The Habitats and Vegetation (NVC) of Ardersier Port proposed for Development

[Redacted] **, Sept 2018**

1 Introduction

A National Vegetation Classification (NVC) survey was undertaken of Ardersier covering about 200 ha. The site is situated close to the village of Ardersier in Moray. In parallel to the NVC survey a Phase 1 Habitat survey was undertaken. The purpose of these surveys was to determine the conservation value of the site and to assess the ecological value of the wetland habitat of the site in terms of the Ground Water Dependent Terrestrial Ecosystems (GWDTE) that it contains.

Detailed descriptions of each of the habitats and NVC communities is presented below. The NVC classification is based on Rodwell (1991a, 1991b, 1992, 1995 and 2000) and the Phase 1 Habitats on the JNCC (2010). It should be noted that the descriptions in the report are based mainly on the information contained in the Appendices of this report and of the digital map supplied. All the maps in this report have been produced using ArcMap 10.6 and the shape file is available.

In view of the proposed development of the area, following the habitat and NVC descriptions, an ecological assessment of the site is presented.

The field survey was undertaken over three full days by the author from 6th August to 8th 2018.

1.1 The Appendices

This contains much of the compiled data from which the habitat and plant community descriptions have been derived.

In **Appendix A** and in Table 1 a list of all the NVC codes that have been mapped along with the main Phase 1 Habitats associated with this site are presented. The table also shows the areas in hectares represented for each of the NVC types mapped. Also shown are the Ground Water Dependent Terrestrial Ecosystem scores (GWDTE) for each NVC type. It should be noted that the GWDTE scores are derived mostly from SNIFFER (2007). However, SNIFFER only records the scores for NVC communities and not sub-communities. On this site there are significant floristic and habitat differences between some sub-communities. For a more complete and robust assessment of GWDTE and based on experience I have assigned four GWDTE categories in this report, whereas SNIFFER only currently recognizes three. The categories are as follows:

1. Highly Groundwater Dependent
2. Moderately Groundwater Dependent
3. Partially Groundwater Dependent
4. Not Groundwater Dependent

The nomenclature for vascular plants is adopted from Stace (2010) and for bryophytes by Hill *et a*l (2008). In **Appendix B**, a list of vascular plants is supplied along with Latin and vernacular names. Note that, in the body of the report only Latin names are supplied.

A set of detailed target notes (40 in total) were obtained during the field survey mainly pertaining to the floristic communities (NVC) that the site contains. These are presented in **Appendix C**. In **Appendix D** set of Phase 1 Habitat maps is presented and likewise in **Appendix E** a set of NVC and is supplied. Note, the Phase 1 Habitat has been simplified and only shows the main habitat type mapped for each polygon area. In **Appendix F** are a set of maps that graphically illustrate the areas that are ground water dependent. Finally, in **Appendix G**, a set of maps are shown that represent the main areas of nature conservation interest of this site.

2 Habitats and Plant Communities

This coastal site contains a moderately diverse range of habitats and plant communities, ranging from woodland and scrub to sand dune and swamp. Each of the habitats and associated plant communities (NVC) are described below. It should be noted that some of the vegetation at this site does not fit neatly into an NVC community and this is partly due to the coastal nature of the site and the widespread disturbance. Also, there are many ecotones represented where one vegetation type merges imperceptibly with another. The disused construction yard which covers a large area (over 80 hectares) has been mapped and is described in this report. There are also areas of spoil heap, tarmac tracks and platforms and some arable field margins. In total all these habitats cover just over half of the site area (105 hectares) and for statistical purposes they have been excluded from this report as they appear to have negligible conservation value and there are no GWDTE developed across them.

2.1 Semi-natural Broadleaved Woodland and Scrub (A1.1.1, A2.1)

Semi-natural woodland makes up about 3.3 % of the site (3.25 ha) but scrub makes up about 23% of the site (22.7 ha). The following types are represented:

W1	*Salix cinerea-Galium palustre* woodland
W4	*Betula pubescens-Molinia caerulea* woodland
W23	*Ulex europaeus-Rubus fruticosus* agg. scrub.
W24	*Rubus fruticosus* agg.-*Holcus lanatus* underscrub
SD18	*Hippophae rhamnoides* dune scrub

Floristically both W1 and W4 woodland are not that well developed and they have largely been defined by the canopy layer. For W1, *Salix cinerea* forms the main canopy tree but there can be occasional *Betula pubescens* and *Salix aurita*. For W4, the main canopy tree is *Betula pubescens* and *Salix cinerea* is occasional. Scattered *Pinus sylvestris* also occurs in places and this tree appears to have been self-sown[1]. *Sorbus aucuparia* and *Fraxinus excelsior* also occur at this site but they do not contribute significantly to any woodland cover.

[1] Unlikely that the pine here is of native origin

For W1 the field layer is variable, but the following are all represented locally: *Agrostis canina s.l.*, *Agrostis stolonifera*, *Carex nigra*, *Epilobium palustre*, *Galium palustre*, *Holcus lanatus*, *Juncus effusus*, *Potentilla anserina*, *Ranunculus repens*, *Rumex acetosa* and *Viola palustris*.

For W4 the main associates are *Agrostis canina s.l.*, *Dryopteris dilatata*, *Holcus lanatus*, *Holcus mollis*, *Juncus effusus* and *Potentilla erecta*. The constant *Molinia caerulea* is absent from W4. In damper areas and near margins of this woodland *Carex echinata*, *Erica tetralix* and *Hydrocotyle vulgaris* can be found along with *Sphagna*. For W1 the ground layer is poorly developed but the following bryophytes are represented locally: *Hypnum cupressiforme*, *Hylocomium splendens*, *Pleurozium schreberi*, *Pseudoscleropodium purum*, *Polytrichum commune* and *Rhytidiadelphus squarrosus*. For W4, the robust *Polytrichum commune* is locally abundant and there is occasional to frequent *Hypnum cupressiforme*, *Hylocomium splendens*, *Pseudoscleropodium purum* and *Rhytidiadelphus triquetrus*. Also, more locally are *Sphagna* (*Sphagnum fimbriatum* and *Sphagnum palustre*).

W1 is developed mostly over damp and probably acid to neutral mineral soils and is moderately ground-water dependent, whereas W4[2] is developed over damp acidic soils and here is only partially ground-water dependent.

For scrub, W23 is widespread and locally extensive and is composed of either *Cytisus scoparius* and *Ulex europaeus* or mixtures of both. There is occasional to frequent *Rubus fruticosus* agg. and where this shrub is dominant W24 is developed. However, the cover of W24 scrub is negligible compared with W23 scrub (see Appendix A). Where these scrub types are developed there are few other associates, but the following grasses are not uncommon: *Agrostis capillaris*, *Anthoxanthum odoratum*, *Arrhenatherum elatius*, *Holcus lanatus* and *Holcus mollis*. For other vascular plants there is occasional to frequent *Chamerion angustifolium*, *Cirsium arvense*, *Calluna vulgaris* and *Senecio jacobaea*. These vegetation types are developed mainly over mineral or sandy freely draining acidic soils.

The dune scrub community SD18[3] is only very locally developed and it is largely dominated by *Hippophae rhamnoides*. For the field layer the main associates are *Agrostis capillaris*, *Anthoxanthum odoratum*, *Chamerion angustifolium*, *Cirsium arvense*, *Holcus lanatus*, *Rumex acetosella* and *Senecio jacobaea*. *Ammophila arenaria* is occasional to frequent. This community is developed over sandy and freely draining acidic soils. Note, *Hippophae rhamnoides* is not native in this part of Scotland and can become invasive.

