species which has been released into the wild in Great Britain. The species is a very effective predator of a range of native species and the presence of mink has been closely associated with declines of native water vole in many areas.

Stoat

- 4.3.74 Stoat *Mustela erminea* was observed at the western boundary of the Dellmore Site within a trap, indicating predator control measures are currently undertaken in the vicinity.

4.4 Evaluation

Water Vole

- 4.4.2 Water vole activity during targeted water vole surveys in September 2017 identified confirmed presence of water vole on the Pitmain Burn only, at this stage. Evidence of potential burrows is present on Drain A towards the western extent of the Site though no confirmed signs of activity/latrines are reported in that area at this stage. There is likely to be a small population of water vole within the Dellmore Site which utilise suitable habitats along Pitmain Burn and other watercourses/ drains within the Site. Evidence of fox, mink and small mustelid species indicates that water voles present are likely to be under significant pressure from predation.

Breeding Birds

- 4.4.3 The Dellmore Site was found to support breeding snipe (possibly up to four pairs) and probable breeding curlew (one to two pairs). No lapwing were reported within the Site boundary, however were confirmed breeding in land to the east of Pitmain Burn immediately adjacent to Site. Oystercatcher were also confirmed breeding in grazed land immediately adjacent to the Site, as well as using river gravels around the River Spey to the south of the Site.
- 4.4.4 The presence of some breeding waders indicates that overall ground conditions in the more northerly and some eastern parts of the Site may at present allow foraging (probing) for a range

of breeding waders, however the rank nature of the vegetation on Site which is at present subject to only light grazing pressure by a small number of brown hare and roe deer is prohibitive to breeding waders utilising the Site. A range of studies confirm that both lapwing and redshank are unlikely to utilise ground with long vegetation as present on the Site. Similarly, the presence of tall vegetation (scrub and trees) are likely to reduce the attractiveness of the Site to breeding wader species.

NVC Survey

- 4.4.5 Notable habitats are identified as a conservation priority through relevant legislation or planning policy, including:
- internationally important habitats identified in Annex 1 of Council Directive 92/43/EEC (the Habitats Directive) (JNCC, 2016)
 - nationally important habitats identified in the Scottish Biodiversity List (SBL)
 - regionally important habitats identified in the Cairngorms Nature Action Plan (CNAP)
- 4.4.6 SEPA has also classified a number of NVC communities as being potentially dependent on groundwater and vulnerable to hydrogeological change (SEPA, 2014a, 2014b). Many of these Groundwater Dependent Terrestrial Ecosystems (GWDTE) contain NVC communities that are very common across Scotland and some are otherwise of low ecological value. Nevertheless, the Water Framework Directive (WFD) seeks to protect, enhance and restore the water environment and confirmed GWDTE.
- 4.4.7 NVC communities recorded within the study area that correlate with notable habitats, as well as their potential groundwater dependency based on SEPA guidance, are summarised in

Table 4.4.1.

Table 4.4.1: NVC communities, notable habitats and potential GWDTE status

NVC Codes Recorded	Potential GWDTE Status	Annex I Type Code	SBL Priority Habitat Type	CNPA Priority Habitat Type
Woodland				
W3	Moderate	-	Wet woodland	Wet & riparian woodland
W7	High	91E0 Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i>	Wet woodland	Wet & riparian woodland
Mires				
M23	High		Coastal and floodplain grazing marsh	Wetlands
M27	Moderate		Lowland fens	Wetlands
Mesotrophic grasslands				
MG9, MG10	Moderate		Coastal and floodplain grazing marsh	Wet grasslands
Swamps				
S9	N/A		Lowland fens	Wetlands

- 4.4.8 One community, the wet woodland community W7, is an Annex 1 habitat, however the small and fragmented nature of the habitat within the survey area means it cannot be considered a prime example of the habitat.

- 4.4.9 Eight NVC communities fall within three SBL Priority Habitats, as follows: wet woodland (W3, and W7), Coastal and Floodplain Grazing Marsh (M23, MG9 and MG10) and Lowland Fens (M27 and S9).
- 4.4.10 Seven NVC communities fall with three CNPA Priority Habitats, as follows: wet and riparian woodland (W3 and W7), Wetlands (M23, M27 and S9) and Wet Grasslands (MG9 and MG10).
- 4.4.11 High value habitats are therefore largely confined to the eastern side adjacent to Ruthven Road and the Site peripheries, particularly adjacent to the River Spey to the south and the Site's streams and ditches to the north. The bulk of the Dellmore Site, consisting of the rank grassland community MG1, falls outside any of the above nature conservation designations and is of low nature conservation value.
- 4.4.12 Seven NVC communities within 24 habitat areas are identified as 'potential' GWDTE (W3, W7, M23, M27, MG9, MG10 and S9), as shown in **Drawing 6.2.14** in **Volume 3**. For each of these, qualitative analysis of the NVC communities and sub-communities present and consideration of possible water supply mechanisms based on site observations, the local topography, underlying geology and the potential for surface water contributions to each habitat has been undertaken. This was completed in order to determine their 'likely' groundwater dependence and the findings are presented in **Table B.5**, **Table B.6** and **Table B.7**.
- 4.4.13 Of the 24 habitats assessed, none have been identified as being likely to have a high dependence on groundwater, as each area is expected to receive reasonable contributions of surface water via the River Spey and other watercourses, and from flooding periodically associated with these.
- 4.4.14 However, the underlying hydrogeology and monitoring information available at the time of writing also suggest that groundwater inputs to the majority of habitats cannot be entirely ruled out. The dominant vegetation in 23 of the areas has therefore been assessed to have a moderate dependence on groundwater. The remaining area which covers the majority of the southern part of the Site has also been assessed to have a moderate dependence on groundwater, however this rating only applies to the sub-dominant (10%) cover of this – which occurs in local topographical lows, former palaeochannels or in association with drainage features.

5 Geology, Soils and Groundwater

5.1 Approach and Methods

- 5.1.1 Baseline conditions in relation to geology, soils and groundwater at the Site have been determined through desk-based data assessments, ground investigations and site walkovers, as referenced in **Chapter 10 (Volume 1)**. The baseline conditions described in the following sections cover superficial and solid geology, soils, groundwater and potential contamination sources.

5.2 Baseline Conditions

Geology

- 5.2.1 As shown in **Drawing 6.2.15 in Volume 3**, published British Geological Survey (BGS) mapping indicates the superficial deposits within the Site to comprise alluvium deposits (clay, silt, sand and gravel) throughout, which are underlain by lacustrine (clay, silt and sand) at unknown depth. The solid geology comprises Precambrian Psammite of the Loch Laggan Psammite Formation; recorded as micaceous and feldspathic psammite with thin semi-pelite beds and possible calc-silicate rock lenses and bands, as shown in **Drawing 6.2.16 in Volume 3**. No areas of faulting are indicated.
- 5.2.2 Intrusive ground investigations were undertaken at the Site by BAM Ritchies in October 2017, comprising five boreholes (DL-BH01 to DL-BH05; locations shown in **Drawing 6.2.4**) to a depth of 10.00 m below ground level (m bgl) and the installation of groundwater monitoring standpipes within these. The factual results of the investigations are presented in the ‘*A9 Dualling – Glen Garry to Dalraddy, Project 9 Crubenmore to Kincaig Draft Final Report on Ground Investigation*’ (BAM Ritchies, July 2018) and reported the superficial deposits to vary from very soft silt and clay to loose and dense sand and gravel. Peat up to 1.00 m thickness was also observed at 3.00 m bgl in one location in the east of the Site, buried beneath layers of silt and sand.
- 5.2.3 The thickness of the individual superficial horizons varied from 0.40 to 5.50 m and these were recorded across the full depth of the boreholes. However, the total superficial thickness and depth to bedrock at the Site were not proven in any location.

Soils

- 5.2.4 As illustrated in **Drawings 6.2.17 and 6.2.18 in Volume 3** the soils underlying the Site comprise mineral alluvial soils with peaty alluvial soils, derived from recent riverine alluvium and lacustrine alluvial deposits along streams and rivers. These soil types can widely vary in texture, from gravel to silty clay, and exhibit variable drainage characteristics, from free to very poor.

Groundwater

- 5.2.5 The SEPA River Basin Management Plan (RBMP) interactive map (SEPA, 2017) indicates the Site is underlain by the Spey Valley (upstream of Kingussie) sand and gravel aquifer. The WFD classification from 2008 for groundwater in the aquifer is ‘good’ with ‘high’ confidence for both quantity and quality, with no trend for pollutants and no current pressures.

- 5.2.6 As shown in **Drawing 6.2.19** in **Volume 3**, the superficial alluvial deposits throughout the Site are identified to be moderate to high in productivity with intergranular flow. Bedrock underlying this is classified as very low in productivity, as shown in **Drawing 6.2.20** in **Volume 3**, with groundwater storage and flow likely to be limited to weathered zones and fractures.
- 5.2.7 Groundwater was encountered in three of the boreholes during drilling (DL-BH02, DL-BH04 and DL-BH05), with water strikes between 0.90 and 1.20 m bgl in the superficial deposits. The other two boreholes (DL-BH01 and DL-BH03) in the southwest and east of the Site were recorded as dry. Post-investigation groundwater level data has been collected from all five borehole locations using continuous monitoring equipment though, between November 2017 and June 2018, with the observed depth ranges summarised in **Table 5.2.1**.

Table 5.2.1: Monthly Groundwater Level Measurement Ranges (m bgl and m Above Ordnance Datum (AOD))

Month	Monthly Borehole Groundwater Level Ranges									
	DL-BH01		DL-BH02		DL-BH03		DL-BH04		DL-BH05	
	m bgl	m AOD	m bgl	m AOD	m bgl	m AOD	m bgl	m AOD	m bgl	m AOD
November 2017	0.00 – 0.42	221.94 – 221.52	0.84 – 1.89	222.62 – 221.57	0.66 – 1.68	223.43 – 222.41	0.00 – 2.10	223.09 – 221.01	0.04 – 0.45	222.70 – 222.29
December 2017	0.00 – 0.41	221.94 – 221.53	0.72 – 1.52	222.74 – 221.94	0.59 – 1.54	223.50 – 222.55	0.00 – 0.70	223.09 – 222.39	0.04 – 0.42	222.70 – 222.32
January 2018	0.00 – 0.46	221.94 – 221.48	0.20 – 1.55	223.26 – 221.92	0.00 – 1.52	224.09 – 222.57	0.00 – 0.69	223.09 – 222.40	0.00 – 0.51	222.74 – 222.23
February 2018	0.00 – 0.49	221.94 – 221.01	1.01 – 1.57	222.45 – 221.89	0.81 – 1.56	223.28 – 222.53	0.19 – 0.73	222.90 – 222.36	0.15 – 0.55	222.60 – 222.19
March 2018	0.25 – 0.50	221.70 – 221.44	1.32 – 1.62	222.15 – 221.84	1.28 – 1.64	222.81 – 222.46	0.52 – 0.77	222.57 – 222.32	0.31 – 0.57	222.43 – 222.17
April 2018	0.10 – 0.50	221.84 – 221.44	1.16 – 1.64	222.30 – 221.82	1.03 – 1.68	223.06 – 222.42	0.49 – 0.76	222.60 – 222.33	0.44 – 0.55	222.30 – 222.19
May 2018	0.44 – 0.73	221.50 – 221.21	1.58 – 1.81	221.88 – 221.65	1.58 – 1.71	222.51 – 222.38	0.73 – 1.02	222.36 – 222.07	0.50 – 0.81	222.24 – 221.93
June 2018	0.60 – 0.75	221.34 – 221.19	1.69 – 1.83	221.77 – 221.63	1.59 – 1.72	222.50 – 222.37	0.94 – 1.05	222.15 – 222.04	0.65 – 0.84	222.09 – 221.90

- 5.2.8 Based on the monitoring ranges observed, groundwater flow in the superficial deposits appears likely to follow the local surface topography and flow direction of the River Spey, to the east and north east, as inferred in **Drawing 6.2.4** in **Volume 3**. Flows are also likely to be locally variable within the boundaries of the Site, being influenced by the presence of other adjacent surface water features and drainage channels.
- 5.2.9 In-situ permeability tests were not completed as part of the ground investigations within the Site. However, analysis of soil particle size distribution testing using Hazen’s formula indicates the superficial deposits are likely to have variable permeability, with estimates of between 10^{-2} and 10^{-8} metres per second (m/s). This variation is likely to be result of the heterogeneous soil types observed (silt, clay, sand, gravel and peat).

Potential Contamination

- 5.2.10 Review of historical Ordnance Survey (OS) mapping for the Dellmore Site identified that a rifle range was present within the Site boundary from around 1843 until the early 1960s, comprising a target mound in the south-western corner and a series of butts extending to the north east of this, at 50 to 100-yard intervals and up to 1000 yards. Additional desk-based research identified that this was likely to have comprised a small arms range, utilised by local volunteer forces in Kingussie, prior to and during World War I.

- 5.2.11 There are few available records with regards to the use of the range following the World War I period and the Site is currently used for recreational activities by members of the general public (including dog walking, deer/ hare coursing and pony trekking). However, information obtained from The Highland Council (THC), Historic Environment Records (HER), Canmore database and site walkovers (CFJV, November 2017; March 2018) identified that some remnants of the rifle range remain. These include the target mound in the south-western corner of the Site (275130, 799368), with a series of three possible butts at approximate 90 m intervals to the north east of this (275206, 799422; 275265; 799488; 275324, 799562) and a fourth butt approximately 200 m beyond (275463, 799729).
- 5.2.12 The target mound comprises sand and gravel banks of earth with some adjacent slit trenches and areas of modern detritus such as iron girders, corrugated sheeting and broken-up reinforced concrete. Such materials are likely to be related to the demolition of a cattle shed, which was reported to have been built into the mound on the Canmore database entry. However, other material associated with the area's use as a rifle range have also been observed within and adjacent to the mounds – including spent bullets and bullet fragments. The former butt areas are not distinct due to vegetation cover, however their locations correspond to identifiable low mounds of earth between 5 to 6 m in length and 1 to 2 m in breadth.
- 5.2.13 Due to the historical presence of the rifle range, risks of potential contamination were identified at the Site; as activities associated with these ranges can result in soil and water pollution due to deposited bullets and/ or bullet fragments. In addition to the physical remnants of these, potential contaminants that can be present in soils or water primarily include metals (antimony, arsenic, copper, lead, nickel and zinc) and polycyclic aromatic hydrocarbons (PAHs) from non-exploding bullets and bullet fragments, bullet jackets and target materials.
- 5.2.14 Based on these considerations, chemical testing of soil samples was completed as part of the ground investigations undertaken by BAM Ritchies in October 2017. Soil samples were retrieved from the five boreholes across the Site (DL-BH01 to DL-BH05), in addition to four hand excavation pits that were focussed around the target mound area (DL-HP01 to DL-HP04) in the south west corner, as shown in **Drawing 6.2.3** in **Volume 3**. An additional 32 hand excavation pits were also completed by CFJV in March 2018 around the target mound area and possible former butts, as shown in **Drawing 6.2.21** in **Volume 3**, while samples of groundwater were retrieved from the borehole installations (DL-BH01 to DL-BH05) by BAM Ritchies in June 2018. Testing of both soil and groundwater samples was undertaken to establish the concentrations of metals, PAHs and other contaminants in these, as well as establish the potential for those contaminants to leach from the soil into groundwater.
- 5.2.15 The results of the chemical testing are presented in the '*A9 Dualling – Glen Garry to Dalraddy, Project 9 Crubenmore to Kincaig Draft Final Report on Ground Investigation*' (BAM Ritchies, June 2018) and are otherwise, summarised in **Tables C.1 to C.4**. These have been initially screened against published generic assessment criteria for human health and the water environment, to provide an assessment of potential risks that the concentrations may represent to current or future Site users, groundwater and surface water. Non-exceedance of the criteria indicate that risk levels from the contaminants are acceptable, while exceedances indicate that further assessment may be needed.
- 5.2.16 The criteria for the human health assessment were sourced from '*Suitable for Use Limits for Human Health Risk Assessment*', Land Quality Management (LQM)/ Chartered Institute of Environmental Health (CIEH) (2015) and '*Category 4 Screening Levels for Assessment of Land Affected by Contamination*', Department for Environment, Food and Rural Affairs (DEFRA) (2014). Those applicable to a public open space (park) land use were utilised on the basis of the current

and intended land use and to provide an indication of potential risks. This was also considered to be conservative based on the assumptions used in the derivation of these criteria, in relation to the nature and exposure characteristics of the critical receptor.

