Making great sport happen

COUL LINKS PROPOSED GOLF DEVELOPMENT

Environmental Statement

Prepared by STRI

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COMMON GOLFING TERMS

Approach - The shot a player takes from the fairway to the green

Apron - The thin strip of slightly longer grass (compared to the grass on the green) that separates the surrounding rough from the green (also called Apron).

Carries – Area of native rough between tees and fairway – Area to be played over (carried) by the golfer. Area of retained native vegetation.

Boundary - The edge of the course that defines the area in play.

Dog Leg - Any golf hole where the fairway bends either left or right toward the green - like a dog's leg.

Fairway - The long stretch of managed amenity grassland neatly trimmed grass that runs between the carry and the green. The desired landing place for your tee shot

Green (or Putting Surface) - The short grassy surface where the cup (or hole) is located. Players putt from the green.

Handicap - A rating of each hole on the course from 1 to 18 with 1 being the most difficult and 18 the easiest. handicap is also a measure of the difference between a player's skill (average score) and the difficulty of a course.

Hazards - Obstacles strategically placed on a golf course to make play on each hole more difficult. Sand traps, water, and trees are all considered hazards.

Links - A term describing coastal golf courses.

Markers - These are the objects on the Tee Box which mark where you should tee off from. You always place your ball behind them, never in front of them.

Par - The number of strokes per hole it should take a player to sink the ball in the cup. Holes measuring up to 250 yards are called par threes; from 251 to 475 yards are par fours; and any hole above 475 yards is considered a par five.

Rough - The taller grass that lines the fairways and greens on each hole.

Bunker - Sand-filled pits on fairways and next to greens that are placed as hazards on a course.

Tee Box - The area at the start of each hole from where players drive the ball.

Water Hazard - A pond or stream. If a ball lands in water and is unable to be played, the golfer takes a penalty stroke.

LIST OF ABBREVIATIONS

Abbreviation	Full Form
AADT	Average Annual Daily Traffic
AMP	Archaeological Management Plan
AOD	Above Ordnance Datum
ATC	Automatic Traffic Counter
BGS	British Geological Survey
CRoW	Countryside and Rights of Way
CTMP	Construction Traffic Management Plan
dB	Decibels
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EIA	Environmental Impact Assessment
ES	Environmental Statement
EC	European Commission
ET	Evapotranspiration
FCS	Favourable Conservation Status
GDL's	Gardens and Designed Landscapes
GIS	Geographic Information Systems
GVA	Gross Value Added
GWDTE	Ground Water Dependant Terrestrial Ecosystem
HEAS	Historic Environment Amendment Scotland
HES	Historic Environmental Statement
HGV	Heavy Goods Vehicles
HS	Historic Statement
HIE	Highlands and Islands Enterprise
IEA	Institute of Environmental Assessments
IEMA	Institute of Environmental Management and Assessments
IHT	Institute of Highways and Transportation
LGVs	Lights Goods Vehicles
LVIA	Landscape and Visual Impact Assessment
NCCA	National Coastal Change Assessment
NHZ	National Heritage Zones
NMRS	National Monuments Record of Scotland
NNR	National Nature Reserve
NRTF	National Road Traffic Forecasts
NSR	Noise Sensitive Receptors
NTS	Non-Technical Summary
NVC	National Vegetation Code
OS	Ordnance Survey
P-AAP	Pre-Application Advice Pack
PAN*	Planning Advice Note
PAN	Proposal of Application Notice

PIA	Personal Injury Accidents
PPG	Pollution Prevention Guidelines
RSPB	Royal Society for the Protection of Birds
SEPA	Scottish Environmental Protection Agency
SM's	Scheduled Monuments
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPLs	Sound Pressure Levels
SPP	Scottish Planning Policy
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Urban Drainage System
TA	Technical Annex
THC	The Highland Council
TP	Travel Plan
TS	Transport Statement
VP	Vantage Point
WFD	Water Framework Directive
WSI	Written Scheme of Investigation
ZTV	Zone of Theoretical Visibility

PART A

NON-TECHNICAL SUMMARY

1.0 NON-TECHNICAL SUMMARY

1.1 INTRODUCTION

Coul Links Ltd is applying for detailed planning permission to create an 18-hole golf links on a site north of Embo, approximately 4 km north of Dornoch, Sutherland.

The proposed development is comprised of a new golf course, to be known as Coul Links, together with a practice ground, club house and associated maintenance and ancillary facilities.

The objective of the proposal is to create a world class links course that would be ranked amongst the top golf courses in the world. By siting the course close to Royal Dornoch, the developers hope to enable the local area to become a competitive golfing destination in the international market. The concept for Coul Links differs to other golf resorts in Scotland in that the volume of development involved would be very modest.

Should planning permission be granted, the golf course will be constructed over a period of 18 months.

As required by the relevant legislation, this Environmental Statement (ES) has been prepared by STRI Group consultants in support of the detailed planning application which will be submitted on behalf of Coul Links Ltd.

1.2 NATURE AND EXTENT OF THE PROPOSED DEVELOPMENT

The proposed development can be summarised as the construction of an 18-hole golf links including all access routes, drainage, earthworks shaping, planting, irrigation systems, services and infrastructure, as required.

The gross development boundary area is approximately 328.4 hectares, however the layout of the golf course within this area will be just 22.7 hectares. The proposal forms part of an extant planning application (16/00053/SCRE) which was lodged on 21st December 2015 for the '*Development of an 18 hole championships links golf course and practice area. The total area of development is anticipated to be approximately 328.4 hectares (811 acres).*' The planning application status at present is awaiting decision due to the requirement of an EIA.

The physical characteristics of the development to construct the golf course and associated facilities will include:

- Creation of a new access road from the C1026;
- Removal of trees and shrubs of low ecological importance;
- Translocation of dune heath;
- Minor earth moving and shaping;
- Installation of irrigation system;
- Sowing of playing surfaces with golf appropriate species;
- Construction of golf club house;
- Refurbishment of existing buildings to accommodate golf course facilities;
- Construction of golf course maintenance facility;
- Upgrading of footpath network across the golf course;
- Installation of interpretation board(s) along public access paths.

A core element to the design concept for the links course will be to incorporate as much as possible of the existing landscape in the course layout, thereby maximising the amount of existing landscape that is unchanged.

Importantly, in terms of the scope of this ES, it also illustrates sites which are designated to provide protection to features of international or national ecological/ornithological, historical or archaeological significance.

1.3 SITE LOCATION

The site of the proposed development is situated on the coast directly to the north of the township of Embo, approximately 4 km north of Dornoch and 6km south of Golspie, in the south of county Sutherland, Scotland. The Loch Fleet estuary lies adjacent the site to the north and Embo beach abuts the site boundary to the east. The total site area of the proposed development is approximately 328.4 hectares.

Coul Farm is central within the development site and is accessed via a residential road which intersects the site from the north western boundary. This road links to an Unnamed Road which forms a portion of the north western boundary of the development site. The A9 runs north-south approximately 2 km west of the site and is the main link between Edinburgh and Inverness north to Thurso. It makes up a portion of the scenic tourist route which navigates the coast line of the Highlands.

The township of Embo, which is adjacent to the southern boundary of the site, has a population of approximately 300 and comprises residential properties as well as several commercial properties including a small store, a number of bed and breakfasts and a caravan park.

1.4 CURRENT LAND USE

The current land use of the site is mixed, though all uses are at present, very low impact.

The central portion of the site, immediately west and south of the old railway line comprises improved pasture currently used for sheep grazing. The land in the southwestern portion of the site comprises rough pasture with patches of scrub, dune heath and woodland.

The land between the coast and the route of the old railway line largely comprises a stable dune system with some areas of trees, scrub, bracken and felled woodland. This portion of the site is designated as being of international and European importance as part of the Dornoch Firth and Loch Fleet RAMSAR Site and Dornoch Firth and Loch Fleet Special Protection Area (SPA) respectively, and of national importance as part of the Loch Fleet Site of Special Scientific Interest (SSSI). The SSSI is notified for its intertidal marine habitats (eelgrass beds and sandflats), its coastlands (saltmarsh and sand dunes), its native pinewood, its vascular plant assemblage, and its birds (breeding bird assemblage and non-breeding eider).

1.5 SERVICES

Scottish Water mains at Fourpenny serve Coul Farmhouse and Cottages via a 25 mm private supply pipe. This will be replaced in a larger bore and metered at Fourpenny in order to serve the proposed clubhouse.

Electricity is supplied via Scottish and Southern Energy to Coul Farmhouse and Cottages. Overhead electricity powerlines are the only services running across / through the site of the proposed golf course. The powerlines will be diverted around the boundary of the site, to ensure they do not interfere with the playability of the golf course.

1.6 EIA APPROACH

The proposals for the site have been developed following the completion of comprehensive technical studies including an Ornithology Survey, an Ecology Survey, a Landscape and Visual Impact Assessment an Access, Traffic and Transport Assessment, a Cultural Heritage Assessment, a Socio-economics Study and a Hydrology and Hydrogeology Study. These assessments have been completed to inform the Environmental Statement (ES).

This Non-Technical Summary (NTS) outlines the findings of the ES, which describe the potential for significant environmental effects (both positive and negative) to arise as a result of the proposed development. The ES also identifies mitigation measures to minimise any likely significant effects.

A Scoping Report was submitted to The Highland Council in July 2016 with a request for a scoping opinion, in accordance with Regulation 10 of the EIA Regulations 1999.

The organisations listed below were consulted as part of the preparation for the formal scoping opinion. Their responses were considered in the preparation of the technical Annexes within the ES.

- The Highland Council;
- Highlands and Islands Enterprise;
- Scottish National Heritage (SNH);
- Scottish Environmental Protection Agency (SEPA);
- The Embo Trust;
- Dornoch Community Council;
- Dornoch Area Community Interest Company; and
- The University of Highlands and Islands Golf Programme.

Further discussion with the public sector, local councillors and environmental organisations was undertaken through public consultations held in July 2016 and August 2016 with a final public information evening scheduled for October 2017. Throughout the ES process, consultation with statutory and non-statutory consultees has taken place which has informed the ES for the Proposed Development. The purpose of these consultations is to identify the baseline conditions at the site and therefore the likely significant environmental effects that need to be assessed. These consultations also aid in obtaining any views on the Proposed Development, which may need to be considered in the design process.

1.7 CONSTRUCTION PROGRAMME AND PHASING

Works will be scheduled to ensure the best chance of providing optimum conditions for establishment and achieving conservation goals. It is intended to complete holes 10 to 18, through the south/central part of the development in May to October 2018 to avoid intrusion into the main dune slack area and impact on associated overwintering birds. Holes 1 – 9 will be completed in April – July of the following year.

The main work stages will be as follows:

1. Mobilisation, site set up, staking out and primary haul route formation
2. Clearing vegetation/ superficial organic matter
3. Heather transplantation
4. Bulk excavation and topsoil stripping
5. Grading (rough shaping)
6. Drainage (temporary and permanent)
7. Irrigation installation
8. Feature construction (tees, greens and bunkers)
9. Fine shaping
10. Surface preparation and seeding
11. Establishment and grow-in

From within the working areas (tees, greens, surrounds, fairways, semi-rough, managed rough and grass pathways) vegetation will be removed together with the superficial layer of partially decomposed organic matter. This will be spread within the working areas using a process of sand inversion i.e. excavated sand will be used to cap the organic matter to form shallow localised mounds or hummocks which blend with the surrounding landscape. The heather transplantation plan will involve preparation of the donor areas and the translocation of heather (from within the playing areas of the golf holes) from September through to early January. This represents the optimum time frame for this operation.

Grading works will involve:

- Localised raising of low areas for drainage importing 0.5 – 1m depth of native sand depending on the proximity of groundwater level.

- Smoothing contours – primarily cut and fill through sections of more abrupt level change within the primary playing areas.

- Development of features, tees, greens and bunkers. This will involve subtle reshaping on a localised basis.

There will be a degree of micro-siting during the above under the direction of the architects and ecologist to minimise intervention.

From areas identified for re-grading, top soil will be stripped, preserved and subsequently replaced on completion of grading operations to maintain overall profile characteristics. For the majority of the site, works will simply be confined to spray treatment with an appropriate total weed killer (adopting appropriate environmental and application procedures) to control regeneration of vegetation after preliminary stripping of organic matter. Surfaces will be cultivated prior to final seed preparation and seeding.

There will be a rolling programme of works with overlap of operations to ensure timely completion of the works.

Final seed bed preparation and seeding will be co-ordinated with weather conditions within the window April to end September. Hydroseeding will be the principle method of establishment to help protect the seed, maximise germination and reduce the impact of erosion.

On completion of construction works all temporary haul routes and compound areas will be decommissioned and completely removed from site and surfaces reinstated.

A site appropriate Construction Environmental Management Plan will be observed throughout all phases of construction during the development. This will be modified as appropriate to take into account specific environmental factors which may come to the fore throughout the life of the project and to maximise environmental outcomes. The works as they progress, together with any proposed changes, will be under constant review on the ground by the designated ecological clerk of works to ensure that environmental objectives are met. The plan will include temporary protection works to prevent damage to adjoining habitat during the construction and establishment phase. Deployment and implementation of the construction plan will involve appropriate equipment and use of skilled operators who have expertise in working in comparable environments.

1.8 POLICY CONTEXT

1.8.1 Local Policy and Guidance

Local policy and guidance considered relevant to the proposed development include the following development plans and associated supplementary guidance:

§ Highland-wide Local Development Plan (HwLDP)

– The HwLDP is a high-level strategy plan which sets out how land in the Highlands can be used by developers for the next 20 years. There are several policies within the LDP which have been considered during the planning process for the proposed development:

Table ES.1: HwLDP Relevant Policies

Policy	Topic
28	Sustainable Design
29	Design Quality and Place Making
30	Physical Constraints
31	Developer Contributions
36	Development in the wider countryside
43	Tourism
49	Coastal Development
51	Trees and Development
56	Travel
57	Natural, Built and Cultural Heritage
58	Protected Species
59	Other Important Species
60	Other Important Habitats and Article 10 Features
61	Landscape
62	Geodiversity
63	Water Environment
64	Flood Risk
65	Waste Water Treatment
66	Surface Water Drainage
72	Pollution
74	Green Networks
77	Public Access

- Sutherland Local Plan
  - The Sutherland Local Plan will shortly be replaced by the Caithness and Sutherland Local Plan but until then, two policies from the local plan are still considered applicable to the proposed development: Policy 2 – Development Factors and Development Requirements; and, Policy 17 – Commerce.
- Caithness and Sutherland Proposed Local Development Plan (CaSPlan)
  - The CaSPlan outlines several policies relevant to the proposed development. Embo is highlighted as a 'Sutherland Growing Settlement' in the plan and is addressed specifically in Policy 3 which highlights the elements for which any new development will be assessed. The proposed development has sought to fulfil each of the requirements including high quality design, no net loss of amenity/recreational areas and no adverse impact on important heritage features.

1.8.2 Highland Council Supplementary Guidance

- The Highland Council (THC) has adopted Supplementary Guidance related to different topic areas. The following were considered relevant to the Proposed Development:
  - Historic Environment Strategy
- The strategy defines THC's approach to the protection of the historic environment through the planning process. The strategy aims to ensure that there is a proactive and consistent approach to the protection of the historic environment and is a material consideration when proposals for development are being considered.
  - Highland Statutorily Protected Species
- This piece of supplementary guidance supplements Policy 58 – Protected Species of the HwLDP.
  - Green Networks
- The proposed development lies within an identified Green Network. This supplementary guidance helps developers and decision makers to promote greenspace linkages and to safeguard and enhance wildlife corridors in and around new and existing developments.
  - Flood Risk and Drainage Impact Assessment

- The guidance aims to improve the design and implementation of developments and their related drainage arrangements. The proposed development has been guided by several elements of the guidance during the preparation of drainage plans and other design aspects.
- Highland Council Interim Supplementary Guidance

  - The Highland Coastal Development Strategy

- This strategy is scheduled for future adoption as Supplementary Guidance and is at present seen as interim guidance. The Strategy's main aim is to guide the sustainable development and use of Highland's coastal zone whilst safeguarding its natural and cultural heritage assets.

1.9 ALTERNATIVES CONSIDERED

Developing a successful golf course requires a series of key elements. These include the ability to use natural landscape features to create the nuances of the course, free draining substrates and spectacular views. All of these contribute considerably to the success of a golf course not only commercially, but in terms of its sustainability through the construction and operational phases. Constructing a course purely in agricultural land, for example, would first require immense establishment and importation processes to create the required undulation for golf. Agricultural soils are nutrient rich and often poorly draining, resulting in playability issues and the end result is unlikely to be a popular venue, thereby reducing the local and regional economic benefits. As such the Coul Links site presents all the attributes for a truly successful golf course, requiring minimal invasive works to create, and operating extremely sustainably.

The following test describes the process undertaken by the course designers, including the evolution of the layout and a description of the proposed course routing.

Having identified Coul Links as the preferred site, the designer spent over a week walking over the site in order to understand its full golf potential. The best land from a golf perspective is to the east of the dismantled railway. The rolling dunes are characterized by a highly distinctive topography of rumpled terrain, comprising hollows, valleys, ridges and plateaux of various shapes and sizes that is ideal for golf. From the dunes, a golfer would be able to experience the essential character of the dunes properly: the views of Skelbo, Loch Fleet, Littleferry, the East Sutherland coast (including Dunrobin Castle) and Embo; the rise and fall of the land; the attractive groupings of trees; the heather; the change in topography and vegetation; the disused rail; the dune slacks; and the beach.

Vitally, the initial positioning of the golf course layout took into account preliminary ecological advice that identified the coastal margins of the site (i.e. the foredune, dune slacks, winter loch and tidal inlet) which were likely to be the most sensitive areas from an ecological and ornithological perspective. As well as considering habitat types and species associated with the SPA and SSSI within the site boundaries.

The developers aim was to highlight and work with existing natural features and topography within the preferred area e.g. heather, dunes, the existing farm buildings and the plateaux around Coul Farm. Therefore, the initial positioning of the course and its layout took into account the natural terrain, views, wind directions, sun angles, watercourses and the location of existing buildings. This would allow for minimal earthworks, minimal infrastructure and therefore limited disturbance to the hydrology, protected habitats and species that this SSSI is designated for as well as preserving the Coul Farm, which is a B listed heritage building.

Course Layout 1

Based on the above, the first layout comprised two loops (a northern loop including holes 1 to 11 and a southern loop including holes 12 to 18) starting and ending on the plateaux at the Coul Farm buildings. Layout 1 also limited the number of holes that crossed the winter loch and approached the foredune and tidal inlet. The direction of play considered the sun, as it is generally preferable to orient the opening holes away from the low morning sun, and vice versa in the late afternoon.

Course Layout 2

The layout developed further as more understanding of the site setting was obtained through additional site visits. The changes made between layout 1 and layout 2 were predominantly associated with utilising the most suitable features on the property for golf, but also included further consideration of the preliminary ecological advice. The change in design primarily involved a move in the extents of the course towards the south and west, which is further away from the tidal inlet in the north. This resulted in a shift in the number of holes in each loop, with the northern loop now including holes 1 to 10 and a southern loop now including holes 11 to 18.

This layout was presented at the first public consultation events held in Dornoch and Embo on 13 July 2016.

Course Layout 3

Layout 3 is similar to layout 2, but shows refinement of the likely extent of turfed areas. Further refinements were made for purposes of utilising natural features for golf most effectively. This layout design was presented at the second public consultation events held in Dornoch and Embo on the 30th and 31st August 2016.

Course Layout 4

The changes made between layout 3 and layout 4 result from a greater appreciation of the natural land forms and features present on the site.

Through further visits to the site the course designers made refinements to hole routeings and layouts that required less alteration of the natural landform to be suitable for golf. In layout 3, hole 3 played northeast over a sand dune and would have required some modest terrain modifications to become workable for golf. In the development of layout 4, a

possibility to reduce the terrain modifications presented itself by playing hole 3 towards the northwest. The setting for this new hole alignment is entirely natural, and the natural features will require only minor alterations to be made suitable for golf. The new alignment also results in a view for golfers to the west along Loch Fleet.

By increasing the distance played to the northwest, the number of holes in the northern loop increased so that holes 1 to 11 were included. This meant that there was a reduction in the number of holes within the southern loop. Reducing the number of holes in the southern loop lead to the possibility of reducing the area of turf around the winter loch and along the landward side of the foredune, which the developer appreciates are important features within the site.

Final Course Design

Following design iterations with SNH and other consultees, the final layout of the golf course gives due consideration to the sensitive nature of the site and its environs by taking into consideration detailed environmental constraints outlined after more thorough ecological ornithological and hydrological investigation. The built element utilises current buildings around the Coul Farm house and does not encroach onto sensitive areas. The golf course incorporates the natural topography of the land, avoiding the most significant area of dune slack along the east of the site entirely and avoiding lesser dune slack areas and water bodies wherever possible. The layout incorporates boardwalk sections and narrow paths between holes to further minimise impact on ecologically sensitive areas.

The Site Masterplan is shown in Appendix ES.1

Hole #1:

As it turns out, on the farm property there is a near-ideal way to start the golf course, by playing due north towards the heather dunes, to a location for a green (which is the target or terminal area for each golf hole) that is entirely natural, ready-made for golf. This first green is a clearly defined, slightly cupped area whose aspect is elevated overall relative to the surrounding topography. This small area, perhaps 1,000 square meters, is surrounded on three sides by beautiful patches of heather, which will help frame the green.

Hole #2:

Immediately adjacent to the location for the first green are a few small sandy hummocks that are suitable as starting points for the second hole. For this hole there are very obvious directions to avoid (including through a low wet area filled with trees), and one very obvious direction to choose. Playing north and west, and around the treed area, the second hole goes up and into a beautiful patch of heather dunes. Again, the features of the hole are very clearly defined by topography. From the tee there is a thrilling “High Road” and a safer, longer, lower route. The green for this hole, just like the first green, is a perfectly natural small plateau in amongst the dunes.

Hole #3:
The tee for the third hole is located just a few paces further along in the dunes. In an earlier rendition of the golf course layout, this hole played up and over a sand dune and would have required some modest terrain modifications to become workable for golf. In the final layout, however, an ideal solution presented itself by playing the third hole from a narrow high starting point north towards Loch Fleet across a corner of a field and into a small pocket set amongst a group of low dunes. The setting for this hole is entirely natural, and the features will require only minor alterations to be made suitable for golf.

Hole #4:
The tees for the fourth hole are located just above the third green, on a small dune that contains a few level spots that are suitable for tees. While the first half of this dramatic hole plays up over a couple of large sand dunes and along a piece of ground that is well suited for golf course turf, it is flanked on both sides by relatively steep drop-offs and ground that is wholly unsuitable for golf. The second half of the hole is back into a portion of the heather dunes that is internal to the farm property, and features a slightly different character than other sections. The green for this hole is another natural green, this time a generous area in a slight bowl that exists inside a larger elevated area. It is a wonderful location for a large green for a long hole.

Hole #5:
The next hole, the fifth, is almost entirely natural. The location of the green for this hole has been present in most if not all the various preliminary layouts that preceded the final layout, and it is superb. In the final layout the tee location is set high in the dunes, near a natural and very dramatic sand “blow-out” that is now covered in heather and gorse.

Hole #6:
The sixth is the shortest hole on the course, a tiny gem that plays from a generous level spot to a green that sits in a pocket in a small dune. A nice view of Dunrobin Castle will be had on this hole, too.

Hole #7:
The tees for the seventh are located just a few paces away, in another couple of small dunes that provide a bit of elevation relative to the small dune slacks that must be crossed or skirted for the first half of the seventh. The green for number seven is a broad, slightly raised heather-clad dune that—while perhaps unremarkable in isolation—provides a nice end to the seventh and a fitting way to start the eighth.

Hole #8:
Everything about the eighth hole is supremely natural: the tees are located on the tail end of the low dune that provides the seventh green. The fairway is a glorious piece of rumpled ground. The main hazard on the hole is a natural sandy hollow that is backed by a large dune. The green sits in another hollow that is flanked by dunes and trees. It is about as near to the ideal of a natural golf hole as can be found.

Hole #9:
The first half of the ninth hole is similar in character to the eighth. The second half plays back towards the steadings and into an area that has been intensively farmed and logged. The natural topography for the hole is very good, including the setting for the green. The conditions for golf, especially with regard to drainage and vegetation, however, will require remediation to reintroduce conditions that are suitable for growing fine turf and the transplanting of heather.

The next five holes, the tenth through the fourteenth, are laid out over topography that is ideal for golf but largely either compromised by farming/logging or overgrown by bracken and gorse.

Hole #10:
The tenth hole covers terrain that was previously conifer plantation and has been logged. Topography—a fine plateau for a green and a good sized dune around which the hole is arranged—dictates the placement of this hole, as it does for all the preceding holes. So, while the plan is to plant this section of the property with fine-leaved coastal grasses, and to transplant marram grasses and heather from other parts of the property (reusing natural materials from the creation of other holes), it is noted that topography is the primary driver of all sections of the golf course. Boardwalk has been incorporated into the pathway between this hole and the next to avoid disturbance to small dune slack areas.

Hole #11:
The 11th is another hole that starts from various small hummocks that will be used for tees and plays back over the logged conifer area towards the farm steading.

Hole #12:
From the steading area, the 12th is a short hole that plays south and east from a slightly elevated position to a perfectly situated natural plateau. The plateau is currently overgrown with bracken but features lovely contours. This hole also has long views down the southern end of the property, towards and including Embo and points further to the south along the coast.

Hole #13:
The thirteenth is a long hole that plays out over more ground that is ideally suited for golf—some of the finest on the property—although it is currently covered in bracken. The setting for the green, just like most of the greens, is an entirely natural raised area that is backed by a small copse of trees. The thirteenth plays over the Central Burn and stops short of the Cluain Burn.

Hole #14:
The tees for the fourteenth are tucked back into a dune that is located to the right of the thirteenth green. From here, the hole crosses the Cluain Burn and plays out into an old field that is currently covered in bracken and gorse. This field is flanked on the right by a slope that leads up to a slight plateau—a bit of raised beach—that will make an excellent upper section of fairway, a different version of the second hole in this way. The green for this hole is perched on a lovely small point towards Embo, and marks the south end of the golf course and the natural connection point or gateway to town.

Hole #15:
The tees for the next hole are located just down the slope from the 14th green. The green for this hole is a natural saddle on the opposite side of a small valley, near Cluain Burn. It is a magnificent setting, tucked low behind the primary dune but still high enough to provide stunning views in all directions. Two existing coastal walk paths are located in this area, and both can/will be kept. Boardwalk has been incorporated into the pathway between this hole and the next to avoid disturbance to the eastern dune slacks.

Hole #16:
The sixteenth is a long hole that heads back north towards the steadings, paralleling hole #13. It is flanked on the right by the primary dune slack. The goal during the process of layout out the golf course in this section of the property was to devise a natural, intuitive way to move through this section with the least impact on the primary dune slacks. And while there are isolated pockets of the ground for the sixteenth hole that must be raised ±1m to make this suitable for turf, the primary dune slack has been avoided altogether. The green setting for the 16th is not unlike the setting for the ninth, tucked against a larger dune. Boardwalk has been incorporated into the pathway between this hole and the next to avoid disturbance to the eastern dune slacks.

Hole #17:
The walk from the sixteenth green to the seventeenth tee is over this dune, which is one of the features that characterize the south end of the property. From the back of this dune, the 17th plays further north towards the primary dune and away from the primary dune slack. On paper, it may appear odd that the sixteenth crosses over the primary dune slack only for the 17th to cross back over again (and the 18th once more to get back to the steadings). This is simply and entirely a function of being guided by finding the best terrain for golf, and the least impactful way to connect these. In their natural state the fifteenth, sixteenth and seventeenth feature superb ground for golf, whereas the ground that has been avoided—by and large—is not. The ground to the east of the dune slack parallel to the sixteenth, for example, is a long, fairly steep slope that is generally unsuitable for golf. The ground to the west of the dune slack parallel to the 17th is not good for golf and appears to be part of the primary dune slack system anyway. The ground to the east, by contrast, is ideal. A natural amphitheatre provides the majority of the ground for the fairway for this hole, and the setting for the green.

Hole #18:
From here the last hole is a simple turn back towards the steadings. The first third of this hole is a carry across the dune slack to reach the fairway, which is a piece of relatively high, rumpled ground that will make an excellent fairway. The last third of the hole is a pitch up and over the brow of a small hill back towards the Coul Farm steadings.

1.10 ORNITHOLOGY

The Ornithology Technical Annex of the ES considers the potential impacts of the proposed development on the important ornithological receptors within the study area, during its construction and operation.

The baseline ornithological conditions were assessed through targeted field surveys in the winter and breeding season, of potentially important and legally protected bird species identified through desk-study and consultation.

The ornithological studies were conducted in two phases. The first was a desk study of historical information sources. The second was a series of targeted field surveys of potentially important and/or legally protected bird species within the study area. A total of 56 bird species were recorded during winter and breeding bird surveys.

Based on the desk study, designated site citations, habitats present and discussions with SNH, the likely important bird species were considered to be: (i) wintering SPA waterfowl and waders and (ii) breeding birds identified within the SSSI citation. Furthermore, whilst all bird species that were observed during ornithological surveys were recorded, SNH general guidance identifies three main important overarching bird species lists, of legally protected species and species of conservation importance:

- Annex I of the EC Birds Directive;
- Schedule 1 of the UK Wildlife and Countryside Act 1981 (as amended); and
- UK Red-listed Birds of Conservation Concern.

Loch Fleet SSSI

Of the Loch Fleet SSSI breeding bird assemblage, the following species were recorded breeding within proximity to the proposed development in the SSSI: oystercatcher, ringed plover, lapwing, redshank, grasshopper warbler, stonechat, linnet, reed bunting and a Schedule 1 species (see Confidential Appendix A.3). These species are considered to have low sensitivity, i.e. they occupy areas subject to frequent human activity/management and exhibit mild and brief reactions to disturbance events, with no long-term adverse effects.

Based on the evidence collected on breeding birds within Loch Fleet SSSI, it is considered that the proposed development layout can be accommodated without having adverse impacts upon the breeding bird assemblage. Therefore, it can be concluded that there will be no likely significant effects on the qualifying features or site integrity.

Dornoch Firth and Loch Fleet SPA and RAMSAR site

Based on targeted wintering surveys, two of the non-breeding bird species mentioned in the Dornoch Firth and Loch Fleet SPA and RAMSAR site citations, regularly occurred within Coul Links or adjacent to the development footprint. Teal were regularly recorded in small-moderate numbers (2-25 birds) and variable numbers of wigeon were recorded (5-100 birds) on four occasions. These were all recorded in the study area during winter 2015-2016 when water was present within the dune slack habitats at Coul Links.

No golf course infrastructure is planned for habitat areas regularly used by wintering SPA species, so no direct adverse habitat loss of SPA bird habitat is predicted. The design layout deliberately crosses over, rather than goes through, the main north-south dune slack habitat at Holes 15, 16 and 17. Consequently, no direct or indirect, significant dune slack habitat loss is predicted.

The main way wintering teal and wigeon are likely to be affected by the proposed development is through the ending of winter wildfowl shooting at Coul Links. As part of the proposed development plans, the shooting of these SPA birds (indeed all wildfowl shooting) would be guaranteed to cease within the entirety of Coul Links. This would lead to two immediate and significant ornithological benefits within the SPA.

- Teal and wigeon from the SPA would no longer be shot and killed, resulting in greater winter survival of both these species within the SPA.
- The disturbance to wildfowl associated with wildfowl shooting would no longer take place.

Studies have shown that regular disturbance to wildfowl causes these birds to lose weight through increased energy use, resulting in lower overall winter survival, i.e. once shooting of the SPA wildfowl ceases, these birds will find sanctuary during the winter within the wetted dune slack habitats at Coul Links, rather than danger. The predicted impact would be a reduction in indirect mortality of SPA qualifying species.

It is highly likely that the population of wintering SPA wildfowl using Coul Links, will increase substantially as the birds learn that it is no longer dangerous nor disturbed. Thus, the likely value of Coul Links for SPA wintering wildfowl is predicted to increase substantially in the long-term with the development of the golf course and its associated management.

Potential uncertainty relates to the replacement of shooting related disturbance with potential golf related disturbance. However, the golf course will close during the winter months when SPA birds use the wetted dune slack habitats at Coul Links (between December and end of March).

Moray Firth pSPA

Based on targeted bird surveys, the evidence collected demonstrates that none of the Moray Firth pSPA species mentioned in the citation, regularly occur within and adjacent to the proposed development. These predominantly marine species occur well away from the proposed development. Non-breeding eider, long-tailed duck and red-breasted merganser were recorded on the sea or at the mouth of Loch Fleet. Given the proposed development avoids both of these areas, there is no likely interaction with these avian receptors. It can be concluded that there will be no likely significant effects on the qualifying features or site integrity.

Wider Countryside Birds

Of the wider countryside bird species present, only one potentially sensitive and relatively uncommon species breeds within the study area. Further details of this Schedule 1 breeding species is provided within the Confidential Appendix A.3.

No significant adverse impacts on wider countryside birds are predicted.

Committed Mitigation Measures and Residual Effects

The following mitigation measures related specifically to ornithology, are part of in-built design with the proposed development and are considered to be 'committed' mitigation measures:

- Termination of winter wildfowl shooting.
- Closure of the proposed golf course during the winter.
- A public access plan that deliberately focusses public access away from potentially sensitive areas for important ornithological receptors.

There will be no significant adverse effects on the ornithological features of the Loch Fleet SSSI, or on wider countryside bird species.

There will be a moderate significant beneficial effect on the ornithological features of the Dornoch Firth and Loch Fleet SPA and RAMSAR site, due to the termination of winter wildfowl shooting.

1.11 ECOLOGY

The potential impacts of the proposed development on the ecology of the site and surrounding study area, during construction and operation were assessed.

The baseline ecological conditions were assessed through targeted field surveys of important and legally protected ecological receptors identified from a desk study and from the scoping opinions. The scope of the ecological assessment includes habitats, flora and fauna but excludes potential effects on birds.

The ecological surveys were conducted in two phases. The first was a desk study of historical information sources. The second was a series of targeted field surveys of potentially important and/or legally protected ecological receptors. The targeted field surveys included:

- Phase 1 habitat Survey- There were 30 Phase 1 habitat types described in the study area. In addition, many matrices were mapped, where two, or more habitats or communities were closely entwined. The most common habitat was improved grassland which made up 28.2% of the study area. There were large areas of dune grassland and dune heath along with open dunes and dune-slacks. Woodland in the study area included coniferous plantation and areas of semi-natural broad-leaved woodland.

- National Vegetation classification (NVC) survey- There was a total of 78 NVC communities and sub-communities, plus many matrixes found and described, making a complex mix in this relatively small study area (328ha). The most commonly found NVC community was a dune grassland community which was tall, rank and tussocky, where marram, red fescue and distinctively false oat-grass were abundant to dominant and there was a high cover of feathermosses forming a carpet below the grasses.

- Groundwater dependant terrestrial ecosystems (GWDTE)- Where wetlands were identified, an assessment was made as to whether they were likely to be GWDTEs. Most of the habitats and communities within the study area are not considered likely to be wetlands or GWDTE. However, SEPAs Guidance Note recommends that some of the NVC communities should be treated as GWDTE unless information can be provided to demonstrate they are not dependent on groundwater. Of these, 7 were considered to be potentially highly groundwater dependent.

- Protected terrestrial mammal survey- Protected terrestrial mammal walkover surveys were conducted to assess the likelihood of the presence of wildcat, badger, red squirrel, otter and water vole within the study area. There were no signs of otters, water voles, wild cats or red squirrels recorded during surveys, despite previous records of occurrence. Further, there was no evidence that the study area was currently used by

badgers. However, that does not preclude their use of the study area in the future. Although there was some potential for pine marten activity, only a single pine marten scat was located. This indicated only occasional use. With very little direct evidence of protected terrestrial mammals within the study area, they have been scoped out of further assessment.

1.11.1 Potential Impacts on Designated Sites

The potential impacts on important ecological features of designated sites that could arise from the construction and operation of the proposed development were assessed. These designated sites are:

- Loch Fleet SSSI (feature: eelgrass beds, sandflats, saltmarsh, sand dunes, native pine woods, vascular plant assemblage).
- Dornoch Firth and Loch Fleet RAMSAR site (feature: reefs, saltmarsh, intertidal mudflats and sandflats and sand dunes).

Several of the features mentioned in the Loch Fleet SSSI citation and the Dornoch Firth and Loch Fleet RAMSAR citation occur within and adjacent to the proposed development. Because RAMSAR sites in Scotland are protected and managed through the SSSI system, these will be dealt with through the SSSI.

1.11.1.1 Loch Fleet SSSI

The only SSSI citation feature assessed to be likely to be significantly and adversely affected by the construction and operation of the proposed development is dune heath. All remaining likely impacts are assessed to be not significant. Therefore, if the proposed development goes ahead as the available information indicates, the Favourable Conservation Status of the Loch Fleet SSSI will not be adversely affected.

After the committed mitigation is implemented, it is predicted that the residual impacts on dune heath are likely to be non-significant.

Bats

A bat roost and activity survey was undertaken around the Coul Farm House and Coul Farm steadings. A wider habitat transect survey for bats was also conducted across the study area.

Activity surveys identified that there was extensive activity from common pipistrelle, along with possible soprano pipistrelle and a small number of brown long-eared bats. In total four roosts were identified; three common pipistrelle roosts and a brown long-eared roost. All three species are common-abundant and found across the UK. Therefore, these species have been evaluated as locally important. Bats have been assessed as highly sensitive to disturbance within roost sites

The results from the transect surveys show that Coul Links was used by small numbers of common pipistrelle bats with the occasional soprano pipistrelle also being recorded. These bats were largely recorded on the western side of the site near the Coul Farm buildings and woodland areas, with no records being found on the dunes or dune-slacks. This suggests that the open dune area is not generally used by bats, and the western side of the study area is used by small numbers of bats providing moderately suitability habitat for bats.

Construction and operation of the proposed development has the potential to negatively impact bats directly or indirectly in two main ways through habitat loss (land-take) and loss of roost sites (potentially resulting in mortality).

Mitigation: A formal bat protection plan will be agreed with SNH and THC. Work will only commence on buildings when this plan is agreed and fully licenced. The mitigation in the Bat Protection Plan will include (and not be limited to):

- All buildings being treated as a 'roost', as it is highly likely that the existing roosts are socially linked, with bats moving between different locations.
- Updated surveys should be undertaken.
- Minimising scale and duration of impacts, undertaking work outwith sensitive times of year and maintaining new roost features in the same location, aspect and structure as currently present.
- Consequently, the likely effects of the potential development on bats are predicted to be not significant in the context of the EIA Regulations, i.e. there will be no detectable adverse regional or national population level impacts.

Fonseca's seed-fly

Targeted sweep net surveys were carried out across Coul Links to ascertain the presence or otherwise of Fonseca's seed-fly within the study area.

Fonseca's seed-fly is an endemic invertebrate known only to be found on the coastal sand-dune systems of east Sutherland. It is listed as a priority species on the UK BAP. Further, SNH highlighted this endemic species as of particular interest to the proposed development as so little was known about it, including its potential occurrence within the Coul Links study area.

Of the several hundred flies recorded, four individuals were found to be Fonseca's seed-fly. The accreting front dunes are considered the most likely place for Fonseca's seed-fly mating and courting and were the location of the three female species found. These areas have been avoided through design, to minimise potentially important habitat loss for this species. The single male, was found on semi-improved neutral grassland, this habitat has also been largely avoided by. However, it is unclear how important these and other areas are to Fonseca's seed-fly.

Insecticide or herbicide affecting areas where Fonseca's seed-fly mate and/or larva are within their food plants may result in death. However, based on previous experience, herbicides and insecticide are not likely to spill beyond the boundary of the tees, fairways and greens. Based on this assumption, an accidental potential pollution event is considered highly unlikely.

The proposed long-term guaranteed conservation management of Coul Links is likely to benefit Fonseca's seed-fly, if conservation managers know more about the species' lifecycle. Detailed research into the ecology of Fonseca's seed-fly is planned and will be used to inform long-term management at Coul Links. Consequently, the likely effects of the potential development on Fonseca's seed-fly are predicted to be not-significant in the context of the EIA Regulations.

Mitigation: Although non-significant effects are predicted on the Fonseca's seed-fly, important mitigation measures are committed to:

- Ensure large and important habitat areas for composite flowers at Coul Links are retained through design layout.
- Fund a PhD studentship or specialist dipterist research into the unknown, important elements of Fonseca's seed-fly ecology.
- Publish the findings of the research so that the ecology of the species is more widely understood and recognised.
- Commit to adjusting and targeting habitat management at Coul Links towards Fonseca's seed-fly favoured composite flowers (and other elements if necessary) in light of the research results.

Plants

The Loch Fleet SSSI citation lists vascular plant assemblage as a feature of the SSSI. The specific species mentioned are those found in pinewoods (found only outside of the study area) and a saltmarsh species, which was not recorded within the study area during the 2016 habitat survey. Therefore, the plant assemblage species recorded within the study area is not evaluated as being of national importance.

A number of notable botanical species recorded in the study area are listed on the UK BAP species list and/or the Scottish Biodiversity List. All these species, with the exception of juniper, have been scoped out from further assessment due to either their widespread occurrence in the UK, or their occurrence in habitats which will not be impacted by the development.

Juniper

Juniper was located in three separate locations within the dune grassland and within the dune heath. Two of these locations have been avoided by the design layout. However, one location, which was described as having 20-30 individual juniper is within the boundary of Hole 3 of the development footprint. Much of this juniper will be avoided through micro-siting and those that are not will be transplanted elsewhere.

Although juniper is a widespread species, it is only known to occur on sand dunes at two locations in the UK, so the transplantation of any remaining juniper which cannot be micro-sited around, is considered necessary. The likely effects of the potential development on juniper are predicted to be not-significant in the context of the EIA Regulations.

Mitigation: Juniper will be avoided wherever possible during construction. The Ecological Clerk of Works will advise contractors of juniper's presence and they will be avoided wherever possible. Any juniper that will be unavoidably impacted by the development will be transplanted, into nearby suitable locations as advised by the Ecological Clerk of Works.

Lichens and fungi

Waxcap fungi within the study area have been assessed as regionally important, given their limited distribution. The sensitivity of waxcap fungi has been assessed as moderate-high, as they are considered relatively intolerant of disturbances such as changes to grazing regimes, herbicide/fungicide applications and nutrient enrichment.

Lichen assemblages have been included in the assessment as part of the dune heath assessment. The lichen species of particular interest - *Cladonia mitis,* has been assessed as regionally important. Its sensitivity is unknown, but given the regional status and local distribution it has been assessed as probably moderate.

The likely effects of the potential development on both waxcap fungi and *Cladonia mitris* are predicted to be not-significant in the context of the EIA Regulations. Furthermore, the proposed long-term guaranteed conservation management of Coul Links towards a shorter sward height (favouring dune heath over rank grassland) is likely to benefit *Cladonia mitris*.

Mitigation: The semi-improved grassland at Coul Links should be managed to promote and enhance waxcap fungi and *Cladonia mitris*. The waxcap fungi assemblage is reliant on the sward height being between 5 and 50cm. Scrub and tree regeneration have an adverse impact on the fungi assemblage. The grass sward management and the control on invasive species within the CLSMP will take into account waxcap fungi and *Cladonia mitris* and be agreed upon with SNH.

Habitat management to benefit butterflies and moths

Although non-significant effects are predicted on the butterflies and moths at Coul Links, mitigation measures are committed to as part of BNG. The main key for Lepidoptera conservation at Coul Links is to maintain and expand suitable habitat, specifically in relation to their food plants. The details of habitat management for Lepidoptera will be agreed upon and detailed in the Coul Links Site Management Plan (CLSMP).

Further committed mitigation measures: The developers have committed to funding, implementing and delivering a long-term CLSMP post consent. This important document will be discussed, developed and agreed with SNH, be based around the relevant sections of the existing Loch Fleet SSSI Site Management Statement and aim to achieve favourable conservation status for the Coul Links part of the Loch Fleet SSSI.

The CLSMP will cover the control of invasive species such as gorse, Rosebay willowherb, thistles, bracken, Scots pine, birch; and willow as well as grass sward management across the site. It will also consider the management of current areas of dune heath to maximise the biodiversity benefits and the management of grassland which surrounds dune heath to allow for the continued natural expansion of dune heath. Furthermore, it will consider the restoration of the felled conifer plantation, which will include dune heath restoration.

An important consideration within the CLSMP will be the translocation and artificial expansion of dune heath within Coul Links, which is outlined in the Supporting Document 1: Dune Heath Translocation Plan. With extensive best practice guidance available to inform proposed heath expansion and transplantation, the translocation involve either a combination of transplanting turfs of the dune heath (that would otherwise be lost through land-take) and seeding with dune heath seeds collected from within Coul Links. Dune heath expansion and heath transplantation has been successful on a number of golf courses in the UK in recent years including three which are at least partly within SSSIs. The proposed development is committed to ensuring no net loss of dune heath habitat at Coul Links and indeed, a small expansion in the dune heath resource is predicted during the life time of the proposed development through planned management.

Finally, the CLSMP will consider the expansion of management from SSSI area southwards to provide a consistent and joined-up management approach across the whole of Coul Links. Conservation management of this wider (non-SSSI) area of Coul Links will be agreed upon with SNH, implemented and funded by the developer for the lifetime of the golf course. This joined-up approach to the management of the whole of Coul Links will ensure that mitigation objectives such as the control of invasive species and grass sward management is effective and contiguous across the wider Coul Links area and not just within the SSSI.

1.12 HYDROLOGY AND HYDROGEOLOGY

The hydrology and hydrogeology assessment addresses the potential effects on surface water and groundwater from the proposed development and considers the potential effects to groundwater dependent terrestrial ecosystems (GWDTE). The temporal scope addresses the construction and operational phases of the proposed development.

1.12.1 Existing Environment

Geology

The soils within the study area are mapped as Links Regosols, which are soils developed on unconsolidated material and are described as comprising "*well drained, weakly developed soils often with a mineral topsoil and no distinct layering in the subsoil"* and Corby and Berridale podzols (which are both humus-iron podzols) which are described as "*well drained acid soils with bright colours and a thin organic surface layer overlying a grey subsoil layer" (Scotland's Environment, 2016).*

The superficial (drift) deposits at the Site comprise three main lithologies. The southwest and central parts of the Site comprise Till and Raised Marine Deposits comprising gravel. Sand and silt are mapped between the eastern and northern extents of the Till and the approximate route of the old railway. From the eastern extent of raised marine deposits to the coast, the superficial geology is mapped as blown sand deposits.

The bedrock geology beneath the whole site comprises the Raddery Sandstone Formation and can be over 1 km thick, however there are no outcrops of this bedrock mapped within the study area. Information presented in the Geoinsight Report indicates that there are no faults mapped in the Raddery Sandstone Formation within the study area and the sandstone is fractured and had a moderate to high permeability.

Hydrology

The data for the proposed developments two most local stations indicated that 2013 was a drier than usual year when compared to the last ten years. The longer term average rainfall indicated that, over the last ten years, the lowest rainfall has occurred in spring and the most has typically occurred in late summer or autumn.

Historical climate data indicated that for the period 1981 to 2010 an average annual rainfall of 646.4 mm and nearly 141 days where 1 mm or more rain fell. This is drier than the climate data for northern Scotland.

The Coast

The eastern boundary is defined by the foredune, beyond which is the beach and the North Sea. There is a tidal inlet from Loch Fleet in the northern part of the study area. Observations made during site walkovers indicate that the southern parts of the tidal inlet are only inundated with water occasionally.

There are existing coastal erosion defences in the southern part of the study area, along the coast by the village of Embo. There are no coastal erosion defences along the shoreline to the east of the dune system at Coul Links.

The National Coastal Change Assessment maps compare the coastline in 1890 to that in the 1970s, and 2009 and coastal vegetation maps produced by SNH both show that there is coastal retreat and accretion occurring along the coastal edge of the study area. The SHN vegetation maps also indicate that rapid changes can occur during storm events.

Watercourses

The surface watercourses in the study area are mapped by the Ordnance Survey as drains and were observed to be as mapped during walkovers of the study area and using aerial imagery. There are three drains that are located in the study area that also pass within the proposed development area.

The northern burn originates within the Fourpenny Plantation and within the rough pasture to the west of Coul Farm. This drain then passes along the southern boundary of Coul Farm House, into a culvert under the farm and discharges into the pool beside the dismantled railway line. Observations indicated that this drain only flows in days following heavy rainfall and that there is no distinct channel once the drain has passed under Coul Farm steading.

The central burn is deeply incised and is fed by a series of field drains that emerge within the improved pasture to the southwest of Coul Farm. The origin of the field drains are unknown, therefore, the water is likely to represent discharge of near-surface groundwater from within the superficial deposits. The drain passes under the dismantled railway line and into the dune slacks. To the east of the dismantled railway, the water flows towards the winter loch. When input from the west is lower, the water appears to infiltrate into the sands, saturating the ground rather than presenting as a surface feature. Based on field observations, this drain flows more often than the northern burn, but does not flow all year round.

The southern burn (known locally as the Cluain Burn) is mapped as originating in the Fourpenny Plantation to the west of the study area, then flowing east under the Dornoch to Fourpenny road, across the southern end of the proposed development area and discharges out to sea. The shape of the channel suggests it is either man-made or has been enhanced to improve the passage of water to the sea. Closer to the coast, the main channel increases in depth and there is evidence of flooding by the sea. Flow along the full length of the watercourse and out to sea does not occur at all times. Water has been observed by Alba Ecology as being present in the western part of the burn, but that this seeps into the sands before the most eastern dunes.

Permanent Water Bodies

Ponds were shown on the 1:10,000 scale Ordnance Survey mapping and observations made during visits indicated that these ponds were present as mapped. The shallower ponds have been observed to have less water in them during drier months and tend to be marshier. Some of the ponds are deeper and typically correspond with known areas of ground workings, where sand and/or gravel was removed in the past. These deeper ponds tend to contain water all year round. It is likely that precipitation provides input to these waterbodies, either directly or as an expression of high groundwater levels.

Ephemeral Water Bodies

The largest water body in the dune slacks is a north-south orientated primary dune slack that contains an ephemeral winter loch, which at high water is approximately 1.4 km long and over 0.1 km wide in places. The winter loch has been observed to contain water on occasion in the winter months, however, the water visible at the surface can appear and then disappear within a matter of weeks. During the rest of the year, the loch is absent and the ground is usually damp or dry with a change in vegetation marking its extent. It is likely that the water in the dune slacks discharges eastwards through the dune sands to the beach.

Other smaller, individual ephemeral pools, or groups of interconnected pools, have been observed within the SSSI during the winter months. These typically occur in hollows with a basal elevation below 3 to 4 m AOD. There is also an area of wet woodland that is located in the northwest part of the dune system that comprises numerous pools of water within a scrub and birch woodland.

The surface water within all ephemeral pools is caused by a combination of the expression of groundwater, when levels are high and from rainwater. In the case of the winter loch, some input is also provided directly by discharge from the northern and central burns. The amount of time the slacks flood and how much of the total area is flooded will be dependent on the frequency of rainfall events and the preceding degree of saturation of the ground.

Flood Risk

SEPA currently has no record of the study area having been subject to any form of flooding. SEPA has reviewed its flood map 200-year flood outline (i.e. the flood with a 0.5% chance of occurring in any single year) and indicated that the study area lies adjacent to this envelope and as such, is potentially at risk of coastal flooding around the mouth of Loch Fleet in the north, the beach to the east and the mouth of the southern burn. SEPA has provided an indicative 1 in 200 year coastal flood level of 3.27 m AOD, based on extreme still water level calculations using its Coastal Flood Boundary Method.

SEPA also identified that there are some areas within the study area that are at medium to high risk of surface water flooding in areas that largely correspond to the drainage channels, as well as the winter loch and other hollows within the dune slack system that are known to be water filled during times of high groundwater levels.

Only the burn that flows through Skelbo is shown to present any risk of flooding from rivers in the study area and it discharges into Loch Fleet outside the proposed development area.

Surface Water Supplies

Each property within the smaller water features survey study area was visited in order to request information on private water supplies, which could include water from surface watercourses. One property occupier in Knockglass, indicated use of water from the drainage channel to the southeast of their property for augmenting the livestock drinking water, but that this only flowed during October to May. No other water users in the study area indicated using surface water supplies.

Surface Water Chemistry

Field parameters of the surface water within the SSSI were recorded using a handheld meter. The measurements indicated that all water has a neutral to slightly alkaline pH and that the electrical conductivity is more indicative of that expected for non-brackish groundwater, as it is higher than typical values for rain water and much lower than would be expected for seawater. This suggests that groundwater provides input to both surface watercourses and to the ephemeral waterbodies.

1.12.2 Hydrogeology

Aquifers

The Dornoch Coastal aquifer groundwater body underlies the northern and eastern parts of the study area that correspond to the mapped location of the Raised Marine Deposits and Wind Blown Sand superficial deposits. The Dornoch Coastal aquifer groundwater body has been classified as having good quantitative and qualitative status and there are currently no pressures identified by SEPA on this water body.

The Dornoch bedrock aquifer underlies the whole of the study area. The Dornoch aquifer has been classified as at good quantitative and qualitative status and there are currently no pressures identified by SEPA on this water body. Across the entire study area, the bedrock aquifers are mapped as an intergranular/fractured, moderately productive aquifer.

Groundwater Vulnerability

Groundwater vulnerability is the tendency and likelihood for general contaminants to move vertically through the unsaturated zone and reach the water table after introduction at the ground surface. From information provided by SEPA, the groundwater vulnerability across the study area is classified as ranging from Class 4 up to Class 5. Class 4 is defined as 'vulnerable to those pollutants not readily adsorbed or transformed and Class 5 is defined as 'vulnerable to most pollutants, with rapid impact in many scenarios'.

Drinking Water Protected Areas

All of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas under the Water Framework Directive. These require protection for their current use or future potential as drinking water resources.

Groundwater Levels and Flow

Water input to ephemeral waterbodies within the dune system in the east of the study area occurs from direct rainfall and input from drainage originating in the west. However, the waterbodies within the dune slacks are largely from groundwater levels exceeding surface topographic elevations, providing insight into groundwater elevations in the coastal dune part of the study area. During most of the year, groundwater elevations are below the elevation of the base of the winter loch. Lower rainfall combined with higher evaporation means recharge to groundwater during these periods is lower and groundwater levels are lower. During winter months the groundwater elevation in the winter loch can rise to between 3 m and 4 m AOD.

There are very few places in the study area where the bedrock geology is exposed at the surface, so direct recharge to the bedrock aquifer will typically occur outside the study area. Recharge to the bedrock aquifer is probably limited, given that the bedrock aquifer is likely overlain by low hydraulic conductivity Till.

Groundwater within the Raised Marine Deposits is likely to originate from direct recharge from rainfall and some run-off from the Till. Groundwater within the Raised Marine Deposits seeps out on steeper areas such as the faces below Coul Farm to the west of the dismantled railway. These seeps then recharge back to groundwater nearby. Groundwater within the dune sands is likely to originate from direct recharge from rainfall and shallow groundwater flow from the Raised Marine Deposits. Groundwater flow will typically follow topography and be from west to east towards the coast. Subsurface groundwater flow in the superficial deposits will discharge through the main dune ridge and seep out along the beach.

There is also likely to be some recharge to groundwater from surface water, when the drains are flowing. Walkover observations indicate that the central and northern burns provide recharge to groundwater either by seeping into the ground at varying points along their preferred channel routes, or by providing direct input into the dune slacks.

Chemistry

There are no groundwater level monitoring locations within the study area. SEPA has identified that there is no trend for pollutants in either the Dornoch Coastal or Dornoch groundwater bodies.

Springs, Wells and Seeps

Historical mapping indicated the presence of a series of springs or wells within the survey area. The springs and wells within the proposed development boundary could not be located during the hydrological study site walkovers. The springs and wells outside the boundary are mainly not shown on more recent mapping and none were mentioned by the occupiers of the properties when the private water supply survey was undertaken.

During the hydrological study site walkovers, unmapped seeps were noted around the base of the slope below the Coul Farm steading. These appear to originate from near surface groundwater beneath the farm house, cottages and buildings that discharges at the surface due to the steep and sudden change in topography in this area and then recharge back to the ground nearby.

Groundwater Supplies

Licensed Abstractions

One licensed groundwater abstraction from a borehole was identified at Embo Mains for the purpose of agricultural use. The grid reference supplied by SEPA for this abstraction is positioned approximately 0.36 km south of the PAN boundary.

Private Water Supplies

The Highland Council (THC) confirmed that there were no known Type A or Type B private water supplies in the area; however, it was highlighted that there is no requirement for Type B supplies to be sampled by THC so it may not hold records.

Information received from landholders at the time of preparing this report indicate that all properties in the area are on mains water supply. Two wells are marked on the most recent Ordnance Survey mapping, however the surrounding properties indicated that they only used mains water.

Licensed Discharges

SEPA was contacted to request information on records of licensed discharges. None of the discharges are located within the PAN boundary. All of the discharges within the survey area relate to sewage discharges from individual properties to land or soakaway of surface water.

Groundwater Dependent Terrestrial Ecosystems

A detailed National Vegetation Classification survey has identified potentially Groundwater Dependent Terrestrial Ecosystems (GWDTE) and wetlands. There are areas of potentially moderate GWDTE and potentially high GWDTE present in the study area. The types of wetland include wet woodland, wet heath, swamp, salt marsh, mire, marshy grassland, flush and dune slack.

The areas of potential GWDTE and wetland are predominantly concentrated within the SSSI. These largely coincide with the areas of ephemeral water bodies. Given the conceptual hydrological and hydrogeological understanding of the system, it is likely that these areas are moderately or highly groundwater dependent.

There is another area of wet heath and marshy grassland outside the SSSI to the southwest of Coul Farm. Based on the British Geological Survey superficial geology mapping, this area is located on Till, so the wetland communities are more likely to be present as a result of poor surface water drainage than be groundwater dependent.

1.12.3 Hydrological Setting

There are several important features associated with the site notably water courses (3 main drains or burns) which run west to east, designated as Southern or Cluain Burn, the Central and Northern Burn, ephemeral water bodies /dune slacks, the largest of which is the primary dune slack immediately behind the main dune ridge (associated within an ephemeral winter loch) and permanent water bodies (mapped on OS Survey Mapping) of varying depth.

Surface water within the winter loch pools and woodland within the triple SSSI is caused by a combination of the expression of ground water when levels are high and direct input from precipitation. In the case of the winter loch some input is also provided directly by discharge from the Northern and Central burns. During drier months, when ground water levels are lower, direct rainfall on these areas infiltrates straight into the underlying sandy geology and ephemeral water bodies are not present. No surface connection has been observed between the dune slacks and the Southern drain (Cluain Burn) that discharges to the sea.

Ground water within the winter loch and other smaller individual ephemeral pools is expressed at a level of around 3-4m AOD.

In addition to the above, there are historical records of springs, wells and additional seeps have been noted around the base of the slope below the Coul Farm Buildings. These can be linked to near surface ground water within the raised marine deposits/made ground, allied to the steep and sudden change in topography in this area.

1.12.4 Ground Water Dependent Terrestrial Eco-Systems (GWDTE)

Mapping of the GWDTE shows that there are potentially moderate GWDTE and potentially high GWDTE present in the area. The wetland mapping shows that the types of wetland include wet woodland, wet heath, swamp, salt marsh, mire, marshy grassland, flush and dune slack. The map shows that the areas of potential GWDTE and wet land are generally concentrated within the SSSI. These are largely coincident with the areas of ephemeral water bodies. It is likely that these areas are moderately or highly ground water dependent.

There is another area of wet heathland and marshy grassland outside the SSSI to southwest of Coul Farm. Based on British Geological Survey superficial geological mapping the area is located on Till so the wetland is more likely to be present as a result of poor surface water draining and is not ground water dependent.

1.12.5 Proposed Development

Factors which potentially could impact on local hydrology and associated ground water terrestrial eco-systems have been identified as follows.

- Raising ground levels and directing water away from individual pools and localised areas at the fringes of the dune slacks (localised ephemeral pools).
- Reseeding managed playing areas with fescue grass species to replace the current vegetation.
- Increased hard surfaces and therefore runoff from roads, compound areas, carparks and roofs.
- Potential changes to evapotranspiration with alterations to vegetation cover.
- Increase risk of flooding due to changes in water courses or construction of buildings in flood risk area.
- Impact of abstraction of water or ground water levels and associated GWDTE and also application of water through irrigation.
- Potential for increased pollution risk due to presence of maintenance yard, service bays, fuelling areas, pressure washes, oil and chemical storage etc.
- Impact of golf course development on coastal erosion.

1.12.6 Preventative and Mitigation Measures

Build-up of localised areas within ephemeral pools will not impact on the main winter loch. Overall patterns of surface and ground water flow will be maintained. Sand will be used for build-up therefore maintaining good infiltration to ground water level.

Runoff from buildings and roads will be infiltrated to ground through use of soakaways incorporating filter strips for pre-treatment.

The course of the existing burns (main drainage channels) will not be altered, however they will be maintained and improved to maintain good flow and recharge to the winter loch (Northern and Central burns).

Bridge crossings and boardwalks will be installed to facilitate course operation and maintain existing hydrology conditions within dune slacks.

Pump testing of the irrigation supply has demonstrated no impact on the wider hydrology of the area

Irrigation will be applied to offset evapotranspiration and sustain turf viability (not presentation). The system will be designed and managed to target water effectively and minimise the risk of overthrow. Water will be applied in response to monitored moisture levels so that excess water is not applied. Water will be applied to offset evapotranspiration losses and not a point of drainage.

There are no buildings proposed in a flood risk area. Application of sustainable drainage (SUDs) principles will prevent an increase in flood risk.

1.12.7 Prevention of Pollution

During the construction phase surface runoff will be controlled by use of shallow drainage channels/mounds and stilling basins together with the use of silt fences to intercept suspended solids.

In the initial establishment phase there will be greater demand for fertiliser but this will be based on slow release products to minimise risk of leaching. Fertiliser input will be progressively reduced as the turf matures and routine application will be withdrawn from the fairways. Low level inputs on a little and often basis will be applied to greens and tees and golf pathways to maintain recovery from wear and tear.

Research has demonstrated that established turf is very effective at intercepting utilising nutrients thereby minimising leaching losses to ground water.

Pesticide applications (fungicides) will be restricted to greens and tees but emphasis will be on cultural control practices to minimise disease pressures and the need for pesticide application. Aeration techniques and control of thatch will improve immediate uptake of fertiliser and pesticides and reduce the risk of runoff.

A commercial water treatment unit will be installed within the maintenance facility to cleanse diluted washdown prior to recycling or discharging to ground. A class 1 oil interceptor will also be incorporated through the carpark area/compound.

1.12.8 Evapotranspiration

Concerns have been raised regarding the impact of replacing the native scrub/heath vegetation with areas of golf turf. Review of the available literature indicated that potential changes in evapotranspiration from heather dominant vegetation to grass dominant would likely result in ET rates declining slightly (Voortman *et al*, 2015). Other authors, when comparing scrub vegetation and meadow vegetation on dune systems found that ET rates would be broadly similar (Betson and Scholefield, 2004). Whilst the literature on this matter is not extensive, the available evidence would suggest that changing the dominant vegetation from heathland scrub to golf turf would not result in large changes to evapotranspiration rates.

Typical ET rates for golf turf are often quoted at 3-4 mm day^{-1} (Aamild *et al*, 2012). However, values can typically vary between 1.5 – 6 mm day^{-1}, depending on ambient temperature and water inputs, plant health, mowing height and frequency (Lodge and Baker, 1992).

It should be borne in mind that, as is standard practice for golf turf maintenance, irrigation inputs will be made to turfed areas to help balance evapotranspiration losses (Beard, 2002). This is an essential part of maintaining a healthy and effective grass sward. Therefore, irrigation of the golf turf with water abstracted from outside the SSSI, can be used to mitigate ET losses. The amount of irrigation water applied is often based on calculated ET losses derived from site weather station data. It is proposed that this approach is taken at Coul Links to ensure appropriate irrigation inputs to not only assist with maintaining healthy turf, but also to ensure the hydrology of the SSSI is not compromised from over or under watering.

Given the development of the golf course in the SSSI, monitoring of various hydrological variables is proposed, such as irrigation water inputs, irrigation water chemical characteristics and water table levels. This will help inform, not only turf management practices, but also to ensure turf maintenance interactions and the wider ecosystem in the SSSI are harmonised.

1.12.9 Groundwater Investigations

Two production wells were drilled within the south eastern portion of the site and two monitoring wells within the south western portion of the site. The monitor well locations were chosen to determine the level of water passing from the farm land to the area of the SSSI and then again within the SSSI. Both borehole locations were chosen to ensure there was as little disruption to the property as possible, but in order to be sure the information would be accurate. The actual SSSI location was chosen to avoid building access roads and destroying the environment. It is just within the SSSI and just north of the original location suggested.

Monitoring was undertaken to establish the water flow in the only running burn on site as it enters the property and as that burn leaves the property. The other two burns on site were checked at the start and finish. Monitoring was also undertaken to establish water abstraction locations in the form of boreholes and to establish monitoring locations to observe effects of water extraction on the aquafer. The Ground Water Investigation Report in its entirety is attached as Appendix C.3.

The Northerly burn on the site remained dry for the entire monitoring period from the start of August until the end of September and there was no sign of flow returning despite heavy rain fall in the area in the final observation week.

The Central burn remained dry until the 25th September when a small flow had been observed entering the central point of the Dune Slacks. As this was a dry bed until that point, no monitoring data was available to record the actual start date of flow. However, the rate of flow had reduced on the 26th so this was determined to not yet be normal winter flow and may be run off from heavy rainfall.

The Cluan Burn at the Southern end of the property had been in continual flow and does so all year round. The flow rate was recorded at 5 litres per second at the 23rd August and then at 7 litres per second on the 26th September. There had been a large increase in flow during the day prior, but as the rainfall had dropped so had the flow.

The area covered by the SSSI remained dry during the monitoring period and there were no signs of water at the surface. The area of the dune slacks averages between 1.5 and 3 metres higher than the bed level of the Cluan burn and thus the flow of water in this burn is not directly filling the dunes slacks. The Central burn will flow directly into the area as will the Northern burn when they have flow.

The water levels within the two monitoring wells did not change from the time completed until present. They remained constant during the step tests and the constant pump tests, thus indicating no direct correlation between activity in the production wells and the area of the Dune Slacks, both before, during, or after testing at the flow rates pumped.

From the test results it was determined that the wells are capable of delivering 210 metres cubed of water per day on a continuous demand from Borehole One and 80 meters cubed per day from Borehole Two. Total abstraction rate per day is 290 m3.
The results confirmed that there was no measurable impact on the aquafer or indeed the SSSI water table when abstracting water during test pumping. The only restriction was in the ability of the wells to replenish while pumping. It was concluded that the water required for the development will not affect the makeup of the SSSI site nor any of the surrounding area.

There would also be a possibility of abstracting water from the burn during the higher flow period during the wet season and a smaller amount during the dryer times. The monitors have been left to run in the temporary weirs to observe water flow in the burn during the coming winter. It has been established that the water flowing in the burn does not fill the Dunes Slacks, so as long as water flow is maintained at all times within the burn, abstraction should be possible without any impact to the surrounding area.

1.13 LANDSCAPE AND VISUAL AMENITY

The designer's approach to the design of the golf course is to intervene as little as possible with existing landforms and vegetation cover, utilising the existing topography and constraints to add to the character and uniqueness of the course wherever possible.

The location of the site offers an opportunity to integrate a sensitive, distinctive golf course within a links landscape to the north of Dornoch. A leading golf course designer has been engaged to develop this unique setting, and has created an imaginative course that integrates with the distinctive baseline landscape character, retaining and beneficially utilising existing landscape features in the layout design.

The landscape and visual impact assessment has evaluated the proposed development in terms of the effect it may have on the landscape and visual resource of the site and its surroundings. The degree to which the golf course designer's approach reflects the inherent ability of the landscape to accommodate the proposed development, as measured by its landscape character and integral characteristics, has been assessed. The assessment has demonstrated that the course design is responsive to the location and has been achieved without loss of key elements and features within the landscape.

The principal landscape and visual effects that are likely to arise will occur during construction of the course, when there will be an inevitable requirement for construction activity such as earthmoving, reprofiling, and vegetation establishment. Once construction works have been completed and the course has established, fully integrated into its setting, the landscape impact arising from the proposed development will all be of a limited magnitude and not deemed significant. The visual effects arising from the completed, operational, development will also be very limited, with locally significant effects restricted to several locations within the site.

The design of the golf course and its level of integration with the landscape and visual setting of the site and its surroundings is a key factor in the very limited occurrence of significant effects. This ensures that the proposed development will retain, and maintain, the distinctive landscape character of the baseline coastal landscape, without introducing elements or characteristics that are intrusive or out of character.

1.14 Access, Traffic and Transport

The most identifiable traffic characteristics associated with the proposed development relate to the transportation of construction materials in standard Heavy Goods Vehicles (HGVs) during the construction phase and the general increase of traffic on the local road network once operational.

Assessment of significance

The sensitivity to changes in traffic levels of any given road segment is assessed by considering the existing residual capacity of the network. Where there is a high degree of residual capacity, the network may readily accept an increase in traffic and therefore sensitivity is considered low. Conversely, where traffic levels are high, there is little spare capacity and sensitivity to any change in traffic levels would be considered high.

The magnitude of traffic impacts is a function of existing traffic volumes, percentage increase and changes due to a development and the temporal distribution of traffic. Consideration has also been given to the composition of traffic. For example, LGVs effect the road system less than HGVs.

Construction Effects

Construction traffic associated with the proposed development comprise of construction workers and HGVs/LGVs. There is expected to be approximately 12 personnel working on site at any one time, however this would vary during the construction process. In general, work hours are expected to be between 7am to 7pm on weekdays and 7am to 1pm on Saturdays, meaning staff would generally arrive and depart outside peak hours (typically 8am to 9am and 5pm to 6pm).

Construction materials such as sand and topsoil will be sourced on-site and will therefore not require HGV transportation to the site.

Months 1 and 2 of the construction phase would feature 144 two-way HGV movements. Additionally, 5 construction workers would access the site daily, resulting in 10 daily two-way vehicle movements. When the vehicle movements associated with months 1 and 2 are averaged across a 5.5 day working week, there is a negligible increase in total traffic across all road links (3.1% at most). The increase in the proportion of HGVs is negligible along the A9, the A949 and the C1026 between the proposed site access and the Embo junction. There is however, a 12.7% increase along the C1026 north of Embo junction between the junction and the site access.

Severance

Non-negligible traffic increases are predicted on roads through residential settlements during the construction phase of the development.

The section of the C1026 accessed for the development is just over 200 metres in length and there are no properties located on either side of the route, therefore its sensitivity to severance is considered to be low. Additionally, the magnitude of change in HGV levels along the C1062 is considered to be negligible. When combining magnitude and sensitivity, it can be concluded that the effect would be not significant in accordance with the EIA regulations.

Driver Delay

Although some driver delay may be experienced when HGVs are accessing the site, it is expected that HGV movements will be spread out rather than being concentrated over short periods of time. Survey information indicates that traffic levels on the C1026 to the north of the Embo junction are less than half of that to the south of the junction which explains the higher percentage HGV impact figure expected to the north of the Embo junction.

The sensitivity of the road link to driver delay is considered to be low as there will only be the junction with the site access and the existing Embo junction where vehicles would be turning. There are no access points to properties and the road is not currently close to its theoretical capacity, therefore finding gaps in the traffic would still be achievable without causing any significant delays.

Pedestrian Delay and Amenity

The magnitude of change in HGV levels along the C1062 is considered to be negligible. As with severance, the sensitivity of the C1026 at the location of the development is considered to be low given that this section of the road does not pass through any large settlement areas.

Accidents and Safety

An annual PIA rate of 0.00009 for the vehicles associated with the development is estimated during the construction phase. While the magnitude of change regarding accidents is negligible, receptor sensitivity is always high. When combined, the effect can be classified as being of minor significance.

Dust and Dirt

HGVs have the potential to collect debris on their tyres when accessing the site, which could then be deposited on the road in the form of either dust or mud depending on weather conditions.

For the C1026, the magnitude of change is considered to be slight as standard good practice working methods will be put in place to minimise dust from vehicles. The sensitivity of the receptor is considered to be negligible and therefore, the overall significance of the environmental effect of dust and dirt is assessed as negligible and not significant in accordance with EIA regulations.

Operational Effects

Operational Traffic Generation

Assuming all tee off times are filled, then a "worst case" scenario of 360 two-way vehicle trips is generated by the proposed development per day (240 two-way by players and 20 two-way by staff). This scenario also assumes that all trips would be by vehicle and not by alternative travel modes.

Operational Traffic Impact

When taking into account the two-way vehicle movements associated with the operational phase of the development, there is a moderate increase in total traffic on the C1062 North of the Embo junction. However, all other links have a negligible increase (less than 30%).

Severance

The magnitude of change in vehicle flows along the associated section of the C1062 is considered to be moderate, while the roads sensitivity to severance is considered negligible given that it does not pass through any large settlement areas. As a result, it can be concluded that there would be only minor / negligible effects.

Driver Delay

Current traffic levels on the C1026 are low at this location, at approximately 556 vehicles per day. Therefore, the relatively high percentage impact (65%) predicted for development traffic is as a result of the baseline flow being low.

The sensitivity of the road link to driver delay is low, as the road link is not close to capacity and therefore finding gaps in the traffic to turn onto the C1062 would still be very much achievable without causing any significant delays. As part of the development proposals, the road between the Embo junction and the development access junction is to be widened, creating a single carriageway link and therefore, will further reduce the chance of any driver delay.

Pedestrian Delay and Amenity

The magnitude of change in vehicle levels along the C1062 is considered moderate for the operational stage of the development, while the sensitivity is considered to be negligible given that the road does not pass through any large settlement areas. As a result, it can be concluded that there would be a minor / negligible overall effect to pedestrians.

Accidents and Safety

The annual PIA rate associated with the operational phase of the development is expected to be 0.0077. It is considered that the magnitude of change regarding accidents is negligible but receptor sensitivity is always high. When combined, the effect can be classified as being of minor significance and not significant for the C1062 between the Embo Junction and the development access.

Dust and Dirt

The access road to the development will be surfaced, therefore there is very limited scope for dust and dirt to be deposited onto the public road network as a result of operational traffic.

Mitigation Measures

Construction Phase

A Construction Traffic Management Plan (CTMP) will help to mitigate any traffic related environmental impacts associated with the construction phase. Measures to be considered include:

- Until a length of 'made' road is available to avoid dust/dirt being transferred onto the wider road network, wheel and road cleaning and wet suppression methods should be employed.
- All contractors will be provided with a site induction pack containing information on delivery routes and any restrictions on routes.
- Restrict construction HGV traffic between the network peak hours which are generally 08:00-09:00 and 16:00-18:00 Monday to Friday if necessary.
- Staggered delivery schedules will allow avoidance of peak and unsociable hours
- The CTMP and control measures will be included within all trade contractor tender enquiries to ensure early acceptance/compliance with the rules that will be enforced on this project.
- The C1026 will be maintained on approach to the site to ensure it is in a clean and safe condition.

Operational Phase

Road widening has been proposed for the C1026 road between the site access and the Embo junction in anticipation that these improvements would mitigate any impacts that could occur as a result of increased traffic volumes during the operational phase of the development.

A Travel Plan (TP) provided as Appendix E.2 will present potential sustainable transport measures to be implemented and detail the monitoring and review process that will be undertaken to reduce the reliance on private car use.

In order to decrease the number of vehicle trips associated with the development, a shuttle bus service between Dornoch and the development has been committed to. It is envisaged that the shuttle bus could halve the impact of operational traffic on the local road network.

Residual Effects

Subject to the successful implementation of both a CTMP and TP, it is considered that any residual effects associated with the construction and operational phases will be negligible given that prior to mitigation, all effects are considered to be not significant.

1.15 CULTURAL HERITAGE

The Cultural Heritage Technical Annex of the ES considers the potential impacts of the proposed development on the important cultural receptors within the study area, during its construction and operational phases.

A total of 28 sites of cultural heritage interest were identified during the desk assessment and archaeological field survey carried out within the development boundary, while a further 42 sites were identified within 1 km of the development boundary.

The assessment of potential effects was conducted with reference to two areas - The Near Study Area and The Wider Study Area. The Near Study Area is that likely for potential direct and indirect effects to take place regarding the proposed development, while The Wider Study Area consists of sites that have no potential to be directly affected but may be subject to indirect effects. The Near Study Area consisted of the area within the proposed development boundary and sites within 1km, while The Wider Study Area extended to 3km from the edge of the development boundary.

Near Study Area

Statutory Designated Cultural Heritage Sites

One statutory designated cultural heritage site is located within the development boundary, that being the Listed Category B building of Coul Farmhouse. Within 1 km of the development boundary there exists two scheduled monuments and eight listed buildings.

Prehistoric Sites

The area within the development boundary holds two previously recorded cultural heritage sites of potential prehistoric date. However, neither was located during the walkover survey.

To the north-east of Coul Farmhouse, a possible hut-circle has been recorded (Site 10), associated with the Bronze and Iron Ages. Some 190 m to the south-west of this, lies the location of a possible prehistoric cairn (Site 5), however a walkover survey confirmed that no clear remains of the cairn were visible.

Within 1 km of the development boundary, there exists seven sites of potential prehistoric date. These include previous findspots of urns (Site 66), flints (Sites 27 & 65), arrowheads and a stone axe (Site 54), a cairn (Site 49), a cairnfield and field systems (Site 1) and the remains of a chambered cairn (Site 38) which is also protected as a scheduled monument (SM5975).

Medieval Sites

The Medieval period appears absent from the visible archaeology within the development boundary. However, within 1 km of the boundary, three potential medieval sites exist, including the scheduled site of Skelbo Castle (Site 56, SM6225).

Post-Medieval and Modern Sites

The most numerous known sites within the development boundary are post-Medieval and modern.

Eight of the sites recorded within the development boundary relate to records of lost or wrecked sea vessels (Sites 12-19) dating primarily from the nineteenth century, however none of these sites were noted during the walkover survey.

Remains of the Dornoch Light Railway were noted in the form of the route itself (Site 26), the remains of Skelbo Station platform (Site 30), a small brick structure (Site 24) and a small quarry (Site 22).

In addition to the main Listed Category B Farmhouse (Site 11, LB604, HER No. MHG17065, NMRS No. NH89SW14), in the centre of the development area there also lies two cottages (Site 6) and a series of farm buildings to the north of the cottages (Site 9).

On the south-eastern fringes of the Coul Farm complex, four irregularly shaped cairns was present, spread over an area of approximately 100 m (Site 23). At the far north-western extent of the boundary a possible eighteenth-century bridge is present on the old Skelbo to Littleferry road (Site 32).

Within 1 km of the development boundary exists numerous and varied post-medieval and modern sites. These include the Listed Category B buildings at Skelbo (Site 69) and the listed category C and B buildings at Littleferry (Sites 66 & 62). On the southern side of Loch Fleet, the remains of the southern pier of the former Littleferry ferry is also present (Site 20).

Sites of Unknown Date

A series of three sites of unknown date were noted within the development boundary. These included the remains of two roughly circular structures located to the east of Coul Farmhouse (Site 8). No sign of either structure was noted during the walkover survey.

Within 1 km of the development boundary, there exists three sites of unknown date. These include a pebble tool recovered from the shore south-east of Embo (Site 39), a previous findspot of unknown nature at Littleferry (Site 67) and a midden of unknown date on the shore at Skelbo (Site 58).

Potential for Unknown Remains

The area within the development boundary and that within 1 km of it contains a wide variety of cultural heritage sites, reflecting the continuous use of and settlement within the area from the prehistoric period onwards. As a result, there is good potential that the development area could hold currently unknown buried archaeological remains, although this is most likely immediately inland from the line defining the edge of the raised beach. This currently corresponds to all land within the proposed development boundary around, to the west and south of Coul Farm.

The western half of the development consists of agricultural fields subject to ploughing, while the eastern half consists of a sand dune system. Due to the nature of these environments, they both have the potential to be holding currently unknown sub-surface archaeological remains.

Wider Study Area

Sites Within 1 km

Within 1km of the proposed development two scheduled monuments are located. These are Skelbo Castle (Site 56, SM6225), 800 m to the west of the development boundary and the remains of a prehistoric Orkney-Cromarty type chambered cairn (Site 38, SM5975) approximately 400 m south.

Eight listed buildings are located within 1 km of the proposed development boundary. To the west, lies the complex of the mid to later nineteenth century Skelbo Farm (Site 69, LB596, Listed Category B) while, to the south, lies the late eighteenth century listed category A Embo House (Site 43, LB24641).

Sites Between 1-3 km

Within 1km to 3km from the development boundary, there are four scheduled monuments. To the west lies the remains of Skelbo Wood Broch (SM 1885) while to the east, sits Glen Cottage prehistoric long cairn (SM5484). To the south lies the prehistoric Embo Street Cairn (SM1788).

Only one listed building lies within 1km to 3 km from the development boundary, that being the listed category B Earl's Cross House (LB24641).

Construction Effects

Potential Effects on Known Remains

Despite the design process avoiding direct effects on most of the known cultural heritage sites within the development boundary, potential direct effects were predicted on 14 sites. The site of a cairn noted on early OS maps (Site 5) and the reported location of a hut-circle (Site 10) are located in areas proposed to be landscaped to the east of the Coul farmstead buildings. Despite no obvious remains being visible on the surface, it is likely that sub-surface remains of these sites exist, particularly given the area does not appear to have been subject to intensive ploughing.

Small scale quarrying was visible at the site of the proposed cairn suggesting, if it is present, it may have been at least partially disturbed. This, in addition to Site 8, which comprises possible circular structures, lack any surface visibility and therefore the current level of the potential effect is *unknown* for both of these sites, although this could be *significant* if important sub-surface remains of these sites are present.