None of the scrub types developed at this site are GWDTE.

[2] According to SNIFFER W4 is highly groundwater dependent but this is only where the community is developed over sloping ground. It is typically associated with ombrogenous peaty soils that are isolated and elevated above the influence of groundwater enrichment.
[3] This has a separate Phase 1 category (H6.7) in the UK as it is mainly confined to the coast. However, it has spread inland and is frequently planted as an ornamental shrub.

2.2 Plantation (A.1.2.2)

There are a few small scattered plantations and plantings across the site, mainly in the southeast part of the site. *Pinus sylvestris* is the main tree but *Chamaecyparis lawsoniana* has also been planted locally. The site contains many scattered semi-mature to mature pines and these have been mapped in places as individual stands. Although many of the Scot's pine trees at this site are self-sown they are unlikely to be of native origin and they have been classed as plantation rather than pure semi-natural coniferous woodland. Thus, near the lagoon there are several notable but small areas where *Pinus sylvestris* has spread or been planted. In total, plantation covers about 3.1% of the site area.

The plantations are relatively species-poor. Locally *Calluna vulgaris* is abundant and there is occasional to frequent *Agrostis capillaris*, *Deschampsia flexuosa* and *Holcus lanatus*. For the ground layer *Hylocomium splendens* and *Polytrichum commune* are not uncommon.

All the plantations at this site occur over freely draining acid soils and are not GWDTE.

2.3 Acid Grassland (B1.1)

This habitat is quite local and confined to the southeast corner of the site. It covers about 5.3% of the site area. It is represented by only one community – the *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland (U4).

Floristically this is a rather species-poor grassland. For the field layer the constants *Agrostis capillaris*, *Anthoxanthum odoratum* and *Galium saxatile* are frequent throughout. *Festuca ovina* agg. is locally abundant and *Potentilla erecta* is occasional to frequent. The moss *Rhytidiadelphus squarrosus* is also locally abundant but on this site the mosses *Hylocomium splendens* and *Pseudoscleropodium purum* are more common.

Apart from the above, *Holcus lanatus*, *Poa pratensis s.l.* and *Rumex acetosa* are not uncommon. Also, *Holcus mollis* is locally abundant and there is occasional *Carex binervis* and *Nardus stricta*. The local abundance of tall grasses such as *Holcus lanatus* and *Holcus mollis* gives the impression that this vegetation is similar to neutral grassland (B2.1) which it grades with at this site.

Here U4 is developed over freely draining acidic soils and is not groundwater dependent.

This grassland is currently not intensively grazed and is vulnerable to invasion by scrub and trees.

2.4 Neutral grassland (B2.1)

Like the acid grasslands, neutral grassland is also rather species-poor but is typically more diverse. Here neutral grassland is represented by the following two communities:

MG1 *Arrhenatherum elatius* community
MG10 *Holcus lanatus-Juncus effusus* rush-pasture

This habitat covers about 6% of the area and is well developed in the south-east part of the site.

The *Arrhenatherum elatius* community is local but widespread and is particularly well developed along the margins of the tarmac tracks and roads that cross the site. Here it often occurs juxtaposed with W23 scrub. The community is dominated mainly by tall grasses such as *Arrhenatherum elatius*, *Dactylis glomerata* and *Holcus lanatus* but *Agrostis capillaris*, *Anthoxanthum odoratum*, *Holcus mollis* and *Phleum pratense* are locally abundant. Tall herbs are also not uncommon, and the main ones include: *Chamerion angustifolium*, *Cirsium arvense*, *Heracleum sphondylium*, *Senecio jacobaea* and *Vicia cracca*. Bryophytes are sparse.

MG10 is locally extensive and the bulk of the cover is made up by the grasses *Holcus lanatus* and *Holcus mollis* and by the rush *Juncus effusus*. There can be occasional to frequent *Anthoxanthum odoratum*, *Agrostis capillaris* and *Dactylis glomerata*. The presence of *Galium saxatile* and *Potentilla erecta* suggests that locally this vegetation is transitional to U4 acid grassland.

MG1 is developed over freely draining neutral soils. It is not groundwater dependent. MG10 is developed over moist acidic to neutral soils that are locally periodically inundated. This grassland is probably partially groundwater dependent.

Note that, where the cover of *Juncus effusus* exceeds 25% within stands of MG10 this has been mapped as Marshy grassland (B5)

2.5 Marshy grassland (B5)

At this site, marshy grassland covers about 5.5% of the site area. It is not floristically diverse but where it grades imperceptibly with swamp there are notable ecotones and the vegetation is more diverse. The following NVC types are represented:

M23b *Juncus effusus-Galium palustre* rush pasture, *Juncus effusus* sub-community
M27c *Filipendula ulmaria-Angelica sylvestris* mire, *Juncus effusus-Holcus lanatus* sub-community
MG9 *Holcus lanatus-Deschampsia cespitosa* grassland
MG10 *Holcus lanatus-Juncus effusus* rush-pasture

Here M23b is locally extensive and typically *Juncus effusus* is the dominant plant – indeed in most areas it's cover exceeds 50%. Associates can vary widely but the most frequent ones are: *Agrostis stolonifera*, *Epilobium palustre*, *Holcus lanatus*, *Myosotis laxa*, *Ranunculus repens*, *Rumex acetosa*, *Senecio jacobaea* and *Viola*

palustris. *Angelica sylvestris* is locally abundant and in better draining stands one can find *Agrostis capillaris*, *Anthoxanthum odoratum*, *Arrhenatherum elatius*, *Deschampsia cespitosa*, *Elymus repens*, *Equisetum arvense*, *Plantago lanceolata* and *Prunella vulgaris*. Where the community merges with swamp, *Carex rostrata* is frequent and there is occasional to frequent *Galium palustre*, *Hydrocotyle vulgaris* and *Veronica scutellata*. The invasive *Crassula helmsii* is locally abundant in M23b, particularly by the lagoon. Also, not uncommon is the grass *Schedonorus arundinaceus* and the forb *Sonchus arvensis* which are indicative of brackish conditions. The presence of those species is indicative of a transition to MG12 grassland. The orchid *Dactylorhiza purpurella* was noted but appears to be scarce.

Unlike M23b, M27c is very local in extent. This vegetation type is like M23b but contains abundant *Filipendula ulmaria*. The main associates include: *Epilobium palustre*, *Holcus lanatus*, *Juncus effusus* and *Ranunculus repens*.

MG9 is very local and was only noted in one area. Here the vegetation is dominated by *Deschampsia cespitosa* and *Holcus lanatus* with abundant *Cirsium arvense*, *Juncus effusus*, *Phleum pratense* and *Ranunculus repens*. Bryophytes are sparse.

MG10 is a variable community and for a full description see Section 2.5 above.

Here, both M23b and M27b are associated with neutral to brackish mineral and partially organic soils that are periodically inundated and generally poorly draining. They are partially to moderately groundwater dependent.

Both MG9 and MG10 are developed mostly over moist acidic to neutral soils that are locally periodically inundated. These marshy grassland communities are only partially groundwater dependent.