- 5.2.17 As shown in **Table C.1**, the vast majority of contaminant concentrations recorded in soils are not elevated. However, eleven individual concentrations of lead (between 1,600 and 6,500 milligrams per kilogram (mg/kg)) are observed to exceed the criteria in ten locations, as shown in **Drawing 6.2.21** in **Volume 3**, at depths between ground level and 0.50 m bgl. Each of the exceedances are from locations at or around the target mound, with the highest concentrations apparent within the mound itself, consistent with the presence of spent bullets and bullet fragments.
- 5.2.18 The results of the soil leachate and groundwater analysis were compared against water quality standards for drinking water, surface water and wetlands in accordance with SEPA Position Statement WAT-PS-10-01 'Assigning Groundwater Assessment Criteria for Pollutant Inputs' (SEPA, 2014). As shown in **Table C.2** and **Table C.3**, exceedances of the drinking water standards were identified in soil leachate, with elevated concentrations of lead (55 to 150 ug/l) observed in seven locations and antimony (11 to 51 ug/l) in four locations. Elevated concentrations of copper (52 to 93 ug/l) were also encountered in three locations, and elevated concentrations of nickel (25 to 27 ug/l) in two locations – all at depths between ground level and 0.50m. The same contaminants exceeded the surface water standards in the same locations, except for lead, which exceeded the criteria in eight additional locations at depths between ground level and 1.00m, as shown in **Drawing 6.2.21** in **Volume 3**. One soil leachate nitrate concentration (13 ug/l) also exceeded the wetland threshold applicable to wet grassland in one location, while low-level and marginally elevated soil leachate detections were observed for some PAH compounds, in soil leachate and groundwater, though these appear unlikely to be associated with the former rifle range given the concentrations reported.
- 5.2.19 Similar to the soil results, the soil leachate exceedances were observed from sample locations within and adjacent to the former target mound and similar contaminants were not observed to be elevated elsewhere across the wider Site. The available groundwater chemical testing results, as shown in **Table C.4**, also did not record similar contaminants to be elevated. Indeed, only concentrations of manganese (63 to 1300 ug/l) were noted to exceed the drinking water and surface water standards in the groundwater sample locations, and given the concentrations of this reported in the soil and soil leachate, the levels appear unlikely to be associated with the former rifle range. However, it is noted that the borehole positions relative to the inferred groundwater flow direction shown in **Drawing 6.2.4** and areas of inferred soil and soil leachate contamination impact shown in **Drawing 6.2.21**, also indicate that the presence of associated contaminants in closer proximity to the mound and to the north east of it, cannot be discounted.
- 5.2.20 Based on the chemical testing results available and the initial screening assessment of them, the metal contaminant concentrations recorded in soil (lead) and soil leachate (antimony, copper, lead and nickel) around the former target mound have the theoretical potential to represent risks to human health (current and future Site users) and the water environment (groundwater and surface water) at the Site. This is based solely on an initial screening risk assessment at this stage using conservative generic assessment criteria, and additional assessment of the results is ongoing at the time of writing, to further determine the actual risk levels in more detail. This is planned to be supplemented with further investigative works (hand excavation pits, shallow boreholes, groundwater and surface water chemical testing) and the development of a site-specific conceptual site model and risk assessment on the basis of these, to determine if remedial action is necessary.

6 Cultural Heritage

6.1 Introduction

- 6.1.1 An initial review of historical mapping was carried out in order to provide a more detailed understanding of the Site's environmental baseline, to help develop a concept design for the Site and to determine the requirement for further survey work.
- 6.1.2 This initial review showed that the planform of the River Spey and its floodplain across the Dellmore Site appear to have changed little since the 1840s. The drainage ditches across the Site appear on 1843 OS mapping, see **Figure 6-1**, suggesting they were constructed prior to this date, and they appear to have been maintained (to differing degrees) to the current day.
- 6.1.3 These ditches were likely created in the 1840s when grants were available from the government to improve land for agriculture through improvements in drainage; this drainage network will be acting to lower the water table in the floodplain, increasing the runoff rate into the River Spey.



Figure 6-1: Rifle range documented on OS Six Inch (1843-1882) on the left and OS One Inch 7th Series (1955-61) on the right

- 6.1.4 Also shown on the OS 1843-1882 map, and depicted up until OS 1955-61, is a rifle range within the Site. There are two Highland Council Historic Environment Records (HER) for a firing range (grid reference NN75138 99366), stating that it is “shown on the 1st edition OS map, 1872.”, and that it was a “1000 yard range”.
- 6.1.5 The Canmore record of the disused firing range states that it extends from NN 7513 9937 to NN 7545 9973 with the archaeological notes stating that:
- “[i]t comprises a large oblong target mound at the SW end (NN 7513 9937) and a series of three butts at 90m intervals to the NE, with a fourth a further 212m beyond (NN 7545 9973). The curve of the river may have removed an intervening butt. A cattle-shed has been built into the target-mound at the SW end so that it is no longer in its original form. The butts have been reduced to low mounds between 7m and 8m in length and from 2m to 2.5m in breadth. The rifle range is depicted on the 1st edition OS 6-inch map which shows that it extended to 1000 yards”.*
- 6.1.6 Based on this information, CFJV commissioned Orkney Research Centre for Archaeology (ORCA) to carry out a desk based archaeological assessment (DBA) and Walkover Survey at the Dellmore Site.

6.2 Approach and Methods

Desk-Based Assessment

- 6.2.1 ORCA carried out a Desk-based Assessment (DBA) in accordance with the Standards and Guidance for Historic Environment Desk-based Assessment issued by the Chartered Institute for Archaeologists (CIfA) (2014a) and the Standards for Archaeological Work issued by the Highland Council (2012).
- 6.2.2 Information on known heritage assets within a 1 km area centred on the Dellmore Site (NGR NN 275201 799523), was used to identify sites that may be both directly and indirectly affected by any proposed works. This information was used to put the Site within its full archaeological and historical context, and the potential for unknown heritage assets that may be present within the Site boundary was assessed (see **Drawing 6.2.22, Volume 3**).
- 6.2.3 Each cultural heritage Site within the assessment area was assigned an individual site number (ORCA No.), see **Table D.1** and **Table D.2**.
- 6.2.4 The DBA reviewed the following sources:
- The National Monuments Record of Scotland, using the ‘Canmore’ and ‘Pastmap’ database websites: accessed 23/11/2017
 - The local Sites and Monuments Record (SMR) using the Highland Council Historic Environment website: accessed 23/11/2017
 - Relevant historic maps available on the National Library of Scotland website: accessed 23/11/2017
 - Statutory lists, registers and designated areas, including List of Scheduled Monuments, Listed Buildings, Inventories of Gardens & Designed Landscapes and Historic Battlefields, and local authority Conservation Areas
 - Appropriate archaeological and historical journals, monographs and books, including the Old and New Statistical Accounts of Scotland
 - Relevant unpublished material by professional and amateur archaeologists and historians
 - Lidar imaging via the Scottish Remote Sensing Portal

Walkover Survey

- 6.2.5 A walkover survey was executed by ORCA in accordance with the Standards and Guidance for Archaeological Field Evaluation issued by CIfA (2014b) and the Standards for Archaeological Work issued by the Highland Council (2012).
- 6.2.6 The walkover survey focussed on the area within a bend of the River Spey and associated with the known location of the Rifle Range (ORCA 01). The walkover area, depicted as the hatched area in **Drawing 6.2.22**, consisted of an area measuring 0.192 km² and was surveyed on 29th October 2017; transects were spaced at 10 m intervals.
- 6.2.7 Features or sites identified were assigned an individual site number (ORCA No.), recorded by notes, sketches, photographs and handheld GPS; the accuracy of the co-ordinates for the sites was also recorded.

Assessment of Significance and Relative Importance

- 6.2.8 Cultural significance lies in the value of a heritage asset to this and future generations because of its heritage interest; this may be artistic, archaeological, architectural, historic, traditional³, aesthetic, scientific or social. Known and potential heritage assets within the Dellmore Site and the wider study area have been identified from national and local designations, SMR data and ORCA’s professional opinion.
- 6.2.9 The determination of the cultural significance or value of historic environment assets is based on statutory designation and/ or professional judgement against the characteristics and criteria expressed in HES Policy Statement 2016, Annexes 1 to 6 (summarised in **Table 6.2.1**).
- 6.2.10 For example, for archaeological areas, sites and monuments the following characteristics are used⁴:
- *Intrinsic*: the condition in which the monument has survived. This includes the potential survival of archaeology above ground and buried, and goes beyond the survival of marked field characteristics. The archaeological, scientific, technological or other research potential of the monument or any part of it needs to be considered. The apparent development sequence of the monument as well as the original or subsequent functions of the monument and its parts is also considered.
 - *Contextual*: relates to the monument’s place in the landscape or within the body of existing knowledge. This takes into account the rarity of the monument as well as the relationship of the monument to other monuments of the same or related classes or period, or to features or monuments within the vicinity. The relationship of the monument within the wider landscape and setting are also considered.
 - *Associative*: historical, cultural and social influences that have affected the form and fabric of the monument as well as the aesthetic attributes and cultural significance in the national consciousness. This is also influenced by the way in which historical, traditional or artistic characters or events have been derived from the monument.
- 6.2.11 For determining the cultural heritage significance or value of historic buildings, the following characteristics are used⁵:
- *Age and rarity*: the older a building is and the fewer of its type to survive, the more likely it will be of special interest. Age is a major factor in the evaluation process of a building, but the weight differs across building types.
 - *Architectural or Historic Interest*: interior and exterior design; the internal planning of the building; evidence of structural or material innovation and regional variation of the building are all taken into account. The setting of the building is also a critical factor.
 - *Close Historical Association*: close association with nationally important people or events that have been well-documented and where the fabric of the building is also of some quality or interest can be a significant factor. This association must be well authenticated and significant.

³ Factors listed in the Ancient Monuments and Archaeological Areas Act, 1979.

⁴ From HES Policy Statement 2016: Annex 1: Criteria for and guidance on the determination of ‘national importance’ for scheduling. Cultural significance defined in the Policy Statement should not be confused with the unrelated usage of significance in referring to effects in EIA.

⁵ From HES Policy Statement 2016: Annex 2: Criteria for determining whether a building is of ‘special architectural or historic interest’ for listing.

- 6.2.12 For determining the cultural heritage significance or value of other kinds of assets, e.g. conservation areas, historic gardens or designed, the relevant HES Policy Statement annex was used.
- 6.2.13 The relative importance (national, regional or local) of a historic environment asset is identified by the heritage authorities by assessing the degree to which the asset has a particular cultural significance using the characteristics outlined above and the criteria identified in Scottish Historic Environment Policy (SHEP) Annexes and on the HES website⁶; this section follows that guidance.
- 6.2.14 The cultural heritage significance or value attributed to each identified historic environment asset reflects the sensitivity of the asset to potential impacts and disturbance, and is recorded in **Tables D.1 and D.2**.
- 6.2.15 These criteria incorporate general policy and guidance used by statutory agencies to assign a level of cultural significance to assets as described above. Such policy and guidance include HES Policy Statement 2016, Scottish Planning Policy (SPP) (Scottish Government, 2014), with the companion Planning Advice Note (PAN 2/2011): Planning and Archaeology and Managing Change in the Historic Environment Guidance Notes (Historic Scotland, various dates).

Table 6.2.1: Criteria for Definitions of importance or sensitivity of cultural heritage assets

Significance and Sensitivity of receptor	Cultural heritage value/ relative importance criteria
High	World Heritage Sites Scheduled Monuments and sites proposed for scheduling Category A Listed Buildings Inventoried Gardens and Designated Landscapes Outstanding Conservation Areas Historic Battlefields Historic Marine Protected Areas Undesignated wrecks, archaeological sites, areas and buildings of national importance (identified in the NMRS/SMR)
Medium	Category B and Category C(S) Listed Buildings Burial Grounds Protected heritage landscapes Conservation Areas Undesignated archaeological sites, areas and buildings of equivalent regional importance (identified in the NMRS/SMR), or of high local value
Low	Cultural heritage assets of poor preservation and/or poor survival of contextual associations Cultural heritage assets of local value or interest for education or cultural appreciation Undesignated archaeological sites, areas and buildings of equivalent local importance (identified in the NMRS/SMR) Unlisted historic buildings and townscapes with local characteristics
Negligible	Sites of former archaeological features Unlisted buildings of very minor historic or architectural interest Poorly preserved examples of particular types of features Single artefact findspots Sites of little or no known importance
Uncertain	Features or sites that cannot be identified without detailed work, but potentially may be of some interest Findspots, which may represent an isolated find, or could represent the location of a hitherto unknown site

⁶https://www.historicenvironment.scot/advice-and-support/listing-scheduling-and-designations/listed-buildings/what-is-listing/#categories-of-listed-building_tab

Limitations

- 6.2.16 The desk-based assessment and walkover surveys were extensive but not exhaustive, thus there remains the possibility that there may be sites or features of archaeological or historical significance that have not been identified by the desk-based assessment.
- 6.2.17 During the walkover survey, every effort was made to thoroughly investigate all parts of the selected area. The ground conditions throughout the assessment area consisted of tussocks of sedge and long grass up to 1 m in height in places. This vegetation cover partially inhibited the surveyor's ability to identify features within the landscape.

6.3 Baseline Conditions

Prehistoric Period c.9000BC to AD800

- 6.3.2 Although there are numerous sites dating to the prehistoric period within the wider environs of Kingussie and the Highlands, there are no records relating to sites from this period within the Site.
- 6.3.3 Two records exist for sites, ORCA 05 and 06, recorded as being located within 1 km of the Site (**Drawing 6.2.22**). The actual location of these sites is uncertain, however, as their National Grid References given in the Canmore data are a four-figure reference for an Ordnance Survey map sheet. These records are for the find of a carved stone ball in 1885, dating to the Neolithic Period (ORCA 05) and a Neolithic/Bronze Age stone circle, known as the Rath of Kingussie (ORCA 06), which is also thought to have been used as a Moot (a meeting place) during the Medieval Period.

The Medieval Period (c. AD 800 to c.1559)

- 6.3.4 There are no records relating to sites from this period within the Site.
- 6.3.5 Evidence for medieval land managements and agriculture is present within the wider environs of Dellmore of Kingussie. On the south side of the River Spey, directly to the southwest of the Site, a series of intercutting blocks of rig and furrow have been recorded on oblique aerial photographs (ORCA 03). Although these features fall outside of the Site, they demonstrate a baseline of activity, which may have continued on the north side of the river, however are no longer visible due to the current land use.

The Post Medieval Period (c.1559 to c.1900)

- 6.3.6 There are no records relating to sites from this period within the Site.
- 6.3.7 The cited location of a tollbooth, ORCA 04, is within 1 km of the Site, though the exact location of the tollbooth is not known. Its most likely location is within the historic town of Kingussie, rather than within the development area.

The Modern Period (c.1900 to 1950)

- 6.3.8 The focus of the walkover survey was to assess the features associated with a rifle range at Dellmore, Kingussie (ORCA 01). The remains of the rifle range comprise a large, oblong target mound at the southwest end of the Site; the Royal Commission for the Ancient and Historic Monuments of Scotland also identified a series of four shooting butts at 90 m intervals to the

northeast in 1995. The butts were described as low mounds between 7 m and 8 m in length and from 2 m to 2.5 m in breadth.