A series of four irregularly shaped cairns (Site 23) to the south of Coul Farm were recorded, however landscaping and drainage as part of the proposed development is only likely to affect part of the cairns equivalent to a *medium* potential magnitude of the effect.

The route of the light gauge railway track (Site 26) is crossed by fairways at several locations. However, the route of the railway is to be maintained as a public walkway, making the sensitivity of this receptor *low* and the potential magnitude of the effect *negligible*. Two disused quarries (Sites 22 & 28) located next to and that could be associated with the railway are considered to have a low sensitivity. While the magnitude of the potential effect is expected to be *slight* for Site 22 as it is located on the fringes of a proposed fairway, the magnitude of the potential effect for Site 28 is expected to be *substantial* due to its more central location.

The small brick structure (Site 24) located east of the railway, is proposed to be maintained and renovated into a tourist information signage point. Similarly, the farm buildings (Site 9) and cottages (Site 6) associated with Coul Farm will be maintained as part of the development. This is not likely to result in the potential adverse magnitude of effect being any greater than *slight* which, given these sites have a *low* sensitivity, would result in the level of the potential adverse effects being *negligible*.

To the north of Coul Farm are two possible oval shaped pits (Site 25), likely to be related to human activity due to their regular shape and depth. Unless the pits prove significant, the level of effect is unlikely to ever be greater than *minor* adverse.

A series of three wells (Sites 44, 47 & 68) were identified on early OS maps of the area that do not appear on modern maps and are not currently visible on the ground. There is potential that any landscaping and drainage associated with the proposed development could impact on sub-surface remains associated with the wells. If present, it is very unlikely their sensitivity would be any more than *low*. The potential magnitude of the effect is only likely to be *slight* due to the potential depth of any well remains. This would result in the level of the potential effect being *negligible*.

Operational Effects

Assessment of the 16 designated cultural heritage sites located both within the development boundary and within 3 km of it (Appendix F.2 and Appendix F.4) showed that 4 sites would have either no visibility or extremely limited views of the proposed development.

An adverse effect on the setting of Skelbo Castle (SM6225), Embo House (LB608, Listed Category A), Littleferry Pier and Boathouse (LB7107, Listed Category C) and Littleferry former Girnel (LB7020, Listed category B) was predicted. An adverse effect on the setting of Coul Farmhouse (LB604, Listed Category B) was predicted, while a beneficial effect of *minor* significance was also predicted on the Coul Farmhouse.

Cumulative Effects

Currently no other golf courses are present or known to be planned in the immediate vicinity of the proposed development, therefore, there are likely to be no immediate cumulative effects on the setting of cultural heritage sites. It is also unlikely that any additions to the development through its operational lifetime will result in any significant change to the setting of cultural heritage sites.

Committed Mitigation Measures

Mitigation of potential direct effects on most sites during construction of the development should be achievable through avoidance, by means of demarcating these sites with an appropriate buffer.

Mitigation is likely to involve pre-construction evaluation through trial trenching of all sites that cannot be avoided and areas deemed sensitive to unknown remains. This will focus on all land west of the line defining the raised beach, roughly corresponding to that immediately around and to the west and south of Coul Farm. It is also important to note that if significant remains are uncovered during this mitigation, full archaeological excavation may be required to ensure preservation through record.

Mitigation of potentially undiscovered remains will also take the form of archaeological watching briefs during ground disturbance in areas deemed sensitive to the discovery of unknown remains.

1.16 SOCIO-ECONOMICS

The Socio-economic Annex of the ES has assessed the potential impacts of the development of Coul Links on the local and broader economy (local business, tourism, direct employment).

The vision for the site is to focus on the development of a top golf course with very limited on-site development. An important consequence of this approach is that it should stimulate significant new demand for existing businesses in the local area as well as creating opportunities for new businesses to be established.

It is estimated that during the first year of operations, 43% of the Gross Value Added (GVA) and 80% of the jobs supported would arise, not as a result of on-site operations, but as a result of the additional demand elsewhere in the economy. Further, by the tenth year of operations, it is estimated that 59% of the GVA and 90% of the jobs supported by Coul Links could be associated with off-site activity.

The key finding of the analysis is that within its first year of operations Coul Links could:

- generate £4.3 million additional GVA and support around additional 120 jobs in the local area;
- generate £6.2 million additional GVA and support around 200 additional jobs within the Highlands; and
- generate £7.9 million additional GVA and support around 250 additional jobs across Scotland.

It is expected that over the first ten years of operations, as the reputation of the course develops and the number of golf tourists increase, this economic impact could more than double such that by year ten Coul Links could be:

- generating £8.1 million additional GVA and supporting around 250 additional jobs in the local area;
- generating £13.1 million additional GVA and supporting around 450 additional jobs within the Highlands; and
- generating £20.1 million additional GVA and supporting around 680 additional jobs across Scotland.

- It was also estimated that the construction of Coul Links could:
- generate £1.4 million GVA for the local area and support 25 years of construction related employment;
- generate £2.5 million GVA across the Highlands and support 42 years of construction related employment; and
- generate £3.4 million GVA across Scotland and support 77 years of construction related employment.

It is expected that the calibre of Coul Links will help to attract new golf tourists to the local area of who would not otherwise have visited and whose expenditure would therefore be entirely additional. Coul Links is also expected to encourage some golf tourists, who might have come to the Highlands to play one of the regions other iconic courses, to extend their stay. By providing an incentive for such visitors to remain longer in the area, Coul Links could help to secure a higher proportion of the expenditure in the region.

It is also expected that, by improving the quality of the local golf tourism experience, Coul Links would also aid an increase in the propensity of visitors to not only return, but to recommend the area to others. These effects should help to increase the future volume of golf tourism in the region.

Implications for Other Local Courses

Aside from Royal Dornoch, highly regarded courses such as Tain, Golspie, Skibo and Brora, all of which are located within half an hour's drive of Dornoch are likely to be concerned that the development of Coul Links could have a negative effect on the number of golf tourists who play these courses. However, there are strong reasons to believe that such concern would be misplaced.

Although it is possible that the new course could attract some visitors who might otherwise have played other local courses, the level of this displacement is expected to be minimal and - more importantly – significantly outweighed by the additional demand that Coul Links is expected to generate. Overall the net effect of the new course on other local courses and the local economy is expected to be strongly positive. Importantly the developers have met with the management and Councils of all the local golf courses and all have expressed publicly their full support for the project.

Dornoch and East Sutherland: Maximising Local Potential

Despite Royal Dornoch being ranked in the top 5 golf courses in the world by Golf Digest, the local area does not currently benefit from golf related tourism to the extent that might be expected. It is estimated that while approximately 15,000 golf tourists currently visit Dornoch and East Sutherland each year, only 6,000 of these visitors stay in the local area. If the Coul Links proposals go ahead, this could stimulate demand for a further 14,000 nights of accommodation by golf tourists each year. From this, it is estimated that at least 80 additional high-quality hotel rooms would be required in the local area to service this demand, along with ancillary tourist services such as food and drink.

Additionally, Coul Links has the potential to create significant demand for the services of approximately 42 full-time caddies during the first year of operations, increasing to approximately 56 caddies by year ten.

Highlands: Establishing a World-Class Destination
Despite the two world class golf courses currently located in the Highlands - Royal Dornoch and Castle Stuart, the region currently lacks the critical mass of courses required to function as a major golf destination. By creating a critical mass of top-ranked courses in the Highlands, Coul Links has the potential to significantly increase the length of time that the average golf tourist spends in the Highlands. This would inevitably help to establish the Highlands as an important destination in its own right for international golf tourists.

Impact in Context
If the proposals for Coul Links proceed, it is likely to have a transformational effect on the local economy. To help put the impact of the proposals into context, it is worth noting that in 2014:

- approximately 4,300 people in the local area were employed by the private sector; and
- around 950 of these individuals worked in the tourism sector.

These figures suggest that the Coul Links project has the potential to increase the total number of local jobs in the private sector by around 6% by year ten of operations. It is also estimated that by year ten, Coul Links could be supporting approximately 450 additional jobs in the Highlands. This is more than half the expected number of new jobs supported by the Highlands and Islands Enterprise (HIE) in 2016.

1.17 NOISE

British Standard 5228-1:2009 Annex a Code of Practice for noise and vibration control on construction and open site Part1: Noise provides information on the prediction and evaluation of noise relevant to the proposed golf course development. Three key noise receptor areas were identified through the scoping process. These were:

- NSR1 – Embo - Grid reference NH 81646 92944
- NSR2 – Coul Farm Cottages – Grid reference NH 81083 94016
- NSR3 – Unnamed – Grid reference NH 80083 94738

The impacts of noise on these key noise receptor sites have been investigated by a dedicated environmental specialist (Affric Consulting). Given the proposed location of the golf course, operational noise will not be appreciably different to baseline levels. Construction noise has also been assessed, based on type and location of works in relation to identified key receptor sites. Again, construction noise was determined to have no significant impact on those receptor points and as such has been scoped out of the EIA.

1.18 COASTAL EROSION

1.18.1 Introduction

The coastal erosion assessment considers the potential impacts of the proposed development on the stability of the shoreline at Coul Links and makes recommendations that should be implemented to increase the sustainability of the project in context of the surrounding coastal processes.

An extensive desktop study that involved reviewing and assessing the findings of a range of technical documents, coastal change maps and survey data has been undertaken to in order to describe key coastal processes and sediment transport regime in the region of the proposed Coul Links development.

The Coul Links region forms the northern part of a low-lying depositional sedimentary unit composed of modern and Holocene emerged estuarine, beach and dune sands.

The site contains an extensive dune system, with high coastal dunes, low-lying dune slacks and extensive dune heath, while the surrounding region has an abundance of glacially derived sands and gravels, with virtually the entire length of this coastline being backed by raised beaches.

1.18.2 Coastal Processes

Short term storm driven acute erosion coupled with significant wave energy are identified to be more important for driving coastal change in this region compared to chronic long term due to underlying causes such as sea level rise etc. (Hansom *et al*., 2013).

Through a range of existing literature, RPS found the shoreline at the Coul Links site to be dynamically stable, meaning that the position of the existing vegetation line will erode in response to arduous storm conditions and then recover during calmer conditions to maintain the natural quasi-equilibrium beach profile. Studies have indicated that there is a substantial sediment source in an area of *c.*123km^2 enclosed by the 20m isobath within the prevailing wave basin just beyond Dornoch sands that is available for wave-induced onshore movement (Hansom & Leafe, 1990). This sediment source would play a crucial role in re-nourishing the Dornoch and Embo coastlines following significant storm activity and therefore maintaining the dynamic stability of these coastlines.

Inspection of coastal change maps that were produced as part of the National Coastline Change Assessment (NCCA) project found that the shoreline in front of the proposed 15th and 17th greens had advanced shoreward by 1.6m – 2.5m between 1977 and 2009. The NCAA also calculated a modest rate of accretion in this area of *c.*+0.10m/yr.

During the extreme winter storms of 2013 and 2014, which are believed to have a return period of between 1 in 25 and 1 in 50 years, the average coastal retreat along Coul Links was *c.*4.00m. However, evidence gathered during a site visit indicated that the dune system has since naturally recovered and that the vegetation line is slowly advancing landward as more sand accumulates and is consolidated by stabilising pioneer species. The overall result of this erosion/recovery process is that the position of the vegetation line along Coul Links will shift about a mean line in response to prevailing storm conditions; i.e. it is dynamically stable in terms of natural geomorphology and sediment supply.

1.18.3 Future Climate Change

The projected change in relative sea level rise in the Coul Links region is expected to be *c.*0.26m by 2050 and *c.* 0.75m by 2100. The projected rate of change in storm surge levels is relatively small (< 0.5mm/year), whilst a minor reduction in wave heights has also been projected for the north of the UK (Lowe et al., 2009).

It is well established that the natural response of a shoreline to sea level rise is to retreat in order to maintain its quasi-equilibrium state and therefore it is possible to infer that the shoreline along Coul Links is highly likely to retreat slowly landward in response to the projected increase in relative sea levels.

1.18.4 Recommendations

Based on previous extreme winter storm events it is expected that the shoreline in this region could retreat by 4m on average in response to 1 in 25 to 1 in 50 year return period storm event. During storm events, the dune system acts as a very flexible and highly effective buffer zone. By effectively managing the existing dune system it is possible to encourage the natural deposition of sediment material along the upper beach profile and increase the overall effectiveness of the dune system buffer zone.

In order to maximise the sustainability of the proposed Coul Links development, it is imperative that the developers commit to an ongoing and robust dune management plan that will involve utilising soft engineering principles to enhance the existing coastal processes. This will increase the overall sustainability of the development by building up the existing dune system which acts as a very flexible and highly effective natural buffer against coastal erosion. It will be necessary to undertake annual and periodic maintenance of the dune as part of this management plan, particularly following arduous storm events, to re-plant and re-build the dune face.

To ensure that hard coastal defences are unlikely to be required into the future, the width of the effective buffer zone at the edge of the proposed 15th and 17th greens should be maximised by constructing the greens as far landward as is permissible within the currently detailed maximum allowable footprint of the development.

Going forward, future increases in relative sea level rise due to climate change are likely to result in a trend of slow landward retreat along the Coul Links. As a result, a coastal monitoring programme should be implemented and a robust coastal processes study undertaken to assess and quantify the risk of coastal erosion and develop an environmentally sustainable long term management plan for the course.

1.19 DIFFICULTIES ENCOUNTERED IN COMPILING ANY SPECIFIED INFORMATION

Difficulties in compiling any specified information for use in this EIS.

No major difficulties were encountered in obtaining baseline information regarding the site of proposed development and its assets. Where necessary, further surveys, interviews and desk-based research was carried out to supplement existing available data. The best available methods were employed to forecast the potential environmental impacts that the proposed development would have on and near to the study area, but also on the wider surrounding landscapes and communities.

In circumstances where there was any uncertainty; evidence, expert opinion, best practice guidance and professional judgement have been used to evaluate what is likely to occur if the proposed development is to be agreed and constructed.

Any particular issues regarding the research gathering and writing of particular annexes which work to inform this EIS are described below:

1. Access, Traffic and Transport
   There were no particular difficulties encountered when compiling the specified information necessary during the researching and writing of the Access, Traffic and Transport annex by SYSTRA Ltd.

2. Cultural Heritage
   Some areas within the development boundary that were previously recorded as being of cultural significance were found by surveyors on walk-over surveys and therefore, many were assessed as having an unknown sensitivity. Apart from this, no particular difficulties were encountered when compiling any specified information for use in the Cultural Heritage annex written by North Light Heritage.

3. Hydrology and Hydrogeology
   There were no specific difficulties encountered when compiling the specified information used to conduct and write the Hydrology and Hydrogeology assessment written by 2Ic and STRI Group to inform this EIS.

4. Landscape and Visual Amenity
   There were no specific difficulties encountered when compiling the specified information used to conduct and write the Landscape and Visual Amenity assessment written by Optimised Environments to inform this EIS.

5. Ecology and Ornithology
   Baseline surveys undertaken are based on sampling techniques, not absolute censuses. Results give an indication of the numbers of ecological receptors recorded at the particular times that surveys were carried out. Species occurrence changes over time and therefore the results presented in this ES are snapshots in time. Importantly, no information gaps were identified in the baseline survey data that would prevent assessments in line with the requirements of the EIA Regulations to be undertaken.

   Putting ecology and ornithology survey results into a wider geographical context is sometimes challenging because most species and habitats have not been systematically surveyed beyond the study area. Thus, defining a population as locally or regionally important is potentially difficult because local or regional population estimates do not exist for most taxa and habitats. Whenever such uncertainty exists, professional judgement and published evidence is used and populations in the study area or site have been assumed to be at their highest potential level of geographical/ecological importance.

6. Socio-Economics

   There were no specific difficulties encountered when compiling the specified information used to conduct and write the socio-economics Annex of this EIS by BIGGAR Economics.

1.20 SUMMARY

Following EIA screening it was identified that the application is for a development that requires an Environmental Impact Assessment, as defined by the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. Accordingly, the Environmental Impact Assessment of the proposed development has taken place, which is documented in Part B, the Environmental Statement, which is submitted in support of the planning application. The scope of the EIA was identified during an EIA scoping process undertaken with Scottish Natural Heritage, The Highland Council and a range of other statutory and non-statutory consultees.

A number of potentially significant effects were identified, due to the SSSI designation of the Loch Fleet as well as the Dornoch Firth and Loch Fleet RAMSAR site that makes up a portion of the proposed development area, a public right of way throughout the area, a range of protected species, archaeological interest in the area and potential traffic and nuisance implications of the scheme.

The proposed development has evolved through expert advice and taking into consideration the comments of consultees to avoid direct impact where possible. A number of management and monitoring plans during both the constructional and operational phases have been identified to avoid, reduce or compensate for potentially significant environmental effects. These are set out within the ES, its appendices and supporting documents. As a result of the mitigation measures being implemented, the ES concludes that the proposed development will lead to no significant adverse effects.

PART B

ENVIRONMENTAL STATEMENT

1.0 INTRODUCTION

1.1 INTRODUCTION

Coul Links Ltd is applying for detailed planning permission to create an 18-hole golf links on a site north of Embo, approximately 4 km north of Dornoch, Sutherland.

The proposed development is comprised of a new golf course, to be known as Coul Links, together with a practice ground and associated maintenance and ancillary facilities.

Should planning permission be granted, the golf course will be constructed over a period of 18 months.

As required by the relevant legislation, this Environmental Statement (ES) has been prepared by STRI Group consultants in support of the detailed planning application which will be submitted on behalf of Coul Links Ltd.

Environmental Impact Assessment (EIA) is a process of meticulous assessment of environmental impacts. It was introduced for the purpose of identifying and evaluating the potential benefits or adverse impacts of development projects on the surrounding environment consisting of land, air, water and biological factors. It also takes in to account environmental, economic, cultural and aesthetic considerations. All activities associated with planning, design, site preparation, construction, operation and maintenance within the proposed development are included in the assessment. These considerations help decision makers and project planners to develop the appropriate mitigation measures at an early stage in the project.

1.2 NATURE AND EXTENT OF THE PROPOSED DEVELOPMENT

The proposed development can be summarised as the construction of an 18-hole golf links including all access routes, earthworks shaping, planting, irrigation systems, services and infrastructure, as required.

The gross development boundary area is approximately 328.4 ha however the footprint of the golf course within this area will be just 22.7 ha. The proposal forms part of an extant planning application (16/00053/SCRE) which was lodged on 21st December 2015 for the '*Development of an 18 hole championships links golf course and practice area. The total area of development is anticipated to be approximately 328.4 hectares (805 acres).*'

Appendix ES.1 Site Masterplan, illustrates the proposed spatial layout of the components of the proposed development. As indicated, the development site is an area of some 328.4 ha. During both construction and operation, all land use requirements will be confined to this area.

Coul Links will comprise:

- A golf course consisting of 18 holes
- 18 greens, tees and fairways comprised of frequently mown grass, plus areas of managed rough (mostly fescue, heather and marram) and scrub (gorse). Note that vegetation will remain natural and native to the site.
- A new golf club house and maintenance facility
- Pro-shop and other admin buildings (retained existing buildings)

The physical characteristics of the development to construct the golf course will include:

- Creation of a new access road from the C1026;
- Removal of trees and shrubs of low ecological importance;
- Translocation of dune heath;
- Minor earth moving and shaping;
- Installation of irrigation system;
- Sowing of playing surfaces with golf appropriate species;
- Construction of golf club house;
- Refurbishment of existing buildings to accommodate golf course facilities;
- Construction of golf course maintenance facility;
- Upgrading of footpath network across the golf course;
- Installation of interpretation board(s) along public access paths.

A core element to the design concept for the links course will be to incorporate as much as possible of the existing landscape in the course layout, thereby maximising the amount of existing landscape that is unchanged.

Appendix ES.2 – A, B and C show the positioning of the site in relation to Dornoch Firth and Loch Fleet RAMSAR Site and Special Protection Area (SPA) respectively, and Loch Fleet Site of Special Scientific Interest (SSSI).

Importantly, in terms of the scope of this ES, it also illustrates sites which are designated to provide protection to features of international or national ecological/ornithological, historical or archaeological significance.

1.3 SITE DESCRIPTION

The current land use of the site is mixed though all uses are at present, very low impact.

The central portion of the site, immediately west and south of the old railway line comprises improved pasture currently used for sheep grazing. The land in the southwestern portion of the site comprises rough pasture with patches of scrub, dune heath and woodland.

The land between the coast and the route of the old railway line largely comprises a stable dune system with some areas of trees, scrub, bracken and felled woodland. This portion of

the site is designated as being of international and European importance as part of the Dornoch Firth and Loch Fleet RAMSAR Site and Dornoch Firth and Loch Fleet Special Protection Area (SPA) respectively, and of national importance as part of the Loch Fleet Site of Special Scientific Interest (SSSI). The SSSI is notified for its intertidal marine habitats (eelgrass beds and sandflats), its coastlands (saltmarsh and sand dunes), its native pinewood, its vascular plant assemblage, and its birds (breeding bird assemblage and non-breeding eider).

The golf course will incorporate a total footprint of 22.7 hectares. As a result of careful planning, the course will include only a 14.0 hectare footprint inside the SSSI (1.1% of the total SSSI area) and 8.7 hectares outside.

1.4 CONSENTING ROUTE AND NEED FOR EIA

A Proposal of Application Notice (PAN) was lodged with The Highland Council (THC) on 29th June 2016 (reference 16/02911/PAN).

The applicants considered this proposed to be a development which requires environmental impact assessment (EIA) given the description of the development matches that specified in Category 12 F (Golf Courses) of Schedule 2 of the Environmental Impact Assessment (Scotland) Regulations 2011 (hereafter referred to as the 'the EIA Regulations'). The area of the site exceeds 1 hectare (ha), the threshold identified for golf courses and associated developments in the EIA Regulations.

A Screening Opinion regarding the need for EIA was sought from THC on the 21st December 2015, (16/00053/SCRE). Responses from Scottish Environment Protection Agency (SEPA) and Scottish Natural Heritage (SNH) received on the 13th and 18th January 2016, respectively, confirmed that an EIA would be required.

The proposed development falls within 'Schedule 2 Development' of the EIA Regulations in that the area of development exceeds 1 ha. In addition, when screening the development against the selection criteria outlined in Schedule 3, including potential impact on Dornoch Firth and Loch Fleet RAMSAR Site and Special Protection Area (SPA) respectively, and Loch Fleet Site of Special Scientific Interest (SSSI), the impact on natural resources and the natural environmental, and on the historic environment, the potential impact on the receiving environment is considered to be significant.

From the responses to the Screening Opinion, it was determined that there were a number of areas of potential environmental impact which would benefit from being addressed through the EIA process, primarily:

- Ecology;
- Ornithology;
- Access, Traffic and Transport
- Cultural Heritage
- Landscape and Visual Amenity
- Socio-economics
- Noise
- Hydrology and Hydrogeology

To determine exactly what extent of environmental information would be required to accompany the planning application, a Scoping Report was prepared and submitted to THC in July 2016 by Golder Associates on behalf of Bandon Dunes Golf Resort.

The Scoping Response from THC, SEPA and SNH agreed the suggested topics of potential impact put forward within the Scoping Report were acceptable and should be considered within the Environmental Impact Assessment, with additions.

1.5 STRUCTURE OF ENVIRONMENTAL IMPACT ASSESSMENT

The ES has been prepared in accordance with the relevant guidance on Environmental Impact Assessment (EIA) including that prepared by SNH. Further, it has also been completed with reference to guidance provided by THC and other statutory consultees, in particular that detailed in the Pre-Application Advice Pack (P-AAP) provided formally by THC on 17th November 2015 (15/03874/PREAPP).

The P-AAP identified the following key issues relevant to the proposal which will be addressed in the following document:

- Impact on the designated features of the Dornoch Firth & Loch Fleet SPA, RAMSAR, and Loch Fleet SSSI;
- Potential disturbance to qualifying bird species and impacts on intertidal habitats;
- Potential disturbance to Fonseca's seed-fly;
- Impact on other recreational uses of the site;
- The area has a high archaeological potential with known prehistoric settlements and burial sites within and close to the development area;
- Coul Farmhouse is a Category B Listed Building within the development site;
- Heritage assets outside of the development site, Skelbo Castle and Embo House, will need to be assessed for impacts;
- Assessment of the flood risk, direct impact on water environment and abstraction to be required;
- Impact on the local road network;
- Visual impact on the local landscape and landscape character.

This ES includes a series of Technical Annexes (TA's) prepared by specialist consultants. As such, this document is referred to as the ES Main Report: it summaries and replicated the key findings of each of the TA's which are, effectively, topic specific assessments. For example, the ecology TA comprises comprehensive ecological assessments on vegetation, invertebrates and other species of importance.

This ES Main Report is structured in accordance with Parts 1 and 2 of the EIA Regulations Regulation 2(1) as far as is practicable and summaries the findings of seven Technical Annexes relating to the following topics:

- Ornithology;
- Ecology;
- Hydrology and Hydrogeology
- Landscape and Visual Amenity
- Access, Traffic and Transport
- Cultural Heritage
- Socio-economics

In addition, as required by the EIA Regulations, this report is summarised in a Non-Technical Summary (NTS).

Each of these subject areas corresponds to those identified during consultations with THC and other key statutory consultees. Specifically, they were confirmed by the Planning Authority's formal Screening Opinion received on 21st December 2015.

In principle, each of the TA's addresses the issues raised in the P-AAP plus any additional potential impacts of equal or greater significance that emerged during the relevant assessment process (should any such issues be identified). Table ES.2 includes details regarding each of the associated TA's.

Table ES.2: Consultant Credentials

Technical Annex	Consultancy	Credentials of Lead Consultant
Ornithology	Alba Ecology Ltd	The Alba Ecology Ltd. ornithological surveyors were Peter Cosgrove, Donald Shields, Robert Potter and Julie Murray. The surveyors have extensive ornithological field experience in the north of Scotland. All surveyors were licensed under Annex II of the Schedule 1 licence (number 54244) held by Peter Cosgrove to work on Coul Links. During their careers the surveyors have attended regular ornithological training events led by experts, covering areas such as bird survey methodologies, identifying potential confusion species, estimating distances and heights of flying birds, recording data concisely and correctly, navigation techniques and Health and Safety. The Alba Ecology Ltd. ecological surveyors were Peter Cosgrove, Kate Massey, Robert Potter, Donald Shields and Julie Murray. The surveyors have extensive ecological field experience, and attended regular training events led by experts, covering areas such as species identification, recording data concisely and accurately, navigation techniques and health and safety. Surveyors were trained to carry out ecological surveying and mapping work in a systematic manner, following recognised standardised survey methods. When detailed technical advice was required, e.g. Fonseca's seed-fly surveys it was commissioned from recognised specialists. The bat roost and activity survey undertaken around Coul Farm House and steadings was conducted by A9 Ecology.
Hydrology and Hydrogeology	Robin Hulme Associates	The Robin Hulme Associates consultant was Adrian Mottram. Adrian has an honours degree and has over twenty years' experience as an irrigation designer and consultant. In that time he has been associated with projects at many of the leading sports venues in the UK and overseas. Adrian has worked on many links golf courses including Royal Dornoch, Skibo Castle, Castle Stuart and has consulted to eleven of the fourteen links golf courses which have held the Open Championship. Adrian has spoken at numerous conferences and seminars including those for the R&A, STRI, BIGGA, CWGC, GCSAI and Irish Links Initiative.

Anna Goodwin	Golder	Anna has thirteen years consultancy experience and is responsible for providing specialist input to a range of environmental projects. She is a Project Manager with experience managing hydrogeological projects; and has also acted as Project Co-ordinator for international mining projects and UK based Environmental Impact Assessment projects, supporting the Project Manager with the management of a multidisciplinary team.
	2iC – Water Resourcing and Reservoir Design	The 2iC consultant was Phil Langdon. Phil has 20 years' experience in the design, construction supervision and project management of irrigation systems, both in the UK and Europe. He has specialist skills in the location of underground water sourcing, combining geological evaluation with water divining. As a consultant, Phil has designed, installed and overseen the installation of many types of irrigation systems, including golf projects, football stadia and large garden projects in conjunction with private developers.
	STRI Group	The STRI Group consultants were Jonathan Tucker and Dr. Christian Spring. Jonathan has 32 years of experience in Agronomy and Sports turf design, specialising in golf course architecture. He is a senior member of the European Institute of Golf Course Architects and has been involved in diverse projects including Masters planning, bunker and green redevelopment, safety reviews, drainage assessment/design and course extension. Christian has a PhD investigating the structural effects of earthworms on soil and is a research manager and head of the soil laboratory. Christian leads research into a variety of subject areas, including sports surface construction and drainage, turfgrass nutrition, sports turf management, use of wetting agents and pesticides, surface performance assessment and machinery testing.
Landscape and Visual Amenity	Optimised Environments	The Optimised Environments consultant was Dan Roebuck. Dan has a BSc Architectural Technology and over 10 years professional experience in both the UK and Australia. He has considerable project experience coordinating and producing high quality documentation for landscape assessment, masterplanning, design development, detail design, and has held key roles in developing masterplans, planning applications, tender packages, and construction documentation.

Access, Traffic and Transport	Systra	The Systra consultant was Alan DeVenny. Alan Devenny has a Bachelor of English (Hons) and a PhD, he is a Member of the Institution of Civil Engineers. Alan is a chartered engineer with over 17 years of experience in the traffic and transport sector. He specialises in private sector development planning projects where he delivers a range of services including access strategies, transport assessments and infrastructure design.
Cultural Heritage	Northlight Heritage	The Northlight Heritage consultant was David Sneddon. David is a field archaeologist with particular expertise in heritage assessment primarily for EIAs. For the past 3 years he served as a senior archaeological clerk of works for a major linear route infrastructure project and is now directing the programme of post-excavation analysis for the project. David is also the co-director of the Glenshee Archaeological Project, which aims to empower local residents and volunteers to explore and research local prehistoric and medieval archaeology.
Socio-economics	BiGGAR Economics	The BiGGAR consultant was Graeme Blackett. Graeme is Managing Director of BiGGAR Economics. He has a BA (Hons) Economics from the University of Strathclyde and is a member of the Economic Development Association Scotland and the Institute for Economic Development. He has more than 25 years of experience in assessing the economic impacts of organisations, sectors, proposed developments and public policies and is familiar with the Highlands economy and the economics of the Scottish tourism industry, including the contribution of golf tourism.

Each of the subject areas scoped in, investigated and reported on in the respective TAs is outlined in the following sub-sections. As is described, each of the TAs is supported by various appendices. As appropriate, some of those which were originally provided have been used or subsumed elsewhere in the overall EIA package.

1.5.1 TA-A Ornithology

An ornithological impact assessment was undertaken in support of this ES by Alba Ecology. Both wintering birds and breeding birds were considered, given that the development could be deemed likely to involve potential impacts on both. Due to the sites location within Dornoch and Loch Fleet Special Protection Area (SPA), special consideration was given to the bird species which are qualifying features of the SPA.

The Ornithology TA is accompanied by four appendices, as detailed in Table ES.3

Table ES.3: Annex A: Appendices

Appendix	Title	Contents
Appendix A.1	Coul Links Winter 2015-2016 Bird Survey Report, with 10 associated figures	Assessed the current population of wintering birds within the study area and adjacent foreshore areas through targeted bird surveys.
Appendix A.2	Coul Links Summer 2016 Breeding Bird Survey Report, with four associated figures	Assessed the current population of breeding birds within the study area and adjacent foreshore areas through targeted bird surveys.
Confidential Appendix A.3	Confidential Information Appendix	Maps indicating locations of protected breeding birds
Appendix A.4	Shadow Habitats Regulations Appraisal for SPA bird species	Appraisal in relation to Regulation 48 of the Conservation Regulations 1994

1.5.2 TA-B Ecology

A detailed report on the ecological sensitivities of the development site was prepared by Alba Ecology. This is denoted as TA-B and is supported by six appendices, as detailed in Table ES.4.

The report addresses potential impacts of the proposed development on flora and fauna (excluding birds). This involves a description of the current plant and animal populations which will be affected by the development and the potential impacts of the of the golf course on these populations. It also outlines the scope for avoiding, mitigating and compensating for potential impacts.

Table ES. 4: Annex B Appendices

Appendix	Title	Contents
Appendix B.1	Coul Links Natural Heritage Desk Study	Identified any site with nature conservation designations within a 10 km radius of the site.
Appendix B.2	Phase 1 Habitat, National Vegetation Code and Ground Water Dependant Terrestrial Ecosystems Survey Report	Identified the different habitats and the fauna and flora supported by each.
Appendix B.3	Protected Terrestrial Mammal Survey Report	Identified the potential presence of terrestrial mammals within the development boundary.
Appendix B.4	Bat Survey Report	Identified bat roost potential of trees within the woodlands and the several buildings on the site.

Appendix B.5	Fonseca's seed-fly Report	Assessed the current population of Fonseca's seed-fly within the dune system at the site.
Appendix B.6	Title- Aerial comparisons: 1988, 2009 and 2016	Contents- A comparison of the extent of dune heath, bracken and birch woodland from aerial photographs of Coul Links from 1988, 2009 and 2016.

Standard approaches for each of the surveys were used, as is described in full in each of the reports.

1.5.3 TA-C Hydrology and Hydrogeology

The Hydrology and Hydrogeology assessment addresses the potential effects on surface water and groundwater from the proposed development and considers the potential effects to groundwater dependent terrestrial ecosystems. It was prepared by Golder Associates, Robin Hulme Associates, 2iC and STRI Group.

This is denoted as TA-C and is supported by three appendices, as detailed in Table ES.5.

Table ES.5: Annex C Appendices

Appendix	Title	Contents
Appendix C.1	Geoindex drawing	Map highlighting hydrological features
Appendix C.2	Ordnance Survey Map	1:10,000 scale Ordnance Survey mapping of site, identifying wells, drains and ponds
Appendix C.3	Groundwater Investigation Report	review of pump tests undertaken as part of the borehole irrigation strategy for the golf course

1.5.4 TA-D Landscape and Visual Amenity

The landscape and visual impact assessment has evaluated the proposed development in terms of the effect it may have on the landscape and visual resource of the site and its surroundings. It was prepared by Optimised Environments. This assessment is denoted as TA-D. A summary has been included within the ES and the technical annex in its Entirety is included as Appendix D.1.

1.5.5 TA-E Access, Traffic and Transport

An access, traffic and transport assessment was undertaken in support of this ES by SYSTRA Ltd. The potential impacts in regards to the traffic and transport characteristics associated with the proposed development (transportation of construction materials in Heavy Goods Vehicles (HGVs) and the general increase of traffic on the local road network once the development is operational) have been considered.

This is denoted as TA-E and is supported by four appendices, as detailed in Table ES.6

Table ES.6: Annex E Appendices

Appendix	Title
Appendix E.1	Transport Statement
Appendix E.2	Travel Plan
Appendix E.3	Study Area
Appendix E.4	Automatic Traffic Counter (ATC) Locations

1.5.6 TA-F Cultural Heritage

A cultural heritage assessment was undertaken in support of this ES by NorthLight Heritage. This is denoted as TA-F and is supported by four appendices, as detailed in Table ES.7.

The report addresses potential impacts of the proposed development on cultural heritage sites that have statutory designation, Scheduled Monuments (SMs) and Listed Buildings, as well as those with non-statutory designations which include Gardens and Designed Landscapes (GDLs) and Historic Battlefields. It also outlines the scope for avoiding, mitigating and compensating for potential impacts.

Table ES.7: Annex F Appendices

Appendix	Title	Contents
Appendix F.1	Cultural Heritage Site Gazetteer within development boundary and within 1 km of the development boundary.	Table outlining descriptions of cultural heritage sites both within the development boundary and within 1 km of the development boundary.
Appendix F.2	Designated cultural heritage sites within proposed development boundary and within 1km of the development boundary.	Co-ordinate locations of designated cultural heritage sites within the proposed development boundary and within 1 km of the development boundary.
Appendix F.3	Location of Cultural Heritage Sites within and Near to Planning Application Boundary	
Appendix F.4	Designated Cultural Heritage Sites within and near to Planning Application Boundary	

1.5.7 TA-G Socio-Economics

An Economic impact assessment was undertaken in support of this ES by BiGGAR Economics. The potential impacts of the development of Coul Links on the local, regional and national economy (local business, tourism, direct employment) have been considered. The Socio-economics TA is not accompanied by any appendices.

1.6 METHODOLOGY OF EIA

The preparation of an Environmental Impact Statement requires the co-ordination and synthesis of associated yet diverse elements of the overall assessment. To facilitate this process, a schematic structure is proposed in order to provide a coherent documentation of the varied aspects of the environment considered. The Grouped Format structure of the Environmental Impact Statement is listed below with a brief outline of each specific stage.

1) Receiving Environment (Baseline situation).
   This section comprises a dynamic description of the environment into which the proposal will fit, taking account of other developments likely to occur. The particular aspects of the environment are discussed in terms of their context, character, significance and sensitivity.

2) The Characteristics of the Proposal.
   This section provides a projection of the specific "load" on the particular aspects of the environment, specific to a particular topic, which the proposal would be likely to generate. This includes a summary of the principle aspects of the scheme that have the potential to impact the environment.

3) The Potential Impact of the Proposal
   a) The potential impact of the proposal comprises a general description of the possible types of impacts which proposals of this kind would be likely to produce.
   b) This includes a consideration of the 'Do-Nothing' scenario. The 'Do-Nothing' scenario describes the environment as it would be in the future if no development of any kind is carried out.

4) Remedial of Reductive Measures
   This section constitutes a description of any specific remedial or reductive measures considered necessary and practicable resulting from the assessment of potential impacts described in 3(a) above.

5) The Predicted Impact of the Proposal
   a) An assessment of the specific direct and indirect impact of the proposal arrived at by adding to the receiving environment (a in (1) above), the loading of the proposal (as in (2) above) and the remedial or reductive measures (as in (4) above). The predicted impacts are discussed having regard to their character, magnitude, duration, consequences and significance.
   b) A 'Worst Case' scenario is also considered. This is an impact arising where a development or its mitigation measures substantially fail.

6) Monitoring
A description of any post development monitoring of effects on the environment which might be necessary, covering the monitoring methods, and the agencies responsible for their implementation.

7) Reinstatement
Where required, a description of reinstatement measures and the agencies responsible for their implementation.

1.7 CONSULTATIONS

A broad range of consultations have been undertaken during the project development process. Engagement with the planning authority, statutory consultees, local and national wildlife bodies, local residents and other key interested parties has been a priority throughout the process.

The following direct consultations have taken place:

- The Highland Council
- SNH
- SEPA
- The Embo Trust
- Dornoch Community Council
- Dornoch Area Community Interest Company
- The University of Highlands and Islands Golf Programme

In addition, formal public consultation events have been held in both Dornoch and Embo

A further two events will be held in October 2017.

The purposed of these events has been to gauge public opinion identify concerns and answer questions regarding the development. The developers have valued the input of the concerned parties at these events and has made amendment to the course design on the back of comments received.

The entire consultation process has been geared toward ensuring the development is designed in a way which has allayed concerns raised to the maximum possible degree.

2.0 DESCRIPTION OF PROPOSED DEVELOPMENT

2.1 PURPOSE OF THE DEVELOPMENT

Coul Links Ltd is applying for detailed planning permission to create an 18-hole golf links on a site north of Embo, approximately 4 km north of Dornoch, Sutherland.

The proposed development can be summarised as the construction of an 18-hole golf links including all access routes, earthworks shaping, planting, irrigation systems, services and infrastructure, including the construction of club house and maintenance facility plus restoration of existing buildings.

The objective of the proposal is to create a world class links course that would be ranked amongst the top golf courses in Scotland. By siting the course close to Royal Dornoch, the developers hope to enable the local area to become a competitive golfing destination in the international market. The concept for Coul Links differs to other golf resorts in Scotland in that the extent of construction works involved would be very modest.

2.2 THE PROPOSED SITE

2.2.1 General Description of the Site and its Surroundings

The site of the proposed development is situated on the coast directly to the north of the township of Embo, approximately 4 km north of Dornoch and 6km south of Golspie, in the south of county Sutherland, Scotland. The Loch Fleet estuary lies adjacent the site to the north and Embo beach abuts the site boundary to the east. The total site area of the proposed development is approximately 328.4 hectares.

Coul Farm is central within the development site and is accessed via a residential road which intersects the site from the north western boundary. This road links to an Unnamed Road which forms a portion of the north western boundary of the development site. The A9 runs north-south approximately 2 km west of the site and is the main link between Edinburgh and Inverness north to Thurso. It makes up a portion of the scenic tourist route which navigates the coast line of the Highlands.

The township of Embo, which is adjacent the southern boundary of the site, has a population of approximately 300 and comprises residential properties as well as several commercial properties including a small store, a number of bed and breakfasts and a caravan park.

The surrounding land use is agricultural, with a mixture of forestry, crops and livestock grazing being dominant. Residential/farm buildings are also scattered throughout the area surrounding the site.

The nearest water bodies to the development site are the North Sea which directly abuts the site to the east and the Loch Fleet estuary which directly abuts the site to the north.

Portions of the study area are formally designated for conservation purposes, all within and adjacent to the area known as Coul Links. These designations include part of the Loch Fleet Site of Special Scientific Interest (SSSI), which itself is part of the Dornoch Firth and Loch Fleet Special Protection Area (SPA) and RAMSAR site. The Loch Fleet SSSI also overlaps with part of the Moray Firth Special Area of Conservation (SAC) to the east of the mouth of Loch Fleet. Immediately adjacent to Coul Links is the Loch Fleet National Nature Reserve (NNR). During the summer 2016 fieldwork season, SNH announced its intention to designate a new marine conservation site for birds immediately adjacent to the study area, the proposed Moray Firth SPA.

Figure shows the positioning of the site in relation to Dornoch Firth and Loch Fleet RAMSAR Site and Special Protection Area (SPA) respectively, and Loch Fleet Site of Special Scientific Interest (SSSI).

2.2.2 Land Use

The current land use of the site is mixed though all uses are at present, very low impact.

Coul Farm is central within the site and comprises a mix of agricultural barns and residential structures, with the older stone buildings dating back to at least 1875. The Coul Farmhouse itself is a statutory designated cultural heritage site, being a Listed Category B building. The land within the site boundary is agricultural land associated with Coul Farm.

The northern portion of the site, north of the dune heathland was improved pasture utilised for sheep and cattle grazing. The western portion of the site, immediately west and south of the old railway line also comprised improved pasture, currently used for sheep and cattle grazing. The land in the southwestern portion of the site comprises rough pasture with patches of scrub, dune heath and woodland.

The land between the coast and the route of the old railway line largely comprises a stable dune system with some areas of trees, scrub, bracken and felled woodland. This portion of the site is designated as being of international and European importance as part of the Dornoch Firth and Loch Fleet RAMSAR Site and Dornoch Firth and Loch Fleet Special Protection Area (SPA) respectively, and of national importance as part of the Loch Fleet Site of Special Scientific Interest (SSSI). The SSSI is notified for its intertidal marine habitats (eelgrass beds and sandflats), its coastlands (saltmarsh and sand dunes), its native pinewood, its vascular plant assemblage, and its birds (breeding bird assemblage and non-breeding eider).

2.2.3 Boundary Features and Land Use

The area surrounding the project development site is rural in character and is predominantly characterised by agricultural land use. Sheep and cattle grazing, livestock raising and forestry plantation are the principal agricultural practices in the area.

The lands to the immediate south of the site comprise the village of Embo. Embo has a population of approximately 300 and comprises residential properties as well as several commercial properties including a small store, a number of bed and breakfasts and a caravan park.

To the immediate north of the site lies the Loch Fleet estuary, with the small village of Littleferry on its northern bank. Lands to the west of the site comprise a mixture of agricultural grazing lands and areas of forestry plantation with several agricultural and residential buildings dispersed throughout. The small village of Fourpenny abuts the western site boundary on the central portion, however, the closest point of development would be approximately 850 m east of the village.

The eastern boundary of the site abuts the coastline and the North Sea.

2.2.4 Existing Road Network in the Vicinity of the Site

In the vicinity of the site, the A9 is a single carriageway of a good standard. The A9 runs north to south, approximately 3 km west of the site and provides a link from Dornoch to the main population centre of Inverness to the south.

The A949 runs west to east and connects the A9 to the C1026 road via Dornoch Town Centre. The A949 is a single carriageway road approximately 6m – 7m wide. It is subject to a 40mph speed limit reducing to a 30mph speed limit as the road reaches the Dornoch boundary and has street lighting along the section between Camore and Dornoch.

The C1026 is a rural road that runs north to south adjacent the western boundary of the site. It has a total length of approximately 9.5km between the A9 Cambusavie junction and the Castle Street / Church Street fork in Dornoch. The road varies in standard with some single carriageway sections as well as some single-track sections with passing places. The proposed site will have its sole access point from this road. The road varies in width from 3m over the single-track sections to approximately 6m over the single carriageway sections. It is noted that there has been significant works undertaken to the road recently to widen sections to single carriageway from existing single track between Dornoch and the Embo junction. The road is generally derestricted in terms of speed limit although subject to a 30mph speed limit within the Dornoch boundary.

A private road runs from the north-western boundary of the site through the proposed site, giving access to the Coul Farm buildings from the C1026.

2.2.5 Existing Services

Scottish Water mains at Fourpenny serve Coul Farmhouse and Cottages via a 25 mm private supply pipe. This will be replaced in a larger bore and metered at Fourpenny in order to serve the proposed clubhouse.

Electricity is supplied vi Scottish and Southern Energy to Coul Farmhouse and Cottages. Overhead electricity powerlines are the only services running across / through the site of the proposed golf course. The powerlines will be diverted around the boundary of the site, to ensure the powerlines do not interfere with the playability of the golf course.

A diagram highlighting the current and proposed routing of powerline in the area is supplied Appendix ES.3.

2.3 THE PROPOSED DEVELOPMENT

2.3.1 Introduction

The proposed development is that of an 18 hole links golf course with practice area set largely within the coastal dune system of Coul Links, directly north of the village of Embo, near Dornoch, Sutherland. The golf course will be developed using the natural topography of the land, with very little earth movement required. The choice of site is due to its natural ability to support a golf course with minimal intervention, together with its significant opportunity to bring large scale economic benefit to the local and wider community.

2.3.2 Structures and Buildings

In addition to the 18 holes of golf will be a new clubhouse, designed to be in-keeping with architecture of the local area, and renovation of existing buildings to create a pro-shop and other ancillary facilities. A maintenance shed building will be constructed and a new access road developed, leading off the C1026.

2.3.2.1 Proposed Buildings and Structures

There are a number of existing stone buildings located near Coul Farmhouse. These buildings were associated with the farm estate and were used either as accommodation or for agricultural functions. They were constructed in the 19th Century. The intention is to convert these buildings for use in running the Golf Course.

Coul Farmhouse will continue to be owned and used by the Abel Smith family as a home.

A new Clubhouse is proposed to be constructed in a position which relates to the existing buildings and to the Golf Course layout

A site layout of prepared buildings and structures is provided in Appendix ES.4 - A and Appendix ES.4 - B.

2.3.2.2 Refurbishment of Existing Buildings

The following existing buildings will be used for the Golf Course:

1. The large stone steading, formerly the Home Farm Steading which lies closest to Coul Farmhouse.

   This building will be reduced in size retaining the southern portion of the steading and converted for storage and caddy workshop use.

2. The small stone store adjacent to the Steading, formerly the Smithie, will be used for a Caddy Hut.

3. The pair of semi-detached one and three-quarter storey stone cottages dating form around 1874 will be used for the Administration offices for the Golf Club. The cottages will be combined.

4. The single storey stone cottage also dating from the 1870s is to be converted to the Professionals' Shop and point of arrival.

5. The grain silo and open sided hay barn which stand adjacent to and north of the steading will be removed.

Further details of these buildings can be found in Appendix ES.5.

2.3.2.3 Club House and Professional Shop

It is intended to build a new Clubhouse south east of the Professionals' Shop in a location which relates well to the 18th green. Sketch drawings of the proposal illustrating one possibility are contained in Appendix ES.5.

The building derives its geometry and materials from the architectural language of the existing structures at Coul Links.

2.3.2.4 Car Parking Facilities

Cars will arrive from the new access road created across the existing farmland south west of the Home Farm. The new access will join the existing farm track south of the future Professionals' Shop and future Clubhouse. A turning area and drop-off point will be created close to those buildings. The track will continue northwards to service the remaining buildings. A staff car park will be created behind the proposed Administration Offices.

The public car park and parking for coaches will be beyond the steadings. Coaches will park in the yard to the former north steading and the main car park will be formed in the walled field beyond it. This will be slightly excavated to hide vehicles. 85 cars can be accommodated. For the layout refer to in Appendix ES.6.

2.3.2.5 Roads and Access

Site access will be taken from the C1026 Dornoch to Fourpenny Road. The proposal comprises one development access point and a new access road from the C1026 located to north of the Embo Junction. The new access junction will be in the form of a priority-controlled junction with the C1026. The C1026 will be widened from single track to single carriageway between the new junction and the C1026 / Embo Street Junction. The new access road will be constructed as a single track road with passing places which is in keeping with the rural location in which it will sit. Details of access road design can be found in Appendix ES.7.

Within the site, an existing private road will be utilised to access the proposed maintenance facility thereby ensuring golfing traffic and maintenance operations do not meet.

2.3.2.6 Haul Routes

A dedicated haul route plan has been supplied in Appendix ES.8. Haul routes have been designed to follow the routing of the golf course only, thereby ensuring retained habitats are not damaged. (Boardwalks will be constructed to cross areas of dune slack and other sensitive areas between holes). The boardwalks will principally be utilised by the golfers and also for routine maintenance. Construction traffic will be monitored via an Ecological Clerk of Works (ECoW).

2.3.2.7 Sheds for Course Maintenance Equipment

A new agricultural style golf course Maintenance Shed will be constructed with access from the existing farm track in the vicinity of the 12th tee. The Shed is illustrated in Appendix ES.5.

It is a wide span steel structure clad in a dark green profiled metal sheet and will house workshop, storage, offices and messing area for green keeping staff.

There is to be a large forecourt and service yard incorporating a wash bay and bunkers for the storage of top dressing for the course.

The building site will be dug into the existing landscape in order to minimise the visual impact of the building.

2.3.2.8 Tourist Information Points

An existing simple brick single storey Railway Hut exists within the course area on the former railway line between Embo and Golspie. This structure will be renovated to return it to its original condition and it will be used for permanent interpretation displays to inform the public about the unique environment (see photo montages included as Appendix ES.5).

2.3.2.9 Water Supply / Foul Drainage

Water supply for the buildings will be taken from the Scottish Water mains at Fourpenny. An existing 25 mm private supply pipe currently serves Coul Farmhouse and the Cottages. This will be replaced in a larger bore and metered at Fourpenny.

2.3.3 Amenity Area and Footpaths

2.3.3.1 Improved Amenity Area North of Embo

The SSSI boundary south toward Embo is the Cluain Burn, however between the Cluain Burn and the Embo football pitch is approximately 16 hectares which are environmentally consistent with the Coul Links SSSI environment. Much of this area is being overtaken by bracken and gorse. The developers have agreed to purchase these hectares in order to facilitate the 14th fairway, green complex as well as the tee complex for the 15th hole. Further, the developers have agreed to work closely with Embo Trust and SNH to enhance this property consistent with the overall Coul Links SSSI Management Plan. The developers have agreed to work closely with EMBO Trust to identify a portion of the property near the football pitch to construct additional community amenity grounds such as walking paths, play fields, benches, access points to the site, and perhaps a community garden. Importantly, this area will be held in environmental conservation consistent with the SSSI and no further housing or building development will be considered. The Embo Trust enthusiastically support this joint project to improve the area and add community amenities.

2.3.3.2 Upgrading of Footpath Network Across the Links

The core path (within the Proposed Development site) running along the disused railway line from Embo to Fourpenny will be maintained and enhanced for public access, with information points needed within the existing small railway building along the path.

Additional access across the site will also be provided. Coul Links Ltd wishes to work closely with SNH and other bodies to develop a network of access routings that enhance public access to ensure the visitors to the site can move readily across Embo beach and the dune systems outwith the playing areas.

2.3.4 18 Hole Golf Course and Practice Area

2.3.4.1 Description of General Course Layout

The golf course layout has been developed and refined after multiple design iterations with the objective of highlighting the natural features of the site and maximising conservation goals. The Coul Farm landscape is one ideally adapted to the requirements of golf by virtue of numerous factors including topography, soil type, natural vegetation and climate (reflected in the importance of the dunes to the development of the game of golf on the east coast of Scotland).

The course is laid out in a butterfly configuration with two start and finish points for the two loops and 9 holes (1 – 9 and 10 – 18) near to the club house location.

A complimentary driving range will be developed for golf practice (this will not be lit). This will be served by a large practice tee and golf target areas mown out of the main driving range/practice area.

The golf course layout has been developed so that it fits as naturally as possible into the landscape while ensuring that construction requirements and changes are minimised.

The objective from a playability perspective can summarised as followed:

1 Present a golf course which is interesting and fun to play for a wide range of golfers of all abilities. The turfed areas must be sufficiently wide and forgiving to achieve this objective so that golf can be played under a wide spectrum of weather conditions.
2 Provide primary playing surfaces which are firm, consistent and true. This should not be confused with conditioning of the golf course for presentational purposes. The look of the golf course is defined by its setting and the overriding objective is to present a golf course which fits harmoniously into its surroundings.
3 Linked with 1, is the provision of multiple start points or tees at each hole which enables course set up and the demands of play to be altered depending on conditions and golfing ability.

The main elements of the golf course can be summarised as follows:

Tees

The starting point for holes consisting of level turfed areas supporting fine turf. The tee surfaces are blended with the surrounds and are usually accessed via shallow banks where slightly elevated. Apart from the main access points to tees the surrounds are usually vegetated with indigenous grasses (including Marram) to help disguise and blend the tee surface with its surroundings.

The area of the tee surface for each hole is adapted to the intensity of play and predominant golf club to be used. For short par 3 tees much greater areas are required due to the heavier damage inflicted. The main teeing areas are apportioned to men's medal tee, men's general play tee, ladies medal or competition tee, ladies general play tee and junior/forward tee. Tees may be amalgamated into one area or separated.

Fairways

The area between the tee and green which constitute the greatest area of managed turf. As with all the sown areas the fairways will support a blend of fescue grasses which are fine textured and adapted to the links environment. The width of the fairway will vary from around 20 – 50 m depending on the demands of play on each golf hole and existing topography.

Carry

The area between the tee and fairway which comprises rough, native grasses/vegetation which have to be carried.

Golf Paths

These provide linkage between holes for golfers and also from tee to fairway (through the carry). It is intended that Coul Links will be entirely a walking course. Golf paths will be a nominal 5 m wide and will be maintained usually at comparable level to the semi rough.

Semi Rough

This consists of an intermediate band of rough approximately 3 m wide and mown at between 30 and 40 mm high which provides graduation from fairway through to the main, deeper cut rough.

Longer Cut Rough

This equates to a band of rough with width adjusted from approximately 4 – 6 m immediately beyond the semi rough. Cutting height will be around 100 mm. This serves to provide a gradual transition to the natural rough beyond.

Managed Natural Rough

The area immediately beyond the cut rough is a section of natural rough which will be mown occasionally (annually or possibly twice a year) with material collected (eg. flail mower) with the objective of reducing organic matter and promoting finer turf growth.

Bunkers

These consist of depressions in the ground filled with native sand. Bunkers are a development of the natural erosion processes found on links land. Bunkers on the Coul Links site will generally exploit natural humps and hollows enhanced by subtle shaping. The finish to the edges of the bunker will ''rough'' with avoidance of over-manicuring or creation of ''hard edges''.

2.3.4.2 Earth Movement Proposals (grading)

2.3.4.2.1 General

Grading works will be carried out with the primary objective of:

- Raising localised low playing areas through build up with additional sand to achieve improved drainage
- Soften the more acute undulations where these may compromise maintenance and playing surface quality through the managed areas of the golf course

- Reduce visual impact of the maintenance compound/building by setting the compound at lower level and bunding around the maintenance area
- Maintaining the general topography of the site where viable and if required adjusting layout and design to minimise the requirement for earth movement. This will be determined during the construction process.

2.3.4.2.2 Preliminary Works/Haul Routes Formation

Prior to carrying out earthworks surface vegetation will be removed to include:

- Bulk herbage (bracken etc)
- Superficial partially decomposed organic material (thatch)
- Tree roots/stumps from previously wooded areas
- Rhizomes from beneath bracken dominated sections

Organic material will be placed within the proposed amenity footprint of the amenity golf areas using a process of sand inversion i.e. the organic material will be placed in excavated areas with the sand from excavation used for capping the organic material to 1 m depth to form shallow mounds/hillocks which blend into the surrounding contours and land form.

Following removal of the organic material available sandy topsoil (nominal 150 mm) will be carefully scraped off and placed to one side for subsequent replacement on completion of grading.

To facilitate movement of construction traffic and movement of materials haul routes will be formed prior to main construction works commencing to avoid impacting on adjoining sensitive habitat. This will include provision of temporary haul routes formed by laying a geotextile membrane with appropriate stone, engineered, layer above. This will be removed on completion of construction and ground reinstated. For localised low wet areas/dune slacks where crossing is required twin wall pipes will be installed through the base of the stone layer to maintain the natural flow through these areas.

2.3.4.2.3 Grading

Grading will be carried out using appropriate equipment, principally tracked excavators with fully articulated buckets to ensure precise control of depth and execution of subtle surface shaping through the exposed sand. Dumpers with low ground pressure tyres (6 – 12 tonnes capacity) will be used for movement of material from cut to fill areas.

Creating smaller features, notably bunkers, will involve small excavators to achieve the necessary finesse needed to form a bunker which is sympathetic to the surrounding landscapes.

There will be a degree of micro siting of greens and tees to utilise the natural features of the site. The objective is to marry the greens and tees into the landscape which will be reinforced by appropriate landscaping and planting.

Where there is a deficit of sand for raising low areas (for drainage purposes) it will be necessary to import sand from designated ''borrow'' areas. Sand will be carefully selected for compatibility and spread over the existing sand in layers (200 - 250 mm depth) and carefully firmed in.

On completion, sandy topsoil will be spread on the regraded sections selecting the most appropriate material for greens, tees and fairways.

2.3.4.2.4 Outline of Green, Tee-box and Fairway Drainage System

Effective drainage is essential to control excess surface water and soil moisture during heavy or prolonged rainfall in order to maintain the quality of the golf course and condition of the playing surfaces. Drainage requirements will also be influenced by the proposed closure of the course from November to March when generally the wettest conditions can be expected.

The natural occurring sands on links courses and which predominate on Coul Links, are free draining and this provides a suitable medium for building up low lying fairways and achieving effective drainage. Generally, water is present at a level of 4 m and below within the dune slack system. The main dune slacks contain standing water at times of high water discharge from the Burns and high precipitation rates. The principal approach to drainage is to build up levels by 0.5 – 1 m above ground water level where playing areas correspond with the dune slacks or lower lying sections which remain soft and wet for prolonged periods. The depth of sand created must be sufficient to prevent water moving up into the critical turf root depth by capillary action. This approach will avoid the need to move water laterally by installation of pipe drainage thereby minimising impact on ground water dependant terrestrial ecosystems (GWDTE).

In localised areas isolated pipe drains may be required (for example at the base of banks) to prevent water from higher ground flowing onto playing areas. The pipe drainage will be connected to outlet drains and from there to a soakaway. Soakaways will be sited outside GWDTE or where there is likely to be an impact. A number of smaller soakaways will be used rather than diverting to one larger soakaway to avoid concentrating flow in a specific area in order to maintain existing patterns and reduce the risk of surcharging in a particular area. The base of soakaways will be located above the maximum ground water level over the winter. This approach reflects good Sustainable Drainage (SUDs) practice.

2.3.4.2.5 Storm water control

The existing site is characterised by a complex pattern of ridges, mounds and hollows underpinned predominately by windblown sand and raised marine deposits which are conducive to higher levels of infiltration. During periods of light to moderate rainfall a large proportion of the rainfall infiltrates into the sand layers and percolates to ground water level. During periods of prolonged/intense rainfall where the underlying ground is saturated and water table levels are high, surface flows can occur on a temporary basis.

On the golf course storm drainage will be controlled by:

1 Build-up of low areas above existing ground water level to promote increased potential for infiltration
2 Increased attenuation through additional depth of sand in the built-up areas
3 Maintaining the undulating nature of the topography and shedding of water to low areas outside the main play areas. These will act as temporary detention basins allowing gradual discharge to ground – mimicking the natural hydrological processes of the site.
4 Localised catch water drain installation at the base of slopes with connecting outlet drains to natural low areas which will act as detention basins.

2.3.4.2.6 Temporary drainage

Temporary drainage will be required to control surface water and seepage and thereby facilitate construction and protect adjacent habitats from runoff and deposition of fine sands and silts. The principal methods deployed will involve:

1 Construction of shallow grips or swales with adjoining mounds to divert and contain flows within the working area
2 Installation of silt traps/fences in potentially vulnerable areas
3 In conjunction with 1 construction of shallow ''stilling'' basins to help retain surface water and promote infiltration to grounds.

The above systems will be maintained throughout the works.

2.3.4.2.7 Golf Course Management

Irrigation

Irrigation will be used for plant health and management and not to control appearances. The grass selected for establishment (*Festuca* species) are drought tolerant and can recover from temporary periods of water shortage. The irrigation system has been designed and will be managed to target water where it is required and minimise overthrow onto adjoining rough areas.

During the establishment phase, irrigation will be critical to help minimise the effects of erosion due to wind blow as well as facilitating grass growth and development of a complete sward cover. After ''grow in'' irrigation will be used sparingly in order to keep the grass alive and ensure the ability to recover from golf traffic/wear and tear. Irrigation input will be controlled by moisture levels recorded in the root zone – maintaining at around 15 – 20% moisture.

Indicative water applications during the summer based on comparable links courses will be in line with the following:

- Greens – 2 mm each night
- Tees – 2 mm every second night
- Fairways – 2- 6 times a month at 3 mm application on each occasion.

Once the course is well established the above rates can be lowered even further.

Fertiliser

During the establishment phase there will be greater demand for fertiliser to promote growth of the sown grasses and prevent ingress of weed species. There will emphasis on use of slow release fertiliser to minimise risk of leaching losses. Indicative quantities are given below:

- Year one establishment 25 g/m^2
- Years 2 – 4 : 16 g/m^2 for tees and greens
- Fairways and semi rough : 8 g/m^2
- Post year 4 : 8-10 g/m^2 for tees and greens
- 0 – 4 (max) g/m^2 for fairways

Mowing Regime

Areas will be cut where possible with hybrid or no-hydraulic oil technology. Equipment will be dove tailed to the requirement of the individual areas using light weight, low ground pressure equipment. Clippings will be boxed off on greens and tees and immediate surrounds with clippings allowed to fly on fairways and rough areas. Clippings will be composted following collection.

Cutting frequencies will be broadly in line with the following:

- Greens – 5-6 times per week with triplex or hand mowers
- Tees – 3 times a week with hybrid triplex or hand mowers
- Fairways – twice per week with hybrid fairway mowers
- Semi rough – once a week to 10 days
- Cut rough - once a week to 10 days
- Managed rough – once per year (organic matter collected)

Cutting levels vary but approximate to the following when the grasses are established:

- Greens: 3.5-6 mm
- Tees and immediate surrounds – 8-10 mm
- Fairways – 13-16 mm
- Semi rough – 30-40 mm
- Cut rough – 100 mm

Cutting and collection on an annual basis of the areas outside the main routinely cut rough will help promote the development of a finer, more open textured vegetation which in turn will encourage specific ground nesting bird species and ecologically more diverse vegetation.

The presentation of artificial striping on fairways or greens and tees will be minimised with the general approach to cut "half and half". This will help to promote the presentation of a more informal golf course which is blended harmoniously with its surrounds.

The edges of the bunkers will be occasionally strimmed but the objective is to maintain a rough edge to give the impression of development by natural erosion.

Pesticide Application

Potentially fungicides (approved for amenity turf use) will be deployed to control specific fungal diseases of turf however, this will be restricted to greens and tees. Cultural methods of control will primarily be used to reduce disease pressures. Pesticides will not be used fairways or semi rough areas.

Landscape Design

Unlike many golf facilities where additional landscape features are needed to provide visual and playability interest, Coul Links will adopt an entirely natural landscape presence. Outside of the managed playing surfaces the footprint of the golf course will retain the natural features of the site. As such no specific landscape plans have been required for the development.

2.3.5 General Irrigation Requirements and Irrigation System Design

Water is undoubtedly the most important factor for good quality turfgrass as it performs numerous physiological functions, all of which are vital for a healthy, strong plant.

During periods of low and zero precipitation (rainfall), combined with high evapo-transpiration, turfgrass will begin to wilt (turf stress) and will become susceptible to wear and damage. Providing soil moisture levels are restored, however, before temporary wilting point and loss of cover occurs then the turfgrass plant will recover.

If this does not happen and the drought continues the soil will dry out and it will become increasingly difficult for the turfgrass plant to extract water from soil pores. Eventually permanent wilting point is reached when soil water is unavailable to the plant, then the grass leaf will dry out and die back and finally the root structure will dry out until a point is reached when it will no longer recover. These points are reached at different time intervals depending on turfgrass species and soil type.

It is worthy of note that all of the above actions are accelerated and made worse by excessive wear (often more prevalent during a dry summer when irrigation is needed most) and compaction from golfers, players and machinery.

The main objectives of supplementary irrigation for the golf course are two fold;

- to replace the water lost from the plant through evapo-transpiration and not replaced by natural precipitation, reasons for which have been covered previously
- to aid in general maintenance practices, such as seed germination or washing in of surfactants and turf tonics to promote turf health and performance and minimise water use

Irrigation is required to ensure soil moisture can be sustained at a point before permanent wilting point, maintaining some turf colour, vigour and sustain adequate growth. It would not be used to promote growth or colour which is where turfgrass irrigation differs from that of agricultural irrigation where irrigation is used in larger quantities to ensure continued growth of the crop until harvesting. For the period known as grow in of the golf course, following initial seeding, irrigation will be required to ensure seed germination and growth to develop sward density, however, this will be for a very short period in the lifespan of the golf course.

The irrigation system at Coul Links will consist of the following areas;

- water supply; boreholes (existing)
- water storage; water storage reservoir (separate planning application)
- pump house; beside the water storage reservoir
- pump station; located within the pump house using high efficiency multistage pumps all with variable speed control
- main line and lateral pipe work; polyethylene of sizes 250mm to 50mm
- irrigation to green putting surfaces, greens surrounds, approaches, fairways, semi rough, walkways and tees playing areas
- control system; central computerised control of all areas using a decoder controller

The irrigation system will be designed to ensure water is targeted to where it is needed, minimising overthrow into areas where water is not required. In this regard the system design will use part circle sprinklers, where required, to allow for water to be applied to the playing areas of the golf course. On greens, green surrounds, approaches and fairways sprinklers will be individually controlled to allow for irrigation scheduling to take into

account localised environmental conditions. Achieving this will save water, energy and ensure promotion of the low input sustainable grass types native to a links course.

For any golf course it is important to remember that an irrigation system provides an insurance policy and will be used only when required and to ensure the course is in a sustainable condition irrespective of the weather and climatic conditions as it enables the course management team to undertake their care of the course effectively and efficiently for future generations of members and golfers to come.

2.3.5.1 Precipitation Requirement and Water Quantities

Irrigation will be applied to the golf course in two distinct phases;

- Grow-in Phase – to establish seed germination, develop the sward and stabilise the rootzone
- Operational Phase – to manage turf growth in a sustainable manner

During grow-in there will be a requirement for additional water to be applied to the ensure successful germination and stabilise the rootzone. Depending upon prevailing climatic conditions i.e. natural precipitation (rainfall), water will be applied in small quantities on a regular cycle to keep moisture in the upper areas of the rootzone so as not to waste water whilst developing sward density and a dense root system.

Irrigation will be scheduled in relation to soil moisture levels which will be measured throughout all of the playing areas. This is to ensure that water is applied only when required and in a sustainable manner to meet the demands of the turfgrass. During general maintenance irrigation will not be applied when the soil moisture levels exceed 15% although during grow in higher soil moisture levels will be required (maximum 25%). In this regard at no time will water applied through irrigation bring the soil moisture levels to field capacity thus creating drainage through the rootzone. The effects of water applied through irrigation will be very localised within the top 300mm of the soil i.e. the rootzone only.

The irrigation design will be based upon replacing water lost from the turf grass through evapo-transpiration (E/T) and the E/T rates used will be taken from local historical knowledge of golf course irrigation within the area of Coul Links. Whilst the design is based upon E/T at a local level as mentioned above scheduling will very much be based upon residual soil moisture levels and not E/T rates from the turf grass. This is a more sustainable way of irrigating. Localised E/T rates will be measured on the golf course via a weather station to provide additional information to ensure that at no time is irrigation applied over and above the daily E/T rate.

We would anticipate the annual water requirement for the golf course, during a dry year, would be 10-15000 m^3. During grow-in and establishment the water quantities used for irrigation will increase to approximately 30000 m^3, however, as mentioned before these

additional quantities will be applied for a very short period (2 years) in the lifespan of the golf course.

2.3.5.2 Golf Course Irrigation Routing Plan

The golf course irrigation routing plan (provided in Appendix ES.9) shows the following;

- the proposed routing of the main line distribution pipe work
- two sample holes

The main line distribution pipe work is required to transport sufficient water to the individual areas of the golf course to ensure it can be irrigated sustainably. At all times the pipe work will be installed within the boundaries of the golf course. The pipe work will originate from the pump house [beside the reservoir] and link all greens, fairways and tees. All of these areas will be individually isolatable to allow for servicing of the irrigation system during its lifespan.

The two sample holes are provided to give an idea of how the sprinklers, valves and lateral distribution pipe work would be laid out. The areas of coverage provide an indication of how water will be targeted to ensure minimal overthrow onto non-golf areas.

2.3.6 Engineering Aspects

2.3.6.1 Boardwalks

Boardwalks, where golfers should cross over dune slack areas, are to be installed to help circumvent the dune slacks without impacting on the hydrology of the area. Construction of the boardwalks will be in line with Scottish Natural Heritage guidelines (Information Sheet 6.4 Raised Boardwalk (Wide Design)).

The Coul Links Golf Course is a “walking golf course” therefore for the majority of the boardwalks a width of 1600 mm is adequate. There are situations where greater width is required (up to 3 m) where it is necessary to access golf holes with maintenance equipment.

Timbers used in construction of boardwalks will not be preservative treated as this could lead to leaching and contamination issues within the dune slacks. Larch is preferred. Posts will be driven into the ground to a sufficient depth to avoid future settlement. This will be determined by local ground investigation.

Shorter sections of bridge will also be formed over the burns, adopting similar principals/materials. There will be no interference to the flow of the drainage channels.

2.3.6.2 Surface Water Drainage from Roads, Carparks and Maintenance Compound

Surface drainage from the maintenance compound area will be collected by perimeter drainage and infiltrated to ground after appropriate pre-treatment. This will include a proposed oil separator (class one).

The access road will be contoured to shed water to adjoining vegetation filter strips. In areas of ''till'' i.e. heterogenous material with a high proportion of silt and poorer infiltration characteristics, shallow swales will be formed to the edge of the road (with check dams on steeper sections) to convey water to soakaways (installed within more permeable strata).

Prior to discharge to the soakaway, silt pits will be installed in order to maintain the integrity of the soakaway and facilitate management.

2.3.6.3 Course Furniture

Course furniture will consist of the following elements

- Tee markers which establish the tee location for play and tee signs which provide information
- Distance markers on fairways
- Benches and litter bins
- Flag sticks

Tee markers will be simple and consist of natural wood.

Tee information ''plaques'' will be set flush to the ground to minimise visual intrusion
Benches and litter bins will be ''rustic'' in nature (refer to photographs for examples)
Distance markers on fairways will also be flush with ground level.

2.4 CONSTRUCTION OPERATIONS/PHASING WORKS AND SITE PROTECTION MEASURE

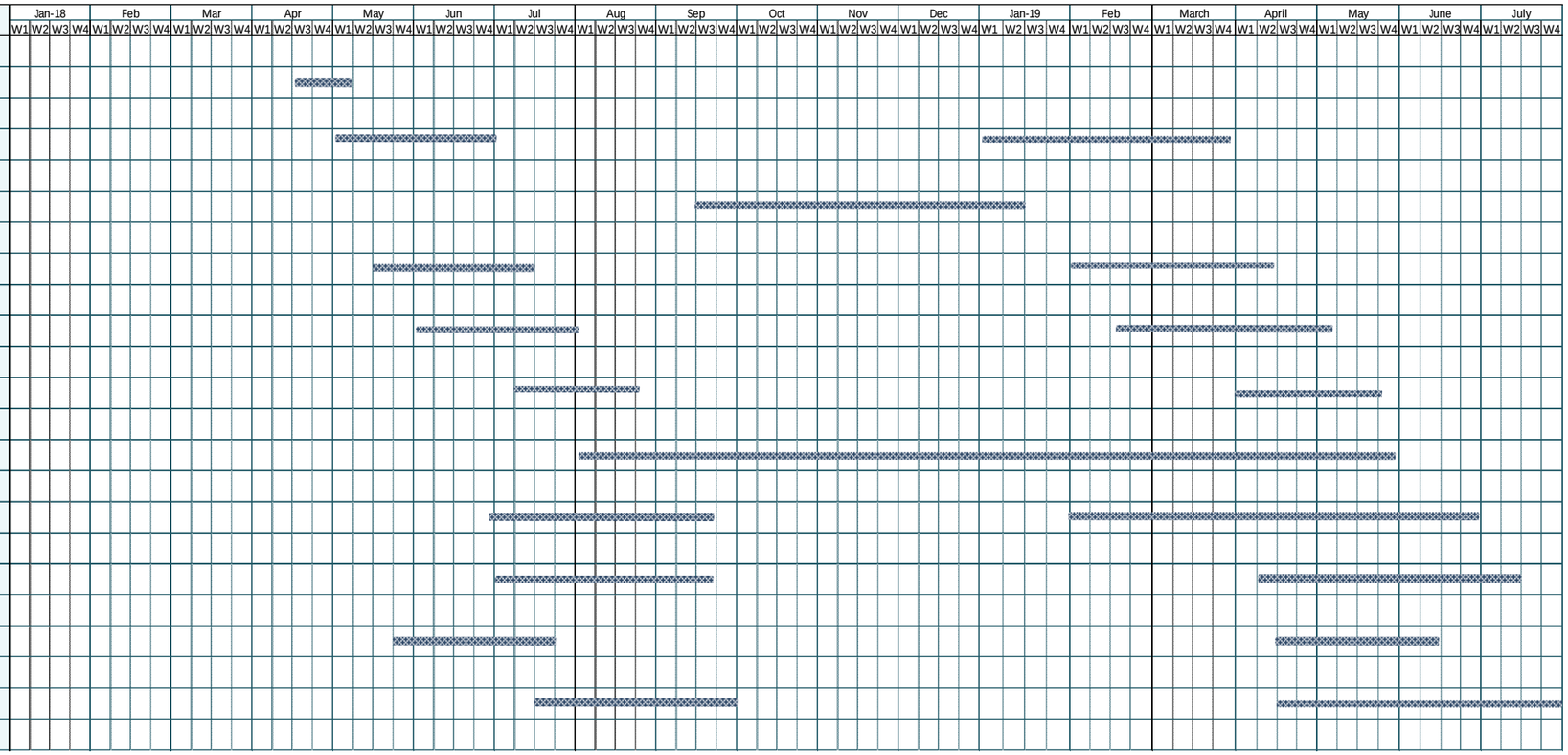
2.4.1 Overview

Works will be scheduled to ensure the best chance of providing optimum conditions for establishment and achieving conservation goals. Figure 1 shows an indicative Phasing Plan. It is intended to complete holes 10 to 18, through the south/central part of the development in May to October 2018 to avoid intrusion into the main dune slack area and impact on associated overwintering birds. Holes 1 – 9 will be completed in April – July of the following year.

Fig. 1 Indicative Phasing Plan

Construction programme, indicative, Coul Links Golf Course - HOLES 10 -18 May to October 2018, HOLES 1-9 Dec to July 2019

No.	Description	Finish	Start
1	Mobilisation/ site establishment		
2	Clearing and grubbing		
3	Dune heath removal and transplantation		
4	Bulk excavation		
5	Rough shaping		
6	Drainage		
7	Irrigation		
8	Feature construction (tees, bunkers, greens)		
9	Final shaping		
10	Boardwalk construction		
11	Seed bed preparation and seeding		



The main work stages will be as follows:

1. Mobilisation, site set up, staking out and primary haul route formation
2. Clearing vegetation/ superficial organic matter
3. Heather transplantation
4. Bulk excavation and topsoil stripping
5. Grading (rough shaping)
6. Drainage (temporary and permanent)
7. Irrigation installation
8. Feature construction (tees, greens and bunkers)
9. Fine shaping
10. Surface preparation and seeding
11. Establishment and grow-in

2.4.2 Mobilisation, site set-up and haul routes/boardwalks

Plant and materials will need to be mobilised to site to ensure that works can be completed in a timely fashion. It is intended to provide a main temporary project headquarters comprising a portacabin or similar in a relatively central area but outside of the SSSI- corresponding with the proposed maintenance facility. Infrastructure, including power, water and sanitation will be laid on together with communication systems. There will be a secondary storage compound developed to the North of the site to facilitate works during the 2nd phase of construction (holes 1-9)

Provision will also be made for storage of equipment/machinery on site which is secure.

Haul routes will be formed about the site to enable movement of plant and materials.

Softer areas of ground will be stabilised by installing a temporary base construction comprising 200 mm depth of DOT 1 type, compacted material over a geotextile protection membrane. Twin wall pipes will be incorporated in low lying areas linked with ephemeral water bodies to maintain existing ground water flows

Once works are completed the stone layer and geotextile membrane will be removed and surface reinstated. This process will be extended to form a temporary storage compounds. On completion, all temporary structures and materials will be removed and ground reinstated.

Boardwalks where golfers have to cross over dune slack areas are to be installed to help circumvent the dune slacks without impacting on the hydrology of the area. Construction of the boardwalks will be in line with Scottish Natural Heritage guidelines (Information Sheet 6.4 Raised Boardwalk (Wide Design)).

The Coul Links Golf Course is a “walking golf course” therefore for the majority of the boardwalks a width of 1600 mm is adequate. There are situations where greater width is required (up to 3 m) where it is necessary to access golf holes with maintenance equipment.

Timbers used in construction of boardwalks will not be preservative treated as this could lead to leaching and contamination issues within the dune slacks. Larch is preferred. Posts will be driven into the ground to a sufficient depth to avoid future settlement. This will be determined by local ground investigation.

Shorter sections of bridge will also be formed over the burns, adopting similar principals/materials. There will be no interference to the flow of the drainage channels.

The main driver for the timing of boardwalk installation is ground condition. Installation needs to be coordinated with reasonable firm ground when the water table is low. Existing vegetation can be protected with temporary ground protection sheets.

Site protection measures

- Haul route formation defined by accurate staking and use of GPS
- Low ground pressure equipment to be used
- Imported materials to be stored separately and brought to site as required.
- Where feasible materials to be taken directly to site to reduce haulage
- Indigenous materials to be used predominantly

2.4.3 Clearing

Within the working areas vegetation will be cleared using appropriate equipment. Surface vegetation and scrub will be removed by grubbing out and flail mowing/collecting.

Woodland within the proposed area of development will be felled, with the resultant timber logged and removed. Trees, stumps and roots will be grubbed out using suitable hydraulic equipment. The organic rich material comprising tree stumps and roots and partially decomposed organic matter will be placed within the bases of hummocks/hillocks to be formed and blended into surrounding areas to mimic the natural geoformation. This will subsequently be covered with sufficient depth of sand in order to support the finer grasses and remove the influence of the organic layers.

Marram and good quality dune turf will be salvaged and relocated to other areas of the golf course.

Site protection measures

- Organic matter arising from site clearance will be deposited in areas away from dune slacks and sensitive GWDTE.
- Long reach excavators used to a minimise impact on adjoining vegetation
- vegetation which is to be transplanted will be relocated as soon as practical following lifting to maintain viability.
- clearance of trees will only be undertaken outside the nesting season

2.4.4 Dune Heath Transplantation

Refer to Supporting Document 1: Dune Heath Translocation.

2.4.5 Bulk Excavation/Topsoil Stripping

Following 2.4.3, available clean sandy topsoil will be stripped and placed to one side to enable adjustment of levels. The depth of sandy topsoil material varies throughout the site but generally 150 to 200 mm will be removed during the course of the works. This material will be stockpiled in a convenient location to permit adjustment of levels through the exposed sand substrate.

Additional sand for raising levels/shaping of features will be imported from designated borrow areas (outside of the SSSI). This will be executed by moving sand to the receiving areas using low ground pressure dumpers.

Estimated earthwork volumes (based on proposed regrading) are shown in figure 2, this provides the net requirement for fill (sand).

Fig. 2 Estimated Earthworks Volumes (based on proposed regrading)

COUL LINKS - EARTHWORKS CALCULATIONS (NET) VOLUME = m3

HOLE	TEES			FAIRWAY		GREEN	TOTAL (m3)
1	-297			3	8		
2	291			59			
3	-543					159	
4	94	287		824		365	
5	-181	7				301	
6						250	
7	475			63	3451	259	
8	253					-620	
9	235			967			
10	137	-43				252	
11				3000		-735	
12						-809	
13	-82	-123	251	5951			
14	61	-78		727			
15	277					526	
16	66			4943			
17	309	120		-202		587	
18	732	183		1262			
Driving range	1,090						
SUM (m3)	2917	353	251	17597	3459	535	25112

Site Protection measures

- Preserved topsoil and sand for filling will be stockpiled separately (maximum 2m height mounds) away from the dune slacks and surface water pathways.
- Machinery will be confined to specified haul routes.
- Extent of ground opened up at any one time will be minimised
- Works will be confined to stripped areas of vegetation within the defined working area

2.4.6 Grading (Rough Shaping)

This will involve a range of equipment depending on extent and type of shaping to be executed. For general shaping, tracked excavators will be used (circa. 7-13 tonne) in conjunction with dumpers (6 – 12 tonne with low ground pressure tyres) in order to move material between locations as required.