2.6 Swamp and Inundation Vegetation (F1 and F2)

This vegetation is well developed along the margins of the lagoon and to the south of the lagoon margin. At Ardersier swamp is only confined to this area but there is a small patch of inundation vegetation at the southeast end of the site. At this site many of the swamps are not typical as they contain “brackish” elements and also locally the invasive *Crassula helmsii* is abundant. The main types are:

S9 *Carex rostrata* swamp
S12 *Typha latifolia* swamp
S14 *Sparganium erectum* swamp
S19 *Eleocharis palustris* swamp
S27 *Carex rostrata*-*Comarum palustre* tall-herb fen
S28 *Phalaris arundinacea* tall-herb fen

Inundation vegetation (F2.1) is represented by the following two communities:

SD17 *Potentilla anserina*-*Carex nigra* dune-slack community
MG12 *Schedonorus arundinaceus* grassland

In total swamp and inundation vegetation cover about 2.4% and 0.16% of the site area respectively.

S9 swamp is very local and is confined to the margins of the lagoon. It is dominated by *Carex rostrata* with few other associates.

S12 swamp is also local and is characterized by the abundance of *Typha latifolia*. Associates are few but there is occasional to frequent *Carex rostrata*, *Galium palustre* and *Myosotis laxa* and occasional *Triglochin palustris*. Also notable is the local abundance of *Crassula helmsii*.

S14 swamp is local and peculiar in that although *Sparganium erectum* is conspicuous throughout, the invasive *Crassula helmsii* forms an almost continuous carpet. Apart from these two species there are few associates. *Juncus effusus* is occasional but the locally rare *Bidens cernua* is not uncommon in this community.

S19 swamp forms a prominent fringe around the margin of the lagoon which is only partially interrupted by S9 and S12 swamp. This swamp type is dominated by *Eleocharis palustris*. However, locally *Crassula helmsii* and *Hydrocotyle vulgaris* are abundant.

The richest swamp type is S27 which is locally extensive just south of the lagoon. Apart from M4 mire this swamp type is the only community on this site that comes close to resembling a fen. *Carex rostrata* is the most abundant plant in this community but *Crassula helmsii* which is not typical of S27 is also abundant. Frequent associates include *Cardamine pratensis*, *Epilobium palustre*, *Galium palustre*, *Juncus articulatus*, *Myosotis laxa*, *Ranunculus flammula*, *Ranunculus repens* and *Veronica scutellata*. There is also occasional *Agrostis stolonifera*, *Carex nigra*, *Comarum palustre*, *Eriophorum angustifolium*, *Potentilla anserina*, *Potamogeton polygonifolius* and *Typha latifolia*. One of the constants *Menyanthes trifoliata* is sparse or absent from this community and this is probably indicative of the brackish conditions of the lagoon area.

Bryophytes occur in this community, but they are not abundant. The most frequent one is *Calliergon cordifolium* and there is occasional *Calliergonella cuspidata*.

A few small stands of S28 occur to the south of the lagoon. This community is dominated by *Phalaris arundinacea* with occasional to frequent *Juncus effusus*.

At Ardersier the SD17 community (which is typically a dune slack community) is best described as an inundation community. The best stands of SD17 occur close to the margin of the lagoon where it is periodically inundated. One small stand was also detected at the southeast end of the site. The constants *Agrostis stolonifera* and *Potentilla anserina* are abundant throughout and *Calliergonella cuspidata* (a moss) which is also a constant is frequent to locally abundant. The constant *Carex nigra* is locally abundant. Other frequent associates are *Carex arenaria*, *Epilobium palustre*, *Galium palustre*, *Crassula helmsii*, *Juncus effusus*, *Ranunculus flammula* and *Viola palustris*. *Juncus articulatus* and *Hydrocotyle vulgaris* are locally abundant. Stands of SD17 have a moderate bryophyte cover. The main species are *Calliergon cordifolium*, *Calliergonella cuspidata* and *Rhytidiadelphus squarrosus*.

MG12 is a very local type and is developed in the vicinity of the lagoon. Here the vegetation is characterized by the tall grass *Schedonorus arundinaceus*. Associates included *Agrostis stolonifera*, *Holcus lanatus*, *Juncus effusus*, *Potentilla anserina* and *Rumex acetosa*. The sedge *Carex otrubae* is local here.

The following swamp types: S9, S12, S14, S19 and S27 are associated with shallowly to moderately deep waters and on this site are associated with mainly mineral soils that are probably mesotrophic and brackish. Unlike the other swamp types S28 swamp can tolerate permanent flooding and is associated typically with lower water tables. Here it is associated with silty soils that are probably mesotrophic and brackish.

SD17 is typically a community of dune-slacks but in Scotland it forms part of a continuum with wetter grasslands to the vegetation of swamps and mires (Dargie, 1993). In Scotland it occurs in a number of inland sites including Loch of Lintrathan (Loizou, 2006). Here it is associated with mineral soils that are periodically inundated.

According to SNIFFER (2007) none of the swamp types described here are groundwater dependent but SD17 is strongly groundwater dependent. Here, MG12 is developed over freely draining mineral soils that are periodically inundated and brackish. It is not groundwater dependent.

2.7 Basin Mire (E3.2)

A poor-fen community the *Carex rostrata-Sphagnum fallax* mire (M4) is developed at the southeast end of the site but it is transitional in character. It covers about 0.4% of the site area.

Here M4 is dominated by *Carex rostrata* and *Juncus effusus*. *Sphagnum* cover is high (>50%) and the main bog mosses are *S. fallax*, *S. fimbriatum* and *S. palustre*. The constant *Sphagnum cuspidatum* is absent from this vegetation and suggests that the soils are less acidic than is typical for this community.

Apart from the species listed above there are few associates. However, *Hydrocotyle vulgaris* is locally abundant and *Epilobium palustre* is frequent. There is also occasional to frequent *Comarum palustre* and *Eriophorum angustifolium*. Apart from *Sphagnum* among the bryophytes there are a few prominent patches of *Polytrichum commune*. Saplings of *Betula pubescens* are not uncommon and its presence suggests a probable succession to W4 woodland.

According to SNIFFER (2007), M4 is moderately groundwater dependent.

2.8 Strandline (H3 and H5)

There are small but prominent stretches of strandline vegetation developed along the coastal fringes of this site. Along the shingle banks of the northern shore of Whiteness Head are mixtures of *Atriplex* species and also present are *Ammophila arenaria*, *Rumex crispus*, *Silene uniflora*, *Sonchus arvensis* and *Tripleurospermum*

maritimum. The *Honckenya peploides-Cakile maritima* strandline community (SD2) is also developed locally and is dominated mainly by *Honckenya peploides*.

Toward the prominent spit of Whiteness Head, the beach is sandy and there are good stands of *Cakile maritima*.

2.9 Open dune (H6.8)

This habitat is developed toward the head of the spit at Whiteness Head and also in the dune area to the south of this. It covers about 19% of the site area. This habitat comprises three zones (fore dune, yellow dune and grey dune) all of which are present at this site. The communities associated with open dune are:

SD4 *Elytrigia juncea* foredune community
SD6 *Ammophila arenaria* mobile dune community
SD11 *Carex arenaria-Cetraria aculeata* dune community

The fore dune is made up exclusively by SD4. The community is characterised by the abundance of the salt tolerant *Elytrigia juncea*. Associates are few and sparse but include *Atriplex littoralis*, *Atriplex prostrata*, *Honckenya peploides*, *Plantago maritima*, *Sonchus arvensis* and *Tripleurospermum maritimum*. The community is widespread but not extensive and forms a narrow zone, rarely more than 4 m wide.