- 6.3.9 The rifle range is depicted on the 1st edition OS 6-inch map, which shows that it extended to 1,000 yards (Inverness-shire 1872, sheet cii). The date of the map indicates that this site was used well before the outbreak of the First World War, probably for training local volunteer units.
- 6.3.10 The walkover survey located the main target mound in the southeast quadrant of the Site. The mound has been altered to accommodate a cattle-shed in modern times. The walkover survey also identified a number of sub-rectangular pits and a series of associated linear trenches, situated directly to the northeast of the target mound. A total of four sub-oval to sub-rectangular pits were identified, measuring between 10 m long by 6 m wide by 1 m deep to 5 m long by 4 m wide by 0.5 m deep.
- 6.3.11 A total of three linear trenches were identified, including a Y-section shaped on an east-west orientation measuring 13 m long in total, a dog-legged section measuring 10 m southwest–northeast before turning 5 m to the southeast, and a southeast-northwest orientated section, measuring 13 m long and turning to the north. All the linear trenches had a width of approximately 1 m.
- 6.3.12 A large amount of modern detritus, including rusting iron girders, corrugated sheeting and broken-up reinforced concrete was noted. This material is likely to be related to the demolition of the modern cattle shed, though some may relate to the use of the shooting range during the First World War.
- 6.3.13 The presence of modern detritus and vegetation cover is likely to have obscured the greater detail of the features as well as any more ephemeral features. It is probable that the arrangement of slit trenches and pits is more extensive than could be identified during the walkover survey.
- 6.3.14 It was not possible to verify the continued survival of the additional shooting butts situated up to 250 m to the northeast. This may partially be due to the vegetation cover masking the presence of extant earthworks, though it is also possible that they are no longer present as extant features.
- 6.3.15 Examination of the Lidar data for the site clearly shows the extant remains of the target mound, as well as linear features which relate to modern trackways and paths. There is no sign of the additional features identified by the walkover survey, or the additional shooting butts to the north east. It is likely that the vegetation cover and modern detritus within the vicinity of the target mound masked the presence of these features.
- 6.3.16 The firing range clearly dates to at least the 1870s, when it was annotated on the 1st Edition Ordnance Survey map, though the range markers of up 1,000 m would suggest that the target butts were used for more than just rifle marksmanship (the various standard issue rifles of that time typically had an effective range of 400-600 yards). The slit trenches and pits closely associated with the target mound may represent training trenches and dugouts from the First World War use of the target range, though they may also date to later activity.
- 6.3.17 A linear feature of uncertain date or form was identified as a crop mark in the field immediately to the northwest of the rifle range (ORCA 02). The linear feature could not be seen as a physical feature within the walkover area. It is possible that this feature is related to the remains of a dyke, field boundary, or drainage channel which has subsequently been deliberately filled in or silted up.

Summary of Assets within the Dellmore Site

- 6.3.18 The combined desk-based assessment and walkover survey identified that the rifle range and associated earthworks are the only visible sites of archaeological or cultural heritage interest within the Site. The full list of cultural heritage assets together with an assessment of their importance and significance are presented in the gazetteers (**Table D.1** and **Table D.2**).

7 Current Site Use

7.1 Non-Motorised Users

- 7.1.1 The track leading to the shinty pitch is a Non-Motorised User (NMU) route, and although there are no formal routes within the Dellmore boundary, there are a number of well-worn, informal tracks that crisscross the southern part of the Site; these are depicted on the Ordnance Survey MasterMap series and can also be seen on aerial imagery, **Drawing 6.2.1**.
- 7.1.2 No such tracks or evidence of access was noted in the northern part of the Dellmore Site; this is likely due to Drain A and Drain B running east through the Site forming a natural boundary to access, separating the northern and southern parts. The watercourses contain relatively deep water and very limited opportunities for crossing. The northern part of the Site is also much wetter and not as easy to traverse due to the tussocky structure of the grassland.
- 7.1.3 The River Spey is navigable for most of its length and is designated as a core path, or waterway, through the Site.

7.2 Dog walking

- 7.2.1 The southern part of the Site is clearly popular with dog walkers who access the Site via the shinty pitch car park to the south east of the Site; several dog walkers were seen during all walkovers undertaken to inform this Report.

7.3 Water sports

- 7.3.1 Water sports are undertaken on the River Spey, notably kayaking. While no activity was observed during walkover surveys, information panels for watercraft users are presented at access points to the River Spey at Ruthven Bridge.

7.4 Deer/ Hare Coursing

- 7.4.1 Some activity was observed during site visits which indicated that hunting with dogs may occur on the Site occasionally. Lurchers (dogs) accompanied by people were observed in an extended uncontrolled pursuit of deer across the northern part of the Dellmore Site on the 23rd March 2017. Similarly, brown hare have been found dead though not eaten on Site which may be associated with similar activity.

7.5 Pony Trekking

- 7.5.1 Anecdotal information from people using the Site, and evidence of tracks, confirm that the Site is used for equestrian purposes (pony trekking). Feedback from The Royal Society for the Protection of Birds (RSPB) suggests that the Site is used almost daily for pony trekking during the summer months and from the tracks on the ground, it seems that activity is restricted to the southern parts of the Site, on drier ground.

7.6 Angling

- 7.6.1 The River Spey is valuable for Salmon fishery and some observations of angling were made during site visits in March 2017. RSPB feedback suggests that the Badenoch Angling Association leased the fishing rights from the previous owners, Dochfour Estate, however the extent of permitted activity is unknown at this stage. Some alder clearance along the river bank was evident during site visits and is considered likely to be associated with angling interests.

7.7 SSE Power Lines

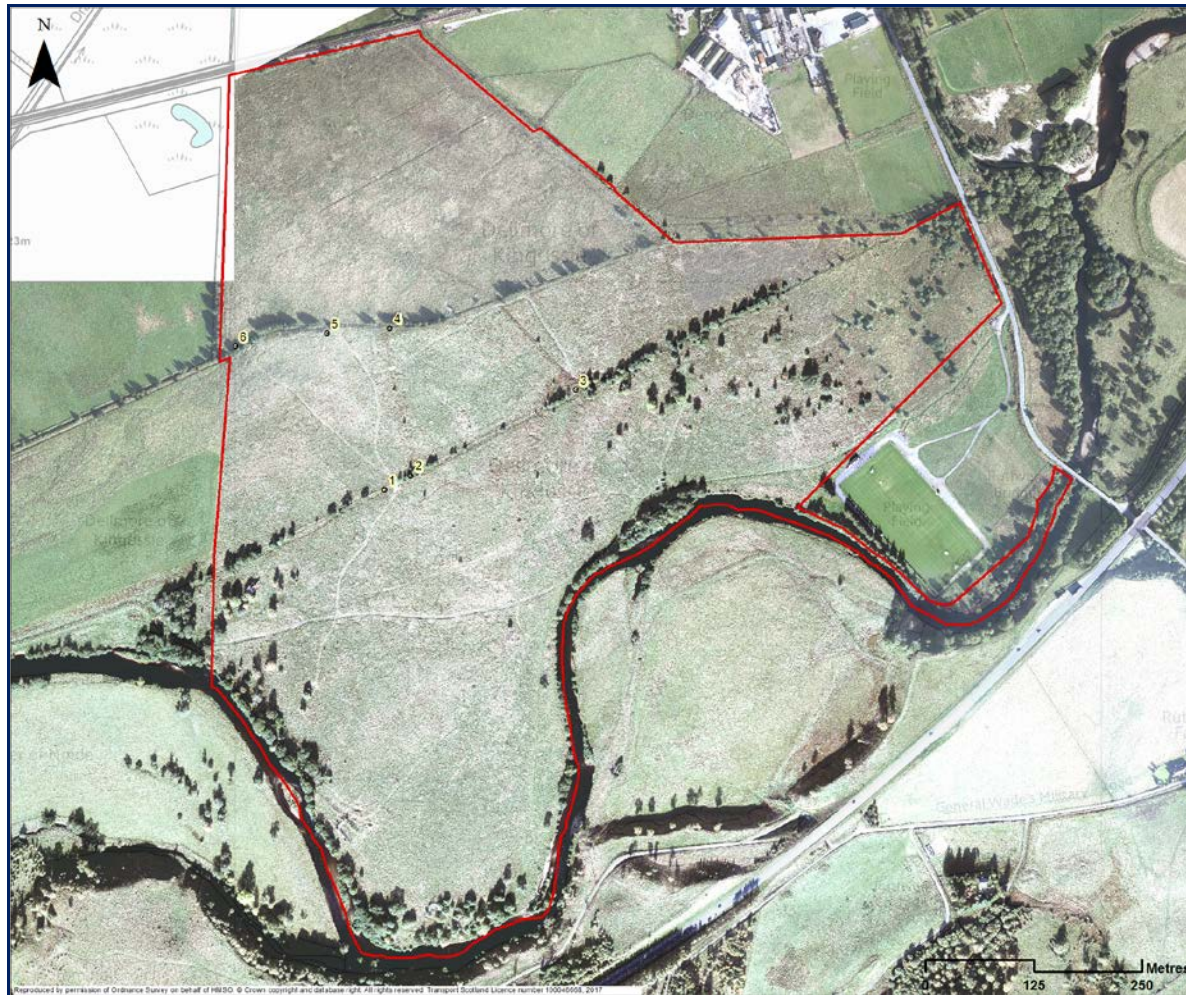
- 7.7.1 There are three SSE overhead power lines and associated poles which traverse the northern and eastern parts of the Dellmore Site; see **Drawing 6.2.23** and **Figure 7-1**. Recent correspondence suggests that SSE is considering placing these lines underground at the request of the local Community Council. It is anticipated that SSE will carry out an instrument survey of each line such proposals can be discussed with landowners in greater detail.
- 7.7.2 At present, these lines and poles may be used as predator perches within the Dellmore Site and undergrounding may see a benefit with regards habitat creation for breeding waders.



Figure 7-1: Looking south east along the Pitmain Burn towards a power line and pole

Detailed Tables

Table A.1: Geomorphology Baseline Photographs



River Spey Floodplain, Location of photographs 1-6



Photograph 1: Downstream small dry ditch



Photograph 2: Ponding in lower wider section of ditch



Photograph 3: Wet, but very slow flowing drain



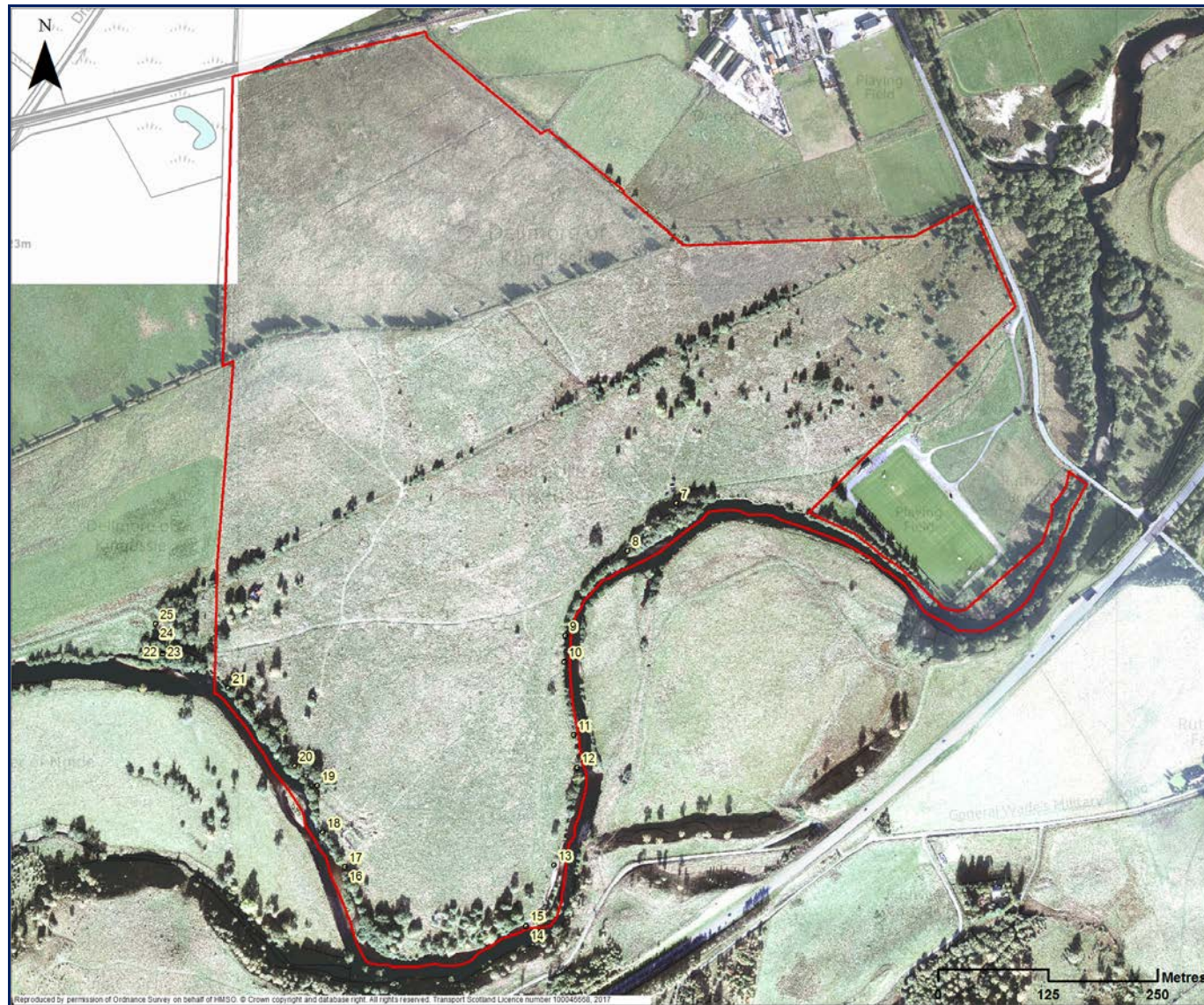
Photograph 4: Upstream narrow drain, with fast flow



Photograph 5: Upstream backwater areas of slow flow attached to ditch



Photograph 6: Downstream small channel with varied form and flowing water



River Spey Channel along edge of Dellmore, Location of photographs 7 to 25



Photograph 7: Flat and open floodplain



Photograph 8: Backwater/ high flow channel with sand deposited in bed.



Photograph 9: Upstream small gravel bar



Photograph 10: Downstream tree lined channel



Photograph 11: Erosion bank, of fines over laying gravels. Gravels will be removed at higher flows and the fines will then collapse into channel



Photograph 12: Gravel mid channel bar



Photograph 13: Upstream high flow channel



Photograph 14: Downstream high flow channel. Gravel deposits are starting to vegetate which will in turn stabilise them in this area



Photograph 15: Terrace construing channel



Photograph 16: Gravel bar



Photograph 17: Eroding bank



Photograph 18: Upstream eroding bank adding sediment to the channel, extending gravel bar



Photograph 19: Breach in embankment



Photograph 20: Upstream low embankment



Photograph 21: Upstream gravel bar deflecting flows away from left bank



Photograph 22: Looking north, area of scour through embankment, uprooting trees



Photograph 23: Looking east, area of scour to left, Spey to right. Bank is not breached



Photograph 24: Looking south towards Spey, area of extensive scour



Photograph 25: Extensive deposition of coarse gravels on the floodplain



Pitmain Burn, Location of photographs 55, 56 and 58



Photograph 55: Downstream low embankment on right bank side








Photograph 56: Over wide channel, with lots of in-channel vegetation



Photograph 58: Downstream channel self-narrowing as deposition and vegetation grow occur, creating more sinuous planform

Table B.1: NVC survey target notes and photographs

Target Note ID	Easting	Northing	NVC Community	Description	Photograph
TN 1	275919	799691	W7	Narrow strip of alder woodland on the banks of the River Spey with a very mixed understorey with melancholy thistle, meadowsweet, common nettle, common valerian, common knapweed, tufted hair-grass, creeping thistle, common sorrel and false oat-grass.	
TN 2	275941	799776	M27a	Small, open area on the river bank dominated by meadowsweet and common valerian, with common nettle, melancholy thistle, devil's-bit scabious, ribwort plantain, lady's bedstraw, common sorrel, <i>Achemilla</i> sp., cleavers, yarrow, marsh violet, tufted hair-grass and false oat-grass.	
TN 3	275910	799677	W7	Woodland on river bank dominated by alder with an individual bird cherry tree. The field layer includes tufted hair-grass, cock's-foot, sweet vernal grass, crested dog's tail, common valerian, hedge woundwort, foxglove, common knapweed, and melancholy thistle. A localised stand of the OV27 rosebay willowherb open vegetation community is also present.	