The objective will be to retain existing ground contours with only localised softening where features are too abrupt for routine mowing – a combination of lowering of high spots and lifting low areas to provide a smooth transition through fairway and rough areas where lower cutting heights are applied.

Sand fill will be placed in layers no greater than 200 – 250 mm depth and carefully tracked in. Fully articulated "tilt" buckets will enable greater control over shaping.

In situations where contour changes are over a wider area small bulldozers (EDG6) may be used to strip surplus material from areas of cut and re-spread in areas of fill.

Creating smaller features, notably bunkers, will involve smaller excavators to achieve the necessary finesse needed to form a bunker which is sympathetic to the surrounding landscape.

There will be a degree of micro-siting of greens and tees to utilise the natural features of the site although the Grading and Earthworks Plan demonstrate the subtle shaping required, involving a combination of cut and fill to achieve the desired finish. The objective is to marry the greens and tees into the landscape which will be reinforced by appropriate landscaping and management.

Site Protection Measures

- Balanced cut and fill within working areas to minimise movement of sand across the site
- Micro siting will reduce overall grading requirements by maximising use of natural features
- Majority of site will not be graded.

2.4.7 Drainage

Drainage requirements will also be influenced by the proposed closure of the course from November to March when generally the wettest conditions can be expected.

The naturally occurring sands on links courses, which predominate on Coul Links, are free draining and this provides a suitable medium for building up low lying fairway areas, tees and greens and achieving effective drainage. The depth of sand created must be sufficient to prevent water moving up into the critical turf root depth by capillary action.

Generally, water is present at a level of 4 m and below within the main dune slack system. There are also several permanent and ephemeral water bodies throughout the site with comparable heights of groundwater expression. The principal approach to drainage is to build up levels by 0.5 – 1 m above high ground water level where playing areas correspond with dune slacks/ ephemeral water bodies. This approach will avoid the need to move water laterally by installation of pipe drainage thereby minimising impacts on ground water dependent terrestrial ecosystems (GWDTE). On-site sand will be used to build up low areas excavated from borrow areas and transported to the receiving area to be filled/raised. This will supplement sand generated from "cut" i.e. lowered areas.

In localised areas pipe drains may be required (for example at the base of banks) to intercept water flowing from higher ground onto playing areas. The pipe drainage will be connected to outlet drains and from there to a soakaway. Soakaways will be sited outside GWDTE or where there is likely to be an impact. A number of smaller soakaways will be used rather than diverting to one larger soakaway to avoid concentrating flow in a specific area in order to maintain existing flow patterns and reduce the risk of surcharging in a particular area. Soakaways will be located above the maximum ground water level. This approach reflects good SUDS practice.

The main drainage channels comprising the 3 burns, will be cleaned to maintain good flows.

Site Protection Measures

- Trenches not to be left open
- Temporary drainage during construction to protect adjoining habitats from run off.

2.4.8 Irrigation Installation

Irrigation infrastructure will be installed on an ongoing basis towards the end of the cut and fill programme and rough shaping.

Site protection measures

- The routing of the irrigation system and associated pipework / control cables will be confined to the defined working area of the golf course layout and pathways to avoid damage to adjoining habitat. Pipework and control cables will principally be introduced using vibratory mole plough equipment to minimise the need for open trenching
- Installation of the system will be coordinated with preliminary earthworks and be operational prior to seeding.
- The irrigation design will optimise the positioning and design of sprinkler heads with the aim of minimising the over throw of irrigation water outside of the maintained playing areas and pathways.
- Irrigation will be controlled by a central computer. Water will be applied to replace evapotranspiration only and will be applied based on calculations linked to on site weather data. Water can be applied on a highly localised basis, rather than on a widespread basis across the golf course.

2.4.9 Feature construction

2.4.9.1 Greens

Preliminary earthworks and grading as detailed under (2.4.5 and 2.4.6) will be executed in accordance with design plans and following further adjustment under the direction of the course architect. There may be minor adjustments to green location and finished levels to ensure optimum siting and design is achieved, whilst reconciling this to environmental factors to maximise net gain and keep impacts to a minimum.

The construction profile of the greens will utilise existing sandy rootzones from the site which will be carefully selected and tested to ensure consistency of physical characteristics and performance. Depth will be 200 – 250 mm over indigenous free draining sand.

2.4.9.2 Tees

The construction process and profile will be comparable to the greens. The tee surface will be flat however this will be carefully blended with the surrounding land to avoid the impression of contrivance.

2.4.9.3 Sand Bunkers

The bunker construction approach is driven by the style of bunker proposed for the golf links. The intention is to create bunkers which appear natural i.e. to reflect the erosion processes and exposure of sand faces in a links setting. Smaller excavators will be used to achieve the desired finish.

Where groundwater levels are high in relation to individual bunkers the ground will be built up around the sand bunker to reduce the influence of groundwater.

Site protection measures

- Smallest machine capable of executing the works to be deployed
- Vegetation preserved (e.g. Marram grass) for transplanting
- Micro adjustment of location and design to fully utilise existing features and minimise environmental impact

2.4.10 Fine shaping

Fine shaping of the surfaces will be carried out using appropriate equipment to achieve features which are indistinguishable from the natural features of the site and blend seamlessly with their surroundings. Maximum 13 tonne excavators with tilt buckets will be used supplemented with smaller excavators (3-7 tonnes).

During this process preserved native sandy topsoil will be spread to provide a suitable growing medium. The material will be tested so that the selected topsoil can be aligned to requirements for specific areas. Depth can also be regulated to provide a suitable balance between drainage and moisture retention with generally a minimum 150 mm depth spread over the indigenous sand. Features achieved during the preliminary grading process will be maintained during topsoil re-spreading.

Site Protection measures

- Depth of topsoil carefully regulated
- Topsoil analysis carried out to ensure consistency
- Depth of topsoil to reflect pre-construction profile in proximity to GWDTE.

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2.4.11 Surface Preparation and Seeding

There will be a rolling programme of final surface preparation and seeding to reduce the extent of exposed surfaces and minimise erosion due to the effects of wind and surface run off. The irrigation system will be installed prior to final surface preparation to enable manipulation of moisture content within the upper profile thereby improving surface stability and erosion resistance and present optimum conditions for sowing.

For playing areas where existing contours are to be retained (which constitutes the majority of the golf development area) a total herbicide will be applied to control regeneration of vegetation after organic matter removal, followed by cultivation and harrowing/ drag matting to provide a smooth surface. Surface raking will remove stone and organic matter.

Where topsoil is returned to graded sections light surface preparation will be required, including surface matting/ raking, prior to seed bed preparation.

Seed selection will be based on the use of fescue grasses to reflect the natural grasses on the Coul Links site.

There will be a sequential programme of seeding across the site, exploiting optimum growth conditions from late Spring to the end of summer.

Hydroseeding will be used throughout the golf course to help bind and protect the seed together with enhancing moisture conservation and providing additional nourishment to the growing grass plant. Hydroseeding can be carried out either by mixing the seed with the water fertiliser and biodegradable mulch containing paper and tackifier. The hydroseed mulch can be applied after seeding of the surfaces.

Site Protection measures

- § COSHH guidelines observed and shrouded sprayer deployed for weed killer application
- § Depth of cultivation regulated to avoid mixing sand and topsoil
- § Seed beds firmed to minimise erosion and watered if required
- § High quality seed cultivars to be used ad set out in "STRI/BSPB Turfgrass Seed 2017"
- § Grasses to be drill seeded to protect below the surface at optimum depth.
- § Seed bed fertiliser based on soil analysis and controlled release products used to minimise leaching

2.4.12 Establishment and Grow-in

Following seeding there will be a temporary increased demand for fertiliser and moisture until the grasses are well established.

Weak areas of growth will be over-seeded.

The course will be ready for a "soft" opening after approximately 18months after seeding.

Mowing levels will be progressively reduced as growth strengthens.

Early weed growth will reduce with regular cutting

Surface moisture will be dispersed by regular brushing and switching to minimise disease pressures.

2.5 SUSTAINABILITY

The sustainability assessment which is enclosed as part of the Environmental Impact Assessment outlines the long-term vision for sustainability within the proposed development and identifies strategies and mechanisms to implement this vision.

2.5.1 Transport

The provision of adequate transport initiatives will facilitate this development in accordance with the principles of sustainability and best environmental practice.

2.5.1.1 Construction Phase

A Construction Traffic Management Plan (CTMP) will help to mitigate any traffic related environmental impacts associated with the construction phase. This will ensure better-planned deliveries and removals which will aim to limit the overall generation of traffic movements and thus, associated noise and air pollution on-site. Planning will also help to reduce development costs. Measures to be considered include:

- Until a length of 'made' road is available to avoid dust/dirt being transferred onto the wider road network, wheel and road cleaning and wet suppression methods should be employed.
- All contractors will be provided with a site induction pack containing information on delivery routes and any restrictions on routes.
- Restrict construction HGV traffic between the network peak hours which are generally 08:00-09:00 and 16:00-18:00 Monday to Friday if necessary.
- Staggered delivery schedules will allow avoidance of peak and unsociable hours
- The CTMP and control measures will be included within all trade contractor tender enquiries to ensure early acceptance/compliance with the rules that will be enforced on this project.
- The C1026 will be maintained on approach to the site to ensure it is in a clean and safe condition.

Considering the nearest existing bus stop to the proposed development is currently 1.6 km south of the site, the proposed development does not meet the standards outlined in PAN 75 guidelines stating that developments should be within 400 m walking distance from a bus stop.

In order to enable and encourage access by alternative and sustainable modes of transport, a shuttle bus has been proposed by the developers. This would consist of bespoke vehicles that would shuttle passengers back and forth to the proposed golf course from Dornoch. The service would facilitate linked trips between visitors of Royal Dornoch and the proposed Coul Links course, fulfilling the main aim of the development. It is also suggested that the service could potentially run via Embo village to benefit not only the visitors of the golf course but local residents too. It is envisaged that the shuttle bus could halve the impact of operational traffic on the local road network.

Road widening in order to facilitate two-way movement has been proposed for the C1026 road between the Site access junction and the Embo junction in anticipation that these improvements would mitigate any impacts that could occur as a result of increased traffic volumes during the operational phase of the development. This improvement is in keeping with the standard of road that is being put in place between the Embo junction and Dornoch where significant upgrade works have been undertaken in recent years to remove single track sections of road.

2.5.1.2 Operational Phase

An increase in golfing traffic is expected when the development is completed. With this comes excess noise and air pollution in the area. To mitigate this, a detailed Travel Plan (TP) produced and provided as Appendix E.2 to this ES.

The overall objective of this TP is to manage the number of car-borne trips (particularly single-occupancy trips) and encourage sustainable travel patterns associate with the proposed golf course for both staff and visitor. This will be achieved by:

- Ensuring that adequate facilities are provided on site to encourage staff and visitors to use alternative modes of travel to the private car, particularly single-occupancy trips
- Ensuring that visitors have a viable alternative mode of transport available to them for accessing the site
- Ensuing that all staff and visitors are provided with sufficient information and advice to allow them to make reasoned choices with regard to sustainable travel; and
- Providing adequate restraint with regard to car parking to ensure that unnecessary journeys to the site by car can be discouraged.

A Travel Plan Co-ordinator (TPC) will be appointed once the golf course becomes operational. The TPC would be responsible for:

- Implementing actions within the Travel Plan (TP)
- Raising awareness of the TP by holding staff inductions introducing its aims
- Processing comments and suggestions from staff, visitors and The Highland Council (THC)
- Ensuring that all of the necessary systems relating to the TP, such as data collection and recording travel questionnaires are established, maintained and regularly updated.
- Keeping a record of the results and preparing progress reports at the request of THC.
- Undertaking a travel survey within six months of occupation and at yearly intervals thereafter for a period of three years;
- Reviewing the TP annually following staff travel to work surveys. The reviews would take place in consultation with THC and in particular, targets would be reviewed to ensure that these are being met and thereafter maintained.

The TPC allocated by Coul Links Ltd would also be expected to work with THC, who will be able to advise on many initiatives for sustainable travel available within the area. The TPC would liaise with the Roads Officers at THC who are responsible for cycling and public transport as required, to ensure maximum advantage is being taken of these sustainable alternatives for travel.

Staff living in proximity to the site should be encouraged to walk or cycle to work and advice will be provided on local walking and cycling routes. To promote cycling as an alternative mode of travel to the private car, the internal site layout will be designed to accommodate cycle movements. Secure cycle parking in the form of 2 Sheffield Cycle Stands will be provided to accommodate up to six bicycles. These stands will be aimed at staff (due to golfers being unlikely to use this mode of transport as a result of the golfing equipment they carry) but will be made available to all.

In addition to these actions, Coul Links Ltd have also pledged to:

- research the opportunity for electric charging points for connection of electric vehicles.
- Encourage car or taxi sharing amongst staff living outwith reasonable walking / cycling distance
- Produce a "How to Get Here" manual and make it readily available on the Coul Links golf course website for visitors to make use of
- Establish a working relationship with local taxi and private hire companies so that taxis regularly serve the golf course;

2.5.2 Design and Energy

All new developments in the Scottish Highlands should incorporate sustainable energy, water and waste management systems in order to reduce these pressures in line with the Scottish governments Climate Change Delivery Plan (June 2009). This includes incorporating energy efficiency measures and generating on-site energy from renewable resources, minimising recycling waste and utilising conservation techniques.

2.5.2.1 Construction Phase

Incorporating small-scale renewable systems into developments can make significant reductions in CO_2 emissions and therefore a variety of options will be investigated during the construction phase of the development. These include Ground Source Heat Pumps (GSHP), Biomass Boilers, Anaerobic Digestion units and small-scale wind turbines.

Heating systems which use locally available fuel, such as Biomass Boilers and Anaerobic Digesters, which for example could use wood pellets/chips and grass clippings as fuel, will reduce the developments dependence on fossil fuels and in addition, will work to reduce transportation costs and hence noise and air pollution factors.

The club house will utilise a passive solar design. Windows will be orientated in a south facing direction to take maximum advantage of the prevailing climate. This will achieve maximum solar gain, along with natural heating/cooling and lighting. Additionally, rooms which are likely to be used most frequently should be located on the south side of the building while those used less frequently, such as toilets, cloakrooms and storage areas should be located to the north.

The developers will also consider and investigate the use of sun pipes and light wells to maximise the use of natural lighting and prevent the unnecessary use of artificial.

Draught proofing and insulation will also be included into the buildings during the construction phase of the development to reduce potential heat losses.

Construction materials with a high thermal mass will be used during the construction of the club house. These materials allow the building to store heat and reduce variations in internal temperatures. Green roofs will be investigated further as they not only provide a greater internal mass but also offer various habitats, reduce flood risk and would allow the buildings to blend into the Highland landscape sympathetically.

Sustainable materials will be used wherever possible during the construction of the development.

2.5.3 Lighting

2.5.3.1 Construction Phase

Lighting design will follow the principles of low energy solutions throughout the development with LED fittings being installed in all facilities on site. LED bulbs are 80% more efficient than both fluorescent and incandescent lights with only 5% of energy being converted into heat.

Within the club house, a lighting control system will be used to reduce running hours of lighting by installing Passive Infrared (PIR) occupancy sensors in areas that are infrequently used i.e corridors and maintenance sheds. It is generally assumed that sensors can reduce electricity consumption by 50% and hence, the developments reliance on fossil fuels will be significantly reduced.

2.5.3.2 Operational Phase

The golf club's facilities will be actively managed and energy consumption will be monitored by taking frequent metre readings. This will be made easier by the upcoming smart metre roll out, of which the developer will take advantage of.

Employees will be expected to promote environmental best practice and sustainability. A green manager will be allocated and will be delegated to carry out internal audits and take corrective action every six months.

This analysis will determine energy consumed unnecessarily outside of working/playing hours and will allow the club to identify their baseload consumption, so that they can form targets to reach and understand their successes.

2.5.4 Water Management

The proposed 18-hole golf links has been designed to provide a water efficient development, which aims to minimise water demand and consumption during its operational lifespan.

Water conservation measures will be taken in order to limit water use during the developments operational phase. The measures taken to aid this are as follows:

- Install water efficient technologies to retain water pressure but reduce water volume such as low-flush cisterns and push taps that obtain only a short running time
- Regular water metering in order to detect any leaks or damages to the water mains which could be causing an unnecessary amount of water to be used.
- Install dual-flush toilets and a watermiser system for urinals

2.5.4.1 Water Quality

A detailed plan regarding how the development proposal will impact upon wetland areas and watercourses which run through the site, and the protection measures to be implemented in order to ensure the retention and/or enhancement of water quality passing through this area during both the construction and operational phases of the development is provided in Supporting Document 2: The Environmental Management Plan of this ES.

2.5.4.2 Irrigation

Water used for irrigation on the golf course will be sourced by on-site harvesting. Water will be collected from two boreholes located adjacent to the proposed access road of the site and stored in a reservoir of c 20,000 m^3 (applied for under separate planning permission). This will then be pumped to an irrigation tank for distribution to tees, greens and fairways via a fully automated and computerised irrigation system.

2.5.4.2.1 Construction Phase

Site protection measures associated with the installation of irrigation infrastructure during the construction phase of the development have been agreed by Coul Links and are listed below:

- Irrigation pipework will be confined to within the footprint of the golf holes so to minimise damage and disturbance to vegetation and habitats.
- Open-ended pipework will be capped overnight to prevent wildlife entering the pipes
- Open ditches will be loosely filled or covered at the end of each working day to prevent wildlife becoming trapped overnight.
- The irrigation design will optimise the positioning and design of sprinkler heads with the aim of minimising the supply of irrigation water outside of the maintained playing areas and pathways.

2.5.4.2.2 Operational Phase

The aim during operational maintenance will be to apply only enough irrigation to replace soil moisture lost through evapotranspiration and not replaced by effective rainfall. To achieve this, irrigation volumes will be based on local weather conditions. Irrigation applications will usually be made during the night when further losses through transpiration will be minimal.

Permanent irrigation will be applied to playing surfaces (tees, greens and fairways) only. Temporary irrigation will be supplied to rough grassland areas during the grow-in period only, when required.

No irrigation will take place within the designated SSSI areas on site.

2.6 WASTE MANAGEMENT

The following measures are proposed to allow developers to manage the waste of their anticipated development in the most efficient and environmentally sustainable manner. In general, the waste streams produced during construction and operational phases will be reduced, reused and/or recycled in accordance with the waste hierarchy, first introduced by the European Union (EU) through the Waste Framework Directive 2008/98/EC.

2.6.1 Demolition and Excavation Phase

The farm buildings and cottages within the development site will be maintained as part of the development, being renovated into a golf course clubhouse, pro shop and administration facilities. Some partial demolition works will be undertaken and a Demolition Statement is supplied as Supporting Document 3.

During site preparation works, some excavation of soil/rock removal will occur, primarily as a result of tree removal works, which will make room for heather to be translocated into. A detailed Dune Heath Translocation Plan is provided as Supporting Document 1 and should be read in conjunction with this document.

Waste produced via vegetation removal and excavation will be reused on site via the infilling of tee areas and the construction of mounds/berms for general landscaping purposes.

Any unsuitable excavated material or excess fill that cannot be reused shall be disposed of to suitably licensed facilities - although it is currently estimated that this requirement will be low or zero.

2.6.2 Construction Phase

Over 1/3 of waste in the UK that is sent to landfill arises from the construction industry. To keep this to a minimum during the development of Coul Links Golf Course, a Site Waste Management plan will be devised prior to works commencing in order to aid developers to identify the volume and type of material to be excavated, as well as opportunities for re-use and recovery of materials.

Having this plan in place assists the developer by helping to manage material supply and waste. In turn, this will reduce associated noise and air pollution issues related to the development in regard to the movement of machinery and deliveries being made.

During construction activities, a number of waste streams (both hazardous and non-hazardous) will inevitably be produced. The following measures will be implemented to manage waste in a sustainably sound manner and to meet the requirements of current waste legislation:

- All waste produced during the construction phase of the development will be contained on-site and minimal amounts of materials will enter the site. By keeping a strict policy on this, associated noise and pollution issues will be reduced.
- A waste manager will be appointed to ensure accountability and efficiency of waste management on site during both the construction and operational phases of the development.
- Any waste that requires removal from site will be removed by a licensed contractor and disposed of off-site. At current, this is expected to be minimal to zero.
- Only appropriate quantities of materials, including gravel and root-zone material will be ordered to reduce the chances of unnecessary waste production and traffic associated impacts.
- Materials delivered to site will be stored immediately and carefully. In addition, materials which are vulnerable to damage by rain will be stored carefully and any hazardous chemicals will be fully bunded to avoid any adverse effects associated with accidental spillage.

- Materials will be handled carefully using appropriate equipment to avoid undue damage to the surrounding landscape and sensitive habitats located on site.
- Separate storage areas for different types of waste will be designated in order to maximise the re-use and recycling potential of the waste. For example, waste paints, solvents and oils used in renovation of the farmhouse and cottages will be stored in drums within temporary bunded areas prior to removal. Excess fill and unsuitable excavated material will also be suitably stored (although it is currently estimated that this requirement will be low). In addition, temporary storage of spoil will be managed to prevent accidental release of dust and uncontrolled surface water run-off which may contain sediment and/or solid matter.
- All storage areas will be examined to reduce the chance of contamination occurring. All waste areas will be kept in good working order, not leaking or over-flowing and will be labelled appropriately to ensure site and construction staff use them correctly.

2.6.3 Operational Phase

The proposed development will produce a variety of waste streams throughout its operational phase - from food and packaging waste to grass clippings. The storage and movement of waste must comply with relevant legislation and have minimal impact on the surrounding environment, landscape and ecology.

The appropriate disposal of waste on development sites is necessary to be compliant with the UN's Waste Framework Directive and the Environmental Protection (Duty of Care) Regulations 1991. Therefore, adequately labelled recycling facilities will be incorporated into all new developments located on the proposed development site. This will allow any waste materials value to be reclaimed and to be converted into new products, while the chances of contamination will be limited.

In addition, a number of other waste management initiatives will be put in place during the operational phase of the development in order to reduce Coul Links Ltd's environmental footprint and comply with current waste legislation:

- Information boards will be appropriately located throughout the club house, pro shop and kitchen facilities, clearly outlining which items are able to be recycled in the dedicated facilities available throughout the site.
- Clear binbags only will be used in both bathrooms and the kitchen and café facilities to reduce any potential for waste contamination.
- Cleaning stock inside the club house will be regularly maintained and rotated to reduce the likelihood of stock to go out of date before being used, leading to unnecessary waste.
- The clubs head greenkeeper will ensure that the maintenance sheds are stocked appropriately i.e being careful to not over-order materials and chemicals, in turn helping to reduce the potential of unnecessary waste production.

- Maintenance sheds will be adequately protected, with chemicals sat upon collection bungs to minimise contamination should there be any spillage. Equipment and chemicals will be stored in cool dry places to reduce contamination potential, rain damage and infestations which could lead to this equipment being wasted.

Recyclable and non-recyclable waste will be re-grouped and stored for collection in the waste store and a vehicle loading area will be provided adjacent to the waste store. The services of a licensed contractor will be engaged to collect all segregated waste and the golf courses appointed waste manager will be responsible for managing its safe and sustainable disposal off site.

The location of the waste storage area will minimise the visual intrusion of waste storage and collection on the overall aesthetically pleasing course that is anticipated to be developed. The waste storage area will be naturally ventilated and equipped with the appropriate fire detection and alarm system. The area is also accessible to firefighting appliances and a fire hydrant will be located in the vicinity of the waste store.

2.6.3.1 Grass Clipping Disposal

Disposal of organic waste on the golf course is an issue for concern as nutrient enriched greens and tees clippings arising from regular mowing can pose a pollution hazard unless appropriately managed. Furthermore, organic waste arising from the wash-down plant on site may contain oil and chemical residues and will require appropriate and safe disposal. Construction of a central composting facility should therefore be considered an integral part of running the maintenance facility.

Grass clippings will be 'boxed off' during mowing and transferred to the maintenance compound(s) for composting.

The length of time that grass clippings can be stored in the exposed bays is weather dependent, but clippings will not be left within the temporary bays for more than two weeks. Storage bays will be simply constructed, requiring three sides of wood to a height of around 1 m and a hard standing base of either poured concrete or cemented concrete slabs. This hard standing prevents nutrients and chemical residues from being washed through the clippings and into the soil and groundwater.

When collected from the course, the greens clippings will be composted using either a windrow system or a more conventional system of designated composting bays. Compost will then be re-used in golf course maintenance operations, primarily around clubhouse gardens. None will be used within the dune systems.

3.0 PLANNING POLICY CONTEXT

3.1 INTRODUCTION

This section of the ES summarises the relevant planning policy context matters which will be considered in undertaking the Environmental Impact Assessment (EIA) for the Proposed Development.

This section identifies and summarises the development plan policies which are relevant to this planning application. In addition to development plans, other material considerations are relevant that relate to the proposed development which include a number of national planning policies and guidelines which are also referenced in the Technical Appendices. Appendix ES.10 also includes further details regarding the same.

The proposal is being made under Section 25 of the Town and Country Planning (Scotland) Act 1997 which states that decision makers, in making any determination, must have regard to the development plan. Planning applications must be determined in accordance with the applicable development plan unless material considerations indicate otherwise.

The relevant material considerations will also be set out in this section and will be considered.

3.2 PLANNING POLICY

The planning policy review will consider the national, regional and local policy documents, which will include a review of National Planning Framework 3, Scottish Planning Policy, the Development Plan, and other relevant planning guidance. Each element of the applicable planning policy framework will be described insofar as each relates to the Proposed Development.

3.3 NATIONAL POLICY GUIDANCE

The Scottish Government expresses its planning policies through the National Planning Framework 3 (NPF3), the Scottish Planning Policy (SPP) and Planning Advice Notes (PAN).

3.3.1 National Planning Framework 3

The National Planning Framework 3 (NPF3) published on 23rd June 2014 is Scotland's Third National Planning Framework. The NPF3 sets out the key principles regarding the spatial strategy that will guide development in Scotland over the next 20-30 years. NPF3 is intended to ensure that sustainable development is at the heart of all policy making, and that it will be a material consideration in determining planning applications.

NPF3 also identifies the matters that must be addressed when consent is sought: the likely need for Environmental Impact Assessment (EIA) and Habitat Regulations Assessment; the routes of any new overhead lines and underground cables; the siting and design of any new structures; carbon impact; landscape and visual impacts; effects on bird species; other aspects of biodiversity; soils; hydrology; hydrogeology; the coast and marine environment; effects on the historic environment, and; any measures necessary to minimise, mitigate or compensate for adverse effects on the environment or communities, including strategic level or whole scheme measures.

NPF3 defines a vision for vibrant rural, coastal and island areas, with growing, sustainable communities supported by new opportunities for employment and education. It notes that the character of rural and island areas and the challenges they face vary greatly across the country, from pressurised areas of countryside around towns and cities to more remote and sparsely populated areas.

NPF3 supports the many and varied opportunities for planning to support business and employment. These range from focus on the role of cities as key drivers of our economy, to the continuing need for diversification of our rural economy to strengthen communities and retain young people in remote areas. Planning should address the development requirements of businesses and enable key opportunities for investment to be realised. It can support sustainable economic growth by providing positive policy context for development that delivers economic benefits.

3.3.2 Scottish Planning Policy (2014)

The new Scottish Planning Policy (SPP) was published in 2014 alongside NPF3. SPP sets out national planning policies which reflect Scottish Ministers' priorities for operation of the planning system and for the development and use of land.

SPP sets out the government's vision for creating "A Successful, Sustainable Place" in Scotland. It notes that the planning system should provide strong support for new and expanding economic development, where it is consistent with the wider framework.

To achieve successful, sustainable places, the SPP policies promote rural development and support business and development whilst valuing the natural and historic environment. Paragraph 28 of SPP highlights the key principles which should be considered in the guidance of new developments. The guidance in SPP states that policies and decisions by Planning Authorities about proposals should be guided by:

- Giving due weight to net economic benefit;
- Responding to economic issues, challenges and opportunities, as outlined in local economic strategies;
- Supporting good design and the six qualities of successful places;
- Making efficient use of existing capacities of land, buildings and infrastructure including supporting town centre and regeneration priorities;
- Supporting delivery of accessible housing, business, retailing and leisure development;

- Supporting delivery of infrastructure, for example transport, education, energy, digital and water;
- Supporting climate change mitigation and adaptation including taking account of flood risk;
- Improving health and well-being by offering opportunities for social interaction and physical activity, including sport and recreation;
- Having regard to the principles for sustainable land use set out in the Land Use Strategy;
- Protecting, enhancing and promoting access to natural heritage, including green infrastructure, landscape and the wider environment;
- Reducing waste, facilitating its management and promoting resource recovery; and
- Avoiding over-development, protecting the amenity of new and existing development and considering the implications of development for water, air and soil quality.

In addition, Paragraph 79 of SPP promotes economic activity and diversification, including, where appropriate, sustainable development linked to tourism and leisure, while ensuring that the distinctive character of the area, the service function of small towns and natural and cultural heritage are protected and enhanced.

In further support of economic development, Paragraph 100 of SPP indicates that the, "*Efficient handling of planning applications should be a key priority, particularly where jobs and investment are involved.*"

The Proposed Development will see the creation of an 18-hole links golf course just north of Embo, some 5 km from the nearest existing golf course at Royal Dornoch. This will promise additional requirements for overnight accommodation in the surrounding towns, further visits from across the UK and abroad, and enhance the areas reputation as a major destination for golf, tourism and business. It is therefore considered that the Proposed Development is a sustainable use of the land and is a facility that will help to improve health, offer opportunity for social interaction and physical activity.

3.3.3 Government Economic Strategy

Scotland's Economic Strategy (SES) was produced in 2015 to highlight how economic strategies have evolved since devolution. SES outlines four central themes of the strategy of inclusive growth, investment, innovation and internationalisation.

SES outlines that business investment is key for future economic success, particularly in sectors and companies where Scotland has a comparative advantage – golf undoubtedly being once of Scotland's biggest business successes.

SES also sets out Scotland's approach to "strengthening our links with the global economy" in several ways, one of which is attracting inward investment - the Proposed Development is a prime example of how international investment can work to boost Scotland's economic performance.

3.3.4 PAN 43 – Golf Courses and Associated Developments

PAN 43 was published in 1994, and defines the national position on guidance for the requirement and location of golf courses in Scotland. Although the document is now somewhat dated a number of the points included within it are considered relevant. For example, it recognises that leisure and tourism development can help to improve the attractiveness of an environment and can in turn bring employment benefits.

3.4 LOCAL POLICY AND GUIDANCE

3.4.1 The Development Plan

The Development Plan for the Proposed Development comprises the Highland-wide Local Development Plan (HwLDP) (2012) and the Sutherland Local Plan 2010 (SLP) (As continued in force, April 2012).

3.4.2 Highland-Wide Local Development Plan

The HwLDP was adopted by THC on the 5th April 2012. This document is a high-level strategy plan which sets out how land can be used by developers for the next 20 years. The HwLDP contains the general policies for determining planning applications in the Highlands.

There are no specific land use proposals relevant to the proposed development. However, the proposed development is deemed to fit within the wider spatial context set out by HwLDP as it is seen as part of the wider vision of the Council for economic growth in the Highlands. It is also seen as a major visitor attraction as part of promoting the recreational, visual and cultural benefits of the area. In doing so, the Proposed Development will further add to and enhance the economic development offer in this part of the Highlands and complement the existing success of Royal Dornoch Golf Club to create a golf destination.

The remaining sections below relating to HwLDP focus on relevant planning policies designed to guide and manage development. The appropriate policies are as follows:

Design

Policy 28 – Sustainable Design outlines THC's support for developments which promote and enhance the social, economic and environmental wellbeing of the people of Highland. The Proposed Development will be delivered in accordance with the criteria listed within the Policy. The golf course has been designed to demonstrate sensitive siting and high quality design in keeping with its surroundings. As is demonstrated throughout the remainder of this Environmental Statement, the proposal has appropriately assessed hydrology/hydrogeology, transport and landscape impacts to ensure that it is compatible with the existing provisions. Furthermore, the Proposed Development will deliver significant social and economic benefit to the local area.

Policy 29 - Design Quality and Place Making requires new development to be designed to make a positive contribution to the architectural and visual quality of the place in which it is located and to consider the incorporation of public art as a means of creating a distinct sense of place and identity.

The policy also requires that new developments should show sensitivity and respect towards the local distinctiveness of the landscape, architecture, design and layouts. The Proposed Development is designed to fit seamlessly into the existing landscape with minimal earthworks, taking advantage of the natural undulations of the dune landscape. The golf course will become a contiguous part of Coul Links and seek to conserve the most sensitive habitats within the locality.

Policy 30 - Physical Constraints requires developers to consider whether their proposals would be located in areas of constraints as set out in Physical Constraints: Supplementary Guidance. Where a proposed development is affected by any of the constraints detailed within the guidance, developers must demonstrate compatibility with the constraint or outline appropriate mitigation measures to be provided. There are no significant major constraints and all other constraints are proposed for appropriate mitigation.

The Proposed Development lies within 15m of a water body/ water dependant habitat identified in the Register of Protected Areas. Specific hydrology and ecology assessments will be undertaken to provide appropriate mitigation for affected areas.

Another constraint is that the Proposed Development lies within 20 m of woodland. Areas of woodland will be removed however this is following consent from the relevant statutory bodies due to the quality of the woodlands present on site.

Overhead lines are also present within the site boundary. This has been considered in the course design and it is planned that the lines are re-routed.

Policy 31 - Developer Contributions enables THC to seek from the developer a fair and reasonable contribution in cash or kind towards additional costs or requirements for improved public services, facilities or infrastructure. The applicant will be willing to discuss appropriate developer contributions as part of the delivery of the Proposed Development.

Policy 36 – Development in the wider countryside outlines several elements which a development proposal will be assessed for the extent that they are acceptable and sympathetic to the countryside that they lie within. The proposed development has been designed in accordance with the local Landscape Character Assessment Plan and seeks to negate the loss of any of the distinct character features of the land at Coul Links.

Policy 43 - Tourism indicates that Area Local Development Plans will identify more specific opportunities for enhancement of existing tourism facilities and areas where a co-ordinated approach to tourism is needed. See below section on the Sutherland Local Plan (As continued in force, April 2012) and Caithness and Sutherland Local Plan (CaSPlan).

Policy 49 – Coastal Development outlines that any coastal development should not have an unacceptable impact on the natural, built or cultural heritage and amenity value of the area. This policy is further supplemented by the Highland Coastal Development Strategy (2010). The Proposed Development has been designed to be low impact and utilises the natural dune landscape present at Coul Links. Amenity value is seen to be impacted in a positive manner.

Policy 51 - Trees and Development seeks the protection of existing trees and woodland on and around development sites. The policy requires adequate separation distances between established tress and any new development which may influence the developable area of the site. The golf course design has taken into account the existing areas of valuable, quality woodland on the site. Areas of unfavourable woodland are planned to be removed to conserve the dune grassland, dune heath and other more important habitat types. Further detail on such workings is outlined in the Ecology Annex of this ES.

Policy 62 – Geodiversity states that development proposals that include measures to protect and enhance geodiversity interests of international, national and regional/local importance in the wider countryside, will be supported. The Proposed Development seeks to conserve and enhance the natural dune landscape within Coul Links which falls under both international and national designations.

Policy 74 – Green Networks states that developments within areas identified for the creation of green networks should seek to avoid the fragmentation of the network and take steps to improve its connectivity, where this is appropriate. Connectivity will be improved through the retention and improvement of the existing public footpath along the old railway line which meanders through the site.

Policy 77 – Public Access outlines that where a proposal affects a route included in a Core Paths Plan (of which the Proposed Development lies adjacent to) then THC requires either the retention of the path or the provision of an alternative that is no less attractive, is safe and convenient for public use, and does not damage or disturb species or habitats. As noted above, the Proposal outlines the retention and improvement of the existing public footpath through the site.

Heritage

Policy 57 – Natural, Built and Cultural Heritage requires all development proposals to be assessed, taking into account the level of importance and type of heritage features, the form and scale of the development, and any impact on the feature and its setting in the context of the policy framework of heritage features. As the development site incorporates a Listed Category B building and also various other recorded archaeology, further requirements will be defined by THC Historic Environment Team and referred to in the Cultural Heritage Annex.

Ecology

Policy 58 – Protected Species requires all applicants to carry out relevant surveys where there is good reason to believe that protected species may be present. As the site lies within Dornoch Firth and Loch Fleet SPA and RAMSAR, and Loch Fleet SSSI, several species specific surveys have been conducted along with a comprehensive Phase 1 Habitat Survey, National Vegetation Classification Survey and Groundwater Dependent Terrestrial Ecosystems Report.

Policy 59 – Other Important Species requires that regard be given to the presence of, and any adverse effects of development proposals either individually and/or cumulatively on, the Other Important Species defined in the policy if these are not already protected by other legislation or by nature conservation sites. Conditions and agreements will be used to ensure detrimental effect on these species is avoided.

Policy 60 – Other Important Habitats and Article 10 Features seeks for developers to give regard to the value of the Other Important Habitats listed in the policy, where not protected by nature conservation site designations (such as natural water courses), in the planning of any development proposal which may affect them either individually and/or cumulatively. Conditions and agreements will be used to ensure that significant harm to the ecological function and integrity of Article 10 Features and Other Important Habitats is avoided.

Policy 61 – Landscape requires developments to reflect the landscape characteristics and special qualities identified in the Landscape Character Assessment of the area in which they are proposed. This should include full consideration of the scale, form, pattern and construction materials and cumulative effects of development. A full Landscape and Visual Impact Assessment has been conducted for the site following submission of the proposed golf course layout.

Air and Water Quality

Policy 63 – Water Environment outlines THC's support for proposals for development that do not compromise the objectives of the Water Framework Directive (2000/60/EC), aimed at the protection and improvement of Scotland's water environment. A full hydrological assessment has been prepared for the site to address the water environment throughout both the construction and operation of the golf course development.

Policy 64 – Flood Risk states that development proposals within or bordering medium to high flood risk areas will need to demonstrate compliance with Scottish Planning Policy through the submission of suitable information which may take the form of a Flood Risk Assessment. Flood Risk is assessed as part of the Hydrology & Hydrogeology Annex.

Policy 65 – Waste Water Treatment requires most new development proposals to connect to the public sewer.

Policy 66 – Surface Water Drainage requires that all proposed development must be drained by Sustainable Urban Drainage Systems (SUDs). All hardstanding areas within the development will be connected to SUDS.

Policy 72 – Pollution requires all proposals that may result in significant pollution such as noise, air, water and light will only be approved where a detailed assessment report on the levels, character and transmission and receiving environment of the potential pollution is provided by the applicant to show how the pollution can be appropriately avoided and if necessary mitigated. Noise and water pollution have been assessed and appropriately mitigated for within the development proposals.

Transport

Policy 56 – Travel requires development proposals that involve travel generation to include sufficient information with the application to enable THC to consider any likely transport implications and, amongst a number of requirements, requires that such developments can be served by the most sustainable modes of travel. A full Access, Traffic and Transport assessment has been conducted to support the planning application and is addressed in the ES.

3.4.3 Sutherland Local Plan 2010 (As continued in force, April 2012)

The adopted HwLDP updates the "general policies" of the existing adopted Sutherland Local Plan (SLP) which was adopted on 24th June 2010. The exception to this relates to the matters detailed in the Retention Schedule to the HwLDP provided at Appendix 7 of the Plan. The retained elements include but are not limited to: site allocations, settlement development areas not covered by the HwLDP and site-specific policies. As such, certain parts of the Sutherland Local Plan form part of the Development Plan for the site area. The policies of the Local Plan which are deemed relevant are:

- Policy 2 – Development Factors and Development Requirements; and,
- Policy 17 – Commerce

As the new Caithness and Sutherland Local Plan (CaSPlan) is likely to be in place prior to the start of the construction of the development, its proposed policies should also be considered throughout the planning process.

3.4.4 Caithness and Sutherland Proposed Local Development Plan 2016

The Sutherland Local Plan described above is being continued in force alongside the HwLDP until the adoption of the Caithness and Sutherland Local Plan (CaSPlan). When in place, CaSPlan will be one of three new area Local Development Plans for three sub-areas (Caithness and Sutherland, Inner Moray Firth, and West Highland and Islands).

The purpose of the area Local Development Plans is to set out plans and proposals for delivering development reflecting on the unique characteristics and attributes of these three areas. Once adopted these area plans should be referred to along with the HwLDP and Supplementary Guidance to make planning decisions in these areas.

In relation to this planning application, several policies within CaSPlan are considered relevant to the proposed development. In particular, *Policy 2 – Delivering Development*, states that "*Development of the locations and uses specified in the 'Sutherland Settlements' sections of this Plan will be supported subject to provision of the necessary infrastructure, services and facilities required to support new development as indicated in this Plan or identified in accordance with the Development Plan as more detailed proposals are brought forward."*

Embo is highlighted as a 'Sutherland Growing Settlement' and is addressed by *Policy 3 – Growing* Settlements which sets out a series of elements for which a development must be assessed against. The development within Embo will be assessed against the following for the extent to which it:

- Takes account of the issues and placemaking priorities identified for Embo;
- Is likely to help sustain, enhance or add to facilities with proposals being located within active travel distance of any facility present;
- Is compatible in terms of use, spacing, character and density with development within Embo and demonstrate high quality design;
- Can utilise spare capacity in the infrastructure network (education, roads, other transport, water, sewerage etc.) or new/improved infrastructure can be provided in a cost-efficient manner, taking into account the Council's requirement for connection to the public sewer other than in exceptional circumstances;
- Avoids a net loss of amenity / recreational areas significant to the local community; and
- Would not result in an adverse impact on any other locally important heritage feature, important public viewpoint/vista or open space.

The issues outlined for development within Embo include the following:

- Limited development opportunities at Embo Street until significant realignment and widening of existing road and junction with Dornoch-Embo Road
- Improvements required to the Dornoch-Embo Road
- Increased pressure on local road network due to traffic from the caravan site
- Potential for development of new crofts as part of a community led initiative

Placemaking priorities significant to the Proposed Development are:

- Maintain open space to north of the village at the football field
- Significant developments to be accompanied by a recreational management plan to assess any likely increased pressures from recreational access of the sand dunes or disturbance to wintering or breeding birds
- Development proposals should have regard to Dornoch Firth and Loch Fleet SPA and Ramsar site, Moray Firth SAC and Loch Fleet SSSI

As such, this EIA will demonstrate that the Proposed Development is suitable and in a sustainable location and as such, meets the location objectives of CaSPlan.

3.4.5 Highland Council Supplementary Guidance

The Highland Council (THC) has adopted Supplementary Guidance related to different topic areas. The following are considered relevant to the Proposed Development:

Historic Environment Strategy

The Highland Historic Environment Strategy (HES) has been prepared as Supplementary Guidance to the Highland-wide Local Development Plan and was adopted in January 2013. The HES specifically relates to Policy 57 Natural, Built and Cultural Heritage of the HwLDP which states that the main principles of the guidance will ensure that:

- Future developments take account of the historic environment and that they are of a design and quality to enhance the historic environment bringing both economic and social benefits;
- It sets a proactive, consistent approach to the protection of the historic environment.

The purpose of the strategy is to define THC's approach to the protection of the historic environment through the planning process. The strategy aims to ensure that there is a proactive and consistent approach to the protection of the historic environment and is a material consideration when proposals for development are being considered.

The Cultural Heritage Annex of the ES makes significant reference to the HES and takes into account the effects of the proposed development on the special features of the heritage assets and associated archaeology, history and architecture of the Scottish Highlands within the development site.

Highland Statutorily Protected Species

The supplementary guidance for Highland Statutorily Protected Species reflects the policy advice given in Scottish Planning Policy, and supplements Policy 58 of the HwLDP as outlined above. The Ecology and Ornithology Annex of the ES make specific reference to the supplementary guidance and its application to the proposed development.

Green Networks

The Green Network: Supplementary Guidance was adopted in January 2013 to help promote greenspace linkages and to safeguard and enhance wildlife corridors in and around new and existing developments. Green Networks already exist in Highland and comprise important habitats and recreation opportunities. THC seeks to protect and where possible enhance these spaces and places, enabling new development to take advantage of the outstanding landscape in the area.

The purpose of the guidance is to put in place a means of identifying the Highland Green Network and a mechanism for the delivery of its enhancement, in line with Policy 74 of the HwLDP.

The design of the golf course, through input from ecological assessments and cultural heritage studies, has sought to provide the best layout with good connectivity into the wider landscape and throughout the development site itself with the creation of biodiversity corridors and safeguarding of important habitats.

Flood Risk and Drainage Impact Assessment

The supplementary guidance on Flood Risk and Drainage Impact Assessment was adopted in January 2013 and puts THCs general planning policy on flooding and development into detailed planning, construction and maintenance practice. It has been produced by THCs Flood Team in conjunction with other THC officials and in consultation with the SEPA. It aims to improve the design and implementation of developments and their related drainage arrangements.

The Hydrology Annex of the ES makes specific reference to the supplementary guidance and its consideration throughout the planning process of the proposed development. Due to the sensitivity of the site and the groundwater dependent terrestrial habitats present, it is a key aim of the development to prevent any significant effect on such areas through inappropriate drainage and/or increased flood risk.

3.4.6 Highland Council Interim Supplementary Guidance

One piece of interim supplementary guidance will be considered for this EIA. The Highland Coastal Development Strategy is scheduled for future adoption as Supplementary Guidance and is at present seen as interim guidance. For the purpose of this development proposal, the Coastal Development Strategy will be considered a material consideration and will still require consideration in the assessment of this planning application.

The Highland Coastal Development Strategy (2010) aims to:

- guide the sustainable development and use of Highland's coastal zone whilst safeguarding its natural and cultural heritage assets;
- provide a strategic planning framework for the coast and nearshore area of Highland which takes account of national policy guidance and the need for more detailed plan coverage in appropriate areas;
- complement the statutory, terrestrial elements of the evolving HwLDP, Scottish Planning Policy and the implementation of the Marine (Scotland) Act 2010. This recognises that the use of nearshore waters (particularly the more sheltered water) is relevant and often closely related to the use of the land adjacent.

4.0 ANNEX A: ORNITHOLOGY

4.1 SCOPE OF ASSESSMENT

This Annex considers the potential impacts of the proposed development on the important ornithological receptors within the study area, during construction and operation. The assessment is based on the Guidelines for Ecological Impact Assessment (EcIA) in the United Kingdom (IEEM 2006; 2016), the Handbook on Environmental Impact Assessment (SNH, 2005) and standard Scottish Natural Heritage (SNH) guidance on ornithological receptors.

The baseline ornithological conditions were assessed through targeted field surveys in the winter and breeding season, of potentially important and legally protected bird species identified through desk-study and consultation. The scope of the ornithological assessment includes birds, but excludes potential effects on their habitats and other species, which are considered separately in Annex B: Ecology.

The scope of the assessment involved the following key stages:

- Reference to relevant legislation, policy and guidance.
- Identification of likely zone of influence of the proposed development.
- Identification of potentially important ornithological receptors likely to be affected (baseline conditions) by the proposed development.
- Evaluation of important ornithological receptors and features likely to be affected by the proposed development.
- Identification of likely impacts and magnitude of the proposed development works on important ornithological receptors.
- Assessment of the likely significant effects of the proposed development, including any mitigation and enhancement measures and definition of any residual significant effects.

The term 'receptor' is used throughout the Environmental Impact Assessment (EIA) process and is defined as the element in the environment affected by a development (e.g. a bird in the case of ornithology). The term 'impact' is also used commonly throughout the EIA process and is defined as a change experienced by a receptor (this can be positive, neutral or adverse). The term 'effect' is defined as the consequences for the receptor of an impact. The use of the word 'effect' rather than 'impact' at the end of species and designated site accounts is based on the wording of the EIA Regulations which require determination of '*likely significant effects'.*

4.1.1 Scoping Opinion

Details of scoping opinions are presented in this section - Scoping and Stakeholder Engagement. Table A.1 summarises the responses from statutory and non- statutory bodies in regard to ornithological issues.

Table A.1: Summary of ornithological scoping responses

Consultee & date	Ornithological issues raised
David Patterson, SNH, 20/10/16	Pre-application comments: § Following a submitted report on breeding birds (provided by Alba Ecology) and consideration of birds in developing the proposed site layout, SNH consider that the proposed golf course design can be accommodated without having adverse impacts upon the SSSI breeding bird assemblage. § Post construction disturbance is a possible issue for some breeding birds on Coul Links and so recommend developing an Access Management Plan to manage potential bird disturbance issues. § Recommend that golf course construction period avoids bird breeding season and develop a species protection plan for breeding terns.
David Patterson, SNH, 18/08/16	Email on information held on eider (*Somateria mollissima)* and breeding bird assemblage and supplementary e-mail containing confidential breeding bird data (released under licence on 25/08/16).
David Patterson, SNH, 01/08/16	Scoping Opinion, the proposed development may have potential impacts on: § Waterfowl within the Dornoch Firth & Loch Fleet Special Protection Area (SPA). § Birds linked to the proposed Moray Firth SPA. § Breeding bird assemblage and non-breeding eider within Loch Fleet Site of Special Scientific Interest (SSSI).
David Patterson, SNH, 22/07/16	Provided information on the newly proposed Moray Firth SPA and the recommendation for the ES to address this designated site also.
David Patterson, SNH, 30/06/16	Scope of breeding bird surveys: § Recommend using O'Brien & Smith survey methodology and provided link to coastal bird species which feature as part of the breeding bird assemblage of 'sand dune and saltmarsh' for Loch Fleet SSSI.
David Patterson, SNH, 18/01/16	EIA Screening. Likely significant effects on the environment for: § Dornoch & Loch Fleet SPA, protected for its waterfowl & osprey. § Loch Fleet SSSI protected for its breeding birds.
David Patterson, SNH, 18/11/15	Email agreement on non-breeding bird survey methods following pre-application meeting at The Highland Council (THC): § Bird survey work should be extended to the foreshore, including the north end of the Coul Links at Loch Fleet. § The walk-through method proposed for the dune slacks. Each surveyor should record the time, number and direction of flushing/arriving birds during the survey. § Dawn/dusk vantage point (VP) watches should be undertaken to establish if waterfowl use the dune slack habitats during the night (when they contain water).

Consultee & date	Ornithological issues raised
David Patterson, SNH, 13/10/15	Email file note discussing potential waterfowl from SPA using Coul Links and associated bird survey effort required to establish baseline bird use of Coul Links.
SNH, 11/11/15	Pre-application advice: § Significant development for local area. § Opportunity to secure and consolidate sporting commercial and tourism spheres for the local East Sutherland and East Ross economy.
Alison Searl, Royal Society for the Protection of Birds (RSPB), 22/07/16 & 28/07/16	Email exchange on historical information held & shared on birds from Coul Links.
Aedàn Smith, RSPB 29/08/16	§ Letter written on behalf of Scottish Wildlife Trust, RSPB, Buglife Scotland & Plantlife Scotland. Alarmed & concerned at impact of proposed development on: § Unique example of undeveloped coastal dunes & seasonally flooded dune slacks with a wide range of associated species. § The SSSI, SPA and RAMSAR site(s) at Coul Links.

4.1.2 Policy Context

Relevant regional and national planning policy guidelines, international commitments, legislation and planning policies relevant to the protection, conservation and enhancement of nature conservation interests associated with the development are outlined in Section 3: Planning Policy Context.

The approach used to assess the significance of potential effects of the Proposed Development upon ornithological receptors is set in the context of:

- The Wildlife and Countryside Act 1981 (as amended).
- European Commission (EC) (2011) European Biodiversity Strategy.
- EC Directive 2009/147/EC on the conservation of wild birds (codified version). The so-called 'Birds Directive'.
- EC Directive 1992/43/EEC on the conservation of natural habitats and of wild fauna and flora. The so-called 'Habitats Directive'.
- The Conservation (Natural Habitats, &c.) Regulations 1994. The so-called 'Habitats Regulations'.
- The Conservation of Habitats and Species Regulations 2010.
- The Nature Conservation (Scotland) Act 2004 (as amended).
- The Scottish Government (2014) Scottish Planning Policy.
- The Scottish Government. (2011). Planning Circular 3 2011: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011.
- The Scottish Government. Planning Advice Note 1/2013 Environmental Impact Assessment.
- The Highland-wide Local Development Plan (2012).

- The Highland Biodiversity Action Plan (2010): The Sutherland Biodiversity Action Plan (2003).
- Guidelines for Ecological Impact Assessment in the United Kingdom, (IEEM, 2006 and second edition (CIEEM, 2016).
- Biodiversity Net Gain: Good practice principles for development. (CIRIA, CIEEM and IEMA, 2016).

It is recognised that the term '*Favourable Conservation Status*' (FCS), as articulated within the EC Habitats Directive, is not used in the EC Birds Directive, but SNH (2006) advises on its use and context in relation to birds. Conservation status is considered favourable where:

- Population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitat.
- The natural range of the species is not being reduced, nor is it likely to be reduced in the foreseeable future.
- There is (and will continue to be) a sufficiently large habitat area to maintain its populations on a long-term basis.

Whilst considering a range of potential outcomes that could arise from the proposed development, the assessment reports the effects that are considered *likely* to be significant on the basis of evidence, standard guidance and professional judgement. It is these likely significant effects that the Applicant is obliged to report and that the decision maker is obliged to consider.

4.1.3 Staff and Experience

Alba Ecology Ltd. is a Scottish-based multi-disciplinary ecological consultancy that has worked in the north of Scotland for many years. Alba Ecology staff have led on and contributed to all aspects of Ecological Impact Assessment on many large-scale development projects. This has included the management of Ecological Clerks of Work teams, principal ornithological/ecological surveyors and advisors on planning applications, including expert witness at Public Local Inquiry and production of Environmental Statements and Habitat Management Plans and development of national standardised survey methods.

The ornithological surveyors that worked in the study area between October 2015 and July 2016, were Peter Cosgrove, Robert Potter, Donald Shields and Julie Murray. The surveyors had extensive ornithological field experience, and attended regular training events led by experts, covering areas such as species identification, recording data concisely and accurately, navigation techniques and health and safety. Surveyors were trained to carry out avian surveying and mapping work in a systematic manner, following recognised standardised survey methods, during appropriate times of year and under suitable weather conditions for the species concerned.

4.2 STUDY AREA AND SENSITIVE RECEPTORS

4.2.1 Study Area Definitions

The following three geographic area terms are used in this Annex and associated technical appendices: the ornithological study area (Appendix A.1 / Figure A1), Coul Links (Appendix A.1 / Figure A.2) and the development footprint (Appendix A.1 Figure A3) and are defined in Table A.2.

Table A.2: Study Area/Development Footprint Definitions

Term	Definition
The study area	This refers to the land surrounding the proposed development, it includes the area known as Coul Links, the development footprint and the surrounding area (Figure A.1).
Coul Links	This refers to the part of the study area characterised by dune/coastal habitats (Figure A.2).
The development footprint	This refers to the whole footprint of the proposed development infrastructure within the study area. It includes the access drive, holes, greens, fairways, practice greens, maintenance shed and club house (Figure A.3).

4.2.2 Surveys undertaken

The ornithological studies were conducted in two phases. The first was a desk study of historical information sources (this was added to as and when new data/information became available). The second was a series of targeted field surveys of potentially important and/or legally protected bird species (so called avian receptors) within the study area. All the field surveys were undertaken by experienced ornithological surveyors using recognised survey methods.

4.2.2.1 Winter Birds Survey

Surveyors undertook monthly winter bird surveys focussed within the Coul Links part of the study area. Following discussions with SNH, the adjacent foreshore areas were also included for survey, i.e. areas immediately to the north and east of Coul Links. The following survey methods were undertaken systematically at least once per month between October 2015 and March 2016:

- Surveyors walked through Coul Links, particularly focussing on the dune slack and foreshore habitats. These areas were the focus of winter bird surveys because the habitats present were those potentially used by the waterfowl and wader species listed on designated site citations. This followed the '*Non-breeding waterfowl: general survey methodology*' as outlined by Gilbert *et al.* Bird Monitoring Methods (1998; reprinted 2011). It stated that "*The distribution of most species of waterfowl (principally swans, geese, ducks and waders) during the non-breeding season is restricted largely or wholly to wetland habitats. Many wetland sites represent relatively discrete areas and, with*

most species readily visible within these areas, regular monitoring of total numbers is/can be relatively easy. Simple look see methods, whereby all birds present within a defined area are counted".

- In particular, all designated site species and their relative abundance(s) were recorded on a map showing the location of any birds present on each survey visit. Surveyors used hand-held GPS units to record locations of birds.
- Surveyors tried to coincide their visits with the two hours either side of high tide, in daylight (but it was recognised this was not always be possible given limited day length in winter).
- Surveyors walked in parallel through Coul Links, recording target species if and when they appeared. There were no wetland habitats along the west side of the study area (i.e. away from Coul Links), so surveying was not required or undertaken to the west of Coul Links.
- Once at the north of Coul Links (having walked through any wetland areas within the dune slack habitats), the surveyors walked around the northern end of the study area (along the adjacent shore of Loch Fleet) and then headed south along the eastern edge of the study area, counting species on the beach and foreshore.

It was agreed with SNH that if standing water was found to be present within the Coul Links dune slack habitat, surveyors would also undertake vantage point (VP) watches over the wetted area at dawn and dusk, to establish if waterfowl used the wetted dune slacks at night, using the following survey methodology:

- Surveyors identified where standing water was present (which varied throughout the winter) and selected a vantage point location overlooking the wetted area.
- Surveyors arrived one hour before dusk and one hour before dawn and sat (hidden) at the predetermined vantage point location (surveying for a period of two hours).
- All target bird species flying into, out of, and using, the wetted area were recorded.

An additional final survey visit was undertaken at the end of March 2016, when an experienced surveyor walked over Coul Links and recorded any physical signs of concentrated waterfowl or wader activity, such as droppings or feathers on the ground that may have been left throughout the winter.

4.2.2.2 Breeding Birds Survey

Between April 2016 and July 2016, ornithological surveyors undertook targeted monthly breeding bird surveys within the whole study area. Following advice from SNH, the adjacent beach/foreshore areas were also included for survey, i.e. areas immediately to the north and east of Coul Links.

The following breeding bird survey methods were undertaken:

- The O'Brien and Smith methodology (Gilbert *et al.* 1998) bird survey method was considered the most suitable methodology for surveying lowland breeding birds in open habitats i.e. the areas within Coul Links, being most likely to register relatively cryptic breeding species e.g. shelduck (*Tadorna tadorna*) or grasshopper warbler (*Locustella*

naevia) etc. This generic walkover methodology requires a minimum of three survey visits, but with some flexibility regarding timing due geographical variation and species targeted. In practice, four such survey visits were undertaken in 2016, with walkovers taking place within three hours of dawn or dusk. The methodology is primarily designed to record breeding waders but can be adapted to include other species.

- Woodland birds were surveyed along the southern study area boundary by an adapted version of the point count methodology. Surveyors walked along the edge of the conifer plantation and stopped at a series of locations to record any bird species seen or heard. These counts were undertaken on the same dates O'Brien and Smith surveys were conducted.
- Coul Farm steading was searched for the signs of nesting species such as jackdaw (*Corvus monedula*) and barn owl (*Tyto alba*) etc. Private gardens and buildings along the study area boundary e.g. at Fourpenny and Embo were not entered or surveyed.
- Finally, any notable avian observations made by Alba Ecology ecologists undertaking other surveys within the study area in 2016 were also recorded.

4.3 EXISTING ENVIRONMENT

4.3.1 Designated Sites

Portions of the study area are formally designated for conservation purposes, all within and adjacent to the area known as Coul Links. These designations include part of the Loch Fleet SSSI, which itself is part of the Dornoch Firth and Loch Fleet SPA and RAMSAR site. The Loch Fleet SSSI also overlaps with part of the Moray Firth Special Area of Conservation (SAC) to the east of the mouth of Loch Fleet. Immediately adjacent to Coul Links is the Loch Fleet National Nature Reserve (NNR). During the summer 2016 fieldwork season, SNH announced its intention to designate a new marine conservation site for birds immediately adjacent to the study area, the proposed Moray Firth SPA. The boundaries of these designated sites are illustrated in Figure A.4.

These conservation designations are there to protect the site's individual ecological features, as well as the integrity of the designated site itself. This has important implications for any proposed development within the designated site boundary. Four of these designated site citations specifically mention birds as qualifying features.

4.3.1.1 Loch Fleet SSSI

Loch Fleet SSSI is the most northerly inlet on the east coast of mainland Britain and is located in the Moray Firth basin, about 3km south of Golspie. Extensive intertidal flats support nationally important numbers of wintering birds. The surrounding coastal and woodland habitats and the assemblages of plants and breeding birds they support are also of national importance. It is a relatively large site (1,231 ha), comprising a range of habitats. The following table provides a summary of the Loch Fleet SSSI designated features, which is taken from the Site Management Statement produced by SNH (Table A.3).

Table A.3: Summary of Loch Fleet SSSI features

Natural feature of Loch Fleet SSSI	Condition of feature (year assessed by SNH)	Comments
Eelgrass beds	Favourable, maintained (2000)	Found in the intertidal zone.
Sandflats	Favourable, maintained (2004)	Extensive intertidal flats support rich marine invertebrates, which are an important source of food for birds.
Saltmarsh	Favourable, maintained (2005)	Dominated by saltmarsh grass (*Puccinellia maritima)* & thrift (*Armeria maritima)*, with noteworthy areas at Balblair Bay, Cambusmore and Coul.
Sand dunes	Unfavourable, recovering (2003)	Coul Links is extensive dune system which is unusual in displaying a complete transition from foredune to wooded slacks & has a large range of vascular plants. Ferry Links is slightly less rich but has large areas of heath.
Native pinewood	Unfavourable, recovering (2005)	Present at Balblair & Ferry Wood, and is old established plantation woodland on the site of an old native pinewood.
Vascular plant assemblage	Favourable, maintained (2005)	The SNH site statement refers to the important plant assemblage in the pinewood, saltmarsh & inter-tidal zone.
Breeding bird assemblage	Favourable, declining (2008)	A wide range of coastal & woodland birds breed throughout the site, although 2008 monitoring indicated this was in decline at the time of assessment.
Eider – non-breeding	Unfavourable, no change (2001)	The rich marine invertebrates of the flats attract large numbers of wintering wildfowl & waders including nationally important numbers of eider. These were in decline at the time of assessment.

SNH have determined eight key management objectives to protect the SSSI, maintain and where necessary enhance its features of special interest. These are:

- To maintain the condition, distribution and extent of the eelgrass beds, sandflats and saltmarsh habitats.
- To restore the condition of the sand dune habitat.
- To maintain the condition, distribution and extent of pinewood habitat.
- To maintain the distribution and population size of rare and scarce plants.
- To maintain the population of breeding birds and to avoid significant disturbance to these birds during the breeding season.
- To increase the wintering population of eider and to avoid significant disturbance to this species.
- To maintain non-breeding populations of waterfowl and avoid significant disturbance.
- To maintain the distribution and extent of marine habitats and species which are part of the Moray Firth SAC.

4.3.1.2 Dornoch Firth and Loch Fleet SPA

Dornoch Firth and Loch Fleet SPA is a large area (7,836 ha) covering the two northernmost estuaries in the Moray Basin ecosystem. The Dornoch Firth extends eastwards for 25 km from Newton Point to the point of Tarbat Ness. It is relatively unaffected by industrial development and supports large areas of intertidal flats, heath, sand dunes, saltmarsh and a stretch of rocky shore. Loch Fleet is a narrow-mouthed estuary containing extensive sandflats which are bordered by dunes, pinewood and alderwood. The dune systems at Dornoch Links and Morrich More are of international importance for their flora and geomorphology. The boundaries of the SPA follow those of Dornoch Firth SSSI, Morrich More SSSI, Tarbat Ness SSSI, Loch Fleet SSSI and Mound Alderwoods SSSI except for the exclusion of a thin corridor of land on Morrich More SSSI.

The Dornoch Firth and Loch Fleet SPA qualifies under Article 4.1 of the EC Wild Birds Directive by providing foraging grounds for nationally important numbers of osprey (*Pandion haliatus)*. It also qualifies under Article 4.2 of the Directive by supporting in excess of 20,000 waterfowl. In the five-year period 1989/90 to 1993/94, a winter peak mean of approximately 34,500 waterfowl was recorded, comprising 22,000 wildfowl and 12,500 waders.

The SPA further qualifies under Article 4.2 by supporting internationally important wintering populations (1989/90-93/94 winter peak means) of Icelandic greylag goose (*Anser anser)* (1,146, 1% of total world population, all of which winters in GB), wigeon (*Anas Penelope)* (15,304, 5% of GB, 2% of NW Europe) and bar-tailed godwit (*Limosa lapponica)* (1,184, 2% of GB, 1% of Western Europe). The diverse assemblage of wintering waterfowl also includes nationally important populations of teal (*Anas crecca)*, scaup (*Aythya marila)*, curlew (*Numenius arquata)* and redshank (*Tringa tetanus)*.

The conservation objectives of the Dornoch Firth and Loch Fleet SPA are as follows:

(i) To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

(ii) To ensure for the qualifying species that the following are maintained in the long term:

- population of the species as a viable component of the site;
- distribution of the species within site;
- distribution and extent of habitats supporting the species;
- structure, function and supporting processes of habitats supporting the species; and
- no significant disturbance of the species.

Qualifying species for the SPA are defined as bar-tailed godwit, curlew, dunlin (*Calidris alpine)*, greylag goose, osprey, oystercatcher (*Haematopus ostralegus)*, teal, wigeon and waterfowl assemblage. As the Dornoch Firth and Loch Fleet SPA is a composite site comprising several different areas and different habitats, some of the designated features (the bird species listed above) will not be present at Coul Links.

In summary, the following wintering ornithological features are present in the Dornoch Firth and Loch Fleet SPA: wintering wildfowl; specifically wintering (Icelandic) greylag geese, wigeon and bar-tailed godwit. The SPA's citation of the waterfowl assemblage also includes specific mention of nationally important populations of teal, scaup, curlew and redshank.

4.3.1.3 Dornoch Firth and Loch Fleet RAMSAR site

This international wetland designation (covering 7,836 ha) has been made for the following features: non-breeding bar-tailed godwit, greylag goose, wigeon, waterfowl assemblage, wet woodland, reefs, saltmarsh, intertidal mudflats and sandflats and sand dune. There does not appear to be any publicly available management advice or conservation objectives on-line for this RAMSAR site. According to SNH, RAMSAR sites in Scotland are protected and managed through the SSSI system and Natura designations (http://www.snh.gov.uk/docs/B699305.pdf).

4.3.1.4 Moray Firth SPA

In 2016 SNH consulted on proposals for designating the Moray Firth as an SPA. The qualifying interests are (www.snh.gov.uk/protecting-scotlands-nature/protected-areas/proposed-marine-spas/moray-firth/):

- Breeding and non-breeding: shag (*Phalacrocorax aristotelis)*.
- Non-breeding: eider, goldeneye (*Bucephala clangula)*, common scoter (*Melanitta nigra)*, great northern diver (*Gavia immer)*, long-tailed duck (*Clangula hyemalis)*, red-breasted merganser (*Mergus serrator)*, red-throated diver (*Gavia stellate)*, scaup (*Aythya marila)*, velvet scoter (*Melanitta fusca)* and Slavonian grebe (*Podiceps auritus)*.

None of these largely marine species regularly use Coul Links or the development footprint, although some do use the mouth of Loch Fleet and the marine areas offshore from the eastern study area boundary.

As a consequence of these designated site sensitivities, SNH requested during consultation that ornithological surveys be undertaken during the winter period (defined as October-March) and the breeding season (defined as April-July) in order to inform the proposed development plan and to be part of the evidence base on which the potential impacts of the proposed development could be subsequently assessed.

4.3.2 Likely Important Avian Receptors

Based on the desk study, designated site citations, habitats present and discussions with SNH, the likely important avian receptors were considered to be: (i) wintering SPA waterfowl and waders and (ii) breeding birds identified within the SSSI citation. Furthermore, whilst all bird species observed were recorded during ornithological surveys, SNH general guidance (SNH, 2005; and subsequently amended) identifies three main important overarching bird species lists, which describe legally protected species and species of conservation importance:

- Annex I of the EC Birds Directive;
- Schedule 1 of the UK Wildlife and Countryside Act 1981 (as amended); and
- UK Red-listed Birds of Conservation Concern.

The conservation/legal importance of potentially important ornithological receptors was determined using criteria set out in Table A.4. The importance of a species, from a legal perspective in this listing, does not equate to the importance of them in the proposed development area. The conservation importance of the birds using the proposed development area is evaluated by considering the number of individuals of species present, in the context of geographical populations. A site can hold a protected species of conservation importance, but the population present may not be regionally, nationally or internationally important. Thus, the occurrence of a legally protected species, listed in Table A.4, does not mean the proposed development area holds an important population of that species. It should be noted that all bird species, not just those listed below, are protected under the UK Wildlife and Countryside Act, 1981 (as amended).

Table A.4: Conservation Listing of Potentially Important Ornithological Receptors

Bird species	Conservation listing
Icelandic greylag goose	SPA
Redshank	SSSI, SPA
Greenshank	S1, A1
Curlew	Red L, SPA, SSSI
Bar-tailed godwit	SPA
Dunlin	A1 (*schinzii*), SPA
Ringed plover	Red L, SSSI
Lapwing	Red-L, SSSI
Oystercatcher	SSSI, SPA
Teal	SPA
Wigeon	SPA
Eider	SSSI
Shelduck	SSSI
Species X & Y	See confidential Appendix A.3
Grasshopper warbler	Red-L, SSSI
Spotted flycatcher	Red-L
Stonechat	SSSI
Skylark	Red-L
Linnet	Red-L, SSSI
Yellowhammer	Red-L
Reed bunting	SSSI

Key: A1 = EC Birds Directive Annex I species, S1 = UK Wildlife and Countryside Act Schedule 1 species, Red L = UK Birds of Conservation Concern Red List species, SSSI = listed on Loch Fleet SSSI citation, SPA = listed on the Doroch Firth and Loch Fleet SPA.
Geographical population estimates for potentially important bird species within the study area are provided in Table A.5.

Table A.5: Geographical Population Estimates for Potentially Important Study Area Bird Species (breeding pairs unless marked (w) = winter population estimate)

Bird species	International	UK/GB	Scotland	Regional
Greylag goose	120,000-190,000	46,000	20,000 post breeding birds	N/A
Redshank	280,000-610,000	25,000	11,700-17,500	N/A
Greenshank	75,000-160,000	770	720-1,480	1
Curlew	220,000-360,000	66,000	58,800	385
Bar-tailed godwit (w)	>120,000	36,000	10,000-14,000	N/A
Dunlin	300,000-570,000	8,600-10,600	8,000-10,000	0
Ringed plover	120,000-220,00	5,300	4,900-6,700	N/A
Lapwing	1.7-2.8 million	130,000	71,500-105,600	N/A
Oystercatcher	300,000-450,000	110,000	84,000-116,500	N/A
Teal (w)	920,000-1.2 million	220,000	37,500	N/A
Wigeon (w)	>1.7 million	450,000	76,000-96,000	N/A
Eider (w)	>1.7 million	63,000	64,500	N/A
Shelduck	42,000-65,000	15,000	1,750	N/A
Species X & Y	See Confidential Appendix A.3			
Grasshopper warbler	840,000-2.2 million	16,000	900-3,700	N/A
Spotted flycatcher	14-22 million	36,000	10,000-20,000	N/A
Stonechat	2-4.6 million	59,000	11,600-29,700	N/A
Skylark	40-80 million	1.5 million	290,000-557,000	N/A
Linnet	10-28 million	430,000	70,000-90,000	N/A
Yellowhammer	18-31 million	710,000	140,000-220,000	N/A
Reed bunting	4.8-8.8 million	250,000	15,000-30,000	N/A
Reference	*Birdlife International, 2004*	*Musgrove et al. 2013*	*Forrester and Andrews, 2007*	*Wilson et al. 2015*

4.4 EVALUATION CRITERIA

4.4.1 Impacts Assessed

The main elements of the proposed development which have the potential to impact on ecological receptors both during construction and operation are described in Section 2: Description of Proposed Development and include:

- 18 fairways;
- greens;
- practice greens;
- turfed areas;
- club house;
- maintenance shed;
- access drive;
- tee green link; and
- tees.

The following potential impacts have been assessed in full, in relation to the construction and operation of the proposed development:

- direct loss of foraging habitat and/or breeding habitat for birds;
- indirect loss of foraging habitat and/or breeding habitat for birds, through displacement; and
- disturbance to birds due to human activity at the proposed development.

4.4.2 Evaluating Conservation Importance and Sensitivity

The likely important ornithological receptors identified in the baseline studies were evaluated following best practice guidelines (IEEM 2006; 2016). The site's ornithological receptors determine its nature conservation interest or value. Guidance on EIA sets out categories of ecological or nature conservation importance that relate to a geographical framework (e.g. international through to local) together with criteria and examples of how to place a site (defined by its attributes) into these categories. It is generally straightforward to evaluate sites or species populations designated for their international or national importance (as criteria for defining these exist), but for sites or populations of regional or local importance, criteria may not be easily defined. Where possible, the potential importance of an ornithological receptor in the site is determined within a defined geographical context using categories outlined in Table A.6.

Table A.6: Summary of Geographic Importance

Importance term	Definition
International	>1% of European Community (EC) bird population
National	>1% of United Kingdom (UK) bird population
Regional	>1% of Natural Heritage Zone bird population
Local	Within local area

According to SNH (2006), the top three geographical tiers (international, national and regional) are the most important within the context of the EIA. This means that if there is an effect at this population level, it is considered '*significant*' in terms of the EIA regulations. For breeding bird species, SNH uses Natural Heritage Zones (NHZ) or Natural Heritage Futures (rebrand) as the appropriate regional biogeographical unit of assessment. Twenty one zones covering Scotland have been drawn to reflect biogeographical differences between zones, with a high level of coherence within each zone. According to SNH (2006) "*the question as to whether there is an impact on a* [bird] *species regionally therefore, may be translated into the question as to whether there is an impact within the relevant NHZ*. The proposed development is within the NHZ 21: The Moray Firth (2002; updated 2009).

Recently, the Scottish Wind Farm Bird Steering Group (with the British Trust for Ornithology) published a systematic review of some important NHZ bird populations across Scotland (Wilson *et al.,* 2015); this is the only published source of such regional populations. Unfortunately, Wilson's work only covered three of the potentially important study area breeding bird species, so regional population metrics are unavailable for most species recorded during surveys.

The importance attached to a species can also be determined to an extent according to legislative status. Some receptors are subject to a general level of legal protection through the UK Wildlife and Countryside Act 1981 (as amended), Nature Conservation (Scotland) Act 2004 and others under the EC Birds Directive. Another factor when assessing potential impacts is the sensitivity of the ornithological receptor under consideration (e.g. high, medium or low), which can vary in space and time. Different receptors respond differently to stimuli, making some particularly sensitive to development activities and others less so. Professional judgement is used when assigning a sensitivity value to an ornithological receptor and this is recorded in a clear and transparent way. It should be noted that to avoid confusion, legal protection requirements need to be considered separately from conservation value (IEEM, 2006; 2016).

By way of example, sensitivity is determined according to species behaviour, using broad criteria set out in Table A.7. Behavioural sensitivity can differ between species and between individuals of the same species. Therefore, sensitivity is likely to vary with both the nature and context of the disturbance activity as well as the experience and even personality of the individual bird. Sensitivity also depends on the activity the species is undertaking and the type of disturbance activity. For example, a species is likely to be less tolerant of disturbance close to its nest during the breeding season, than at other times of year and a species which has been shot at is likely to be less tolerant of disturbance than one which has not. Thus, sensitivity changes in both space and time with different activities.

Table A.7: Summary of Sensitivity Criteria

Sensitivity term	Definition
High	Species occupying remote areas away from human activities and exhibiting strong and long-lasting reactions to disturbance events.
Medium	Species that appear to be warily tolerant of human activities and exhibiting short-term reactions to disturbance events.
Low	Species occupying areas subject to frequent human activity and exhibiting mild and brief reaction to disturbance events.

4.4.3 Magnitude

Effects on ornithological receptors may be beneficial (positive), neutral or adverse (negative). The characteristics and significance of an effect involve several factors such as the scale (e.g. number of individuals killed or displaced by an activity, or hectares (ha) of habitat lost), extent (the area over which an impact occurs), duration (the time over which an impact occurs), reversibility (whether an impact is temporary or permanent) and its timing or frequency.

A reversible (temporary) effect is one from which spontaneous recovery is possible, or for which effective mitigation is possible and a commitment to undertake this mitigation has been made. An irreversible (permanent) effect is one from which recovery is not possible within a reasonable timescale, or for which there is no reasonable chance of successful action being taken to reverse it.

The duration of a predicted impact can be important, with three time frames used in the assessment: short term (two years or less), medium term (two-five years) and long term (life-time of the golf course). The timing of an impact can also have a large influence on its effect. Finally, a level of confidence (whether the impact is likely) is attached to predicted effect.

Magnitude refers to the 'size' or 'amount' of a predicted impact (i.e. change). Changes on ornithological receptors are therefore judged in terms of their magnitude in space and time. There are many different ways in which these can be defined and it is important that whatever method is used, clear definitions are provided (IEEM, 2006). Professional judgement is used to synthesise the many attributes of magnitude (such as the effect's timing, scale, frequency, duration and reversibility) on species of conservation importance and these are reported.

In this assessment there are considered to be four levels of magnitude of change (Table A.8) and it is assumed these are adverse, unless otherwise stated.

Table A.8: Levels of Magnitude of Change

Term	Definition
Major (high)	Total/near total loss of a population due to mortality or displacement. Total/near total loss of breeding productivity in a population, due to disturbance. Guide: >50% of population affected.
Moderate (medium)	Moderate reduction in the status or productivity of a population, due to mortality or displacement or disturbance. Guide: 10-49% of population affected.
Minor (low)	Small but discernible reduction in the status or productivity of a population, due to mortality or displacement or disturbance. Guide: 1-9% of population affected.
Negligible (or none)	Very slight reduction in the status or productivity of a population, due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the 'no change' situation. Guide: < 1% population affected.

4.4.4 Significance

Consideration of the importance and sensitivity of receptors and magnitude of impacts or changes helps to determine the likely significance of a potential effect. In the context of the EIA Regulations, each likely effect is evaluated and classified as either significant or not significant, using professional judgement, evidence and best practice guidance. In this assessment, a significant effect on an ornithological receptor is defined following IEEM (2006), as "*an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a defined geographical area*". Thus, the geographical terms of reference at which a predicted effect may be considered significant must also be defined (e.g. an effect on a bird species evaluated to be of regional importance is either significant or not at the regional level). Using the four levels of magnitude of change shown in Table A.8 and the four levels of importance shown in Table A.6, a matrix comparing the level effect on avian receptors can be determined - see Table A.9. The effects that are considered major or moderate are defined as significant in terms of the EIA Regulations. Those effects that are considered minor or negligible are defined as not significant.

Table A.9: Matrix showing level of effect, related to importance of feature and magnitude of change

Importance of avian feature	Magnitude of Change			
	Major	Moderate	Minor	Negligible
International	Major	Major	Moderate	Negligible
National	Major	Moderate	Minor	Negligible
Regional	Moderate	Moderate	Minor	Negligible
Local	Minor	Minor	Negligible	Negligible

4.4.5 Limitations to the Assessment

Where assumptions within the assessment are made, these are explicitly identified and explained. Similarly, limitations in methods and uncertainty over parameter values and species' ecology are also identified and discussed, particularly where this is likely to affect the outcome of the assessment. As with any environmental assessment there will be elements of uncertainty. Where there is uncertainty, this is identified and reported, along with the measures taken to try and reduce it, assumptions made and an explanation as to the likely extent that any uncertainties are likely to affect the conclusions. In circumstances where there is uncertainty; evidence, expert opinion, best practice guidance and professional judgement have been used to evaluate what is biologically likely to occur if the proposed development is constructed.

The level of certainty of impact prediction varies depending upon a range of parameters discussed already. For some elements in the environment it is relatively straightforward to assess and quantify the predicted impact (e.g. the area of habitat that is likely to be lost or restored). However, other impacts are less certain because there can be a range of possible scenarios. The main limitations in this assessment are common to most ecological assessments because:

- Baseline surveys undertaken are based on sampling techniques, not absolute censuses. Results give an indication of the numbers of ornithological receptors recorded at the particular times that surveys were carried out. Species occurrence changes over time and therefore the results presented in this Environmental Statement are snapshots in time. Importantly, no information gaps were identified in the baseline survey data that would prevent assessments in line with the requirements of the EIA Regulations being undertaken.

- Putting ornithological survey results into a wider geographical context is sometimes difficult because many species have not been systematically surveyed to provide regional populations estimates. Thus, defining a species population as locally or regionally important is potentially challenging, because local or regional population estimates do not exist for some bird species. Whenever such uncertainty exists, professional judgement and published evidence is used and populations in the study area or site have been assumed to be at their highest potential level of geographical/ornithological importance.

4.5 RESULTS

A total of 56 bird species were recorded during winter and breeding bird surveys within the study area (Table A.10 + 2 additional species detailed in Confidential Appendix A.3).