The yellow dune is locally extensive but is eroding in places. It is made up by the SD6 community which is dominated by the tall tussocks of *Ammophila arenaria*. For SD6 there are many associates, but few are abundant. The main ones on this site are: *Agrostis capillaris*, *Chamerion angustifolium*, *Cirsium arvense*, *Festuca rubra*, *Holcus lanatus*, *Hypochaeris radicata*, *Senecio jacobaea* and *Sonchus arvensis*. Bryophytes are rather sparse but there is occasional *Brachythecium albicans*, *Ceratodon purpureus* and *Pseudoscleropodium purum*.

Elytrigia juncea is occasional in SD6 and the robust *Leymus arenarius* is also locally frequent. *Carex arenaria* is also locally frequent but not abundant.

The grey dune is also locally extensive and comprises stands of SD11.

For SD11, the community is characterised by the abundance of lichens. The main ones include various *Cladonia* species that include: *Cladonia furcata*, *Cladonia ramulosa*, *Cladonia rangiformis* and *Cladonia portentosa*. The constant *Cetraria aculeata* is also occasional to frequent and *Hypogymnia physodes* is conspicuous. Bryophytes are also not uncommon, and they include *Polytrichum juniperinum* and *Syntrichia ruraliformis*. Vascular plant cover is variable but typically low (<40 %). Surprisingly the constant *Carex arenaria* is only locally frequent. Other associates include *Agrostis capillaris*, *Ammophila arenaria*, *Anthoxanthum odoratum*, *Aira praecox*, *Chamerion angustifolium*, *Festuca ovina* and *Chamerion angustifolium*. More local is *Filago minima* and in places *Calluna vulgaris* is not uncommon.

It should be noted that the rare *Cladonia mitis* might occur at this site and further investigation might reveal the presence of this species.

At this site lichen assemblages have developed across the disused platform construction yard. These assemblages resemble SD11 but appear to lack key elements. More details of these assemblages are provided by Andy Acton.

2.10 Dune grassland (H6.4)

This comprises mostly fixed dune vegetation with an almost complete vegetation cover. It covers about 14% of the site area. The following four communities are represented at this site:

SD7 *Ammophila arenaria-Festuca rubra* semi-fixed dune community
SD8 *Festuca rubra-Galium verum* fixed dune grassland
SD9 *Ammophila arenaria-Arrhenatherum elatius* dune grassland
SD12 *Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland

In many ways SD7 is a transitional dune community which is best described as a semi-fixed dune grassland type. Here bryophytes are conspicuous, and the vegetation is less open than in stands of SD6. *Ammophila arenaria* remains abundant throughout but there is also frequent to abundant *Anthoxanthum odoratum*, *Carex arenaria*, *Festuca rubra*, *Holcus lanatus* and *Hypochaeris radicata*. *Chamerion angustifolium*, *Poa pratensis s.l.* and *Cerastium fontanum* and *Senecio jacobaea* are occasional to frequent. For bryophytes the most frequent species are *Brachythecium albicans*, *Ceratodon purpureus*, *Dicranum scoparium*, *Hypnum cupressiforme* and *Rhytidiadelphus triquetrus*. In some areas *Syntrichia ruraliformis* is abundant. Lichens are occasional but not typically abundant. *Peltigera* species occur locally.

SD8 is the richest grassland dune community and it occurs locally along the spit of Whiteness Head. It is associated with freely draining soils that have been locally enriched by sea shells. Most of the species associated with SD7 also occur here but additional ones include: *Euphrasia* agg., *Galium verum*, *Linum catharticum*, *Lotus corniculatus*, *Plantago lanceolata*, *Thymus polytrichus* and *Viola tricolor*. Note that, the local presence of *Armeria maritima* suggests transitions to maritime grassland (see Section 2.12).

SD9 is also well developed along the spit of Whiteness Head and is more extensive than SD8. Superficially this community resembles SD6 as *Ammophila arenaria* is abundant throughout. However, unlike SD6 this community contains an abundance of other tall grasses that include *Arrhenatherum elatius*, *Dactylis glomerata* and *Holcus lanatus*. Other frequent associates are *Anthoxanthum odoratum*, *Festuca rubra* agg., *Plantago lanceolata*, *Poa pratensis s.l.* and *Senecio jacobaea*. *Chamerion angustifolium* is locally abundant and there is occasional to frequent *Hypochaeris radicata*, *Pilosella officinarum* and *Veronica officinalis*. Bryophytes are not uncommon. Note, patches of *Ligusticum scoticum* also occur mainly within this vegetation but this coastal species appears to favour shingle rather than sandy soils.

SD12 is also locally developed along the spit of Whiteness Head. It is developed over freely draining acid soils. The most abundant species are *Agrostis capillaris*, *Anthoxanthum odoratum*, *Festuca ovina* agg., *Holcus lanatus* and *Plantago lanceolata*. There is also occasional to frequent *Calluna vulgaris*, *Carex arenaria*, *Lotus corniculatus*, *Veronica officinalis* and *Viola riviniana*. *Ammophila arenaria* is frequent but unlike SD9 it is not that conspicuous. There is also occasional *Viola canina*. Bryophyte cover is high, and the main species are *Dicranum scoparium*, *Hylocomium splendens*, *Pleurozium schreberi* and *Rhytidiadelphus triquetrus*.

2.11 Dune heath (H6.6)

Although *Calluna vulgaris* is not uncommon at this site (as individual shrubs) dwarf shrub heath is very local and is confined mainly to the spit. Here the *Calluna vulgaris-Carex arenaria* heath (H11) is locally developed but it covers a mere 0.02% of the site area.

For H11, *Calluna* is abundant throughout and there is occasional *Erica cinerea*. The constant, *Carex arenaria* is also frequent but its cover seldom exceeds 10 %. Other frequent associates are *Agrostis capillaris*, *Anthoxanthum odoratum*, *Festuca ovina* agg., *Lotus corniculatus*, *Plantago lanceolata* and *Veronica officinalis*. There is also occasional *Pilosella officinarum* and *Viola canina*. Bryophyte cover is high, and the main species are *Dicranum scoparium*, *Hylocomium splendens* and *Rhytidiadelphus triquetrus*. The lichen *Cladonia portentosa* is not uncommon.

Note that, along the spit there are a number of prominent patches of *Empetrum nigrum*. Although *Calluna* is sparse this vegetation is probably best placed within H11 and the *Empetrum nigrum* sub-community (H11b). In Scotland, crowberry is also associated with more stable shingle structures and is also influenced by natural cycles of degeneration and regeneration of the shrub vegetation that occurs on some of the oldest ridges (JNCC, 2016, European Habitats Directive).

2.12 Maritime coastal grassland (H8)

This has developed locally along shingle toward the western end of the spit of Whiteness Head. It covers about 0.67% of the site area. Here, *Festuca rubra-Armeria maritima* maritime grassland (MC8) is developed. The community is characterised by the constants *Armeria maritima* and *Festuca rubra* and frequent associates include *Aira praecox*, *Hypochaeris radicata*, *Koeleria macrantha*, *Lotus corniculatus* and *Plantago lanceolata*. Bryophyte cover is high, and the main species are *Dicranum scoparium*, *Hypnum cupressiforme* var. *lacunosum* and *Rhytidiadelphus triquetrus*.

Note, none of the communities listed in the above five sections (2.8, 2.9, 2.10, 2.11 and 2,12) are groundwater dependent.