Target Note ID	Easting	Northing	NVC Community	Description	Photograph
TN 4	275880	799638	W7	River bank with sandy/ gravely substrate. Mixture of species not readily placed in any NVC community, but in a mosaic with W7 woodland and in a process of succession. Species include European gorse, broom, lupin, eyebright, hogweed, lady's bedstraw, cock's-foot, bitter vetch, devil's-bit scabious, creeping soft grass, common knapweed, bladder campion, bird's-foot trefoil, ribwort plantain, yarrow, sweet vernal grass, dog rose, sneezewort, hogweed, silverweed and alder and European larch saplings.	
TN 5	275857	799925	M27a	Area of grassland next to the road dominated by meadowsweet and tufted hair-grass with melancholy thistle, false oat-grass, cleavers, devil's-bit scabious, common knapweed, common sorrel, soft rush, sneezewort, angelica, cock's-foot, coltsfoot, marsh woundwort.	
TN 6	275631	799787	MG1a	Mesotrophic grassland dominated by false oat-grass, with Yorkshire fog, common knapweed, germander speedwell, red fescue, lesser stitchwort, common bent, common sorrel, creeping thistle, lady's bedstraw.	
TN 7	275492	799722	W7c	Canopy of alder with grey willow, birch, bird cherry and sycamore. Ground flora of dog's-mercury, hedge woundwort, tufted hair-grass, broadleaved dock, currant, nipplewort, creeping soft grass, ground elder, raspberry, common hogweed, cock's-foot, common sorrel, false oat-grass, valerian, and melancholy thistle.	
TN 8	275260	799250	W7c	Canopy of alder, together with locally abundant bird cherry. Ground flora with angelica, bitter vetch, lady's mantle, lupin, spear thistle, cock's-foot, devil's-bit scabious, woundwort, germander speedwell, cleavers, Yorkshire fog, creeping buttercup, cuckooflower, sheep's sorrel, dog rose, common knapweed, marsh marigold, tufted hair-grass, sweet vernal grass, mint, pink purslane, bugle, common dog violet.	


Target Note ID	Easting	Northing	NVC Community	Description	Photograph
TN 9	275060	799942	S9a	Broad ditch dominated by bottle sedge and broad-leaved pondweed.	

Table B.2: Results of Winter Bird Surveys

Species	Latin Name	BTO Code	Site Visit				
			1	2	3	4	5
Grey heron	<i>Ardea cinerea</i>	H.	0	1	3	0	1
Cormorant	<i>Phalacrocorax carbo</i>	CO	0	0	0	0	0
Pink footed goose	<i>Anser brachyrhynchus</i>	PF	0	0	0	0	0
Greylag goose	<i>Anser</i>	GJ	220	69	32	36	25
Common buzzard	<i>Buteo</i>	BZ	0	1	0	3	2
Mallard	<i>Anas platyrhynchos</i>	MA	15	4	3	0	10
Goldeneye	<i>Bucephala clangula</i>	GN	1	1	1	2	4
Moorhen	<i>Gallinula chloropus</i>	MH	0	2	0	0	0
Pheasant	<i>Phasianus colchicus</i>	PH	6	5	6	0	4
Grey partridge	<i>Perdix</i>	P.	0	0	0	0	2
Curlew	<i>Numenius arquata</i>	CU	0	0	0	0	53
Oystercatcher	<i>Haematopus ostralegus</i>	OC	0	0	0	2	3
Lapwing	<i>Vanellus</i>	L.	0	0	8	0	3
Woodcock	<i>Scolopax rusticola</i>	WK	0	0	1	0	0
Snipe	<i>Gallinago</i>	SN	1	0	0	0	19
Black headed gull	<i>Chroicocephalus ridibundus</i>	BH	0	0	0	0	6
Raven	<i>Corvus corax</i>	RA	5	0	0	0	2
Jackdaw	<i>Cirvus monedula</i>	JD	12	50	0	0	10
Blue tit	<i>Cyanistes caeruleus</i>	BT	0	9	9	0	4
Long-tailed tit	<i>Aegithalos caudatus</i>	LT	19	8	15	0	0
Coal tit	<i>Pariparus ater</i>	CT	0	0	3	0	1
Great tit	<i>Parus major</i>	GT	0	2	0	0	0
Goldcrest	<i>Regulus</i>	GC	0	0	0	0	2
Wren	<i>Troglodytes</i>	WR	5	2	2	0	2
Treecreeper	<i>Certhia familiaris</i>	TC	0	2	1	0	0
Fieldfare	<i>Turdus pilaris</i>	FF	0	0	1	0	0
Mistle thrush	<i>Turdus viscivorus</i>	M.	0	1	0	0	1
Song thrush	<i>Turdus philomelos</i>	ST	1	0	3	0	2
Blackbird	<i>Turdus merula</i>	B.	0	0	1	0	3
Robin	<i>Erithacus rubecula</i>	R.	0	0	1	0	4
Dipper	<i>Cinclus cinclus</i>	DI	3	9	1	0	1
Dunnock	<i>Prunella modularis</i>	D.	2	0	0	0	2
Chaffinch	<i>Fringilla coelebs</i>	CH	0	5	1	0	7
Siskin	<i>Carduelis spinus</i>	SK	7	90	31	0	1
Lesser Redpoll	<i>Carduelis cabaret</i>	LR	19	15	0	0	0
Bullfinch	<i>Pyrrhula pyrrhula</i>	BF	0	1	0	0	1
Goldfinch	<i>Carduelis carduelis</i>	GO	0	25	5	0	0
Reedbunting	<i>Emberiza schoeniclus</i>	RB	4	13	2	0	4

Table B.3: Bat Roost Potential Survey Results

CFJV Tree Reference	Grid Reference	Species	Lifted Bark	Cracked Limbs	Epiphytic/ Epicormic Growth	Tree Cavity	Splits	Knot Hole / Rot Hole	Woodpecker Hole	Comments	Bat Roost Potential (BRP)
T1	NN7583499887	Alder	No	Yes	No	Yes	Yes	Knot Hole(s)	No	Cavity limited and at ground level	Low
T2	NN7583299889	Alder	Yes	No	No	No	No	No	No	Good suitable cavity, low tree - 3m	Medium
T3	NN7581799908	Alder	Yes	Yes	No	Yes	No	Knot Hole(s)	No	Multi stemmed tree, one stem with lifted bark	Low
T4	NN7581499924	Alder	No	Yes	No	Yes	Yes	Knot Hole(s)	No	Cavity is rotted from the top of the tree, nesting jackdaw within, good knot hole leading to cavity	Medium
T5	NN7581099919	Alder	No	Yes	No	No	No	Rot Hole(s)	No	Split stem exposing upward cavity into tree	Medium
T6	NN7580999922	Alder	No	No	No	Yes	Yes	No	No	Cracked limb leading to rot hole, potential to continue into tree though cannot confirm from ground	Low
T7	NN7580499970	Alder	No	Yes	No	No	No	Rot Hole(s)	Yes	Tree cavity formed from split, low down in tree and branches obscure it slightly for bat access reducing risk	Low
T8	NN7581099973	Alder	No	Yes	No	Yes	Yes	No	No	Multi-stemmed tree, cracked stem with rot hole from the top with woodpecker hole directly below, may be superficial, cannot determine from ground	Low
T9	NN7579299983	Alder	No	No	No	Yes	Yes	No	No	Good suitable cavity from split, dead pheasant at base of cavity	Medium
T10	NN7579599988	Alder	No	Yes	No	Yes	No	Rot Hole(s)	No	Good cavity on tree suitable for bats	Medium
T11	NN7570599944	Alder	No	Yes	No	No	No	Rot Hole(s)	No	Low down cavity with some obstructions but access possible	Medium
T12	NN7571699910	Alder	No	Yes	No	Yes	Yes	Rot Hole(s)	No	Cracks in limbs and rot hole present, holes may be superficial	Low
T13	NN7570299893	Alder	No	Yes	No	Yes	Yes	Rot Hole(s)	No	One main exposed cavity that leads to less exposed areas, rot hole limb may also support suitable cavity.	Medium
T14	NN7573599851	Alder	No	No	No	Yes	Yes	Rot Hole(s)	No	Multi stemmed tree with the dead main trunk having BRP, cavity and multiple holes.	Medium
T15	NN7562599924	Alder	Yes	Yes	No	Yes	Yes	Rot Hole(s)	No	Top down rot hole leading to potential cavity for bats, rot hole present	Medium
T16	NN7564299874	Alder	No	No	No	Yes	No	Rot Hole(s)	No	Large multi stemmed tree with potential lightening damage, most cavity so are generally exposed but do lead to multiple BRP features throughout	High
T17	NN7566199881	Alder	No	Yes	No	Yes	No	Rot Hole(s)	No	Very suitable rot hole with potential to lead to cavity	Medium
T18	NN7566599873	Alder	Yes	Yes	No	No	No	No	No	Mustelid scat in tree cavity	Medium

CFJV Tree Reference	Grid Reference	Species	Lifted Bark	Cracked Limbs	Epiphytic/ Epicormic Growth	Tree Cavity	Splits	Knot Hole / Rot Hole	Woodpecker Hole	Comments	Bat Roost Potential (BRP)
T19	NN756299877	Alder	No	Yes	No	No	No	Rot Hole(s)	No		Low
T20	NN7568299868	Alder	No	Yes	No	Yes	Yes	No	No		Low
T21	NN7566699841	Alder	No	Yes	No	Yes	Yes	Rot Hole(s)	No	Small tree with multiple cavities	Medium
T22	NN7564999830	Alder	No	Yes	No	No	Yes	Rot Hole(s)	No	Lots of features	High
T23	NN7564099841	Alder	No	No	No	Yes	Yes	No	No		Low
T24	NN7563799823	Alder	Yes	Yes	No	No	Yes	No	No	Small low down cavity from split, endoscope	Low
T25	NN7563499824	Alder	No	Yes	No	Yes	Yes	No	No		Low
T26	NN7557999861	Alder	No	No	No	Yes	No	Rot Hole(s)	No	Multi stemmed tree	Medium
T27	NN7552399922	Alder	Yes	No	No	Yes	Yes	Rot Hole(s)	No	Stem dead with large cavity and multiple rot holes	High
T28	NN7553499882	Alder	No	Yes	No	No	No	Rot Hole(s)	No	Some obstruction to cavity	Medium
T29	NN7553599842	Alder	No	Yes	No	Yes	Yes	No	No	Rotting limb	Low
T30	NN7552799849	Alder	No	Yes	No	Yes	No	Rot Hole(s)	No		Low
T31	NN7551399861	Alder	No	No	No	Yes	No	Rot Hole(s)	No	Large tree with main large cavity at 6m	High
T32	NN7551099870	Alder	No	No	No	Yes	No	Rot Hole(s)	No	Rot hole to cavity at 2.5m no signs	Medium
T33	NN7550399844	Alder	No	No	No	Yes	Yes	Rot Hole(s)	No	Rot hole to cavity at 2m	Medium
T34	NN7550199845	Rowen	Yes	No		Yes	No	Rot Hole(s)	No	Jackdaw nesting within split crown, multiple rot holes	High
T34	NN7549499833	Dead tree	Yes	No	No	Yes	Yes	No	No	Low down obstructed cavities	Low
T36	NN7548399845	Alder	No	Yes	No	Yes	Yes	Rot Hole(s)	No	Leaning against hawthorn	Medium
T37	NN7545199871	Alder	Yes	No	No	No	No	Rot Hole(s)	No	Top cavity, rot holes	Low
T38	NN7541299858	Alder	Yes	No	No	No	No	Yes	No	Cavity with open top leading down	Low

Table B.4: Water Vole Survey Results

CFJV Reference	Ditch	Species	Grid Reference	Latrines	No. of Burrows	Runs	Feeding Remains	Other Signs/ Comments
1	Pitmain Burn Downstream of Drain A	Field/ Bank vole	NH 7577400046	-	-	-	-	Bank/ field vole latrine, other latrine noted 12 m upstream, bank vole sighting 30 m upstream
2	Pitmain Burn Downstream of Drain A	Unknown	NH 7569200040	-	1	-	-	No other signs to confirm species use
3	Pitmain Burn Downstream of Drain A	Field/ Bank vole	NH 7564800039	-	-	-	-	Bank vole latrine
4	Pitmain Burn Downstream of Drain A	Water vole	NH 7559600037	Single dropping	-	-	-	-
5	Pitmain Burn Upstream of Drain A	Mustelid	NH 75420013	-	-	-	-	Mustelid Sp. scat
6	Pitmain Burn Upstream of Drain A	Water vole	NH 75370017	Latrine	-	-	Feeding remains present	Some smaller droppings with water vole sized dropping present
7	Pitmain Burn Upstream of Drain A	Rat/ Water vole	NH 75310022	Single dropping	-	-	-	Rat or old water vole, dark in colouration
8	Pitmain Burn Upstream of Drain A	Water vole and Mustelid Sp.	NH 75290023	2 water vole droppings	-	-	-	Recent Mustelid Sp. scat also present
9	Pitmain Burn Upstream of Drain A	Water vole	NH 75270025	Latrine	-	Runs present	Feeding remains present	-
10	Pitmain Burn Upstream of Drain A	Water vole	NH 75300023	-	1	-	Feeding remains present	-
11	Drain A	Rat	NH 7541600009	-	3	-	-	-
12	Drain A	Bank vole/ rat	NN 7537299993	-	2	-	-	Bank vole latrine
13	Drain A	Unknown	NN 7535999987	-	1	-	-	No other signs to confirm species use
14	Drain A	Potential water vole	NN 7533099982	-	1	Runs present	-	-

CFJV Reference	Ditch	Species	Grid Reference	Latrines	No. of Burrows	Runs	Feeding Remains	Other Signs/ Comments
15	Drain A	Unknown	NN 7530699970	-	1	-	-	No other signs to confirm species use
16	Drain A	Unknown	NN 7500999912	-	2	-	-	No other signs to confirm species use
17	Drain A	Unknown	NN 7507999945	-	1	-	-	No other signs to confirm species use
18	Drain A	Unknown	NN 7509999945	-	1	-	-	No other signs to confirm species use

Table B.5: Potential GWDTE NVC Community and Sub-Community Description and Distribution