Table A.10: Bird species recorded using study area between October 2015 & July 2016

Bird Species	Conservation Listing
Icelandic greylag goose	SPA
Redshank	SSSI, SPA
Greenshank	S1, A1
Curlew	Red L, SPA, SSSI
Bar-tailed godwit	SPA
Dunlin	A1 *(schinzii*), SPA
Ringed plover	Red L, SSSI
Lapwing	Red L, SSSI
Oystercatcher	SSSI, SPA
Teal	SPA
Wigeon	SPA
Eider	SSSI
Shelduck	SSSI
Species X & Y	See Confidential Appendix A.3
Grasshopper warbler	Red L, SSSI
Spotted flycatcher	Red L
Stonechat	SSSI
Skylark	Red L
Linnet	Red L, SSSI
Yellowhammer	Red L
Reed bunting	SSSI

Key: A1 = EC Birds Directive Annex 1 species, S1 = UK Wildlife and Countryside Act Schedule 1 species, Red L = UK Birds of Conservation Concern Red List species, SSSI = listed on Loch Fleet SSSI citation, SPA = listed on the Dornoch Firth and Loch Fleet SPA.

4.5.1 Wintering Birds

The results of the 2015-2016 wintering bird surveys are provided in Technical Appendix A.1. Coul Links Winter 2015-2016 Bird Survey Report and the following species summaries are taken from there.

4.5.1.1 Redshank

Very low numbers of redshank were recorded during surveys and all birds were present at the north of the site on the Loch Fleet foreshore or flying along the beach foreshore to the east of Coul Links. No redshank were recorded within the Coul Links dune slack area.

4.5.1.2 Curlew

Single curlews were recorded on two occasions, once in the north on the Loch Fleet foreshore and once on the reseeded grassy fields southwest of Coul Farm. No curlew were recorded within the Coul Links dune slack area.

4.5.1.3 Dunlin

One flock of 150 dunlin was recorded on the foreshore of the beach to the east of Coul Links. None were recorded during dawn and dusk VP surveys. No dunlin were recorded within the Coul Links dune slack area.

4.5.1.4 Oystercatcher

Small-moderate numbers of oystercatchers (range 2-50 birds) were recorded on the Loch Fleet foreshore and the beach east of Coul Links. No oystercatchers were recorded within the Coul Links dune slack area.

4.5.1.5 Greylag goose

One flock of six greylag geese was recorded on the reseeded grassy fields southwest of Coul Farm during dawn and dusk VP surveys and flew off out to sea. No greylag geese were recorded using the Coul Links dune slack area.

4.5.1.6 Teal

Teal were regularly recorded in small-moderate numbers (range 2-25 birds) in Coul Links during the 2016 winter months (January-March), within the dune slack area. The birds were associated with standing water within the main wet dune slack habitats (e.g. at NH815942, NH814946, NH813947 and NH814938). None were recorded in the 2015 winter months (October-December), when the dune slacks were dry.

4.5.1.7 Wigeon

Variable numbers of wigeon (range 5-100 birds) were recorded on four occasions during winter surveys, including within the dune slack area. Five wigeon were recorded during December, when they flew across Coul Links (which was dry) and landed on the foreshore at NH817942. Three different flocks were recorded using wetted dune slack habitats in March, including a flock of ca. 100 wigeon at NH813945.

4.5.1.8 Eider

Variable numbers of eiders (range 20-500 birds) were recorded during winter surveys. The eiders were only recorded on the sea or Loch Fleet, with none in the Coul Links dune slack area.

4.5.1.9 Other non SSSI/SPA species

The only other regularly recorded non SSSI/SPA waterfowl and wader species on Coul Links during winter surveys were mallard (range 1-16 birds) and snipe (range 1-22 birds). During December two greenshank were recorded on a dune slack at NH814942. Long-tailed ducks were recorded in small numbers (range 4-8 birds), and associated with the eider flock off the mouth of Loch Fleet. Red-breasted mergansers were recorded in low numbers at the mouth of Loch Fleet (range 2-3 birds). Low-moderate numbers of pink-footed geese *Anser brachyrhynchus* (range 6-300 birds) were irregularly recorded feeding on the reseeded grassy fields southwest of Coul Farm.

4.5.2 Breeding Birds

The results of the 2016 breeding bird surveys are provided in Technical Appendix A.2 Coul Links Summer 2016 Bird Survey Report and the following species summaries are taken from there. During breeding bird surveys between April and July 2016 a total of 32 potential breeding species were recorded in the study area and an additional nine species were recorded, but with no evidence of breeding. Two Schedule 1 species were confirmed breeding, details of which are provided separately in a Confidential Appendix A.3.

4.5.2.1 Curlew

No evidence of breeding, but one dead adult curlew was found freshly predated by a peregrine, in Coul Links in April during a non-ornithological survey.

4.5.2.2 Eider

No evidence of breeding, but present at the mouth of Loch Fleet throughout April-July in variable numbers. Eider was not recorded within the Coul Links dunes during surveys.

4.5.2.3 Grasshopper warbler

One bird recorded singing in dunes at NH812951 during July, but not recorded previously. Assumed to be breeding within the SSSI. The one pair represents 0.03-0.1% of the Scottish breeding population; no comparative regional population metrics are available.

4.5.2.4 Lapwing

Two pairs recorded breeding, one pair with two chicks at NH806939 and one pair at NH804949; the birds were seen to fly across into Coul Links and land on the salt marsh habitat in the north of the study area. Recorded breeding within the SSSI. The two pairs represent 0.002-0.003% of the Scottish breeding population; no comparative regional population metrics are available.

4.5.2.5 Linnet

One pair recorded breeding at NH806946, on the boundary of the SSSI. The one pair represents 0.001% of the Scottish breeding population; no comparative regional population metrics are available.

4.5.2.6 Oystercatcher

Four pairs recorded breeding, with nests at NH804951, NH809939, NH806939 and NH808944. Recorded breeding within the SSSI. The four pairs represent 0.003-0.005% of the Scottish breeding population; no comparative regional population metrics are available.

4.5.2.7 Redshank

One pair nested and was seen with two chicks centred at NH804947. Recorded breeding within the SSSI. The one pair represents 0.006-0.009% of the Scottish breeding population; no comparative regional population metrics are available.

4.5.2.8 Reed bunting

Four pairs recorded in wet scrub along the disused railway line, within but close to boundary of the SSSI. The four pairs represent 0.01-0.03% of the Scottish breeding population; no comparative regional population metrics are available.

4.5.2.9 Ringed plover

One pair bred on Coul Links in northeast, along foreshore at NH813953. Recorded breeding within the SSSI. The one pair represents 0.02% of the Scottish breeding population; no comparative regional population metrics are available.

4.5.2.10 Shelduck

No evidence of breeding within the SSSI, but one pair recorded on open grassy field at NH810943 in June and four birds together in field at NH808944 also in June.

4.5.2.11 Stonechat

One pair breeding on Coul Links at NH817935. Recorded breeding within the SSSI. The one pair represents 0.003-0.009% of the Scottish breeding population; no comparative regional population metrics are available.

4.5.2.12 Teal

No evidence of breeding. Seven teal were recorded flying together at NH815937 in April during a non-ornithological survey and a single male was recorded in the same area in July.

4.6 EVALUATION OF EFFECTS

4.6.1 Designated Sites

This section describes the potential impacts on ornithological features of designated sites that could arise from the construction and operation of the proposed development. These designated sites are:

- Loch Fleet SSSI (feature: breeding bird assemblage and non-breeding eider).
- Dornoch Firth and Loch Fleet SPA and RAMSAR site (feature: non-breeding bar-tailed godwit, curlew, dunlin, greylag goose, osprey (foraging), oystercatcher, teal, wigeon and waterfowl assemblage).
- Moray Firth pSPA (feature: breeding and non-breeding shag; non-breeding eider, goldeneye, common scoter, great northern diver, long-tailed duck, red-breasted merganser, red-throated diver, scaup, Slavonian grebe and velvet scoter).

Based on targeted breeding bird surveys, the evidence collected demonstrates that several of the bird species mentioned in the Loch Fleet breeding bird assemblage citation, regularly occur within and adjacent to the proposed development. Consequently, further consideration of potential impacts and associated effects on the Loch Fleet SSSI is required.

Based on targeted wintering bird surveys, the evidence collected demonstrates that several of the bird species mentioned in the Dornoch Firth and Loch Fleet SPA citation, regularly occur within and adjacent to the proposed development. Consequently further consideration of potential impacts and associated effects on the Dornoch Firth and Loch Fleet SPA is required.

Based on targeted bird surveys, the evidence collected demonstrates that none of the Moray Firth pSPA species mentioned in the citation, regularly occur within and adjacent to the proposed development. These predominantly marine species occur well away from the proposed development. Non-breeding eider, long-tailed duck and red-breasted merganser were recorded on the sea or at the mouth of Loch Fleet. Given the proposed development avoids both of these areas, there is no likely interaction with these avian receptors. Having considered the potential impacts of proposed development on the qualifying species of the Moray Firth pSPA and based on evidence collected, it can be concluded that there will be no likely significant effects on the qualifying features or site integrity. Therefore, there is no need for an Appropriate Assessment (a Habitats Regulations Assessment) and the Moray Firth pSPA is dropped from further consideration.

4.6.1.1 Loch Fleet SSSI

Of the Loch Fleet SSSI breeding bird assemblage, the following species were recorded breeding within proximity to the proposed development in the SSSI: oystercatcher, ringed plover, lapwing, redshank, grasshopper warbler, stonechat, linnet, reed bunting and a Schedule 1 species (see Confidential Appendix A.3). These species are considered to have low sensitivity, i.e. they occupy areas subject to frequent human activity/management and exhibit mild and brief reaction to disturbance events with no long-term adverse effects.

- Oystercatcher – none of the four pairs was within the development footprint.
- Ringed plover – the single pair was not within the development footprint.
- Lapwing - the two pairs were not within the development footprint, although one was adjacent to it (Hole 3).
- Redshank - the single pair was not within the development footprint.
- Grasshopper warbler - the single pair was not within the development footprint.
- Stonechat - the single pair was not within the development footprint, but adjacent to it (Hole 15).
- Linnet - the single pair was not within the development footprint.
- Reed bunting – two of the four pairs were within/adjacent to the development footprint (Holes 9 and 12).
- It should be noted that the actual nest sites of many of the species listed above were not located (exceptions were lapwing, oystercatcher and ringed plover where nests were found). With the exception of these three waders, the gird references reported refer to likely territory centres based on results from multiple survey visits across the breeding season.

Based on the evidence collected on breeding birds within Loch Fleet SSSI, SNH considers that the proposed development layout can be accommodated without having adverse impacts upon the breeding bird assemblage and we concur with this assessment. Consequently, having considered the potential impacts of proposed development on the breeding bird assemblage of the Loch Fleet SSSI and based on evidence collected, it can be concluded that there will be no likely significant effects on the qualifying features or site integrity.

4.6.1.2 Dornoch Firth and Loch Fleet SPA and RAMSAR site

Based on targeted wintering surveys, two of the non-breeding bird species mentioned in the Dornoch Firth and Loch Fleet SPA and RAMSAR site citations, regularly occurred within Coul Links and adjacent to the development footprint. Teal were regularly recorded in small-moderate numbers (2-25 birds) in the study area during winter 2015-2016 when water was present within the dune slack habitats at Coul Links. Variable numbers of wigeon were recorded (5-100 birds) on four occasions during winter 2015-2016 in the study area when water was present within the dune slack habitats at Coul Links.

No golf course infrastructure is planned for habitat areas regularly used by wintering SPA species, so no direct adverse habitat loss of SPA bird habitat is predicted. The design layout deliberately crosses over, rather than goes through, the main north-south dune slack habitat at Holes 15, 16 and 17. Consequently, no direct or indirect, significant dune slack habitat loss is predicted.

The main way wintering teal and wigeon are likely to be affected by the proposed development is through the cessation of winter wildfowl shooting at Coul Links. The existing landowner currently exercises their legal right to shoot wildfowl (including teal and wigeon) on Coul Links within the SPA. Numbers killed vary annually, but usually several dozen are shot each winter. This activity has taken place at Coul Links over many decades during the winter shooting season. In winter 2015-2016, bird surveyors noted that the wildfowl recorded in wetted dune slack habitats (teal, wigeon and mallard) were very wary of humans, taking flight at hundreds of metres distance from the observer(s). As part of the proposed development plans, the shooting of these SPA birds (indeed all wildfowl shooting) would be guaranteed to cease within the entirety of Coul Links for the lifetime of the proposed development. This would lead to two immediate and significant ornithological benefits within the SPA.

- Teal and wigeon from the SPA would no longer be shot and killed, resulting in greater winter survival of both these species within the SPA. The predicted effect would be a reduction in direct mortality of SPA qualifying species.
- The disturbance to SPA wildfowl associated with wildfowl shooting throughout the winter would no longer take place (which causes the birds which are not shot to expend valuable energy looking for 'safe areas' elsewhere to rest and feed). Studies have shown that regular disturbance to wildfowl causes these birds to lose weight through increased energy use, resulting in lower fitness and overall winter survival, i.e. once shooting of the SPA wildfowl ceases, these birds will find sanctuary during the winter within the wetted dune slack habitats at Coul Links, rather than danger. The predicted impact would be a reduction in indirect mortality of SPA qualifying species.

Over time, it is considered highly likely that the population of wintering SPA wildfowl using the Coul Links part of the SPA, will increase substantially as the birds learn that Coul Links is neither dangerous nor disturbed (the current winter baseline conditions). Thus, the likely value of Coul Links for SPA wintering wildfowl is predicted to increase substantially in the long-term with the development of the golf course and its associated management due to the guaranteed cessation of wildfowl shooting. Consequently, significant beneficial

impacts (of moderate magnitude) resulting from the cessation of winter wildfowl shooting within the Dornoch Firth and Loch Fleet SPA and RAMSAR site are predicted.

Potential uncertainty associated with this element of the proposed development, relates to the replacement of shooting related disturbance with potential golf related disturbance. The Applicant will close the golf course during the winter months when SPA birds use the wetted dune slack habitats at Coul Links. Based on ornithological monitoring, the dune slacks are typically wetted during the winter between December and the end of March. Thus, the golf course will be closed to golfers during these months and only be operational outside of these months (i.e. April-November).

4.6.2 Wider Countryside Birds

Of the wider countryside bird species present, only one potentially sensitive and relatively uncommon species breeds within the study area. Further details of this Schedule 1 breeding species is provided within the Confidential Appendix A.3.

No significant adverse impacts on wider countryside birds are predicted and consequently the 'wider countryside birds' receptor is dropped from further consideration.

4.7 COMMITTED MITIGATION MEASURES

The following mitigation measures related specifically to ornithology are part of in-built design with the proposed development and are considered to be 'committed' mitigation measures and treated accordingly with the evaluation undertaken within the ES:

- Cessation of winter wildfowl shooting.
- Closure of the proposed golf course during the winter.
- A public access plan that deliberately focusses public access away from potentially sensitive areas for important ornithological receptors.

4.8 RESIDUAL EFFECTS

There will be no significant adverse effects on the ornithological features of the Loch Fleet SSSI.

There will be no significant adverse effects on wider countryside bird species.

There will be a moderate significant beneficial effect on the ornithological features of the Dornoch Firth and Loch Fleet SPA and RAMSAR site.

4.9 SUMMARY OF EFFECTS

The summary of likely effects from the construction and operation of the proposed development on ornithological receptors is provided in Table A.11.

Table A.11: Summary of Effects

Project Phase	Receptor	Sensitivity	Description of Change (Pre-mitigation)	Level of Effect (Pre-mitigation)	Mitigation Measure	Magnitude of Change (Post-mitigation)	Level of Effect (Post-mitigation)	Nature of Effect			
								Positive/ Negative	Permanent/ Temporary	Reversible/ Irreversible	Residual Significance
Construction	Wider countryside bird species	Local	Small loss of habitat	Negligible	None, other than breeding birds protection plan	Negligible	Negligible	Negative	Temporary	Reversible	Not significant
Operation	Wider countryside bird species	Local	Small loss of habitat	Negligible	Cessation of wildfowl shooting, winter closure & access plan	Negligible	Negligible	Negative	Permanent	Irreversible	Not significant
Construction	Loch Fleet SSSI	National	Small loss of habitat	Negligible	None, other than breeding birds protection plan	Negligible	Negligible	Negative	Temporary	Reversible	Not significant
Operation	Loch Fleet SSSI	National	Cessation of wildfowl shooting	Moderate	Cessation of wildfowl shooting, winter closure & access plan	Moderate	Moderate	Positive	Permanent	Irreversible	Significant
Construction	Dornoch Firth & Loch Fleet SPA & RAMSAR	International	Small loss of habitat not used by SPA species	Negligible	None, other than breeding birds protection plan	Negligible	Negligible	Negative	Temporary	Reversible	Not significant
Operation	Dornoch Firth & Loch Fleet SPA & RAMSAR	International	Cessation of wildfowl shooting	Moderate	Cessation of wildfowl shooting, winter closure & access plan	Moderate	Moderate	Positive	Permanent		Significant

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5.0 ANNEX B: ECOLOGY

5.1 SCOPE OF ASSESSMENT

This Annex considers the potential impacts of the proposed development on the ecology of the site and surrounding study area, during construction and operation. The assessment is based on the Guidelines for Ecological Impact Assessment (EcIA) in the United Kingdom (IEEM, 2006; CIEEM, 2016); and A Handbook on Environmental Impact Assessment (SNH, 2005).

The baseline ecological conditions were assessed through targeted field surveys of important and legally protected ecological receptors identified from a desk study and from the scoping opinions. The scope of the ecological assessment includes habitats, flora and fauna but excludes potential effects on birds, which are considered separately in Annex A: Ornithology.

The scope of the assessment involved the following key stages:

- Reference to relevant legislation, policy and guidance.
- Identification of likely zone of influence of the proposed development.
- Identification of potentially important ecological receptors (baseline conditions) likely to be affected by the proposed development.
- Evaluation of potentially important ecological receptors and features likely to be affected by the proposed development.
- Identification of likely impacts and magnitude of the proposed development works on potentially important ecological receptors.
- Assessment of the likely significant effects of the proposed development, including any mitigation and enhancement measures and definition of any residual significant effects.
- The term 'receptor' is used throughout the Environmental Impact Assessment (EIA) process and is defined as the element in the environment affected by a development (a species or habitat in the case of ecology). The term 'impact' is also used commonly throughout the EIA process and is defined as a change experienced by a receptor (this can be positive, neutral or adverse). The term 'effect' is defined as the consequences for the receptor of an impact. The use of the word 'effect' rather than 'impact' at the end of species and designated site accounts is based on the wording of the EIA Regulations which require determination of '*likely significant effects'.*

5.1.1 Scoping Opinion

Details of scoping opinions are presented in Section 4: Scoping and Stakeholder Engagement. Table B.1 summarises the responses from statutory and non- statutory bodies in regard to ecological issues raised.

Table B.1: Summary of Ecological Scoping Responses

Consultee & date	Ecological issues raised
David Patterson, SNH, 01/06/17	SNH recently made aware of an additional ecological sensitivity potentially present at Coul Links: Rough horsetail (*Equisetum hyemale*) was known to grow at Coul Links and is nationally scarce. It was recorded 25 years ago outwith the current boundary of the SSSI, being very close to Embo.
David Patterson, SNH, 10/12/16	SNH recently made aware of additional ecological sensitivities potentially present at Coul Links: Grassland fungi, specifically waxcap fungi (*Hygrocybe*). An assessment of impacts should be included within the ES. Proposed holes 4 and 5 support areas of lichen heath. These areas do not appear to be featured within the 1991 lichen survey by Alan Fryday. The *Cladonia mitis* recorded by Fryday on Coul Links is assessed as Near Threatened against IUCN Red List criteria. Of the known 61 species of bryophytes recorded on Coul Links, only one, *Tortella fragilis* is listed as Nationally Rare and Vulnerable against the IUCN criteria.
Aedàn Smith, RSPB 16/10/16	Objected to consultation process and meaningful engagement with RSPB. Reiterated strong concerns towards a golf course at Coul Links.
Aedàn Smith, RSPB 29/08/16	Letter written on behalf of Scottish Wildlife Trust, RSPB, Buglife Scotland & Plantlife Scotland. Alarmed & concerned at impact of proposed development on: Unique example of undeveloped coastal dunes & seasonally flooded dune-slacks with a wide range of associated species. The SSSI, SPA and RAMSAR site(s) at Coul Links.
David Patterson, SNH, 01/08/16	Scoping Opinion, issues raised: Impacts on the sand dune habitat within the Loch Fleet Site of Special Scientific Interest (SSSI) should be surveyed by someone experienced and the NVC should employ British Plant Communities – Volume 5. The data provided should allow SNH to overlay NVC survey results with their mapping data sets (i.e. ARC GIS). Need to provide information on approach taken to layout 'minimal in its design', i.e. as indicated for similar sites like Sand Hills, Nebraska. The course design presented should show reductions in impacts on SSSI. Need to show habitat loss and modification for all the different NVC sand dune communities e.g. green-keeping vehicle routes, rough management, golf walk ways and any locations of proposed cut and fill. Policy on herbicide and pesticide use needs to be provided. ES should identify if there are any impacts on sand dune habitat from irrigation and link the hydrology studies being undertaken. ES should highlight positive management plans for e.g. control of scrub as well as invasive species (thistles, nettles, bracken etc.). Sand dune restoration should be explored within the ES where conditions allow. Understand that saltmarsh habitat at Coul Links will remain unaffected. Clarification on this should be provided in the ES. Impacts on the rare Fonseca's seed-fly (*Botanophila fonsecai*) and associated species protection plan. The impacts of the proposal should be assessed against each of the SSSI features (which are defined as nationally important within the context of

Consultee & date	Ecological issues raised
	EIA). To help make that assessment, the following aspects should be considered: i) The extent to which adverse impacts undermine the management objectives of the SSSI as set out in the Site Management Plan. ii) The extent to which the impacts might affect the condition of the SSSI interests. iii) The permanence of the impacts; and iv) The impacts combined with other proposals or activities.
David Patterson, SNH, 30/06/16	Scope of ecological surveys: Important that vegetation surveys follows baseline NVC surveys as amended by Tom Dargie, through Sand Dune Vegetation Survey of Scotland. Note that rock-rose (*Helianthemum nummularium*) at Coul Links supports a coastal population of northern brown argus butterfly (*Aricia artaxerxes*). The range of protected mammal surveys proposed is generally adequate. However bats should also be surveyed following best practice guidance. Otters use the sand dune system, particularly during non-summer months. The overall survey plans for the rare Fonseca's seed-fly are adequate, but more detail is required.
David Patterson, SNH, 13/10/15	Consultation discussion. Recommended that: Several course layout options should be provided for consideration. Consider issue of Fonseca's seed-fly being present in the general area. Suggest that the proposal should move to a formal pre-application meeting with The Highland Council (THC) to help move discussion forward and identify survey requirements.

The scoping opinions identified key ecological surveys that that were required to consider the potential impacts of the proposed development on the ecology of the study area. These studies included:

- Phase 1 habitat survey;
- National Vegetation Classification (NVC) survey;
- Groundwater Dependant Terrestrial Ecosystem (GWDTE) survey;
- Protected terrestrial mammals survey;
- Bat survey; and
- Fonseca's seed-fly survey.

Full details of ecological survey methodologies and results can be found in Technical Appendix B.1: Coul Links Natural Heritage Desk Study, Technical Appendix B.2: Phase 1 Habitat, NVC and GWDTE Survey Report, Technical Appendix B.3: Protected Terrestrial Mammal Survey Report, Technical Appendix B.4 Bat Survey Report and Technical Appendix B.5: Fonseca's Seed-fly Report. Additional, supporting information is provided in Technical Appendix B.6: Aerial comparisons: 1988, 2009 and 2016.

5.1.2 Policy Context

Relevant regional and national planning policy guidelines, international commitments, legislation and planning policies relevant to the protection, conservation and enhancement of nature conservation interests associated with the development are outlined in Section 3: Policy Framework.

The approach used to assess the significance of potential effects of the proposed development upon ecological receptors is set in the context of:

- The Wildlife and Countryside Act 1981 (as amended).
- European Commission (EC) (2011) European Biodiversity Strategy.
- EC Directive 1992/43/EEC on the conservation of natural habitats and of wild fauna and flora. The so-called 'Habitats Directive'.
- The Conservation (Natural Habitats, &c.) Regulations 1994. The so-called 'Habitats Regulations'.
- The Conservation of Habitats and Species Regulations 2010.
- The Nature Conservation (Scotland) Act 2004 (as amended).
- Scottish Government (2014) Scottish Planning Policy.
- Scottish Government (2011) Planning Circular 3 2011: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011.
- Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2006).
- Guidelines for Ecological Impact Assessment in the UK and Ireland, second edition (CIEEM, 2016).
- A Handbook on Environmental Impact Assessment (SNH, 2005).
- Land-use planning system SEPA guidance note 4: planning guidance on windfarm developments. LUPG-GU4 Version 7 (SEPA, 2014a).
- 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. LUPG-GU31 Version 2 (SEPA, 2014b).
- The UK Biodiversity Action Plan (BAP) 2004.
- Strategic Plan for Biodiversity 2011–2020' Convention on Biological Diversity, 2010.
- The Scottish Government. Planning Advice Note 1/2013 Environmental Impact Assessment.
- The Highland-wide Local Development Plan (2012).
- The Highland Biodiversity Action Plan (2010): The Sutherland Biodiversity Action Plan (2003).
- Biodiversity Net Gain: Good practice principles for development. (CIRIA, CIEEM and IEMA, 2016).

Whilst considering a range of potential outcomes that could arise from the proposed development, the assessment reports the effects that are considered *likely* to be significant on the basis of evidence, standard guidance and professional judgement. It is these likely significant effects that the applicant is obliged to report, and that the decision maker is obliged to consider.

5.1.3 Staff and Experience

Alba Ecology Ltd. is a Scottish-based multi-disciplinary ecological consultancy that has worked in the north of Scotland for many years. Alba Ecology staff have led on and contributed to all aspects of Ecological Impact Assessment on many large-scale development projects, including the management of Ecological Clerks of Work teams, principal ornithological/ecological surveyors and advisors on planning applications, including expert witness at Public Local Inquiry and production of Environmental Statements and Habitat Management Plans and development of national standardised survey methods.

The ecological surveyors that worked in the study area between October 2015 and December 2016 were Peter Cosgrove, Kate Massey, Robert Potter, Donald Shields and Julie Murray. The surveyors had extensive ecological field experience, and attended regular training events led by experts, covering areas such as species identification, recording data concisely and accurately, navigation techniques and health and safety. Surveyors were trained to carry out ecological surveying and mapping work in a systematic manner, following recognised standardised survey methods, during appropriate times of year and under suitable weather conditions for the species concerned. When detailed technical advice was required, e.g. Fonseca's seed-fly (*Botanophila fonsecai*) surveys it was commissioned from recognised specialists. The bat roost and activity survey undertaken around Coul Farm House and steadings was conducted by A9 Ecology.

5.2 STUDY AREA AND SENSITIVE RECEPTORS

5.2.1 Study Area Definitions

The following three geographic areas are used in this Annex and associated technical appendices: the study area (Appendix B.7, Figure B.1), Coul Links (Appendix B.7, Figure B.2) and the development footprint (Appendix B.7, Figure B.3) and are defined in Table B.2.

Table B.2: Study Area/Development Definition

Term	Definition
The study area	This refers to the land surrounding the proposed development, it includes the area known as Coul Links, the development footprint and the surrounding area (Appendix B.7, Figure B.1).
Coul Links	This refers to the part of the study area characterised by dune/coastal habitats (Appendix B.7, Figure B.2).
Development footprint	This refers to the whole footprint of the proposed development infrastructure within the study area. It includes the access drive, holes, greens, fairways, practice greens, maintenance shed and club house (Appendix B.7, Figure B.3).

5.2.2 Surveys Undertaken

The ecological surveys were conducted in two phases. The first was a desk study of historical information sources (this was added to and amended as and when new data/information became available). The second was a series of targeted field surveys of potentially important and/or legally protected ecological receptors. All the ecology field surveys were undertaken by experienced ecological surveyors using recognised survey methods, during suitable times of year and under suitable weather conditions for the habitats and species concerned.

5.2.2.1 Desk Study

The desk study was conducted using the SNH's SiteLink website (SNH, 2017a) and a variety of information sources, including commissioning the Highland Biological Records Centre to search for all known biological records within the study area. Other relevant published and unpublished sources of information were also used including historic ecological surveys. All designated sites with ecological qualifying features within a 10km radius of the site were identified. Details of the desk study methodology and results are provided in Technical Appendix B.1: Coul Links Natural Heritage Desk Study.

5.2.2.2 Phase 1 Habitat Survey

A Phase 1 habitat survey was conducted in June and July 2016. The vegetation was described and mapped following the methods described in Joint Nature Conservation Committee (JNCC) Handbook for Phase 1 Habitat surveys (JNCC, 2003) and IEEM best practice guidelines (O'Reilly, 2010). Details of the survey methodology and results are provided in Technical Appendix B.2: Phase 1 Habitat, NVC and GWDTE Survey Report.

5.2.2.3 National Vegetation Classification (NVC) Survey

An NVC field survey was carried out in July 2016. The vegetation was described and mapped in accordance with the published standard NVC methodology (Rodwell, 2006) These were adapted to follow the baseline NVC survey for this area as amended through the Sand Dune Vegetation Survey of Scotland using the additional sand-dune specific NVC community types that have been described by Dargie (Dargie 2001a; Dargie, 2001b; Dargie, 2001c). Details of the survey methodology and results are provided in Technical Appendix B.2: Phase 1 Habitat, NVC and GWDTE Survey Report.

5.2.2.4 Groundwater Dependent Terrestrial Eco-systems (GWDTE)

Wetland habitats were identified in June and July 2016 as part of the Phase 1 habitats and NVC vegetation surveys in accordance to the Functional Wetland Typology (SNIFFER, 2009a, SNIFFER 2009b).

Where wetlands were identified, an assessment was made as to whether they were likely to be GWDTEs as defined by Table 2 in SEPA Guidance Note LUPS-GU4 Version 7 (SEPA, 2014a). Details of the survey methodology and results are provided in Technical Appendix B.2: Phase 1 Habitat, NVC and GWDTE Survey Report.

5.2.2.5 Protected Terrestrial Mammal Survey

Protected terrestrial mammal walkover surveys were conducted to assess the likelihood of the presence of wildcat (*Felis sylvestris*), badger (*Meles meles*), red squirrel (*Sciurus vulgaris*), otter (*Lutra lutra*), pine marten (*Martes martes*) and water vole (*Arvicola terrestris*) within the study area. The walkover surveys was undertaken between April and September 2016, after prolonged period of suitable survey conditions (required for otter and water vole surveys) and consisted of site walkovers using standard methods (Chanin, 2003; Harris *et al.* 1991; MacDonald and Tattersall, 2001; MacDonald *et al.* 2004; Strachan and Moorhouse, 2007; and Wilson *et al.* 1997). Details of the survey methods and results are provided in Technical Appendix B.3: Protected Terrestrial Mammal Survey Report.

5.2.2.6 Bats

A bat roost and activity survey was undertaken around the Coul Farm House and Coul Farm steadings in August and September 2016. A wider habitat transect survey for bats was also conducted in July and August 2016 across the study area. Full details of the survey methods and results are provided in Technical Appendix B.4: Bat Survey Report.

5.2.2.7 Fonseca's seed-fly

Targeted sweep net surveys were carried out across Coul Links in June 2016 to ascertain the presence or otherwise of Fonseca's seed-fly within the study area. The methodology used followed that undertaken in the previous SNH survey for Fonseca's seed-fly (i.e. Gibbs, 2013). Survey effort was only undertaken in suitable dry weather conditions and when the vegetation was dry, so samples collected were identifiable. Details of the survey methodology and results are provided in Technical Appendix B.5: Fonseca's seed-fly Survey Report.

5.3 EXISTING ENVIRONMENT

5.3.1 Designated Sites

Portions of the study area are formally designated for conservation purposes, all within and adjacent to the area known as Coul Links. These designations include part of the Loch Fleet Site of Special Scientific Interest (SSSI), which itself is part of the Dornoch Firth and Loch Fleet Special Protection Area (SPA) and RAMSAR site. The Loch Fleet SSSI also overlaps with part of the Moray Firth Special Area of Conservation (SAC) to the east of the mouth of Loch Fleet. Immediately adjacent to Coul Links is the Loch Fleet National Nature Reserve (NNR). To the east of Coul Links lies the Moray Firth Special Area of Conservation (SAC), a marine protected area. The boundaries of these designated sites are illustrated in Appendix B.7 Figure B.4.

These conservation designations are there to protect the site's individual ecological features, as well as the integrity of designated site(s) itself. This has important implications for any proposed development within the designated site boundary. Two of these designated site citations specifically mention ecological features directly relevant to this Annex.

There are no likely source-route-impacts on marine designated sites (i.e. Moray Firth SAC) and so these are scoped out of further consideration. Potential impacts on designated sites for birds are considered separately in Annex A: Ornithology.

5.3.1.1 Loch Fleet SSSI

Loch Fleet SSSI is the most northerly inlet on the east coast of mainland Britain and is located in the Moray Firth basin, about 3km south of Golspie. The surrounding coastal and woodland habitats and the assemblages of plants and breeding birds they support are of national importance. It is a relatively large site (1,231 ha) comprising a range of habitats. The following table provides a summary of the Loch Fleet SSSI designated features, which is taken from the Site Management Statement produced by SNH (Table B.3).

Table B.3: Summary of Loch Fleet SSSI Features.

Natural feature of Loch Fleet SSSI	Condition of feature (year assessed by SNH)	Comments
Eelgrass beds	Favourable, maintained (2000)	Found in the intertidal zone.
Sandflats	Favourable, maintained (2004)	Extensive intertidal flats support rich marine invertebrates, which are an important source of food for birds.
Saltmarsh	Favourable, maintained (2005)	Dominated by saltmarsh grass (*Puccinellia maritima*) & thrift (*Armeria maritima*), with noteworthy areas at Balblair Bay, Cambusmore and Coul.
Sand dunes	Unfavourable, recovering (2003)	Coul Links is extensive dune system which is unusual in displaying a complete transition from foredune to wooded slacks and has a large range of vascular plants. Ferry Links is slightly less rich but has large areas of heath.
Native pinewood	Unfavourable, recovering (2005)	Present at Balblair and Ferry Wood, and is old established plantation woodland on the site of an old native pinewood.
Vascular plant assemblage	Favourable, maintained (2005)	The SNH site statement refers to the important plant assemblage in the pinewood, saltmarsh and inter-tidal zone.
Breeding bird assemblage	Favourable, declining (2008)	A wide range of coastal and woodland birds breed throughout the site, although 2008 monitoring indicated this was in decline at the time of assessment.

Natural feature of Loch Fleet SSSI	Condition of feature (year assessed by SNH)	Comments
Eider (*Somateria mollissima*) – non-breeding	Unfavourable, no change (2001)	The rich marine invertebrates of the flats attract large numbers of wintering wildfowl and waders including nationally important numbers of eider, a species of duck. These were in decline at the time of assessment.

SNH have determined eight key management objectives for land managers to protect the SSSI and maintain and where necessary enhance its features of special interest. These are:

- To maintain the condition, distribution and extent of the eelgrass beds, sandflats and saltmarsh habitats.
- To restore the condition of the sand dune habitat.
- To maintain the condition, distribution and extent of pinewood habitat.
- To maintain the distribution and population size of rare and scarce plants.
- To maintain the population of breeding birds and to avoid significant disturbance to these birds during the breeding season.
- To increase the wintering population of eider and to avoid significant disturbance to this species.
- To maintain non-breeding populations of waterfowl and avoid significant disturbance.
- To maintain the distribution and extent of marine habitats and species which are part of the Moray Firth SAC.

5.3.1.2 Dornoch Firth and Loch Fleet RAMSAR Site

This international wetland designation (covering 7,836 ha) has been made for the following features: non-breeding bar-tailed godwit (*Limosa lapponica*), greylag goose (*Anser anser*), wigeon (*Anas penelope*), waterfowl assemblage, wet woodland, reefs, saltmarsh, intertidal mudflats and sandflats and sand dune. There does not appear to be any publicly available management advice or conservation objectives on-line for this RAMSAR site. According to SNH, RAMSAR sites in Scotland are protected and managed through the SSSI system and Natura designations (SNH, 2017c).

5.3.2 Phase 1 Habitat Survey

Full details of the habitats present, as identified during Phase 1 habitat surveys, are provided in Technical Appendix B.2: Phase 1 Habitat, NVC and GWDTE Survey Report. There were 30 Phase 1 habitat types described in the study area (Appendix B.7, Figure B.5, Table B.4). In addition, many matrices were mapped, where two, or more habitats or communities were closely entwined. The study area held a wide variety of habitats, the most common of which was improved grassland which made up 28.4% of the study area. There were large areas of dune grassland (10.3% of the study area), and dune heath (8.8% of the study area) along with open dunes (2.8% of the study area) and dune-slacks (4.6% of the study area). Woodland in the study area included coniferous plantation (4.0% of the study area) and areas of semi-natural broad-leaved woodland (3.2% of the study area). The complete list of Phase 1 habitats and percentage covers are in Table B.4.

Table B.4: The Phase 1 Habitats within the Study Area.

Phase 1 habitat	Area (km^2)	Area (ha)	% of study area
Improved grassland	0.933	93.3	28.4
Dune grassland	0.338	33.8	10.3
Dune heath	0.288	28.8	8.8
Neutral grassland - semi-improved	0.246	24.6	7.5
Dune slack	0.151	15.1	4.6
Coniferous plantation	0.131	13.1	4.0
Semi-natural broad-leaved woodland	0.105	10.5	3.2
Dune grassland: dune heath	0.098	9.8	3.0
Scrub	0.098	9.8	3.0
Open dune	0.092	9.2	2.8
Neutral grassland: scrub	0.079	7.9	2.4
Dune grassland: dune slack	0.075	7.5	2.3
Neutral grassland: marshy grassland	0.065	6.5	2.0
Coniferous plantation - recently felled	0.056	5.6	1.7
Bare sand	0.055	5.5	1.7
Improved grassland: dune grassland	0.052	5.2	1.6
Marshy grassland	0.045	4.5	1.4
Acid grassland: scrub	0.044	4.4	1.4
Bracken	0.041	4.1	1.2
Dry dwarf shrub heath	0.033	3.3	1.0
Acid grassland - unimproved	0.029	2.9	0.9
Wet dwarf shrub heath	0.027	2.7	0.8
Intertidal sand/shingle	0.023	2.3	0.7
Saltmarsh	0.022	2.2	0.7
Amenity grassland	0.018	1.8	0.5
Buildings and roads	0.017	1.7	0.5
Marginal/inundation	0.011	1.1	0.3

Phase 1 habitat	Area (km^2)	Area (ha)	% of study area
Improved grassland: dune slack	0.011	1.1	0.3
Swamp	0.010	1.0	0.3
Improved grassland: scrub	0.010	1.0	0.3
Marshy grassland: dune slack	0.010	1.0	0.3
Acid grassland: dune grassland	0.008	0.8	0.3
Acid flush: acid grassland	0.008	0.8	0.3
Neutral grassland: tall ruderal	0.007	0.7	0.2
Tall ruderal	0.006	0.6	0.2
Neutral grassland: dune heath	0.006	0.6	0.2
Arable	0.005	0.5	0.2
Dune heath: scrub	0.005	0.5	0.1
Dune heath: dune slack	0.005	0.5	0.1
Acid grassland: small sedge mire	0.003	0.3	0.1
Short perennial	0.002	0.2	0.1
Acid flush	0.002	0.2	0.1
Dune heath: semi-natural woodland	0.002	0.2	0.1
Swamp/acid flush	0.002	0.2	0.1
Neutral grassland: semi-natural woodland	0.002	0.2	0.1
Bare ground	0.001	0.1	0.0
Intertidal	0.001	0.1	0.0
Scrub: tall ruderal	0.001	0.1	0.0
Tall Ruderal and dump	0.001	0.1	0.0
Open water	0.001	0.1	0.0
Running water	<0.001	<0.1	0.0
Bog pool	<0.001	<0.1	0.0
Total	3.284	328.4	100.0

5.3.3 NVC Survey

Full details of the plant communities present, as identified during the NVC survey, are provided in Technical Appendix B.1: Phase 1 Habitat, NVC and GWDTE Survey Report. There was a total of 78 NVC communities and sub-communities plus many matrixes found and described making in the study area a complex mix in this relatively small study area (328ha) (Appendix B.7, Figure B.6). The most commonly found NVC community was SD9x *Ammophila arenaria – Arrhenatherum elatius* dune grassland community, *Hylocomium splendens* sub-community. This dune grassland community was tall, rank and tussocky where marram (*Ammophila arenaria*) and red fescue (*Festuca rubra*) and, distinctively, false oat-grass (*Arrhenatherum elatius*) were abundant to dominant and there was a high cover of feather mosses, usually *Hylocomium splendens* but also *Pleurozium sherberi* forming a carpet below the grasses. The next most commonly found NVC community was the MGh *Festuca rubra – Holcus lanatus – Anthoxanthum odoratum* provisional grassland. This provisional grassland community was dominated by Yorkshire fog (*Holcus lanatus*) and was common across the farmland within the study area. Other key NVC communities found in the study area included: MG6, MG7, H11, SD4, SD5, SD6, SD7, SD12, SD15, SD16, SD17, S19, W2, W10, W11 and W23.

5.3.4 GWDTE

Full details of the GWDTE are provided in Technical Appendix B.2: Phase 1 Habitat, NVC and GWDTE Survey Report. Most of the habitats and communities within the study area are not considered likely to be wetlands or GWDTE (Appendix B.7 - Figure B.7 and Figure B.8). However, SEPAs Guidance Note (SEPA, 2014a) recommends that some of the NVC communities should be treated as GWDTE unless information can be provided to demonstrate they are not dependent on groundwater.

The NVC communities recorded in the study area that are considered in the guidance (i.e. SEPA, 2014a) to be potentially groundwater dependent include:

- SD15 *Salix repens – Calliergon cuspidatum* dune-slack community;
- SD16 *Salix repens – Holcus lanatus* dune-slack community;
- SD17 *Potentilla anserina – Carex nigra* dune-slack community;
- MG9 *Holcus lanatus – Deschampsia cespitosa* grassland community;
- MG10 *Holcus lanatus –Juncus effusus* rush-pasture community;
- MG11 *Festuca rubra – Agrostis stolonifera – Potentilla anserina* grassland community;
- M6 *Carex echinata – Sphagnum fallax* mire community;
- M15 *Tricophorum cespitosum – Erica tetralix* wet heath community;
- M23 *Juncus effusus/acutiflorus – Galium palustre* rush-pasture community;
- M25 *Molinia caerulea – Potentilla erecta* mire community;
- M27 *Filipendula ulmaria – Angelica sylvestris* mire community;
- Small sedge mire (no NVC code);
- W1 *Salix cinerea – Galium palustre* woodland community;
- W2 *Salix cinerea – Betula pubescens – Phragmites australis* woodland community; and
- S27 *Carex rostrata – Potentilla palustris* tall-herb fen community.

Of these, SD15, SD16, SD17, M6, M23, M25 and M27 are considered to be potentially highly groundwater dependent (SEPA, 2014a). The remaining vegetation communities are of moderate groundwater dependence in the guidance (SEPA, 2014a).

SEPA recognises that some of these communities are common across Scotland (e.g. M6, M15 and MG10). SEPA also recognise that these communities may be considered GWDTEs only in certain hydrogeological settings, or may have limited dependency on groundwater in certain hydrogeological settings.

Further discussion of GWDTE can be found in Annex C: Hydrology and Hydrogeology.

5.3.5 Lichens, Bryophytes and Fungi

The desk study (Technical Appendix B.2: Coul Links Natural Heritage Desk Study) found a total of 84 bryophytes (mosses), 124 lichens and 47 fungi recorded species within the Coul Links study area. This included records from local recording groups and historic commissioned surveys. In consultation with SNH and local experts five species were noted as being of particular concern/importance with regard to the proposed development, these included three waxcap fungi species (*Hygrocybe*), a lichen species *Cladonia mitis*, and a moss species fragile twisted moss (*Tortella fragilis*).

5.3.5.1 Lichens

The lichen assemblage, particularly the lichen-rich heath, within the study area was assessed by Fryday in 1991. Fryday demonstrated that the main area of lichen interest in Coul Links was in the north of the study area, around OS grid reference NH 80700 95220 (Fryday, 1992). This area was noted to include the lichen species *Cladonia mitis* which is assessed as near threatened against IUCN Red List criteria, is considered nationally rare and listed on the Scottish Biodiversity List. The area in question was recorded as the lichen rich NVC dune heath community H11a, with some of the H11b dune heath community around it in the recent NVC survey (Appendix B.7,Figure B.6 and Technical Appendix B.2): Phase 1 Habitat, NVC and GWDTE Survey Report) and so it is likely that this species is still present. However, it was noted that some of this area was becoming dominated by sweet vernal grass, with less heath characteristics than would otherwise be expected.

Fryday's report into the lichens at Coul Links states it "*was rather disappointing*", and notes that the area of interest was in just one location and that "*elsewhere lichens were restricted to the edges of grassy knolls, but were often completely absent*" (Fryday, 1992). The dune heath and lichen assemblage on Ferry Links (to the north of Coul Links) was assessed as being more extensive with a greater diversity of lichen species than was found at Coul Links (Fryday, 1992).

The dune heath, across the study area, was walked extensively in 2016 during the Phase 1 habitat and NVC survey. Several areas in the north, including the areas already mentioned, were mapped as the lichen rich dune heath sub-community H11a. During 2016 surveys, lichen species were identified to the genus *Cladonia*. It was noted that there were small patches of lichen commonly throughout the dune heath, but not as an extensive carpet.

A study in the 1980's mentioned that Coul Links was "*especially noteworthy for its lichens on stable shingle pebbles, stones and shell fragments*" (Fletcher *et al.*, 1984). These areas were completely avoided by the design layout and so potential no impacts are predicted. Lichens, as part of the dune heath, are considered further within this assessment.

5.3.5.2 Bryophytes

The fragile twisted moss species is listed as nationally rare and vulnerable against the IUCN criteria. This species was found within dune-slack habitats at OS grid reference NH 81 94 in August 1968 (David Patterson, SNH, *pers. comm*.).

The dune-slacks have been avoided through design. Therefore, impacts on potentially important bryophytes have been scoped out of the assessment and are not considered further in the assessment.

5.3.5.3 Fungi

A survey in 2003 found that some of the semi-improved grassland at Coul Links supported an important fungi assemblage (Holden, 2003). The 29ha area surveyed was within the SSSI boundary from OS grid reference NH 81500 93150 to NH 81500 94000. It was suggested that this area would qualify for its grassland fungi against JNCC's SSSI guidelines because of the high diversity of waxcap fungi including (*Hygrocybe insipida*, *H. irrigata* and *H. punicea*.) (David Patterson, SNH *pers. comm*.). The appendix for this report (Holden and Savage, 2003) notes that the fungi assemblage was reliant on the sward being rabbit grazed and being between 5 and 50cm high. It was noted that a change in land-use, such a reduction in grazing allowing scrub and tree regeneration, tree planting or ploughing/reseeding would have an adverse impact on the fungi assemblage (Holden and Savage, 2003).

The NVC survey at Coul Links in 2016 found a mixture of plant communities within this area. There were some patches of scrub and bracken. There was much semi-improved neutral grassland (NVC community MG1) and much dune grassland (NVC community SD9x), as well as dune-slacks. Both of the grassland communities (MG1 and SD9x) were tall, approximately waist height, at the time of the NVC survey (Technical Appendix B.2: Phase 1 Habitat, NVC and GWDTE Survey Report). The tall, and sometimes rank, grassland many not have been in as good as a condition for the waxcap fungi as in 2003 when the survey was undertaken. This is likely to have been due to a reduction in grazing pressure within the study area which has been reported over the last 10-20 years (Colin Taylor, Coul Farm Manager *pers. comm.*). MG1 and SD9x grasslands were common across the study area, including outside of the area noted for fungi assemblages.

The Guidelines for selecting SSSI for fungi note that "*insufficient grazing or mowing can also be a problem since these fungi (*i.e. waxcaps*) may not thrive in rank swards and do best where there is fairly intense grazing or regular mowing. Rabbit grazing has probably provided ideal conditions on some sites and the recent reduction of rabbits due to disease may also constitute a threat if substitute gazing stock cannot be arranged"* (JNCC, 2015).

Some of the grassland noted previously for fungi assemblages has been identified for proposed development and so fungi are considered further within this report.

5.3.6 Protected Terrestrial Mammals Survey

Full details of the protected terrestrial mammal surveys are provided in Technical Appendix B.3: Protected Terrestrial Mammals Survey Report.

There was no direct evidence that specially protected terrestrial mammals *regularly* used the study area. There were no signs of otters, water voles, wild cats or red squirrels recorded during surveys, despite previous records of occurrence.

There was no evidence that the study area was currently used by badgers. There was a large hole at OS grid reference NH 80534 94787 which was considered possibly to have been created by a badger (it only had signs of rabbits and dogs nearby), but there was no evidence it was occupied during the summer 2016 survey period. Badger use of setts varies annually, and although there is no evidence to suggest the study area is currently important for badgers, that does not preclude their use of the study area in the future. Other than potential disturbance and damage to setts, the main concern with regards to badger is a potential loss of foraging areas. As there were no current signs of badgers foraging in the study area (no tracks, hairs, latrines, snuffle holes etc.) at the time of survey, it is considered unlikely that there would be any impact on foraging badgers.

The most preferred pine marten foraging habitats in Scotland have been shown to be mature woodland and rough grassland, with agricultural land amongst the least preferred (Caryl, 2008). Although there was some potential for pine marten activity, particularly in the west of the study area, only a single pine marten scat was located at OS grid NH 81235 94065 within some gorse scrub to the centre of the study area, approximately 100m from Coul Farm House. This indicates only occasional use. There was no evidence to suggest the study area was used regularly by pine martens.

With very little direct evidence of protected terrestrial mammals within the study area, they have been scoped out of further assessment.

5.3.7 Bats

Bat activity and roost surveys were conducted around the existing Coul Farm buildings within the study area during suitable weather conditions in August and September 2016 (Technical Appendix B.4 Bat Survey Report). Wider bat transect surveys were also conducted across the study area in July and August 2016 during suitable weather conditions. These surveys recorded three species of bat present: soprano pipistrelle (*Pipistrellus pygmaeus*), common pipistrelle (*Pipistrellus pipistrellus*), and brown long-eared bat (*Plecotus auritus*).

The preliminary roost assessments identified that many of the Coul Farm House and steading buildings offered moderate or high roosting potential for bats. Activity surveys identified that there was extensive activity from common pipistrelle along with possible soprano pipistrelle and a small number of brown long-eared bats. Activity was concentrated within the barn buildings, along the southern aspect of the barns and between the semi-detached houses and the workshop. In total four roosts were identified; three common pipistrelle roots and a brown long-eared roost.

The results from the transect surveys show that Coul Links was used by small numbers of common pipistrelle bats with the occasional soprano pipistrelle also being recorded. These bats were largely recorded on the western side of the site near the Coul Farm buildings and woodland areas with no records being found on the dunes or dune-slacks. This suggests that the open dune area is not generally used by bats, and the western side of the study area is used by small numbers of bats providing moderately suitability habitat for bats.

Bats are considered further within this assessment.

5.3.8 Invertebrates

The desk study (Technical Appendix B.1: Coul Links Natural Heritage Desk Study) found 479 records of invertebrate species known to be within the Coul Links study area (Table B.5). This included records from local recording groups and historic surveys. In consultation with SNH and local experts four species were noted as being of particular concern/importance with regard to the proposed development, these included three Lepidoptera, small blue (*Cupido minimus*), northern brown argus (*Aricia artaxerxes*) and a rare micro-moth *Caryocolum blandelloides*, and one Diptera; Fonseca's seed-fly.

Table B.5: The Number of Invertebrate species recorded at Coul Links based on the Desk Study.

Order/Class/Group	Notes (includes)	Number of species recorded
Lepidoptera	Butterflies & moths	178 species
Diptera	Two-winged or true flies	106 species
Coleoptera	Beetles	49 species
Hymenoptera	Bees, wasps, ants & sawflies	33 species
Hemiptera	True bugs	67 species
Chrysopidea	Lacewings	2 species
Crustaceans	Woodlice & earwigs	3 species
Orthoptera	Grasshoppers & crickets	4 species
Diplopoda	Millipedes	1 species
Gastropod	Snail	1 species
Arachnids	Spiders & mites	33 species
Odonata	Dragonflies & damselflies	2 species

5.3.8.1 Small Blue

The small blue is the UKs smallest butterfly. It is distributed, locally, across the UK and is generally in decline (Butterfly Conservation, 2017). It is listed as a UK BAP priority species and has been recorded at Coul Links.

The small blue's sole food plant is kidney vetch (*Anthyllis vulneraria*) (Butterfly Conservation, 2017). Therefore, kidney vetch is essential to maintain the population of small blue at Coul Links. Kidney vetch was recorded commonly across Coul Links (Technical Appendix B.2: Phase 1, NVC and GWDTE Survey Report). It was particularly common in the more disturbed open dunes communities (e.g. NVC community SD5c and SD7x). These open dune areas have been deliberately avoided through the design layout and so potential impacts of the proposed development on small blue have been scoped out of further assessment. Guaranteed long-term conservation management of Coul Links is likely to be beneficial to this species.

5.3.8.2 Northern Brown Argus

The northern brown argus butterfly occurs as small, scattered colonies in the north of the UK (Butterfly Conservation, 2017). It is listed as a priority species on the UK BAP and is thus a priority species for conservation. Its population is reported to have declined in northern England, but not in Scotland and it has been recorded at Coul Links. It is known that this species of butterfly forms small, discrete colonies around its food plant common rock-rose (*Helianthemum nummularium*) (Butterfly Conservation, 2017). Most of the colonies are on small habitat patches, less than 1ha in size, of lightly grazed unimproved grassland, where

common rock-rose grows frequently. These areas have been deliberately avoided by the design layout. Therefore, potential impacts on northern brown argus have been scoped out of further assessment. Guaranteed long-term conservation management of Coul Links is likely to be beneficial to this species.

5.3.8.3 Micro-moth *Caryocolum blandelloides*

The micro-moth *Caryocolum blandelloides* is a rare species in the UK, found locally in in the north east of Scotland. It was first located at Coul Links in 1994. Subsequent records show it is present at Little Ferry, and along the Coast line between Ardersier and Findhorn (Gelechiid Recording Scheme, 2017). It is also found across Europe (Motyle Europy, 2017). In Britain it appears restricted to northern large sandy coastal dunes with open, sparse to moderate low plant cover.

Caryocolum blandelloides feeds on common mouse-ear (*Cerestium fontana*) in the UK (Gelechiid Recording Scheme, 2017). Common mouse-ear was very commonly found across the Coul Links in open dunes, dune grasslands, improved grassland, semi-improved grassland and marshy grassland (Technical Appendix B.2: Phase 1, NVC and GWDTE Survey Report). Given that *Caryocolum blandelloides* is reported to be restricted to sandy dunes, with open, sparse to moderate low plant cover, it is likely to be restricted to mouse-ear plants located within the open dune habitats (e.g. NVC communities SD5, SD6 and SD7x).

These open dune habitat areas have been deliberately avoided by the design layout. Therefore, potential impacts on *Caryocolum blandelloides* have been scoped out of further assessment. Guaranteed long-term conservation management of Coul Links is likely to be beneficial to this species.

5.3.8.4 Fonseca's seed-fly

Fonseca's seed-fly is an endemic invertebrate known only to be found on the coastal sand-dune systems of east Sutherland. It is listed as a priority species on the UK BAP.

Fonseca's seed-fly was known to be located on sand-dunes along stretches of sand-dunes near the town of Dornoch and between the Dornoch Firth and the village of Embo (Gibbs, 2013) but its distribution was unknown on Coul Links itself. SNH highlighted this endemic species as of particular interest to the proposed development as so little was known about it, including its potential occurrence within the Coul Links study area.

Fonseca's seed-fly is thought to be a univoltine species, only producing one brood of young a year, overwintering before emerging as adults in June. It is believed, but not confirmed, that they use the flowers of composite plants, possibly ragwort (*Senecio jacobaea*), to oviposit their eggs (Gibbs, 2013).

Full details of the Fonseca's seed-fly survey are provided in Technical Appendix B.5: Fonseca's Seed-fly Survey Report. Over the course of the survey days, several hundred potential anthomyid flies were collected out of thousands of flies caught in order to identify

them in the laboratory. These flies were collected from the fore-dunes, mid-dunes, dune-slacks and hind-dunes within the study area (Appendix B.7 - Figure B.9 and Figure B.10).

Of the flies recorded, four individuals were found to be Fonseca's seed-fly (Table B.6). Three of these flies were female. Two were recorded in roughly the same location in the mid-dune zone in the north-eastern part of the study area. The third female was recorded on the accreting side of the fore-dune area in the northern half of the study area. These three females were recorded on the 7th June 2016. A single male fly was recorded in a hind-dune zone at the southern end of the study area. This male was recorded on the 13th June 2016 (Appendix B.7, Figure B.9).

Table B.6: The Location, Date and Sex of Fonseca's seed-flies Collected on Coul Links, 2016

Date	Approx. location	Habitat type	Species	Sex
07/06/2016	NH 81538 94332	Fore-dune	*Botanophila fonsecai*	Female
07/06/2016	NH 813 950	Mid-dune	*Botanophila fonsecai*	Female
07/06/2016	NH 813 950	Mid-dune	*Botanophila fonsecai*	Female
13/06/2016	NH 813 935 – NH 813 940	Hind-dune	*Botanophila fonsecai*	Male

The results of the 2016 Fonseca's seed-fly survey on Coul Links extended the known global range of this apparently endemic species by 29% from 6.3km to 8.1km of coastal dune system. It has also documented Fonseca's seed-fly in its adult form four days earlier than it had previously been recorded, indicating that the flight period is longer than currently known.

It is necessary to consider the lack of knowledge regarding important elements of the ecology of Fonseca's seed-fly. It is believed, but not confirmed, that they use the flowers of composite plants to oviposit their eggs, and so parts of the study area which are rich in these plants (ragwort in particular (Gibbs, 2013)), could be important for the life cycle of Fonseca's seed-fly. While the relatively botanically rich areas of the more southerly mid-dune and hind dunes contained most of the potential host/food plants, the more open, sandy fore-dune and northerly mid-dune areas also held small amounts of these potentially important species.

Previous studies into the ecology of the species suggest that the warm, bare sandy areas of the fore-dune and mid-dune may play an important role in the mating of the species before the dispersal of females to lay their eggs (Gibbs, 2013). The number of flies recorded in this survey was too low to provide much insight regarding this, though the presence of the three females in the fore and more open, sandy mid-dune areas suggests that this habitat was important for this species.

From what is known about the ecology of these flies and other similar species, it would appear that both the open sandy parts of the study area nearest the coast and the presence of healthy populations of composite plants (especially ragwort) are important for the completion of the life cycle of these flies.

Fonseca's seed-fly is considered further within this assessment.

5.4 EVALUATION CRITERIA

5.4.1 Impacts Assessed

The main elements of the proposed development which have the potential to impact on ecological receptors both during construction and operation are described in Section 2: Project Description and include:

- 18 holes;
- Greens;
- Fairways;
- Practice greens;
- Turfed areas;
- Club house;
- Maintenance shed;
- Entrance drive;
- Tee green link; and
- Tees.

The following potential impacts have been assessed in full in relation to the construction and operation of the proposed development:

- Direct loss of habitat;
- Direct loss of foraging habitat and/or breeding habitat for important species;
- Indirect loss of foraging habitat and/or breeding habitat for species, through displacement; and
- Disturbance to protected species due to construction, heavy machinery, noise and human activity on the site.

5.4.2 Impacts Scoped Out

Uncertainties regarding climate change predictions mean that it is not possible at present to carry out a quantitative assessment of the likely changes to habitats and species use of the site over time in relation to climate change. Therefore, these have been scoped out of further consideration within this Annex.

Ecological impacts arising from the process of decommissioning have been scoped out of this assessment. An assessment of the ecological impacts of decommissioning the proposed development has not been undertaken as part of the EIA because: (i) the future baseline conditions (environmental and other developments) cannot be predicted accurately at this stage; (ii) the proposals for decommissioning are not known at this stage, and (iii) the best practice decommissioning guidance methods will likely change during the lifetime of the proposed development and so cannot be predicted at this stage. The developer does however fully commit to use best practice decommissioning methods and technologies at the time of decommissioning. General decommissioning plans are considered within Section 2: Project Description.

There are no likely source-route-impacts on adjacent marine habitats and species and so these are scoped out of further consideration.

5.4.3 Evaluating Conservation Importance and Sensitivity

The likely important ecological receptors identified in the baseline studies were evaluated following best practice guidelines (IEEM, 2006; CIEEM, 2016). The site's ecological receptors determine its nature conservation interest or value. Guidance on EIA sets out categories of ecological or nature conservation importance that relate to a geographical framework (e.g. international through to local) together with criteria and examples of how to place a site (defined by its ecological attributes) into these categories. It is generally straightforward to evaluate sites or species populations designated for their international or national importance (as criteria for defining these exist), but for sites or populations of regional or local importance, criteria may not be easily defined. Where possible, the potential importance of an ecological receptor in the site is determined within a defined geographical context using categories outlined in Table B7.

Table B.7: Summary of Geographic Importance of Species or Habitat.

Importance term	Definition
International	>1% of European Community (EC) population/area of habitat
National	>1% of United Kingdom (UK) population/area of habitat
Regional	<1% of UK population/area of population/area of habitat
Local	Within local area

According to SNH (2005), the top three geographical tiers (international, national and regional) are the most important within the context of the EIA. This means that if there is an effect at this level, it is considered 'significant' in terms of the EIA regulations.

The importance attached to a species or habitat can also be determined according to legislative status. Some ecological receptors are subject to a general level of legal protection through the *Wildlife and Countryside Act 1981* (as amended) and others under *Council Directive 1992/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora* (Habitats Directive). There is no clear guidance for conservation importance of ecological receptors other than those of European protected species and designated sites. The importance of other species is based on professional judgement. The status of potentially important species, such as UK BAP priority species and species with proportionally large geographic populations within the study area, is taken in to consideration.

Another factor when assessing potential impacts is the behavioural sensitivity of the ecological receptor under consideration (e.g. high, moderate or low), which can vary in space and time. Different receptors respond differently to stimuli, making some particularly sensitive to development activities and others less so. Professional judgement is used when assigning a sensitivity term to an ecological receptor and this is recorded here in a clear and transparent way. Sensitivity criteria vary across the wide range of taxonomic groups considered in an ecological impact assessment and are therefore provided in the

receptor accounts of this Annex. It should be noted that to avoid confusion, legal protection requirements need to be considered separately from sensitivity and importance.

By way of example, sensitivity is determined according to species' behaviour, using broad criteria set out in Table B.8. Behavioural sensitivity can differ between species and between individuals of the same species. Therefore, sensitivity is likely to vary with both the nature and context of the disturbance activity as well as the experience and even 'personality' of the species, in the case of mammals. Sensitivity also depends on the activity the species is undertaking. For example, a species is likely to be less tolerant of disturbance during the breeding season than at other times of year. Thus, sensitivity changes with both space and time.

Table B.8: Summary of Sensitivity Criteria.

Sensitivity term	Definition
High	Species occupying remote areas away from human activities, or exhibiting strong and long-lasting reactions to disturbance events. Habitats that are considered to have a slow recovery time to disturbance and/or are highly groundwater dependant.
Moderate (medium)	Species that appear to be warily tolerant of human activities, or exhibiting short-term reactions to disturbance events. Habitats that are considered to have a moderate recovery time to disturbance and/or are moderately groundwater dependant.
Low	Species occupying areas subject to frequent human activity and exhibiting mild and brief reaction to disturbance events. Habitats that are considered to have a quick recovery time from disturbance and/or have low groundwater dependency or are not groundwater dependant.

5.4.4 Magnitude

Effects on ecological receptors may be beneficial (positive), neutral or adverse (negative). The characteristics and significance of an effect involve several factors such as the scale (e.g. number of individuals killed or displaced by an activity, or hectares (ha) of habitat lost), extent (the area over which an impact occurs), duration (the time over which an impact occurs), reversibility (whether an impact is temporary or permanent) and its timing or frequency.

A reversible (temporary) effect is one from which spontaneous recovery is possible or for which effective mitigation is possible and a commitment to undertake this mitigation has been made. An irreversible (permanent) effect is one from which recovery is not possible within a reasonable timescale, or for which there is no reasonable chance of successful action being taken to reverse it.

The duration of a predicted impact can be important, with three time-frames used in the assessment: short term (up to two years), medium term (two to five years) and long term (life of the development). The timing of an impact can also have a large influence on its ecological effect. Finally, a level of confidence (whether the predicted effect is certain, probable, possible or unlikely) is attached to the predicted effect.

Magnitude refers to the 'size' or 'amount' of a predicted impact (i.e. change). Changes on ecological receptors are therefore judged in terms of their magnitude in space and time. There are many different ways in which these can be defined and it is important that whatever method is used clear definitions are provided (IEEM, 2006). Professional judgement is used to synthesise the many attributes of magnitude (such as the effect's timing, scale, frequency, duration and reversibility) on species of conservation importance and these are reported.

In this assessment there are considered to be four levels of magnitude – set out in Table B.9 and it is assumed these effects are adverse, unless otherwise stated.

Table B.9: Levels of Magnitude of Change.

Term	Definition
Major (high)	Total/near total loss of a population/habitat due to mortality or displacement. Total/near total loss of breeding productivity in a population due to disturbance. Guide: ≥50% of population/habitat affected.
Moderate (medium)	Moderate reduction in the status or productivity of a population/habitat due to mortality or displacement or disturbance. Guide: 10-49% of population/habitat affected.
Minor (low)	Small but discernible reduction in the status or productivity of a population/habitat due to mortality or displacement or disturbance. Guide: <10% of population/habitat affected.
None (negligible)	Very slight reduction in the status or productivity of a population/habitat due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the 'no change' situation. Guide: <1% population/habitat affected.

5.4.5 Significance

Consideration of the importance and sensitivity of receptors and magnitude of impacts or changes helps to determine the likely significance of a potential effect. In the context of the EIA Regulations, each likely effect is evaluated and classified as either significant or not significant, using professional judgement, evidence and best practice guidance. In this assessment, an ecologically significant effect is defined following IEEM (2006), as "*an impact on the integrity of a defined site or ecosystem and/or the conservation status of habitats or species within a defined geographical area*". Thus, the geographical terms of reference at which a predicted effect may be considered significant must also be defined (e.g. an effect on a species or habitat evaluated to be of regional importance is either significant or not at the regional level). Using the four levels of magnitude as shown in Table B.9 and the four levels of importance shown in Table B.7, a matrix comparing the level of effect can be seen in Table B.10. The effects that are considered major or moderate are defined as significant in terms of the EIA Regulations. Those effects that are considered minor or negligible are defined as not significant.

Table B.10: Matrix showing Level of Effect, related to Importance of Feature and Magnitude of Change.

Importance of feature	Magnitude of Change			
	Major	Moderate	Minor	None/negligible
International	Major	Major	Moderate	Negligible
National	Major	Moderate	Minor	Negligible
Regional	Moderate	Moderate	Minor	Negligible
Local	Minor	Minor	Negligible	Negligible

5.4.6 Limitations to the Assessment

Where assumptions within the assessment are made, these are explicitly identified and explained. Similarly, limitations in methods and uncertainty over parameter values and species' ecology are also identified and discussed, particularly where this is likely to affect the outcome of the assessment. As with any environmental assessment there will be some elements of uncertainty. Where there is uncertainty, this is identified and reported, along with the measures taken to reduce it, assumptions made, and an explanation as to the likely extent that any uncertainties are likely to affect the conclusions. In circumstances where there is uncertainty; evidence, expert opinion, best practice guidance and professional judgement have been used to evaluate what is biologically likely to occur if the proposed development is constructed.

The level of certainty of impact prediction varies depending upon a range of parameters discussed already. For some elements (e.g. land-take) it is relatively straightforward to assess and quantify the area of habitat that is likely to be lost to development infrastructure and therefore quantify potential impacts of land-take on the habitats present. However, other impacts are less certain because there can be a range of possible scenarios. The main limitations in this assessment are common to most ecological assessments because:

- Baseline surveys undertaken are based on sampling techniques, not absolute censuses. Results give an indication of the numbers of ecological receptors recorded at the particular times that surveys were carried out. Species occurrence changes over time and therefore the results presented in this ES are snapshots in time. Importantly, no information gaps were identified in the baseline survey data that would prevent assessments in line with the requirements of the EIA Regulations to be undertaken.

- Putting ecology survey results into a wider geographical context is sometimes challenging because most species and habitats have not been systematically surveyed beyond the study area. Thus, defining a population as locally or regionally important is potentially difficult because local or regional population estimates do not exist for most taxa and habitats. Whenever such uncertainty exists, professional judgement and published evidence is used and populations in the study area or site have been assumed to be at their highest potential level of geographical/ecological importance.

5.5 METHOD OF PREDICTING LIKELY CHANGE

To assess the predicted change for the important ecological receptors as a consequence of the proposed development it is first necessary to evaluate the sensitivity and the importance of each ecological receptor, then assess how much these receptors will be impacted by the proposed development using a combination of calculations (where appropriate), research, best practice guidance and professional judgement. The initial impact assessment assumes no mitigation (but does include in-built design). Mitigation is taken into account later in the ES assessment process.

5.5.1 Evaluating the Importance and Sensitivities of Habitats

Within the study area habitats are present both within and outwith the national and international designated sites. Based on guidance, those listed within designated site citations are the most important and potentially sensitive habitats to consider within the context of the ES and are necessarily the main focus of this Annex.

5.5.1.1 Designated Site Habitat Features

The Loch Fleet SSSI citation (SNH, 2011) describes the saltmarsh vegetation around the sheltered shores of Loch Fleet as an increasingly rare habitat in the UK, with characteristic saltmarsh plants (e.g. saltmarsh grass (*Puccinellia maritima*), thrift (*Armeria maritima*) and glasswort (*Salicornia europaea*)). These plants were recorded in the saltmarsh (NVC community SM13) which was in the northern part of the study area. It should be noted that the saltmarsh in the study area is not the only saltmarsh found within the Loch Fleet SSSI, it is also found extensively at Balblair Bay and Cambusmore (SNH, 2011). The saltmarsh in the study area is equivalent to the UK BAP priority habitat coastal saltmarshes and the Annex 1 habitat Atlantic salt meadows. In accordance the criteria set out to evaluate the importance of habitats (Table B.7) the saltmarsh within the study area is evaluated as being of national importance. Saltmarsh is considered to have a moderate recovery time to disturbance and is not GWDTE. All areas of saltmarsh habitat have been deliberately avoided by the design layout. Therefore, potential impacts on saltmarsh have been scoped out of further assessment.

The Loch Fleet SSSI citation describes Coul Links as "*an extensive dune system which is unusual in displaying a complete transition from foredune to slack. Coastal heathland is well developed in drier areas, supporting juniper scrub locally*" (SNH, 2011). The Loch Fleet Site Management Statement describes Loch Fleet SSSI as transitioning from foredune to wooded slack (SNH, Site Management Plan). The SSSI citation includes many of the habitats that were recorded in the study area including open dunes (NVC communities SD4, SD5, SD6 and SD7), dune-slacks (NVC communities SD15, SD16, SD17), dune grassland (NVC communities SD7, SD9, SD12), dune heath (NVC communities H11) and the semi-natural broad-leaved woodland that was found within the dune-slacks (NVC communities W2).

These habitats form part of the UK BAP Coastal Sand Dunes (which includes open dunes, fixed dunes and dune heaths). The sand dune system within the study area contains a series of Annex 1 Habitats (or habitats equivalent to or approaching Annex 1 definitions) including:

- Embryonic shifting dunes (NVC communities SD4 and SD5);
- Shifting dunes with marram (NVC communities SD6);
- Fixed dunes with herbaceous vegetation (NVC communities SD7, SD12);
- Dune-slacks with creeping willow (NVC communities SD16);
- Humid dune-slacks (NVC communities SD15, SD16, SD17);
- Decalcified fixed dunes with crowberry (NVC communities H11b);
- Atlantic decalcified fixed dunes (NVC communities H11a and H11c); and
- Coastal dunes with common juniper.

In accordance with the criteria set out to evaluate the importance of habitats (Table B.7), the sand dune habitats within the study area are evaluated as being of national importance. However, two points should be noted. Coul Links is not the only part of Loch Fleet SSSI to hold sand dunes, Ferry Links, nearby to the north also has a sand dune system, although it is described as being slightly less rich in vascular plants but has large areas of lichen-rich and moss-rich heathland (SNH, 2011). Also, the quality of some of the habitats is not as high as others. For example, only SD9b is listed as an Annex 1 habitat, which was not found within the study area. SD9x is a fairly tall, rank community and was found extensively across the sand dune system within the study area. It is considered that the dune heath, open dunes and dune-slacks are the best quality habitats and most ecologically valuable communities within the Coul Links sand dune system, and the dune grassland, which was largely made up of SD9x is of lower quality and ecological value.

The dune-slacks (low-lying sandy areas seasonally inundated with water) are highly GWDTE and so are considered highly sensitive habitats. Open dune, dune heaths and dune grasslands are not GWDTE, and have been shown to recover relatively rapidly from disturbance; indeed they can be relatively mobile habitats. Therefore, their sensitivity is considered to be low-moderate.

5.5.1.2 Non-designated Site Habitat Features

Several habitats within the study area, but not listed within the SSSI citation, are approaching or equivalent to UK BAP or Annex 1 habitats. These are evaluated below using the criteria set out in Table B.7.

The UK BAP priority habitat upland flushes, fens and swamps are defined as "*peat or mineral-based terrestrial wetlands in upland situations, which receive water and nutrients from surface and/or groundwater sources as well as rainfall…it is a varied habitat category but is typically dominated by sedges and their allies, rushes, grasses and occasionally wetland herbs and/or a carpet of bryophytes*" (Maddock, 2011). Some of the flushes and swamps described in the study area are equivalent to or approaching this definition, including M27, S10, S19 and S27. Upland flush UK BAP habitat is widespread but local

throughout the uplands of Scotland (Maddock, 2011). The extent has not been recorded as it has not been comprehensively surveyed in many areas and tends to occur in small, sometimes numerous stands (Maddock, 2011). There was 6.9ha of M27 (including matrixes) and 1.0ha of these swamp communities (S10, S19 and S27). Given the widespread natures of M27, this was considered to be, at best, of local importance. The swamps, which are less common across Scotland, were assessed as locally important features due to their small size and quality. The sensitivity of swamps is considered to be low as they are easily formed and readily colonised.

Upland birch woodlands are also priority habitats in the UK and contribute to the UK BAP targets. The W11 semi-natural broad-leaved woodland within the study area was equivalent to or approaching UK BAP definitions for upland birch woodlands. There is an estimated 16,400ha (164km^2) of upland birch woodland in Scotland (JNCC, 2016). There was 0.59ha of the W11 semi-natural broad-leaved woodland within the study area. This is much less than 1% (0.003%) of the Scottish total. Consequently, the woodland was evaluated as being of local importance. The sensitivity of birch woodland is considered to be low as it is readily able to recover quickly after disturbance/grazing and colonise open ground.

UK BAP dry dwarf shrub heath (within the upland heath BAP habitat) in favourable condition is defined as being "*dominated by dwarf shrubs such as ling heather* (Calluna vulgaris)*, bilberry (*Vaccinium myrtillus*), crowberry (*Empetrum nigrum*), and bell heather (*Erica cinerea*)*" (Maddock, 2011). Annex 1 European dry heath includes dwarf shrub dominated vegetation with ling heather, bilberry and bell heather (JNCC, 2016). Some of the dry dwarf shrub heath may have been approaching these definitions, but it was found in very small patches on hillocks. There is 608,000ha (6,080km^2) of dry dwarf shrub heath in the UK (JNCC, 2016). There was 3.3ha of dry dwarf shrub heath within the study area which is much less than 1% (0.0005%) of the total. The dry dwarf shrub heath was not considered to be of sufficient quantity or quality to be regionally important and was evaluated as being of local importance. The sensitivity of dry heath is considered to be low as heaths can recover over a short-medium time scale after disturbance.

UK BAP wet dwarf shrub heath (within the upland heath BAP habitat) in favourable condition is defined as "*dominated by a mixture of cross-leaved heath* (Erica tetralix)*, deergrass* (Tricophorum cespitosum)*, ling heather and purple moor-grass* (Molinia caerulea) *over an understory of bog-moss* (Sphagnum)" (Maddock, 2011). Annex 1 Northern Atlantic wet heath includes M15 including wet heath (JNCC, 2016). There is 462,000ha (4,620km^2) of wet dwarf shrub heath in the UK (JNCC, 2016). There was 2.7ha of wet dwarf shrub heath within the study area, which is much less than 1% (0.0005%) of the total. Therefore, the wet dwarf shrub heath was evaluated as being of local importance. The sensitivity of wet heath is considered to be low as heaths can recover over a short-medium time scale after disturbance.

None of the other terrestrial habitats found and described in the study area had particular ecological value or sensitivity. Some were potential GWDTE, but their location resulted in them being evaluated as not GWDTE (See Annex C: Hydrology and Hydrogeology). Therefore, they were evaluated to be of local importance and low sensitivity.

A summary of the sensitivities and importance of the habitats found within the study area taking into account ecological value and groundwater dependency is provided in Table B.11.

Table B.11: Summary of Important Ecological Habitat Receptors Importance & Sensitivity.

Phase 1 habitat	Importance	Sensitivity
Saltmarsh	National	Moderate
Open dunes	National	Moderate
Dune-slacks	National	High
Dune heath	National	Low
Dune grassland (excluding SD9x)	National	Low
Dune grassland (SD9x)	Local	Low
Semi-natural broadleaved woodland	Local	Low
Swamps and flushes	Local	Low
Dry dwarf shrub heath	Local	Low
Wet dwarf shrub heath	Local	Low
All other habitats	Local	Low

5.5.2 Evaluating the Importance and Sensitivities of Species

5.5.2.1 Protected Terrestrial Mammals

As there was very little direct evidence of protected terrestrial mammals regularly using the study area (Appendix B.3: Protected Terrestrial Mammal Survey Report), potential impacts on these species have been scoped out of further assessment; they are likely to be negligible.

5.5.2.2 Bats

Three species of bat were recorded present within the study area: soprano pipistrelle, common pipistrelle, and brown long-eared bat (Appendix B.4 Bat Survey Report). All three species are common-abundant and found across the UK. Therefore, these species have been evaluated as locally important. Bats have been assessed as highly sensitive to disturbance within roost sites, four of which are present within the study area.

5.5.2.3 Invertebrates

Fonseca's seed-fly was discovered within the study area during 2016 surveys (Appendix B.5: Fonseca's Seed-fly Report). It is apparently endemic to Scotland with a limited distribution in East Sutherland. Therefore, this species has been evaluated as nationally important. It is unknown how sensitive the species is because so little is known about its ecology, but given its limited range and localised distribution it is assumed to be a highly sensitive species.

5.5.2.4 Plants

The study area, particularly the sand dune system, supports a species rich flora including some rare and/or protected species. The Loch Fleet SSSI citation lists vascular plant assemblage as a feature of the SSSI (SNH, 2011). The specific species mentioned are those found in pinewoods (found only outside of the study area) and a saltmarsh species, sea centaury (*Centaurium littorale*) (SNH, 2011) which was not recorded within the study area during the 2016 habitat survey. Therefore, the plant assemblage species recorded within the study area is not evaluated as being of national importance.

A number of notable botanical species recorded in the study area (Appendix B.2 Phase 1 Habitat, NVC and GWDTE Survey Report) are listed on the UK BAP species list and/or the Scottish Biodiversity List. These are listed in Table B.12. All these species, with the exception of juniper, have been scoped out from further assessment due to either their widespread occurrence in the UK, such as wild pansy (*Viola tricolor*), or their occurrence in habitats which will not be impacted by the development, such as frog orchid (*Coeloglossum viride*). Further details of these species can be found in Technical Appendix B.2: Phase 1, NVC and GWDTE Survey Report.

Table B.12: Summary Importance and Sensitivity of UK BAP Plant Species Located within the Study Area.

Common name	Scientific name	Listing	Location found in study area	UK population	Importance	Sensitivity
Purple milk-vetch	*Astragalus danicus*	UK BAP priority species Scottish Biodiversity List	Open dunes and dune grassland	Widespread, particularly in the east of the UK. Declining in parts of England	Local	Low
Frog orchid	*Coeloglossum viride*	UK BAP priority species Scottish Biodiversity List	Dune-slack	Found across the UK – locally frequent	Local	Low
Common juniper	*Juniperus communis*	UK BAP priority species Scottish Biodiversity List	Dune grassland and dune heath	Widespread, declining in the UK Rare on dune grassland	Regional	Low
Lesser butterfly-orchid	*Platanthera bifolia*	UK BAP priority species Scottish Biodiversity List	Wet heath	Widespread	Local	Low

Common name	Scientific name	Listing	Location found in study area	UK population	Importance	Sensitivity
Wild pansy	*Viola tricolor*	Scottish Biodiversity List	Open dune, dune grassland and dune-slack	Widespread, declining in the UK	Local	Low

Common juniper was seen in several locations within the study area, particularly in dune grassland and dune heath. Common juniper is found only rarely in sand dune systems (Maddock, 2011), but is widespread throughout the UK and Scotland, although it is apparently in decline. As common juniper is rarely seen on sand dunes, it has been classed as regionally important in this location and having low sensitivity. Due to its location with respect to the proposed development, juniper is considered further within this assessment.