2.13 Saltmarsh (H2.6)

The best development of saltmarsh occurs in an area known as the Carse of Delnies it is also developed at the western end of the site just west of the lagoon. Saltmarsh makes up about 2.8% of the site area investigated but it extends eastward beyond the site boundary for over 1.5 km. The following NVC types occur:

SM13	*Puccinellia maritima* saltmarsh
SM13a	*Puccinellia maritima* sub-community
SM13b	*Glaux maritima* sub-community
SM16	*Festuca rubra* saltmarsh community

The *Puccinellia maritima* saltmarsh (SM13) is typically dominated by *Puccinellia maritima*. However, for SM13a *Salicornia* species and *Suaeda maritima* are also frequent to abundant and there is occasional *Aster tripolium*. For SM13b, *Glaux maritima* is abundant and there is occasional *Armeria maritima*, *Plantago maritima* and *Spergularia media*. For SM16 *Festuca*

rubra is prominent throughout and *Armeria maritima*, *Glaux maritima*, *Plantago maritima* and *Spergularia media* are frequent to abundant.

None of the saltmarshes are groundwater dependent.

2.14 Brackish water (G1.6)

There is an area of open water (the lagoon) that contains the locally rare *Potamogeton pectinatus*[4]. The lagoon itself covers about 3% of the site area and although no other species were identified, the locally rare *P. filiformis* could also occur in the lagoon. Note, the invasive *Crassula helmsii* which is locally abundant is not invading the lagoon itself and this is probably due to the brackish conditions of this open water body.

2.15 Disturbed Ground, Spoil and Tracks (J5.1, C3.1)

The site of the disused construction yard covers a large area (over 80 hectare) where ruderal vegetation has developed. Lichen assemblages have also developed in this area. Also developed locally (in the western part) are mobile dunes (mostly SD6). Among the ruderal vegetation *Chamerion angustifolium* is locally abundant and the OV27 community is locally developed. This community also occurs locally along the side of tracks and roads. Less common is OV25 which has abundant *Cirsium arvense*. There are many vascular plant species represented in the disturbed area but NVC types are not well developed and GWDTE are absent. Among the vascular plants *Centaurium littorale* has been reported in the area (see Section 3 below). Although this species is Nationally Scarce it is not uncommon along the Moray coast (particularly at Culbin), where the author has monitored many populations (Loizou, 2014) of high numbers (>1000 plants). The area also has scattered scrub of mostly *Cytisus scoparius* and *Ulex europaeus*. However, locally there is some *Betula pubescens*.

Among the vascular plants all the following are not uncommon, and a few are locally abundant: *Agrostis capillaris*, *Chamerion angustifolium*, *Erodium cicutarium*, *Rumex acetosella*, *Senecio jacobaea* and *Trifolium dubium*. Locally there is also some *Aira praecox*, *Carex arenaria*, *Centaurium erythraea*, *Filago minima*, *Festuca ovina* agg., *Hypericum perforatum*, *Hypochaeris radicata*, *Lotus corniculatus* and *Plantago major*.

2.16 Miscellaneous vegetation

At the south east corner of the site there are large patches of the robust moss *Polytrichum commune* with few associates. These prominent tall cushions are developed over damp acidic ground where there is impeded drainage. There is no NVC equivalent for this vegetation apart from possibly M6 mire. Note that, often these patches occur close to scrub or woodland and they are often surrounded by acid grassland vegetation.

[4] The plant has been verified by Chris Preston.

3 Vascular Plants

Many taxa are represented at this site (see Appendix B). The list provided in Appendix B is not exhaustive and apart from two exceptions only shows the species found in August. Early flowering annuals and orchids would be missed. Although not found by the author there are recent records for the Nationally Scarce *Centunculus minimus* and *Centaurium littorale* at the site. *Centaurium littorale* is reported at NH814574, where several thousand plants were recorded on 04/08/2017 by the Vice County Recorder.

The locally rare *Bidens cernua* has not been reported in the area for over 20 years and the lagoon area undoubtedly contains one of the best populations of this plant in northern Scotland. Although a population estimate was not obtained for this site there are probably over 1000 plants present at this site. Along Whiteness Head there are good populations of *Ligusticum scoticum*.

The brackish lagoon contains *Potamogeton pectinatus* which is also a local rarity.

4 Invasive Species

The presence of *Crassula helmsii* is a cause for concern. It is abundant in the vicinity of the lagoon. *Hippophae rhamnoides* has become established at this site but it cannot be classed yet as being truly invasive. Along Whiteness Head there are two prominent patches of *Rosa rugosa* which have been mapped. This robust rose species could potentially spread.

5 Ecological Assessment

Ardersier contains a diverse range of habitats and plant communities. Part of the site occurs within the Whiteness Head SSSI and there is little doubt that based on the findings of this report that the SSSI which includes the lagoon is the most ecologically interesting part of the site.

If this area (the SSSI) can be mostly safeguarded the development is unlikely to have a widespread negative impact on the habitats and plant communities of the area. However, migratory and other birds might be affected by the development.

It is clear from the findings that the most diverse assemblages of plant communities and species occur along the Whiteness Head Spit and within the lagoon area.

Along Whiteness Head all the following communities can be found: SD2, SD4, SD6, SD8, SD9, SD12, MC8, H11 and W23. Apart from a few patches of the invasive *Rosa rugosa* the area contains a series of communities and a flora which is typical of a coastal headland spit. The dynamic nature of this geomorphological feature is partly what makes the area of great interest. For instance, the changing nature of the Spit has created opportunities for more mobile plant assemblages to become established. For example, at the western end of the Spit there are good stands of *Cakile maritima* with various *Atriplex* species.

Toward the western end of the SSSI is an area known as the Carse of Delnies. Here saltmarsh is well developed, and this area has been assigned the highest conservation score (4) for this site (see Appendix G and Section 5.4). This maritime habitat contains lower to middle saltmarsh assemblages which are lacking in many parts of Scotland. Also, there are good stands of *Salicornia* (Glasswort) and *Suaeda maritima* that are not encountered in many other coastal areas of Scotland. This saltmarsh area is also important for wintering birds and thus further promotes the conservation status of it.

If managed sympathetically a local development is unlikely to impact on the saltmarsh itself. Nevertheless, any pollution could be detrimental to the integrity of the saltmarsh vegetation and would impact on birds.

The lagoon area is of major significance for the large population of *Bidens cernua* that it contains and is undoubtedly one of the largest populations of this plant in Northern Britain (personal communication with Andy Amphlett, August 2018). The lagoon itself also contains *Potamogeton pectinatus* and possibly *Potamogeton filiformis* neither of which are common in this part of Scotland.

The associated swamp, inundation vegetation and marshy grassland associated with the lagoon contain a wide range of NVC communities: All the following are represented: S9, S12, S14, S19, S27, S28, SD17, M23b, MG12 and MG1.

Although wetland habitats are represented at this site, GWDTE are not on the whole well developed. For example, according to SNIFFER (2007) none of the swamp types listed above are GWDTE. Although SD17 is reported as a highly groundwater dependent ecosystem it is localised in extent and appears to be functioning as an

“inundation” community rather than a true “dune slack” community. Thus, on this site, all of the SD17 is probably only partially groundwater dependent (score of 3).

The marshy grasslands described in this report are partially to moderately ground water dependent (scores 2 to 3). Nevertheless, M23b which is dominated largely by *Juncus effusus* is not particularly diverse and this vegetation type is fairly widespread in Scotland. The few stands of MG9 and MG10 that fall into the category of marshy grassland are also not that diverse floristically and are at best only partially groundwater dependent.

If possible areas of W1 and W4 woodland should be retained. Semi-natural woodland vegetation is very local in the north of Scotland and covers a small portion (probably less than 5% of the land area). However, none of the semi-natural woodland is floristically diverse. Nevertheless, the woodland vegetation could diversify, and it provides habitats for mammals and birds. W1 is moderately groundwater dependent (score of 2) whereas all of the W4 woodland is only partially groundwater dependent (score of 3).