NVC Community	NVC Community Name	NVC Community Description	NVC Community Distribution
M27	Filipendula ulmaria - Angelica sylvestris mire	This community is typically found where moist, reasonably rich, circumneutral soils occur in situations protected from grazing. It can be found in both topogenous and soligenous mires and is especially typical of silted margins of slow-moving streams and soakways, the edges of flushes and damp hollows, and also of artificial habitats such as along dykes and roadside ditches and around ponds (Rodwell et al 1991; Elkington et al 2001).	This community occurs frequently towards the eastern end of the Site, where the soils are particularly moist and subject to occasional inundation. The high abundance of meadowsweet is the most obvious defining feature of the community, together with frequent wild angelica <i>Angelica sylvestris</i> , common valerian <i>Valeriana officinalis</i> , marsh bedstraw, marsh thistle <i>Cirsium palustre</i> , creeping buttercup and water mint <i>Mentha aquatica</i> .
MG9	<i>Holcus lanatus</i> – <i>Deschampsia cespitosa</i> grassland	MG9 grassland is highly characteristic of permanently moist, gleyed and periodically inundated circumneutral soils across large areas of the British lowlands. It can exist on level to moderately sloping ground in areas of pasture or meadow, but can also be found along woodland rides and fen/ wetland margins. MG9 usually contains a coarse and tussocky sward dominated by <i>D. cespitosa</i> (Rodwell et al., 1992; Cooper, 1997).	Large areas of MG9b <i>Arrhenatherum elatius</i> sub-community are found in the study area, particularly to the north and east. These areas are dominated by the grasses tufted hair-grass <i>Deschampsia cespitosa</i> , Yorkshire fog and creeping soft grass <i>Holcus mollis</i> , with abundant creeping bent <i>Agrostis stolonifera</i> , cock's-foot and occasional perennial ryegrass <i>Lolium perenne</i> . Herbaceous associates include broadleaved dock <i>Rumex obtusifolius</i> , common knapweed, meadow vetchling, ribwort plantain <i>Plantago lanceolata</i> , creeping buttercup <i>Ranunculus repens</i> and common mouse-ear <i>Cerastium fontanum</i> .
MG10	<i>Holcus lanatus</i> – <i>Juncus effusus</i> rush pasture	MG10 is a form of rush-pasture characteristic of areas with strongly impeded drainage over a wide range of usually acid to neutral mineral soils on level to gently sloping ground (Rodwell et al 1992; Cooper, 1997). This community requires consistently high soil moisture (Rodwell et al 1992). Although found on various soil types including brown earth and calcareous earth throughout its range, this habitat can also have close associations with various types of mire vegetation and can form significant parts of rush-dominated mire mosaics in areas of suitably moist soils.	One area of MG10a Typical sub-community is located to the north of the study area beside the stream channel. The MG10a sub-community is a species-poor grassy sward of Yorkshire fog and creeping bent with prominent tussocks of soft rush <i>Juncus effusus</i> .
W3	<i>Salix pentandra</i> - <i>Carex rostrata</i> woodland	This is a community of peat soils kept moist by moderately base-rich and calcareous groundwater in open water transitions, most common in northern Britain (Rodwell et al 1991; Hall et al 2004). W3 is fairly constant in its composition and structure.	A small and fairly open stand of this community occurs in water-logged soils adjacent to the road and ditch which crosses the Site. Grey willow <i>Salix cinerea</i> predominates in the low canopy, with only occasional bay willow <i>S. pentandra</i> , over a field layer which bears strong affinities to the adjacent M27 meadowsweet-wild angelica mire, with abundant meadowsweet and frequent wild angelica, soft rush, bottle sedge, creeping buttercup, tufted hair-grass and water mint.
M23	<i>Juncus effusus/acutiflorus</i> – <i>Galium palustre</i> rush pasture	This rush-pasture is a community of gently-sloping ground in and around the margins of soligenous flushes, as a zone around topogenous mires and wet heaths, and in poorly drained, comparatively unimproved or reverted pasture. It can be found on a variety of moderately acid to neutral soils that are kept moist to wet for most of the year (Rodwell et al 1991; Elkington et al 2001). As a result this community can be, at least partially, potentially dependent on groundwater; however, it is also commonly associated with surface water flows and surface water collection.	A narrow band of M23 is present along a ditch towards the centre of the Site. The stand is dominated by sharp-flowered rush <i>Juncus acutiflorus</i> , identifying it as the M23a sub-community. Other species include marsh bedstraw <i>Galium palustre</i> , greater bird's-foot-trefoil <i>Lotus pedunculatus</i> and occasional soft rush.
W7	Residual alluvial forests (<i>Alnus glutinoso-incanae</i>)	W7 is typical of moist to very wet mineral soils which are only moderately base-rich and not very eutrophic (Rodwell et al 1991; Hall et al 2004). It is most extensive in the wetter parts of Britain, but usually occurs in soils where there is no great tendency for peat accumulation. There are three sub-communities; differences between them are related to the extent of waterlogging, the nature of the water supply and its movement.	Narrow bands of the W7 community are present along the bank of the River Spey. The canopy is dominated by alder, with varying amounts of grey willow, downy birch <i>Betula pubescens</i> , bird cherry <i>Prunus padus</i> and sycamore <i>Acer pseudoplatanus</i> . The ground flora is also very variable, but includes dog's-mercury <i>Mercurialis perennis</i> , hedge woundwort <i>Stachys sylvestris</i> , tufted hair-grass, broad-leaved dock, nipplewort <i>Lapsana communis</i> , creeping soft grass <i>Holcus mollis</i> , ground elder <i>Aegopodium podagraria</i> , raspberry <i>Rubus idaeus</i> , common hogweed <i>Heracleum sphondylium</i> , cock's-foot, common sorrel, false oat-grass, valerian, and melancholy thistle <i>Cirsium heterophyllum</i> . Yellow pimpernel <i>Lysimachia nemorum</i> is atypically scarce. Two sub-communities are identifiable. Along the upstream reach of the river, the W7a nettle <i>Urtica dioica</i> sub-community predominates, with nettle a near constant in the field layer. Elsewhere, the field layer contains more grass species including tufted hair-grass and creeping soft grass, which is more typical of the W7c tufted hair-grass sub-community.

Table Notes:

	Potential moderately groundwater dependent NVC community based on 'Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems'. Version 3. Issue date: 27/10/2014 (Scottish Environment Protection Agency, 2017).
	Potential highly groundwater dependent NVC community based on 'Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems'. Version 3. Issue date: 27/10/2014 (Scottish Environment Protection Agency, 2017).

Table B.6: Potential GWDTE NVC Community and Sub-Community Details

Polygon ID	Total Area (ha)	NVC Communities and Sub-communities with Percentage of Polygon Cover (in order of dominance)											
		Comm. 1	%	Comm. 2	%	Comm. 3	%	Comm. 4	%	Comm. 5	%	Comm. 6	%
1	2.41	MG9b	100		0		0		0		0		0
2	0.18	MG9b	100		0		0		0		0		0
2	0.09	MG9b	100		0		0		0		0		0
3	0.74	MG9b	100		0		0		0		0		0
6	0.37	MG9b	100		0		0		0		0		0
7	0.32	MG9b	100		0		0		0		0		0
8	0.12	M23a	100		0		0		0		0		0
9	0.07	MG9b	100		0		0		0		0		0
10	0.12	MG10a	100		0		0		0		0		0
12	0.74	M27a	100		0		0		0		0		0
13	0.41	M27a	100		0		0		0		0		0
14	0.36	W3	100		0		0		0		0		0
15	0.37	M27a	100		0		0		0		0		0
16	1.00	M27a	100		0		0		0		0		0
18	1.23	W7a	100		0		0		0		0		0
20	0.55	W7c	80	MG1a	10	MG9b	10		0		0		0
22	0.19	MG9b	100		0		0		0		0		0
23	1.08	MG9b	100		0		0		0		0		0
24	22.26	MG1a	90	MG9b	10		0		0		0		0
25	1.87	MG9b	100		0		0		0		0		0
26	4.05	MG9b	100		0		0		0		0		0
27	0.50	W7c	100		0		0		0		0		0
28	0.10	W7	100		0		0		0		0		0
29	0.23	MG9b	100		0		0		0		0		0

Table Notes:

- Potential moderately groundwater dependent NVC community or sub-community based on 'Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems'. Version 3. Issue date: 27/10/2014 (Scottish Environment Protection Agency, 2017).
- Potential highly groundwater dependent NVC community or sub-community based on 'Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems'. Version 3. Issue date: 27/10/2014 (Scottish Environment Protection Agency, 2017).

Table B.7: Potential GWDTE Consideration of Likely Dependence

Polygon ID	SEPA Potential Groundwater Dependency	Broad Habitat Type	Hydrogeology Consideration (geology, soils and groundwater)	Hydro-ecological Consideration (vegetation, topographic setting, visual signs of groundwater, surface water features)	Likely Groundwater Dependency
1	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located at the northern end of Dellmore, adjacent to the south of the Highland Main Line railway (HML) and east of Pitmain Burn. The habitat occurs over generally flat ground within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the locality indicated strata of clayey sand, organic traces, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH05) south of and slightly elevated relative to the habitat recording groundwater levels variably between ground level and 0.84 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
2	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located at the northern end of Dellmore, to the east of Pitmain Burn in a slight topographic low around a drainage line. The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and the drainage channel may be periodically likely. Ground investigation in the locality indicated strata of clayey sand, organic traces, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH05) south west of and slightly elevated relative to the habitat recording groundwater levels variably between ground level and 0.84 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
2	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located at the northern end of Dellmore, to the east of Pitmain Burn in a slight topographic low. The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses are periodically likely. Ground investigation in the locality indicated strata of clayey sand, organic traces, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH05) south west of and slightly elevated relative to the habitat recording groundwater levels variably between ground level and 0.84 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
3	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located in the north-eastern extent of Dellmore, adjacent east of the Pitmain Burn on gently sloping ground towards this. The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses are periodically likely. Ground investigation in the locality indicated strata of clayey sand, organic traces, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH05) north west of and slightly elevated relative to the habitat recording groundwater levels variably between ground level and 0.84 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
6	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located in the central portion of Dellmore, between two drainage lines and distinctly occurring along the line of a palaeochannel identified from geomorphological mapping in the area. The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses are periodically likely. Ground investigation in the locality indicated strata of sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH04) west of and slightly elevated relative to the habitat recording groundwater levels variably between ground level and 2.10 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
7	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located in the central portion of Dellmore and corresponding to a ponding location around a drainage line. The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses are periodically likely. Ground investigation in the locality indicated strata of sand and gravel, with continuous in-situ monitoring at a borehole location north east of and slightly elevated relative to the habitat recording groundwater levels variably between ground level and 2.10 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
8	High	Mires	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Linear stand of mire (M23a) located distinctly along a wet, slow flowing drainage channel in the central eastern portion of Dellmore. The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this as well as along the drainage line are likely. Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at borehole locations (DL-BH01, DL-BH02 and DL-BH04) nearby recording groundwater levels variably between ground level and 2.10 m bgl between November 2017 and June 2018 (Table 5.2.1). The hydrogeology and groundwater levels suggest groundwater inputs cannot be entirely ruled out, but that surface water contributions are also likely owing to the channelised occurrence of the vegetation in association with the drainage line. Based on these considerations and in this setting, groundwater dependence is therefore assessed to be moderate.	Moderate
9	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located in the central eastern portion of Dellmore adjacent to Polygon 8 and the slow flowing drainage channel within which that occurs. The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at borehole locations (DL-BH01, DL-BH02 and DL-BH04) nearby recording groundwater levels variably between ground level and 2.10 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate

Polygon ID	SEPA Potential Groundwater Dependency	Broad Habitat Type	Hydrogeology Consideration (geology, soils and groundwater)	Hydro-ecological Consideration (vegetation, topographic setting, visual signs of groundwater, surface water features)	Likely Groundwater Dependency
10	Moderate	Mesotrophic grasslands	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Rush pasture (MG10a) located in the central eastern portion of Dellmore adjacent to Polygon 9 and some drainage channels. The habitat occurs over generally flat lying ground within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at borehole locations (DL-BH01 and DL-BH05) nearby recording groundwater levels variably between ground level and 0.84 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
12	Moderate	Mires	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Area of mire (M27a) located in the eastern extent of Dellmore, adjacent to the south of the Pitmain Burn, between this and a drainage channel. The habitat occurs over gently sloping ground toward the Pitmain Burn, within the modelled flood extents of the River Spey; which suggests contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH01) nearby recording groundwater levels variably between ground level and 0.75 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
13	Moderate	Mires	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Area of mire (M27a) located in the eastern extent of Dellmore, adjacent to the south of the Polygon 12, separated from this by a drainage channel. The habitat occurs over gently sloping ground toward the drainage channel, within the modelled flood extents of the River Spey; which suggests contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH01) nearby recording groundwater levels variably between ground level and 0.75 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
14	Moderate	Woodlands and scrub	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Woodland (W3) located at the eastern end of Dellmore adjacent to the B970 and coincident with a palaeochannel identified from geomorphological mapping in the area. The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH01) nearby recording groundwater levels variably between ground level and 0.75 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
15	Moderate	Mires	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Area of mire (M27a) located at the eastern end of Dellmore adjacent to the B970 and areas of marshy grassland (MG9b) and woodland (W3). The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH01) nearby recording groundwater levels variably between ground level and 0.75 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
16	Moderate	Mires	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Mire (M27a) located within an area of grassland (MG9b) in the eastern extent of Dellmore, adjacent to the north of the playing field and coincident with a palaeochannel identified from geomorphological mapping in the area. The habitat lies within the modelled flood extents of the River Spey, suggesting contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the habitat area indicated strata of clay, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH01) nearby recording groundwater levels variably between ground level and 0.75 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
18	High	Woodlands and scrub	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Alder woodland (W7a) located at the south-western end of the Dellmore Site, along the banks of the River Spey. The location of the habitat suggests it is likely to receive reasonable contributions from surface water via the river and flooding periodically associated with this. Ground investigation information in the locality indicates sand and gravel, with continuous in-situ monitoring at two locations (DL-BH03 and DL-BH04) to the east of the habitat recording groundwater levels between ground level and 2.10 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. The hydrogeology and groundwater levels suggest groundwater inputs cannot be entirely ruled out, but no evidence of groundwater seepage through the woodland were observed during ecology surveys, and surface water contributions to the habitat are also likely to be significant owing to its location and the inferred groundwater flow directions. Based on these considerations and in this setting, groundwater dependence is therefore assessed to be no more than moderate.	Moderate