SNH's scoping response highlighted the large population of common rock-rose within the study area (David Patterson, SNH, *pers. comm*.) (not just within the SSSI), and it was abundant during the survey across some of the sand dune system. This species, although important in supporting some invertebrates (e.g. northern brown argus), is not in itself listed as a UK BAP species or on the Scottish Biodiversity list. It is cited by the ICUN as low – risk, near threatened. Common rock-rose is widespread throughout the UK and so is evaluated as being locally important with low sensitivity. Common rock-rose's sensitivity to disturbance has been determined by its basic physiology and population status as well as professional judgement.

Rough horsetail was also noted in SNH's scoping response, stating it was recorded 25 years ago close to Embo, outside of the SSSI (David Patterson, SNH, pers. comm.). Rough horsetail is not listed as a UK BAP species and is not on the Scottish Biodiversity list. It is listed as nationally scares. Rough horsetail was not recorded during the Phase 1 and NVC survey conducted in 2016, although marsh horsetail (*Equisetum palustre*) and water horsetail (*Equisetum fluviatile*) were found commonly in some of the marshy grasslands and swamps in the study area. Rough horsetail is widespread in Scotland and so is evaluated as being locally important with low sensitivity. It has been scoped out of further assessment as it has not been recently recorded in the study area.

5.5.2.5 Lichens and Fungi

Waxcap fungi within the study area have been assessed as regionally important, given their limited distribution. The sensitivity of waxcap fungi has been assessed as moderate-high as they are considered relatively intolerant of disturbances such as changes to grazing regimes, herbicide/fungicide applications and nutrient enrichment.

Lichen assemblages have been included in the assessment as part of the dune heath assessment. The lichen species of particular interest *Cladonia mitis* has been assessed as regionally important. Its sensitivity is unknown, but given the regional status and local distribution it has been assessed as probably moderate.

5.5.2.6 Summary of Receptor Importance and Sensitivity

Table B.13 summaries the importance and sensitives of the important ecological receptors for the proposed development.

Table B.13: Summary of Important Ecological Species Receptors Importance and Sensitivity.

Ecological receptor	Importance	Sensitivity
Bats (roosts)	Local	High
Fonseca's seed-fly	National	High
Common juniper	Regional	Low
Waxcap fungi	Regional	Moderate-High
Lichen (*Cladonia mitis*)	Regional	Moderate

5.5.3 Evaluation of Construction and Operation Effects

5.5.3.1 Impacts Assessed

This section describes the potential effects on habitats, species and designated sites that could arise, in the absence of mitigation, from the construction and operation of the proposed development. Mitigation measures to reduce potential effects are described in the Section 5.7: Committed mitigation measures. Committed mitigation measures, with an assessment of the residual effects (i.e. after mitigation has been implemented) are described in Section 5.8: Residual effects. Potential impacts include:

- Direct habitat loss (sometimes referred to as habitat change), including habitat severance/connectivity due to land-take by the proposed development;
- Indirect habitat loss due to the displacement of species as a result of construction, operation and maintenance activities;
- Habitat modification e.g. due to changes in hydrology, and chemical inputs from fertilizers, pesticides and herbicides;
- Direct habitat loss and/or mortality and injury due to pollution of habitat from construction activities;
- Mortality or injury e.g. due to road traffic accidents or construction methods; and
- Disturbance caused by noise of construction or operation and maintenance.

The main construction and operational elements of the proposed development which have the potential to impact on important ecological receptors both during construction and operation are assessed within this section. For full details of the proposed scheme refer to Section 2: Project Description. A summary of the potential construction and operational impacts on ecology are outlined in Tables B.14 and Table B.15. Potential impacts in these tables do not imply that they will occur, or that any resultant effects will be significant.

Table B.14: A Summary of Potential Construction Impacts on Ecological Receptors.

Activity	Potential ecological impact
Mobile plant operations & traffic	Direct habitat loss. Temporary noise. Vibration, movement, vegetation disturbance & habitat fragmentation. Pollution & sediment release into watercourses. Mortality.
Greens, tee, fairways & bunker construction	Direct habitat loss. Temporary noise. Vibration, movement, vegetation disturbance, habitat loss & fragmentation. Pollution & sediment release into watercourses. Mortality.
Tracks & watercourse crossings including cut/fill works	Direct habitat loss. Temporary noise. Vibration, movement, vegetation disturbance & habitat fragmentation. Pollution & sediment release into watercourses. Changes in hydrology & chemistry leading to vegetation changes. Mortality.
Construction of buildings	Direct habitat loss. Temporary noise. Vibration, movement, vegetation disturbance, habitat loss & fragmentation. Pollution & sediment release into watercourses. Mortality.

Table B.15: A Summary of Potential Operational Impacts on Ecological Receptors.

Activity	Potential ecological impact
Tracks, greens, tees, fairways, bunkers & buildings	Residual loss of habitat from construction throughout operation. Impacts on hydrology & chemistry resulting in changes to vegetation. Sediment release into watercourses. Mortality from vehicles. Disturbance from increased human activity.
Maintaining greens & tees	Use of herbicide & pesticide reduced diversity of plants and invertebrate in surrounding areas. Nutrient enrichment from fertilizers changing species composition & community. Pollution from these activities into watercourses/ground water sources. Disturbance from increased human activity. Loss of habitat from grass cutting piles. Nutrient enrichment from grass cutting piles. Disturbance & mortality from cutting equipment.
Recreation i.e. recreational use of pathways	Increased disturbance & associated effects through noise and trampling etc. e.g. motorbikes, walking, dogs & litter etc.

Severance/habitat fragmentation describes the loss of continuity between habitats which ultimately results in the isolation or fragmentation of discrete populations. The proposed development has been designed in such a way that physical barriers to habitats and species are avoided and severance will not occur. There are many gaps and breaks in the design layout, which keeps connectivity between contiguous habitats. There is no evidence that any of the important terrestrial ecological receptors within the study area would find a 3.5m wide access track for example a physical barrier, causing severance and preventing movement between habitat patches. The fairways, tees and greens have been designed to not separate habitats, such as the dune heath, into different isolated patches. Therefore, the likelihood for severance is assessed as negligible and it is not specifically considered further unless as part of inbuilt design mitigation.

Following the baseline studies, consideration of ecological receptors, potential impacts on the following important ecological receptors are assessed:

- Habitats;
- Bats;
- Fonseca's seed-fly;
- Juniper;
- Waxcap fungi; and
- Lichen (*Cladonia mitis*).

5.5.3.2 Potential Impacts and Habitats

The construction and operation of the proposed development has the potential to negatively affect habitats directly and indirectly through temporary habitat loss at construction and permanent habitat loss during operation. Potential effects on habitats have been determined by overlaying the proposed development layout onto the NVC map (Appendix B.7, Figure B.6). It should be noted that a series of design, management and mitigation measures aimed at avoiding or reducing impacts on important and sensitive habitats (especially dune heath, open dunes and dune-slacks) have been incorporated into the design (see Section 2: Project Description), with numerous design iterations considered before the final one was determined. Table B.16 displays the metrics assumptions made in relation to the operational land-take calculations presented.

The elements presented for operational habitat loss are considered to be permanent effects (i.e. for the lifetime of the golf course). The elements presented for construction habitat loss are considered to be temporary effects and these habitats will be restored post construction. The predicted habitat losses from operation and construction are not additive.

Table B.16: Summary of Predicted Operational Habitat Loss (Land-take) and Parameters.

Element	Element metric	Total area[(b)]
Entrance drive	Road length = 1,470m Estimated 3.5m wide, plus passing places[(a)] – as yet unmarked. Assumed 6m wide along length to include possible passing places.	8,808m^2
Bunkers	79 bunkers, outside of the tees and greens	6,331m^2
Pond	1 pond	550m^2
Club house	1 club house	225m^2
Maintenance building	1 maintenance building	2749 m^2
Tees, greens, fairways, pathways and semi-rough	18 hole golf course	207,862m^2

(a) Passing places will be determined during construction and will avoid the most sensitive habitats – note the entrance drive is wholly outwith the Loch Fleet SSSI.

(b) Area calculated from ArcGIS shapefiles.

The habitat around the tees, greens and fairways will be regularly mown or cut (known as 'the semi-rough'). This semi-rough area is approximately 3m around the tees, greens and fairways and is included within the land-take calculations due to the proposed regular management. There is a further area around the tees, greens and fairway which will be occasionally mown (a maximum of once per year). This is termed 'the rough'. The rough has not been included in the land-take calculations as management is not considered likely to materially change the habitat type present (only reduce its height - mimicking grazing). There will be no seeding or chemical application in the semi-rough or rough. The rough habitat is approximately 2-15m around the semi-rough.

Table B.17 displays the assumptions and metrics used in relation to the predicted construction land-take calculations i.e. those that are 'temporary' for the duration of construction (prior to successful habitat reinstatement/restoration). The construction land-take includes borrow pits and a buffer around the road to account for works vehicles and drainage. No buffer has been added to the golf course infrastructure as the construction team are confident they will not significantly impact the land outside the golf course layout (for details see Section 2: Project Description)

Table B.17: Summary of Predicted Construction Habitat Loss (Land-take) and Parameters.

Element	Element metric	Total area[(b)]
Entrance drive	Operational loss plus 1m buffer either side of road	11,756m^2
Bunkers	Operational loss	6,331m^2
Pond	Operational loss	550m^2
Club house	Operational loss	225m^2
Maintenance building	Operational loss	2749 m^2
Tees, greens, fairways and semi-rough	Operational loss	207,862m^2
Borrow pits[(c)]	6 borrow pits, all 394m^2	2,183m^2

(c) Passing places will be determined during construction and will avoid the most sensitive habitats – note the entrance drive is wholly outwith the Loch Fleet SSSI.

(d) Area calculated from ArcGIS shapefiles. Note that the area is not the same as operational + 2 m buffer due to buffering of all sides of infrastructure unless otherwise specified. The predicted construction land-take is based on buffers applied in an ARC GIS model and includes additional areas e.g. at the end of roads. Where necessary, overlapping buffers were merged.

(e) The amount of material that will be required to be used from borrow pits is not known at present and will be determined once ground investigation work is completed. The number and size of borrow pits presented here is the worst case (not likely) scenario.

The actual area from the merged development shapefile is not the same as all the separate metrics combined due to overlap between components added. It should also be noted that the boundaries of the communities on the NVC map are indicative only, because there is usually a gradation between different habitat types and rarely a distinct or linear boundary. The approximate predicted NVC community loss as a consequence of land-take caused during construction and operation is provided in Table B.18.

Table B.18: Predicted Habitat Loss (land-take) during Operation and Construction.

Phase 1 habitat	NVC community	Total operational loss (ha)	Total construction loss (ha)
Improved grassland	Total combined MG6a:MG6b MG6a MG7a	5.74 (1.83) (2.23) (1.68)	6.02 (1.93) (2.40) (1.69)
Dune heath	Total combined H11c H11b H11a	4.47 (4.02) (0.30) (0.15)	4.47 (4.02) (0.30) (0.15)
Dune grassland	Total combined SD9x SD7a SD12	2.51 (2.50) (0.01) (<0.01)	2.51 (2.50) (0.01) (<0.01)
Neutral grassland - semi-improved	Total combined MG1b MG1c MG9a MGh MG6b	1.42 (0.61) (0.48) (0.16) (0.09) (0.08)	1.45 (0.61) (0.48) (0.16) (0.09) (0.11)
Dune grassland: dune-slack	Total combined SD17:SD12 SD9x:SD16 SD9:SD16	1.15 (1.12) (0.02) (0.01)	1.15 (1.12) (0.02) (0.01)
Improved grassland: dune grassland	MGh:SD9x	1.04	1.04
Dune grassland: dune heath	H11b:SD9x	1.22	1.22
Conifer plantation - recently felled	Felled plantation	0.98	1.02
Open dune	Total combined SD7y SD5c	0.74 (0.74) (<0.01)	0.74 (0.74) (<0.01)
Bracken	U20c	0.53	0.53
Scrub	Total combined SDRp W23a	0.49 (0.28) (0.21)	0.50 (0.28) (0.22)
Improved grassland: scrub	MGh:SDRp	0.36	0.36
Acid grassland: dune grassland	U4a:SD7a	0.28	0.28
Dune-slack	Total combined SD17 SD17:M27 SD15a SD16 SD17:SD15a	0.27 (0.16) (0.06) (0.02) (0.02) (0.01)	0.27 (0.16) (0.06) (0.02) (0.02) (0.01)
Neutral grassland: marshy grassland	MG6b:M23b	0.19	0.25
Marshy grassland	Total combined MG10a M25a M23b:M27c	0.15 (0.12) (0.02) (0.01)	0.15 (0.12) (0.02) (0.01)

Phase 1 habitat	NVC community	Total operational loss (ha)	Total construction loss (ha)
	M27c	(<0.01)	(<0.01)
Marshy grassland: dune-slack	Total combined MG10a:SD17 MG10a:SD15a	0.14 (0.14) (<0.01)	0.14 (0.14) (<0.01)
Semi-natural broad-leaved woodland	W2	0.14	0.14
Tall ruderal	Total combined OV24b OV25a	0.13 (0.12) (0.01)	0.13 (0.12) (0.01)
Acid grassland - unimproved	U2a	0.11	0.11
Dune heath: dune-slack	H11b:SD17	0.11	0.11
Marginal and inundation	Total combined MG11a A24	0.09 (0.09) (<0.01)	0.09 (0.09) (<0.01)
Scrub: neutral grassland	Total combined MG6b:W23a MG6b:MG10a:W23a	0.11 (0.08) (0.03)	0.14 (0.10) (0.04)
Neutral grassland: dune heath	MGh:H11c	0.07	0.07
Buildings and roads	Buildings and roads	0.05	0.06
Dune heath: scrub	H11: W23a	0.01	0.01
Acid grassland: small sedge mire	U4a: small sedge mire	0.04	0.04
Open water	Open water	0.06	0.06
Bare sand	Bare sand	0.02	0.02
Amenity grassland	OV23	0.01	0.01
Bare ground	Bare ground	<0.01	<0.01
Running water	Stream	<0.01	<0.01
Short perennial	OV21c	<0.01	<0.01
Improved grassland: dune-slack	MG6a:SD12b		0.04
Total		22.6	23.2

The habitat which will experience the largest land-take loss (in terms of overall area) from the proposed development is improved grassland followed by dune heath, dune grassland and semi-improved neutral grassland (Table B.18). Some of the most sensitive habitats found within the study area, such as saltmarsh, have been completely avoided through the design layout. However, it is recognised that there is little scope for completely avoiding other sensitive habitats such as dune heath with the proposed design layout.

Table B.19 displays the proportional amount of habitat loss during construction for habitats considered nationally important (i.e. those featured as part of the SSSI citation). There is approximately 33,000ha of sand dune habitat in Scotland (Maddock, 2011). The most detailed and comprehensive data for this comparison is that of Dargie, (2001a) in the Sand Dune Vegetation Survey of Scotland for the Moray Firth, which gives the area of different habitat types on a regional basis. Therefore, the magnitude of impact is assessed at the study area and the regional (Moray Firth) level (where area metrics are available).

Table B.19: The Proportional Land-take Habitat Losses from Operation of the Proposed Development.

Phase 1 habitat (NVC community)	Proportional study area loss and magnitude	Proportional regional loss and magnitude
Dune heath (H11)	A total of 4.47ha of dune heath is predicted to be lost from the proposed development out of the 28.8ha study area resource = 15.5%[1] Magnitude of change = Moderate	A total of 4.47ha of dune heath is predicted to be lost from the proposed development out of the 383.2ha regional resource =1.6% Magnitude of change = Minor
Dune grassland (SD9, SD7)	A total of 2.51ha of dune grassland is predicted to be lost from the proposed development out of the 33.8 study area resource = 7.4%[2] Magnitude of change = Minor	A total of 2.51ha of dune grassland is predicted to be lost from the proposed development out of the 352.5ha regional resource = 0.7% Magnitude of change = Negligible
Open dune (SD7y)	A total of 0.74ha of open dune is predicted to be lost from the proposed development out of the 9.2ha study area resource = 8.0%[3] Magnitude of change = Minor	A total of 0.74ha of open dune is predicted to be lost from the proposed development out of the 352.5ha regional resource = 0.2% Magnitude of change = Negligible
Dune-slack (SD15, SD16, SD17)	A total of 0.27ha of dune-slack is predicted to be lost from the proposed development out of the 15.1ha study area resource = 1.8[4]% Magnitude of change = Minor	A total of 0.27ha of dune-slack is predicted to be lost from the proposed development out of the 228.7ha regional resource = 0.12% Magnitude of change = Negligible

Likely significant effects through land-take are predicted for the dune heath habitat. The magnitude of change predicted for dune heath was considered moderate within the study area. Dune heath within the study area is considered nationally important as it is listed within the SSSI citation (SNH, 2011). Therefore, the likely effect of land-take is considered significant, even though the land-take area at a regional scale is considered minor. All other predicted effects on habitats are assessed as either likely to be negligible or minor and so not significant.

Micro-siting of the golf course infrastructure will be undertaken to avoid sensitive habitats wherever possible e.g. around more species rich, or lichen rich dune heath and dune-slack vegetation. This will necessarily be carried out on the ground (under guidance/supervision of an experienced Ecological Clerk of Works) and not as a desk-based exercise.

[1] 90% of the dune heath that is proposed to be impacted is the species poor H11c sub-community. Patches of lichen and species richer areas will be avoided through micro-siting wherever possible.

[2] >99% of the dune grassland proposed to be impacted by the development is the SD9x rank dune grassland.

[3] >99% of the open dune grassland proposed to be impacted by the development is SD7y, which is a semi-fixed dune grassland and not the more mobile dune communities such as SD5 or SD6.

[4] Some of the dune-slack calculated land-take will be boardwalk crossings which will have a minimal impact on the dune-slack.

There are several habitat matrices predicted to be impacted by the proposed development, such as dune grassland: dune-slack and dune grassland: dune heath. The dune grassland: dune-slack matrices had 10% dune-slack (or less) within them, and so no additional impact for dune-slack is predicted. The dune heath: dune grassland was made up of a very grassy form of dune heath, amongst dune grassland SD9x. No significant impacts on dune heath are predicted from the loss of these matrix habitats due to land-take.

For each of the other habitats present, predicted habitat loss (Table B.18) during construction and operation constitutes <1% of the total study area proportion, or the habitat holds low ecological value (such as improved grassland). No other likely significant effects are predicted due to habitat loss from construction or operation for these habitats. Herbicide and fertiliser application has the potential to change the composition of habitats within the study area. However, these chemicals will be carefully used in discrete and defined areas, following approved methods (Supporting Document 12 - Golf Course Management Plan) Based on previous experience (STRI, no date), herbicides and fertilisers are not likely to spill beyond the boundary of the tees, fairways and greens. Based on this assumption, the potential impact of herbicide and fertiliser application on adjacent habitats as a result of the use of these chemicals is considered unlikely (Table B.20).

The proposed development has the potential to impact upon the GWDTE, particularly dune-slack habitats, within the study area by altering the hydrology and hydrochemistry within the study area. No likely significant effects are predicted on the hydrology and hydrochemistry by the proposed development. Full details are provided in Annex C - Section 6.0: Hydrology and Hydrogeology. Based on this assumption, no likely significant effects for GWDTE from hydrological change are predicted (Table B.20).

In summary, without mitigation likely significant effects are only predicted for one important habitat within the study area: dune heath. All other predicted effects on habitats are assessed as either likely to be negligible or minor and so not significant.

Table B.20: Summary of Potential Construction and Operational Effects on Habitats.

Parameter	Habitat loss	Herbicide/fertiliser pollution event	Impacts on GWDTE
Extent	Site wide, within development footprint	Habitats adjacent to greens, tees, fairways, bunkers	On GWDTE site wide
Duration	Long-term	Event = short term Recovery = variable	Event = short term Recovery = variable
Reversibility	Irreversible	Reversible	Reversible
Frequency	One-off	Rare/never	Rare/never
Probability	Certain	Unlikely	Unlikely
Magnitude	Negligible or Minor except for dune heath which is Moderate	Negligible	Negligible

5.5.3.3 Potential Impacts on Important Species

5.5.3.3.1 Bats

Construction and operation of the proposed development has the potential to negatively impact bats directly or indirectly in two main ways through habitat loss (land-take) and loss of roost sites (potentially resulting in mortality) (Table B.21).

Bat activity within the study area was concentrated around the Coul Farm House and steading buildings, which offered moderate or high roosting potential for bats (and where roosts were found), with low foraging activity across Coul Links itself. (Technical Appendix B.4 Bat Survey Report). Consequently, the foraging habitat changes associated with the proposed development are likely to be minimal. However, the buildings/steadings around Coul Farm House will be demolished/renovated, directly affecting four known bat roosts. Whilst the three bat species recorded during studies (soprano pipistrelle, common pipistrelle and brown long-eared bat) are common-abundant species in the UK, they are specially protected by law.

A Species Protection Plan will be developed to ensure that the bats are maintained on site at a favourable conservation status. The Technical Appendix B.4 Bat Survey Report will form the basis of this plan but additional work will be required in consultation with The Highland Council (THC) and SNH. Given the nature of the planned works on the Coul Farm house steading buildings (Appendix ES.5, it is considered highly likely that adverse impacts could not be avoided or reduced to a very low level and an offence under The Conservation (Natural Habitats, &c) Regulations 1994 (as amended) would be committed.

Licences are available from SNH for certain purposes to permit actions, such as building renovations that might otherwise constitute an offence in relation to bats. Licences to permit development can only be granted subject to strict tests being met. How these conditions should be met is outlined in the Discussion of Appendix B.4 Bat Survey Report and is, in effect, the draft Species Protection Plan that needs discussing and agreeing with SNH and THC.

Consequently, the likely effects of the potential development on bats are predicted to be not significant in the context of the EIA Regulations, i.e. there will be no detectable adverse regional or national population level impacts.

Table B.21: Summary of Potential Construction and Operational effects on Bats.

Parameter	Habitat loss - foraging	Loss of roost sites
Extent	Development footprint	Four known roosts, all within buildings identified for renovation
Duration	Long-term	Event = short term
Reversibility	Irreversible	Reversible
Frequency	One-off	One-off
Probability	Likely	Likely
Magnitude	Minor	Minor

5.5.3.3.2 Fonseca's seed-fly

The construction of the proposed development has the potential to negatively affect Fonseca's seed-fly within the dune grassland directly through habitat loss during construction, herbicide/insecticide use during operation (Table B.22) and food-plant loss via accidental, but inappropriate management.

Relatively little is known about the Fonseca's seed-fly and its habitat ecological requirements. In total, only three studies of these species are known, studies in the 1965, when it was first described (Ackland, 1989), in 2010 (Gibbs, 2013) and in 2016 during Coul Links ES studies (Technical Appendix B.5: Fonseca's Seed-fly Report). The accreting front dunes are considered the most likely place for Fonseca's seed-fly mating and courting (Gibbs, 2013) and were the location of the three female species found in the study area in 2016. These areas have been avoided through design to minimise potentially important habitat loss for this species. The single male that was located in the study area in 2016 was found on semi-improved neutral grassland. The habitat that is it was found on has been largely avoided by design layout. However, it is unclear how important these and other areas are to Fonseca's seed-fly.

There is likely to be 0.74ha (8.0% of study area resource) of open dune habitat lost and 2.51ha (7.4% of study area resource) of dune grassland lost through land-take by the proposed development. Insecticide or herbicide affecting areas where Fonseca's seed-fly mate and/or larva are within their food plants may result in death. However, these chemicals will be carefully used in discrete and defined areas, following approved methods. Based on previous experience (STRI, no-date), herbicides and insecticide are not likely to spill beyond the boundary of the tees, fairways and greens. Based on this assumption, an accidental potential pollution event is considered highly unlikely.

The proposed long-term guaranteed conservation management of Coul Links is likely to benefit Fonseca's seed-fly if conservation managers know more about the species' lifecycle. Detailed research into the ecology of Fonseca's seed-fly is planned and will be used to inform long-term management at Coul Links. Consequently, the likely effects of the potential development on Fonseca's seed-fly are predicted to be not-significant in the context of the EIA Regulations, i.e. there will be no detectable adverse regional or national population level impacts.

Table B.22: Summary of Potential Construction and Operational Effects on Fonseca's Seed-Fly.

Parameter	Habitat loss	Herbicide/ insecticide pollution event	Food plant loss
Extent	Land-take: 8.0% of open dune and 7.4% of dune grassland	Adjacent to greens, tees, fairways, bunkers	Greens, tees, fairways, bunkers
Duration	Long-term	Event = short term Recovery = unknown	Long-term
Reversibility	Irreversible	Reversible	Reversible
Frequency	One-off	Rare/never	One-off
Probability	Certain	Unlikely	Unlikely
Magnitude	Minor	Negligible	Negligible

5.5.3.3.3 Juniper

The construction of the proposed development has the potential to negatively affect juniper within the dune grassland directly through habitat loss during construction and herbicides use during operation (Table B.23).

Juniper was located in three separate locations within the dune grassland and within the dune heath during the Phase 1 habitat and NVC survey. Two of these locations have been avoided by the design layout. However, one location, which was described as having 20-30 individual juniper is within the boundary of Hole 3 of the development footprint. Many of these juniper will be avoided through micro-siting and those that are not will be transplanted elsewhere during the autumn prior to construction commencing at Hole 3.

Although juniper is a widespread species, it is only known to occur on sand dunes at two locations in the UK (Maddock, 2011), so the transplantation of any remaining juniper which cannot be micro-sited around, is considered necessary. The likely effects of the potential development on juniper are predicted to be not-significant in the context of the EIA Regulations, i.e. there will be no detectable adverse regional or national population level impacts.

Table B.23: Summary of Potential Construction and Operational Effects on Juniper.

Parameter	Habitat loss/removal of species	Herbicide pollution event
Extent	1-30 individual plants	Adjacent to greens, tees, fairways, bunkers
Duration	Long-term	Event = short term Recovery = unknown
Reversibility	Reversible	Reversible
Frequency	One-off	Rare/never
Probability	Likely	Unlikely
Magnitude	Minor	Negligible

5.5.3.3.4 Waxcap fungi

The construction of the proposed development has the potential to negatively affect waxcap fungi within the dune grassland directly through habitat loss during construction and chemical use during operation (Table B.24).

The likely effects of the potential development on waxcap fungi are predicted to be not-significant in the context of the EIA Regulations, i.e. there will be no detectable adverse regional or national population level impacts. Furthermore, the proposed long-term guaranteed conservation management of Coul Links towards a shorter vegetation sward height is likely to benefit waxcap fungi.

Table B.24: Summary of Potential Construction and Operational Effects on Waxcap Fungi.

Parameter	Habitat loss	Herbicide/pesticide/fungicide
Extent	Unknown[5]	Adjacent to greens, tees, fairways, bunkers
Duration	Long-term	Event = short term Recovery = medium
Reversibility	Irreversible	Reversible
Frequency	One-off	One off/never
Probability	Certain	Unlikely
Magnitude	Minor	Negligible

5.5.3.3.5 *Cladonia mitris*

The construction of the proposed development has the potential to negatively affect *Cladonia mitris* within the dune heath directly through habitat loss during construction and chemical use during operation (Table B.25).

[5] This potential impact is described as unknown because the extent of waxcap mycelia within the soil across the study area is unknown. ca 15% of the study area grassland noted in for waxcap fungi in 2003 surveys will be lost to land-take. However, in 2003 it was noted that the waxcap grassland was short and rabbit grazed. This was not the case in the 2016, where the same grassland was tall and dominated by false oat-grass. Therefore, it is unclear how suitable the grassland is for waxcap fungi at the present time.

The likely effects of the potential development on *Cladonia mitris* are predicted to be not-significant in the context of the EIA Regulations, i.e. there will be no detectable adverse regional or national population level impacts. Furthermore, the proposed long-term guaranteed conservation management of Coul Links towards a shorter sward height (favouring dune heath over rank grassland) is likely to benefit *Cladonia mitris*.

Table B.25: Summary of Potential Construction and Operational Effects on *Cladonia mitris.*

Parameter	Habitat loss	Herbicide/pesticide
Extent	0.15ha[6]	Adjacent to greens, tees, fairways, bunkers
Duration	Long-term	Event = short term Recovery = medium
Reversibility	Irreversible	Reversible
Frequency	One-off	One off/never
Probability	Certain	Unlikely
Magnitude	Minor	Negligible

5.5.3.4 Potential Impacts on Designated Sites

This section describes the potential impacts on important ecological features of designated sites that could arise from the construction and operation of the proposed development. These designated sites are:

- Loch Fleet SSSI (feature: eelgrass beds, sandflats, saltmarsh, sand dunes, native pine woods, vascular plant assemblage).
- Dornoch Firth and Loch Fleet RAMSAR site (feature: reefs, saltmarsh, intertidal mudflats and sandflats and sand dunes).

Based on targeted habitat surveys, the evidence collected demonstrates that several of the features mentioned in the Loch Fleet SSSI citation occur within and adjacent to the proposed development. Consequently further consideration of potential impacts and associated effects on the Loch Fleet SSSI is required.

Based on targeted habitat surveys, the evidence collected demonstrates that several of the features mentioned in the Dornoch Firth and Loch Fleet RAMSAR citation occur within and adjacent to the proposed development. However, these features are also noted within the Loch Fleet SSSI citation and since, according to SNH, RAMSAR sites in Scotland are protected and managed through the SSSI system (SNH, 2017c), these will be dealt with through the SSSI. Consequently, no further consideration of potential impacts and associated effects on the Dornoch Firth and Loch Fleet RAMSAR site is required as they will be addressed through determination of the potential impacts on the SSSI.

[6] The lichen *Cladonia mitis* was found within an area of H11a in the 1990s. A total of 0.15ha of H11a dune heath predicted to be lost, or otherwise affected during construction and operation of the proposed development.

5.5.3.4.1 Loch Fleet SSSI

The construction of the proposed development has the potential to negatively affect the Loch Fleet SSSI directly by adversely impacting on the citation features and delivery of SSSI management objectives. Based on assessments outlined above, the only SSSI citation feature that is likely to be significantly and adversely affected by the construction and operation of the proposed development is dune heath. No likely significant effects are predicted for any other SSSI citation features. Table B.26 summaries the potential impacts on the proposed development on the Loch Fleet SSSI management objectives.

Table B.26: Summary of Potential Impacts on Loch Fleet SSSI Management Objectives.

SSSI Management objective	Potential impact
To maintain the condition, distribution and extent of the eelgrass beds, sandflats and saltmarsh habitats	None. These habitats are fully avoided by the design layout.
To restore the condition of the sand dune habitat.	A likely significant negative effect is predicted on dune heath (part of sand dune habitat) from land-take prior to mitigation. No likely significant negative impacts are predicted on other sand dune habitats. Likely positive impacts are predicted through mitigation which are detailed in Section 5.7.
To maintain the condition, distribution and extent of pinewood habitat.	None. The pinewoods are avoided by the design layout.
To maintain the distribution and population size of rare and scarce plants.	SSSI species cited are those found within pinewoods and saltmarsh habitats. No impacts are predicted for these species as their habitats are fully avoided by the design layout.
To maintain the population of breeding birds and to avoid significant disturbance to these birds during the breeding season.	See Annex A: Ornithology for details.
To increase the wintering population of eider and to avoid significant disturbance to this species.	See Annex A: Ornithology for details.
To maintain non-breeding populations of waterfowl and avoid significant disturbance.	See Annex A: Ornithology for details.
To maintain the distribution and extent of marine habitats and species which are part of the Moray Firth SAC.	None. No impacts on marine habitats or species are likely.

The likely impacts for all SSSI features (except dune heath) are judged to be not significant in the context of the EIA Regulations, i.e. there will be no detectable population level impacts on the qualifying features of the SSSI. Therefore, if the proposed development goes ahead as the available information indicates the Favourable Conservation Status of the Loch Fleet SSSI will not be adversely affected.

After the committed mitigation is implemented, detailed in Section 5.7, it is predicted that the residual impacts on dune heath are likely to be non-significant.

5.6 EVALUATION OF EFFECTS

Table B.27 summaries the evaluation of effects of ecological receptors before mitigation.

Table B.27: Summary of Importance, Magnitude of Change and Significance of Effect on Ecological Receptors before Mitigation.

Ecological receptor	Importance	Magnitude of change	Significance of effect
All habitats except dune heath	National/regional/local	Minor/negligible	Non-significant
Dune heath	National	Moderate	Significant
Bats	Local	Minor/negligible	Non-significant
Fonseca's seed-fly	National	Minor/negligible	Non-significant
Common juniper	Regional	Minor-Negligible	Non-significant
Waxcap Fungi	Regional	Minor-Negligible	Non-significant
Cladonia mitris	Regional	Minor-Negligible	Non-significant

5.7 COMMITTED MITIGATION MEASURES

The mitigation measures detailed in this section are related specifically to ecology, are part of in-built design with the proposed development and are considered to be 'committed' mitigation measures and treated accordingly with the evaluation undertaken within the ES.

The recent development of best practice guidance and principles in regard to Biodiversity Net Gain (BNG) and planning in the UK (CIRIA, CIEEM and IEMA, 2016), has emphasised the requirement for developers not just to mitigate against potential negative impacts, but to provide overall tangible biodiversity benefits. Within the committed mitigation measures are a number of actions that will provide a commitment to BNG at Coul Links.

In this regard, the developers have committed to funding, implementing and delivering a long-term Coul Links Site Management Plan (CLSMP) post consent. This important document will be discussed, developed and agreed with SNH, be based around the relevant sections of the existing Loch Fleet SSSI Site Management Statement and aim to achieve favourable conservation status for the Coul Links part of the Loch Fleet SSSI. This CLSMP is distinct and different from the Coul Links golf course management plan, which is provided separately. A baseline Management Plan Aspirations report), outlining strategies and proposals is provided as (Support Document 4.

The Loch Fleet SSSI Site Management Statement (SNH, 2011) details a series of SSSI management objectives, some of which are specifically relevant to the Coul Links part of this large designated site (Table B.26). The CLSMP will aim to address these existing management objectives and will provide full details of the committed mitigation measures. These are outlined here as habitat management and enhancement measures and species management and enhancement measures.

5.7.1 Habitat Management and Enhancement

The habitat mitigation measures will be fully developed and agreed after consultation with SNH in the CLSMP post-consent. Once mitigation measures have been implemented they will not only reduce the impacts of the proposed development on ecological features, but result in positive ecological benefits to elements of the SSSI. A post-mitigation monitoring scheme will be agreed upon and applied to regularly assess and modify the management actions as necessary. A public access plan will be also be developed and agreed so public understanding is enhanced and public access is managed in such a way to protect the important ecological sensitives at Coul Links. Full details are provided in the Visitor and Recreational Access Plan..

5.7.1.1 Control of Invasive Species

Parts of Coul Links, specifically (but not exclusively) the south and southwest, have had substantial increases in invasive species cover since SSSI designation in the 1980's and monitoring began. For example, the SNH Site Management Statement reports that '*Tree saplings e.g. Scots pine, birch, willow and gorse encroachment of the dune habitats has been causing gradual modification of the dune system*' (SNH, Loch Fleet SSSI Site Management Statement). Furthermore, detailed analysis of aerial images by Alba Ecology have shown that in 1988 there was 1.83 ha of bracken (*Pteridium aquilinum*) and the expansion has continued with 3.66 ha of bracken in 2016, an increase of 100% (Technical Appendix B.6: Aerial comparisons: 1988, 2009 and 2016). This invasive species expansion has adversely affected several of the SSSI citation listed habitats at Coul Links, including composite flower-rich areas of potential importance to Fonseca's seed-fly. Consequently, control and management of the areas of invasive species, particularly at the south and southwest end of Coul Links, both within and outside of SSSI, will be beneficial.

A management plan and details of the control techniques for the following species will be agreed upon with SNH and detailed in the CLSMP:

- Gorse;
- Rosebay willowherb (*Chamaenerion angustifolium*);
- Thistles;
- Bracken;
- Scots pine;
- Birch; and
- Willow.

5.7.1.2 Dune Heath Management

It is predicted that, without mitigation, dune heath will experience likely significant negative effects from the proposed development. Land-take calculations predict that 4.47ha, 15.5% of the dune heath, will be lost. It is proposed that the dune heath loss is mitigated for through;

- Management of the current areas of dune heath;
- Natural expansion;
- Restoration; and
- Translocation and artificial expansion.

Management of the current dune heath at Coul Links will be considered carefully within the CLSMP to maximise the biodiversity benefits. Proposed management includes reducing the dominance of ling heather and abundance of grasses from some dune heath areas to promote greater biodiversity, particularly of lichens and species such as crowberry. The dune heath management may involve grazing or cutting (plus removal of cut material) which would be agreed upon with SNH and include ongoing monitoring.

Natural expansion of dune heath has been occurring at Coul Links since the SSSI was designated. Using a series of detailed aerial photographs and GIS, it has demonstrated that there has been an approximate 3.6ha expansion of dune heath at Coul Links since SSSI designation in the 1980s; an increase of 17% in the 28 year time period (Technical Appendix B.6 Aerial comparisons: 1988, 2009 and 2016). The area of natural dune heath expansion is predominantly in the west and northwest of Coul Links and the evidence clearly demonstrates this natural expansion is on-going. The grassland surrounding the dune heath will be managed, through the CLSMP, to allow this natural expansion of dune heath habitat to continue.

Restoration of the felled conifer planation will include dune heath restoration and will be a direct biodiversity benefit to Coul Links. This is detailed in Section 5.1.7.3.

Transplantation and artificial expansion of dune heath into new areas will minimise the impacts of the proposed development on dune heath. There is extensive best practice guidance available to inform proposed heath expansion and transplantation (e.g. SNH, 2017b). Dune heath expansion and heath transplantation has been successful on a number of golf courses in the UK in recent years including three which are at least partly within SSSIs. These courses are:

- Castle Stuart Golf Links, Inverness (SSSI);
- Walton Heath, Surrey;
- Carnegie Golf Club, Skibo Castle, Dornoch (SSSI);
- Sunningdale Golf Couse, Berkshire (SSSI);
- Thornbury Golf Club, Bristol; and
- Royal Birkdale Golf Club, Southport.

Castle Stuart, partly located within a SSSI, translocated 1.5ha of heather and associated species (including crowberry) onto sandy soils in 2007 from a donor location ca. 40 miles away. The seed and brash from the translocated heather was collected and sown to create new heathland areas. According to Castle Stuart's monitoring programme, the translocation was almost immediately successful with a lichen understorey quickly established within the translocated heather.

The dune heath management objective for the CLSMP will be agreed with SNH and likely involve either transplanting turfs of the dune heath (that would otherwise be lost through land-take) and/or seeding with dune heath seeds collected from within Coul Links. UK experts in heath management, restoration and transplantation at golf courses will undertake the proposed work at Coul Links. Further details of these techniques will be provided in CLSMP and an outline of proposed locations and techniques are provided in Supporting Document 1: Dune Heath Translocation Plan).

It is proposed that the area of dune heath expansion at Coul Links should be considerably greater than the predicted area of dune heath loss (through land-take), resulting in the proposed development achieving '*no nett loss*' in overall dune heath habitat extent. It is predicted that the proposals will result in a small 'net increase' of dune heath within the SSSI. Furthermore, if a greater portion of the felled conifer plantation is seeded with dune heath, the estimated net increase would be greater. We currently anticipate approximately 0.5-2ha of additional dune heath habitat will be created, but this will be decided and implemented in consultation with SNH.

The proposed development is committed to ensuring no net loss in dune heath habitat at Coul Links and indeed, a small expansion in the dune heath resource is predicted during the life time of the proposed development through planned management.

5.7.1.3 Conifer Plantation Habitat Restoration

Within the Coul Links SSSI there is a 5.6 ha area of felled conifer plantation (see Appendix B.7, Figure B.5), with very low current biodiversity value. As part of the proposed development, this area, which will contain a portion of two golf holes (Holes 10 and 11), will also be restored to a mosaic of dune heath and dune grassland using established and effective management methods.

There are examples of dune heath restoration work within Europe (e.g. Denmark) where dune heath has been re-established on areas which had previously been conifer plantation (IFFN, 2004). The 5.6ha felled plantation area within the Coul Links SSSI would be suitable for dune heath restoration work of this nature.

The techniques and methods for conifer plantation habitat restoration will be agreed upon and detailed within the CLSMP.

5.7.1.4 Grass Sward Management

Management of the grassland at Coul Links will be considered carefully within the CLSMP to maximise the biodiversity benefits. Proposed management objectives would include managing the sward height, reducing the thatch of rank species, increasing species diversity, particularly of forbs, and allowing waxcap fungi to thrive. The grassland management may involve grazing or cutting (plus removal of cut material) but would be agreed upon with SNH and include a monitoring system to ensure success. Different management regimes are likely to be required for different grassland types and areas within Coul Links.

5.7.1.5 Expansion of Management from SSSI Area Southwards

The two areas of land outwith the SSSI, but part of Coul Links will be managed to provide a consistent and joined-up management approach across the whole of Coul Links. These areas are: (i) 7.2ha of land at Coul Links between the southern burn and Embo (not within the SSSI and known locally as 'the MacIntosh property'), and (ii) 7.5ha of land at Coul Links in the northwest (which is within the SSSI and known locally as 'the Bain property'). Conservation management of this wider (non-SSSI) area of Coul Links will be agreed with SNH, implemented and funded by the developer for the lifetime of the golf course as part of the CLSMP.

This joined-up approach to the management of the whole of Coul Links will ensure that mitigation objectives such as the control of invasive species and grass sward management is effective and contiguous across the wider Coul Links area and not just within the SSSI.

5.7.2 Species Management

5.7.2.1 Bats

In light of bat roosts within the buildings at Coul Links a formal bat mitigation (protection) plan will be agreed with SNH and THC. Work will only commence on buildings when this plan is agreed and fully licenced. The mitigation in the Bat Protection Plan will include (and not be limited to):

- All buildings being treated as a 'roost' as it is highly likely that the existing roosts are socially linked with bats moving between different locations.
- Updated surveys should be undertaken.
- Minimising scale and duration of impacts, undertaking work outwith sensitive times of year and maintain new roost features in the same location, aspect and structure as currently present.

5.7.2.2 Fonseca's seed-fly

Although non-significant effects are predicted on the Fonseca's seed-fly, important mitigation measures are committed to. When studying the conservation needs of this species, it is necessary to consider the lack of knowledge regarding important elements of the ecology of Fonseca's seed-fly. Given the small global range and importance afforded to

Fonseca's seed-fly, understanding more about the ecology of the species is crucial for its management, not just at Coul Links, but elsewhere in east Sutherland.

The requirements of Fonseca's seed-fly will be considered in four main ways:

- Ensure large and important habitat areas for composite flowers at Coul Links are retained through design layout.
- Fund a PhD studentship or specialist dipterist research into the unknown, important elements of Fonseca's seed-fly ecology.
- Publish the findings of the research so that the ecology of the species is more widely understood and recognised.
- Commit to adjust and target habitat management at Coul Links towards Fonseca's seed-fly favoured composite flowers (and other elements if necessary) in light of the research results.

These committed mitigation measures for the Fonseca's seed-fly will ensure that: (i) areas of potentially important Fonseca's seed-fly food plant will be protected and managed for this species (note for the first time this conservation management would cover a substantial proportion of the known global range of Fonseca's seed-fly), and (ii) the golf course development will be used as a mechanism to fund and target detailed research into the poorly known areas of Fonseca's seed-fly's ecology and then disseminate the findings by publication for use in conservation management.

5.7.2.3 Habitat Management to Benefit Lepidoptera

Although non-significant effects are predicted on the Lepidoptera at Coul Links, mitigation measures are committed to as part of BNG. The main key for Lepidoptera conservation at Coul Links is to maintain and expanding suitable habitat, specifically in relation to their food plants. The details of habitat management for Lepidoptera will be agreed upon and detailed in the CLSMP, but will include:

- Management to maintain and where possible enhance the current habitat for the northern brown argus and promote management for common rock-rose in suitable areas. This would provide additional habitat potentially enabling the population of the northern brown argus to expand with Coul Links. Butterfly Conservation provides details of suitable management techniques for this species (Butterfly Conservation, 2017) and it is anticipated that the CLSMP would implement these.
- Ensuring the kidney vetch population at Coul Links is maintained and where possible expanded for the small blue. Kidney vetch is found commonly across Coul Links. It is a species that readily colonises disturbed ground, but which can be out competed by other species in later years. Restoration of the borrow pits immediately adjacent to Coul Links would be ideal for kidney vetch and annual creation of disturbed ground, such as creating butterfly banks and creating small bare sand scrapes would also encourage the small blue population (Butterfly Conservation 2017).
- The micro-moth *Caryocolum blandelloides* feeds on common mouse-ear which is found commonly across Coul Links. Management of the grass swards, as detailed in Section 5.7.1.4 will ensure common mouse-ear can thrive.

- Grass sward management and the creation of small bare sand scrapes or butterfly banks will potentially be beneficial to other species of Lepidoptera across Coul Links.

5.7.2.4 Juniper Translocation

Juniper will be avoided wherever possible during construction. The Ecological Clerk of Works will advise contractors of juniper's presence and they will be avoided wherever possible. Any juniper that will be unavoidably impacted by the development will be transplanted, into nearby suitable locations as advised by the Ecological Clerk of Works.

5.7.2.5 Grassland Management to Benefit Waxcap Fungi

The semi-improved grassland at Coul Links should be managed to be promote and enhance waxcap fungi. The waxcap fungi assemblage is reliant on the sward height being between 5 and 50cm. Scrub and tree regeneration have an adverse impact on the fungi assemblage. The grass sward management and the control on invasive species within the CLSMP will take into account waxcap fungi and be agreed upon with SNH.

5.8 RESIDUAL EFFECTS

Before mitigation likely significant effects were only predicted for one important ecological receptor within the study area: dune heath. All other predicted effects on habitats and species, before mitigation, were assessed as either likely to be negligible or minor and so not significant under the EIA Regs. The impacts and effects on dune heath are reassessed here, in light of the planned mitigation outlined in section 5.7 (Table B.28). All other predicted adverse effects remain non-significant.

Based on evidence from dune heath translocation, transplantation and seeding from other similar sites see Supporting Document 1: Dune Heath Translocation Plan, the mitigation proposed is likely to result in an small increase (approximately 0.5-2ha) in dune heath at Coul Links. It also commits to management of the dune heath to increase the biodiversity of the current dune heath areas. The small/modest increase in dune heath resource would be considered a likely minor, non-significant positive impact on dune heath habitat. The restoration of natural dune habitats, particularly dune heath in the felled conifer plantation and the unambiguous biodiversity net gain benefit it would bring is considered to be a likely minor non-significant positive impact/effect for the Loch Fleet SSSI.

In summary after the committed mitigation measures are implemented no likely significant negative effects are predicted for any ecological receptors. Some minor positive effects for ecological receptors are predicted after taking into account the committed mitigation measures. The only likely significant effect predicted, after mitigation, is the positive effect on the conservation of Fonseca's seed-fly.

Table B.28: Summary of Importance, Magnitude of change and Significance of Effect on Ecological Receptors after Mitigation.

Ecological receptor	Importance	Magnitude of change before mitigation	Significance of effect before mitigation	Magnitude of change after mitigation	Resultant effect
All (except dune heath)	National/ regional/local	Low/negligible	No likely significant effect	Negligible/ low positive	No likely significant effect
Dune heath	National	Moderate	Likely significant effect	Negligible/ low positive	No likely significant effect
Bats	Local	Low/negligible	No likely significant effect	Negligible	No likely significant effect
Fonseca's seed-fly	National	Low/negligible	No likely significant effect	Moderate	Significant positive effect
Common juniper	Regional	Medium	Likely significant effect	Low	No likely significant effect
Waxcap Fungi	Regional	Low/negligible	No likely significant effect	Negligible/ minor positive	No likely significant effect

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6.0 ANNEX C: HYDROLOGY AND HYDROGEOLOGY

6.1 SCOPE OF ASSESSMENT

6.1.1 Technical and Temporal Scope

The scope of the hydrology and hydrogeology assessment addresses the potential effects on surface water and groundwater from the proposed development and considers the potential effects to groundwater dependent terrestrial ecosystems (GWDTE). The assessment of effects on GWDTEs draws on the relevant findings of the assessment of ecological effects of the proposed development (see Annex B: Ecology). The temporal scope addresses the construction and operational phases of the proposed development.

6.1.2 Scoping

Guidance on the scope of the assessment has been received at various stages through the planning and EIA process. Initial guidance was received in a pre-application advice pack from the Highland Council (THC, ref. 15/03874/PREAPP, dated 17 November 2015). Further guidance was also provided in association with the screening opinion (ref. 16/00053SCRE, dated 26 January 2016), in scoping responses via THC (ref. 16/00081/SCOP, dated 26 June 2016; and 16/00081/SCOP, dated 8 August 2016), and in an additional scoping response from Scottish Natural Heritage (CNS/EIA/Coul Links Golf Course/CEA 142632, dated 15 September 2016).

Table C.1 presents a summary of the key aspects associated with hydrology and hydrogeology that have been identified from the pre-application, screening and scoping advice and should be addressed in this assessment.

Table C.1: Summary of Scoping

Consultee	Topic	Details
Scottish Natural Heritage	Loch Fleet Site of Special Scientific Interest (SSSI) - Sand Dune Habitat	Consider the protected sand dune habitat. Design should retain maintenance of the transition between the four main dune types; embryo, fixed dune, dune heath and dune slack.
		Consider the impact to dune hydrology, which may affect the function of the dune slack habitats
		Consider the coastal setting and the implications of coastal erosion, if parts of the course are proposed close to the dune edge. Design should not rely on coastal defences.
		Consider the potential effects of herbicide and/or pesticide use and from irrigation.
Scottish Environment Protection Agency (SEPA)	Water Environment	Avoid direct impacts on the water environment.
		Consider the potential effects of drainage from hardstanding, parking, roads/tracks, fertilisers, herbicide and irrigation.

Consultee	Topic	Details
		Consider high pollution risk activities, such as yard areas, service bays, fuelling areas, pressure washing areas, oil or chemical storage, handling and delivery areas.
		Consider the effects on existing watercourses.
		Address the potential impacts from water abstraction, if required.
		Consider the effect on existing groundwater abstractions.
		Consider the effects on GWDTE outside the designated site.
		Consider flood risk if watercourses will be realigned, or buildings are proposed in the area of medium to high risk from flooding.

6.1.3 Relevant Guidance and Advice

This assessment will be undertaken in light of the guidance and advice provided through scoping and in accordance with current planning guidance, advice and legislation, including, but not limited to:

- The Water Framework Directive (2000/60/EC);
- The Water Environment and Water Services (Scotland) Act 2003;
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended);
- The Flood Risk Management (Scotland) Act 2009;
- Scottish Planning Policy (SPP);
- Relevant Planning Advice Notes (PAN);
- Land Use Planning System SEPA Guidance Note 31 Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems;
- UK Technical Advisory Group on the Water Framework Directive: Technical report on groundwater dependent terrestrial ecosystem (GWDTE) threshold values;
- SEPA Pollution Prevention Guidelines (PPGs);
- SEPA and Natural Scotland Engineering in the water environment: Good Practice Guide, River Crossings, (2010, Second Edition);
- CIRIA C692: Environmental Good Practice on Site (2010, Third Edition); and
- CIRIA C532: Control of Water Pollution from Construction Sites (2001)

6.2 STUDY AREA AND SENSITIVE RECEPTORS

The study area has been defined so that potential issues relating to the hydrology and hydrogeology of the proposed development and how these may be influenced by the proposed development, are adequately assessed. The proposed development is located on the coast and is supported by a localised catchment originating in the plantations to the west; therefore, the study area extends to the coast in the east and north and 2 km landward to the south and west in order to consider nearby off-site water receptors that may have the potential to be affected by changes at the proposed development. For the purposes of identifying private water supplies a landward study radius of 1.2 km was used, which was defined by the maximum distance required by SEPA for water features surveys (SEPA 2010).

Using information on the setting of the proposed development and the scoping responses, the key receptors that will be considered are as follows:

- Watercourses.
- Wetlands and Groundwater Dependent Terrestrial Ecosystems (GWDTE) both inside and outside the dune system. GWDTE are identified through the terrestrial ecology survey work (see Chapter 5: Ecology), but, due to the link to hydrogeology, these specific habitats are considered in this assessment as potential receptors.
- Public and private water supplies from surface water (i.e. lochs and burns) and their associated infrastructure.
- Public and private water supplies from groundwater (i.e. underground water or springs) and their associated infrastructure.
- The coastline.
- Proposed golf course infrastructure.

6.3 EXISTING ENVIRONMENT

6.3.1 Topography and Setting

The study area is bounded by the North Sea to the east and Loch Fleet to north. The majority of the land within the study area comprises areas of fields for arable agriculture and livestock and of conifer planation. The land in the most northern and eastern parts of the study area comprises the coastal dune system of Coul Links. The dismantled railway line of the Dornoch Light Railway delineates the change between the agricultural land in the west and the dune system in the east. Information regarding land use and land designations is presented in Sections 6.3.4, 6.3.5 of this annex, respectively.

The topography within the study area ranges from around 1 to 2 m AOD along the coast in the north and east to a high of 100 m AOD in the western part of the study area beyond the Fourpenny Planation. Within the coastal dune environment to the east of the dismantled railway, the land rises steeply from the beach to the top of the foredune at approximately 10 to 15 m AOD. The land between the foredune and the dismantled railway comprises dune slack and dune heath, in which the topography typically undulates

between approximately 3 m AOD and 10 m AOD, with localised highs of around 12 m AOD. The dune system is typically about 350 m to 700 m wide from the coast to the change to improved pasture inland. Within the dune slacks is an elongated winter loch that is approximately 1.5 km long and up to 0.15 km wide and typically has a basal elevation of 3 to 4 m AOD.

Immediately to the west of the dismantled railway, around Coul Farm House and steading, the elevation of the land increases sharply to around 15 m AOD. Coul Farm and steading are located on a relatively flat plateaux. To the south and northwest from Coul Farm, the increase in elevation inland from the dismantled railway occurs more gradually. This increase in elevation may represent an old coastline as it also corresponds with the geological boundary between the mapped dune sands and the older raised marine deposits. The topography then continues to increase gradually toward the southwest.

6.3.2 Soils and Superficial Geology

6.3.2.1 Soils

The soils within the study area mapped as Links Regosols derived from windblown sands, Corby podzols derived from fluvioglacial and raised beach sands and gravels and Berridale podzols derived from Middle Old Red Sandstone (The Macaulay Institute for Soil Research, 1981). The Links Regosols are mapped as covering all of the land to the north and west of the access track to Coul Farm and also extend over parts of the improved pasture to the west of that track and south down to the village of Embo. The Corby and Berridale podzols (which are both humus-iron podzols) are mapped over the rest of the study area.

Regosols are soils developed on unconsolidated material and are described as comprising "well drained, weakly developed soils often with a mineral topsoil and no distinct layering in the subsoil", and humus-iron podzols are described as "well drained acid soils with bright colours and a thin organic surface layer overlying a grey subsoil layer" (Scotland's Environment, 2016).

Observations made at sheep scrapes and rabbit burrowing on the land to the east and north of Coul Farm suggest a thin (typically less than 3 cm) organic layer is present that supports the grasses, scrub and trees. This thin soil layer overlies sand.

6.3.2.2 Superficial Geology

The superficial (drift) deposits at the Site comprise three main lithologies (BGS, 2016). An excerpt from the 1:50,000 scale geology mapping is shown within Appendix C.1 as Geoindex Drawing. The superficial deposits mapped in the southwest and central parts of the Site (i.e. beneath the areas of woodland and rough pasture in the southwest, and beneath the upper parts of the improved pasture, approximately coinciding with land located above the 20 m AOD contour line on the Ordnance Survey 1:25,000 scale map) comprise Till. Till is a term for non-stratified material deposited by glacial ice that is poorly sorted and contains a wide range of grain sizes from clay to boulders. Raised Marine Deposits comprising gravel, sand and silt are mapped between the eastern and northern extents of the Till and the approximate route of the old railway. The land located on this

geology is mainly the improved pasture. From the eastern extent of raised marine deposits to the coast, the superficial geology is mapped as blown sand deposits. These are described as fine grained and un-cemented sands.

There are no boreholes to confirm the sequence or thickness of the superficial deposits. To the west of the study area beneath the Harriet Planation there is an area where the Till is not present and the bedrock is mapped at the surface. Therefore, it is most likely that the Till was deposited first during a period of glaciation and largely covered the older bedrock in this area. After the glaciers retreated, costal marine and then dune sands would have been deposited. Based on this, there may be both Till and Raised Marine Deposits present beneath the blown sand deposits if they were not eroded.

6.3.3 Bedrock Geology

The bedrock geology beneath the whole site comprises the Raddery Sandstone Formation (part of the Black Isle Sandstone Group and the Old Red Sandstone Supergroup) that was deposited in the mid-Devonian (BGS, 2016). This sandstone is described as being "largely of fluvial origin with lensing conglomerate members and muddy lacustrine members with fish fragments" and can be over 1 km thick (BGS, 2016). There are no outcrops of this bedrock mapped within the study area.
Information presented in the Geoinsight Report (Groundsure, 2016), indicates that there are no faults mapped in the Raddery Sandstone Formation within the study area and the sandstone is fractured and had a moderate to high permeability.

6.3.4 Land Use

6.3.4.1 Historical Land Use

Historical mapping (Groundsure 2016, and National Library of Scotland 2016) provides information about previous land uses and activities in the study area. A summary of the mapping information is presented in Table C.2

Table C.2.

Table C.2: Summary of Historical Mapping

Map Source	Sheet and Survey Date	Details
1:2,500 Ordnance Survey Maps (National Library of Scotland) 1:10,560 Ordnance Survey Maps (Groundsure)	Sutherland Sheets CX6, CX10 and CX14, surveyed 1874 Country Series, dated 1874	The land north of the road to the village of Embo and east of the road through the community of Fourpenny is largely undeveloped and comprises Coul Links in the east, fields in the central section and Coul Plantation in the west. A series of buildings called 'Coul' were shown in the central part of the Site, with the location of a hut, circle cairn and old quarry mapped nearby. A well is marked in the vicinity of the Coul buildings and another two are marked just north of Embo. An access track is located between Coul and the main road north from Fourpenny. There is a track running over the north-western part of the Site to a ferry pier in the north.

Map Source	Sheet and Survey Date	Details
		Loch na Con is a water body mapped near the north-western boundary of the Site. There was a watercourse/drainage channel crossing the Links and out to sea in the southern part of the study area and a field drainage channel originating in the fields south of Coul and discharging into the Links system. The land to the south of the road to Embo and west of the road through Fourpenny comprises a mixture of plantations and farmland. Within the farmland to the west are clusters of individual properties focused around Skelbo, Skelbo Street, Skelbo Muir, Knockglass and Fourpenny. Skelbo comprises a house, farm office, the remains of a castle, cottages and a corn mill. To the south is the village of Embo and Embo Mains. Embo mains includes a house, offices and a smithy. Numerous wells are mapped near to these properties.
1:2,500 Ordnance Survey Maps (National Library of Scotland) 1:10,560 Ordnance Survey Maps (Groundsure)	Sutherland Sheets 110.06, 110.10, 110.11 and 110.14, surveyed 1904/1905 Country Series, dated 1907	As pervious, except: The Dornoch light railway has been constructed and passes through the Site from the northwest, though the western part of Coul Links, past the eastern side of Coul Farm House and steading, and south through Embo. A station is mapped at Skelbo and in Embo. Gravel and sand pits are mapped adjacent to the access track to Coul Farm, by Coul, to the south east on the coast by Embo and near Embo Mains. A sheepwash is mapped as part of the Coul steading. More springs are mapped near the wells to the north of Embo and another well is mapped adjacent to the railway line. Pools are mapped within the Coul Plantation and a watercourse is mapped as originating to the west of Coul Farm House and discharging into the Links. The village of Embo has expanded to the south and west and the smithy at Embo mains is no longer marked.
1:25,000 Ordnance Survey Maps (National Library of Scotland) 1:10,560 Ordnance Survey Maps (Groundsure)	Sheets NH79 & Parts of NH89, published 1950 Country Series, dated 1956	As previous, except: The Coul Plantation in the southwestern part of the study area has been felled and is mapped as rough pasture and furze (gorse). The mill at Skelbo is no longer marked. The village of Embo has expanded to the south and west.

Map Source	Sheet and Survey Date	Details
1:10,000 Ordnance Survey Maps (Groundsure)	National Grid, 1978	As previous, except: The railway is dismantled and none of the wells or springs are mapped. A small area of conifer forest has been planted to the northeast of Coul Farm steading. The village of Embo has expanded to the south and west. The remains of a chambered cairn is mapped to the south of Embo. Grannie's Heilan Hame holiday park has also been mapped south of Embo, on Embo Links.
1:10,000 Ordnance Survey Maps (Groundsure)	1:10,000 Raster, 2002	As previous, except: A drain is mapped along the field boundary to the west of Coul Farm House. There has been an increase in the number of properties in Skelbo Street.
1:10,000 Ordnance Survey Maps (Groundsure)	National Grid, 2010	As previous.
1:10,000 Ordnance Survey Maps (Groundsure)	National Grid, 2014	As previous.

Information provided by the Farm Manager at Coul (letter dated 6 October 2016) indicates that in the last 20 years there has been no known storage of agricultural chemicals (e.g. preservative or pesticides), sheep dipping (including storage and/or disposal of sheep dipping chemicals), disposal of liquid waste via a route other than approved drainage systems, or storage and maintenance of vehicles at Coul Farm.

Information provided by THC contaminated land team indicates that the following former land uses that could present sources of contamination are located within the study area and are as follows:

- A disused pit (THC Ref: SU-MIN-1074) centred at NGR 280538: 894466;
- A disused quarry (THC Ref: SU-MIN-1106) centred at NGR 281240: 893986;
- A disused pit (THC Ref: SU-MIN-1107) centred at NGR 281166: 894054; and
- A former waste disposal tip (THC Ref: SU-WDS-1019) that has not been used for domestic refuse for over 30 years. Based on the mapping included in the Groundsure report (Groundsure, 2016), this tip is located to the west of the village of Embo around NGR 281216 892931.

Anecdotal evidence provided by the local community at the public consultation events suggests that, in the past (pre-1970), residents of Embo tipped some rubbish on the land immediately north of the village to the north-east of where a football pitch is located today. Accounts suggest localised fly tipping of unwanted objects, but no further information is available.

6.3.4.2 Current Land Use

At present, the coastal dune system in the north and east of the study area is used for cattle grazing and by some walkers. The pasture to the south, west and north-west of Coul Farm is used for sheep grazing. The rough pasture east of the road to Fourpenny and north of the road to the village of Embo is used for cattle grazing. The land to the west of the road to Fourpenny and south of the road to Embo predominantly comprises fields used for grazing and crops, plantations and residential properties/gardens.

- Coul Farm House is occasionally occupied by the landowner. Coul Farm steading comprises a series of other buildings. The following details of these are available:
- Coul Cottage (No.1) is a semi-detached, single storey building occupied by a tenant who uses the cottage as his residence and also uses the single storey building to the south as a workshop.
- Coul Cottage (No.2) is a semi-detached, single storey building and is unoccupied.
- The U-shaped steading building is not currently in use, but has been used for equipment storage.
- The small building between the cottages and the U-shaped steading buildings is used for vehicle storage.
- A tall, cylindrical, metal agricultural storage tank (silo) located opposite Coul Farm House. It is not currently used and will reportedly be removed in the near future.

There is a rectangular area of concrete located to the east of the steading buildings that was a cow shed, but is no longer used.

Information provided by the Farm Manager at Coul (letter dated 6 October 2016) indicates that the current activities or installations at Coul Farm include the following:

- Above ground heating oil tanks for two properties;
- Septic tanks for two properties; and
- Burning (seasonal burning of garden waste only).

6.3.5 Designated Sites

The dune land between the coast and the dismantled railway line (as far south as the drainage channel that comes from the plantations to the west and flows out to sea) is part of the Dornoch Firth and Loch Fleet Special Protection Area (SPA) and Ramsar site as well as the Loch Fleet Site of Special Scientific Interest (SSSI).

The Dornoch Firth and Loch Fleet SPA and Ramsar site cover over 7,800 ha. The SPA is designated for: providing foraging grounds for nationally important numbers of osprey; supporting internationally important wintering populations of Icelandic greylag goose, wigeon and bar-tailed godwit; and for supporting a diverse assemblage of wintering waterfowl that includes nationally important populations of teal, scaup, curlew and redshank. The Ramsar site is designated for the following features: non-breeding bar-tailed godwit, greylag goose, wigeon, waterfowl assemblage, wet woodland, reefs, saltmarsh, intertidal mudflats and sandflats and sand dune. The area of the SPA/Ramsar site that lies within the study area is approximately 158 ha.

Loch Fleet SSSI extends beyond the study area of this assessment and covers over 1,230 ha. The whole SSSI includes extensive intertidal flats that support nationally important numbers of wintering birds. The surrounding coastal and woodland habitats and the assemblages of plants and breeding birds they support, are also of national importance. The area of the SSSI that lies within the study area is approximately 158 ha and largely comprises the Coul Links dune system, which displays a complete transition from foredune, through winter lochs, to wooded slacks.

Table C.3 provides a summary of the Loch Fleet SSSI designated features, which is taken from the Site Management Statement produced by SNH.

Table C.3: Summary of Loch Fleet SSSI Features

Notified Natural Feature of SSSI	Condition of feature (year assessed by SNH)
Eelgrass beds	Favourable, maintained (2000)
Sandflats	Favourable, maintained (2004)
Saltmarsh	Favourable, maintained (2005)
Sand dunes	Unfavourable, recovering (2003)
Native pinewood	Unfavourable, recovering (2005)
Vascular plant assemblage	Favourable, maintained (2005)
Breeding bird assemblage	Favourable, declining (2008)
Eider Somateria mollissima – non-breeding	Unfavourable, no change (2001)

6.3.6 HYDROLOGY

6.3.6.1 Precipitation

Historical climate data is available from the Met Office (Met Office, 2016) for its station at Tain Range, which is located approximately 10.5 km south of the proposed development and at 4 m above mean sea level (m asl). The average climate data for the period 1981 to 2010 provides an average annual rainfall of 646.4 mm and nearly 141 days where 1 mm or more rain fell. This is drier than the climate data for northern Scotland, for which the data for the same period provides an average annual rainfall of 1721 mm and nearly 207 days where 1 mm or more rain fell.

Monthly rainfall data is freely available from the Met Office (Met Office, 2016) for its stations at Leuchars and Wick Airport. The Leuchars station is located at 10 m asl approximately 185 km south of the proposed development. The Wick Airport station is located at 36 m asl approximately 80 km northeast of the proposed development. The annual rainfall recorded at each of these stations over the last 10 complete years (2006 to 2015) is presented in Table C.4.

Table C.4: Rainfall Data (2006-2015)

Year	Rainfall at Leuchars Station (mm)	Rainfall at Wick Airport Station (mm)
2006	619.0	829.3
2007	704.5	784.4
2008	805.2	719.2
2009	791.3	912.3
2010	744.9	710.5
2011	853.8	809.4
2012	896.0	784.0
2013	629.2	642.3
2014	810.5	788.0
2015	726.5	757.8

Table C.5: Average Rainfall Data

Station	Tain Range Station	Leuchars Station	Wick Airport Station
Average Rainfall (2006-2015)	No data available	758.1	774.6
Average Rainfall (1981-2010) (mm)	646.4	690.8	814.3
Average number of days where 1 mm or more rain fell (1981-2010)	141	122	166

From the data presented in Table C.4 and Table C.5, 2013 was a drier than usual year when compared to the last ten years. The longer term average rainfall for Tain is more similar to the data from Leuchars than Wick. The monthly average rainfall for the Leuchars and Wick Airport stations over the period 2006 to 2015 are shown in Figure C.1. This data indicate that, over the last ten years, the lowest rainfall has occurred in spring and the most has typically occurred in late summer or autumn.

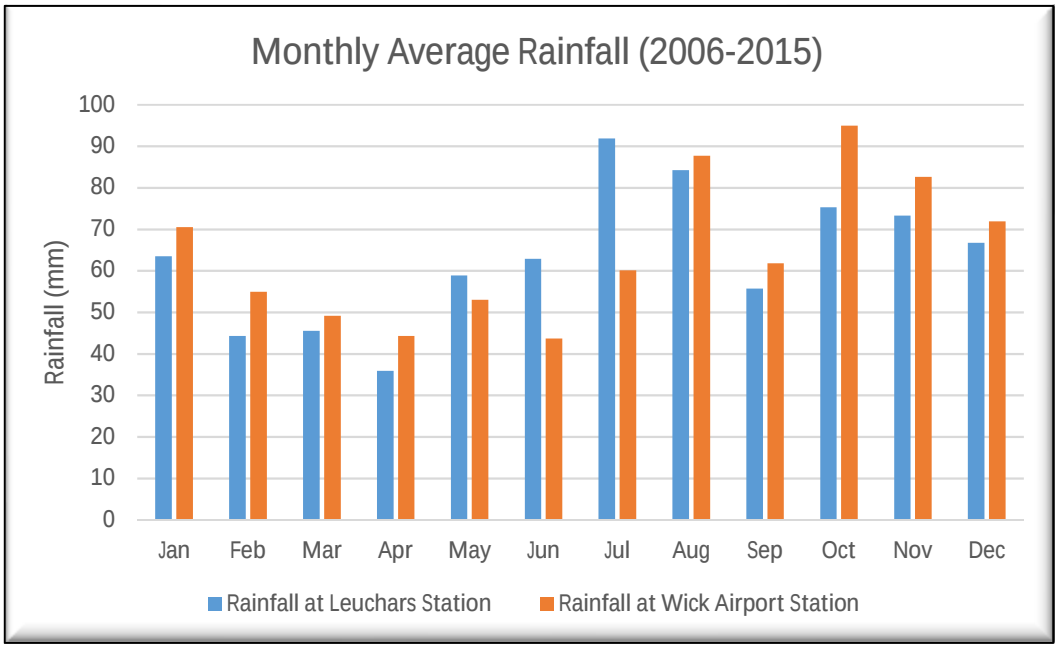

Figure C.1. Monthly Average Rainfall (2006-2015)

6.3.6.2 The Coast

The coast borders the north-western, northern and eastern sides of the study area. The eastern boundary is defined by the foredune, beyond which is the beach and the North Sea. The northern and north-western edges of the study area are bound by Loch Fleet. There is a tidal inlet from Loch Fleet in the northern part of the study area. Observations made during site walkovers indicate that the southern parts of the tidal inlet are only inundated with water occasionally.

There are existing coastal erosion defences in the southern part of the study area, along the coast by the village of Embo. These are a mixture of hard and soft defences. There are no coastal erosion defences along the shoreline to the east of the dune system at Coul Links.

A recent study has developed a tool for identifying assets that are currently inherently exposed to coastal erosion (Fitton et. al., 2016). That study has identified that the land within the study area that is located around the coast to the north and east of the dismantled railway line, is modelled as having medium to very high susceptibility to coastal erosion. This susceptibility to coastal erosion model does not identify areas where erosion is currently happening or predict where erosion will occur in the future, but where erosion can occur based on the setting.

The National Coastal Change Assessment (NCCA) is a project that 'aims to establish historic coastal change by extracting the georectified coastline position from OS 2nd Edition Country Series maps (1892-1905) and to then compare it to both the 1970's and current coastal position (updated by LiDAR datasets where available) in order to estimate past erosion/accretion rates' (NCCA, 2016). The project is currently underway, but draft maps are available that compare the coastline (defined by the Mean High Water Mark/Springs) in 1890 to that in the 1970s, and compare the coastline in the 1970s to that in 2009. The maps show that the eastern coast along Coul Links has typically been retreating at an average rate of between 10 cm and 30 cm per year. Larger changes (both retreat and accretion) have typically occurred around the tidal inlet in the northern part of the study area.

A map showing the change in the position of the vegetation edge along the coast at Coul Links has been provided by SNH. The map shows the relative position of coastal vegetation in 2009 and 2015 (both digitised from aerial imagery) and in 2016 (based on the recorded location of a walked edge). A second map has also been provided showing the overall direction of change (i.e. stable, accretion or retreat) between 2009 and 2016. The maps indicate that the vegetation line retreated along the eastern coast of Coul Links by between 1 m and 16 m over that period. Accretion of up to 18 m is mapped towards the tidal inlet in the northern part of the study area. SNH notes that most of this is thought to have occurred during two storms in 2014 and that generally the changes are more modest when these storm events are not included and spatial errors and method differences are considered.

The NCCA data and the maps produced by SNH both show that there is coastal retreat and accretion occurring along the coastal edge of the study area. The SHN information also indicates that rapid changes can occur during storm events.

6.3.6.3 Watercourses

The surface watercourses in the study area are mapped by the Ordnance Survey as drains. The drains are shown on the 1:10,000 scale Ordnance Survey mapping (Appendix C.2: Groundsure, 2016a) and were observed to be as mapped during walkovers of the study area and using aerial imagery. Many of these drains appear to have been managed and provide drainage to either agricultural land or forestry plantations. Most of the drains do not pass onto the proposed development area and either discharge to Loch Fleet to the north or the North Sea to the southeast. There are three drains that are located in the study area that also pass within the proposed development area. For the purpose of this assessment, these drains are referred to as the northern, central and southern burns.

The northern burn originates within the Fourpenny Plantation and a cluster of pools underlain by Glacial Till within the rough pasture to the west of Coul Farm. This drain then passes along the southern boundary of Coul Farm House, into a culvert under the farm and discharges from the side of the slope below the farm into the pool beside the dismantled railway line. Observations made during visits to the proposed development area indicate that this drain only flows in days following heavy rainfall and that there is no distinct channel once the drain has passed under Coul Farm steading.

The central burn is deeply incised (>1.5 m between base and field level) and is fed by a series of field drains that emerge within the improved pasture to the southwest of Coul Farm. The position of the western end of the channel corresponds with the approximate location of the boundary, between the mapped Till deposits and the Raised Marine Deposits. However, the origin of the field drains that discharge water into the drain are not known. Therefore, the water in the drain is likely to represent discharge of near-surface groundwater from within the superficial deposits (Till and/or the Raised Marine Deposits). The drain passes under the dismantled railway line and into the dune slacks. To the east of the dismantled railway, the water flows within a much less well defined sinuous channel towards the winter loch. When input from the west is lower, the water appears to infiltrate into the sands, saturating the ground rather than presenting as a surface feature. Based on field observations, this drain flows more often than the northern burn, but does not flow all year round.

The southern burn (known locally as the Cluain Burn) is mapped by the Ordnance Survey as originating in the Fourpenny Plantation to the west of the study area, then flowing east under the Dornoch to Fourpenny road, through the rough pasture and improved pasture, across the southern end of the proposed development area (approximately 300 m north of Embo) and discharges out to sea. The watercourse is located within a main channel that varies in width and depth along its length, but is typically less than 1.0 m wide and 0.4 m deep. The shape of the channel suggests it is either man-made or has been enhanced to improve the passage of water to the sea. Channel improvement is particularly evident where it crosses the improved pasture. Where this is the case, the channel is deeper, wider and straighter than along much of its length.

Closer to the coast, the main channel increases in depth and there is evidence of flooding by the sea, indicated by seaweed lines on either side of the watercourse. The southern burn was flowing on all occasions that it was visited by Golder, but it is understood from discussions with Alba Ecology (ecology consultants for the project) that flow along the full length of the watercourse and out to sea does not occur at all times. Water has been observed by Alba Ecology as being present in the western part of the burn, but that this seeps into the sands before the most eastern dunes.

6.3.6.4 Permanent Water Bodies

Ponds are shown on the 1:10,000 scale Ordnance Survey mapping (Appendix C.2): Groundsure, 2016a). Observations made during visits indicate that these ponds are present as mapped. The shallower ponds have been observed to have less water in them during drier months and tend to be marshier. Some of the ponds are deeper and typically correspond with known areas of ground workings, where sand and/or gravel was removed in the past. These deeper ponds tend to contain water all year round. It is likely that precipitation provides input to these waterbodies, either

6.3.6.5 Ephemeral Water Bodies

The Loch Fleet SSSI includes dune slacks, which are depressions behind dunes that run parallel to the coast and typically have a ground elevation close to sea level. Water can be present in these depressions and the water level and extent of standing water will vary depending on the level of the water table and the input from precipitation and surface water.

The largest water body in the dune slacks is a north-south orientated primary dune slack that contains an ephemeral winter loch. The winter loch has been observed to contain water on occasion in the winter months (typically December to March). Observations made in early March 2016 and late March 2016, indicate that the water visible at the surface can appear and then disappear within a matter of weeks. During the rest of the year, the loch is absent and the ground is usually damp or dry with a change in vegetation marking the extent of the winter loch. The elevation of the high water mark within this Loch typically corresponds to a height between the 3 m AOD and 4 m AOD contours. During periods of high water, the extent of standing water in the winter loch is approximately 1.4 km long and over 0.1 km wide in places, with higher areas of ground within the loch appearing as islands. The water in the winter loch was tested using an electrical conductivity probe in early March 2016, which indicates that the water was not brackish or saline (see Section 6.3.6.8 of this annex). During the same visit, the water level in the flooded winter loch relative to the vegetation change around its borders was also observed. There was no distinguishable change in water level, so it is inferred that the water in the winter loch is affected by tides. No surface connection has been observed between the dune slacks and the southern drain that discharges to the sea; therefore, it is likely that the water in the dune slacks discharges eastwards through the dune sands to the beach.

Other smaller, individual ephemeral pools, or groups of interconnected pools, have been observed within the SSSI on occasion during the winter months. These are too numerous to map individually, but typically occur in hollows with a basal elevation below 3 to 4 m

AOD between Embo and the southern drain, near the central burn, around the area of cut woodland to the northeast of Coul Farm and in the fields to the northwest of Coul Farm (north of the farm access track). There is also an area of wet woodland that is located in the northwest part of the dune system that comprises numerous pools of water of various sizes within a woodland that is dominated by scrub and birch trees

The surface water within the winter loch, pools and wet woodland within the SSSI is caused by a combination of the expression of groundwater when levels are high and from direct input from precipitation. In the case of the winter loch, some input is also provided directly by discharge from the northern and central burns. During drier months when groundwater levels are lower, direct rainfall in these areas infiltrates straight into the underlying sandy geology and the ephemeral waterbodies are not present. The amount of time the slacks flood and how much of the total area is flooded will be dependent on the frequency of rainfall events and the preceding degree of saturation of the ground. Natural variations between years and longer term climate changes, will be drivers for the frequency and extent of flooding of the main dune slack.

6.3.6.6 Flood Risk

SEPA holds information on past small catchment flooding in Scotland that has led to significant impacts upon people and property. SEPA currently has no record of the study area having been subject to any form of flooding.

As part of its response to a data enquiry, SEPA has reviewed its flood map 200-year flood outline (i.e. the flood with a 0.5% chance of occurring in any single year) and indicates that the study area lies adjacent to this envelope and as such, is potentially at risk of coastal flooding. Using the SEPA flood mapping website (SEPA, 2016) the areas mapped as being at risk from coastal flooding are around the mouth of Loch Fleet in the north, the beach to the east and the mouth of the Cluain Burn (southern burn). SEPA has provided an indicative 1 in 200 year coastal flood level of 3.27 m AOD, based on extreme still water level calculations using its Coastal Flood Boundary Method (which does not take into account the potential effects of wave action, funnelling or local bathymetry).

SEPA also identified that there are some areas within the study area that are at medium to high risk of surface water flooding. Using the SEPA flood mapping website (SEPA, 2016), these mapped areas largely correspond to the drainage channels, as well as the winter loch and other hollows within the dune slack system that are known to be water filled during times of high groundwater levels.
The SEPA flood mapping website (SEPA, 2016) also indicates areas at risk from river flooding. Only the burn that flows through Skelbo is shown to present any risk of flooding from rivers in the study area and it discharges into Loch Fleet outside the proposed development area.

6.3.6.7 Surface Water Supplies

On 29 and 30 August 2016, each property within the smaller water features survey study area was visited in order to request information on private water supplies, which could include water from surface watercourses. One property occupier in Knockglass, indicated use of water from the drainage channel to the southeast of their property for augmenting the livestock drinking water, but that this only flowed during October to May. No other water users in the study area indicated using surface water supplies.

6.3.6.8 Surface Water Chemistry

Field parameters (pH, electrical conductivity and temperature) of the surface water within the SSSI were recorded during a visit in March 2016 using a handheld meter. Two measurements were made in the southern burn (Cluain Burn); one at the discharge to the coast and one further inland. Five measurements were made in the winter loch and 11 measurements were made in other pools within the ephemeral dune slacks. The measurements are summarised in Table C.6.

Table C.6: Summary of Surface Water Field Parameter Measurements

Location	Statistic	pH	Electrical Conductivity (uS/cm)	Temperature (degrees Celsius)
Southern Burn (Inland)	*	6.8	1600	4.0
Southern Burn (Coast)	*	7.87	400	4.1
Winter Loch	Minimum	7.36	282	5.7
	Mean	8.01	361	7.1
	95th percentile	8.61	441	8.4
	Maximum	8.63	454	8.4
Ephemeral Slack Pools	Minimum	6.28	226	2.5
	Mean	7.44	495	5.4
	95th percentile	8.21	746	7.2
	Maximum	8.33	801	7.5

* Single measurement location

The measurements indicate that the all of the water has a neutral to slightly alkaline pH and that the electrical conductivity is more indicative of that expected for non-brackish groundwater, as it is higher than typical values for rain water and much lower than would be expected for seawater. This suggests that groundwater provides input to both surface watercourses and to the ephemeral waterbodies.

6.3.7 Hydrogeology

6.3.7.1 Aquifers

Using information provided by SEPA following a data request for this assessment, the study area is located upon two groundwater bodies, the Dornoch Coastal aquifer and the Dornoch aquifer.

The Dornoch Coastal aquifer groundwater body underlies the northern and eastern parts of the study area that correspond to the mapped location of the Raised Marine Deposits and Wind Blown Sand superficial deposits. The Dornoch Coastal aquifer groundwater body has been classified as having good quantitative status and good qualitative status and there are currently no pressures identified by SEPA on this water body.