A small basin mire occurs at the southeast end of the site where the M4 community is developed. This community is moderately groundwater dependent and although not floristically diverse should be retained. This area is dynamic and colonization by birch is a real possibility and if this happens, the fen will eventually succeed to W4 woodland.

The site contains large areas of scrub. Much of the scrub is dominated by *Cytisus scoparius* and *Ulex europaeus* (NVC W23). Floristically this vegetation is not diverse, but the mosaics of scrub and grassland provide habitats for small mammals and birds.

There is also some *Rosa rugosa* scrub along Whiteness Head and there are a few patches of young birch and willow scrub.

Lichens are not uncommon and are particularly conspicuous within stands of SD11. A full review of this group is presented in a separate report by the lichenologist Andy Acton.

5.1 Invasive Species

Although it would be desirable to eradicate *Crassula helmsii* from this site it would be a major undertaking and not likely to succeed. The only possible way to eradicate this plant would be to completely destroy the swamp habitats associated with it. At present the locally rare *Bidens cernua* grows in close association with this alien and would also be eradicated if stringent measures are taken. A report by Ewald (2014) of the Freshwater Habitats Trusts concludes that *Crassula helmsii* cannot be effectively eradicated and that undertaking various treatments over a long time period is likely to be detrimental to the native wetland flora.

In the future some form of biological control might be effective but could also introduce further problems.

Hippophae rhamnoides and *Rosa rugosa* are also invasive species but at present they only cover a limited area. Nevertheless, these two species should be monitored.

Fallopia japonica occurs along the west side of the road at NH 830551 but it is not abundant.

5.2 Pollution

This is currently not a major problem at this site but locally beach litter is conspicuous along the Spit of Whiteness Head. This could be cleared by encouraging local groups to clean the beach. A new development could potentially create pollution issues, and this would need to be addressed and monitored effectively.

5.3 Coastal Processes

Analysis of past maps reveals that the spit is extending westward. However, the dunes situated to the north and west of the lagoon are eroding. This erosion will lead to some localised loss of dune habitat but is unavoidable.

5.4 Conservation Evaluation

The site contains a number of UK Bap Priority Habitats and these will be briefly considered below.

Coastal Vegetated Shingle This habitat is developed along the spit of Whiteness Head. It contains a range of vascular plants (listed in Section 2.3) and is important for invertebrates and birds. Shingle structures are of geomorphological interest and at this site have taken the form of a spit and a shingle barrier. Here the shingle feature is not completely independent but forms part of a dynamic coastline with varying deposits of silt and sand. According to JNCC (2008) there is about 700 ha. of coastal vegetated shingle in Scotland and it is considered to be a comparatively rare feature in the UK. This is also a European Annex 1 Habitat (1210 and 1220).

Coastal Sand Dunes This habitat is also well developed along the spit of Whiteness Head and it merges with the coastal vegetated shingle forming distinct zonations. Many dune communities are represented at this site and they have been listed above and in Sections 2.9, 2.10 and 2.11 of this report. The dune vegetation situated just north and west of the lagoon area is in variable condition. It is eroding in places and has also been disturbed (by spoil and the construction of the platform). In the past the dunes in this area would have been more extensive and would have contained dune slack communities. For these reasons the area has a lower conservation score than would be typical of a natural mobile dune system (see Appendix G). Within this broad habitat there are several European Annex 1 Habitats represented at this site. Fixed dunes with herbaceous vegetation (2130) are well represented but there is also some limited development of Shifting dunes (2120) and Embryonic shifting dunes (2110). Also very locally developed are

Atlantic De-calcified fixed dunes (2150) and possibly Decalcified fixed dunes with *Empetrum nigrum* (2140)[5].

Coastal Saltmarsh This habitat is best developed in an area known as the Carse of Delnies. Here, the saltmarsh is in good condition and has an abundance of *Salicornia* species and *Suaeda maritima*. According to the JNCC (2008) about 3% of the Scottish coastline consists of saltmarsh. Therefore, it is a comparatively rare habitat and furthermore lower saltmarsh communities containing *Salicornia* are even rarer. Saltmarshes are also an important resource for wading birds and wildfowl. For these reasons, this area has been given the highest conservation score for this site (see Appendix G). This habitat is also a European Annex 1 Habitat (1330 and possibly 1310).

Lowland Fens This habitat is not well developed at this site but there is a small basin mire situated in the south-east section of the site. Here, M4 mire has developed but it is transitional and may eventually succeed to W4 woodland.

Coastal Lagoon This is not considered to be a UK Bap Habitat, but Coastal lagoons are a European Annex 1 Habitat (1150). At this site the lagoon is best described as isolated and separated from the sea by a barrier (mostly sand or other sediment). At a European scale, this habitat is scarce and its distribution is restricted mainly to the Atlantic coast.

[5] Along Whiteness Head, these Annex 1 Habitats appear to have developed over shingle substrates but with moderate inputs of sand.

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APPENDIX A

Table 1. List of NVC Types showing area in hectares covered by each one. The portion (in terms of percent) of each NVC type is also shown. The Phase 1 Habitats are also listed which excludes the Disused Construction Platform, Spoil, Tarmac Tracks, Spoil and Arable). Also shown are the GWDTE scores. They are as follows: 1 = Strongly Ground Water Dependent, 2 = Moderately Ground Water Dependent, 3 = Partially Ground Water Development, 4 = Not Ground Water Dependent. Note following miscellaneous codes: Psyl = *Pinus sylvestris*, Lc = *Chamaecyparis lawsoniana*, PL = Forestry plantation, Rrug = *Rosa rugosa* scrub, Pcom = *Polytrichum commune* lawn, SH = Shingle, BS = Bare sand.

Habitat	Code	NVC	Area (Ha.)		Portion (%)		GWDTE
Semi-natural Broadleaved Woodland	A1.1.1	W1	0.30		0.31		2
		W4	2.95		3.04		3
Coniferous Plantation	A1.2.2	Psyl	2.69		2.77		4
		Lc	0.20		0.20		4
		PL	0.13		0.14		4
Scrub	A2.1	W23	22.58		23.31		4
		W24	0.09		0.09		4
		Rrug	0.02		0.02		4
Dune scrub	H6.7	SD18	0.04		0.04		4
Acid grassland	B1.1	U4	5.13		5.29		4
Neutral Grassland	B2.1	MG1	4.22		4.36		4
		MG10	1.73		1.79		3
Marshy Grassland	B5	MG9	0.11		0.12		3
		MG10	1.44		1.48		3
		M23b	3.82		3.94		2
		M27	0.01		0.01		2
Tall-ruderal	C3.1	OV25	0.07		0.08		4
		OV27	0.36		0.37		4
Basin Mire	E3.2	M4	0.41		0.42		2
Pcom		Pcom	0.19		0.19		4

Table 1 continued

Swamp	F1	S9	0.07		0.07		4
		S12	0.17		0.17		4
		S14	0.16		0.16		4
		S19	0.76		0.79		4
		S27	0.91		0.93		4
		S28	0.27		0.28		4
Inundation - dune slack	F2.1	SD17	0.13		0.13		3
Inundation Grassland	F2.1	MG12	0.03		0.03		3
Open Water	G1.6	OW	2.88		2.97		4
Bare Sand	H1.1	BS	4.30		4.44		4
Shingle & Strandline	H1.1/H3	SH	5.34		5.51		4
Saltmarsh	H2.6	SM13a	1.60		1.65		4
Saltmarsh		SM13b	0.38		0.39		4
Saltmarsh		SM16	0.72		0.75		4
Strandline	H5	SD2	0.06		0.06		4
Dune grassland	H6.5	SD7	2.20		2.27		4
		SD9	8.83		9.12		4
		SD8	1.43		1.48		4
		SD12	1.13		1.16		4
Maritime Heath	H6.6	H11	0.02		0.02		4
Open dune	H6.8	SD4	0.30		0.31		4
		SD6	11.96		12.35		4
		SD11	6.09		6.28		4
Maritime grassland	H8.4	MC8	0.65		0.67		4
Totals			96.85		100.00		

APPENDIX B: **Vascular Plant List**

Table 2. List of vascular plants encountered while undertaking the survey. The list is not exhaustive. Note species marked with an asterisk* were not seen by the author but are known to be present. For Site Status A = Abundant, LA = Locally abundant F = Frequent, LF = Locally Frequent, O = Occasional, R = Rare.