Polygon ID	SEPA Potential Groundwater Dependency	Broad Habitat Type	Hydrogeology Consideration (geology, soils and groundwater)	Hydro-ecological Consideration (vegetation, topographic setting, visual signs of groundwater, surface water features)	Likely Groundwater Dependency
20	High	Woodlands and scrub	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Alder woodland (W7c) and grassland (MG9b) located at the southern end of the Dellmore Site, along the banks of the River Spey and wholly within its flood extents. The location of the habitat suggests it is likely to receive reasonable contributions from surface water via the river and flooding periodically associated with this. Ground investigation information in the locality indicates sand and gravel, with continuous in-situ monitoring at one location (DL-BH03) immediately north of the habitat recording groundwater levels between ground level and 1.72 m bgl between November 2017 and June 2018 (Table 5.2.1). The hydrogeology and groundwater levels suggest groundwater inputs cannot be entirely ruled out, but no evidence of groundwater seepage through the woodland were observed during ecology surveys, and surface water contributions to the habitat are also likely to be significant owing to its location and the inferred groundwater flow directions. Based on these considerations and in this setting, groundwater dependence is therefore assessed to be no more than moderate.	Moderate
22	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located at the southern end of Dellmore in a slight topographic low point near the River Spey within its flood extents, and surrounded by Polygon 24. The location of the habitat suggests that it is likely to receive reasonable contributions from surface water via run-off and periodic flooding. Ground investigation information in the locality indicates sand and gravel, with continuous in-situ monitoring at one location (DL-BH03) west of and slightly elevated relative to the habitat recording groundwater levels between ground level and 1.72 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
23	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located at the southern end of Dellmore in a slight topographic low point near the River Spey within its flood extents, and surrounded by Polygon 24. The location of the habitat suggests that it is likely to receive reasonable contributions from surface water via run-off and periodic flooding. Ground investigation information in the locality indicates sand and gravel, with continuous in-situ monitoring (DL-BH03) west of and slightly elevated relative to the habitat recording groundwater levels between ground level and 1.72 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
24	Partial (Moderate Sub-dominant)	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Mesotrophic grassland mosaic, predominantly comprising MG1a and a smaller percentage of marshy grassland MG9b. The habitat covers the majority of the southern part of the Dellmore Site, with the wet vegetation forming fragmented parts of it and occurring in topographically lower points, palaeochannels and in association with drainage features. The topography generally gently falls northward and the habitat falls wholly within the modelled flood extents of the River Spey, which is adjacent to the south. Contributions of surface water associated with flooding from this and other watercourses may therefore be periodically likely. Ground investigation information in the locality indicates sand and gravel, with continuous in-situ monitoring at two locations (DL-BH02 and DL-BH03) within the habitat recording groundwater levels between ground level and 1.83 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs for the sub-dominant wet vegetation is assessed to be moderate.	Partial (Moderate Sub-dominant)
25	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located in the eastern extent of Dellmore, adjacent to the south of the Pitmain Burn, between this and a drainage channel. The habitat occurs over gently sloping ground toward the Pitmain Burn, within the modelled flood extents of the River Spey; which suggests contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at a borehole location (DL-BH01) south of and slightly elevated relative to the habitat recording groundwater levels variably between ground level and 0.72 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
26	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Marshy grassland (MG9b) located in the south-eastern extent of Dellmore, adjacent to the south of a drainage channel and Polygon 25. The habitat occurs over gently sloping ground toward the drainage line, within the modelled flood extents of the River Spey; which suggests contributions of surface water associated with flooding from this and other watercourses may be periodically likely. Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at a borehole location immediately within the habitat recording groundwater levels variably between ground level and 0.72 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. Based on the available data however, the indicated hydrogeology and typical characteristics of the habitat type, dependence on groundwater inputs is assessed to be moderate.	Moderate
27	High	Woodlands and scrub	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	Alder woodland (W7) located at the southern end of the Dellmore Site, along the banks of the River Spey and wholly within its flood extents. The location of the habitat suggests it is likely to receive reasonable contributions from surface water via the river and flooding periodically associated with this. Ground investigation information in the locality indicates sand and gravel, with nearby groundwater levels between ground level and 0.72m bgl. The hydrogeology and groundwater levels suggest groundwater inputs cannot be entirely ruled out, but no evidence of groundwater seepage through the woodland were observed during ecology surveys, and surface water contributions to the habitat are also likely to be significant owing to its location and the inferred groundwater flow directions. Based on these considerations and in this setting, groundwater dependence is therefore assessed to be no more than moderate.	Moderate

Polygon ID	SEPA Potential Groundwater Dependency	Broad Habitat Type	Hydrogeology Consideration (geology, soils and groundwater)	Hydro-ecological Consideration (vegetation, topographic setting, visual signs of groundwater, surface water features)	Likely Groundwater Dependency
28	High	Woodlands and scrub	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	<p>Narrow strip of alder woodland (W7c) located at the southern end of the Dellmore Site, along the banks of the River Spey and wholly within its flood extents. The location of the habitat suggests it is likely to receive reasonable contributions from surface water via the river and flooding periodically associated with this.</p> <p>Ground investigation in the locality indicated strata of clay, sand and gravel, with continuous in-situ monitoring at a borehole location north east of and slightly elevated relative to the habitat recording groundwater levels variably between ground level and 0.72 m bgl between November 2017 and June 2018 (Table 5.2.1). This continuous monitoring is ongoing and due to be continue until January 2019. The hydrogeology and groundwater levels suggest groundwater inputs cannot be entirely ruled out, but no evidence of groundwater seepage through the woodland were observed during ecology surveys, and surface water contributions to the habitat are also likely to be significant owing to its location and the inferred groundwater flow directions. Based on these considerations and in this setting, groundwater dependence is therefore assessed to be no more than moderate.</p>	Moderate
29	Moderate	Mesotrophic grassland	Mineral alluvial soils with peaty alluvial soils and alluvium deposits overlying bedrock in the Loch Laggan Psammite Formation. Aquifer productivity is mapped as moderate to high (intergranular) in superficial deposits and very low (fracture flow) in bedrock.	<p>Marshy grassland (MG9b) located at the southern end of Dellmore Site, along the banks of the River Spey. The location of the habitat suggests it is likely to receive contributions from surface water via the river and flooding periodically associated with this.</p> <p>Ground investigation information in the locality indicates sand and gravel, with continuous in-situ monitoring west of and elevated relative to the habitat (DL-BH03) recording groundwater levels between ground level and 1.72 m bgl between November 2017 and January 2019. This continuous monitoring is ongoing and due to be continue until January 2019. The hydrogeology and groundwater levels suggest groundwater inputs cannot be entirely ruled out, but that surface water contributions are also likely to be significant owing to the habitat location. Based on these considerations, groundwater dependence is assessed to be no more than moderate.</p>	Moderate

Table C.1: Human Health Risk Assessment Summary (Soil Chemical Testing Results – Public Open Space (Park) Land Use Criteria)

Contaminant	Units	Chemical Testing Results Summary					Assessment Criteria			
		Detection frequency	Minimum	Maximum	Mean	Location and depth of maximum	GAC	GAC Source	No. of detected concentrations exceeding GAC	Location and depth of exceedances
Antimony	mg/kg	8/67	<4	57	N/A	HP2 (0.20m)	-	-	-	-
Arsenic	mg/kg	12/67	<2	3	2.06	DL-BH01 (0.50m)	170	EA/ DEFRA C4SL	0	N/A
Boron (water-soluble)	mg/kg	0/44	<1	<1	N/A	N/A	46,000	LQM/ CIEH S4UL	0	N/A
Cadmium	mg/kg	0/67	<1	<1	N/A	N/A	880	EA/ DEFRA C4SL	0	N/A
Chromium	mg/kg	44/44	15	40	21	DL-BH01 (1.00m)	33,000	LQM/ CIEH S4UL	0	N/A
Copper	mg/kg	67/67	5	930	57.07	HP2 (0.20m)	44,000	LQM/ CIEH S4UL	0	N/A
Lead	mg/kg	67/67	4	6,500	683.37	HP2 (0.20m)	1,300	EA/ DEFRA C4SL	11	DL-HP01 (0.20m), DL-HP02 (0.20m), HP2 (0.20m), HP3 (0.20m), HP4 (0.20m and 0.50m), HP6 (0.50m), HP32 (0.20m), HPM1 (0.00m), HPM2 (0.00m), HPM3 (0.00m)
Manganese	mg/kg	52/52	310	840	503.85	HP7 (0.20m)	-	-	-	-
Mercury	mg/kg	0/67	<1	<1	N/A	N/A	240	LQM/ CIEH S4UL	0	N/A
Nickel	mg/kg	67/67	8	180	17.01	HP2 (0.20m)	3,400	LQM/ CIEH S4UL	0	N/A
Selenium	mg/kg	0/44	<3	<3	N/A	N/A	1,800	LQM/ CIEH S4UL	0	N/A
Vanadium	mg/kg	44/44	18	46	25.18	DL-BH05 (0.50m)	5,000	LQM/ CIEH S4UL	0	N/A
Zinc	mg/kg	67/67	27	280	50.66	HP2 (0.20m)	170,000	LQM/ CIEH S4UL	0	N/A
Tin	mg/kg	6/15	<2	130	N/A	DL-HP03 (0.20m)	-	-	-	-
Asbestos ID	-	0/20	ND	ND	N/A	N/A	-	-	-	-
Nitrate	mg/kg	14/14	7	84	27.43	HP2 (0.20m)	-	-	-	-
pH	Units	30/30	4.6	6.2	5.15	DL-HP02 (0.20m)	-	-	-	-
Naphthalene	mg/kg	1/27	<0.01	<0.01	N/A	DL-HP01 (0.20m)	1,200	LQM/ CIEH S4UL	0	N/A
Acenaphthylene	mg/kg	0/27	<0.01	<0.01	N/A	N/A	29,000	LQM/ CIEH S4UL	0	N/A
Acenaphthene	mg/kg	1/27	<0.01	<0.01	N/A	DL-HP01 (0.20m)	29,000	LQM/ CIEH S4UL	0	N/A
Fluorene	mg/kg	1/27	<0.01	<0.01	N/A	DL-HP01 (0.20m)	2,000	LQM/ CIEH S4UL	0	N/A
Phenanthrene	mg/kg	13/27	<0.01	0.06	0.01	HP35 (0.20m)	6,200	LQM/ CIEH S4UL	0	N/A
Anthracene	mg/kg	4/27	<0.01	<0.01	N/A	DL-HP01 (0.20m)	150,000	LQM/ CIEH S4UL	0	N/A
Fluoranthene	mg/kg	16/27	<0.01	0.08	0.02	DL-HP03 (0.20m)	6,300	LQM/ CIEH S4UL	0	N/A
Pyrene	mg/kg	16/27	<0.01	0.07	0.02	DL-HP03 (0.20m)	15,000	LQM/ CIEH S4UL	0	N/A
Benzo(a)anthracene	mg/kg	14/27	<0.01	0.04	0.01	DL-HP03 (0.20m)	49	LQM/ CIEH S4UL	0	N/A
Chrysene	mg/kg	9/27	<0.01	0.04	0.01	DL-HP03 (0.20m)	93	LQM/ CIEH S4UL	0	N/A
Benzo(b)fluoranthene	mg/kg	13/27	<0.01	0.05	0.01	DL-HP03 (0.20m)	13	LQM/ CIEH S4UL	0	N/A
Benzo(k)fluoranthene	mg/kg	6/27	<0.01	0.02	N/A	DL-HP03 (0.20m)	370	LQM/ CIEH S4UL	0	N/A
Benzo(a)pyrene	mg/kg	6/27	<0.01	0.04	N/A	DL-HP03 (0.20m)	11	LQM/ CIEH S4UL	0	N/A
Indeno(123-cd)pyrene	mg/kg	9/27	<0.01	0.02	0.01	DL-HP03 (0.20m)	150	LQM/ CIEH S4UL	0	N/A
Dibenzo(ah)anthracene	mg/kg	1/27	<0.01	<0.01	N/A	DL-HP01 (0.20m)	1.1	LQM/ CIEH S4UL	0	N/A
Benzo(ghi)perylene	mg/kg	6/27	<0.01	0.02	N/A	DL-HP03 (0.20m)	1,400	LQM/ CIEH S4UL	0	N/A
PAH(total)	mg/kg	20/27	<0.01	0.41	0.07	DL-HP03 (0.20m)	-	-	-	-
Benzene	ug/kg	0/15	<1	<1	N/A	N/A	90,000	LQM/ CIEH S4UL	0	N/A
Toluene	ug/kg	0/15	<1	<1	N/A	N/A	87,000,000	LQM/ CIEH S4UL	0	N/A
Ethylbenzene	ug/kg	0/15	<1	<1	N/A	N/A	17,000,000	LQM/ CIEH S4UL	0	N/A
m/p Xylene	ug/kg	0/15	<1	<1	N/A	N/A	17,000,000	LQM/ CIEH S4UL	0	N/A
o Xylene	ug/kg	0/15	<1	<1	N/A	N/A	17,000,000	LQM/ CIEH S4UL	0	N/A
Methyl tert-Butyl Ether	ug/kg	0/15	<1	<1	N/A	N/A	-	-	-	-
TPH (C5-C6 aliphatic)	ug/kg	0/15	<10	<10	N/A	N/A	95,000,000	LQM/ CIEH S4UL	0	N/A
TPH (C6-C8 aliphatic)	ug/kg	0/15	<10	<10	N/A	N/A	150,000,000	LQM/ CIEH S4UL	0	N/A

Contaminant	Units	Chemical Testing Results Summary					Assessment Criteria			
		Detection frequency	Minimum	Maximum	Mean	Location and depth of maximum	GAC	GAC Source	No. of detected concentrations exceeding GAC	Location and depth of exceedances
TPH (C8-C10 aliphatic)	ug/kg	0/15	<10	<10	N/A	N/A	14,000,000	LQM/ CIEH S4UL	0	N/A
TPH (C10-C12 aliphatic)	mg/kg	0/15	<1	<1	N/A	N/A	21,000	LQM/ CIEH S4UL	0	N/A
TPH (C12-C16 aliphatic)	mg/kg	0/15	<1	<1	N/A	N/A	25,000	LQM/ CIEH S4UL	0	N/A
TPH (C16-C21 aliphatic)	mg/kg	0/15	<1	<1	N/A	N/A	450,000	LQM/ CIEH S4UL	0	N/A
TPH (C21-C35 aliphatic)	mg/kg	2/15	<1	1	N/A	DL-HP01 (0.20m)	450,000	LQM/ CIEH S4UL	0	N/A
TPH (C6-C7 aromatic)	ug/kg	0/15	<10	<10	N/A	N/A	76,000,000	LQM/ CIEH S4UL	0	N/A
TPH (C7-C8 aromatic)	ug/kg	0/15	<10	<10	N/A	N/A	87,000,000	LQM/ CIEH S4UL	0	N/A
TPH (C8-C10 aromatic)	ug/kg	0/15	<10	<10	N/A	N/A	7,200,000	LQM/ CIEH S4UL	0	N/A
TPH (C10-C12 aromatic)	mg/kg	0/15	<1	<1	N/A	N/A	9,200	LQM/ CIEH S4UL	0	N/A
TPH (C12-C16 aromatic)	mg/kg	0/15	<1	<1	N/A	N/A	10,000	LQM/ CIEH S4UL	0	N/A
TPH (C16-C21 aromatic)	mg/kg	0/15	<1	<1	N/A	N/A	7,600	LQM/ CIEH S4UL	0	N/A
TPH (C21-C35 aromatic)	mg/kg	0/15	<1	<1	N/A	N/A	7,800	LQM/ CIEH S4UL	0	N/A

Table Notes:

Text	Denotes number of exceedances/ exceedance of GAC
mg/kg	milligrams per kilogram
ug/kg	micrograms per kilogram
LQM/ CIEH S4UL	Land Quality Management/ Chartered Institute of Environmental Health 'Suitable for Use Limits for Human Health Risk Assessment' (Land Quality Management/ Chartered Institute of Environmental Health, 2015)
EA/ DEFRA C4SL	Environment Agency/ Department for Environment, Food and Rural Affairs 'Category 4 Screening Levels for Assessment of Land Affected by Contamination' (Environment Agency/ Department for Environment, Food and Rural Affairs, 2014)
N/A	Not applicable

Table C.2: Water Environment Risk Assessment Summary (Soil Lechate Chemical Testing Results – Groundwater Assessment Criteria)