The Dornoch bedrock aquifer groundwater body underlies the whole of the study area. The Dornoch aquifer groundwater body has been classified as at good quantitative status and good qualitative status and there are currently no pressures identified by SEPA on this water body. Across the entire study area, the bedrock aquifers are mapped as an intergranular/fractured, moderately productive aquifer. Old Red Sandstone aquifers in the Moray area have been recorded to have transmissivity values ranging from 10 m2/d to 608 m2/d (mean 198 m2/d) and recorded yields of between 162 m3/d and 2160 m3/d (mean 970 m3/d) (BGS, 2010).

6.3.7.2 Groundwater Vulnerability

Groundwater vulnerability is the tendency and likelihood for general contaminants to move vertically through the unsaturated zone and reach the water table after introduction at the ground surface. From information provided by SEPA follow`ing a data request for this assessment, the groundwater vulnerability across the study area is classified as ranging from Class 4 up to Class 5 (on a scale from 1 to 5, where Class 5 is high vulnerability and Class 1 is low vulnerability). Class 4 is defined as 'vulnerable to those pollutants not readily adsorbed or transformed and Class 5 is defined as 'vulnerable to most pollutants, with rapid impact in many scenarios' (BGS, 2011).

6.3.7.3 Drinking Water Protected Areas

All of Scotland's groundwater bodies have been designated as Drinking Water Protected Areas under the Water Framework Directive, which is enacted through The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013. These require protection for their current use or future potential as drinking water resources.

6.3.7.4 Groundwater Levels and Flow

There are no groundwater level monitoring locations within the study area and SEPA does not currently monitor groundwater levels within the vicinity. Water input to ephemeral waterbodies within the dune system in the east of the study area occurs partially as a flashy response to recharge from direct precipitation and input from drainage originating in the west. However, the waterbodies within the dune slacks are largely an expression of groundwater levels exceeding surface topographic elevations, so they provide a useful insight into groundwater elevations in the coastal dune part of the study area. During most of the year, groundwater elevations are below the elevation of the base of the winter loch (i.e. below 3 m AOD). Lower rainfall combined with higher evaporation means recharge to groundwater during these periods is lower and groundwater levels are lower. For parts of the winter months the dune slacks are flooded to a level marked clearly by a vegetation change. Using an overlay of aerial imagery and Digital Elevation Mapping, the groundwater elevation in the winter loch can rise to between 3 m AOD and 4 m AOD.

A conceptual understanding of groundwater flow has been developed using the baseline information. The amount and rate of recharge will vary depending on vegetation cover and the composition of the soils and superficial geology. Where the surface geology within the study area is mapped as 'Till' (i.e. most of the west of the study area), there is likely to be limited recharge or lateral groundwater flow over distance. As such, deposits tend to be highly heterogeneous, comprise materials ranging from clay to gravel and have a low bulk hydraulic conductivity. Precipitation will mainly run off to local surface watercourses or collect in localised depressions in the surface topography. Recharge and lateral flow in the Till may be possible where sandy or gravelly horizons are present. Recharge to groundwater within the Raised Marine Deposits and Blown Sand will be greater, as soils overlying these superficial deposits are thin and the sands and gravels will have a higher hydraulic conductivity than the Till.

There are very few places in the study area where the bedrock geology is exposed at the surface, so direct recharge to the bedrock aquifer will typically occur outside the study area. Recharge to the bedrock aquifer is possible within the study area if there is a hydraulic connection with the overlying superficial deposits and there is also a downwards hydraulic gradient. Given that the most likely geological sequence of deposition of the superficial despots would result in the bedrock aquifer being overlain by low hydraulic conductivity Till, it is possible that this hydraulic connection is limited.

Assuming that the majority of recharge to groundwater within the study area occurs to the higher hydraulic conductivity superficial deposits and there is limited hydraulic connection with the bedrock below, groundwater within the Raised Marine Deposits is likely to originate from direct recharge from precipitation and some run-off from the Till. Groundwater within the Raised Marine Deposits seeps out on steeper areas such as the faces below Coul Farm to the west of the dismantled railway. These seeps then recharge back to groundwater nearby. Groundwater within the dune sands is likely to originate from direct recharge from precipitation and shallow groundwater flow from the Raised Marine Deposits. Groundwater flow will typically follow topography and be from west to east towards the coast. Subsurface groundwater flow in the superficial deposits will discharge through the main dune ridge and seep out along the beach.

There is also likely to be some recharge to groundwater from surface water, when the drains are flowing. Surface water in the drains will largely originate from run-off and issues in and to, the west of the study area. Walkover observations indicate that the central and northern burns provide recharge to groundwater either by seeping into the ground at varying points along their preferred channel routes at different times of the year, or by providing direct input the dune slacks. The southern burn (Cluain Burn) may also provide recharge to groundwater if there is an outward hydraulic gradient present along all or part of its length at any point in the year.

6.3.7.5 Chemistry

There are no groundwater level monitoring locations within the study area. The nearest SEPA groundwater quality monitoring is ~12km from the study area. As part of the River Basin Management Plans, SEPA reviews the condition and of water bodies and SEPA has identified that there are no trend for pollutants in either the Dornoch Coastal or Dornoch groundwater bodies.

General groundwater chemistry information is available for the bedrock aquifer (BGS, 2010 and BGS, 2015). These sources of information indicate that the Old Red Sandstone aquifer in this northern area of Scotland is typically moderately mineralised, often anoxic and calcium bicarbonate dominated. Summary baseline chemistry data for the northern Old Red Sandstone aquifers is presented in Table 7 (after BGS, 2015).

Table C.7: Summary of Baseline Chemistry of Old Red Sandstone North Aquifers in the Moray Basin

Element	Units	na	n <dlb	P0.1	P0.25	P0.5	P0.75	P0.9
Ca	mg/L	99	0	26.6	47.3	61.6	79.5	99.1
Cl	mg/L	99	0	17.5	26.9	46	72.7	92.6
DO2	mg/L	49	14	n/a	n/a	1.22	5.59	8.16
Fe	µg/L	91	19	2.1	4	28.8	300	857
HCO3	mg/L	99	1	77	127	193	250	327
K	mg/L	98	1	1.3	1.8	2.6	3.8	5.8
Mg	mg/L	99	0	2.3	3.67	8.1	17.4	23.8
Na	mg/L	99	0	11.7	15.3	25.5	41.2	56.9
NO3 as NO3	mg/L	82	20	n/a	0.18	2.92	15.91	27.54
pH		97	0	6.5	6.8	7.2	7.45	7.7
SEC	µS/cm	94	0	240	374	547	708	890
SO4	mg/L	99	0	6.13	10.6	19.6	35.9	54.5

a number of samples
b number below detection limit

6.3.7.6 Springs, Wells and Seeps

Historical mapping (Groundsure, 2016b) indicates the presence of a series of springs or wells within the survey area. The springs and wells within the proposed development boundary could not be located during the hydrological study site walkovers undertaken between December 2015 and April 2016. The springs and wells outside the boundary are mainly not shown on more recent mapping and none were mentioned by the occupiers of the properties when the private water supply survey was undertaken in August 2016.

During the hydrological study site walkovers, unmapped seeps were noted around the base of the slope below the Coul Farm steading. These appear to originate from near surface groundwater beneath the farm house, cottages and buildings (likely a mixture of the Raised Marine Deposits and made ground) that discharges at the surface due to the steep and sudden change in topography in this area and then recharge back to the ground nearby.

6.3.7.7 Groundwater Supplies

Licensed Abstractions

SEPA was contacted by email on 24 June 2016, to provide information on records of licensed groundwater or surface water abstractions. One licensed groundwater abstraction from a borehole was identified at Embo Mains for the purpose of agricultural use. The grid reference supplied by SEPA for this abstraction is NH 79455 94315, which is positioned approximately 0.36 km south of the PAN boundary.

Embo Mains was visited on 30 August 2016, with the intention of requesting further information regarding this abstraction and any other sources of water. Due to animal health issues, entry to the farm was not permitted. A letter and questionnaire was sent to the property on 5 September 2016. At the time of preparing this report, no response had been revived.

Private Water Supplies

There are two types of private water supply defined by The Private Water Supplies (Scotland) Regulations 2006. Type A means “a private water supply for human consumption purposes which on average, provides 10 or more cubic metres of water per day or serves 50 or more persons, or regardless of the volume of water provided or the number of persons served, is supplied or used as part of a commercial or public activity”. A Type B supply means “a private water supply for human consumption purposes, other than a Type A supply”.

The Highland Council (THC) was contacted by email on 4 July 2016 to request information on records held of private water supplies from groundwater or surface water. A response was received on 8 August confirming that there were no known Type A or Type B private water supplies in the area; however, it was highlighted that there is no requirement for Type B supplies to be sampled by THC so it may not hold records.

On 29 and 30 August 2016, each property within the survey area was visited in order to request information on private water supplies. Where no occupier could be spoken to, a letter, questionnaire and stamped addressed envelope were left at the property. All responses received at the time of preparing this report indicate that all properties in the area are on mains water supply.

Two wells are marked on the most recent 1:10,000 scale Ordnance Survey mapping. One is located in Fourpenny, near the property called Fourpenny House and one in Skelbo Muir, between the properties called Highfield and The Old School House. All three of these properties were included in the private water supply survey and none indicated that they used water from a source other than mains.

6.3.7.8 Licensed Discharges

SEPA was contacted by email on 24 June 2016 to request information on records of licensed discharges. Details of these discharges are included in Table C.8. None of the discharges are located within the PAN boundary. All of the discharges within the survey area relate to sewage discharges from individual properties to land or soakaway of surface water.

Table C.8: Controlled Activity Regulation Licensed Discharges

Licence Number	Site Name	Activity	Receiving Location
CAR/R/1009384	Housekeepers Cottage, Skelbo House, Skelbo	Sewage (Private) Primary	Discharge to land
CAR/R/1009385	Burnside Cottage, Skelbo House, Skelbo	Sewage (Private) Primary	Discharge to land
CAR/R/1009386	Skelbo House, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1013326	Fairways, Skelbo Street, Dornoch	Sewage (Private) Secondary	Discharge to land
CAR/R/1018085	Farthingworth, 369 Skelbo Street, Dornoch	Sewage (Private) Primary	Discharge to land
CAR/R/1064459	Highfield, Skelbo Muir, Dornoch, Sutherland	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1064499	Carn Mhor, Knockglass, Skelbo, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1064825	Knockglass, Dornoch, Sutherland	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1064861	25 Skelbo Muir, Dornoch, Sutherland	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1066030	The Old Smiddy, Skelbo Street, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1066846	Fair Havens, Skelbo Street, Skelbo, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1067035	Smithy House, Skelbo Street, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1069862	Old School House, Skelbo Muir,Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1071836	Berriedale, Skelbo Street, Dornoch	Sewage (Private) Secondary	Discharge via soakaway

Licence Number	Site Name	Activity	Receiving Location
CAR/R/1075911	Bunillidh, 371 Skelbo Street, Dornoch	Sewage (Private) Secondary	Discharge via soakaway
CAR/R/1076265	Tollich, Skelbo Street, By Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1076406	28 Skelbo Muir, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1076479	26 Skelbo Muir, Dornoch, Sutherland	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1076774	Toubkal, 4 Skelbo Muir, Dornoch	Sewage (Private) Primary	Discharge to land
CAR/R/1078262	The Croft, 24 Skelbo Muir, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1089454	Station House, Skelbo, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1092585	New House at Fourpenny, Skelbo, Dornoch	Sewage (Private) Secondary	Discharge to Loch
CAR/R/1094352	Tideways, Skelbo Street, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1110222	Highview, Skelbo Street, Dornoch	Sewage (Private) Primary	Discharge via soakaway
CAR/R/1141635	New House at Skelbo Street, Dornoch	Sewage (Private) Tertiary	Discharge to unnamed watercourse

6.3.7.9 Groundwater Dependent Terrestrial Ecosystems

A detailed National Vegetation Classification survey of the area within the PAN boundary has been undertaken by Alba Ecology. Drawings prepared by Alba Ecology showing the NVC mapping, as well as those areas identified as potentially Groundwater Dependent Terrestrial Ecosystems (GWDTE) and wetlands, are included within the Ecology Annex. Where the vegetation communities are highly variable over very short distances, the NVC classifications have been combined (e.g. to the south of the Cluain Burn where one area is classified as a tight mixture of both SD9 and SD16 dune grassland communities). In such cases, the GWDTE and wetland classifications may also be a mixture (e.g. of potentially highly GWDTE/wetland relating to community SD16 and not GWDTE/wetland relating to SD9) and this has been shown on the drawings.

The GWDTE drawing shows that there are areas of potentially moderate GWDTE and potentially high GWDTE present in the study area. The wetland drawing shows that the types of wetland include wet woodland, wet heath, swamp, salt marsh, mire, marshy grassland, flush and dune slack.

The drawings show that the areas of potential GWDTE and wetland are predominantly concentrated within the SSSI. These largely coincide with the areas of ephemeral water bodies. Given the conceptual hydrological and hydrogeological understanding of the system presented in the preceding sections, it is likely that these areas are moderately or highly groundwater dependent.

There is another area of wet heath and marshy grassland outside the SSSI to the southwest of Coul Farm. Based on the British Geological Survey superficial geology mapping (BGS, 2016), this area is located on Till, so the wetland communities are more likely to be present as a result of poor surface water drainage than be groundwater dependent.

The rest of the study area outside the surveyed area is largely dominated by improved grassland, arable fields and conifer plantation. There are smaller areas of woodland and rough pasture around field boundaries. The rough pasture may include patches of wet heath and marshy grassland, much like that present to the southwest of Coul Farm. The underlying geology in these areas is also dominated by Till, so the presence of such wet areas is also more likely to be as a result of poor surface water drainage.

6.4 DRAINAGE IMPACT ASSESSMENT

6.4.1 Drainage Strategy and mitigation measures

Effective drainage is essential for the development of sustainable and firm golf playing surfaces which support the desirable grasses selected for establishment. Inadequate drainage would have a negative impact on growth and turf condition and playing surface quality. Poor growth can also inhibit root depth and vigour which reduces moisture availability for turf in dry conditions – necessitating increased use of irrigation. A balanced approach to drainage and irrigation forms a core element of the Coul Links development and underpins both design and subsequent maintenance of the golf course.

Drainage principals are based on responding to site conditions to provide sustainable surfaces of the required quality and reconcile this with environmental conditions and constraints as identified above. In order to meet these objectives the design is based on the following key principals:

1. The raised marine deposits and windblown sands which cover the vast majority of the golf course are inherently free-draining therefore supplementary drainage is not required. Furthermore, the course will not be used from November to March, corresponding with invariably the wettest period of the year when groundwater levels are at their highest.

2. Avoidance of sensitive habitats by taking into account existing levels and minimising the impact on GWDTE through adjustment of course layout.

3. Maintaining and improving existing drainage channels to maintain flows and hydraulic connectivity with the main dune slack.

4. Ground adjustment will be kept to a minimum so as to minimise impact on local catchments and flow patterns.

5. Adopting the principal of raising low areas above winter groundwater level through use of indigenous sand rather than using artificial drainage.

6. Localised installation of cut-off drains to intercept seepage and surface flow from areas above playing surfaces. This will be directed to soakaways (taking into account existing groundwater levels) away from playing areas to recharge groundwater or existing drain channels in order to maintain existing catchwater flow patterns. The access road will be contoured to shed water to adjoining vegetation filter strips. In areas of "till" i.e. heterogenous material with a high proportion of silt material and poor infiltration characteristics, shallow swales will be formed to the edge of the road (with check dams on steeper sections) to convey water to soakaway's (installed within more permeable strata).

   For the maintenance compound area surface water drainage will be infiltrated to ground (after appropriate pre-treatment) in accordance with Sustainable Urban Drainage System (SUDS) principals.

7. The central and northern burns, with proven hydrological links to the main dune slack, will not receive additional flows from site drainage unless there is linkage to the existing catchment. There will be a process of channel enhancement to ensure that future flows are no affected.

8. Boardwalks will be installed for movement of golfers (and localised movement of maintenance machinery) to avoid impact on existing hydrological conditions and flow paths.

6.4.2 Storm Drainage

The existing site is characterised by a complex pattern of ridges, mounds and hollows which is underpinned predominantly by sand and raised marine deposits (superficial geology) linked with high levels of infiltration. During periods of light to moderate rainfall a large proportion of the rainfall infiltrates into the sand layers and recharges groundwater. During periods of prolonged/ intense rainfall the underlying ground is saturated and table levels are high, surface flows can occur on a temporary basis.

On the proposed golf course storm drainage will be controlled by:

1. Build-up of low areas above existing ground to provide increased potential for infiltration.
2. Depth of build-up will generally be 0.5 – 1 m above existing level.
3. Increased attenuation through additional depth of sand in the build-up areas.
4. Maintaining the undulating nature of the topography reflecting the original flow patterns by shedding water to localised areas away from the main playing surfaces.
5. Longer surface vegetation will be maintained to the edge of the main playing surfaces to attenuate surface flows and provide vegetation filter strips before reaching the dune slacks.

6.4.3 Drainage Materials

Indigenous sand will be used to build up low areas for drainage enhancement. This will be Excavated from identified borrow areas or from surplus "cut" from grading operations.

For localised drainage and soakaways/infiltration trenches, aggregates will be hard durable materials, resistant to weathering or dissolving in water and free from organic material. Where required the materials will be subject to ASTM procedures C-88-90 (Standard Test Method for Soundness of Aggregates) and/or ASTM C-131-89 (Standard Test Method for Resistant to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles machine).

Particle size range and material should be such that it provides adequate percolation rates which will satisfy the following bridging criteria between gravel and the native dune sand where D15 (gravel) is less than or equal to 8 x D85 sand (to prevent the movement of sand into the underlying aggregate). The aggregate should be lime free material to eliminate any impact on the chemical nature of the wetland habitats/dune slacks.

6.4.4 Construction Phase Requirements

Prior to course construction works commencing a detailed Construction Method Statement will be submitted by the developer for approval.

Guidance given in CIRIA C532 "Control of Water Pollution from Construction Sites: Guidance for Consultants and Contractors", 2001 will be adhered to during construction of the course and associated facility. During the construction phase temporary drainage works will be required to control surface run-off and protect habitats and adjoining areas adjacent to the works. Requirements from these works will be dependent on weather and ground conditions at each stage during the progress of the works. Protection of habitats can be achieved in a number of ways following the principals outlined below:

- Works will be confined to drier periods of the year.
- Works will be phased so that areas "opened up" at any one stage will be kept to a minimum.
- The working footprint will be kept to the minimum practical and avoid sensitive habitat areas outside of the footprint of the golf course.
- Different soil materials will be stockpiled and replaced separately to ensure no contamination or mixing of layers occurs.
- Temporary localised storage areas will be formed in strategic locations away from sensitive habitat areas.
- Where required temporary interceptor drains, dams and settlement lagoons will be excavated to contain any silt washing off the working area to protect adjacent habitats.
- Where necessary temporary pumping facilities will be provided to remove any discharged silty water away from sensitive habitats.
- Drainage water will be discharged into small stilling basins formed with rock to disperse the water into dune slack areas at the original level.

6.5 IRRIGATION IMPACT ASSESSMENT

6.5.1 Construction and Operational Phase Requirements

As stated previously there must be an appropriate balance between drainage and irrigation to maintain optimum soil moisture conditions to facilitate establishment and sustain viable playing surfaces during the operational phase.

Sufficient irrigation will be applied to make good water loss by evapotranspiration and to assist in preliminary grass establishment and specific maintenance operations. It is not intended to promote growth and manipulate turf appearance. Indeed, links courses need to be firm and "running" for golf and therefore excess irrigation is anathema to the turf and the cultivars of grass proposed. Periods when the turf is near to wilting point are acceptable as the native fescue grasses are adapted to temporary periods of water shortage. Excess irrigation would lead to a decline in the turf quality and an increase in poorer grasses and increased organic matter build up. Therefore, from an environmental and golf management perspective best management practice with regard to irrigation is to keep applications to a minimum.

Water will not be applied to the point of drainage through the profile. In the autumn and winter water will not be applied at all when the grass is not growing and evapotranspiration levels are minimal.

The key features of the irrigation system design and operation at Coul Links will be as follows:

- Sprinkler irrigation layout and design will confine coverage to tees, greens, fairways, semi-rough areas and grass walkways and minimise overthrow onto adjoining areas. The designed layout will incorporate both full and part circle sprinklers to achieve this desired objective.
- Sprinklers will be individually controlled (valve in head) so that water application can be targeted and adjusted to meet the needs of specific areas without over watering adjoining areas.
- Soil moisture meters will be routinely used to only apply water when required to maintain moisture levels at around 15 – 20%.
- The irrigation system will incorporate a central weather station. This will enable calculation of evapotranspiration (ET) and measure precipitation which will help to determine water requirements. This will be adapted for local environmental conditions on the golf course using the knowledge of the greens staff.
- A sensor will be fitted to the irrigation system so that when more than 2 mm of rainfall is experienced the irrigation system will turn off thereby avoiding over watering.
- Management of irrigation and moisture levels will involve complementary treatments, notably use of aeration equipment to improve uniformity of surface infiltration on contoured surfaces. Hand watering will also be carried out on greens to top up local dry areas to maintain surface uniformity. In prolonged dry spells stress on the grass can be alleviated by relaxing mowing levels and frequency of cut.

§ Irrigation control systems will enable water to be applied in cycles so that repeat, lower application rates can be given to minimise run off.

6.6 WATER QUALITY

6.6.1 Potential Sources of Pollution

The main sources of pollution which could potentially impact on local hydrology and associated groundwater dependent terrestrial ecosystems include:

1. Fertiliser application to managed areas of the golf course.
2. Pesticide application (fungicides).
3. Fuel spillage/oil residue wash off from hard standing areas/roads.
4. Application of irrigation water with elevated levels of metals and high salinity levels.
5. Application of water which alters baseline pH or salt levels may have an adverse impact on the existing vegetation.
6. Wash- down from the maintenance compound.

6.6.2 Assessment of Fertiliser and Pesticide Application Impacts

During the establishment and operational phases fertiliser and pesticides will be used to maintain turf quality and recovery from wear and tear however this must be put into context of the frequency and extent of application and the fate of these materials after application.

During establishment the fairways will receive fertiliser to encourage early growth but once established the fairways will not receive routine application of fertiliser. It is the grass species which primarily dictates the level of fertiliser input. The fescue grasses which are to be used on all areas of the golf course will require relatively low input and furthermore are generally more resistant to disease. Approximate quantities of nitrogen required per annum are set out as follows:

Year 1 (Establishment)	25 g/m^2
Years 2 – 4	16 g/m^2 for tees and greens
	8 g/m^2 for fairways/semi-rough
Post Year 4	8-10 g/m^2 tees and greens
	0 to a maximum of 4 g/m^2 for fairways

The higher levels of fertiliser are proposed to promote rapid grow-in and reduce weed infestation.

Several research papers have been presented with regard to the Fate of Pesticide and Fertiliser application to amenity turf areas (refer to Supporting Document 11) and the main points are summarised as follows:

1. Where normal rates of fertiliser are applied to established fine turf, leaching losses are low i.e. the turf is very effective at intercepting and utilising nutrients.
2. Nitrogen detected in the leachate from greens following normal rates of application are well below the EC Directive for Drinking Water Quality
3. Spoon Feeding (light but regular applications) of fertiliser reduces leaching losses and improves uptake.
4. Light applications of slow release fertiliser at frequent intervals provides excellent protection from leaching.

6.6.3 Summary of Protection Measures

1. Routine application of fertiliser to fairways will be restricted to the immediate establishment phase.
2. The greens and tees will receive routine application of fertiliser together with the more heavily trafficked walkways.
3. Pesticide application will be restricted to tees and greens.
4. The formulation of fertiliser will primarily be based on slow release products or organic based materials which are less soluble and provide controlled release which is adapted to the requirements of the grass plant.
5. Application of fertiliser on a little and often basis will improve uptake and response.
6. The consistent depth of sandy loam soil (with organic matter) will be maintained over all playing surface areas to improve fertiliser and pesticide retention and minimise leachate.
7. Fertiliser and pesticides will not be applied near to any water bodies/dune slacks.
8. Aeration techniques/control of thatch will improve immediate uptake of pesticide and fertiliser and reduce the risk of run-off.
9. A shrouded sprayer will be deployed which will reduce drift onto adjoining non-managed areas. For fertiliser application “air feeder” is proposed which unlike a conventional spinner type fertiliser distributor will not throw fertiliser where it is not required. For tees and greens a hand operated small distributor will still be employed.

Water quality will be continuously checked from abstraction sources to ensure compatibility with the existing hydrology and ensure that threshold levels are not exceeded for key indicators, notably pH salinity and heavy metals.

6.6.4 Surface Run-off from Roads, Car Parks & Maintenance Compound

Surface water drainage proposals from the above will incorporate appropriate SUDs features as already set out. In addition, there may be potential for oil spillage and given the sensitivity of the local hydrology and groundwater dependent terrestrial ecosystems it is proposed to install an oil separator (class 1) in accordance with BSE

Within the maintenance facility there will be a dedicated wash-down area for machinery. This will be fully bunded with collection of wash-down in below ground sump with connection to a biological separator unit with appropriate filters (e.g. Waste2Water or Acumen High Speed System) before discharge to soakaways.

6.7 EVAPOTRANSPIRATION

After a soil has reached field capacity, i.e. gravitational drainage has ceased, evapotranspiration (ET) is the main process governing water loss from the soil. The rate of ET water losses from a soil is governed by a wide range of edaphic, biological and climatic factors such as:

- Soil water availability
- Time since last water input
- Soil water storage (primarily determined by soil particle size, structure and organic matter content)
- Density of canopy layer
- Plant species and physiological adaptions for surviving dry conditions
- Rooting depth
- Plant health and stress factors
- Time of day and day length
- Air and soil temperatures
- Precipitation frequency and intensity
- Solar radiation

The interaction among these variables is complex and dynamic and will be affected by local conditions at any given site.

Concerns have been raised regarding the impact of replacing the native scrub/heath vegetation with areas of golf turf. Review of the available literature indicated that potential changes in evapotranspiration from heather dominant vegetation to grass dominant would likely result in ET rates declining slightly (Voortman *et al*, 2015). Other authors, when comparing scrub vegetation and meadow vegetation on dune systems found that ET rates would be broadly similar (Betson and Scholefield, 2004). Whilst the literature on this matter is not extensive, the available evidence would suggest that changing the dominant vegetation from heathland scrub to golf turf would not result in large changes to evapotranspiration rates.

Typical ET rates for golf turf are often quoted at 3-4 mm day^{-1} (Aamild *et al*, 2012). However, values can typically vary between 1.5 – 6 mm day^{-1}, depending on ambient temperature and water inputs, plant health, mowing height and frequency (Lodge and Baker, 1992).

It should be borne in mind that, as is standard practice for golf turf maintenance, irrigation inputs will be made to turfed areas to help balance evapotranspiration losses (Beard, 2002). This is an essential part of maintaining a healthy and effective grass sward. Therefore, irrigation of the golf turf with water abstracted from outside the SSSI, can be used to mitigate ET losses. The amount of irrigation water applied is often based on calculated ET losses derived from site weather station data. It is proposed that this approach is taken at Coul Links to ensure appropriate irrigation inputs to not only assist with maintaining healthy turf, but also to ensure the hydrology of the SSSI is not compromised from over or under watering.

Given the development of the golf course in the SSSI, monitoring of various hydrological variables is proposed, such as irrigation water inputs, irrigation water chemical characteristics and water table levels. This will help inform, not only turf management practices, but also to ensure turf maintenance interactions and the wider ecosystem in the SSSI are harmonised.

6.8 GROUNDWATER INVESTIGATIONS

Two production wells were drilled within the south eastern portion of the site and two monitoring wells within the south western portion of the site. The monitor well locations were chosen to determine the level of water passing from the farm land to the area of the SSSI and then again within the SSSI. Both borehole locations were chosen to ensure there was as little disruption to the property as possible, but in order to be sure the information would be accurate. The actual SSSI location was chosen to avoid building access roads and destroying the environment. It is just within the SSSI and just north of the original location suggested.

Monitoring was undertaken to establish the water flow in the only running burn on site as it enters the property and as that burn leaves the property. The other two burns on site were checked at the start and finish. Monitoring was also undertaken to establish water abstraction locations in the form of boreholes and to establish monitoring locations to observe effects of water extraction on the aquafer. The Ground Water Investigation Report in its entirety is attached as Appendix C.3.

The key steps and findings of the work carried out were as follows:

- A monitor weir at the west of the site was installed directly at the start of the property where a flow rate was established at the time. This was monitored for a period of 30 days and is now ongoing. The flow was recorded and found to fluctuate from a normal flow to one in excess of ten times the normal flow, depending on rainfall in the area. Full details are shown in the main report with graphs indicating flow pressure and temperature.

- A monitor weir at the east of the site was installed at a point above the maximum height of the incoming tide, to monitor flow leaving the property out to sea. This was monitored for 30 days and is now ongoing. The flow within the lower end of the burn correlates directly with that at the top of the site and indicates that there is no

appreciable water runoff into the burn from the property and that the water leaving the property is directly proportional to the incoming volume.

- Borehole one was installed by the roadside and was drilled to 100 metres. This has a standing water level of 12.93 meters below the top of the well casing which is taken as the measure datum.

- Borehole two is located over 100 meters to the east of borehole one in the same agreed area and was drilled to 100 metres in depth. The rest water level is 14.58 meters below the datum.

- A monitor well was located east of the two main boreholes and was drilled to a depth to be able to monitor fluctuations within the standing water level of the aquafer.

- A monitor well was located in the SSSI in order to avoid having to disturb the area with heavy machinery and imported material to gain access. This was drilled to a level to monitor any fluctuations within the standing water table in the area.

- Once the wells were drilled monitors were installed to observe water levels before any pumping was undertaken to establish the standing conditions. The levels remained constant in all 4 wells prior to any pumping taking place.

- Step test on the two primary wells were made lasting for 6 hours each. Followed by recovery rate tests.

- Constant rate pump tests of both wells were undertaken over a two week period, followed by a recovery period of two full days.

The Northerly burn on the site has remained dry for the entire monitoring period from the start of August until the end of September and there was no sign of flow returning despite heavy rain fall in the area in the final observation week.

The Central burn remained dry until the 25th September when a small flow had been observed entering the central point of the Dune Slacks. As this was a dry bed until that point, no monitoring data was available to record the actual start date of flow. However, the rate of flow had reduced on the 26th so this was determined to not yet be normal winter flow and may be run off from heavy rainfall.

The Cluan Burn at the Southern end of the property had been in continual flow and does so all year round. The flow rate was recorded at 5 litres per second at the 23rd August and then at 7 litres per second on the 26th September. There had been a large increase in flow during the day prior, but as the rainfall had dropped so had the flow.

The area covered by the SSSI remained dry during the monitoring period and there were no signs of water at the surface. The area of the dune slacks averages between 1.5 and 3 metres higher than the bed level of the Cluan burn and thus the flow of water in this burn is not directly filling the dunes slacks. The Central burn will flow directly into the area as will the Northern burn when they have flow.

The water levels within the two monitoring wells did not change from the time completed until present. They remained constant during the step tests and the constant pump tests, thus indicating no direct correlation between activity in the production wells and the area of the Dune Slacks, both before, during, or after testing at the flow rates pumped.

Conclusions:

From the test results it was determined that the wells are capable of delivering 210 metres cubed of water per day on a continuous demand from Borehole One and 80 meters cubed per day from Borehole Two. Total abstraction rate per day is 290 m3.

The results confirmed that there was no measurable impact on the aquafer or indeed the SSSI water table when abstracting water during test pumping. The only restriction was in the ability of the wells to replenish while pumping. It was concluded that the water required for the development will not affect the makeup of the SSSI site nor any of the surrounding area.

There would also be a possibility of abstracting water from the burn during the higher flow period during the wet season and a smaller amount during the dryer times. The monitors have been left to run in the temporary weirs to observe water flow in the burn during the coming winter. It has been established that the water flowing in the burn does not fill the Dunes Slacks, so as long as water flow is maintained at all times within the burn, abstraction should be possible without any impact to the surrounding area.

6.9 REFERENCES

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7.0 ANNEX D: LANDSCAPE AND VISUAL AMENITY

The Landscape and Visual Impact Assessment forms Technical Annex D of this ES. As Annex-D is a largely visual document, it has been included in its entirety as two separate documents- Appendix D.1 (Landscape and Visual Impact Assessment) and Appendix D.2. Appendix D.1 is accompanied by a set of A1 elongated Landscape and Visual Impact Assessment Visualisations (Appendix D.2). The computer generated visualisations have been prepared with the benefit of a three dimensional terrain model of the site which has helped to inform this assessment.

The designer's approach to the design of the proposed golf course is to intervene as little as possible with existing landforms and vegetation cover, utilising the existing topography and constraints to add to the character and uniqueness of the course wherever possible.

The location of the project site offers an opportunity to integrate a sensitive golf course within a links landscape to the north of Dornoch. A leading golf course designer has been engaged to develop this unique setting, and has created an imaginative course that integrates with the distinctive baseline landscape character, retaining and beneficially utilising existing landscape features in the layout design.

The landscape and visual impact assessment has evaluated the proposed development in terms of the effect it may have on the landscape and visual resource of the site and its surroundings. The degree to which the golf course designer's approach reflects the inherent ability of the landscape to accommodate the proposed development, as measured by its landscape character and integral characteristics, has been assessed. The assessment has demonstrated that the course design is responsive to the location and has been achieved without loss of key elements and features within the landscape.

The principal landscape and visual effects that are likely to arise will occur during construction of the course, when there will be an inevitable requirement for construction activity such as earthmoving, reprofiling, and vegetation establishment. Once construction works have been completed and the course has established, fully integrated into its setting, the landscape impact arising from the proposed development will all be of a limited magnitude and has not been deemed to be significant. The visual effects arising from the completed, operational, development will also be very limited, with locally significant effects restricted to several locations within the site.

The design of the golf course and its level of integration with the landscape and visual setting of the site and its surroundings is a key factor in the very limited occurrence of significant effects. This ensures that the proposed development will retain and maintain, the distinctive landscape character of the baseline coastal landscape, without introducing elements or characteristics that are intrusive or out of character

See Appendix D.1 and D.2 for the full report and visualisations.

8.0 ANNEX E: ACCESS, TRAFFIC AND TRANSPORT

8.1 INTRODUCTION

This Annex considers the potential effects of the proposed development on the surrounding road network and nearby sensitive receptors as a result of the construction and operational stages of the proposed development. The key objectives of this Annex are to:

- Describe the assessment methodology and significance criteria used in completing the assessment;
- Describe the study area and existing local and strategic road networks;
- Identify and assess the likely effects of increased traffic levels and associated environmental effects;
- Identify and describe the mitigation measures proposed to address any significant effects; and
- Assess any residual effects post mitigation implementation.

Planning policies of relevance to this assessment are provided in Section 3: Policy Framework.

This Access, Traffic and Transport Annex and the associated Appendix E.1 Transport Statement (TS) and Appendix E.2 Travel Plan (TP) for the proposed development have been prepared by SYSTRA Ltd.

8.2 SCOPE OF ASSESSMENT

The assessment is made with reference to the proposed development, as described in Chapter 1: Introduction.

The most identifiable traffic and transport characteristics associated with the proposed development relate to the transportation of construction materials to the proposed development in standard Heavy Goods Vehicles (HGVs) during the construction phase and the general increase of traffic on the local road network once the development is operational.

Site access will be taken from the C1026 Dornoch to Fourpenny Road and from the wider road network there are three route options that connect to the C1026. These routes are as follows:

- Route 1 – from the A9, exit east onto the A949 towards Dornoch, continue through Dornoch onto the C1026 heading northbound to the site access just north of Embo Junction;
- Route 2 – from A9, exit onto the C1026 at the Cambusavie Junction and continue south eastwards past Skelbo and Fourpenny towards the site access; and

- Route 3 – from A9, exit onto C1103 from the junction at Poles, continue north east towards Skelbo Street and either continue north along C1103 to reach the C1026 road or take the unclassified road east and join the C1026 at Fourpenny junction. Continue southwards to reach the site access.

A detailed assessment of each of the three routes (informed by two site visits undertaken in 2016) and a desktop study, identified Route 1 as the most suitable route for all traffic (both construction and operational) due to the overall standard and condition of the road in comparison to the other route options.

Considering this, Routes 2 and 3 have not been included within the study area. It is noted that visitors would still have the option to use Routes 2 and 3 to reach the development. However, signage to the proposed development will only be included along Route 1 to encourage this as the primary route to be used to access the development and all promotional material for the golf course will encourage visitors to use the preferred route.

The accompanying Appendix E.1 (TS) for the proposed development includes a full review of the site accessibility and assessment of the local road network capacity. A (TP) Appendix E.2) has also been prepared alongside the TS to identify potential sustainable transport measures to be implemented with the development and it outlines the monitoring and review process that the development will undertake to reduce reliance on the private car.

8.3 ASSESSMENT METHODOLOGY

8.3.1 Guidance

Assessment guidance is provided by the Institute of Environmental Assessment (IEA) now the Institute of Environmental Management and Assessment (IEMA), Guidance Notes No. 1: 'Guidelines for the Environmental Assessment of Road Traffic' (IEA, 1993). These Guidelines are principally for assessing the environmental impact of road traffic associated with major new developments. The purpose of the IEMA Guidelines is to provide the basis for a systematic, consistent and comprehensive approach to the appraisal of traffic impacts for a wide range of development projects.

The Institution of Highways and Transportation (IHT) now the Chartered IHT 'Guidelines for Traffic Impact Assessment' (IHT, 1997) recommends that ES Reports should be undertaken in accordance with the IEMA Guidelines.

The IEMA Guidelines state that two rules can be adopted to delimit the scale and extent of the assessment:

- Rule 1: Include road links where traffic flows will increase by more than 30% (or the number of HGVs will increase by more than 30%); and
- Rule 2: Include any other specifically sensitive areas where traffic flows have increased by 10% or more.

The IEMA Guidelines suggest that where the predicted increase in traffic flows is lower than the above thresholds, the significance of the impacts can be stated to be low or not significant and further detailed assessments are not required.

8.3.2 Consultation

In undertaking this assessment, consideration has been given to the EIA scoping responses received and public consultations which were held in 2016. Concerns were raised by local residents with regard to potential traffic increases on the local road network as a result of the development and the condition of the C1026 to sustain additional traffic. Concerns have also been raised with regard to accidents and safety on the local road network and with the level of parking provision within Dornoch if visitors were to park and take the proposed shuttle bus service to the proposed development.

These concerns are noted and measures will be outlined which aim to mitigate these issues.

Pre-application advice from THC identified the following mitigation measures which may be required:

- Road widening along the C1026;
- Additional passing places along the C1026;
- Junction improvements;
- Signage; and
- Traffic calming or management.

These potential mitigation measures are considered under the mitigation section of this assessment and the supporting Transport Assessment document.

Ongoing consultation will be undertaken with THC, TS and the local community informing consultees of any changes to the traffic and transport situation associated with the proposed development.

8.3.3 Desk Based Research and Data Sources

This Annex has been prepared taking cognisance of the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (EIA Regulations). The following data sources and guidelines have been used to inform this assessment:

- Institute of Highways and Transportation (IHT) publications - “Guidelines for Traffic Impact Assessment”, 1998;
- IEA publication - “Guidelines for the Environmental Assessment of Road Traffic”, 1993;
- Department for Transport (DfT) publication “Design Manual for Roads and Bridges” (DMRB); and
- DfT 2016 Average Annual Daily Traffic (AADT) flows for two locations along the A9 .

- The traffic and transport study area characteristics have been determined by a desk based assessment, publically available Annual Average Daily Flow (AADF) information and commissioned Automatic Traffic Counter (ATC) data. Described below is the source of the traffic count information, the locations of which are indicated by Appendix E.4.
- Site 1 24-hour ATC on C1026 North of access to Embo;
- (2) 24-hour ATC on C1026 south of access to Embo;
- (3) AADF available from Department for Transport's (DfT) website. Counter ID number 10992 – A949 Castle St. in town centre of Dornoch ;
- (4) AADF available from DfT's website. Counter ID number 80003 - A9 south of Dornoch junction with A949.

8.3.4 Assessment of Effects

The magnitude of the environmental effects associated with traffic and transport and the significance of any effects are assessed in this Annex. The sensitivity to change in traffic levels of any given road segment or junction is generally assessed by considering the residual capacity of the network under existing conditions. Where there is a high degree of residual capacity, the network may readily accept and absorb an increase in traffic and therefore the sensitivity may be said to be low. Conversely, where the existing traffic levels are high compared to the road capacity, there is little spare capacity and the sensitivity to any change in traffic levels would be considered high.

The magnitude of traffic impacts is a function of the existing traffic volumes, the percentage increase and change due to a development, the changes in type of traffic, and the temporal distribution of traffic (day of the week, time of day). The determination if magnitude has been undertaken by reviewing the proposed development, establishing parameters of the road that may be affected and quantifying these effects utilising IEA Guidelines and professional judgement.

Consideration has been given to the composition of the traffic on the road network, under both existing and proposed conditions. For example, LGVs (vans and cars) have less effect on traffic and the road system than HGVs.

8.3.4.1 Evaluation Criteria

This assessment is structured around the consideration of potential environmental effects associated with traffic and transport, as identified by the IEMA Guidelines and including the following:

- Noise;
- Visual impact;
- Severance;
- Driver delay;
- Pedestrian delay;
- Pedestrian amenity;
- Accidents and safety;
- Hazardous loads; and
- Dust and dirt.

The environmental effects associated with visual impact is addressed in Annex D: Landscape and Visual Amenity. No hazardous loads are associated with the proposed development so these effects are not considered further in this Annex.

8.3.4.2 Assessment of Significance

The magnitude of the environmental effects associated with traffic and transport and the significance of any effects are assessed in this Annex. The sensitivity to change in traffic levels of any given road segment is generally assessed by considering the residual capacity of the network under existing conditions. Where there is a high degree of residual capacity, the network may readily accept and absorb an increase in traffic and therefore the sensitivity may be said to be low. Conversely, where the existing traffic levels are high compared to the road capacity, there is little spare capacity and the sensitivity to any change in traffic levels would be considered high.

The magnitude of traffic impacts is a function of the existing traffic volumes, the percentage increase and change due to a new development, the changes in type of traffic, and the temporal distribution of traffic (day of the week, time of day). The determination of magnitude has been undertaken by reviewing the Proposal, establishing parameters of the road that may be affected and quantifying these effects utilising IEA Guidelines and professional judgement.

Consideration has been given to the composition of the traffic on the road network, under both existing and potential future conditions. For example, LGVs have less effect on traffic and the road system than HGVs.

The criteria that has been used to make judgements on the importance / sensitivity of the receptor(s) and the magnitude of change are presented in Table E.1 and Table E.2 respectively.

Table E.1: Receptor Sensitivity

Sensitivity	Description
High	**People whose livelihood depends upon unrestricted movement within their environment; this includes commercial drivers & the companies who employ them. Local residents whose daily activities depend upon unrestricted movement within their environment. Receptors such as schools, colleges and accident hotspots.**
Medium	**People who pass through or habitually use the area but whose livelihood is not wholly dependent on free access. Receptors such as congested junctions, hospitals, cemeteries and conservation areas.**
Low	**Occasional users of the road network. Receptors such as public open space and residential areas. Areas with trunk road or A class roads constructed to accommodate significant HGV volumes.**
Negligible	**Users not sensitive to transport effects. Includes very small settlements and roads with no significant settlements including new strategic trunk roads or motorways.**

Table E.2: Magnitude of Effect

Magnitude	Description
Substantial	**The proposals could result in a significant change in terms of length and / or duration to the present traffic routes or schedules or activities, which may result in hardship. Generally regarded as a change in traffic flow above 90% on any given road link.**
Moderate	**The proposals could result in changes to the existing traffic routes or activities such that some delays or rescheduling could be required, which cause inconvenience. Generally regarded as a change in traffic flow between 60% and 90% on any given road link.**
Slight	**The proposals could occasionally cause a minor modification to routes, or a very slight delay in present schedules, or on activities in the short term Generally regarded as a change in traffic flow between 30% and 60% on any given road link.**
Negligible	**No effect on movement of road traffic above normal level Generally regarded as a change in traffic flow below 30% on any given road link.**

As a guide to inform the assessment, but not as a substitute for professional judgement, criteria for determining the significance of traffic related effects are set out in the matrix in E.3. This is based on combining the magnitude of the effect with the receptor sensitivity.

Table E.3: Significance Criteria

Receptor Sensitivity	**Magnitude of Change**			
	Substantial	**Moderate**	**Slight**	**Negligible**
High	**Major**	**Major / Moderate**	**Moderate**	**Minor**
Medium	**Major / Moderate**	**Moderate**	**Moderate / Minor**	**Minor / Negligible**
Low	**Moderate**	**Moderate / Minor**	**Minor**	**Negligible**
Negligible	**Minor**	**Minor / Negligible**	**Negligible**	**None**

Potential impacts are considered to be of major, moderate, minor or negligible significance. Major and moderate significance represent impacts considered to be significant in the context of the Environmental Impact Assessment (EIA) Regulations. Assessments were undertaken of the impacts and professional judgement used to determine the significance of residual impacts.

8.4 STUDY AREA

The study area for the purposes of the Access, Traffic and Transport assessment includes the extent of the proposed development site, the public road network in the vicinity of the proposed development and potential routes likely to be used by development traffic accessing the site. Appendix E.3 indicates the extent of the study area.

The study area is as follows:

- The A9 in the vicinity of the development (section running between the Dornoch Firth and Loch Fleet);
- The A949 into Dornoch; and
- The C1026 between Dornoch and Fourpenny.

8.5 EXISTING ENVIRONMENT

The traffic and transport characteristics of the study area have been determined by the site visits and trough a comprehensive desk based assessment. Traffic count data publicly available from DfT and accident statistics for the A9 and A949 have also been used to understand baseline traffic characteristics while new data has been gathered from surveys.

8.5.1 Road Network

The following paragraphs describe the characteristics of the road network within the study area.

8.5.1.1 A9

The A9 forms part of the trunk road network in Scotland and runs from Dunblane in central Scotland to Thurso in the north. The A9 is a single carriageway road with several dual carriageway sections. It has a varying speed limit but is generally 60 mph for cars and LGVs and 50mph for HGVs. Speed reduction measures are in place in the form of average speed cameras and marked sections where overtaking is restricted.

In the vicinity of the site, the A9 is single carriageway and of a good standard. The A9 provides a link from Dornoch to the main population centre of Inverness to the south.

8.5.1.2 A949

The A949 connects the A9 to the C1026 road via Dornoch Town Centre. The A949 is a single carriageway road approximately 6m – 7m wide. It is subject to a 40mph speed limit reducing to a 30mph speed limit as the road reaches the Dornoch boundary and has street lighting along the section between Camore and Dornoch.

8.5.1.3 C1026

The C1026 is a rural road with a total length of around 9.5km between the A9 Cambusavie junction and the Castle Street / Church Street fork in Dornoch. The road varies in standard with some single carriageway sections as well as some single track sections with passing places. The proposed site will have its sole access point from this road. The road varies in width from 3m over the single track sections to approximately 6m over the single carriageway sections. It is noted that there has been significant works undertaken to the road recently to widen sections to single carriageway from existing single track between Dornoch and the Embo junction. The road is generally derestricted in terms of speed limit although subject to a 30mph speed limit within the Dornoch boundary.

As mentioned in this Annex, the C1026 can be reached by three routes all stemming from the A9. The most suitable route for all traffic has been identified as being via the A949 through Dornoch.

8.5.1.4 Development Access

The proposal comprises one development access point and a new access road from the C1026 located to north of the Embo Junction. The new access junction will be in the form of a priority-controlled junction with the C1026. The C1026 will be widened from single track to single carriageway between the new junction and the C12026 / Embo Street Junction. The new access road will be constructed as a single track road with passing places which is in keeping with the rural location in which it will sit.

8.5.2 Baseline Traffic Flows

ATC data is available from the DfT website which indicates the two-way AADF for the A9 within the study area and for the A949 in Dornoch.

To gain baseline traffic flow data for the C1026 road near the site access, 24-hour ATC surveys were undertaken over a two week period on 15th – 29th October 2016 and over a one week period on 13th – 19th July 2017. For the purposes of this assessment, average traffic flows have been calculated.

The baseline traffic flows are summarised in Table E.4 below for ATC locations within the study area.

Table E.4: Study Area Traffic Flows

Counter Location	AADF	HGV	Percentage HGV
1. C1026 North of Embo Junction	556	55	10%
2. C1026 between Dornoch and Embo Junction	1,273	102	8%
3. A949 in Dornoch	3,987	130	3%
4. A9 west of Dornoch	7,207	418	6%

8.5.3 Road Safety

The Crash Map website has been utilised (www.crashmap.co.uk) to determine the number of accidents that have occurred in the previous five years (2011 – 2015) within the area of influence (800m radius of counter location). The results of this process are indicated by Table E.5 with additional commentary provided on serious accidents.

Table E.5: Accident Statistics

Counter Location	Slight	Serious	Fatal	Comment
1. C1026 North of Embo Junction	-	-	-	-
2. C1026 between Dornoch and Embo Junction	-	-	-	-
3. A949 in Dornoch	**3**	1	-	One serious accident involving one vehicle occurred on the A949 between Dornoch Town Centre and Dornoch Academy.
4. A9 west of Dornoch	-	-	-	-

Table E.5 indicates that a total of four accidents have occurred on the road network within the area of influence between 2011 and 2015, none of which were fatal and only one that was serious throughout this time period. Systra is aware that a fatal accident occurred on the A9 near Dornoch in 2016 between a pedestrian and a vehicle. No other details are available at this time to include in the assessment.

8.5.4 The 'Do Nothing' Scenario

If the proposed development was not implemented then it is likely that there would be no significant changes to the traffic and transport situation in the vicinity of the proposed development, other than changes to background traffic as a result of general growth.

The National Road Traffic Forecasts (NRTF) estimates that there would be slight increases in traffic levels on the trunk road network including the A9. Unclassified roads and existing access tracks are unlikely to experience any significant changes in traffic flows as a result of general traffic growth. For the purposes of assessing the impacts of the proposed development, existing traffic flows have not been subjected to any traffic growth factors thus providing a robust assessment.

8.6 METHOD OF PREDICTION OF CHANGE AND RESULTS

8.6.1 Construction Effects

The construction traffic associated with the proposed development would comprise of construction workers and HGVs / LGVs carrying construction materials.

There is expected to be approximately 12 personnel working on site at any one time. It is important to note that the number of personnel on site would vary during the construction process. In general, work hours are expected to be between 7am to 7pm on weekdays and 7am to 1pm on Saturdays which means that staff would generally arrive and depart outside the peak hours associated with the surrounding road network (typically 8am to 9am and 5pm to 6pm).

Estimates of traffic generation associated with the construction phase of the proposed development have been calculated from first principles and consider the following activities:

Golf Course

- One-time delivery of materials for irrigation system (sprinklers, pipe, wire);
- One-time delivery of turf; and
- Plant and equipment deliveries.

Clubhouse and Ancillary Buildings

- Materials for building construction (Stone, cement, steelwork, cladding etc)
- Drainage materials
- Stone and tarmac for the C1026 access junction and widening to Embo junction;
- Stone for access road, car park and hardstanding areas; and
- Tarmac for access road and associated passing places.

Construction materials such as sand, gravel, topsoil will be sourced on-site and will therefore not require HGV transportation to the site.

In order to calculate a robust scenario, information has been gathered regarding the materials required and the size of average loads associated with the construction vehicles. Table E.6 includes an estimate of construction vehicle numbers required for each task during the construction period.

Table E.6: Estimated No. of HGV Trips During Construction

Construction Task	Vehicle Type	Approximate No. of Loads
Access Road, new junction and widening to Embo Junction	**44t (gross weight) HGV**	**144**
Site Establishment	**Low loader**	**10**
Earthworks	**D6 Bulldozer x2**	2
	21t Excavator x2	2
	18t Excavator	1
	Articulated dumper	1
	9t dumper x2	2
	6t dumper	1
Shaping	**13t Excavator x3**	3
	2.5t Mini-excavator	1
Drainage	**Backhoe loader**	1
	1.5t Mini-excavator	1
	Drainage trencher	1
	Dumper (included in Earthworks)	n/a
	32t HGV	10
Internal Paths (Boardwalks)	**20t (gross weight) HGV**	8
	10t HGV	2
Landscaping	**10t HGV**	2
	20t HGV	2
	32t HGV	6
	Low loader x2	2
Clubhouse facility & car park	**7.5t HGV**	10
	10t HGV	5
	20t HGV	10
	32t HGV	10
	44t HGV	70
Maintenance facility building and hardstanding	**10t HGV**	5
	20t HGV	10
	32t HGV	10
	44t HGV	50
Total (one-way trips)		**382**
Total (two-way trips)		**764**

The construction of the proposed development would take approximately 12 months. Using the indicative construction programme, the number of construction trips that are anticipated to visit the site for each month of the construction period has been calculated and is indicated by Table E.7. For the purposes of this assessment, it is assumed that all vehicles associated with the construction of the proposed development are HGVs. In practice some of the materials may be small enough to be transported by light goods vehicle.

Table E.7: Estimated No. of HGV Trips During Construction by Month

Task	Month												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Access Road	**72**	**72**											**144**
Site Establishment	**5**	5											10
Earthworks			9										9
Shaping				4									4
Drainage				4	5	4							13
Internal Paths (Boardwalks)							6	4					10
Landscaping					2	4	4	2					12
Clubhouse facility & car park							25	25	15	15	15	15	105
Maintenance facility building and hardstanding				25	25	15	10						75
Total One-Way	**77**	**77**	**9**	**33**	**32**	**31**	**45**	**31**	**15**	**15**	**15**	**15**	**382**
Total Two-Way	**144**	**144**	**18**	**66**	**64**	**62**	**90**	**62**	**30**	**30**	**30**	**30**	**764**

As indicated by Table E.7, months 1 and 2 of the construction programme would feature the most HGV movements at 144 two-way movements over both months. Assuming that construction will take place 4 weeks in the month, and a 5.5 day working week average, approximately 7 daily two-way HGV movements are predicted to be generated during these months. In addition to the HGV movements, it is estimated that 5 construction workers would access the site daily, resulting in 10 daily two-way vehicle movements

Table E.8 details the daily percentage increases in AADF and HGV movements along the road links within the study area as an average of the annual number of trips generated. This assessment considers a scenario whereby 100% of the construction related vehicles are distributed over each counter location.

Table E.8: Construction Traffic Impacts on Routes within Study Area

	ATC 1	ATC 2	ATC 3	ATC 4
Existing AADF	**556**	**1,273**	**3,987**	**7,207**
Existing HGV Count	**55**	102	130	418
Existing HGV %	**10%**	**8%**	**3%**	**6%**
Month 1&2 Increase in Total Daily Traffic Flow	**17**	17	17	17
Existing AADF + Month 1&2 Traffic	**573**	1,290	4,004	7,224
Percentage increase in total traffic due to the proposed development	**3.1%**	**1.3%**	**0.4%**	**0.2%**
Month 1&2 HGV Traffic	**7**	**7**	**7**	**7**
Existing HGV Count + Month 1&2 HGV Traffic	**62**	**109**	**137**	**425**
Percentage increase in HGVs due to the proposed development	**12.7%**	**6.9%**	**5.3%**	**1.7%**

Table E.8 indicates that, when the two-way HGV and construction staff vehicle movements associated with months 1 and 2 of the construction programme are averaged across a 5.5 day working week, there is a negligible increase in total traffic across all road links (3.1% at most). These predicted increases do not trigger the requirement for a full assessment of environmental effects on any of the links within the study area.

The increase in the proportion of HGVs is negligible along the A9 and A949 and the C1026 between the proposed site access and the Embo junction. There is however, a 12.7% increase along the C1026 north of Embo junction between the junction and the site access. Such an increase triggers the need for further assessment of environmental effects as per Rule 2 of the IEMA Guidelines.

It is noted that the section of road involved is just over 200 metres in length but the following paragraphs detail a full assessment of environmental effects for the C1026 road link at this location. The assessment utilises the sensitivity and magnitude tables (Tables E.1 and E.2) and the significance matrix (Table E.3) as an aide to determine the significance of the effect of increased traffic levels as a result of the proposal.

8.6.1.1 Severance

The IEMA Guidelines advise the following in relation to the effect of severance:

"Severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery"

The potential for traffic associated with the development to cause severance is assessed on a case by case basis using professional judgement where, non-negligible traffic increases are predicted on roads through residential settlements.

Increased severance can result in the isolation of areas of a settlement or individual properties. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. Severance effects could equally be applied to residents, motorists or pedestrians.

It is noted that the section of road being assessed here is just over 200 metres in length and there are no properties located on either side of the route. On-site observations indicated that there is some limited pedestrian activity on the route.

In accordance with Table E.2, the magnitude of change in HGV levels along the C1062 is considered to be negligible. The sensitivity of the C1026 to severance at this location is considered to be low given that the road does not pass through any large settlement areas. When the magnitude of change is combined with the sensitivity of the road link in accordance with Table E.3, it can be concluded that the effect would be negligible, which is considered to be not significant in accordance with the EIA regulations.

8.6.1.2 Driver Delay

Some driver delay may be experienced when HGVs are accessing the site although it is expected that the HGV movements will be spread out through the day rather than being concentrated over short periods of time. The IEMA Guidelines advise:

"Delays are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system."

Traffic delay to non-development traffic can occur at several points on the network surrounding the development site including:

- At the development entrance where there will be additional turning movements;
- At intersections along the local road network which might be affected by increased traffic; and
- At side roads where the ability to find gaps in traffic may be reduced, thereby lengthening delays.

It is noted that there are no existing significant areas of congestion within the study area and there are currently no issues with the section of road that is being assessed between Embo junction and the proposed site access location. The survey information indicates that traffic levels on the C1026 to the north of the Embo junction are less than half of that to the south of the junction which explains the higher percentage HGV impact figure to the north of the Embo junction.

In accordance with Table E.2, the magnitude of change in HGV levels along the C1062 is considered to be negligible. The sensitivity of the road link to driver delay is considered to be low as there will only be the junction with the site access and the existing Embo junction where vehicles would be turning. There are no access points to properties and the road is also not close to its theoretical carrying capacity therefore finding gaps in the traffic to turn onto the C1062 would still be achievable without causing any significant delays. The magnitude and sensitivity combined equates to an effect of negligible significance in accordance with Table E.3 which is not significant in accordance with the EIA Regulations.

8.6.1.3 Pedestrian Delay and Amenity

Traffic volume, composition, speed, pedestrian footways and crossings all contribute to the level of general pleasantness or fear, intimidation and delay experienced by pedestrians and other vulnerable road users.

In accordance with Table E.2, the magnitude of change in HGV levels along the C1062 is considered to be negligible. As with severance, the sensitivity of the C1026 at this location is considered to be low given that this section of the road does not pass through any large settlement areas. Those affected would be pedestrians who use the road for leisure activities such as dog walking and rambling.

When the magnitude of change is combined with the sensitivity of the road link receptor in accordance with Table E.3, it can be concluded that there would be a negligible effect on pedestrian delay and amenity. This is considered to be not significant in accordance with the EIA regulations.

8.6.1.4 Accidents and Safety

Accidents that are appraised in relation to transport are predominantly those in which personal injury is sustained by those involved (personal injury accidents (PIAs)). The accident rate for a road link is identified within DMRB (COBA Lite) depending on the geometry and standard of the road and expressed in PIA/mvkm.

The accident rate for roads with similar characteristics to the C1026 (Link Type 9 – Other S2 Roads, single carriageway road not designed to modern standards) is 0.233 PIA/mv/km. Assuming a two-way trip along the road from the site access to the Embo junction (approximately 0.5km) for each vehicle over the construction period (764 HGVs two-way movements), a total distance of 382km is obtained. This suggests an annual PIA rate of 0.00009 for the vehicles associated with the development.

It is considered that the magnitude of this change is negligible but receptor sensitivity to accidents and safety is always high. When combined, the effect can be classified as being of minor significance and not significant in terms of the EIA regulations for this section of the C1062.

8.6.1.5 Dust and Dirt

IEMA Guidelines acknowledge that it is not practical to quantify the level of dust and dirt that can be anticipated from development traffic. Therefore a quantitative description of dust and dirt effects from construction traffic is not provided here.

It is acknowledged that HGVs have the potential to collect debris on their tyres when accessing the Development. This could be transferred to the road surface when vehicles travel away from the Development and can be deposited on the road in the form of either dust or mud depending on weather conditions.

For the C1026, the magnitude of change is considered to be slight as standard good practice working methods will be put in place to minimise dust from vehicles (use of wheel washes and covering any loads likely to generate dust) and the sensitivity of the receptor is considered to be negligible. The overall significance of the environmental effect of dust and dirt is assessed as negligible and not significant in accordance with the EIA regulations.

8.6.2 Operational Effects

8.6.2.1 Operational Traffic Generation

The associated Transport Statement for the proposed development calculated the trip generation for the operational phase of the development using a first principles method to predict a "worst-case" assessment scenario suitable for assessment purposes. The assessment assumed the following parameters based on the rate of play and capacity of the nearby Royal Dornoch Golf Course:

- 56 tee-off times per day;
- players per tee-off time;
- All players travel by car and 1 in 4 cars will contain two people; and
- staff members travelling to the golf course per day.

Assuming all tee off times are filled, then the above equates to a worst case of 360 two-way vehicle trips generated by the proposed development per day (240 two-way by players and 20 two-way by staff). This "worst case" trip generation scenario provides a robust assessment as it assumes that all trips would be vehicle trips and no trips would be made by other alternative travel modes.

It is noted that golf courses tend to experience seasonal variations in visitor numbers whereby summer months are usually the busiest (peak) periods while winter months are quieter (off-peak). This assessment is based on the peak trip generation that the proposed development is expected to have capacity for during the peak summer months.

8.6.2.2 Operational Traffic Distribution

The predicted trip distribution of traffic associated with the proposed development is indicated by Table E.9 below. These predictions are based on an assumption that all vehicles travelling to the proposed development will use Route 1 via all ATC locations, providing a robust assessment of the impact on these roads. It is understood that a proportion of traffic may travel to the site by Routes 2 or 3; however, traffic increase on these roads would be negligible and would not trigger the 30% threshold for further assessment.

Table E.9: Operational Trip Distribution

ATC Location	Vehicle Trip Distribution	Vehicle Trips (Daily)
1. C1026 North of Embo Junction	**100%**	**360**
2. C1026 between Dornoch and Embo Junction	**100%**	**360**
3. A949 in Dornoch	**100%**	360
4. A9 west of Dornoch	**100%**	**360**

8.6.2.3 Operational Traffic Impact

Table E.10: Traffic Impact on Routes within the Study Area

	1. C1026 North of Embo Junction	2. C1026 between Dornoch and Embo Junction	3. A949 in Dornoch	4. A9 west of Dornoch
Baseline AADF	**556**	**1,273**	**3,987**	**7,207**
Propose Development Daily Traffic Flow	**360**	**360**	**360**	**360**
Baseline AADF + Daily Traffic Flow	**916**	**1,633**	**4,347**	**7,567**
Percentage Increase In Total Traffic Due To The Proposed Development	**65%**	**28%**	**9%**	**5%**

Table E.10 indicates that, when taking into account the two-way vehicle movements associated with the operational phase of the development there is a moderate increase in total traffic on the C1062 North of the Embo junction to the proposed development access location. All other links have a negligible increase (less than 30% increase) across all other road links and do not trigger the need for further assessment of environmental effects.

The following paragraphs detail a full assessment of environmental effects for the C1026 road link (north of Embo junction to the development access location) where the IEMA Rule 1 triggers the requirement for further detailed assessment. The assessment utilises the sensitivity and magnitude tables (Tables E.1 and E.2) and the significance matrix (Table E.3) as an aide to determine the significance of the environmental effects associated with increased traffic levels from the development.

8.6.2.4 Severance

Severance is a perception that a road is more difficult or possibly less safe to cross. Increased severance can result in the isolation of areas of a settlement or individual properties. Severance may result from the difficulty of crossing a heavily trafficked road or a physical barrier created by the road itself. Severance effects could equally be applied to residents, motorists or pedestrians.

In accordance with Table E.2, the magnitude of change in vehicle flows along this section of the C1062 is considered to be moderate. The sensitivity of the C1026 at this location to severance is considered to be negligible given that the road does not pass through any large settlement areas. When the magnitude of change is combined with the sensitivity of the receptor road link in accordance with Table E.3, it can be concluded that there would be minor / negligible effect, which is not considered to be significant in accordance with the EIA regulations

8.6.2.5 Driver Delay

The IEA guidelines suggest that driver delay is only likely to be of significance when the traffic on the surrounding road network is at, or close to full capacity. It is understood hat the current traffic levels on the C1026 are low at this location at approximately 556 vehicles per day. Therefore, it must be acknowledge that the relatively high percentage impact (65%) predicted for development traffic is as a result of the baseline flow being low.

In accordance with Table E.2, the magnitude of the change in vehicle levels along the C1062 is considered to be moderate in line with the percentage change. The sensitivity of the road link to driver delay is considered to be low as there is only the new access junction and the Embo junction at either end of the considered road link where vehicles would be turning. The road link is short and is also not close to capacity therefore finding gaps in the traffic to turn onto the C1062 would still be very much achievable without causing any significant delays. As part of the development proposals, the applicant is committed to widening the road between the Embo junction and the development access junction to a single carriageway link capable of accommodating two-way traffic. This will further reduce the chance of any driver delay.

Traffic generated by the proposal will also be spread across the course of a day and therefore will not be concentrated during the commuter peak periods. The moderate magnitude of the effect combined with the negligible sensitivity of the receptor equates to an effect of minor / negligible significance in accordance with Table E.3 which is not significant in accordance with the EIA Regulations.

8.6.2.6 Pedestrian Delay and Amenity

Traffic volume, composition, speed, pedestrian footways and crossings all contribute to the level of general pleasantness, fear, intimidation and delay experienced by pedestrians and other vulnerable road users.

In accordance with Table E.2, the magnitude of change in vehicle levels along the C1062 is moderate for the operational stage of the development. As with severance, the sensitivity of the C1026 (north of the Embo junction) is considered to be negligible given that the road does not pass through any large settlement areas over this section. Those affected over this section of the C1026 would be a low volume of pedestrians who generally use the route for leisure purposes.

When the moderate magnitude of change is combined with the negligible sensitivity of the road link, in accordance with Table E.3 it can be concluded that there would be a minor / negligible effect which is considered to be not significant in accordance with the EIA regulations.

8.6.2.7 Accidents and Safety

Accidents that are appraised in relation to transport are predominantly those in which personal injury is sustained by those involved (personal injury accidents (PIAs)). The accident rate for a road link is identified within DMRB (COBA Lite) depending on the geometry and standard of the road and expressed in PIA/mvkm.

The accident rate for roads with similar characteristics to the C1026 (Link Type 9 – Other S2 Roads, single carriageway road not designed to modern standards) is 0.233 PIA/mv/km. Assuming a two-way trip along the link road from the site access to the Embo junction (approximately 0.5km) for each vehicle over the course of a year (131,400 vehicles assuming 360 vehicles every day for a full year), a total distance of 32,850km is obtained. This suggests an annual PIA rate of 0.0077 for the vehicles associated with the operational phase of the development.

It is considered that the magnitude of this change is negligible but receptor sensitivity to accidents and safety is always high. When combined, the effect can be classified as being of minor significance and not significant for the C1062 between the Embo Junction and the development access.

8.6.2.8 Dust and Dirt

IEMA Guidelines acknowledge that it is not practical to quantify the level of dust and dirt that can be anticipated from development traffic. Therefore a quantitative description of dust and dirt effects from operational traffic is not provided here. It is noted that the access road to the development will be surfaced and there is very limited scope for dust and dirt to be deposited onto the public road network as a result of operational traffic.

8.7 MITIGATION MEASURES

8.7.1 Construction Phase

A Construction Traffic Management Plan (CTMP) will be produced to support the construction phase of the development. The plan would be prepared at the earliest opportunity following planning consent and used to mitigate the possible traffic related environmental impacts associated with the construction stage. Appropriate measures to be considered would include:

- Until an appropriate length of 'made' road is available to avoid dust and dirt being transferred onto the wider road network by construction vehicles, specific measures such as wheel cleaning, road cleaning and wet suppression methods should be employed to reduce mud or dust transfer at the access.
- All contractors will be provided with a site induction pack containing information on delivery routes and any restrictions on routes.
- It is an option to restrict construction HGV traffic between the network peak hours which are generally 08:00-09:00 and 16:00-18:00 Monday to Friday if necessary. Deliveries will also try and avoid the start and end of the school day.

- The construction material 'lay down' areas will allow for a staggered delivery schedule throughout the day, avoiding peak and unsociable hours (i.e. before 07:00 and after 22:00).
- The CTMP and the control measures therein will be included within all trade contractor tender enquiries to ensure early understanding and acceptance/compliance with the rules that will be enforced on this project.
- The C1026 will be maintained on approach to the site to ensure it is in a clean and safe condition.

8.7.2 Operational Phase

Infrastructure upgrades to the C1026 road between the site access and the Embo junction are proposed in the form of road widening. It is anticipated that these improvements would mitigate any impacts that could occur as a result of increased traffic volumes during the operational phase of the development.

Furthermore, a TP will be prepared to present potential sustainable transport measures to be implemented and detail the monitoring and review process that will be undertaken to reduce the reliance on the private car by visitors and staff.
In particular and in order to reduce the number of car trips to the development, the applicant has committed to the provision of a shuttle bus service between Dornoch and the proposed development. This service would decrease the number of vehicle trips associated with the development and therefore significantly reduce the impact of operational traffic on the local road network. It is envisaged that the shuttle bus could halve the predicted volume of car trips to the development.

8.8 RESIDUAL EFFECTS

Subject to the successful implementation and monitoring of both a CTMP and TP, it is considered that any residual effects associated with the construction and operational phases will be negligible given that prior to mitigation, all effects are considered to be not significant. As a result, the residual effects after implementation of the CTMP and TP would also be classed as not significant.

8.9 SUMMARY OF EFFECTS

Table E.11 below provides a summary of the effects detailed in this assessment.

Table E.11: Summary of Effects

Project Phase	Receptor	Sensitivity		Description of Change (Pre-mitigation)	Level of Effect (Pre-mitigation)	Mitigation Measure	Level of Effect (Post-mitigation)	Nature of Effect			
								Positive/ Negative	Permanent/ Temporary	Reversible/ Irreversible	Residual Significance
Construction	Severance	Negligible		Increase in traffic	Negligible	CTMP	Negligible	Negative	Temporary	Reversible	Not significant
Construction	Driver delay	Negligible		Increase in traffic	Negligible	CTMP	Negligible	Negative	Temporary	Reversible	Not significant
Construction	Pedestrian delay and amenity	Negligible		Increase in traffic	Negligible	CTMP	Negligible	Negative	Temporary	Reversible	Not significant
Construction	Accident and safety	High		Increase in traffic	Minor	CTMP	Minor	Negative	N/A	N/A	Not significant
Construction	Dust and Dirt	Negligible		Increase in Traffic	Minor	CTMP	Negligible	Negative	Temporary	Reversible	Not Significant
Operational	Severance	Negligible		Increase in traffic	Minor	Road widening, shuttle bus service	Negligible	Negative	Permanent	Reversible	Not significant
Operational	Driver delay	Negligible		Increase in traffic	Minor	Road widening , shuttle bus service	Negligible	Negative	Permanent	Reversible	Not significant
Operational	Pedestrian delay and amenity	Negligible		Increase in traffic	Minor	Road widening, shuttle bus	None	Negative	Permanent	Reversible	Not significant
Operational	Accident and safety	High		Increase in traffic	Minor	Road Widening	Minor	Negative	N/A	N/A	Not significant

On the basis of the findings of the assessment on access, traffic and transport, this Annex concludes that effects of increased traffic as a result of the construction of the development are not deemed to be significant given that they represent a temporary change which can be accommodated by the existing road network within the study area. Implementation of a CTMP will ensure efficient transportation of construction materials to minimise the effects and disruption to the local area.

This Annex also concludes that there will be no significant environmental effects associated with the operational stage of the development. Notwithstanding this, a number of measures have been improved which help to reduce traffic and associated environmental effects.

On this basis, no significant residual traffic and transport effects are predicted for the construction or operation of the proposed development.

9.0 ANNEX F: CULTURAL HERITAGE

9.1 SCOPE OF ASSESSMENT

This annex provides a survey of the cultural heritage environment that may be affected by the proposed development and an assessment of the potential effects of the proposed development on this.

Cultural heritage assets and places comprise those with both statutory and non-statutory designations.

Sites with statutory designations include:

- Scheduled Monuments (SMs);
- Listed Buildings;
- Conservation Areas; and
- Designated Wrecks.

Cultural heritage sites with non-statutory designations include:

- World Heritage sites;
- Gardens and Designed Landscapes (GDLs);
- Historic Battlefields; and
- Other historic environment sites or areas.

The assessment of potential effects on cultural heritage considers two types of potential effect: direct and indirect. In both cases effects can be adverse or beneficial.

9.1.1 Direct Effects

Potential adverse direct effects on known cultural heritage features can occur within the boundary of the proposed development or in areas affected by related works, where avoidance of such features is not possible. There is also the potential for direct effects on as-yet-undiscovered archaeological remains, which may occur, for example, where sub-surface remains are present but have not yet been identified because they have no visible, above-ground elements.

Direct effects on known or as-yet-unidentified cultural heritage features may result from:

- Ground-breaking works related to the construction of the proposed development; and
- Movement of machines over or near to sensitive areas, resulting in the disturbance of elements of a feature, including through wheel rutting and/or the compaction of archaeological deposits.

Direct effects on the archaeological resource are typically permanent and irreversible.

9.1.2 Indirect Effects

Potential indirect effects frequently comprise potential effects on the settings of cultural heritage sites that have statutory designation as well as those with non-statutory designations. While potential effects on the setting of cultural heritage assets and places are usually visual in nature non-visual effects can also exist, for example, other sensory factors including vibration and noise. Non-visual aspects of the setting of a site could also include particular associations, for example, historic, artistic, literary or place name.

These non-visual aspects that could form part of the setting of a cultural heritage site means the setting of a cultural heritage feature may be affected even when important views, including to or from that feature, are not.

Potential setting effects of a visual nature include:

- Effects on the inter-relationships between features;
- Effects on the relationship of a feature to the landscape within which it sits; and
- Effects on other significant views from or to features.

A development may have effects on setting as a result of:

- Changes associated with the constructional phase of development; and
- Changes resulting from the operation of the proposed development.

Other potential indirect effects include damage caused by short and long term changes in hydrology. Changes in drainage regimes can result in the desiccation of sediments and potentially the deterioration or destruction of archaeological remains which they may contain.

9.1.3 Policy and Guidance

9.1.3.1 National Policy and Guidance

This assessment was carried out within the context of relevant national legislation, policy and guidance which includes:

- the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011;
- the Historic Environment Scotland Act 2014;
- Historic Environment Scotland Policy Statement, June 2016;
- Historic Environment Circular 1, June 2016;
- the Historic Environment Strategy for Scotland: Our Place in Time, 2014;
- Historic Environment Scotland's Managing Change in the Historic Environment guidance note series;
- the Historic Buildings and Ancient Monuments Act 1953;
- the Ancient Monuments and Archaeological Areas Act 1979;

- the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997;
- the Town and Country Planning (Scotland) Act 1997;
- the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013;
- the Planning etc. (Scotland) Act 2006;
- Historic Environment (Amendment) (Scotland) Act 2011 (HEAS Act);
- Scottish Planning Policy (SPP), particularly paragraphs 135-151: Valuing the Historic Environment, June 2014;
- Planning Advice Note (PAN*) 2/2011: Planning and Archaeology, July 2011;
- PAN* 71: Conservation Area Management, December 2004;
- A Guide to Conservation Areas in Scotland, Scottish Government, March 2005;
- other nationally relevant documents, including PAN* 1/2013: Environmental Impact Assessment.

The *Historic Environment Policy Statement*, June 2016, sets out the principles under which HES operates and provides a framework that informs the day-to-day work of a range of organisations that have a role and interest in managing Scotland's historic environment. The policy statement is also relevant to the EIA process.

The *Ancient Monuments and Archaeological Areas Act 1979* requires that HES compile and maintain, on behalf of the Scottish Ministers, a schedule of archaeological monuments important to the nation. Such monuments are known as Scheduled Monuments. Works that would destroy damage, remove, repair, alter, append, flood or bury any part of a monument on this schedule can only be carried out with the permission of the Scottish Ministers (known as Scheduled Monument Consent). By definition, under the 1979 Act, SMs are of national importance.

SPP paragraph 145 states that:
"Where there is potential for a proposed development to have an adverse effect on a scheduled monument or on the integrity of its setting, permission should only be granted where there are exceptional circumstances."

Historic Environment Scotland Policy Statement, Annex 7, paragraph 3 provides more detail:
"Scheduled Monument Consent and planning permission are both required where works/development would have a direct impact on the legally protected area of the monument, as defined in the scheduling documents. However, the provisions of the Ancient Monuments and Archaeological Areas Act 1979 do not extend beyond that. In the case of impact on the setting of the monument, securing the preservation of the monument 'within an appropriate setting' as required by national policy is solely a matter for the planning system. Whether any particular development will have an adverse impact on the setting of a scheduled monument is a matter of professional judgement. It will depend upon such variables as the nature, extent and design of the development proposed, the characteristics of the monument in question, its relationship

to other monuments in the vicinity, its current landscape setting and its contribution to our understanding and appreciation of the monument."

Buildings of special architectural and/or historic importance are protected under the *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997* (the 1997 Act) and are assigned to one of three categories: A, B and C listings, in decreasing order of significance. The *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*, sections 14(2) & 59, states, in relation to the determination of an application for listed building consent or for a proposal for development which may affect a listed building or its setting, that the Planning Authority or Scottish Ministers shall have:
"special regard to the desirability of preserving the building or its setting or any features of special architectural or historic interest which it possesses."

SPP Paragraph 141 also states that:
"Where planning permission and listed building consent are sought for development to, or affecting, a listed building, special regard must be given to the importance of preserving and enhancing the building, its setting and any features of special architectural or historic interest."

The HEAS Act 2011 aims to leave the fundamentals of existing legislation in place, while addressing gaps and weaknesses identified during the stakeholder engagement process which preceded the introduction of the bill. These include introducing new powers to Scottish Ministers to enter land to inspect the condition of SMs, introducing a system of stop and temporary stop notices for unauthorised works to SMs and Listed Buildings, increasing the level of fines for unauthorised works that disturb or otherwise damage SMs and Listed Buildings, removing the 'defence of ignorance' for unauthorised works and introducing new powers to enable Scottish Ministers to serve a scheduled monument or listed building enforcement notice.

Conservation Areas are protected under Part II of the *Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997*. Section 64(1) of the Act states:
"In the exercise, with respect to any buildings or other land in a conservation area, of any powers under any of the provisions [under the Planning Acts or Part I of the Historic Buildings and Ancient Monuments Act 1953] special attention shall be paid to the desirability of preserving or enhancing the character or appearance of that area."

SPP paragraph 143 also states that:
"Proposals for development within conservation areas and proposals outwith which will impact on its appearance, character or setting, should preserve or enhance the character and appearance of the conservation area."

An Inventory of GDLs in Scotland is maintained by HES as required by the *Ancient Monuments and Archaeological Areas Act 1979*. Although a non-statutory designation, Scottish Planning Policy confirms that maintaining and enhancing the quality of the historic environment, of which Gardens and Designed Landscapes form part, are important functions of the planning system (HES Policy Statement, paragraph 2.70).

Schedule 5 (17) of the *Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013* requires planning authorities to consult HES if a development could affect a historic garden or designed landscape and that:
"Historic Environment Scotland's views on such applications will be a material consideration in the planning authority's determination of the case."

An Inventory of Historic Battlefields was compiled and is maintained by HES which lists and details the nationally important battlefields in Scotland.

Schedule 5 (17) of the *Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013* requires planning authorities to consult HES if a development could affect a historic battlefield and that:
"Historic Environment Scotland's views on such applications will be a material consideration in the planning authority's determination of the case."

PAN* 2 informs the handling of archaeological matters in local authority planning. It emphasises that preservation *in situ* of archaeological remains, in an appropriate setting, should occur where feasible and where not possible that mitigation will be necessary. It also highlights the opportunities which can occur for place-making, education, community and public engagement when archaeological sites are identified.

Other cultural heritage and archaeological sites, not subject to the above designations, are recorded within the National Monuments Record of Scotland (NMRS) and the local Historic Environment Records (HER). Such undesignated sites are frequently informally assigned to regional, local or lesser categories of importance although some could be of national importance.

The importance of such a site is established on the basis of professional judgement, although the criteria for identifying nationally important sites (as outlined in HES Policy Statement, Annex 1) will often be referred to in making such judgements. Some sites are also variously classed as of 'lesser', 'unknown' or 'other' importance, where 'unknown' or 'other' importance refers to examples where insufficient information exists to assign a more definitive level of importance.

9.1.3.2 Local Policy and Guidance

Strategic Aim 1 of the Highland Historic Environment Strategy, adopted January 2013 and prepared as supplementary guidance to Policy 57 of the Highland Wide Local Development Plan, aims to:
'ensure that future management strategies, proposals and decisions affecting the historic environment are based on a thorough understanding of the special features of the heritage assets and associated archaeology, history and architecture of the Scottish Highlands'

9.1.4 Scoping Responses

Highland Council's Historic Environment Team, responding through the Highland Council in a letter dated 8 August 2016, advised that:
'The proposed development is located in a rich archaeological landscape which includes evidence for prehistoric settlement and burial practice, as well as medieval and later occupation. Within the proposed development area there are recorded archaeological remains, most notably a Neolithic burial cairn to the south of Coul Farm, and an enclosure or prehistoric roundhouse to the north. Both of these features may survive at least in part, with any surviving remains lying beneath the current ground surface. It is clear that the archaeological potential of the area is high, and there is considered to be significant potential for buried, hitherto unrecorded archaeological features and remains to survive within Coul Links.'