Taxon	Vernacular	Site Status
Achillea millefolium	Yarrow	O-LF
Achillea ptarmica	Sneezewort	O
Agrostis canina sens. lat.	Velvet Bent	LF
Agrostis capillaris	Common Bent	F-LA
Agrostis stolonifera	Creeping Bent	O
Aira praecox	Early hair-grass	O-LF
Ammophila arenaria	Marram	A
Angelica sylvestris	Wild Angelica	LA
Anthoxanthum odoratum	Sweet Vernal-grass	F
Armeria maritima	Thrift	O-LF
Arrhenatherum elatius	False Oat-Grass	LA
Aster tripolium	Sea Aster	O
Athyrium filix-femina	Lady-fern	O
Atriplex laciniata	Frosted orache	O
Atriplex littoralis	Grass-leaved orache	O
Atriplex prostrata	Prostrate orache	LF
Bellis perennis	Daisy	O
Betula pendula	Silver Birch	O
Betula pubescens	Downy Birch	LA
Bidens cernua	Nodding bur-marigold	LF
Blechnum spicant	Hard-fern	O
Buddleja davidii	Butterfly Bush	R
Cakile maritima	Sea Rocket	O
Calluna vulgaris	Heather	F
Campanula rotundifolia	Harebell	LF
Cardamine flexuosa	Wavy Bitter-cress	O
Cardamine pratensis	Cuckooflower	O-LF
Carex arenaria	Sand Sedge	F
Carex binervis	Green-ribbed Sedge	O
Carex demissa	Common Yellow-sedge	O
Carex echinata	Star Sedge	O
Carex leporina	Oval Sedge	O
Carex nigra	Common Sedge	LF
Carex otrubae	False Fox Sedge	R
Carex rostrata	Bottle Sedge	LA
Centaurea nigra	Common Knapweed	O-LF
Centaurium erythraea	Common Centaury	LF
*Centaurium littorale**	Seaside Centaury	O

*Centunculus minimus**	Chaffweed	R
Cerastium diffusum	Sea Mouse-ear	O
Cerastium fontanum	Common Mouse-ear	O
Chamaecyparis lawsoniana	Lawson's Cypress	O
Chamerion angustifolium	Rosebay Willowherb	LA
Cirsium arvense	Creeping Thistle	F-LA
Cirsium palustre	Marsh Thistle	O-LF
Cirsium vulgare	Spear Thistle	O-LF
Comarum palustre	Marsh Cinquefoil	O
Crassula helmsii	New Zealand Pigmyweed	LA
Crataegus monogyna	Hawthorn	O
Crepis capillaris	Smooth Hawk's beard	O
Cynosurus cristatus	Crested Dog's-tail	O
Cytisus scoparius	Broom	LA
Dactylis glomerata	Cock's-foot	LF
Dactylorhiza purpurella	Northern Marsh-orchid	R
Deschampsia cespitosa	Tufted Hair-grass	O-LF
Deschampsia flexuosa	Wavy Hair-grass	O
Digitalis purpurea	Foxglove	O
Dryopteris carthusiana	Narrow Buckler fern	O
Dryopteris dilatata	Broad Buckler-fern	O
Dryopteris filix-mas	Male-fern	O
Eleocharis palustris	Common Spike rush	LA
Elytrigia juncea	Sand Couch	LF
Elytrigia repens	Common Couch	LF
Empetrum nigrum	Crowberry	O
Epilobium brunnescens	New Zealand Willowherb	O
Epilobium palustre	Marsh Willowherb	F
Equisetum arvense	Field Horsetail	O (LA)
Erica cinerea	Bell Heather	O
Erica tetralix	Cross-leaved Heath	O
Eriophorum angustifolium	Common Cottongrass	O-LF
Erodium cicutarium	Common Stork's-bill	LF
Euphrasia agg.	Eyebright	F
Fallopia japonica	Japanese Knotweed	R
Festuca ovina agg.	Sheep's-fescue	LA
Festuca rubra agg.	Red Fescue	F-LA
Filago minima	Small Cudweed	O
Filipendula ulmaria	Meadowsweet	O
Fraxinus excelsior	Ash	R
Galeopsis tetrahit	Common Hemp-nettle	O
Galium aparine	Cleavers	O
Galium palustre	Marsh-bedstraw	LF
Galium saxatile	Heath Bedstraw	LF
Galium verum	Lady's Bedstraw	O

Geranium robertianum	Herb-Robert	R
Glaux maritima	Sea Milkwort	LF
Gnaphalium uliginosum	Marsh Cudweed	O
Hedera helix	Common Ivy	O
Heracleum sphondylium	Hogweed	F
Hippophae rhamnoides	Sea Buckthorn	R
Holcus lanatus	Yorkshire-fog	F-LA
Holcus mollis	Creeping Soft-grass	F-LA
Honckenya peploides	Sea Sandwort	LF
Hydrocotyle vulgaris	Marsh Pennywort	LF
Hypericum perforatum	Perforate St John's-wort	LF
Hypericum pulchrum	Slender St John's-wort	O
Hypochaeris radicata	Common Cat's-ear	F
Ilex aquifolium	Holly	O
Juncus articulatus	Jointed Rush	O-LF
Juncus effusus	Soft-rush	LA
Juncus tenuis	Tufted rush	O
Koeleria macrantha	Hair-grass	O
Lathyrus pratensis	Meadow Vetchling	O
Leymus arenarius	Lyme grass	LF
Ligusticum scoticum	Scot’s Lovage	O-LF
Linum catharticum	Fairy Flax	O-LF
Lotus corniculatus	Common Bird's-foot-trefoil	O
Luzula campestris	Common Wood-rush	O
Luzula sylvatica	Great Wood-rush	O
Mentha sp.	Mint	R
Myosotis laxa	Tufted Forget-me-not	O
Nardus stricta	Mat-grass	O
Odontites vernus	Red Bartsia	O
Oxalis acetosella	Wood-sorrel	O
Pedicularis palustris	Marsh Lousewort	R
Persicaria maculosa	Redshank	O
Phalaris arundinacea	Reed Canary-grass	LA
Pilosella officinarum	Mouse-ear-hawkweed	O-LF
Pinus sylvestris	Scot’s Pine	LA
Plantago lanceolata	Ribwort Plantain	F
Plantago major	Greater Plantain	O
Plantago maritima	Sea Plantain	O-LF
Poa annua	Annual Meadow-grass	O
Poa pratensis sens. lat.	Smooth Meadow-grass	F
Polygala serpyllifolia	Heath Milkwort	O
Polypodium vulgare	Polypody	R
Potamogeton pectinatus	Fennel Pondweed	LF
Potamogeton polygonifolius	Bog Pondweed	R
Potentilla anserina	Silverweed	O-LF