Contaminant	Units	Chemical Testing Results Summary					Groundwater Assessment Criteria			
		Detection frequency	Minimum	Maximum	Mean	Location and depth of maximum	GAC	GAC Source	No. of detected concentrations exceeding GAC	Location and depth of exceedances
Antimony (Dissolved)	ug/l	14/33	<1	51.00	4.36	HP2 (0.20m)	5	ECDWS	4	DL-HP02 (0.20m), HP2 (0.20m), HPM1 (0.00m), HPM3 (0.00m)
Arsenic (Dissolved)	ug/l	2/22	<0.2	0.70	N/A	DL-HP02 (0.20m)	10	Sco. DWS	0	-
Cadmium (Dissolved)	ug/l	17/22	<0.02	0.11	0.05	DL-HP02 (0.20m)	5	Sco. DWS	0	-
Chromium (Dissolved)	ug/l	1/21	<1	3.00	N/A	DL-BH03 (3.20m)	50	Sco. DWS	0	-
Copper (Dissolved)	ug/l	30/33	<0.5	150.00	14.22	HP2 (0.20m)	28	Sco. DWS	3	DL-HP02 (0.20m), HP2 (0.20m), HPM3 (0.00m)
Lead (Dissolved)	ug/l	26/33	<0.3	150.00	22.11	DL-HP03 (0.20m)	25	Sco. DWS	7	DL-HP02 (0.20m), DL-HP03 (0.20m), HP2 (0.20m), HP6 (0.50m), HP37 (0.50m), HP32 (0.20m), HPM3 (0.00m)
Manganese (Dissolved)	ug/l	16/16	6.00	35.00	17.38	HP36 (0.20m)	50	ECDWS	0	-
Mercury (Dissolved)	ug/l	0/22	<0.05	<0.05	N/A	N/A	1	Sco. DWS	0	-
Nickel (Dissolved)	ug/l	26/33	<1	27.00	4.85	HP2 (0.20m)	20	Sco. DWS	2	DL-HP02 (0.20m), HP2 (0.20m)
Selenium (Dissolved)	ug/l	0/20	<0.5	<0.5	N/A	N/A	10	Sco. DWS	0	-
Vanadium (Dissolved)	ug/l	0/20	<2	<2	N/A	N/A	-	-	-	-
Zinc (Dissolved)	ug/l	22/22	4.00	110.00	39.05	DL-HP02 (0.20m)	5000	USEPA DWS	0	-
pH	Units	20/20	5.31	7.96	5.73	DL-BH03 (3.20m)	-	-	-	-
Nitrate	mg/l	10/11	<0.5	13.00	6.14	HP36 (0.20m)	50	ECDWS	0	-
Dissolved Organic Carbon	mg/l	8/11	<1	5.00	N/A	HP2 (0.20m)	-	-	-	-
Naphthalene	ug/l	15/18	<0.01	0.61	0.06	HP2 (0.20m)	-	-	-	-
Acenaphthylene	ug/l	1/18	<0.01	0.04	N/A	DL-BH05 (0.50m)	-	-	-	-
Acenaphthene	ug/l	3/18	<0.01	<0.01	N/A	DL-HP02 (0.20m)	-	-	-	-
Fluorene	ug/l	11/18	<0.01	0.01	0.01	DL-HP02 (0.20m)	-	-	-	-
Phenanthrene	ug/l	11/18	<0.01	0.04	0.01	DL-BH02 (0.00m)	-	-	-	-
Anthracene	ug/l	1/18	<0.01	<0.01	N/A	DL-HP02 (0.20m)	-	-	-	-
Fluoranthene	ug/l	4/18	<0.01	0.03	N/A	DL-BH02 (0.00m)	-	-	-	-
Pyrene	ug/l	4/18	<0.01	0.04	N/A	DL-BH03 (1.00m)	-	-	-	-
Benzo(a)Anthracene	ug/l	3/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	-	-	-	-
Chrysene	ug/l	7/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	-	-	-	-
Benzo(b)fluoranthene	ug/l	3/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	-	-	-	-
Benzo(k)fluoranthene	ug/l	2/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	-	-	-	-
Benzo(a)Pyrene	ug/l	2/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	0.01	Sco. DWS	2	DL-HP02 (0.20m), DL-BH03 (1.00m)
Indeno(123-cd)Pyrene	ug/l	2/18	<0.01	0.04	N/A	DL-BH03 (1.00m)	-	-	-	-
Dibenzo(ah)Anthracene	ug/l	2/18	<0.01	0.03	N/A	DL-BH03 (1.00m)	-	-	-	-
Benzo(ghi)Perylene	ug/l	2/18	<0.01	0.03	N/A	DL-BH03 (1.00m)	-	-	-	-
PAH(total)	ug/l	18/18	<0.01	0.65	0.12	HP2 (0.20m)	-	-	-	-
Sum of PAH4	ug/l	3/18	<0.04	0.17	N/A	DL-BH03 (1.00m)	0.1	Sco. DWS	1	DL-BH03 (1.00m)
Benzene	ug/l	0/6	<1	<1	N/A	N/A	1	Sco. DWS	0	-
EthylBenzene	ug/l	0/6	<1	<1	N/A	N/A	300	USEPA DWS	0	-
M/P Xylene	ug/l	0/6	<1	<1	N/A	N/A	-	-	-	-
Methyl tert-Butyl Ether	ug/l	0/6	<1	<1	N/A	N/A	-	-	-	-
O Xylene	ug/l	0/6	<1	<1	N/A	N/A	-	-	-	-
Toluene	ug/l	0/6	<10	<10	N/A	N/A	-	-	-	-
TPH (C5-C6 aliphatic)	ug/l	0/6	<10	<10	N/A	N/A	-	-	-	-
TPH (C6-C8 aliphatic)	ug/l	0/6	<10	<10	N/A	N/A	-	-	-	-
TPH (C8-C10 aliphatic)	ug/l	1/6	<10	11.00	N/A	DL-HP02 (0.20m)	-	-	-	-

Contaminant	Units	Chemical Testing Results Summary					Groundwater Assessment Criteria			
		Detection frequency	Minimum	Maximum	Mean	Location and depth of maximum	GAC	GAC Source	No. of detected concentrations exceeding GAC	Location and depth of exceedances
TPH DW(C10-C12 aliphatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	-	-	-	-
TPH DW(C12-C16 aliphatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	-	-	-	-
TPH DW(C16-C21 aliphatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	-	-	-	-
TPH DW(C21-C35 aliphatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	-	-	-	-
TPH (C6-C7 aromatic)	ug/l	0/6	<10	<10	N/A	N/A	-	-	-	-
TPH (C7-C8 aromatic)	ug/l	0/6	<10	<10	N/A	N/A	-	-	-	-
TPH (C8-C10 aromatic)	ug/l	0/6	<10	<10	N/A	N/A	-	-	-	-
TPH DW(C10-C12 aromatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	-	-	-	-
TPH DW(C12-C16 aromatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	-	-	-	-
TPH DW(C16-C21 aromatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	-	-	-	-
TPH DW(C21-C35 aromatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	-	-	-	-

Table Notes:

Text	Denotes number of exceedances/ exceedance of GAC
ug/l	micrograms per litre
mg/l	milligrams per litre
Sco. DWS	Scottish Drinking Water Standard
ECDWS	European Drinking Water Standard
USEPA DWS	United States Environment Protection Agency Drinking Water Standard
N/A	Not applicable

Table C.3: Water Environment Risk Assessment Summary (Soil Lechate Chemical Testing Results – Surface Water Assessment Criteria)

Contaminant	Units	Chemical Testing Results Summary					Surface Water Assessment Criteria			
		Detection frequency	Minimum	Maximum	Mean	Location and depth of maximum	GAC	GAC Source	No. of detected concentrations exceeding GAC	Location and depth of exceedances
Antimony (Dissolved)	ug/l	14/33	<1	51.00	4.36	HP2 (0.20m)	5	EQS	4	DL-HP02 (0.20m), HP2 (0.20m), HPM1 (0.00m), HPM3 (0.00m)
Arsenic (Dissolved)	ug/l	2/22	<0.2	0.70	N/A	DL-HP02 (0.20m)	50	SRBD	0	-
Cadmium (Dissolved)	ug/l	17/22	<0.02	0.11	0.05	DL-HP02 (0.20m)	0.25	SRBD	0	-
Chromium (Dissolved)	ug/l	1/21	<1	3.00	N/A	DL-BH03 (3.20m)	50	EQS	0	-
Copper (Dissolved)	ug/l	30/33	<0.5	150.00	14.22	HP2 (0.20m)	28	SRBD	3	DL-HP02 (0.20m), HP2 (0.20m), HPM3 (0.00m)
Lead (Dissolved)	ug/l	26/33	<0.3	150.00	22.11	DL-HP03 (0.20m)	4	EQS	16	DL-HP02 (0.20m), DL-HP03 (0.20m), HP1 (0.50m), HP2 (0.20m) HP6 (0.20m and 0.50m), HP14 (0.50m), HP16 (0.20m), HP17 (0.20m), HP32 (0.20m), HP35 (0.20m), HP36 (0.20m), HP37 (0.50m), HP38 (0.20m), HPM1 (0.00m), HPM3 (0.00m)
Manganese (Dissolved)	ug/l	16/16	6.00	35.00	17.38	HP36 (0.20m)	50	EQS	0	-
Mercury (Dissolved)	ug/l	0/22	<0.05	<0.05	N/A	N/A	0.005	SRBD	0	-
Nickel (Dissolved)	ug/l	26/33	<1	27.00	4.85	HP2 (0.20m)	20	SRBD	2	DL-HP02 (0.20m), HP2 (0.20m)
Selenium (Dissolved)	ug/l	0/20	<0.5	<0.5	N/A	N/A	0.5	LOD	0	-
Vanadium (Dissolved)	ug/l	0/20	<2	<2	N/A	N/A	2	LOD	0	-
Zinc (Dissolved)	ug/l	22/22	4.00	110.00	39.05	DL-HP02 (0.20m)	125	SRBD	0	-
pH	Units	20/20	5.31	7.96	5.73	DL-BH03 (3.20m)	-	-	-	-
Nitrate	mg/l	10/11	<0.5	13.00	6.14	HP36 (0.20m)	0.5	LOD	10	HP2 (0.20m), HP5 (0.20m), HP6 (0.20m), HP13 (0.20m), HP16 (0.20m), HP32 (0.20m), HP35 (0.20m), HP36 (0.20m), HP39 (0.50m), HPM3 (0.00m)
Dissolved Organic Carbon	mg/l	8/11	<1	5.00	N/A	HP2 (0.20m)	-	-	-	-
Naphthalene	ug/l	15/18	<0.01	0.61	0.06	HP2 (0.20m)	2.4	SRBD	0	-
Acenaphthylene	ug/l	1/18	<0.01	0.04	N/A	DL-BH05 (0.50m)	0.01	LOD	1	DL-BH05 (0.50m)
Acenaphthene	ug/l	3/18	<0.01	<0.01	N/A	DL-HP02 (0.20m)	0.01	LOD	0	-
Fluorene	ug/l	11/18	<0.01	0.01	0.01	DL-HP02 (0.20m)	0.01	LOD	0	-
Phenanthrene	ug/l	11/18	<0.01	0.04	0.01	DL-BH02 (0.00m)	0.01	LOD	11	DL-HP02 (0.20m), DL-HP03 (0.20m), DL-BH02 (0.00m), DL-BH03 (1.00m and 3.20m), DL-BH05 (0.50m), HP2 (0.20m), HP6 (0.20m), HP36 (0.20m), HP39 (0.50m), HPM3 (0.00m)
Anthracene	ug/l	1/18	<0.01	<0.01	N/A	DL-HP02 (0.20m)	0.1	SRBD	0	-
Fluoranthene	ug/l	4/18	<0.01	0.03	N/A	DL-BH02 (0.00m)	0.01	LOD	4	DL-HP02 (0.20m), DL-HP03 (0.20m), DL-BH02 (0.00m), DL-BH03 (1.00m)
Pyrene	ug/l	4/18	<0.01	0.04	N/A	DL-BH03 (1.00m)	0.01	LOD	4	DL-HP02 (0.20m), DL-HP03 (0.20m), DL-BH02 (0.00m), DL-BH03 (1.00m)
Benzo(a)Anthracene	ug/l	3/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	0.01	LOD	3	DL-HP02 (0.20m), DL-BH02 (0.00m), DL-BH03 (1.00m)
Chrysene	ug/l	7/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	0.01	LOD	7	DL-HP02 (0.20m), DL-HP03 (0.20m), DL-BH02 (0.00m), DL-BH03 (1.00m), DL-BH05 (0.50m), HP2 (0.20m)
Benzo(b)fluoranthene	ug/l	3/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	0.03	SRBD	1	DL-BH03 (1.00m)
Benzo(k)fluoranthene	ug/l	2/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	0.03	SRBD	1	DL-BH03 (1.00m)
Benzo(a)Pyrene	ug/l	2/18	<0.01	0.05	N/A	DL-BH03 (1.00m)	0.05	SRBD	0	-
Indeno(123-cd)Pyrene	ug/l	2/18	<0.01	0.04	N/A	DL-BH03 (1.00m)	0.002	SRBD	18	DL-HP02 (0.20m), DL-HP03 (0.20m), DL-BH02 (0.00m), DL-BH03 (1.00m and 3.20m), DL-BH05 (0.50m), HP1 (0.50m), HP2 (0.20m), HP5 (0.20m), HP6 (0.20m), HP13 (0.20m), HP16 (0.20m), HP32 (0.20m), HP35 (0.20m), HP36 (0.20m), HP39 (0.50m), HPM1 (0.00m), HPM3 (0.00m)
Dibenzo(ah)Anthracene	ug/l	2/18	<0.01	0.03	N/A	DL-BH03 (1.00m)	0.01	LOD	2	DL-HP02 (0.20m), DL-BH03 (1.00m)
Benzo(ghi)Perylene	ug/l	2/18	<0.01	0.03	N/A	DL-BH03 (1.00m)	0.002	SRBD	18	DL-HP02 (0.20m), DL-HP03 (0.20m), DL-BH02 (0.00m), DL-BH03 (1.00m and 3.20m), DL-BH05 (0.50m), HP1 (0.50m), HP2 (0.20m), HP5 (0.20m), HP6 (0.20m), HP13 (0.20m), HP16 (0.20m), HP32 (0.20m), HP35 (0.20m), HP36 (0.20m), HP39 (0.50m), HPM1 (0.00m), HPM3 (0.00m)

Contaminant	Units	Chemical Testing Results Summary					Surface Water Assessment Criteria			
		Detection frequency	Minimum	Maximum	Mean	Location and depth of maximum	GAC	GAC Source	No. of detected concentrations exceeding GAC	Location and depth of exceedances
PAH(total)	ug/l	18/18	0.01	0.65	0.12	HP2 (0.20m)	0.01	LOD	18	DL-HP02 (0.20m), DL-HP03 (0.20m), DL-BH02 (0.00m), DL-BH03 (1.00m and 3.20m), DL-BH05 (0.50m), HP1 (0.50m), HP2 (0.20m), HP5 (0.20m), HP6 (0.20m), HP13 (0.20m), HP16 (0.20m), HP32 (0.20m), HP35 (0.20m), HP36 (0.20m), HP39 (0.50m), HPM1 (0.00m), HPM3 (0.00m)
Sum of PAH4	ug/l	3/18	<0.04	0.17	N/A	DL-BH03 (1.00m)	0.04	Sco. DWS	1	DL-BH03 (1.00m)
Benzene	ug/l	0/6	<1	<1	N/A	N/A	10	SRBD	0	-
EthylBenzene	ug/l	0/6	<1	<1	N/A	N/A	1	LOD	0	-
M/P Xylene	ug/l	0/6	<1	<1	N/A	N/A	30	SRBD	0	-
Methyl tert-Butyl Ether	ug/l	0/6	<1	<1	N/A	N/A	1	LOD	0	-
O Xylene	ug/l	0/6	<1	<1	N/A	N/A	30	SRBD	0	-
Toluene	ug/l	0/6	<10	<10	N/A	N/A	50	SRBD	0	-
TPH (C5-C6 aliphatic)	ug/l	0/6	<10	<10	N/A	N/A	10	LOD	0	-
TPH (C6-C8 aliphatic)	ug/l	0/6	<10	<10	N/A	N/A	10	LOD	0	-
TPH (C8-C10 aliphatic)	ug/l	1/6	<10	11.00	N/A	DL-HP02 (0.20m)	10	LOD	1	DL-HP02 (0.20m)
TPH DW(C10-C12 aliphatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	0.01	LOD	0	-
TPH DW(C12-C16 aliphatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	0.01	LOD	0	-
TPH DW(C16-C21 aliphatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	0.01	LOD	0	-
TPH DW(C21-C35 aliphatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	0.01	LOD	0	-
TPH (C6-C7 aromatic)	ug/l	0/6	<10	<10	N/A	N/A	10	LOD	0	-
TPH (C7-C8 aromatic)	ug/l	0/6	<10	<10	N/A	N/A	10	LOD	0	-
TPH (C8-C10 aromatic)	ug/l	0/6	<10	<10	N/A	N/A	10	LOD	0	-
TPH DW(C10-C12 aromatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	0.01	LOD	0	-
TPH DW(C12-C16 aromatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	0.01	LOD	0	-
TPH DW(C16-C21 aromatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	0.01	LOD	0	-
TPH DW(C21-C35 aromatic)	mg/l	0/5	<0.01	<0.01	N/A	N/A	0.01	LOD	0	-