In addition to the requirement that the Environmental Statement would need to follow the Highland Council Standards for Archaeological work the Historic Environment Team provided more detail on what would be required:
'The required work will be non-invasive and will include a desk-based assessment, a detailed archaeological walkover survey and a rapid (i.e. vehicle-mounted) geophysical survey of the area to ensure that the archaeological baseline is understood as fully as possible at an early stage. This is to ensure that impacts on cultural heritage assets can be minimised, as well as minimising unexpected costs and delays to development. Further mitigation (i.e. trial trenching) may be required as a condition of any planning consent issued.'

Early discussion with Highland Council's Historic Environment Team resulted in the rapid geophysical survey not being required as part of the EIA. This was based on the knowledge that the only practical place to undertake this would be within the western half of the proposed development boundary i.e. the flatter land utilised for agriculture. This also corresponded to where potential ground disturbance would be confined to relatively small and distinct parcels of land rather than larger spaces where wide ranging geophysical survey could prove more informative.

With regard to the Listed Category B Coul Farmhouse (Site 11, LB604) they note that:
'Impacts resulting from development on the setting of the listed building will need to be carefully considered. Where adverse impacts on the building's setting are identified, mitigation measures will be proposed. Where indirect impacts are predicted, these will be illustrated using photomontages that comply with Highland Council visualisation standards. Where impacts are unavoidable, HET expect proposed methods to mitigate this impact to be discussed in detail, including both physical (i.e. re-design) and where appropriate, compensatory and off-setting.'

9.2 STUDY AREAS

The assessment of potential effects on the cultural heritage receptors was conducted with reference to two distinct areas.

- The Near Study Area - the study area for potential direct and indirect effects consisted of the area within the proposed development boundary and sites within 1km, the latter being in order to provide an archaeological and historical context for the area. This wider context also helps in the process of determining the potential for discovering as-yet-unknown, sub surface remains within the development site.

- The Wider Study Area - the study area for sites that have no potential to be directly affected but may be subject to indirect effects consisted of the area beyond the development boundary. This second study area extended to 3km from the edge of the development boundary. The methodology for establishing the cultural heritage environment baseline condition of each of these areas is given in Section 9.5.

9.3 EXISTING ENVIRONMENT

The baseline environment for both the near and wider study areas is given below.

9.3.1 Near Study Area

A total of 28 sites of cultural heritage interest were identified during the desk assessment and field survey within the development boundary and a further 42 sites were identified within 1 km of the development boundary, although the latter grouped numerous sites at Littleferry into one site. Full descriptions of the sites located in the development boundary and within 1 km of it are given in Appendix F.1, Table F.9 and their locations shown in Appendix F.3. This information is summarised by period below.

9.3.1.1 Statutory Designated Cultural Heritage Sites

Only one statutory designated cultural heritage site is located within the development boundary that being the Listed Category B building of Coul Farmhouse (Site 11, LB604, HER No. MHG17065, NMRS No. NH89SW14). The farmhouse dates to 1809 and comprises a two storey, three bay house with a later wing to the rear (Information from HES Listing).

In the immediate surrounding landscape, within 1 km of the development boundary, there exists two scheduled monuments and eight listed buildings.

Just under 1km to the west of the development boundary sits the scheduled monument of Skelbo Castle (Site 56, SM6225) while just to the south sits the scheduled monument of Garnnie's Heilan Hame Chambered Cairn (Site 38, SM5975).

The listed category A Embo House (Site 43, LB608) lies to the south of the development boundary while a cluster of listed category B buildings sit to the west at Skelbo Farm (Site

69, LB596). A cluster of listed category B and C buildings also lie to the north at Little ferry (Sites 62 & 66, LB7015-7020).

9.3.1.2 Prehistoric Sites

The area within the development boundary holds two previously recorded cultural heritage sites of potential prehistoric date. However, neither was located during the walkover survey.

A short distance to the north-east of Coul Farmhouse a possible hut-circle has been recorded (Site 10). These round structures are generally associated with the Bronze and Iron Ages. The OS recorded the site in 1873 as being faintly visible near the north-eastern corner of Coul Farm stack yard. In 1971 they recorded it as comprising a circular enclosure set into a slight north-west slope and measuring roughly 19.5 m in diameter between the centres of an ill-defined mutilated ditch averaging 2.0m wide and 0.2m deep. It was noted as being ploughed out in the north-western area and there were suggestions that spoil has

been piled on the inner rim to form a slight bank. No trace of this feature was found during the field survey.

Some 190 m to the south-west of this lies the location of possible prehistoric cairn (Site 5). In 1873 the OS recorded it as what was once a large cairn that had had the majority of the stones removed for building purposes. In 1971 they noted that no intelligible remains were present and that the location lay in a quarried area. The walkover survey confirmed that no clear remains of the cairn were visible. The location did show signs of small scale quarrying although the larger quarry (Site 28) was further to the east.

In the immediate surrounding landscape, within 1 km of the development boundary, there exists seven sites of potential prehistoric date. These include previous findspots of urns (Site 66), flints (Sites 27 & 65), arrowheads and a stone axe (Site 54), a cairn (Site 49), a cairnfield and field systems (Site 1) and the remains of a chambered cairn (Site 38) which is also protected as a scheduled monument (SM5975).

9.3.1.3 Medieval Sites

One period that appears absent from the visible archaeology within the development boundary is the Medieval period. No sites that can confidently be assigned to this time are known within the development boundary.

In the immediate surrounding landscape, within 1 km of the development boundary, three potential medieval sites exist. These include the scheduled site of Skelbo Castle (Site 56, SM6225) which likely originated as a wood and earthwork structure gradually being rebuilt and extended in stone, a possible motte to the north-west of Fourpenny (Site 52) and the previous discovery of long cist burials north of Fourpenny (Site 53).

9.3.1.4 Post-Medieval and Modern Sites

By far the most numerous known sites with the development boundary are post-Medieval and modern.

Eight of the sites recorded within the development boundary relate to records of lost or wrecked sea vessels (Sites 12-19) dating primarily from the nineteenth century. Not surprisingly none of these sites were noted during the walkover survey despite their recorded locations being within the development boundary. This is likely due to their actual locations being unknown with a broad grid-references being provided to cover a very general location.

At least three of the sites within the development area relate to the former Dornoch Light Railway which ran through the middle of the development area. This line once branched off the main line at The Mound and ran south to Dornoch. It was opened in 1902, after being greatly subsidised by the Duke of Sutherland, and closed in 1960. Remains of the railway were noted in the form of the route itself (Site 26) which comprised a distinct built up and cut linear route roughly 4 m to 5 m in width, the remains of Skelbo Station platform

(Site 30), a small brick structure (Site 24) and a small quarry (Site 22), located immediately east of the line and possibly associated with the construction or maintenance of the line.

Located broadly in the centre of the development area a cluster of sites forming part of the Coul Farm complex are present. In addition to the main Listed Category B Farmhouse (Site 11, LB604, HER No. MHG17065, NMRS No. NH89SW14) the site also includes two cottages (Site 6), with the southernmost appearing to be the oldest (see Appendix F.1), and a series of farm buildings to the north of the cottages (Site 9). Site 9 is currently in use as a barn although the buildings generally reflect the layout shown on the first edition OS 25 inch map of 1879. A series of more modern additions and modifications have been made since then, including one of the roofs being lowered, although two original crow stepped gable ends are visible on the southern side of the complex. To the south of the main farmhouse (Site 11) the first edition 25 inch to the mile OS map, surveyed in 1874 and published in 1879, depicts a sluice & garden, possibly walled (Site 29). The garden is not depicted on the second edition OS 25 inch to the mile map surveyed in 1904 and published in 1906 or is it visible in the current field, however, upstanding remains of the sluice still survive.

A general reference to Easter Coul Farmstead is also present in the NMRS and HER (Site 7) that appears to refer to an archive plan of the farm dating to 1788 and held in the National Library of Scotland.

On the south-eastern fringes of the Coul Farm complex a series of four irregularly shaped cairns, most likely post-Medieval clearance was present spread over an area of approximately 100 m (Site 23). They varied in size but were up to 16 m by 10 m and exist up to 0.3 m in height. At the north-eastern end of the cairns a small quarried area measuring 22 m by 9 m was present which contained a mound of dumped soil & gravel.

At the far north-western extent of the development boundary a possible eighteenth century bridge is present on the old Skelbo to Littleferry road (Site 32) while three wells

have been previously noted within the development boundary, two on the early 25 inch to the mile map OS map survey in 1874 (Sites 44 & 68) and one on the 1906 edition of the same map series (Site 47). None of these wells were noted during the field survey.

A former school was noted just outside the southern edge of the development area (Site 3) but was not located during field survey. The first edition OS 25 inch map of 1879 does not show a school at this location but does at NH 81688 892733 suggesting HER co-ordinates are incorrect.

In the immediate surrounding landscape, within 1 km of the development boundary, there exist numerous and varied post-medieval and modern sites. These include upstanding buildings, for example the Listed Category B buildings at Skelbo (Site 69) and the listed category C and B buildings at Littleferry (Sites 66 & 62).

The area around Littleferry also holds remains of a similar age to the listed buildings, which include a former Customs House and walled garden (Site 64) and some ruined buildings (Site 61), along with the more modern remains of a World War Two bunker (Site 63). On the southern side of Loch Fleet the remains of the southern pier of the former Littleferry ferry is present (Site 20) along with other features relating to the areas maritime past including a jetty (Site 34) and remains of fishing vessels (Site 59).

Additional post-medieval and modern cultural heritage sites in this area include a former mill (Site 55), parts of the former light guage railway including Skelbo Station (Site 57) and a boundary wall (Site 33).

To the west of the proposed development area previous finds of sixteenth century coins (Site 50) and a building noted on early OS maps (Site 51) have been previously recorded.

A collection of post-medieval and modern sites have been recorded to the south of the proposed development area within and around Embo. These include references to nineteenth century ship wrecks (Sites 2 & 42), general references to Embo (Sites 35 & 36), Embo light gauge railway station (Site 4), Embo Hall (Site 37), a possible eighteenth century quarry (Site 31), an ice house (Site 41), reference to a pier (Site 60) and buildings at Embo Mains Farm (Sites 45 & 46). A record also exists of an archaeological watching brief being undertaken to the south of Embo (Site 40) although no archaeological remains were uncovered.

9.3.1.5 Sites of Unknown Date

A series of three sites of unknown date were noted within the development boundary. These included the remains of two roughly circular structures located to the east of Coul Farmhouse (Site 8). These were recorded in 1948 and by the OS in 1969, the latter only identifying one possible structure which was thought to potentially relate to the nearby farm. No sign of either structure was noted during the walkover survey and there is uncertainty over the description given in 1948 which states that they overlook the Kyle of Sutherland and Loch Fleet (Davidson 1948). It could be argued that views of Loch Fleet are present from the recorded location at Coul but not of the Kyle of Sutherland.

To the north of Coul Farm two possible pits were located (Site 25). These comprised two grass covered circular depressions existing to approximately 6 m to 8 m in diameter and 1 m to 2 m in depth. Given their location on the edge of a dune system it is possible that these are naturally formed depressions but could also represent some form of quarrying.

In the northern half of the development area there exists a general record of a lead mask being found lying in the mud near Meikleferry (Site 21). It has been suggested that it was a death mask, a head of a ship or something to do with the ferry disaster although no more information was present as to its current whereabouts or exactly where it was found. Given Meikle ferry is located a reasonable distance away on the Dornoch Firth it is likely that the grid co-ordinates for this site are inaccurate and the find was not actually recovered from Coul Links.

In the immediate surrounding landscape, within 1 km of the development boundary, there exists three sites of unknown date. These include a pebble tool recovered from the shore south-east of Embo (Site 39), a previous findspot of unknown nature at Littleferry (Site 67) and a midden of unknown date on the shore at Skelbo (Site 58).

9.3.1.6 Potential for Unknown Remains

The area within the development boundary and that within 1 km of it contains a wide variety of cultural heritage sites reflecting the relatively continuous use of and settlement within the area from the prehistoric period onwards. Potential prehistoric activity is present near to Coul Farmhouse (Sites 5 & 10) while a farm is noted on or close to the current farmhouse from mid-seventeenth century mapping onwards suggesting a lengthy history of occupation on the site. For these reasons alone there is good potential that the development area in general could hold currently unknown buried archaeological remains although this is most likely immediately inland from the line defining the edge of the raised beach. This currently corresponds to all land within the proposed development boundary around, to the west and south of Coul Farm.

It is also important to note that, in general, the western half of the development area consists of agricultural fields that have been subject to previous ploughing while the eastern half consists of a sand dune system. Both these types of local environment can hold sub surface archaeological remains. The process of ploughing and land improvement can remove surface traces of previous activity whilst retaining sub surface components beneath the plough soil. The moving sands of dune systems can also cover evidence for previous activity which is often revealed again in periods of severe storms or through gradual sand movement.

9.3.2 Wider Study Area

A total of 6 SMs, 1 Category A Listed Building, 5 Category B Listed Buildings and 4 Category C Listed Buildings were identified within 3 km of the development boundary. No Historic Battlefields or Gardens and Designed Landscapes that form part of Historic Environment Scotland's Inventory or Conservation Areas were present. A full list of these sites is given in Appendix F.2, Tables F.10 and F.11 and shown on Appendix F.4.

9.3.2.1 Sites Within 1 km

Within 1km of the proposed development two scheduled monuments are located. Approximately 800 m to the west of the development boundary and positioned on top of a prominent slope above the current shores of Loch Fleet is the remains of Skelbo Castle (Site 56, SM6225). The site is complex and shows evidence of numerous building phases ranging from a natural motte which likely held a timber tower in the early second millennium AD, through a variety of stone built phases which were last occupied in the twentieth century.

Approximately 400 m to the south of the development boundary, located in the entrance to a caravan park, are the remains of a prehistoric Orkney-Cromarty type chambered cairn (Site 38, SM5975). The monument is broadly round and contains two chambers. Excavations have shown that later cists and un-cisted cremations had been inserted into the cairn.

Eight listed buildings are located within 1 km of the proposed development boundary. The largest concentration of these is at Littleferry which includes Ferry Cottage (Site 66, LB7015, Listed Category C), Mr Urquhart's House (Site 66, LB7016, Listed Category C), the remains of the Pier, Waiting Room and Boathouse (Site 66, LB7017, Listed Category C), Bertha's House and Store to rear (Site 66, LB7018, Listed Category C), the Ice House (Site 66, LB7019, Listed Category B) and the former Girnel House Site 62, LB7020, Listed Category B).

To the west lies the complex of the mid to later nineteenth century Skelbo Farm (Site 69, LB596, Listed Category B) while, to the south, lies the late eighteenth century listed category A Embo House (Site 43, LB24641).

9.3.2.2 Sites Between 1-3 km

Within 1km to 3km from the development boundary four scheduled monuments are located. To the west, within Skelbo Wood, lies the remains of Skelbo Wood Broch (SM 1885) while a short distance to the east of the broch sits Glen Cottage prehistoric long cairn (SM5484). To the south of the development boundary lies the prehistoric Embo Street Cairn (SM1788). A further 1km south-west of the cairn lies the Earl's Cross Carved Stone (SM7672).

Only one listed building lies within 1km to 3 km from the development boundary that being the listed category B Earl's Cross House (LB24641).

9.4 EVALUATION CRITERIA

Assessment of potential effects involves two sets of criteria: the first, a methodology for assessing the potential direct effects of the proposed development, which relate to the potential physical effects of the development on cultural heritage features; and the second, a methodology for assessing the potential effects of the development on the settings of cultural heritage features (indirect effects), including SMs, Listed Buildings, GDLs and Conservation Areas, which relates principally, though not exclusively, to potential visual effects. In both cases effects can be adverse or beneficial.

9.4.1 Evaluation Criteria for Potential Direct Effects

The significance of a potential direct effect resulting from the proposed development is assessed by taking into account the sensitivity of the cultural heritage site and the magnitude and nature of the change occurring.

9.4.1.1 Evaluation Criteria for Potential Direct Effects

The sensitivity of the cultural heritage asset or place (the receptor) is determined with reference to any statutory or non-statutory designation and, especially for non-designated archaeological remains, by professional judgement made with reference to criteria such as those set out in Annex 1 of the Historic Environment Scotland Policy Statement 2016. Other forms of non-designated cultural heritage feature can be assigned equivalent levels of importance, with reference, for example, to the criteria for designating Listed Buildings (as outlined in Annex 2 of the Historic Environment Scotland Policy Statement 2016).

The following table represents a guide used in assigning levels of sensitivity to designated and non-designated cultural heritage assets and places.

Table F.1: Sensitivity/Importance of Receptor and Definitions

Sensitivity	Importance	Feature Examples
High	National	World Heritage sites; SMs or sites of schedulable quality; A-Listed Buildings or buildings of equivalent quality; GDLs included in Historic Scotland's Inventory; Battlefield sites included in Historic Scotland's Inventory; some Conservation Areas.
Medium	Regional	B-Listed Buildings or buildings of equivalent quality; some Conservation Areas; archaeological remains of regional importance.
Low	Local	C-Listed Buildings or buildings of equivalent quality; archaeological remains of local importance.
Lesser	Lesser	Archaeological remains of lesser importance.
Unknown	Unknown	Archaeological remains of unknown character and importance; generally where not enough information exists to assign one of the above sensitivities.

It is important to note that the sensitivity of a particular cultural heritage asset or place could be defined, at least to some extent, by the value placed on it by the local community or wider public.

9.4.1.2 Magnitude of Change Criteria for Direct Effects

The magnitude of the change is determined with reference to the scale and type of the potential change to the receptor:

Table F.2: Magnitude of Change and Definitions

Magnitude	Definition
Substantial	Total loss of or major alteration to key elements or features of the pre-project conditions, such that the post-project character or composition of the feature would be fundamentally changed.
Moderate	Loss of or alteration to key elements or features of the pre-project conditions, such that key aspects of the post-project character of the feature would be partially changed.
Slight	Minor alteration from pre-project conditions.
Negligible/ No change	No or slight change to pre-project conditions.

9.4.1.3 Assessing the Level of Direct Effect

The level of any potential direct effect on a receptor is assessed as *major, moderate, minor, negligible* or *none*. Judgement of the significance of an effect is made with reference to the following assessment matrix:

Table F.3: Approach for Determination of Level of Effect

Magnitude of Change	*Receptor Sensitivity*			
	Lesser/Unknown	Low	Medium	High
Substantial	Minor/ Unknown	Minor/ Moderate	Moderate/ Major	Major
Moderate	Negligible/ Unknown	Minor	Moderate	Moderate/ Major
Slight	None/ Unknown	Negligible	Minor	Minor/ Moderate
Negligible/ No change	None/ Unknown	None	None	None

A level of effect which is 'major' or 'moderate' is considered significant. A level of effect which is 'minor' or 'negligible' is considered not significant.

Where the effect on a receptor is classified as major or moderate this is considered to be equivalent to a significant effect as referred to in the Environmental Impact Assessment (Scotland) Regulations 2011.

Where Table F.3 indicates more than one level of potential effect, for example, minor/moderate, this reflects the reality that the varying levels of effect are not clear and distinct categories from a cultural heritage perspective. Where the level of an effect falls within an area that could be interpreted as, for example, minor or moderate professional judgement will be used to assign the appropriate significance to the potential effect.

9.4.2 Evaluation Criteria for Potential Indirect Effects

In the context of the current assessment, potential effects on the settings of cultural heritage features (indirect effects) will be primarily visual in nature. The assessment of such effects involves the determination of the sensitivity of each feature to setting effects and of the magnitude of the change on the relationship between that feature and its setting. Sensitivity and magnitude are, in each case, combined to determine the level of the potential effect. The assessment of potential effects on setting is based on professional judgements concerning the sensitivity, magnitude of change and significance of the effect in each case. These professional judgements are made in the context of the following structure.

9.4.2.1 Sensitivity Criteria for Potential Indirect Effects

The sensitivity of a cultural heritage asset or place (the receptor) in this context relates to the degree to which change can be accommodated without detrimental effects on the relationship between the receptor and its setting. The sensitivity of each receptor subject to assessment is defined as high, medium, low or not sensitive. Unless otherwise justified by specific factors in an individual case, the sensitivity of each receptor is determined as follows:

Table F.4: Sensitivity of Receptors to Setting Effects

Sensitivity	Feature Designation Categories
High	SMs; PiC; A-Listed Buildings; GDLs in HS Inventory; Battlefield sites in HES Inventory; some Conservation Areas
Medium	B-Listed Buildings; some Conservation Areas
Low	C-Listed Buildings

It is important to note that the sensitivity of the cultural heritage receptor with regard to its setting could be defined, at least to some extent, by the value placed on it by the local community or wider public who may have a strong attachment to a particular place for aesthetic reasons or due to particular historical associations.

9.4.2.2 Magnitude of Change Criteria for Indirect Effects

The magnitude of change arising from the proposed development in relation to a given cultural heritage receptor and its setting is described as substantial, moderate, slight or negligible/no change based on the interpretation of largely quantifiable parameters. Definition of these descriptions is equivalent to those outlined in Table F.2.

9.4.2.3 Assessing Level of Indirect Effect

The level of any potential effect on the setting of a receptor is assessed as major, moderate, minor, negligible or none. The professional judgement of the significance of an effect is made with reference to the following assessment matrix:

Table F.5: Matrix for the Assessment of the Level of Potential Setting Effects

Magnitude of Change	*Receptor Sensitivity*			
	Not Sensitive	Low	Medium	High
Substantial	Negligible/ Unknown	Minor/ Moderate	Moderate/ Major	Major
Moderate	Negligible/ Unknown	Minor	Moderate	Moderate/ Major
Slight	Negligible/ Unknown	Negligible	Minor	Minor/ Moderate
Negligible/ No change	Negligible/ None/ Unknown	Negligible/ None	Negligible/ None	Negligible/ None

A level of effect which is 'major' or 'moderate' is considered significant. A level of effect which is 'minor' or 'negligible' is considered not significant.

Where the level of effect on a receptor is classified as major or moderate this is considered to be equivalent to a significant effect as referred to in the Environmental Impact Assessment (Scotland) Regulations 2011.

Where Table F.5 indicates more than one level of potential effect, for example, minor/moderate, this reflects the reality that the varying levels of effect are not clear and distinct categories from a cultural heritage perspective. Where the level of an effect falls within an area that could be interpreted as, for example, minor or moderate professional judgement will be used to assign the appropriate significance to the potential effect.

9.5 METHOD OF PREDICTION OF CHANGE

9.5.1 Near Study Area

Baseline studies for the area within the development boundary comprised a desk-based assessment and an archaeological field survey (in the form of a walk-over survey). The desk-based assessment of this study area included the following:

- Information on SMs, PiC, Listed Buildings, Conservation Areas, GDLs and Historic Battlefields was obtained from Historic Environment Scotland's online download facility, allowing accurate plotting of site data into a GIS. This was supplemented by a search of Historic Scotland's online databases of these sites. This process was also undertaken for the area extending 1 km from the site boundary;
- A digital extract of the local Historic Environment Record (HER), maintained by the Highland Council Historic Environment Team, was obtained allowing accurate plotting of site data into a GIS. This process was also undertaken for the area extending 1 km from the site boundary;

- The National Monuments Record of Scotland was consulted through the online PastMap facility. These data were cross referenced with the HER. This process was also undertaken for the area extending 1 km from the site boundary;
- Relevant aerial photographs were viewed at the National Collection of Aerial Photography in Edinburgh in order to identify any unknown sites or features of archaeological interest. Four series of photographs were viewed, ranging in date from 1946 to 1988;
- Digital versions of pre-Ordnance Survey maps and the first, second and subsequent editions of the Ordnance Survey (OS) maps of the area of interest, held by the National Library of Scotland, were identified online and examined. Relevant maps range in date from the late sixteenth to the early twentieth century;
- Information on relevant Development Plans was obtained from the Highland Council website;
- Readily accessible primary and secondary historical sources on the area were consulted for information on its history and past land use; and
- Relevant unpublished archaeological reports were consulted for information on previous archaeological fieldwork.

The walk-over survey was undertaken between 31 May 2016 and 1 June 2016 in generally bright, sunny conditions. Any cultural heritage features identified were recorded by written description, photographs and, where appropriate, measured sketches. Their location was also noted and tied to the Ordnance Survey grid.

The methodology for assessing potential direct effects on cultural heritage sites sought to assess how the development would affect cultural heritage sites, or receptors, within the development boundary. This primarily related to the degree by which construction of the development would adversely affect known sites and potentially unknown buried remains.

9.5.2 Wider Study Area

Baseline studies for the area beyond the development boundary consisted of the identification of cultural heritage sites, including SMs, Listed Buildings, Conservation Areas, Inventory Battlefields and GDLs within 3km of the development boundary. The area within 1km from the development boundary was considered to be where the most significant effects on the setting of cultural heritage sites could potentially occur although sites at up to 3km were included in the assessment.

The methodology for assessing potential indirect setting effects on cultural heritage sites sought to assess how the development would affect cultural heritage receptors in the surrounding area, with particular focus on the area within 3km from the development boundary.

The first stage in the assessment of potential indirect setting effects on cultural heritage features was the establishment of a site gazetteer noting those sites within 3km of the development boundary (Appendix F.2, Tables F.10 and F.11, Appendix F.4). Data on cultural heritage sites was viewed and searched in a GIS which allowed for accurate identification of cultural heritage sites within 3km.

Cultural Heritage sites beyond 3km from the development boundary were discounted from subsequent detailed assessment, however, they remained part of the wider assessment of potential setting impacts until it was determined whether or not there could be effects on their setting as part of a group of sites and/or on views in which the sites in question were located. Potential setting effects of this nature could still occur despite specific sites themselves not being indivisible with the proposed development.

In addition. not all sites within 3km from the development boundary were ground truthed. In various cases visits to sites which had the same sight lines to the development as other, further away, sites and where the closer sites had been assessed as not enduring a significant effect, was taken to be enough evidence to determine that no significant effect would be present on the sites further away. This was only deemed appropriate in certain cases after taking into consideration other factors such as relative heights of sites, presence of tree cover, etc.

A process of desk-based analysis and consideration of known landscape characteristics, for example, tree or building cover, led to the sites present within the ZTV being divided into two groups:

- Those where it was felt that the predicted effect on setting would clearly not be significant; and
- Those where there remained the possibility of a significant effect and therefore further investigation was required.

Those cultural heritage features where there remained the possibility of a significant effect on setting were then the subject of further assessment. This involved a consideration of the sensitivity of each feature to setting effects, the likely magnitude of the effect and the significance of the potential effect. This process included field visits to the surrounding area, in order to gain a sense of the character of the landscape and key sites and areas within it, including designated cultural heritage sites within 3km of the site boundary.

9.6 EVALUATION EFFECTS

The evaluation of effects is based on the proposed development as described in Section 2 of the ES.

The evaluation of effects has been separated in to construction effects and operational effects.

9.6.1 Evaluation of Construction Effects

Potential effects on cultural heritage sites during the construction period will primarily take the form of potential direct, permanent, effects. Indirect effects, where they occur, are likely to be short term.

Through the design process the layout of the proposed development has avoided direct impacts on many of known cultural heritage sites (Appendix F.3). The assessment of potential direct effects on sites located within the development boundary is given below in Table F.6.

9.6.1.1 Potential Effects on Known Remains

Despite the design process avoiding direct effects on most of the known cultural heritage sites within the development boundary, potential direct effects were predicted on 14 sites.

Of the potential pre-historic remains recorded within the proposed development area both the site of a cairn noted on early OS maps of the area (Site 5) and the reported location of a hut-circle (Site 10) are both located in areas proposed to be landscaped to the east of the Coul farmstead buildings. Despite no obvious remains of either site being visible on the surface it is very likely that sub-surface remains of these sites exist, particularly given the area does not appear to have been subject to intensive ploughing over a long period of time. Small scale quarrying was visible at the site of the proposed cairn suggesting, if it is

present, it may have been at least partially disturbed. However, the quarrying also shows that the area is likely to have contained a reasonable amount of stone, suggesting that a substantial cairn could have once stood here. The potential adverse magnitude of effect on both receptors is *substantial* due to the potential that landscaping and drainage associated with the proposed development could remove a significant amount of any remains which could be present. However, the sensitivity of both features is *unknown* as no obvious surface remains are visible. Due to this lack of visibility the current level of the potential effect is *unknown* although this could be *significant* if important sub-surface remains of these sites are present.

A similar situation exists with regard to Site 8 which comprises possible circular structures of which no surface remains are currently visible. The potential adverse magnitude of effect on this receptors is *substantial* although the sensitivity the features is *unknown* due to no obvious surface remains being present. Due to this lack of visibility the current level of the potential effect is *unknown* although this could be *significant* if important sub-

surface remains of these sites are present. This is, however, less likely than with Sites 5 and 10 as there is some doubt over the accuracy of the grid co-ordinate given (see section 9.3.15).

A series of four irregularly shaped cairns (Site 23) to the south of Coul Farm were recorded during the field survey. Although there is the possibility that they represent the remnants of prehistoric remains they are more likely to relate to more recent field clearance. Given the doubt over their origin the sensitivity of this receptor is *unknown*. Landscaping and drainage as part of the proposed development is only likely to affect part of the cairns equivalent to a *medium* potential magnitude of the effect. This would result in the level of the potential adverse effect being *unknown*.

A series of sites related to and possibly associated with the light gauge railway which operated here in the first half of the twentieth century have the potential to be affected by the proposed development. The route of the track (Site 26) is crossed by fairways at several locations. However, it is proposed that the route of the railway be maintained as a public walkway which would limit the potential magnitude of the effect. In this case the sensitivity of this receptor is *low* and the potential magnitude of the effect is *negligible*,

therefore, the level of the potential adverse effect is considered *negligible*. Two disused quarries (Sites 22 & 28) are located next to and could be associated with the railway. The sensitivity of both these receptors is considered to be *lesser* while the magnitude of the potential effect is expected to be *slight* for Site 22, as it is located on the fringes of a proposed fairway and is unlikely to be significantly affected by landscaping or drainage, but *substantial* for Site 28 which is situated in a more central location. This would result in the potential level of the effect being *negligible* and *minor* respectively.

The small brick structure (Site 24), located just east of the railway, is proposed to be maintained as part of the development and renovated in to a tourist information signage point. This is not likely to result in the potential adverse magnitude of effect being any greater than *slight* which, given it has a *low* sensitivity, would result in the level of the potential adverse effect being *negligible*. It is also possible that the renovation of the structure and the associated preservation that would come with this, could result in a beneficial direct effect presuming key existing features are maintained.

To the north of Coul Farm two possible oval shaped pits (Site 25) were recorded during the field survey. It is possible that they are natural in origin, however, their regular shape and depth suggest they relate to human activity. Due to its unknown origin the sensitivity of this receptor is *unknown* while the potential magnitude of the effect is *substantial*. This means the level of the potential effect is also *unknown* although unless the possible pits prove to be significant the level of effect is very unlikely to ever be greater than *minor* adverse.

The farm buildings (Site 9) and cottages (Site 6) associated with Coul Farm will be maintained as part of the development and will be utilised within it. The sensitivity of these upstanding buildings is considered to be *low* while the development is not likely to result in a potential adverse magnitude of effect any greater than *slight* resulting in the level of

the potential adverse effect being *negligible*. It is also possible that the renovation of the structure and associated preservation that would come with this, could result in a beneficial direct effect presuming key existing features are maintained.

A series of three wells (Sites 44, 47 & 68) were identified on early OS mapping of the area that do not appear on modern maps and are not currently visible on the ground. One is only visible on the 25 inch to the mile series surveyed in 1874 (Site 44), one is only noted on the 25 inch to the mile map published in 1906 and 1950 (Site 47) while Site 68 is noted on both the 1874 and 1906 editions. The original nature of the wells is not known and they could have had a variety of forms from being stone lined to open springs. There is potential that any landscaping and drainage associated with the proposed development could impact on sub-surface remains associated with the wells, if any remains are present. Even if the current condition of the wells was fully understood it is very unlikely their sensitivity would be any more than *low*. The potential magnitude of the effect is only likely to be *slight* due to the potential depth of any well remains which would result in the level of the potential effect never being greater than *negligible*.

Table F.6: Assessment of potential adverse direct effects on known receptors within development boundary

Site No.	Site Type	Sensitivity	Potential Magnitude of Effect	Level of Potential Effect
5	Cairn	Unknown	Substantial	Unknown
6	Cottage(s)	Low	Slight	Negligible
8	Structure(s)	Unknown	Substantial	Unknown
9	Building(s), Farmstead	Low	Slight	Negligible
10	Possible Hut Circle	Unknown	Substantial	Unknown
12	Wreck: Craft (19th century)	Unknown	No Change	None
13	Wreck: Craft (19th century)	Unknown	No Change	None
14	Wreck: Smack (19th century)	Unknown	No Change	None
15	Wreck: Auxiliary Lugger (20th century)	Unknown	No Change	None
16	Wreck: Brigantine (19th century)	Unknown	No Change	None
17	Wreck: Schooner (19th century)	Unknown	No Change	None
18	Wreck: Craft (19th century)	Unknown	No Change	None
19	Wreck: Sloop (19th century)	Unknown	No Change	None
21	Findspot: Lead Mask	Unknown	No Change	None
22	Quarry	Lesser	Slight	Negligible
23	Cairns	Unknown	Moderate	Unknown
24	Structure	Low	Slight	Negligible
25	Pits (possible)	Unknown	Substantial	Unknown
26	Railway	Low	Negligible	Negligible
28	Quarry	Lesser	Substantial	Minor
29	Garden	Low	No Change	None
30	Railway Platform	Low	No Change	None
32	Bridge	Low	No Change	None
44	Well	Low	Slight	Negligible

Site No.	Site Type	Sensitivity	Potential Magnitude of Effect	Level of Potential Effect
47	Well	Low	Slight	Negligible
68	Well	Low	Slight	Negligible

9.6.1.2 Potential Effects on Unknown Remains

Given the area within the development boundary has been identified as holding potential to contain buried archaeological remains there exists potential that there could be direct effects on these currently undiscovered sites during the construction process. By their very nature the sensitivity of any potential buried remains that we are not currently aware of is *unknown* meaning the level of any potential effect on these undiscovered remains is also *unknown*.

Many of the 28 previously recorded sites within the development area were not located during the field survey, therefore, many were assessed as having an unknown sensitivity. The absence of surface evidence for these sites does not mean they are not present at all as they may survive as subsurface buried remains.

Several of the previously recorded sites within the development area were records of lost or wrecked sea vessels (Sites 12-19) with an unknown sensitivity. Their recorded locations are unusually on land primarily due to broad grid-references being provided as a result of their precise location not being known.

9.6.2 Evaluation of Operational Effects

Potential effects on cultural heritage sites during the operational period will primarily take the form of potential indirect setting effects. Indirect effects, where they occur, are likely to exist for the duration of the proposed development's operational lifetime.

In the context of this assessment, potential effects on the settings of cultural heritage features will be primarily visual in nature. No potential setting effects of a non-visual nature were identified.

Initial assessment of the 16 designated cultural heritage sites located in the proposed development boundary and within 3 km of it (Appendix F.4) showed that 4 sites would have no visibility or extremely limited views of the proposed development. These were:

- SM7672: Earl's Cross, Carved Stone, Dornoch - the cross faces east to west not in the direction of the proposed development. Intervening vegetation growth, topography and modern structures results in no or incredibly limited views of the proposed development at a distance of some 3 km.
- SM1788: Embo Street Cairn, SE of - The cairn is located some 1.6 km from the southern extent of the proposed development. Views, including those to the north, are hindered by gorse and other vegetation resulting in no or incredibly limited views of the proposed development.

- § SM5975: Grannie's Heilan Hame Chambered Cairn, 30 NNE of - the historical setting of the chambered cairn is already significantly compromised as it sits at the entrance to a caravan park. There are no views to the proposed development as the upstanding remains of Embo village lies between the cairn and development.
- § LB24641: Earl's Cross House, Listed Category B - the entrance to the house faces south, away from the proposed development. Intervening vegetation growth, topography and modern structures results in no or incredibly limited views of the proposed development at a distance of some 3 km.

An evaluation of the potential setting effects on the remaining 12 designated sites within 3 km of the proposed development are given in Table F.7.

Effects on the setting of six designated cultural heritage sites were identified during the assessment although none of these effects were considered significant.

An adverse effect on the setting of Skelbo Castle (SM6225), Embo House (LB608, Listed Category A), Littleferry Pier and Boathouse (LB7107, Listed Category C) and Littleferry former Girnel (LB7020, Listed category B) was predicted although the level of effect was no greater than *negligible* and not significant.

An adverse effect on the setting of Coul Farmhouse (LB604, Listed Category B) was predicted while a beneficial effect was also predicted on the Coul Farmhouse (LB604, Listed Category B) and associated farmstead and cottages. The level of effect for both adverse and beneficial effects was considered *minor* and not significant

Table F7: Assessment of the Level & Significance of Potential Setting Effects

Receptor ID	Receptor Name	Sensitivity of Receptor	Magnitude of Change	Level & Significance of Adverse/ Beneficial Effect	Notes on Potential Effect on Setting
SM6225	Skelbo Castle	High	Negligible	Adverse, Negligible, not significant	The upstanding remains of Skelbo Castle are heavily overgrown with trees and bushes. The most prominent part of the castle when viewed from the north and east is the upstanding north-easternmost wall which is part supported on its southern side by scaffold and concrete. Due to the tree cover and intervening landscape the only prominent contemporary view out from the castle is from this wall looking over Loch Fleet. Both these views to and from the castle still allow an appreciation of the castles elevated position. Views of other upstanding remains within the castle complex are, due to vegetation cover and local topography, very limited from both within the castle and looking towards it from outwith the scheduled area. From the castle views to the proposed development are limited to the far south-eastern edge of the scheduled monument where Coul Farm can be seen at a distance. Overall the proposed development will be visible from very limited parts of the castle but will be virtually imperceptible within key historical and contemporary views to and from the Castle.
SM1885	Skelbo Wood Broch, 300m SW of Glen Cottage	High	No Change	None	The upstanding remains of Skelbo Wood Broch are situated within commercial forestry but form part of a woodland walk. The broch has been cleared of woodland and is interpreted through an information board. Felling of further trees has allowed clear distant views to the north and north-east up the Sutherland coast. This allows for appreciation of the broch's elevated position and its key location on the coast at a time when Maritime travel would have been important. Current

Receptor ID	Receptor Name	Sensitivity of Receptor	Magnitude of Change	Level & Significance of Adverse/ Beneficial Effect	Notes on Potential Effect on Setting
					views to the proposed development are not present due to dense forestry and it is likely that, in the absence of the forestry, views would be limited to the northern part of the development at most.
SM5484	Glen Cottage, Long Cairn 520m SE of	High	No Change	None	Glen Cottage Long Cairn is located in a clearing within commercial forestry. The cairn itself has been cleared of trees but is heavily overgrown with heather. No meaningful views in any direction are currently possible due to the forestry cover. The NNE-SSW orientation of the cairn and its elevated location suggests views to the north over Loch Fleet and the Sutherland coast beyond were key during its use. In this situation views to the proposed development would be peripheral with the development itself being virtually imperceptible.
LB608	Embo House, Listed Category A	High	Negligible	Adverse, Negligible, not significant	Full assessment of the potential effects on the setting of the listed category A Embo house was not possible due to it being a private residence and access being restricted. However, the property is surrounded by deciduous trees to the north, east and west with the house clearly having an orientation that allows commanding views from the front of the property out over the coast to the south-east, away from the development. Views to the proposed development will not be possible during summer months when leaves are on the trees but views could be possible during the winter. However, these views, if present at all, will be very limited and will cause no meaningful change to views from or to the house.
LB604	Coul Farmhouse, Listed Category B	Medium	Slight	Adverse, Minor, not significant	Coul Farmhouse has been heavily modified and added to over time with any key surviving historical views most likely being out of the top floor windows on the main southern elevation,

Receptor ID	Receptor Name	Sensitivity of Receptor	Magnitude of Change	Level & Significance of Adverse/ Beneficial Effect	Notes on Potential Effect on Setting
					where the principal door of at least the most recent phase is also located. The proposed development will result in a driving range being present in this view although it will not involve a significant alteration to the current topography or grass covering. Having historically been a working farm the key views in relation to understanding this context are those from the house eastwards to the associated farmstead and cottages, the view in the opposite direction from the farmstead/cottages to the house and that present from within the complex of farmstead and cottages. The initial two of these views are currently partially blocked by mature trees which results in a sense that the house is somewhat separated from the core working area of the farm. This ultimately leads to a loss of association between the two areas. Although it is possible that distance and separation between the house and working area of the farm would have been desirable in the past it is presumed a clearer view between the two would have been present compared to the current situation. The proposed development will alter the setting of the house and in particular the associated buildings by primarily changing the function of the settlement from farm to golf course, including the addition of a clubhouse and parking. This will, however, be within a context of an already altered and segregated farm and is not considered to be significant.
LB604	Coul Farmhouse, Listed Category B	Medium	Slight	Beneficial, Minor	The proposed development proposes to retain and incorporate the farmstead and cottages that form part of the setting of Coul Farmhouse. As part of incorporating them into the development the more modern additions to the farmstead

Receptor ID	Receptor Name	Sensitivity of Receptor	Magnitude of Change	Level & Significance of Adverse/ Beneficial Effect	Notes on Potential Effect on Setting
					will be removed and the farmstead restored to a layout more akin to when initially constructed. This will also result in the renovation and preservation of farmstead and cottages, the farmstead currently being particularly dilapidated and dangerous. Although there will be an adverse effect on the setting of this complex (see above) the restoration of the farmstead and renovation of the cottages will ultimately result in a beneficial effect on the setting of these sites by returning the structures to their more original form.
LB596	Skelbo Steading, Listed Category B	Medium	No Change	None	Full assessment of the potential effects on the setting of the listed category A Embo house was not possible due to it being a private residence and access being restricted. However, the location of the complex is tucked away in a small glen surrounded by trees. Any views out from the site will be in a north-eastern direction across Loch Fleet. Views of the proposed development from the farm are very unlikely although, if present at all they will be minimal and will not affect the setting of the listed building in any way.
LB7015	Little Ferry Ferry Cottage, Listed Category C	Low	No Change	None	The setting of Littleferry is focussed around its association with Loch Fleet and the pier on the opposite bank. The proposed development will not alter the current view across the Loch from Littleferry to any significant degree (see Annex D2, Viewpoint 1) and will not alter the setting of the Listed C cottage.
LB7016	Little Ferry Mr Urquhart's House, Listed Category C	Low	No Change	None	The setting of Littleferry is focussed around its association with Loch Fleet and the pier on the opposite bank. The proposed development will not alter the current view across

Receptor ID	Receptor Name	Sensitivity of Receptor	Magnitude of Change	Level & Significance of Adverse/ Beneficial Effect	Notes on Potential Effect on Setting
					the Loch from Littleferry to any significant degree (see Annex D2, Viewpoint 1) and will not alter the setting of the Listed C house.
LB7017	Little Ferry Pier and Boathouse, Listed Category C	Low	Negligible	Adverse, Negligible, not significant	The setting of Littleferry pier and boathouse is focussed around its association with Loch Fleet and the pier on the opposite bank. The proposed development will not alter the current view across the Loch from the pier to any significant degree (see Annex D2, Viewpoint 1) and will only slightly alter the setting of the pier and boat house this primarily being due to the background of the south shore pier being slightly modified.
LB7018	Little Ferry "Berth's House" and Store to rear, Listed Category C	Low	No Change	None	The setting of Littleferry is focussed around its association with Loch Fleet and the pier on the opposite bank. The proposed development will not alter the current view across the Loch from Littleferry to any significant degree (see Annex D2, Viewpoint 1) and will not alter the setting of the Listed C house and store particularly given they are set back from the shore.
LB7019	Littelferry Ice House, Listed Category B	Medium	No Change	None	The setting of Littleferry is focussed around its association with Loch Fleet and the pier on the opposite bank. The proposed development will not alter the current view across the Loch from Littleferry to any significant degree (see Annex D2, Viewpoint 1) and will not alter the setting of the Listed B ice house particularly given it is set back from the shore.
LB7020	Little Ferry former Girnel, now	Medium	Negligible	Adverse, Negligible, not significant	The setting of the former Girnel building is focussed around its association with Loch Fleet. The building has been renovated

Receptor ID	Receptor Name	Sensitivity of Receptor	Magnitude of Change	Level & Significance of Adverse/ Beneficial Effect	Notes on Potential Effect on Setting
	Cottages, Listed category B				into dwellings with key views out of the front of the building across the loch. The proposed development will not alter the current view across the Loch to any significant degree (see Annex D2, Viewpoint 1) and will only slightly alter the setting of the contemporary setting of the building.

9.7 COMMITTED MITIGATION MEASURES

All archaeological mitigation to be undertaken prior and during the construction process in relation to direct impacts will be detailed in an Archaeological Management Plan (AMP) or Written Scheme of Investigation (WSI) which will be subject to the approval of the local authority archaeology service.

The Highland Council Historic Environment Team has indicated that they would intend to view the farm steading as part of the curtilage of the listed B category Coul Farmhouse (LB604) and, therefore, it too would be considered part of the listing. This would result in listed building consent being required for any alterations proposed to the farmstead.

Mitigation of potential direct effects on most known sites during the construction phase of the proposed development should be achievable through avoidance, by means of clearly demarcating these sites on the ground with an appropriate buffer. This will occur where the sites lie in close proximity to all infrastructure relating to the proposed development.

Where avoidance is not possible the mitigation put in place will be outlined in the AMP or WSI. This is likely to involve pre-construction evaluation through trial trenching of all known sites that cannot be avoided and all areas deemed sensitive to unknown remains. This mitigation will focus on all land west of the line defining the raised beach roughly corresponding to that immediately around and to the west and south of Coul Farm. It is also important to note that if significant remains are uncovered during this mitigation that cannot be avoided full archaeological excavation may be required to ensure preservation through record. Archaeological excavation of any remains would offset but not reduce the significance of any effect.

Mitigation of potentially undiscovered remains will also take the form of archaeological watching briefs during ground disturbance in areas deemed sensitive to the discovery of unknown remains where pre-construction evaluation revealed no significant buried remains.

9.8 SUMMARY OF RESIDUAL EFFECTS

The completion of a programme of archaeological works in advance of and during the construction of the proposed development will minimise the potential loss of the archaeological resource as a result of direct effects.

A summary of the residual effects are given below in Table F.8.

If direct effects do occur on currently known sites archaeological recording will offset but not reduce the level of effect.

Potential direct effects on as yet undiscovered archaeological remains are also possible during the construction phase. If archaeological remains are uncovered during

construction that cannot be avoided and preserved *in-situ* then archaeological recording will offset but not reduce the level of effect.

No mitigation of potential operational setting effects has been proposed, therefore, residual effects will remain as those predicted in Table F.7. of which none are regarded as significant.

9.9 FUTURE MONITORING REQUIREMENTS

All future monitoring requirements in relation to cultural heritage will be agreed and detailed in the AMP or WSI, however, in addition to mitigation relating to the construction phase it could have to account for management of cultural heritage during the lifespan of the proposed development, for example, the effect routine changes in drainage and course layout could have on cultural heritage assets.

Table F.8: Summary of Effects

Project Phase	Receptor	Sensitivity	Description of Change (Pre-mitigation)	Level of Effect (Pre-mitigation)	Mitigation Measure	Magnitude of Change (Post-mitigation)	Level of Effect (Post-mitigation)	Nature of Effect			
								Positive/ Adverse	Permanent/ Temporary	Reversible/ Irreversible	Residual Significance
Construction	Site 5: Cairn (no obvious remains visible on the surface)	Unknown	Potential substantial loss of sub-surface remains relating to a cairn recorded on early Ordnance Survey mapping	Unknown	Archaeological evaluation/ excavation to be agreed in WSI/AMP	Substantial	Unknown	Adverse	Permanent	Irreversible	Unknown
Construction	Site 6: Cottage(s)	Low	Buildings to be renovated and maintained as part of the proposed development	Negligible	None	Slight	Negligible	Adverse	Permanent	Irreversible	Not Significant
Construction	Site 8: Structure(s) (no obvious remains visible on the surface & possible inaccurate location)	Unknown	Potential substantial loss of sub-surface remains relating to a previous record of circular structures although doubt exists over the accuracy of the co-ordinates provided	Unknown	Archaeological evaluation/ excavation to be agreed in WSI/AMP	Substantial	Unknown	Adverse	Permanent	Irreversible	Unknown
Construction	Site 9: Building(s), Farmstead	Low	Buildings to be renovated and maintained as part of the proposed development	Negligible	None	Slight	Negligible	Adverse	Permanent	Irreversible	Not Significant

Project Phase	Receptor	Sensitivity	Description of Change (Pre-mitigation)	Level of Effect (Pre-mitigation)	Mitigation Measure	Magnitude of Change (Post-mitigation)	Level of Effect (Post-mitigation)	Nature of Effect			
								Positive/ Adverse	Permanent/ Temporary	Reversible/ Irreversible	Residual Significance
Construction	Site 10: Hut-Circle (no obvious remains visible on the surface)	Unknown	Potential substantial loss of sub-surface remains relating to a hut-circle recorded on early Ordnance Survey mapping	Unknown	Archaeological evaluation/ excavation to be agreed in WSI/AMP	Substantial	Unknown	Adverse	Permanent	Irreversible	Unknown
Construction	Site 22: Quarry	Lesser	Potential slight loss of small quarry likely associated with adjacent light gauge railway	Negligible	None	Slight	Negligible	Adverse	Permanent	Irreversible	Not Significant
Construction	Site 23: Likely clearance cairns	Unknown	Potential moderate loss of some cairn material	Unknown	Archaeological evaluation/ excavation to be agreed in WSI/AMP	Moderate	Unknown	Adverse	Permanent	Irreversible	Unknown
Construction	Site 24: Structure	Low	Building to be renovated and maintained as part of the proposed development	Negligible	None	Slight	Negligible	Adverse	Permanent	Irreversible	Not Significant
Construction	Site 25: Possible Pits	Unknown	Potential substantial loss possible pit features of unknown origin	Unknown	Archaeological evaluation/ excavation to be agreed in WSI/AMP	Substantial	Unknown	Adverse	Permanent	Irreversible	Unknown

Project Phase	Receptor	Sensitivity	Description of Change (Pre-mitigation)	Level of Effect (Pre-mitigation)	Mitigation Measure	Magnitude of Change (Post-mitigation)	Level of Effect (Post-mitigation)	Nature of Effect			
								Positive/ Adverse	Permanent/ Temporary	Reversible/ Irreversible	Residual Significance
Construction	Site 26: Railway	Low	Potential negligible loss light gauge railway	Negligible	None	Negligible	Negligible	Adverse	Permanent	Irreversible	Not Significant
Construction	Site 28: Quarry	Lesser	Potential substantial loss of quarry if removed during construction	Minor	None	Substantial	Minor	Adverse	Permanent	Irreversible	Not Significant
Construction	Site 44: Well (no obvious remains visible on the surface)	Low	Potential slight loss well if present beneath surface	Negligible	Archaeological watching brief/ evaluation to be agreed in WSI/AMP	Slight	Negligible	Adverse	Permanent	Irreversible	Not Significant
Construction	Site 47: Well (no obvious remains visible on the surface)	Low	Potential slight loss well if present beneath surface	Negligible	Archaeological watching brief/ evaluation to be agreed in WSI/AMP	Slight	Negligible	Adverse	Permanent	Irreversible	Not Significant
Construction	Site 68: Well (no obvious remains visible on the surface)	Low	Potential slight loss well if present beneath surface	Negligible	Archaeological watching brief/ evaluation to be agreed in WSI/AMP	Slight	Negligible	Adverse	Permanent	Irreversible	Not Significant

Project Phase	Receptor	Sensitivity	Description of Change (Pre-mitigation)	Level of Effect (Pre-mitigation)	Mitigation Measure	Magnitude of Change (Post-mitigation)	Level of Effect (Post-mitigation)	Nature of Effect			
								Positive/ Adverse	Permanent/ Temporary	Reversible/ Irreversible	Residual Significance
Construction	Potentially as yet undiscovered Cultural Heritage remains	Unknown	Potential loss of as yet undiscovered, buried archaeological remains during ground disturbance in relation to golf course construction and all other ancillary works	Unknown	Archaeological evaluation/ excavation to be agreed in WSI/AMP	Unknown	Unknown	Adverse	Permanent	Irreversible	Unknown
Operation	SM6225: Skelbo Castle	High	Alteration to the setting of the site	Negligible	None	Negligible	Negligible	Adverse	Permanent although relevant to longevity of golf course and related structures	Reversible	Not Significant
Operation	LB608: Embo House	High	Alteration to the setting of the site	Negligible	None	Negligible	Negligible	Adverse	Permanent although relevant to longevity of golf course and related structures	Reversible	Not Significant
Operation	LB604: Coul Farmhouse	Medium	Alteration to the setting of the site	Minor	To be agreed as part of listed building consent	Slight	Minor	Adverse	Permanent although relevant to longevity of	Reversible	Not Significant

Project Phase	Receptor	Sensitivity	Description of Change (Pre-mitigation)	Level of Effect (Pre-mitigation)	Mitigation Measure	Magnitude of Change (Post-mitigation)	Level of Effect (Post-mitigation)	Nature of Effect			
								Positive/ Adverse	Permanent/ Temporary	Reversible/ Irreversible	Residual Significance
									golf course and related structures		
Operation	LB604: Coul Farmhouse	Medium	Alteration to the setting of the site returning the farmstead to layout more akin to when originally constructed	Minor	To be agreed as part of listed building consent	Slight	Minor	Beneficial	Permanent	Reversible	Not Significant
Operation	LB7017: Little Ferry Pier & Boathouse	Low	Alteration to the setting of the site	Negligible	None	Negligible	Negligible	Adverse	Permanent although relevant to longevity of golf course and related structures	Reversible	Not Significant
Operation	LB7020: Little Ferry former Girnel now Cottages	Medium	Alteration to the setting of the site	Negligible	None	Negligible	Negligible	Adverse	Permanent although relevant to longevity of golf course and related structures	Reversible	Not Significant

9.10 SOURCES

9.10.1 Documentary

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9.10.2 Cartographic Maps (in chronological order)

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Ordnance Survey, 25 inch to the mile series, Sutherland, Sheet CX.10, Surveyed 1874, Published 1879.
Ordnance Survey, 25 inch to the mile series, Sutherland, Sheet CX.14, Surveyed 1874, Published 1879.
Ordnance Survey, 6 inch to the mile series, Sutherland, Sheet CX, Surveyed 1874, Published 1879.
Ordnance Survey, 25 inch to the mile series, Sutherland, Sheet 110.6, Surveyed 1904, Published 1906.
Ordnance Survey, 25 inch to the mile series, Sutherland, Sheet 110.10, Surveyed 1904, Published 1906.
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Ordnance Survey, 25 inch to the mile series, Sutherland, Sheet CX.110.14, Surveyed 1904, Published 1906.
Ordnance Survey, 6 inch to the mile series, Sutherland, Sheet CX, Surveyed 1904, Published 1907.
Ordnance Survey, 1:25,000 series, sheet NH79, Published 1950.
Ordnance Survey, 1:25,000 series, sheet NH89, Published 1950.
Ordnance Survey, 1:2500 national grid series, Surveyed 1971.
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9.10.3 Aerial Photography

Library Reference		Sortie	Date	Frames
C_0061		CPE/SCOT/UK/0182	1946	5054, 5055
B_0063		CPE/SCOT/UK/0182	1946	1488, 1490
B-0568		543/0829	1960	V0005, V0068
C_0250		ASS/62888	1988	65-68, 162-166

10.0 ANNEX G: SOCIO ECONOMICS

10.1 SCOPE OF ASSESSMENT

This annex is based on an economic impact assessment undertaken on behalf of the developer by BiGGAR Economics. The objectives of the assessment were to assess the potential economic effects of the proposed development at the local, regional and national level.

10.1.1 Economic Rationale

The objective of the proposals is to create a world-class links course that, once completed, would be ranked amongst the top golf courses in Scotland. By siting the new course in close proximity to Royal Dornoch the developers hope to create a critical mass of world-class courses that would enable the local area to become a competitive golfing destination in the international market. If successful then it is expected that this approach would help Scotland to attract more golfing visitors each year and increase its share in the global golf tourism market.

The concept for the proposed development is very different to other modern golf resorts elsewhere in Scotland in that the volume of development involved would be very modest. Other than a small clubhouse and other essential infrastructure the amount of on-site development would be very limited. The proposals do not for example include the development of any accommodation on-site and only include provision for very basic visitor services. This approach should mean that the development would generate additional demand for accommodation and other tourist services off-site.

10.1.1.1 Approach

A key objective of this analysis was to test the economic rationale behind the proposed development. The starting point for doing this was to review existing research on golf tourism in Scotland to determine the current value and volume of the sector and its future potential.

The next step was to develop an understanding of the dynamics of golf tourism in Scotland and more specifically in the Highlands and Dornoch. In order to do this interviews were undertaken with key stakeholders with a strong understanding of the local and national sector (a list of those interviewed is provided in Table G.1.

Table G.1: List of Consultees

Name	Organisation
Cameron Reid	Perry Golf (luxury international golf tour operator)
Chris Haspell	Castle Stuart Golf Club
Gordon Todd	Scottish Enterprise
Joan Bishop	Dornoch Area Community Interest Company
John Baker	Eversham and Baker (luxury international golf tour operator)
Mike Keiser	Golf Course Developer and co-sponsor of Coul Links
Neil Hampton	Royal Dornoch Golf Club
Susan Smith	Highlands and Islands Enterprise
Todd Warnock	Proprietor of Links House and co-sponsor of Coul Links

To assess how the proposed development could affect Scotland's position in the global golf tourism market further interviews were undertaken with leading international golf tour operators and additional desk-based research was undertaken to investigate the economic effects of similar proposals elsewhere in the world.

The results of these interviews and desk-based research were then used to develop a series of assumptions that were used to model the potential economic benefits of the proposed development.

10.1.1.2 Guidance

The modelling exercise was undertaken with reference to draft advice published by the Scottish Government on the assessment of net economic benefit of proposed development. According to the draft guidance the key criterion in assessing the economic impact of a proposed development is "net economic benefit", that is the difference between the estimated economic position if the development proceeds and the likely economic position if the proposal does not proceed. In order to assess net additional benefits it is necessary to take account of a number of important concepts:

- Displacement – i.e. the extent to which the increase in economic activity generated by the proposed development could result in a reduction in economic activity elsewhere. This could for example arise if some of the golf tourists playing at the proposed development would otherwise have played at another course elsewhere in Scotland.
- Leakage – i.e. the extent to which benefits could occur outside the study area in question. For example, it is likely that some of the supplies required to operate the proposed development would be obtained from businesses outside the local area so the impact of this expenditure would not be retained locally; and

- Multiplier effects – i.e. the effect of subsequent spending rounds further down the supply chain. For example, the staff employed to operate the proposed development would generate additional economic activity by spending their wages elsewhere in the economy, the businesses that would supply the proposed development would generate activity by purchasing their own supplies and the staff employed by the developer's suppliers would generate activity by spending their wages.

10.2 STUDY AREA AND SENSITIVE RECEPTORS

This assessment considers the economic impact that the proposed development could have on three geographic study areas, these are:

- local Area - the Highland Council wards of East Sutherland & Edderton and Tain & Easter Ross;
- Highlands - the Highland Council Area; and
- Scotland.
- In terms of economic impact the sensitive receptors are therefore:
- the local economy (covering the two Highland Council wards identified above);
- the regional economy (covered by the Highland Council area); and
- the Scottish economy.

The assessment also considers the effects that the proposed development could have on the local communities in the immediate vicinity, i.e. the communities of Embo and Dornoch. In terms of socio-economic effects the sensitive receptors are therefore:

- the communities of Embo and Dornoch.
- The sensitivity of the socio-economic receptors was assessed using professional judgement. The factors considered in doing this included the scale and diversity of the economy in question, levels of economic activity and how resilient the economy is likely to be to any external shocks. On this basis the sensitivity of the receptors was assessed as follows:
- The communities of Embo and Dornoch and the local economy were assessed as being highly sensitive to socio-economic change, because of the relative lack of economic opportunities and high reliance of the local economies on a small number of sectors (e.g. tourism).
- The Highland economy was assessed as having a medium sensitivity to change. The reason for this was that because incorporates a wide range of sectors and has relatively high levels of economic activity therefore it is likely to be more resilient to change than the local area.
- The Scottish economy as a whole is very diverse and therefore likely to be highly resilient to change in one part of the country. For this reason the sensitivity of the Scottish economy was assessed as low.

10.3 EXISTING ENVIRONMENT

10.3.1 The Golf Tourism Market

Golf was first played in Scotland in the 15th century and formal records of the sport being played date back to the early 16thcentury. Over the next two hundred years several golfing organisations and societies were set up as the game spread first through Britain and was then exported throughout the rest of the world, becoming popular globally in the late 19th century. As well as being the home of golf, Scotland remains important in the global profile of golf. For example the R&A, which was spun out from the Royal and Ancient Club in 2004, is responsible for overseeing the rules of golf in conjunction with the US Golf Association (USGA).

10.3.1.1 The Value of Golf Tourism in Scotland

In 2013 research was commissioned by the Scottish Golf Union (KPMG, 2013a) to assess the economic value of golf to Scotland's economy. This report found that in 2011 golf contributed £496 million GVA to the Scottish economy and supported approximately 20,000 jobs.

Of this, the largest components in terms of employment supported were golf facility operations and golf course capital investments, which accounted for 12,380 jobs and 2,700 jobs respectively. This included the number of people directly employed by the golf courses, as well those involved in providing supplies, and those supported by the expenditure of those directly employed.

The third largest component in terms of employment supported was golf tourism, which was estimated to support 2,100 jobs. This measure considered only spending by golf tourists outside of playing golf and excluded other types of spending, such as that on golfing supplies or while visiting tournaments.

The report estimated that golf tourists spent £70 million in 2011, which generated £57 million GVA. As a large proportion of the economic value created by the operation and development of golf courses and providing supplies to these facilities depends on demand from tourists however, this estimate is likely to be a significant underestimate.

A separate analysis that used a different methodology (SQW, 2011) estimated that golf tourism, including expenditure at golf facilities and shops but excluding events, generated £102 million GVA in 2010.

10.3.1.2 The Potential of Golf Tourism in Scotland

The 2011 analysis undertaken by SQW referred to above also considered the potential for growth in the Scottish golf tourism sector. It estimated that the annual GVA generated by the industry could increase by up to 54% by 2020 to between £138 million and £157 million.

In this report it was also estimated that golf tourists in the Highlands and Islands generated £10.0 million GVA in 2010, 8% of the Scottish total. It was estimated that this could increase to £11.4 million GVA by 2020, which would represent 7.3% of the Scottish total. This slightly reduced proportion reflects an element of displacement expected to arise as a result of the Trump International golf course in Aberdeenshire, which opened in 2012.

Golf tourism represents an important area of potential growth in the tourism offering of both the Highlands and Scotland. This is highlighted in both the Highland Tourism Action Plan 2020 (Highland Area Tourism Partnership, 2014), which recognises golf as an asset with real growth potential, and Tourism Scotland 2020 (Scottish Tourism Alliance, 2012), which recognise golf as an important part of Scotland's distinctive appeal.

The Scottish Golf Tourism Development Strategy 2013-2020 (Scottish Golf, 2013), which aims to make Scotland the world's leading golfing destination by 2020, outlines specific strategic objectives to improve the golf tourism sector. These include:

- improving the golf tourism experience to boost reputation, increase visitor numbers, spend and repeat visits;
- co-ordinating regional golf development;
- maximising the impact from hosting major golf events, using them to boost Scottish golf tourism more generally; and
- promoting sustainable golf club and course management.

The proposed development has the potential to contribute directly to most of these objectives. For example, the vision for the development is to create a world-class course of a similar calibre to Royal Dornoch. Increasing the number of iconic courses in Scotland would make Scotland more attractive to international golf tourists, helping to increase visitor numbers, expenditure and repeat visits.

One of the initiatives being considered by the developers is the creation of an electronic tee booking system that would enable golfers visiting the local area to book tee times at several local courses from one centralised point. Such an innovation would directly improve the coordination of regional golf development and could also provide a model of best practice for other golf regions elsewhere in Scotland – potentially improving the competitiveness of the Scottish golf tourism offering.

The design and proposed operational model for the proposed development is also consistent with the objective of promoting sustainable golf club and course management. The design philosophy for the site is for example to create something that works in harmony with the existing landscape. Unlike other golf developments elsewhere the proposed development would not be a neatly a manicured, exclusive golf resort but a much more traditional links golf course with limited on-site development.

This means that the majority of the economic benefits would occur in the wider tourism economy, rather than within the development itself. This should create opportunities for existing businesses and demand that should help attract new businesses to the area.

10.3.1.3 Scotland's Golf Courses

Scotland has more than 550 golf courses, a larger number of courses per head of population than anywhere else in the world. The economic activity associated with golf is however heavily concentrated within a relatively small number of high-profile courses with around 80 clubs in Scotland responsible for generating 75% of the nation's green fees (Scottish Golf, 2013).

Although Scotland only accounts for around 0.075% of the world's population the country accounts for around 2% of the world's estimated 34,000 golf courses. Scotland's golf courses also feature prominently in various lists of top golf courses. For example Scottish courses take nine spots out of the top 100 according to Golf Digest and 12 spots according to Top 100 Golf Courses. Of particular significance for this analysis is the fact that Royal Dornoch is ranked as the best golf course in Scotland (5th in the world) by Golf Digest and the 2nd best in Scotland (8th in the world) in The Top 100 Golf Courses list.

A summary of Scotland's top golf courses and a map illustrating their location are provided below. The aspiration for the proposed development is to create an additional course of a similar standard to those listed below.

Table G.2: Golf Courses in Scotland Ranked Amongst the World Top 100

Course	Area	Golf Digest	Top 100 Golf Courses
Royal Dornoch	Highlands	5	8
St Andrews Old Course	Fife	8	5
Muirfield	East Lothian	9	9
Trump Turnberry (Alisa)	South Ayrshire	22	19
Carnoustie (Championship)	Angus	26	26
North Berwick	East Lothian	50	49
Trump International	Aberdeenshire	54	65
Kingsbarns	Fife	69	42
Machrihanish	Strathclyde	91	-
Castle Stuart	Moray	-	54
Royal Aberdeen (Balgownie)	Aberdeenshire	-	56
Cruden Bay	Aberdeenshire	-	75
Royal Troon Old Course	South Ayrshire	-	77

Figure G.1: Location of Scotland's Top Golf Courses

10.3.1.4 The Structure of Scottish Golf Tourism

Research shows that (KPMG, 2013b) the quality and accessibility of golf courses are two of the most important factors for golf tourists when choosing a destination (after the price of the package). It is therefore unsurprising that research has also shown (KPMG, 2010) that that the ideal golfing destination has four or five easily accessible, high-quality golf courses located in close proximity to one another.

According to Haversham and Baker (accessed June 2016), one of the world's leading golf tour operators, there are currently six main golfing destinations in Scotland: St Andrews, East Lothian, the West Coast, Kintyre, the Highlands and Aberdeen. As can be seen in Figure G.2, these destinations correspond to clusters of Scotland's top courses.

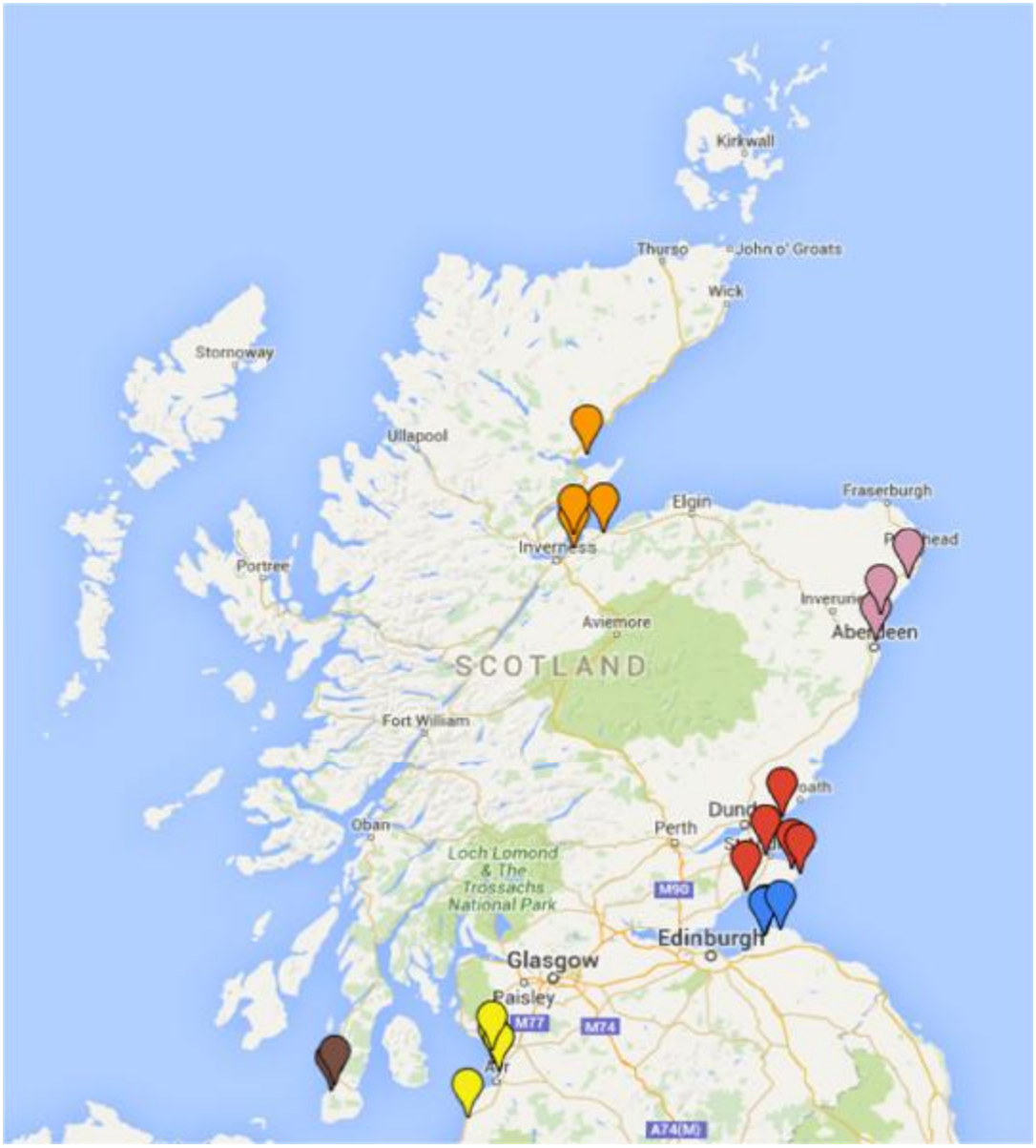

Figure G.2: Location of Scotland's Golf Clusters

10.3.1.4.1 St. Andrews

The status of St Andrews as the home of golf means that this cluster is usually at the top of the list for international golf tourists planning a first trip to Scotland. Around 44,000 rounds/year are played on the St Andrews Old Course and the cluster also includes two other top ranked courses (Kingsbarns and Carnoustie).

The region has a rich golfing heritage and good accommodation facilities, however the cluster is relatively spread out with Carnoustie in particular located relatively far from the other courses in the cluster (45 miles from St Andrews and 65 miles from Kingsbarns). The St Andrews cluster is also less accessible than other clusters in Scotland since it is located over an hour from the nearest airport at Edinburgh.

10.3.1.4.2 East Lothian

The East Lothian cluster is currently perhaps the most well developed golf cluster in Scotland. It includes two of Scotland's top golf courses: Muirfield and North Berwick (as well as a number of 2nd tier courses such as Gullane). All of the courses in this cluster are located between 5-15 minutes drive from each other, making the cluster highly accessible for visiting golfers. The cluster is also located within around 45 minutes of Edinburgh, which means that it not only has good international connectivity but also benefits from well-developed tourist facilities.

10.3.1.4.3 West Coast & Kintyre

The golf cluster in the west of Scotland has two iconic courses: Trump Turnberry and Royal Troon as well as a number of highly regarded 2nd tier courses such as Prestwick and Western Gailes. Glasgow is under an hour away from three of the sites and around an hour and a quarter from Trump Turnberry. Except for the Trump Turnberry course, the golf clubs in the west are all fairly close together.

This cluster also incorporates Machrihanish Dunes on the Kintyre peninsula. This part of the cluster is less well developed because transport links between the Kintyre peninsula and major Scottish cities are relatively poor.

10.3.1.4.4 Aberdeen

The cluster of golf courses around Aberdeen includes Royal Aberdeen, Trump International and Cruden Bay. All of the courses are situated to the north of Aberdeen and all are all ranked in the top world 100. The courses in this cluster are all relatively close to each other and to the airport at Aberdeen.

10.3.1.4.5 The Highlands

The cluster of golf courses in the Highlands features two top ranked courses: Royal Dornoch and Castle Stuart as well as a number of highly regarded 2nd tier courses such as Tain, Nairn, Fortrose and Rosemarkie, Brora and Golspie.

Castle Stuart and Nairn are both located relatively near to each other and to the Inverness, which provides air connectivity. Fortrose and Rosemarkie is a little further north, less than half an hour's drive from Inverness and Royal Dornoch is about an hour north of Inverness and over an hour away from all of the other golf courses in the cluster. Tain, Skibo, Brora and Golspie are all also located to the north of Inverness between 15 and 30 minutes from Dornoch.

10.3.1.5 Volume of Play

Comprehensive data on the number of golf visitors playing Scotland's iconic golf courses each year is not readily available; however it is possible to draw some conclusions by drawing together evidence from a number of different sources.

Scotland's best known and almost certainly most popular golf course, at least as far as golf tourists are concerned, is the Old Course at St Andrews. Publicly available information (Golf Digest, 2009) suggests that around 44,000 rounds/year are played on the St Andrews Old Course. Although this figure was published in 2009, given the popularity of the course it is likely that it is operating at full capacity and that this figure would therefore not have significantly changed since then.

In contrast, player statistics provided by Royal Dornoch Golf Club show that in 2014/15 around 20,500 people played the Championship course. Discussions with the club suggests that the course is currently operating at around full capacity so this number is also unlikely to change significantly in the near future.

Further evidence is available from an audit of Scotland's golf courses undertaken in 2003, which identified 23 "class one" courses in Scotland(MW Associates, 2003). Class one courses were defined as those with an average annual income of at least £0.5 million and weekday green fees of more than £50, which is likely to include all of Scotland's iconic courses. On average the audit found that around 30,000 rounds per year were played on each of these courses. Although this source is now somewhat dated, as most of Scotland's top courses will be operating at full capacity it is likely that data on player numbers has not changed significantly since 2003.

10.3.1.6 Origin of Golf Tourists in Scotland

The majority of golf tourists in Scotland are Scottish residents. According to the latest available statistics (Scottish Golf Intelligence, 2012) 70% of green fee revenues came from Scottish visitors . According to research undertaken by SQW (SQW, 2009) the average length of stay was 4.6 days and the average visitor spent £906 per trip in 2007 (equivalent to around £961 per trip in 2014).

Tourists from the rest of the UK made up 17% of green fees (and 56% of non-Scottish visitors). On average these visitors stayed longer than Scottish visitors (an average of 5.4 days) and spent slightly more £999 (equivalent to £1,060 in 2014). Tourists from elsewhere in the EU accounted for 6% of green fee revenues, or 19% of those from outside Scotland. On average, these visitors stayed for 7.6 days and spent £1,541 in 2007 (equivalent to £2,143 in 2014).

Tourists from the USA made up 5% of green fee revenues, 16% of all revenue from non-Scottish residents; however these visitors typically stayed longer and spent more than visitors from elsewhere. On average visitors from the USA stayed for 10 days and spent £3,309 (equivalent to £4,602 in 2014).

Table G.3: Golf Tourist Origin and Expenditure

Course	% of Green Fee Revenues(a)	Average Length of Stay (days) (b)	Inflated Expenditure (£)(b)
Scotland	70	4.6	961
Rest of UK	17	5.4	1,060
Other Europe	6	7.6	2,143
USA	5	10	4,602

(a) Scottish Golf Intelligence (2012) (b) BiGGAR Economics estimate based on data from SQW, 2009

Scottish Golf Intelligence suggests that golf courses in the Highlands received relatively less green fee revenue from Scottish visitors (61%) in 2012 and relatively more from visitors from the rest of the UK (23%) and the USA (6%).

It is worth noting that the average figures presented above will incorporate the expenditure of a relatively small group of very high net-wealth golf tourists who visit Scotland each year to play the nations top courses. Interviews undertaken with leading luxury golf tour operators suggest that on average these visitors spend between £500 and £750 per day on green fees, transport in Scotland and accommodation and a further £100 - £200 per day on food, drink and shopping. The average expenditure of this group of visitors is therefore likely to be between 30% and 106% higher than the expenditure of the "average" golf tourist.

The objective of the developer is to create the type of world-class course at Dornoch that appeals to these type of high-value visitors. It is therefore reasonable to expect that the average expenditure of visitors to the course could be significantly higher than the average expenditure of golfing tourists in general.

10.3.1.7 Golf Tourist Expenditure

The analysis produced by SQW in 2009 also provides a break-down of the type of expenditure made by golfing tourists in Scotland (see Figure G.3). This shows that green fees account for only around a fifth of the total expenditure of the average non-Scottish resident golfing tourist with more than a quarter being spent on accommodation and a further 11% being spent on food and drink. As the figure below illustrates, this leaves around 38% of the expenditure of the average golf tourist on "other" items, such as shopping.

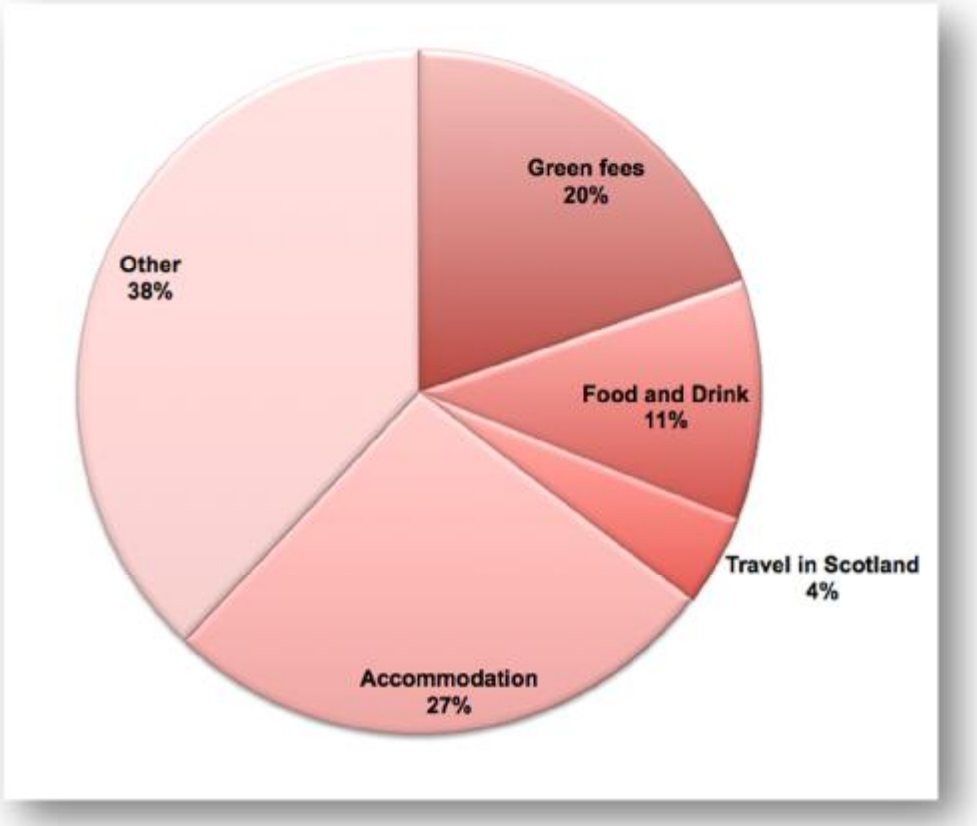

Figure G.3: Break-down of Golf Tourist Expenditure (SQW, 2009)

10.3.2 Golf Tourism and the Local Area

This section describes Dornoch's golf heritage and how the golf tourism sector currently operates in the local area. It also considers the implications that the proposed development could have for the local golf tourism market and the extent to which existing tourist facilities in the area might have the capacity to accommodate any increase in demand.

10.3.2.1 Tourism in the Local Area

As with many other area of the Highlands, tourism is an important component of the economy of the local area. Overall 17% of those employed in the local area (around 950 people) work in the tourism sector, compared to 13% (around 14,100 people) in the Highlands and 7.2% across Scotland as a whole. Within the East Sutherland and Edderton ward, which is the part of the local area where Dornoch is actually located and that is furthest from the main employment centre of Inverness this proportion is even higher, accounting for 23% of all employment (or around 720 jobs).

10.3.2.1.1 The Dornoch Masterplan

In 2013 Highlands and Islands Enterprise (HIE) published a masterplan for the Dornoch area, which was developed in consultation with local businesses and the local community. It is intended that the Master plan will provide a framework for the future development of Dornoch. The masterplan identified five overarching objectives, these were to:

- build a brand profile – a "quality destination";
- increase the number of visitors to Dornoch and South East Sutherland;
- enable business development, entrepreneurship and private sector investment;
- build a local destination supported by community academic infrastructure; and
- secure effective partnership delivery.