Table Notes:

Text	Denotes number of exceedances/ exceedance of GAC
Text	Denotes number of exceedances/ exceedance of GAC on account of the Limit of Detection being used as the GAC
Text	Denotes number of exceedances/ exceedance of GAC on account of the Limit of Detection being greater than the GAC
ug/l	micrograms per litre
mg/l	milligrams per litre
Sco. DWS	Scottish Drinking Water Standard
ECDWS	European Drinking Water Standard
USEPA DWS	United States Environment Protection Agency Drinking Water Standard
N/A	Not applicable

Table C.4: Water Environment Risk Assessment Summary (Groundwater Chemical Testing Results – Groundwater and Surface Water Assessment Criteria)

Contaminant	Units	Chemical Testing Results					Assessment Criteria					
							Groundwater			Surface Water		
		DL-BH01	DL-BH02	DL-BH03	DL-BH04	DL-BH05	GAC	GAC Source	No. of detected concentrations exceeding GAC	GAC	GAC Source	No. of detected concentrations exceeding GAC
Antimony (Dissolved)	ug/l	<1	<1	<1	<1	<1	5	ECDWS	0	5	EQS	0
Arsenic (Dissolved)	ug/l	<0.2	<0.2	<0.2	<0.2	<0.2	10	Sco. DWS	0	50	SRBD	0
Cadmium (Dissolved)	ug/l	0.07	<0.02	<0.02	<0.02	<0.02	5	Sco. DWS	0	0.25	SRBD	0
Chromium (Dissolved)	ug/l	<1	<1	<1	<1	<1	50	Sco. DWS	0	50	EQS	0
Copper (Dissolved)	ug/l	0.7	<0.5	0.6	0.9	0.5	2000	Sco. DWS	0	28	SRBD	0
Lead (Dissolved)	ug/l	<0.3	<0.3	<0.3	<0.3	<0.3	25	Sco. DWS	0	4	SRBD	0
Manganese (Dissolved)	ug/l	1300	130	150	63	450	50	ECDWS	5	50	EQS	5
Mercury (Dissolved)	ug/l	<0.05	<0.05	<0.05	<0.05	<0.05	1	Sco. DWS	0	0.005	SRBD	0
Nickel (Dissolved)	ug/l	1	<1	<1	<1	<1	20	Sco. DWS	0	20	SRBD	0
Selenium (Dissolved)	ug/l	<0.5	<0.5	<0.5	<0.5	<0.5	10	Sco. DWS	0	0.5	LOD	0
Vanadium (Dissolved)	ug/l	<2	<2	<2	<2	<2	-	-	-	2	LOD	0
Zinc (Dissolved)	ug/l	11	<2	6	22	13	5000	USEPA DWS	0	125	SRBD	0
pH	Units	5.87	7	6.06	5.89	6.02	-	-	-	-	-	-
Nitrate	mg/l	<0.5	<0.5	6.7	0.7	<0.5	50	ECDWS	0	0.5	LOD	2
Calcium	mg/l	5	10	6	4	8	-	-	-	-	-	-
Dissolved Organic Carbon	mg/l	3	3	3	8	3	-	-	-	-	-	-
Naphthalene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	2.4	SRBD	0
Acenaphthylene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
Acenaphthene	ug/l	<0.01	<0.01	<0.01	<0.01	0.02	-	-	-	0.01	LOD	0
Fluorene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
Phenanthrene	ug/l	<0.01	<0.01	0.01	<0.01	0.03	-	-	-	0.01	LOD	1
Anthracene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.1	SRBD	0
Fluoranthene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
Pyrene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
Benzo(a)Anthracene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
Chrysene	ug/l	0.01	0.02	0.01	<0.01	0.01	-	-	-	0.01	LOD	4
Benzo(b)fluoranthene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.03	SRBD	0
Benzo(k)fluoranthene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.03	SRBD	0
Benzo(a)Pyrene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	Sco. DWS	0	0.05	SRBD	0
Indeno(123-cd)Pyrene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.002	SRBD	5
Dibenzo(ah)Anthracene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
Benzo(ghi)Perylene	ug/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.002	SRBD	5
PAH(total)	ug/l	0.01	0.02	0.02	<0.01	0.06	-	-	-	0.01	LOD	4
Sum of PAH4	ug/l	<0.04	<0.04	<0.04	<0.04	<0.04	0.1	Sco. DWS	0	0.04	LOD	0
Benzene	ug/l	<1	<1	<1	<1	<1	1	Sco. DWS	0	10	SRBD	0
EthylBenzene	ug/l	<1	<1	<1	<1	<1	300	USEPA DWS	0	1	LOD	0
M/P Xylene	ug/l	<1	<1	<1	<1	<1	-	-	-	30	SRBD	0
Methyl tert-Butyl Ether	ug/l	<1	<1	<1	<1	<1	-	-	-	1	LOD	0
O Xylene	ug/l	<1	<1	<1	<1	<1	-	-	-	30	SRBD	0
Toluene	ug/l	<1	<1	<1	<1	<1	-	-	-	50	SRBD	0

Contaminant	Units	Chemical Testing Results					Assessment Criteria					
							Groundwater			Surface Water		
		DL-BH01	DL-BH02	DL-BH03	DL-BH04	DL-BH05	GAC	GAC Source	No. of detected concentrations exceeding GAC	GAC	GAC Source	No. of detected concentrations exceeding GAC
TPH (C5-C6 aliphatic)	ug/l	<10	<10	<10	<10	<10	-	-	-	10	LOD	0
TPH (C6-C8 aliphatic)	ug/l	<10	<10	<10	<10	<10	-	-	-	10	LOD	0
TPH (C8-C10 aliphatic)	ug/l	<10	<10	<10	<10	<10	-	-	-	10	LOD	0
TPH DW(C10-C12 aliphatic)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
TPH DW(C12-C16 aliphatic)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
TPH DW(C16-C21 aliphatic)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
TPH DW(C21-C35 aliphatic)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
TPH (C6-C7 aromatic)	ug/l	<10	<10	<10	<10	<10	-	-	-	10	LOD	0
TPH (C7-C8 aromatic)	ug/l	<10	<10	<10	<10	<10	-	-	-	10	LOD	0
TPH (C8-C10 aromatic)	ug/l	<10	<10	<10	<10	<10	-	-	-	10	LOD	0
TPH DW(C10-C12 aromatic)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
TPH DW(C12-C16 aromatic)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
TPH DW(C16-C21 aromatic)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0
TPH DW(C21-C35 aromatic)	mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	0.01	LOD	0

Table Notes:

Text	Denotes number of exceedances/ exceedance of GAC
Text	Denotes number of exceedances/ exceedance of GAC on account of the Limit of Detection being used as the GAC
Text	Denotes number of exceedances/ exceedance of GAC on account of the Limit of Detection being greater than the GAC
ug/l	micrograms per litre
mg/l	milligrams per litre
Sco. DWS	Scottish Drinking Water Standard
ECDWS	European Drinking Water Standard
USEPA DWS	United States Environment Protection Agency Drinking Water Standard
N/A	Not applicable

Table D.1: Gazetteer of sites identified within the Dellmore Site

ORCA Site No.	THC HER Mon. UID	Site Name	Description	NGR	Period	Significance	Accuracy (if applicable)
1	161491	Dellmore of Kingussie	Rifle Range	NN 7513 9937	19th- 20th Century	Low	3 m

Table D.2: Gazetteer of sites identified within 1 km of the Dellmore Site

ORCA Site No.	THC HER Mon. UID	Site Name	Description	NGR	Period	Significance	Accuracy (if applicable)
2	25201	Inverton	Linear Feature	NN 747 996	Unknown	Unknown	N/A
3	25202	Tom Na Crooiche	Rig and Furrow	NN 7490 9922	Medieval	Low	N/A
4	112217	Tolbooth	Tolbooth	NH 75 00	19 th Century	Negligible	N/A
5	14071	Kingussie	Carved Stone Ball	NH 75 00	Prehistoric	Low	N/A
6	14088	Rath of Kingussie	Moot Stone Circle	NH 75 00	Medieval Prehistoric	Low	N/A

References

- Atherton, I., Bosanquet, S. & Lawley, M. (2010). Mosses and Liverworts of Britain and Ireland: a field guide. British Bryological Society.
- BAM Ritchies (2018). A9 Dualling – Glen Garry to Dalraddy, Project 9 Crubenmore to Kincaig – Draft Final Report on Preliminary Ground Investigation, BAM Ritchies, issued July 2018.
- Brown, A. F. & Shepherd, K. B. (1993) *A method for censusing upland breeding waders*. Bird Study, 40: pp. 189-195.
- Cairngorms National Park (2013) *Cairngorms Nature Action Plan 2013-2018* [Online] Available at: <https://cairngorms.co.uk/resource/docs/publications/13052013/CNPA.Paper.1898.Cairngorms%20Nature%20Action%20Plan%202013-2018.pdf> [Accessed 30 March 2018].
- Centre for Ecology and Hydrology (2017). *Flood Estimation Handbook (FEH) Web Services*. Available at <https://fehweb.ceh.ac.uk/> [Accessed 30 May 2018].
- CIfA (Chartered Institute of Field Archaeologists) (2014a). *Standards and guidance for historic environment desk-based assessment (Updated 2017)*. Available at: http://www.archaeologists.net/sites/default/files/CIfAS%26GDBA_3.pdf [Accessed 24 March 2017].
- CIfA (Chartered Institute of Field Archaeologists) (2014b) *Standards and guidance for archaeological field evaluation*. Available at: http://www.archaeologists.net/sites/default/files/CIfAS&GFieldevaluation_1.pdf [Accessed 24 November 2017].
- Collins, J. (ed.) (2016) *Bat Surveys for Professional Ecologists: Good Practice Guidelines* (3rd edn). The Bat Conservation Trust, London
- Cooper, E.A. (1997) *Summary Descriptions of National Vegetation Classification grassland and montane communities*. ISBN 1 86107 433 3.
- Cuthbertson & Partners (1990). *Flooding in Badenoch and Strathspey*. Final Report Vol. 1
- Dean, M., Strachan, R., Gow, D., & Andrews, R. (2016). *The Water Vole Mitigation Handbook. (The Mammal Society Mitigation Guidance Series)*. Eds Fiona Mathews and Paul Chanin. The Mammal Society, London.
- Department for Environment, Food and Rural Affairs (DEFRA) (2014) *Category 4 Screening Levels for Assessment of Land Affected by Contamination*.
- Dietz, C., von Helversen, O., and Nil, D., (2007) *Bats of Britain, Europe & northwest Africa*. A & C Black Publishers. Edinburgh.
- Eaton et al. (2015) *Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man*. British Birds 108, 708–746
- European Union Water Framework Directive 2000/60/EC. Available at <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060> [Accessed 30 May 2018].
- Forrester, R. and Andrews, D. (2007) *The Birds of Scotland*. Scottish Ornithologists Club. Aberlady.

- Gemmell, S. L. G., Hansom, J. D., Hoey, T. B., (2001). *The geomorphology, conservation and management of the River Spey and Spey Bay SSSIs Moray*. Scottish Natural Heritage Research and Monitoring Report No. 57.
- Gilbert, G., Gibbons, DW. and Evans, J. (1998) *Bird Monitoring Methods: A manual of techniques for key UK species*. Bedfordshire: RSPB.
- Gustard, A., Bullock, A and Dixo, J.M. (1992) *Report No. 108: Low flow estimation in the United Kingdom*, Institute of Hydrology: Oxfordshire.
- Historic Environment Scotland (2011) *Planning Note (PAN 2/2011): Planning and Archaeology and Managing Change in the Historic Environment Guidance Notes* [Online] Available at: <http://www.gov.scot/Publications/2011/08/04132003/0> [Accessed 30 May 2018].
- Historic Environment Scotland (2017) *Canmore (Dellmore of Kingussie, Rifle Range)* [Online]. Available at: <https://canmore.org.uk/site/161491/dellmore-of-kingussie-rifle-range>
- Historic Environment Scotland. (2016) *Policy Statement June 2016*. Edinburgh.
- JNCC (2016) Annex I habitats and Annex II species occurring in the UK [Online] Available at: <http://jncc.defra.gov.uk/page-1523> [Accessed 29 May 2018].
- Joint Nature Conservation Committee (JNCC) (2010) *Handbook for Phase 1 habitat survey: a technique for environmental audit*. Peterborough: Joint Nature Conservation Committee.
- Land Quality Management (LQM)/ Chartered Institute of Environmental Health (CIEH) (2015) *Suitable for Use Limits for Human Health Risk Assessment*.
- Rodwell, J.S. (2006). *NVC Users' Handbook*. ISBN 978 1 86107 574 1.
- Rodwell, J.S. (Ed), et al. (1991 – 2000). *British Plant Communities* (5 volumes). Cambridge, Cambridge University Press.
- Rose, F. (1989) *Colour Identification Guide to the Grasses, Sedges, Rushes and Ferns of the British Isles and North-Western Europe*. ISBN 978-0670806881.
- Scottish Environment Protection Agency (2014b). Position Statement WAT-PS-10-01 Assigning Groundwater Assessment Criteria for Pollutant Inputs, Version 3.
- Scottish Environment Protection Agency (2017) *River Basin Management Plan Interactive Map* [Online] Available at: <http://map.sepa.org.uk/rbmp/> [Accessed 14/02/2018]
- Scottish Government (2011) *Historic Environment (Amendment) (Scotland) Act 2011*. Edinburgh.
- Scottish Government (2011) Planning Advice Note 2/2011: Planning and Archaeology.
- Scottish Government (2014) *Scottish Planning Policy (SPP)*. Edinburgh.
- Secretary of State for Scotland (1997) *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 (Listed Buildings)*. Edinburgh
- Secretary of State for Scotland (1998) *The Ancient Monuments and Archaeological Areas Act 1979*. Edinburgh
- SEPA (2010) *River Basin Management Planning – River Spey catchment summary* [Online] Available at: <https://www.sepa.org.uk/media/75401/doc-6-river-spey.pdf> [Accessed 30 May 2018].

SEPA (2014a) Land Use Planning System SEPA Guidance Note 4: Planning advice on windfarm developments. Issue No: Version 7. Issue date: 14/05/2014.

SEPA (2014b) Land Use Planning System SEPA Guidance Note 31: Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems. Version 2. Issue date: 27/10/2014.

Spey Catchment Steering Group (2003) *River Spey Catchment Management Plan* [pdf] Available at: <http://www.snh.org.uk/pdfs/consults/spey/speyreport.pdf> [Accessed 23 February 2017].

Spey Fishery Board, 2015. *Catchment characteristics*. [Online] Available at: <http://www.speyfisheryboard.com/catchment-characteristics/> [Accessed 20 February 2017].

Stace, C.A. (2010). *New Flora of the British Isles*. 3rd Edition. Cambridge University Press.

Strachan, R., Moorhouse, T., and Gelling, M. (2011). *Water Vole Conservation Handbook*, 3rd ed. Wildlife Conservation Research Unit, Oxford.

The Highland Council (2012) Standards for Archaeological Work [Online] Available at: http://www.highland.gov.uk/downloads/file/1022/standards_for_archaeological_wok Accessed on 24-11-2017

The Highland Council, 2016. *Highland HER (Record MHG30865)* [Online]. Available at: <http://her.highland.gov.uk/SingleResult.aspx?uid=MHG30865> [Accessed 1 March 2017].