The Masterplan places a strong emphasis on the importance of golf to the future of Dornoch and promoting the town as a quality golf destination is one of four specific objectives identified as being required to build a strong "brand profile". The Masterplan also recognises the importance of encouraging golfers to base themselves within Dornoch and identifies a lack of high-end accommodation as a potential barrier to achieving this.

10.3.2.1.2 Dornoch Vision and Action Plan

In December 2015 HIE commissioned Upper Quartile LLP to update a HIE Vision and develop an Action Plan for HIE's future development work and priorities in Dornoch. This work, which was published in September 2015 (Upper Quartile, 2016), covered the town and the surrounding wider area and considered the prospects and opportunities for Dornoch over the short, medium and long term. The process for developing this Vision and Action plan involved a community workshop and individual semi-structured interviews various key stakeholders from the local community and was therefore directly informed by individuals with a direct interest in the future success and continued prosperity of the town.

The vision and action plan document explicitly welcomes the investment that the developer has made in Dornoch to date and identifies the proposed development as an important opportunity for the town. The proposed development is for example identified within a list of key projects identified during the consultation programme where is

described as being *"potentially transformative for all Dornoch".* The vision and action plan document also suggests that the proposed development could be a source of high value jobs, which are identified as a critical measure of the action plan's success. In recommending the next steps that would be required to progress the action plan it is suggested that:

"The single biggest transformative project opportunity is the new Coul Links course."
The Dornoch Vision and Action Plan therefore provides very strong support for the proposed development. This is significant since the document has been developed in close collaboration with local stakeholders who are likely to be particularly well informed about the needs and challenges faced by the local area.

10.3.3 Dornochs Golf Heritage

Dornoch is a small town with a total population of around 1,200 located almost 200 miles north of Edinburgh and more than 40 miles from Inverness. The town is the main settlement in Sutherland, one of the least populated districts of the Highlands, which is its self the least populated region of Scotland. Despite its small size and isolated location Dornoch is well known in golfing circles, not only for being the home of the renowned Royal Dornoch Golf Club but also as the birth-place of Donald Ross, an influential golf course designer.

10.3.3.1 The Royal Dornoch Golf Club

The Royal Dornoch Golf Club was founded in 1877 and is consistently ranked as one of the best courses in the world. In 2016 the Championship Course was ranked number five in the world and number one in Scotland by Golf Digest and number eight in the world and number two in Scotland in the list of the world's top 100 golf courses.

Despite its international reputation, geography means that Royal Dornoch is something of an outpost in the global golf market. While many golfers know the course by reputation, only the most dedicated are prepared to make the trip north to play. This is reflected in the playing statistics for the Championship Course, which, despite its reputation, have been consistently been between 20,000 and 21,000 rounds/year for the past 10 years – around half the number of rounds played each year at the Old Course in St Andrews.

The status of Royal Dornoch as a world-class golf course is better reflected in the profile of members and visitors who play the course each year. In 2016 around a third (34%) of the members of the Royal Dornoch Golf Club and around half of all visiting golfers were not resident in the UK. The vast majority (around 95%) of these golfers were from North America.

10.3.3.2 Donald Ross

The popularity of Dornoch, particularly with American visitors, is not only due to the quality of the Royal Dornoch Course but also to the fact that the town was the birth place of Donald Ross, the man credited with bringing golf to North America.

Donald Ross was born in Dornoch in 1872 and became the head green-keeper and professional at Royal Dornoch before moving to the USA in 1899. Over the next five decades he was involved in designing or redesigning around 400 courses, which laid the foundation for America's golf industry.

Donald Rosses approach to golf course design was heavily influenced by his early years in Dornoch and the experience this gave him of traditional Scottish links golf. Many of Rosses later designs, most notably Pinehurst number two (which is ranked the 14th best golf course in the USA and the 23rd best in the world) were inspired by Royal Dornoch. This association means that the area holds a special significance for American golfers and makes the area particularly attractive to golfing tourists from this part of the world.

10.3.4 Golfing Visitors

Dornoch's reputation amongst golfers around the world means that the town and surrounding area already attracts significant number of golf tourists each year.
Player statistics provided by Royal Dornoch show that in 2014/15 20,559 rounds of golf were played on the championship course at Royal Dornoch. This included almost 10,200 visitor rounds, the vast majority of which would have been tourists. The remaining 10,365 rounds were played by members of Royal Dornoch and their guests.

Membership data provided by Royal Dornoch suggests that in 2014/15 20% of members of the Royal Dornoch Golf Club were from the local area and a further 11% were from elsewhere in the Highlands. As these individuals are all local residents any expenditure that they may make would not be additional to the local area and must therefore be excluded from the analysis.

Membership data provided by Royal Dornoch also shows that in 2014/15 19% of members were from elsewhere in Scotland, 16% were from elsewhere in the UK and 34% were from overseas. This implies that 69% of Royal Dornoch members are golf tourists.

It is not possible to say with certainty how many of the rounds played by Royal Dornoch members and their guests were played by members resident in the Highlands since it is not known how many times per year members play. If the number of rounds played by non-resident members was proportional to the number of non-resident members however then this would imply that this group accounted for 7,180 of the 10,365 rounds played by members. This would in turn imply that golf tourists accounted for 17,374 of the 20,559 rounds played at Royal Dornoch in 2014/15 (85%).

In reality however it is likely that resident members play more frequently than non-resident members and that the number of rounds played by golf tourists is therefore smaller than this. To account for this it was assumed that Royal Dornoch attracts around 15,000 golf tourist days to the local area each year.

There are also a number of other courses in the local area such as Brora, Golspie, Tain and Skibo, which will also attract visiting international golf tourists. Although these courses are highly regarded however, none of them has the international recognition of Royal Dornoch and are therefore unlikely to attract visitors in their own right. Instead tourists who play these other local courses are likely to do so because they are already in the local area in order to play Royal Dornoch. Any international golf tourists playing these courses are therefore almost certainly included within the player statistics for Royal Dornoch discussed above.

10.3.5 The Castle Stuart Effect

Despite the reputation of Royal Dornoch and the status of the town as the birth-place of Donald Ross the current dynamics of golf tourism in the Highlands means that a significant proportion of the benefits of this are not retained within the local area. This is because, according to discussions with golf tour operators, the Royal Dornoch Golf Course and others involved in the local golf tourism market, the vast majority of golf visitors who play Royal Dornoch each year do not currently stay overnight in the area. This means that instead of being retained within the local economy, the majority of the expenditure made by these visitors instead occurs in Inverness, where most visitors stay overnight.

This pattern of behaviour arises because of how the Highland golf tourism cluster currently operates. The objective of a typical golf tourist is to play as many top-ranked courses as possible during the course of their holiday. In the Highlands this currently means that the main draws for most golf tourists are Royal Dornoch and Castle Stuart.

For most visitors intending to play both of these high profile courses a stay of two nights in the Highlands is sufficient. This means that most golf tourists currently incorporate a trip to the Highlands as a component of a longer golfing holiday to Scotland.

The location of the two courses means that, for most visitors, Inverness is the logical place to stay. The effect of this is that much of the expenditure by golfing tourists is retained not in the local area surrounding the two courses but in Inverness but this has not always been the case.

Prior to the development of Castle Stuart Royal Dornoch was the only iconic golf course in the Highlands. This means that at that time there would have been little incentive for golf tourists visiting the Highlands to stay anywhere other than Dornoch or the surrounding local area.

Given the location of the course and length of time required to travel there from virtually anywhere else in the UK it would also have been necessary for the vast majority of visitors to stay over night. In practice, the journey times involved in getting to Dornoch and the availability of a number of high quality second tier courses close to the town meant that many visitors would have stayed in the area for more than one night, spending money in local businesses and supporting other local courses.

When Castle Stuart opened in 2009 it created a new and powerful draw for golf tourists visiting the region. While this has undoubtedly brought benefits to the region as a whole it may also have made the local area around Dornoch relatively less attractive as an overnight destination. Indeed consultations with local stakeholders confirm that the majority of visiting golfers now only come to Dornoch for the day before leaving again in the evening.

10.4 EXPERIENCE ELSEWHERE

In order to assess the potential effects of the proposed development it is helpful to consider other relevant developments that have been delivered successfully elsewhere in the world and the factors that have helped to make these developments a success.

10.4.1 Mike Keiser

The developer behind the proposed development includes the American businessman turned golf course developer/owner, Mike Keiser. Described by Fortune magazine as "Donald Trump's biggest rival in the golf business", Mike Keiser is one of, if not the most, influential golf course designer in the world.

Keiser's experience as a golf course developer started in the late 1980s when he built a private nine-hole course near Lake Michigan. Soon after he purchased 1,200 acres of land in Bandon a depressed logging village an hour north of California, which, with the help of a young Scottish architect called David McLay Kidd, he transformed into one of the most successful golf resorts in the world. Since then Keiser has gone on to develop two more highly successful resorts, one in Tasmania (Barnbougle Dunes) and the other in Nova Scotia (Cabot Links) and is in the process of taking forward plans for a fourth resort in Wisconsin. Two of the courses at Bandon Dunes and one of the courses at Cabot Links were designed by the leading golf course architects, Bill Coore and Ben Crenshaw, the same team responsible for designing the proposed development.

Keiser's approach to golf course development has been heavily influenced by traditional Scottish links golf. The three existing resorts are all located on or near the coast and make full the use of the existing natural terrain. In this respect, the Royal Dornoch Golf Course has continued to influence the design and development of some of today's leading golf courses, just as it did in the early 20th century.

10.4.1.1 Bandon Dunes

The developer's first commercial golf venture was the Bandon Dunes resort located north of Bandon, Oregon. Like Dornoch, Bandon is a small town in a relatively remote rural location. The population of the town is currently around 3,000 people and Bandon is around 4.5 hours drive from the nearest airport in Portland.

The first course in the resort, Bandon Dunes, opened in 1999. This was followed by three other links courses, Pacific Dunes in 2001, Bandon Trails in 2005 and Old MacDonald in 2010. The four links courses were then supplemented by a 13 hole par-3 short course called Bandon Preserve, opened in 2012.

Before opening the first course it was hoped around 10,000 rounds of golf might be played at Bandon Dunes each year but the resort has proved much more popular than originally anticipated. During its first year of operation 24,000 rounds of golf were played at Bandon Links and by 2016 that figure had increased to around 160,000. The popularity of Bandon Links is also reflected in its position within various rankings with three of the resorts courses listed within the World's Top 100 Golf Courses list and two included in the top 100 list published by Golf Digest.

10.4.1.2 Cabot Links

Cabot Links is the second of the developer's golfing ventures. The resort is located in Inverness, Nova Scotia a small former mining town of around 1,200 people. The closest airport to Cabot Links is located in Sydney, which is approximately two hours drive from the resort; however, most direct flights from America arrive in Halifax, which is around three hours drive from the resort.

The first golf course at Cabot Links opened in 2011 and a second course followed in 2015. The second course was developed with the support of the Novia Scotia Government, which provided a $8.25 million loan to help finance the project. The loan was provided because local officials were convinced that the project would deliver significant economic benefits by helping to stimulate the regeneration of the community, which has undergone significant economic hardship since the decline of the mining industry in the mid-late 20th century.

Like its sister courses in Bandon, Cabot Links is also ranked highly by golfers around the world and is included in both the World's Top 100 Golf Courses list and the top 100 list published by Golf Digest. Despite only operating between June and October (a shorter season than anticipated at the proposed development), the resort attracts 30,000 visitors/year.

During its initial years of operations Cabot Links has developed an extensive pool of caddies. During the 2015 season there were 113 caddies (88 full-time and 25 part-time) who provided a total of 6,400 rounds. By the start of the 2016 season this pool had increased to 208 caddies, the vast majority of whom were residents of the surrounding local communities.

10.4.1.3 Barnbougle Dunes

Barnbougle Dunes is the most recent addition to the developer's golf course portfolio. The resort currently consists of one course, which opened in 2005 but in 2016 a further course was in the process of being built. As with Bandon Links and Cabot Links, Barnbougle Dunes has been well received by golfers and is now ranked within the top 50 courses in the world by both the World's Top 100 Golf Courses list and the top 100 list published by Golf Digest.

Barnbougle Dunes is located near the seaside village of Birdport in the north east of Tasmania, which is home to around 1,200 people. The resort is located around an hour and a half from the nearest airport at Launceston.

Although in theory it is possible to play golf at the resort all year round, in practice because golf is not a popular summer sport for Australians (the main customer base) the resort tends to operate over a nine-month season. Despite this, once the second course opens the resort is expected to attract around 35,000 visitors/year.

10.5 EVALUATION CRITERIA

In order to evaluate the socio-economic effects associated with the proposed development (i.e. the effect of the changes proposed) it was first necessary to estimate the potential scale of the socio-economic impacts that it could generate (i.e. the magnitude of the changes genrated). These socio-economic impacts would include both those directly associated with the development and construction of the golf course as well as longer-term effects arising from the on and off-site expenditure of the people who visit it. In order to fully assess the socio-economic effects of the proposed development it was necessary to consider each of these potential effects individually.

The socio-economic impacts directly associated with the proposed development would include:

- short-term socio-economic impacts during the construction phase;
- long-term socio-economic impacts arising from the day-to-day operations of the proposed development including:

  - direct employment and wealth generated;
  - the effect of expenditure on supplies on the local supply chain; and
  - effects that those employed at the proposed development would have by spending their wages in the local economy.

- § long-term socio-economic impacts associated with the employment and wealth supported by the caddy core that would be required to service demand from the proposed development.
- § The longer-term socio-economic impacts associated with the catalytic effect that proposed development is expected to have on the local, regional and national golf tourism market would include:
- § long-term socio-economic impacts arising from the off-site expenditure of visitors to the proposed development on accommodation, food and drink and other tourist services. These impacts could include:
  - the potential to retain existing Royal Dornoch visiting golfers in the area for longer, including converting day visitors to overnight visitors;
  - the potential to attract new golfers to play the highly ranked course; and
  - the potential to grow golf tourism as a result of providing a quality experience.

The magnitude of each of these socio-economic impacts was measured in terms of gross value added (GVA), a widely accepted measure of the additional economic activity supported by an initiative or organisation and jobs.

10.6 METHOD OF PREDICTION OF CHANGE AND RESULTS

The socio-economic impacts associated with the proposed development were estimated using a bespoke economic impact model that was developed specifically for this purpose, in accordance with the best practice requirements set out at the beginning of this Annex. The approach taken was to compare the level of economic activity that might occur if it does not proceed (the reference case) against the level of economic activity that would be expected if it does proceed (the intervention case).

10.6.1 Economic Impact Method

Economic activity can be measured using the value of expenditure on a particular activity (e.g. the amount spent on operational supplies). Best practice dictates that economic impacts should be measured in terms of the value that an activity adds to the economy (i.e. GVA), rather than the total amount of associated expenditure. In order to estimate economic impacts it is therefore necessary to convert the expenditure associated with each area of activity into GVA.

The expenditure associated with a particular activity represents turnover within the sectors in which it occurs (e.g. expenditure on supplies represents additional turnover for suppliers). It is therefore possible to convert turnover into GVA and employment impacts using turnover/GVA and turnover/employee ratios for the sectors in which the expenditure occurs. These ratios were taken from the Annual Business Survey (Scottish Government, 2015a).

As discussed above, best practice guidance dictates that economic impact assessments should take account of multiplier effects (i.e. the effects of subsequent spending rounds).

In order to do this it was necessary to apply economic multipliers to each of the effects considered. The economic multipliers used to do this were taken from the Scottish Government's Input Output Tables (Scottish Government, 2015b).

The approach was also dynamic rather than static to reflect the fact that the impacts associated with the proposed development would change over time. This is particularly true of the economic activity related to golf tourism because the reputation of the course is likely to develop over time, which should help it to attract more players as time goes on. To address this the analysis considered a ten year operational period and impacts were estimated at year one, five and ten. These impacts are therefore annual.

As construction related activity would be temporary these impacts were considered in their totality. This means that employment effects were presented in terms of years of employment rather than jobs where one year of employment could equate to one person being employed full time for a year, to four people being employed full time for three months or to some other combination.

10.6.2 Dynamics of the Golf Tourism Market

In order to properly assess the effects of the proposed development it is necessary to take account of the dynamics of the local, regional and national golf tourism market. The method for doing this involved reviewing publicly available reports and data about the sector and undertaking a series of consultations with individuals with particular knowledge of the sector. In this way it was possible to draw a number of important conclusions about the implications of the proposed development, which were then used to inform the subsequent economic modelling work. These conclusions are described below.

10.6.3 Creating a Golf Tourism Destination

As discussed above, an important challenge currently facing the local golf tourism sector is the relatively small proportion of visitors who currently choose to stay over night in Dornoch and the surrounding area. It is hoped that the proposed development would give visiting golfers a strong incentive to stay in the local area and in so doing help to restore the balance within the local golf tourism sector.

It is also anticipated that by providing a second iconic course in Dornoch the development of Coul Links would fundamentally alter the dynamics of the regional golf tourism market by helping to transform the Highlands into a golf destination in its own right rather than a component of a longer golfing break. Discussions undertaken with golf tour operators and other stakeholders in the sector suggest that this expectation is entirely reasonable.

A representative from one leading golf tour operator for example explained that, while most of their customers currently spend two or three nights in the Highlands if the proposals for Coul Links are realised then the Highlands would become "very interesting" as a destination for groups of tourists staying for five or six nights. Importantly this view was reflected by everyone interviewed for this study all of whom agreed that the successful delivery of Coul Links would enable the Highlands to attain the critical mass required to operate as a successful golf tourism destination in its own right.

10.6.3.1 Implications for Scotland's Golf Tourism Market

If the developers succeed in their objective of establishing Dornoch as a successful golf tourism destination in its own right then this could have implications for the Scottish golf tourism market as a whole. Interviews with leading golf tour operators suggest that the addition of another successful golf cluster could help to encourage visitors who have already been to Scotland to return rather than go elsewhere.

This effect is likely to manifest its self is by making Scotland the first choice for international visitors who have already made at least two international golfing trips. This is because Scotland's status as the home of golf means that the country is already the top priority for most visitors considering their first overseas golfing holiday and for most golf tourists considering a second international trip, the destination of first choice is Ireland. For golfers planning a third trip however, the choice of destination is likely to be between Ireland and Scotland.

At present most golf tourists who come to Scotland for the first time will tend to focus on the St Andrews cluster. Although some of these tourists do visit the Highlands it is usually for a relatively short period of perhaps two or three days. By helping to make the Highlands an attractive destination in its own right the proposed development could encourage some golfers to make a separate (additional) trip to the Highlands, rather than trying to incorporate the Highland courses as part of a trip focused on St Andrews. The effect of this should be to make Scotland the destination of choice for a higher proportion of golf tourists who are planning a third or subsequent international trip.

10.6.4 Implications for Local Accommodation Providers

Dornoch is already well established on the international golf tourism map and already has many of the characteristics a successful golf tourism resort. For this reason the developer does not propose to develop any accommodation or other ancillary tourist facilities on-site. Instead, it is anticipated that the market will respond to the additional demand that the proposed development is expected to create by increasing the supply of tourist facilities. In order to understand what this might mean for the existing tourism sector in the local area it is necessary to have some understanding of the quantity – and quality – of existing tourist facilities.

10.6.4.1 Tourist Accommodation in the Local Area

The VisitScotland website provides details of tourist accommodation available in different parts of Scotland. A search undertaken to support this study identified 96 separate listings within the local area. These listings included 53 self-catering establishments, 26 B&Bs, 3 caravan parks, 12 hotels and 2 other establishments.

This corresponds closely to the findings of a detailed accommodation audit of the Dornoch area that was undertaken to inform the development of the Dornoch Masterplan published by HIE in 2013. This audit identified seven hotels, 32 small serviced accommodation providers, 55 self-catering establishments one exclusive use property and 4 holiday parks in and around Dornoch.

It is not expected that holiday park accommodation would meet the requirements of the target market for the proposed development so it was excluded from further consideration.

By combining the findings from both these sources with information provided by local stakeholders interviewed for this study it was estimated that the tourism sector in the local area currently consists of around 100 establishments with a combined capacity of around 500 rooms. A break-down of this capacity is provided below:

Table G.4: Accommodation Supply in the Local Area

Type	Number of Establishments	Number of Rooms
Hotels	13	253
Guest houses and B&Bs	32	84
Self-catering	56	162
Total	101	499

The Scottish weather means that the golfing season in the Highlands is generally between April and October. Using the assumptions presented above it therefore be estimated that a total of around 106,800 tourist bed-nights might be available in the local area over this period.

It was estimated above that around 15,000 golf tourists currently visit the area each year but interviews with local stakeholders suggests that the majority of these visitors do not stay overnight in the area. It was therefore assumed that only 40% of these visitors stay overnight in the area, which implies that around 6,000 golf tourists might stay in the local area each season.

Discussion with golf tour operators suggests that around 70% of golf tourists come to the Highlands as part of a small, usually single-sex, groups while 30% come with a partner. By applying this assumption to the total number of golfing tourists who stay in the local area each year it was possible to estimate that golfing visitors currently account for around 5%

of the available tourism accommodation in the local area between April and October. This is surprisingly low given the status of Royal Dornoch as one of the top golf courses in the world and the presence of numerous other highly regarded course in the local area.

10.6.4.2 Capacity of the Local Accommodation Sector

Evidence published by VisitScotland suggests that over this period the average occupancy level within hotels, guest houses and B&Bs in the Highlands is 68% but discussion with local stakeholders suggests that occupancy in and around Dornoch is typically lower than this at around 50%.

By applying these assumptions to the total number of rooms available in the local area it was possible to estimate that between April and October each year there are likely to be somewhere between 27,800 and 44,100 unoccupied room nights.

By applying the assumptions described above in relation to single room occupancy to the number of unoccupied room nights it was possible to estimate that, in theory, the local tourist accommodation sector might have the capacity to accommodate between 23,600 and 37,500 additional golfer bed nights/year. This would seem to suggest that the local accommodation sector has ample capacity to accommodate any increase in demand generated by the proposed development; however, in practice this is unlikely to be the case.

In the first instance it is highly unlikely that the availability of accommodation at any point in time would to correspond to directly to demand. This means that, although in theory there may be sufficient bed-space available to accommodate golfers who may visit the area over the course of the season, this may be spread across a number of establishments and may not be available during the periods required by specific groups.

This means that the total capacity of the sector over the season is likely to be an unreliable measure of actual capacity at any point in time. Evidence for this is contained within the Dornoch Masterplan produced by HIE, which notes that there is an under-supply of accommodation during the high season.

Perhaps more importantly however is that much of the current accommodation stock within the local area is unlikely to meet the requirements of the target market for the proposed development.

10.6.4.3 Quality of Local Accommodation Offering

As discussed elsewhere, the vision for the proposed development is to create a top calibre golf course that will appeal directly to a relatively small group of high value international (particularly American) golf tourists. It is anticipated that green fees for the new course are likely to be around £175/round. It therefore follows that these types of visitors are likely to require accommodation (and other tourist services) of a higher standard than might be expected by other types of tourists.

This tendency was noted in the 2009 study undertaken by SQW(SQW, 2009), which noted that *"overseas golfers are more likely to stay in five star hotels or resorts" while UK visitors "tend to stay more in B&Bs or guest houses".*

At the time of writing there was only one five star hotel in Dornoch (the Links House, which is owned by one of the developers). In addition to Links House there were three four star hotels in the local area (the Royal Golf Hotel in Dornoch, the Kincraig Castle Hotel in Invergordon and the Royal Marine Hotel in Brora).

Together these four establishments have a total of 66 rooms, although this will soon increase to 72 as the result of an expansion of Links House. By multiplying this by the total number of nights in the season and making appropriate assumptions about levels of single occupancy it was estimated that the local area has the potential to accommodate around 16,600 golf tourists in 4* or 5* accommodation each season.

In theory this implies that current demand from golf tourists visiting the local area is sufficient to completely fill all of the existing 4* and 5* accommodation within the local area throughout the season. In practice however, mismatches between the timing of supply and demand mean that many of these potential visitors are actually forced either to stay outside the local area (usually in Inverness) or to stay in lower quality accommodation than they would ideally prefer within the local area. Both of these outcomes represent a loss of potential income to the local area.

Interviews with stakeholders undertaken to as part of this study confirms that a lack of suitable accommodation within the local area is currently an important limiting factor for the local golf tourism market. This conclusion was also echoed in the Dornoch Masterplan, which noted that there was a lack of "high end" accommodation in Dornoch suitable for golfing visitors.

As discussed in above, it is anticipated that by helping to transform Dornoch into an important golf destination, the proposed development could significantly increase the number of golfers who wish to stay overnight in the town each year. For the reasons discussed above this would create a major stimulus for investment in the local tourist sector and provide an incentive for existing operators to upgrade their facilities and for new operators to enter the market. The long-term effect of this would be to increase both the quality and quantity of tourist facilities in the local area, which should serve to enhance the competitiveness of the tourism sector as a whole.

10.6.5 Implications for other Local Courses

Aside from Royal Dornoch, there are a number of other highly regarded courses in the local area such as Tain, Golspie, Skibo and Brora, all of which are located within half an hour's drive of Dornoch. The developers have met with the management and Councils of each of these golf courses and all have expressed publicly their full support for this project. None of these courses can claim to be iconic in terms of world golf and as such none of them are likely to be a strong draw for visiting golf tourists in their own right; however, all of them

are strong 2nd tier courses likely to be of interest to golf tourists whom might already be in the area.

This means that some of the golf tourists who currently visit the local area primarily to play Royal Dornoch may also play one or more of the other local courses during their visit. It would therefore be natural for there to be some of concern that the proposed development could have a negative effect on the number of golf tourists who play these other courses. There are however strong reasons to believe that such concern would be misplaced.

While it is possible that some of those who will play the proposed development might otherwise have played one of the other local courses instead it is likely that this effect would be strongly outweighed by the overall increase in the number of golf visitors attracted to the area by the new course.

It is anticipated that the proposed development will help to establish Dornoch and the surrounding area as a successful golfing destination. This means that in future there will be a strong incentive for visiting golf tourists to remain in the local area for a number of days rather than simply playing Royal Dornoch and then leaving,

By their very nature demand for tee times at iconic courses such as Royal Dornoch (and potentially in future the proposed development) is very high, which means that golfing visitors will often not be able to play exactly when they might like. This means visitors who come to the region primarily to play the iconic courses are unlikely to be able to do so on consecutive days and are therefore likely to need to spend longer in the region to fulfil the primary objective of their trip. As most golfing tourists expect to play golf on every day of their trip, this is likely to generate additional demand for other courses in the region.

As the following section will highlight, successful golf resorts elsewhere in the world generally incorporate multiple courses (St Andrews for example has seven public courses). In contrast, even after the proposed development is completed, Dornoch would only have two. Other quality courses in the local area therefore have the potential to play an important role in supporting the development of the local area as a successful golf destination.

Although it is possible that the new course could attract some visitors who might otherwise have played other local courses, the level of this displacement is expected to be very low and - more importantly – significantly outweighed by the additional demand that the proposed development is expected to generate. Overall the net effect of the new course on other local courses is therefore likely to be strongly positive.

10.7 EVALUATION OF EFFECTS

This section evaluates three main types of effect:

- § temporary effects that would occur during the construction phase;
- § (permanent) operational effects directly associated with the operation of the proposed development; and
- § (permanent) wider catalytic effects arising from the off-site expenditure of visitors to the proposed development on accommodation, food and drink and other tourist services.
- § The magnitude of each type of effect was assessed as being either: Negligible, very low, low, medium or high. This assessment was made using professional judgement about the overall scale of the impact (i.e. value of GVA generated and number of jobs expected to be supported) within the context of the scale of the economy of each study area.

10.7.1 Construction Effects

The proposed development would have an economic effect during the construction of the clubhouse and the golf course itself. The developer has estimated that the total capital investment costs for the new course would be around £8.0 million. It was assumed that 75% of these costs would be associated with construction and the remaining 25% with capital equipment.

The effects associated with the construction of the proposed development would be confined to the period of the capital investment expenditure. In order to estimate the economic effects associated with this expenditure it was first necessary to assess what proportion of the capital contracts that could be won by companies in each of the study areas.

Although the design of the proposed development has been undertaken by an international design team, the majority of the work involved in actually developing the course would be unspecialised ground works, which could be undertaken by local contractors. To model this it was assumed that 90% of construction expenditure would occur in Scotland, 80% would occur in the Highlands and 50% would be retained within the local area.

In addition to the construction works, the investment would also include the procurement of capital equipment required to operate the course. Given Scotland's established position within the world golf market it is anticipated that a high proportion of this equipment could be procured from Scottish businesses. To model this it was assumed that 75% of the expenditure on equipment would be retained in Scotland.

By applying these assumptions to the total anticipated value of the capital investment it was estimated that around £6.9 million of the £8.0 million capital investment could be

retained by Scottish businesses, £4.8 million could retained by businesses in the Highlands and £3.0 million could be retained by businesses within the local area.

This expenditure would represent additional turnover for the manufacturing businesses that provide the equipment and the construction firms responsible for the physical development. The employment supported by this expenditure was estimated by dividing the additional turnover by the average turnover/employee in each sector. In this way it was estimated that the proposed development could enable the main contractors appointed to deliver the project to support 39 years of construction related employment. An appropriate multiplier was then applied to this estimate in order to capture the number of jobs that might be supported within sub-contractors. In this way it was estimated that the proposed development could support a total of 65 construction related jobs of which 27 could be located within the Highlands and 24 could be within the local area.

Those employed to deliver the proposed development would also support further employment elsewhere in the economy by spending their wages on goods and services. This effect was captured by applying an appropriate multiplier to the direct effect estimated above. In this way it was estimated that the total employment effect associated with the construction phase could be 77 years of employment across the Scotish economy, of which 42 could be secured by individuals in the Highlands and 25 could be secured by individuals in the local area.

The GVA impact was then estimated by applying the GVA/turnover ratio for each sector. The multiplier impacts of this expenditure were then captured by applying multipliers for each sector to the direct effects. These effects are summarised below:

Table G.5: Construction Effects

Study area	GVA (£m)	Employment (job years)
Local area	1.4	25
Highlands	2.5	42
Scotland	3.4	77

Overall the magnitude of these effects was assessed as follows:

- local area – very low;
- Highlands – very low; and
- Scotland – negligible.

10.7.2 Operational Effects

Once operational the proposed development would also support economic activity as a result of:

- direct effects - the direct GVA and employment supported by the proposed development;

- § supply chain effects – the proposed development would also support economic activity in the companies within its supply chain; and
- § income effects - the economic activity supported by the people directly employed at the proposed development as they spend their salaries in each study area.

10.7.2.1 Direct Effect

The direct economic impact of an institution is measured by the GVA that it contributes to the economy and the number of individuals it employs.

It is expected that the proposed development would directly employ around 20 people.

This is expected to include a general and a deputy manager, between six and eight grounds keeping staff, three or four golf professionals and between six and eight food service staff. Based on discussions with other local clubs about typical salaries for these positions in the industry it was estimated that the total staff costs would be around £0.6 million per year. The direct GVA of an organisation can be estimated by subtracting its total expenditure on supplies from its total income. The total income of the proposed development was estimated by multiplying the number of visitors expected/year (15,000 in year one increasing to 20,000 by year ten) by an average green fee of £175.

In addition to this, based on discussions with other operators, it was assumed that on average each golfer would spend around £10/head on food and drink and other sundries within the clubhouse (this is slightly lower than average expenditure/head elsewhere to reflect the more limited facilities expected to be available at the proposed development). Using these assumptions it was estimated that during its first year of operations the proposed development could generate turnover of around £2.8 million and that this could increase to around £3.7 million by year ten.

Based on data from other local courses it was estimated that expenditure on supplies for the proposed development could amount to almost £0.5 million in year one and that this might increase to over £0.5 million by year ten as player activity increases.

By subtracting expenditure on supplies from total income in each year of operations it was estimated that in year one the proposed development could generate £2.3 million GVA for the Scottish economy and that this could increase to £3.2 million/year by year ten. This impact is summarised below.

Table G.6: Direct Effect

Impact	Year 1	Year 5	Year 10
GVA (£m)	2.3	2.7	3.2
Jobs	21	21	21

10.7.2.2 Supply Chain Effect

The proposed development would also have an effect on the economy through its expenditure on goods and services. Based on data from other local courses it was estimated that expenditure on supplies for the proposed development could amount to almost £0.5 in year one. It was assumed that the spending on supplies would increase as the number of rounds of golf played increased in the first ten years of operation.

To estimate the effect of this expenditure it was then necessary to estimate how much of it might occur in different sectors of the economy. These assumptions were informed by a breakdown of expenditure provided in the annual accounts for Nairn Dunbar Golf Club. As some areas of expenditure would depend on the number of visitors to the golf course (i.e. food and drink supplies) it was assumed that these areas would grow in proportion to the anticipated increase in player activity between year one and year ten.

This expenditure represents an increase in the turnover of the companies that would provide goods and services to the proposed development. The number of jobs that might be directly supported by this expenditure was therefore estimated by dividing the additional turnover by average turnover/employee in the sectors in which the expenditure would occur. The direct GVA impact of this expenditure was then estimated by applying an appropriate turnover/GVA ratio for each sector. Finally, the multiplier effects of this expenditure elsewhere in the economy were estimated by applying appropriate multipliers for relevant sectors to the direct effects.

The supply chain effect in each study area would depend on the value of expenditure made in each study area. At this stage this level of detail is not available so it was necessary to make reasonable assumptions based on what is known about the nature of supplies that might be required and the extent to which these might be available within each study area. It is likely that the operation of a world-class golf course might from time to time require specialist professional services that may not be easily available within Scotland. Similarly, it is also likely that the insurance policies the proposed development would require might be provided by financial services companies based outside Scotland. For this reason it was assumed that there would be some leakage from the Scottish economy. To model this it was assumed that 25% of expenditure might occur outside Scotland.

It is however also likely that the management of the proposed development would seek to procure supplies locally or from within the region wherever possible, both for reasons of convenience and out of a desire to support the local economy. Data on expenditure on supplies by other local golf courses indicates that one important areas of expenditure is likely to relate to the cost of utilities. As there are no major utility companies based in the Highlands it was therefore assumed that this expenditure would be likely to occur elsewhere in Scotland. To model this it was assumed that around 50% of supplies would be procured within the Highlands.

Three of the most important areas of expenditure at other clubs in the local area include the cost of materials required to maintain the course its self (i.e. seeds, soils and fertiliser), cleaning and maintenance and clubhouse supplies. At one club for which data was available these areas of expenditure together accounted for around a third of total expenditure. It is likely that it would be possible to procure most of this material from businesses within the local area. To model this it was therefore assumed that 30% of the supplies purchased for the proposed development would be procured within the local area.

The resulting economic effect supported by the supply chain expenditure of the proposed development is presented below. This shows that by year ten the supply chain expenditure could support 8 jobs throughout Scotland and £0.3 million GVA.

Table G.7: Supply Chain Effect

	Year 1	Year 5	Year 10
GVA (£m)			
Local area	0.1	0.1	0.1
Highlands	0.1	0.1	0.1
Scotland	0.2	0.3	0.3
Jobs			
Local area	2	2	2
Highlands	3	3	4
Scotland	7	7	8

10.7.2.3 Effect of Staff Expenditure

The staff employed at the proposed development would also have an effect on the economy by spending their wages. As discussed in above, it was estimated that the total staff costs associated with the proposed development could be around £0.6 million.

The economic effect of staff expenditure would depend on where staff spend their wages. The Scottish Government input output tables show that Scottish residents spend 74% of their income within Scotland so it was assumed that 74% of this expenditure would be retained in Scotland.

The geography of the Highlands means that a relatively high proportion of personal expenditure is likely to be retained in the region. To account for this it was assumed that staff would spend two thirds of their wages in the region. The local area is however located around an hour from Inverness, the main economic centre of the Highlands where the majority of business are located. For this reason it was assumed that staff might spend around a third of their wages in the local area.

The economic effect of this expenditure was estimated using GVA to turnover and turnover per employee ratios for the whole economy because household expenditure covers such a wide range of sectors. After multiplier effects were taken into account it was estimated that the expenditure of staff salaries could support an additional 4 jobs throughout Scotland and generate £0.2 million GVA. The impact within the Local Area was estimated as 1 job and almost £0.1 million GVA. This effect is summarised.

Table G.8: Effect of Staff Expenditure

	Year 1	Year 5	Year 10
GVA (£m)			
Local area	<0.1	<0.1	<0.1
Highlands	0.1	0.1	0.1
Scotland	0.2	0.2	0.2
Jobs			
Local area	1	1	1
Highlands	3	3	3
Scotland	4	4	4

10.7.2.4 Summary of Operational Effects

A summary of the three sources of operational effect considered above is provided in the table below. This shows that by year ten of operations the proposed development is expected to support a total of 24 jobs in the local area and generate a total of £3.3 million GVA for the local economy as a result of its direct operations.

Table G.9: Summary Operational Effects

	Year 1	Year 5	Year 10
GVA (£m)			
Local area	2,433	2,819	3,303
Highlands	2,562	2,952	3,439
Scotland	2,752	3,149	3,646
Jobs			
Local area	24	24	24
Highlands	27	27	27
Scotland	32	33	33

Overall the magnitude of these effects was assessed as follows:

- local area – low;
- Highlands – very low; and
- Scotland – negligible.

10.7.3 Golf Tourism Effects

This section considers the longer-term effect associated with the catalytic effect that the proposed development is expected to have on the local, regional and national golf tourism market. These effects could include:

- short-term effects arising from the development of other golf tourism facilities required to service additional demand stimulated by the proposed development on the local construction sector; and
- long-term effects arising from the off-site expenditure of visitors to the proposed development on accommodation, food and drink and other tourist services.

The value of these effects would depend on the extent to which the proposed development succeeds in:

- attracting new visitors to the area;
- increasing how long visitors stay in the area;
- increasing how much visitors spend in the area;
- increasing visitor's propensity to return; and
- increasing visitor's propensity to recommend the area to others.

All of these factors were therefore taken into account in the analysis.

10.7.3.1 Potential Golf Visitor Numbers

The main driver behind the longer-term catalytic impacts associated with the proposed development is the number of golf visitors who might play at the proposed development. The developer expects that between 10,000 and 15,000 rounds of golf would be played at Coul Links during the first year of operations with the expectation that numbers would increase further in subsequent years. Given the importance of this estimate to the results of the analysis it was therefore important to test the robustness of this expectation. This was done with reference to the experience elsewhere in Scotland and elsewhere in the world that was described above.

The rationale behind the proposed development is to create a world-class golf course that will enable the Highlands to achieve the critical mass required to function as an effective golf destination in its own right. The information presented above provided evidence to show that similar projects have been successfully delivered elsewhere and provides some confidence that the aspirations for the proposed development are realistic.

A number of issues are worth highlighting to reinforce this point.

The first issue relates to geography. It could be suggested that the potential for golf tourism in and around Dornoch could be limited by the relative remoteness of the area. The evidence presented above however suggests that this is unlikely to be the case.

All of the resorts described above are at least as inaccessible, if not more so than Dornoch. Bandon Dunes, the developer's first and most successful venture to date is located around four and a half hours from the nearest airport while visitors to Cabot Links must make a three hour trip across Nova Scotia to get to the resort.

In contrast Dornoch is located around three and a half hours from the international airports at Glasgow and Edinburgh and under an hour from Inverness airport, which provides direct connections to London Heathrow. The town also already has its own small airstrip, which, given appropriate investment and necessary consents, could conceivably accommodate incoming private flights.

Another challenge that could be levelled at the aspiration of creating a golf tourism destination in the Scottish Highlands would be the weather, which is already recognised as the single biggest challenge facing the Scottish golf sector. The experience at Cabot Links however, which is located in the heart of Nova Scotia, proves that this is not necessarily a barrier to creating a world-class golf resort.

Dornoch does however differ from all of the other locations described above in one important respect. It already has a world-class golf club and is already well known in golfing circles as a result of its strong golfing heritage. This means that around 20,000 visiting golfers already visit the town each year and, unlike any of the locations described above, the town already has a range of tourist accommodation and facilities.

All of this provides strong evidence that the aspirations for Coul Links are not only achievable but could turn out to be conservative.

The developer's expectations also appear to be rather conservative in comparison to the performance of other top Scottish golf courses.

In 2014/15 around 20,500 people played the Championship course at Dornoch, more than double the number expected to play the proposed development in its first year. The volume of play at Dornoch is also significantly below that of other top Scottish golf courses. As discussed above, data from an audit undertaken in 2003 (MW Associates, 2003) suggests that on average around 30,000 rounds of golf are played at each of Scotland's top tier courses each year with the number of rounds played at the Old Course in St Andrew's reaching around 44,000.

It is also worth noting that prior to opening it was expected that around 10,000 rounds might be played at Bandon Dunes during the first year of operations but the actual figure turned out to be around 24,000. It is therefore reasonable to regard the developer's estimate of 10,000 – 15,000 rounds/year for the proposed development as conservative. Best practice dictates that when assessing the effects of a proposed development it is important to consider the worst-case scenario. As socio-economic benefits would increase with visitor numbers, for this assessment the worst-case scenario would therefore be the lowest number of visitors that might reasonably be expected. For this reason the wider

impacts were modelled on the basis that 15,000 golfers would visit the proposed development in year one and that this would increase to 20,000/year by year ten.

10.7.3.2 Types of Golf Tourist

Not all of the golf tourists who visit the proposed development would be additional to the area however and the impact associated with each golf tourist would vary depending on the nature of their visit. To address this, golf tourists were split into three categories:

- "Coul Customers" - golf tourists who would visit Scotland specifically to play at the proposed development;
- "Extenders" - golf tourists who would extend their stay in the local area to play at the proposed development, in addition to other Scottish courses; and
- "Displaced" - golf tourists who might chose to play at the proposed development instead of another course elsewhere in Scotland.

The displaced golf tourists were assumed to constitute a significant proportion of the initial visitors to the proposed development, particularly in the first few years. Over time however the proportion of visitors choosing the proposed development in addition to other courses, rather than instead of, was assumed to increase. As displaced golf tourists would otherwise have played at another Scottish course the impact of their expenditure would not be additional to the Scottish economy and was therefore excluded. As some fo these visitors would otherwise have played an alternative course outside the Highlands however, the impact of their expenditure would be additional at the local level.

The choice of courses to play during a golfing holiday depends on the time taken to travel between each course and the relative merits of each course. For this reason displacement is likely to be more of an issue for courses that are in the local area because golf tourists with a more restricted geographic itinerary would be more inclined to choose the proposed development over another local course.

As the vision for Coul Links is to create a world-leading course there could also be some displacement from courses elsewhere in Scotland, particularly for those who plan to travel around the country playing courses in different regions. For example, there may be some golf tourists who choose to spend two or three days in Dornoch instead of combining a visit to Dornoch with a trip to Aberdeenshire, which is currently common practice.

Over time, as the proposed development gains an international reputation, it is expected that the number of "Coul Customers" would increase. The implication of this is that over time the proportion of golf tourists who choose the proposed development instead of another course would fall. The assumptions that were used to model this are presented below.

Table G.3: Proportion of "Displaced" Golf Tourists

Location of other courses	Year 1	Year 10
Other courses in the local area	25%	18%
Other courses in the Highlands	10%	8%
Other courses in Scotland	10%	8%
Total	45%	31%

The number of extenders was also assumed to be constant throughout the study. It was assumed that 15% of the golf tourists playing other courses in the local area would also play at the proposed development. These are golf tourists who would not otherwise have played another course if the proposed development does not proceed. The assumptions that were made to model the proportion of visitors who would extend their stay are presented below.

Table G.11: Proportion of "Extenders"

Location of other courses	Year 1	Year 10
Other courses in the local area	15%	15%
Other courses in the Highlands	3%	3%
Other courses in Scotland	0%	0%

It was assumed that the number of golf tourists specifically visiting the area to play the proposed development ("Coul Customers") would grow significantly in the first ten years of operations. This would be the result of both previous visitors returning to play the course again and those visitors who had played previously providing positive feedback to other golfers. Over the first ten years of operations it was estimated that "Coul Customers" would account for the majority of growth in the visitor numbers and as a result that the proportion of golf tourists who would be additional to Scotland would increase over time.

The figure below shows the expected break-down of golf tourists to the proposed development by category over the first ten years of operations. The proportions shown should however be regarded as indicative of expected trends rather than an absolute prediction of actual visitor numbers.

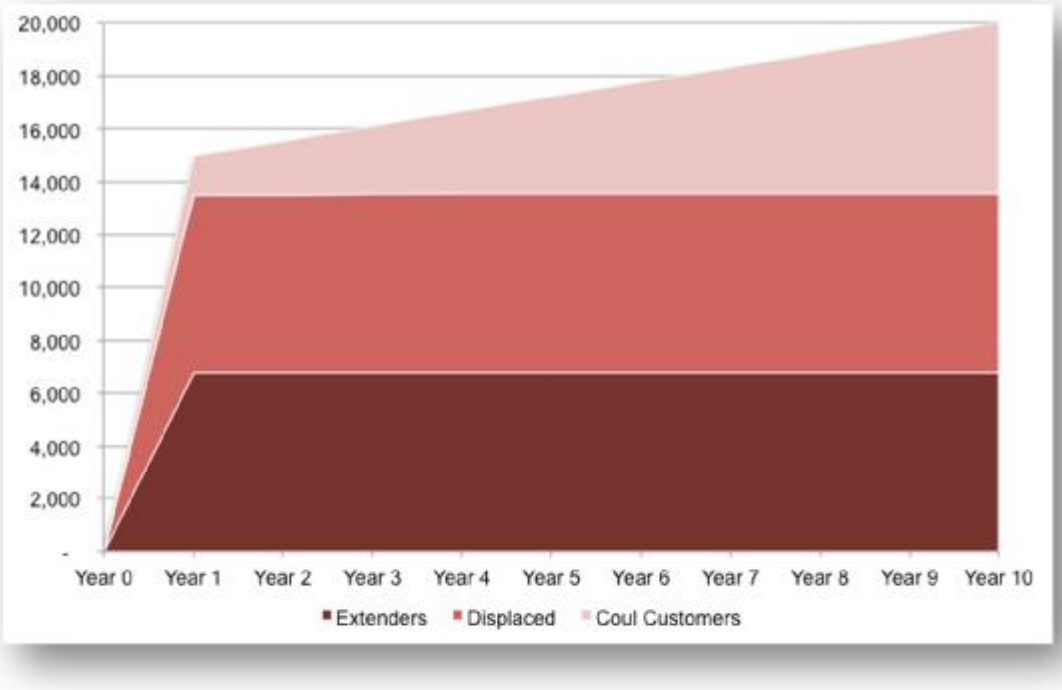

Figure G.4: Break-down of golf tourists to proposed development by category over time

10.7.3.3 Golf Tourists at Other Scottish Courses

The extent to which the proposed development succeeds in attracting new golf tourists to other courses in Scotland will have a significant effect on the overall economic impact that the course could generate for the Scottish economy.

The drive for additional golf tourists coming to Scotland would be "Coul Customers", who would make the decision to choose Scotland as their destination because of the existence of the proposed development. These customers would also play on other courses elsewhere in Scotland during their trip. Based on the findings from the consultation programme it was estimated that visiting golf tourists would play a total of five courses during their stay in Scotland, including the proposed development. It was assumed that these additional courses would be split evenly through the three study areas.

The impact of these customers on demand for courses throughout Scotland is shown in the figure below. This shows that although displaced golf tourists would result in a decrease in the overall number of golf tourists outside the proposed development within the first two to three years, the growth in "Coul Customers" after this point would more than make up for this decrease. By year ten it was estimated that there would be 18,900 additional rounds played by golf tourists in Scotland as a result of the proposed development and that of this, over 5,000 would be with golf clubs in the local area.

To put this in context, elsewhere in this annex it was estimated that around 15,000 golf tourists currently visit the local area each year. This implies that the proposed development could increase the total number of golf tourists visiting the area by around a third after around ten years of operation.

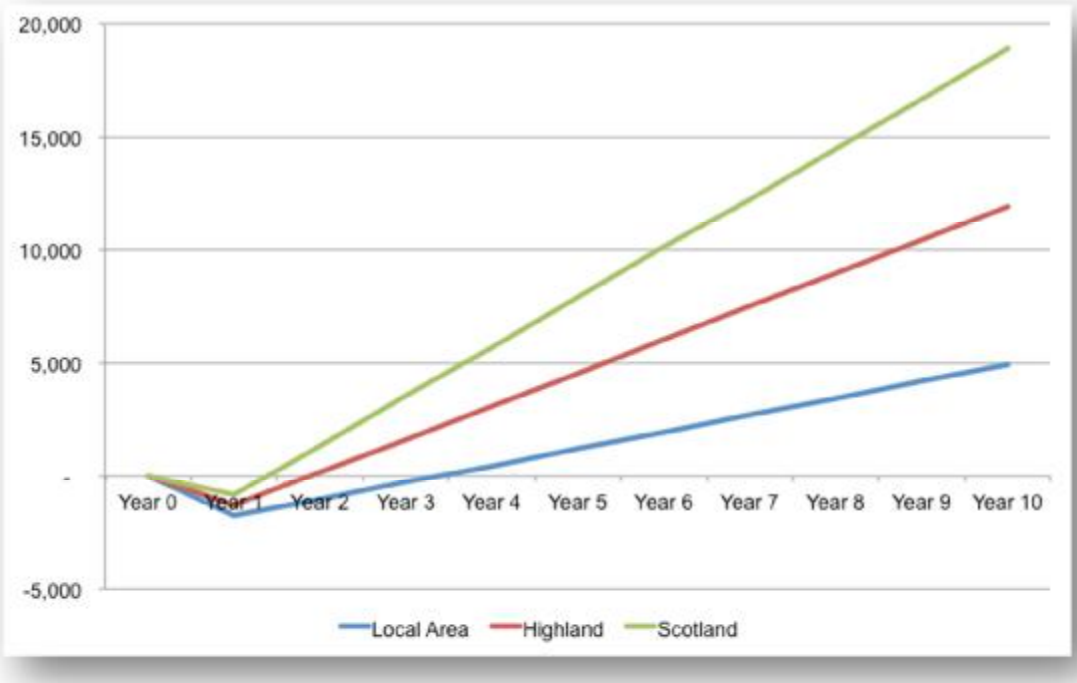

Figure G.5: Additional golf tourist rounds at other courses in each study area

10.7.3.4 Golf Tourists Expenditure

In addition to attracting more golf tourists to each study area, the proposed development would also have an impact on the behaviour of all visitors to golf courses in the local area. In particular, the creation of a cluster of world leading golf courses around Dornoch should increase the propensity of golf tourists to stay overnight in the local area, in order to play multiple courses. Overnight visitors have a higher level of expenditure than day visitors so this would enable the local area to capture a higher proportion of the Scottish golf tourism market.

Expenditure by golf tourists varies considerably depending on the origin of the golf tourist so in order to estimate the average expenditure per trip of a golf tourist to the proposed development, it was first necessary to estimate the weighted average expenditure of golf tourists based on the expected origin of visitors. It is expected that the proposed devleopment would have the same visitor profile as the Royal Dornoch Golf Club, which implies that 50% of visitors would come from North America. It was assumed that the remaining 50% of visitors would include equal proportions of visitors from Scotland, the rest of the UK and elsewhere in Europe. By applying these assumptions it was estimated

that the average expenditure of visitors to the proposed development would be £3,333 per trip.

The economic impact of this expenditure would depend on what this money is spent on. A study undertaken in 2009 (SQW, 2009) provided a break-down of the main areas of expenditure for golf tourists visiting Scotland. This break-down is replicated in the figure below, which shows that the majority of expenditure is likely to occur outside the clubhouse on items such as accommodation, food and drink and travel.

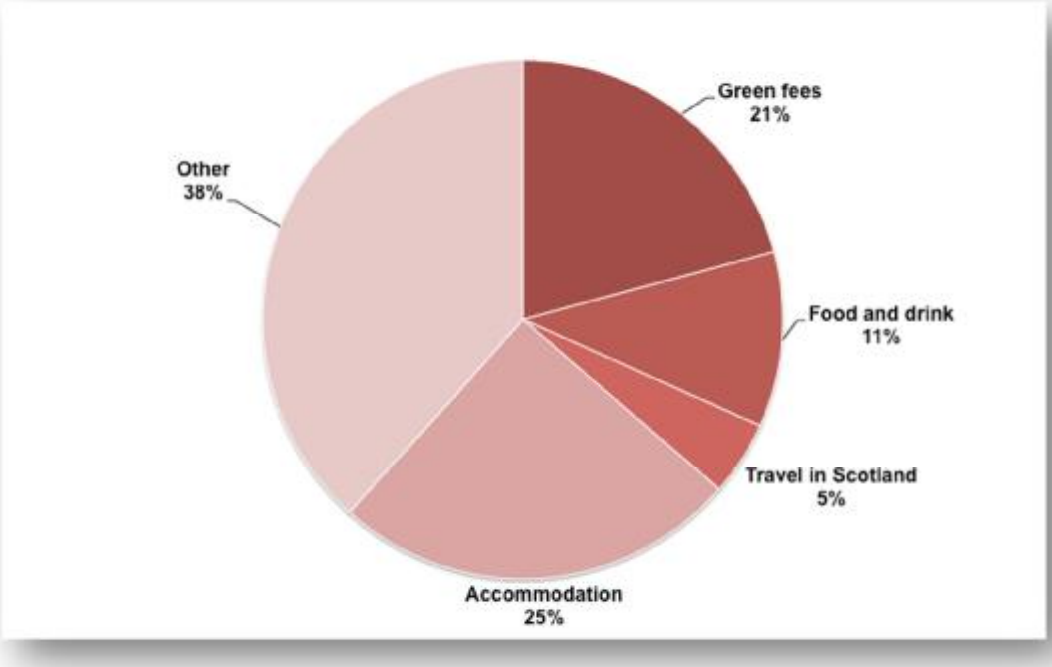

Figure G.6: Breakdown of expenditure by golf tourists to the proposed development

The largest category of expenditure identified was classified as "other". This category would include expenditure on a variety of areas, including other tourist attractions such as whisky distilleries, shopping for souvenirs and hiring caddies.

Table G.4: Average Daily Expenditure of Day and Overnight Visitors

Category of Expenditure	Day Visitor	Overnight Visitor
Green fees	£139	£139
Food & Drink	£30	£73
Travel in Scotland	-	£31
Accommodation	-	£168
Caddies	£56	£56
Other	-	£200
Total	£225	£667

The economic effect associated with the green fees paid by golfers at the proposed development was included as part of the direct effect considered above was therefore excluded here to avoid double counting.

The implications of the main categories of golf tourist expenditure for businesses in the local area and the local labour market are considered in further detail below.

10.7.3.5 Accommodation

It was estimated above that demand for accommodation by golf tourists currently accounts for around 6,000 bed-nights – or around 5% of the available tourism accommodation in the local area - between April and October. It was also highlighted that a lack of high quality accommodation in the local area means that this figure is currently much lower than it could be.

This assessment has also assumed that a proportion of golf tourists who would play at the proposed development would have extended their trip to the Highlands in order to do so. It was estimated that these visitors ("Extenders") might play around 6,800 rounds of golf at the proposed development. It would be reasonable to expect that golfers playing more than one course in the local area would be more likely to stay overnight in the local area. In order to assess the implications that this could have for local accommodation providers it was necessary to take account of:

- the total number of rounds played at the proposed development by year ten;
- the proportion of golf tourists who would stay overnight in the local area; and
- the proportion of golf tourists who would play more than one course in the local area.

By doing this it was estimated that the proposed development could stimulate demand for an additional 14,000 nights of accommodation in the local area by year ten, which would equate to around 80 additional high-quality rooms. This is however based on the assumption that demand for rooms would correlate with their availability. In reality this assumption is likely to be wholly unrealistic. This therefore implies that there would be a requirement for more than 80 high-quality rooms in order to accommodate peaks of demand.

10.7.3.6 Caddies

Discussions undertaken to support this study suggest that 80% of golf tourists playing at the proposed development might be expected to hire a caddy and desk-based research suggests that caddies might undertake an average of around eight round of golf per week during the 30-week golf season. Applying these assumptions to the total number of rounds of golf expected to be played at the proposed development suggests that the Course could provide employment for around 42 full-time caddies during the year one and that this could increase to around 56 caddies by year ten.

Interviews undertaken to support this study also suggest that caddies might expect to earn around £70 per bag. This implies that caddies might expect to earn around £16,800 over the course of a season.

10.7.3.7 Food and Drink

Another important area of expenditure associated with visitors to the proposed development would be food and drink. Based on the assumptions described above it was estimated that by year ten additional demand for food and drink from visitors to the proposed development could amount to £1.1 million in the local area.

Discussions with stakeholders suggests that the local area is unlikely to have the capacity to accommodate this increase in demand. While plans are underway to create some additional catering capacity as part of the on-going refurbishment of the court house in Dornoch, this is unlikely to be sufficient. This implies that the proposed development would also create significant opportunities for development of new food and drink outlets in the local area.

10.7.4 Economic Effect of Additional Golf Tourism Expenditure

The total additional expenditure that golf tourists playing at the proposed development might make in the local area is given in the table below. This shows that by year ten, the additional expenditure of golfers visiting the proposed development could amount to £19.3 million per year across Scotland.

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The table includes a break-down of the additional expenditure by day visitors and overnight visitors for each study area. This shows that the expenditure of day visitors in the Highlands and Scotland as a whole is expected to fall because it is expected that in the future more golfers visiting the Highlands would stay overnight. This is reflected in the increased expenditure of overnight visitors, which more than outweighs the reduction in expenditure by day visitors.

The overall effect is a significant increase in the level of additional expenditure by golf tourists to Scotland. (NB. The figures presented below are net additional expenditure and therefore take account of leakage outwith each study area and displacement of existing activity).

Table G.13: Additional Visitor Expenditure

Type of visitor	Year 1	Year 5	Year 10
Local Area			
Day visitors	0.4	0.8	1.1
Overnight visitors	2.4	4.0	6.4
Total	2.8	4.8	7.5
Highlands			
Day visitors	- 0.9	- 0.8	- 0.6
Overnight visitors	6.5	10.5	15.4
Total	5.6	9.7	14.8
Scotland			
Day visitors	- 1.0	- 1.0	- 0.9
Overnight visitors	7.1	13.0	20.2
Total	6.1	12.0	19.3

The expenditure of golf tourists represents additional turnover for businesses in the local tourism sector. The number of jobs directly supported by this expenditure was therefore estimated using current turnover/employee ratios for the sector while the GVA impact was estimated using turnover/GVA ratios. The multiplier effects of this expenditure were then captured by applying multipliers for the sector to the direct impacts

The total economic effect associated with the additional golf tourism expenditure that the proposed development could attract is summarised in the table below. This shows that by year ten the golf tourism supported by the proposed development could generate £16.5 million GVA in the Scottish economy and support 651 jobs. Of this, £4.8 million GVA and over 220 jobs could be supported in the local area.

Table G.5: Effect of Additional Golf Tourism Expenditure

Type of visitor	Year 1	Year 5	Year 10
GVA (£m)			
Local Area	1.9	3.1	4.8
Highlands	3.6	6.3	9.7
Scotland	5.2	10.2	16.5
Jobs			
Local Area	95	151	226
Highlands	170	284	425
Scotland	219	411	651

Overall the magnitude of these impacts was assessed as follows:

- local area – high;
- Highlands – high; and
- Scotland – medium.

10.7.5 Community Effects

Exactly where the local economic effects described above would occur would be determined by a number of factors including:

- where the employees of the proposed development live and where they spend their income;
- where the suppliers for the proposed development are located, where their suppliers are based and where their employees live;
- where the additional golf tourists who might visit the area spend their money.

None of these factors can be accurately predicted at this stage so for this reason it is not possible to estimate with any degree of certainty what proportion of the local economic effects described above could occur within the immediate vicinity of the proposed development. It is however possible to assess the benefits that the proposed development would generate for the local communities in the immediate vicinity (i.e. those located in Embo and Dornoch) in more general terms. These benefits are discussed below.

10.7.5.1 Quality of Life

Unlike some golf developments, one of the key objectives of the proposed development from the outset has been to maximise the socio-economic benefits it would generate for the local area. The developers have demonstrated this commitment by supporting a number of supplementary developments that are not strictly necessary to the commercial success of the venture.

The Developer has for example provided £20,000 match funding to support the development of a new service point in the court house in Dornoch, which will make it easier for local residents to access council services locally. As part of the investment in the Court the developer has also agreed to fund the development and upkeep of a public square, which will be made available for the use of the local community. It is anticipated that in the future the square could host a variety of events such as farmers markets or craft fairs.

The developer also proposes to invest in the creation of a new playing field at Embo for the use of local residents and in the development of infrastructure to facilitate walking at the site including way marked trails, interpretation boards and a series of bothies to provide shelter from the elements.

The developers have worked closely with the managements and Councils of Brora, Golspie and Tain Golf clubs with respect to various strategies to improve visitor play at these courses. These discussions have included ideas such as packaged pricing such that rounds at Coul Links can be combined with rounds at these three courses. The developers believe that if visitors play these additional courses their overall customer experience will be enhanced and they will be likely to return to the area on subsequent trips. Most recently, the developers have agreed to serve among the lead sponsors of a new Scottish PGA

sponsored Pro-Am tournament to be played exclusive over these three courses. The inaugural John Sutherland Legacy Pro-Am will be held over two days in May 2018 at Tain and Golspie golf clubs. In 2019, the event will be played over Brora and Golspie and in 2020 over Tain and Brora. The strategy of the tournament is to raise awareness within the golf industry of these exceptional seaside links near to Royal Dornoch and Coul Links. John Sutherland was the extraordinary Secretary of Royal Dornoch for 58 years, from 1883 to his death in 1941. Sutherland was lead designer of Royal Dornoch, Brora, Golspie and Tain golf clubs.

All of these facilities will help to enhance quality of life for local people and make Dornoch and Embo more desirable places to live and work.

10.7.5.2 Local Economic Resilience

Like many rural areas in the Highlands and Islands the population of Dornoch and the surrounding local area is ageing rapidly. Data presented in the Dornoch Masterplan shows that the proportion of the local population aged over 60 is significantly higher in Dornoch than it is either elsewhere in the Highlands or across Scotland as a whole while the proportion of children and young people is correspondingly lower. It also shows that the position deteriorated between 2001 and 2011 as the proportion of people aged over 60 increased substantially while the proportion aged under 15 or between 30 and 44 declined. This has obvious implications for the long-term economic health of the area and for the sustainability of local services.

By attracting new visitor expenditure to the local area the proposed development would create new employment opportunities for local residents. This could not only help to retain more people in the area but could also help the area to attract new workers. The economic impact of these opportunities was quantified in the previous section but what is more difficult to quantify is the effect that these opportunities could have on the dynamism and resilience of the local economy.

The new demand is also likely to create opportunities for enterprising local residents to start new businesses. As part of his wider investment in Dornoch for example the developer has already invested around £1 million in redeveloping the Dornoch Court House which had been closed and empty for several years. Renamed The Carnegie Court House currently hosts four businesses (a Tearoon & Deli, Whisky retail shop, Spa and the Service point/Visitors Centre) which combined employ over 35 people. will accommodate a number of local enterprises including a local distillery and tea-room, both of which will be managed and run by local residents. Since the opening of the Carnegie Courthouse several other entrepreneurs have opened businesses in Dornoch including Coccoa Mountain Chocolates, Dornoch Stores high-end grocery, Lily & Roux Boutque children clothier and the redevelopment of local Dornoch Hardware.

10.7.5.3 A Stimulus for Investment

As this report has demonstrated, the proposed development is expected to stimulate significant additional demand from golf tourists in the local area, which will support additional demand for tourist services. The development also represents the single biggest private investment in Dornoch in many, many years.

In addition to the direct investment in the golf course the developer has also already invested around £7 million developing a new 5* hotel in the town (Links House) and around a further £1 in upgrading the formally vacant court house to provide further tourist services. These developments provide a strong signal to the market about the developer's commitment to and expectations of the proposed development.

By investing in the Court House the developer has also made a direct contribution to the success of at least two new local enterprises (the tea-room and distillery referred to above). This investment is likely to be particularly valuable at a time when many small businesses struggle to secure finance for new ventures. The fact that a private individual is willing to invest such a substantial sum in the local economy should also provide a significant boost to the confidence of other prospective investors and provide a strong stimulus for further investment in the area.

10.8 COMMITTED MITIGATION MEASURES

Where mitigation measures are proposed, these will be put to the developer as 'recommended' mitigation measures. Those that are agreed to by the developer will be reported as 'committed' mitigation measures and the final evaluation completed accordingly. Committed mitigation measures will be listed/described below and summarised in the Summary of Effects table at the end of this annex.

This assessment has not identified any significant negative effects associated with the proposed development. As such, it is unnecessary to consider mitigation measures. The assessment has however identified some significant positive effects so it is important to consider how these effects could be enhanced.

Some of the positive effects (the operational effects and effects during the construction phase) would arise as a result of additional expenditure made by the developer, appointed contractors and their employees. The magnitude of these effects in the local area would depend on the proportion of expenditure that occurs in the local area. In order to maximise these effects, it is therefore recommended that the developer takes steps to ensure that local businesses secure as high a proportion of available contracts as possible. Such steps would include engaging with local businesses prior to the construction phase to ensure that they are aware of and know how to find out about new business opportunities. It could also involve adopting a local procurement policy to guide future procurement decisions.

This assessment has also identified that the proposed development has the potential to generate significant benefits for the local economy and communities as a result of stimulating golf tourism in the local area. The developer has already demonstrated a strong commitment to maximising these benefits by engaging extensively with local community interests, other local golf courses and business groups. It will be important that this engagement is maintained during subsequent phases of the project to ensure that these benefits are maximised.

In particular it is recommended that the developer continues to engage with the operators of other local golf courses and actively pursues the development of initiatives that would enable other local courses to benefit from the additional demand that the propose development is expected to stimulate.

10.9 RESIDUAL EFFECTS

The developer has already demonstrated a strong commitment to maximising the local economic benefits of the proposed development throughout the course of the project planning phase (for example by supporting the redevelopment of the Court House) so the economic impact assessment was undertaken with the expectation that this commitment would be maintained. The effects of the measures described above are therefore included in the economic impact estimates outlined above. The combined total of these impacts is summarised below.

10.9.1 Summary Economic Impact

By adding together the quantifiable economic impacts considered in this report it can be estimated that during its first year of operations the proposed development could:

- generate £4.2 million GVA for the local economy and support almost 120 jobs in the local area;
- generate £6.2 million GVA for the local economy and support almost 200 jobs across the Highlands; and
- generate £7.9 million GVA for the local economy and support around 250 jobs across Scotland as a whole.
- By the tenth year of operations it was estimated that this impact could have increased to:
- £8.1 million GVA and 250 jobs in the local area;
- £13.1 million GVA and around 450 jobs across the Highlands; and
- £20.1 million GVA and support around 680 jobs across Scotland as a whole.

This impact includes both the operational impact of the proposed development (i.e. the people employed on-site, the impact of expenditure on supplies and the impact of expenditure by employees) as well as the wider catalytic effect that the proposed development could have on the Scottish golf tourism sector.

In addition to the on-going, annual economic impact of the proposed development it was also estimated that the construction of the new course could:

- generate £1.4 million GVA for the local area and support 25 years of construction related employment;
- generate £2.5 million GVA across the Highlands and support 42 years of construction related employment; and
- generate £3.4 million GVA across Scotland and support 77 years of construction related employment.

10.9.1.1 Impact in Context

To help put these figures in context it is worth noting that in 2014:

- approximately 4,300 people in the local area were employed by the private sector; and
- around 950 of these individuals worked in the tourism sector.

This suggests that the proposed development has the potential to increase the total number of local jobs in the private sector by around 6% by year ten of operations. An increase of this scale would be equivalent to around a quarter of the jobs currently supported by the tourism sector in the local area and around 3% of the tourism related jobs across the Highlands as a whole.

To take this further it is also instructive to note that year end figures released by HIE in May 2016 (HIE, 2016) reported that 855 jobs were expected to be created or retained in the region as a result of the organisation's investments during the year. By year ten of operations this report has estimated that the proposed development could be supporting around 450 additional jobs in the Highlands, more than half the total number of new jobs supported by HIE in 2016.

A break-down of the impact of the proposed development in each study area is provided below. This illustrates that during the first year of operations 43% of the GVA and 80% of the jobs supported would arise, not as a result of on-site operations, but as a result of the additional demand the golf course is expected to stimulate elsewhere in the economy. It also shows that by the tenth year of operations it 59% of the GVA generated and 90% of the jobs supported in the local area by the proposed development would be associated with off-site activity. These off-site benefits would directly benefit the local economy and communities rather than the developer.

Table G.6: Total Economic Impact by Source – Local Area

Type of Impact	Year 1	Year 5	Year 10
GVA (£000s)			
Core Impacts	2,319	2,701	3,180
Supply Chain	67	71	77
Staff Expenditure	47	47	47
Total Operational Impact	*2,433*	*2,819*	*3,303*
Golf Tourism Impacts	1,852	3,110	4,803
Total GVA Impact	4,285	5,929	8,105
Jobs			
Core Impacts	21	21	21
Supply Chain	2	2	2
Staff Expenditure	1	1	1
Total Operational Impact	*24*	*24*	*24*
Golf Tourism Impacts	95	151	226
Total Jobs Impact	119	175	250

Table G.16: Total Economic Impact by Source – Highlands

Type of Impact	Year 1	Year 5	Year 10
GVA (£000s)			
Core Impacts	2,319	2,701	3,180
Supply Chain	120	127	136
Staff Expenditure	123	123	123
Total Operational Impact	*2,562*	*2,952*	*3,439*
Golf Tourism Impacts	3,645	6,318	9,658
Total GVA Impact	6,207	9,269	13,097
Jobs			
Core Impacts	21	21	21
Supply Chain	3	3	4
Staff Expenditure	3	3	3
Total Operational Impact	*27*	*27*	*27*
Golf Tourism Impacts	170	284	425
Total Jobs Impact	197	311	453

Table G.17: Total Economic Impact by Source – Scotland

Type of Impact	Year 1	Year 5	Year 10
GVA (£000s)			
Core Impacts	2,319	2,701	3,180
Supply Chain	241	256	274
Staff Expenditure	193	193	193
Total Operational Impact	*2,752*	*3,149*	*3,646*
Golf Tourism Impacts	5,168	10,196	16,482
Total GVA Impact	7,920	13,346	20,127
Jobs			
Core Impacts	21	21	21
Supply Chain	7	7	8
Staff Expenditure	4	4	4
Total Operational Impact	*32*	*33*	*33*
Golf Tourism Impacts	219	411	651
Total Jobs Impact	252	444	684

10.9.1.2 Conclusions

The proposed development is an ambitious project to create a world-class golf course specifically designed to appeal to high-value international visitors. It is expected that it would help to attract and retain significant numbers of high-value international visitors to Dornoch and help to transform the local area into one of Scotland's top golfing destinations. Evidence from elsewhere in the world suggests that these aspirations are likely to be achievable and could very well turn out to be conservative.

The rationale for the project rests on the fact that, although Dornoch is home to one of Scotland's top ranked golf courses and attracts significant numbers of golf tourists each year, the vast majority of these visitors currently spend little time – or money – in the local area. The conclusion of this assessment is that the proposed development has the potential to change this by fundamentally altering the current dynamics of golf tourism in the local area and in the Highlands.

By providing visiting golfers with a strong incentive to remain in Dornoch for at least two or three days the proposed development has the potential to create wealth and support employment in the local area and stimulate investment in local tourist facilities. Ultimately this should help to improve the quality of the overall tourism offering in the local area and help to support the competitiveness of the sector as a whole.

By creating a critical mass of top-ranked courses in the Highlands the proposed development also has the potential to significantly increase the length of time that the average golf tourist spends in the Highlands, generating wealth and supporting employment across the region as a whole. It is anticipated that over time this should help to establish the Highlands as an important destination in its own right for international golf tourists.

By helping to establish the Highlands as an important golf destination the proposed development would also increase the range of holiday options available to prospective international golf tourists. By increasing the product range within the overall Scottish golf tourism offer this should enhance the competitiveness of the sector and help Scotland to become the destination of first choice for a higher proportion of international golf tourists in the future.

10.10 SUMMARY OF EFFECTS

The table below summarises the effects assessed in this annex.

Table G.18: Summary of Effects

Project Phase	Receptor	Sensitivity	Description of Change (Pre-mitigation)	Level of Effect (Pre-mitigation)	Mitigation Measure	Magnitude of Change (Post-mitigation)	Level of Effect (Post-mitigation)	Nature of Effect			
								Positive/ Negative	Permanent / Temporary	Reversible/ Irreversible	Residual Significance
Operations	Embo and Dornoch communities	High	Improved community resilience, quality of life and economic opportunity	High	n/a	High	Major	Positive	Permanent	n/a	Major
Construction	Local economy	High	Additional economic activity and jobs supported in the construction sector and its supply chain.	Low	n/a	Very low	Moderate	Positive	Temporary	n/a	Moderate
	Highland economy	Medium		Very low	n/a	Very low	Slight	Positive	Temporary	n/a	Slight
	Scottish economy	Low		Negligible	n/a	Negligible	None	Positive	Temporary	n/a	None
Operations (operational impacts)	Local economy	High	New jobs created and activity supported on-site, within the	Low	n/a	Low	Moderate	Positive	Permanent	n/a	Moderate
	Highland economy	Medium		Very low	n/a	Very low	Slight	Positive	Permanent	n/a	Slight
	Scottish economy	Low		Negligible	n/a	Negligible	None	Positive	Permanent	n/a	None

Project Phase	Receptor	Sensitivity	Description of Change (Pre-mitigation)	Level of Effect (Pre-mitigation)	Mitigation Measure	Magnitude of Change (Post-mitigation)	Level of Effect (Post-mitigation)	Nature of Effect			
								Positive/ Negative	Permanent / Temporary	Reversible/ Irreversible	Residual Significance
			supply chain and by the expenditure of on-site staff.								
Operations (golf tourism impacts)	Local economy	High	New jobs created and activity supported by stimulus to golf tourism.	High	n/a	High	Major	Positive	Permanent	n/a	Major
	Highland economy	Medium		Medium	n/a	High	Moderate	Positive	Permanent	n/a	Moderate
	Scottish economy	Low		Medium	n/a	Medium	Minor	Positive	Permanent	n/a	Minor

10.11 REFERENCES

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11.0 COASTAL EROSION

A review was undertaken of the coastal processes at Coul Links in context of a proposed Golf Course development located just north of Embo. The review in its entirety is attached as Appendix ES.11 of this report. An extensive desktop study was undertaken that involved reviewing and assessing the findings of a range of technical documents, coastal change maps and survey data, in order to describe key coastal processes and sediment transport regime in the region of the study site. The primary aim of the desktop study was to determine the stability of the shoreline at the Coul Links and make recommendations that should be implemented to increase the sustainability of the project in context of the surrounding coastal processes.

A review of existing literature found the shoreline to be dynamically stable, which means that the position of the existing vegetation line will erode in response to arduous storm conditions and then recover during calmer conditions to maintain the natural quasi-equilibrium beach profile.

Inspection of publicly available coastal change maps found that the shoreline in front of the proposed 15th and 17th greens (where the golf course comes nearest the coast) had advanced shoreward by 1.6m – 2.5m between 1977 and 2009. A modest rate of sand build up in this area was also calculated.

During storm events, the dune system acts as a very flexible and highly effective buffer zone. The toe of the dune is usually eroded in such events, this supplies material to help minimise the general erosion along the entire section of shoreline. After the storm, the damaged dune will gradually be built up again to restore the natural quasi-equilibrium profile. By effectively managing the existing dune system it is possible to encourage the natural deposition of sediment material along the upper beach profile and increase the overall effectiveness of the dune system buffer zone.

Therefore, in order to maximise the sustainability of the proposed Coul Links development, it is imperative that the developers commit to an ongoing dune maintenance programme that will enhance the coastal processes in this area and maximise the natural protection that is currently afforded by the existing dune system. Enhancing the existing coastal processes and managing the dune system can be achieved by implementing environmentally friendly and sustainable soft engineering techniques including the installation sand trap fencing, planting pioneer species and maintaining the dune profile.

11.1 SAND TRAP FENCING

The effect of installing sand-trap fencing is to break the natural flow of sand within the dune transport system. Moving sand is vital for the health of sand dune vegetation, however, for vegetation to become established a degree of stability is required. This can be achieved by constructing sand trap fencing.

Where human interference has damaged foredunes, sand-trap fencing can repair this damage and facilitate a return to a state of equilibrium. The sand may be trapped and dispersed seasonally or it may lead to a long term build-up. In both cases there is a beneficial effect.

Vulnerable foredunes such as those at Coul Links can be protected by encouraging the seasonal development of embryo dunes using sand trap fencing. Excessive pedestrian traffic can cause serious fore-dune breaks resulting in the formation of active blowouts. Sand-trap fencing will help repair this damage without upsetting the dynamics of the system.

11.2 DUNE RECONSTRUCTION AND VEGETATION STABILISATION

Where dune faces have become over-steepened through erosion of the dune toe or a continual lowering of beach levels over many years, it can be difficult to acquire and retain a reasonable vegetation cover. Steep dunes will be continuously vulnerable to undercutting by wave action; resulting in failure and slumping of the upper dune face and the likely loss of a significant volume of sand to the offshore area. Re-profiling the dune to a more stable slope angle (usually around 1 in 2.5) will reduce the extent of damage caused if the toe of the dune is eroded by wave action.

The success of re-profiling can be enhanced by the planting of marram, seeding, sand trap fencing or, preferably a combination of all three. The aim of adopting a dune re-profiling, planting and fencing coastal protection strategy is to rebuild the fore dune over time before the next extreme event. The built up re-profiled fore dune then acts as a reservoir to feed sand onto the beach during a storm event. Where erosion is active, this buffer provides a short-term defence to assets behind the dunes, possibly only lasting through a single storm event.

11.3 MAXIMISE THE BUFFER ZONE WIDTH

Aside from building up the existing dune system through actively managing and enhancing the coastal processes, using the techniques described in the previous sections, it is also vital that that the width of the effective buffer zone between the proposed development and the dune system is maximised by the careful planning and construction of the Coul Links development.

To ensure that coastal defences are unlikely to be required into the future, it is recommended that every effort is taken to maximise the width of the buffer zone between the edge of the proposed 15th and 17th green and the edge of the current vegetation line. This can be achieved by constructing the greens as far landward as is permissible within the currently detailed maximum allowable footprint of the development, illustrated in the Golf Course Layout Plan submitted with the planning application.

11.4 LONG TERM MONITORING AND PLANNING

Although the dune system at Coul Links is considered to be dynamically stable, the future increases in relative sea level rise are likely to result in a trend of slow landward retreat of the vegetation line. It is imperative that a pro-active and environmentally sustainable strategy is adopted to monitor and mitigate this threat. It is therefore recommended that a robust coastal monitoring programme be implemented and a detailed study of the coastal processes in this area be commissioned, in order to quantify the risk of coastal erosion and develop a long term management plan.

Going forward, future increases in relative sea level rise due to climate change are likely to result in a trend of slow landward retreat along the Coul Links. Therefore, a coastal monitoring programme should be implemented and a robust coastal processes study should be undertaken to assess and quantify the risk of coastal erosion and develop an environmentally sustainable long term management plan for the course.

12.0 DIFFICULTIES IN COMPILING ANY SPECIFIED INFORMATION

No major difficulties were encountered in obtaining baseline information regarding the site of proposed development and its assets. Where necessary, further surveys, interviews and desk-based research was carried out to supplement existing available data. The best available methods were employed to forecast the potential environmental impacts that the proposed development would have on and near to the study area, but also on the wider surrounding landscapes and communities.

In circumstances where there was any uncertainty; evidence, expert opinion, best practice guidance and professional judgement have been used to evaluate what is likely to occur if the proposed development is to be agreed and constructed.

Any particular issues regarding the research gathering and writing of particular chapters which work to inform this EIS are described below:

12.1 ACCESS, TRAFFIC AND TRANSPORT

There were no particular difficulties encountered when compiling the specified information necessary during the researching and writing of the Access, Traffic and Transport annex by SYSTRA Ltd.

12.2 CULTURAL HERITAGE

.Some areas within the development boundary that were previously recorded as being of cultural significance were found by surveyors on walk-over surveys and therefore, many were assessed as having an unknown sensitivity. With the exception of this, no particular difficulties were encountered when compiling any specified information for use in the Cultural Heritage annex written by North Light Heritage.

12.3 HYDROLOGY AND HYDROGEOLOGY

There were no specific difficulties encountered when compiling the specified information used to conduct and write the Hydrology and Hydrogeology assessment written by 2Ic and STRI Group to inform this EIS.

12.4 LANDSCAPE AND VISUAL AMENITY

There were no specific difficulties encountered when compiling the Landscape and Visual Amenity Annex written by Optimised Environments.

12.5 ECOLOGY AND ORNITHOLOGY

Baseline surveys undertaken are based on sampling techniques, not absolute censuses. Results give an indication of the numbers of ecological receptors recorded at the particular times that surveys were carried out. Species occurrence changes over time and therefore the results presented in this ES are snapshots in time. Importantly, no information gaps were identified in the baseline survey data that would prevent assessments in line with the requirements of the EIA Regulations to be undertaken.

Putting ecology and ornithology survey results into a wider geographical context is sometimes challenging because most species and habitats have not been systematically surveyed beyond the study area. Thus, defining a population as locally or regionally important is potentially difficult because local or regional population estimates do not exist for most taxa and habitats. Whenever such uncertainty exists, professional judgement and published evidence is used and populations in the study area or site have been assumed to be at their highest potential level of geographical/ecological importance.

12.6 SOCIO-ECONOMICS

There were no specific difficulties encountered when compiling the specified information used to conduct and write the socio-economics Annex of this EIS by BIGGA Economics.