Potentilla erecta	Tormentil	O
Prunella vulgaris	Selfheal	LF
Puccinellia maritima	Common Saltmarsh grass	LA
Radiola linoides	Allseed	O
Ranunculus acris	Meadow Buttercup	O
Ranunculus flammula	Lesser Spearwort	O-LF
Ranunculus repens	Creeping Buttercup	F
Rhinanthus minor	Yellow Rattle	LF
Rubus fruticosus agg.	Bramble	LA
Rubus idaeus	Raspberry	O
Rumex acetosa	Common Sorrel	F
Rumex acetosella	Sheep's Sorrel	O-LF
Rumex crispus	Curled Dock	O-LF
Rumex obtusifolius	Broad-leaved Dock	O-LF
Sagina procumbens	Procumbent Pearlwort	O
Salicornia agg.	Glasswort	LA
Salix aurita	Eared Willow	O
Salix cinerea subsp. *oleifolia*	Rusty Willow	O-LF
Salix repens	Creeping Willow	O
Schedonorus arundinaceus	Tall Fescue	O-LF
Scorzoneroides autumnalis	Autumn Hawkbit	LF
Sedum acre	Biting stonecrop	O
Sedum album	White Stonecrop	O
Senecio jacobaea	Common Ragwort	F
Senecio viscosus	Sticky Groundsel	O
Senecio vulgaris	Groundsel	O
Silene latifolia	White Campion	O
Silene uniflora	Sea Campion	O-LF
Sonchus arvensis	Perennial Sow-thistle	O-LF
Sorbus aucuparia	Rowan	O
Sparganium erectum	Branched Bur-reed	O-LF
Spergularia media	Common Sea spurrey	LF
Stellaria alsine	Bog Stitchwort	O
Stellaria graminea	Lesser Stitchwort	O-LF
Stellaria media	Common Chickweed	O
Succisa pratensis	Devil's-bit Scabious	O
Suaeda maritima	Annual Seablite	LA
Taraxacum agg.	Dandelion	O
Thymus polytrichus	Wild Thyme	O
Torilis japonica	Upright Hedge parsley	O
Trifolium arvense	Hare's-foot Clover	O
Trifolium dubium	Lesser Hop-trefoil	O
Trifolium pratense	Red Clover	O
Trifolium repens	White Clover	LF
Tripleurospermum maritimum	Sea Mayweed	LF

Tussilago farfara	Colt's-foot	R
Typha latifolia	Common Bullrush	LA
Ulex europaeus	Gorse	A
Urtica dioica	Common Nettle	O
Vaccinium myrtillus	Bilberry	R
Valeriana officinalis	Common Valerian	O-LF
Veronica chamaedrys	Germander Speedwell	O
Veronica officinalis	Heath Speedwell	LF
Veronica scutellata	Marsh Speedwell	O-LF
Vicia cracca	Tufted Vetch	O-LF
Vicia sepium	Bush Vetch	O
Viola canina	Heath Violet	R
Viola palustris	Marsh Violet	LF
Viola riviniana	Common Dog-violet	O-LF
Viola tricolor	Field Pansy	O

Note that in the Environmental Statement presented by Savills (2014), *Cirsium acaule* (Dwarf Thistle) was recorded for this site. Unfortunately, this species does not occur in Scotland.

APPENDIX C Target Notes

Target Notes for Southeast Section

1 NH 81367 57021 An area of rush pasture (M23b) with abundant *Juncus effusus* and frequent *Epilobium palustre*, *Galium palustre*, *Holcus lanatus* and *Ranunculus repens*. The local abundance of *Agrostis capillaris*, *Arrhenatherum elatius*, *Deschampsia cespitosa* and *Elymus repens* suggests transitions to MG9 and MG10 grassland. Also, not uncommon are *Anthoxanthum odoratum*, *Cirsium arvense*, *Equisetum arvense*, *Plantago lanceolata* and *Prunella vulgaris*.

2 NH 81294 57003 Area of MG9 grassland close to 1 with abundant *Deschampsia cespitosa*, *Holcus lanatus*, *Juncus effusus* and *Ranunculus repens*. The abundance of *Cirsium arvense* suggests the area has been disturbed. Also noted are *Agrostis capillaris*, *Agrostis stolonifera*, *Dactylis glomerata*, *Senecio jacobaea* and *Trifolium repens*.

3 NH 81274 56822 Patch of SD17 with abundant *Carex nigra* and *Potentilla anserina*. Also frequent are *Agrostis capillaris*, *Epilobium palustre*, *Festuca rubra agg.*, *Galium palustre*, *Potentilla erecta*, *Rumex acetosa* and *Viola palustris*. There is also occasional *Carex demissa*, *Holcus lanatus* and *Juncus effusus* and *Salix aurita* is invading. For bryophytes *Rhytidiadelphus squarrosus* is abundant and there is occasional to frequent *Calliergon cordifolium*.

4 NH 81273 56827 Patch of W1 woodland close to 3 above. *Salix aurita* is abundant. The field flora is poorly developed but there is occasional to frequent *Carex nigra*, *Galium palustre*, *Potentilla anserina*, *Ranunculus repens* and *Viola palustris*.

5 NH 81260 56742 Area of W1 woodland with abundant *Salix aurita*. For the field layer *Juncus effusus* is abundant and there is frequent *Agrostis canina s.l.*, *Agrostis stolonifera*, *Anthoxanthum odoratum*, *Equisetum arvense*, *Holcus lanatus* and *Potentilla erecta*. For mosses *Polytrichum commune* is abundant and there is occasional to frequent *Aulacomnium palustre*, *Hylocomium splendens* and *Pleurozium schreberi*.

6 NH 81314 56723 Area of W4 woodland with canopy of abundant *Betula pubescens* and occasional *Salix aurita*. Field layer is sparse but there is occasional to frequent *Agrostis canina s.l.*, *Dryopteris dilatata*, *Holcus lanatus*, *Holcus mollis*, *Juncus effusus* and *Potentilla erecta*. For mosses, *Polytrichum commune* is locally abundant and there is occasional to frequent *Hypnum cupressiforme*, *Hylocomium splendens*, *Pseudoscleropodium purum* and *Rhytidiadelphus triquetrus*.

7 NH 81648 56699 Area of MG10 marshy grassland with abundant *Holcus lanatus* and *Juncus effusus* and occasional to frequent *Agrostis capillaris*, *Anthoxanthum odoratum*, *Galium saxatile* and *Potentilla erecta*. For mosses, *Pseudoscleropodium purum* is frequent and there is occasional *Rhytidiadelphus squarrosus*.

8a NH 81608 56584 Basin mire with abundant *Carex rostrata* and *Juncus effusus*. *Hydrocotyle vulgaris* is locally abundant and there is frequent *Epilobium*

palustre. Sphagnum cover is high (>50%) and there is *Sphagnum fallax*, *Sphagnum fimbriatum* and *Sphagnum palustre*. The area is being invaded by birch.

8b NH 81683 56598 Area of M4 mire with abundant *Carex rostrata* and frequent *Eriophorum angustifolium* and *Carex nigra*. Also, abundant *Sphagnum fallax*, *Sphagnum fimbriatum* and *Polytrichum commune*.

9 NH 81608 56665 Area of U4 acid grassland with abundant *Agrostis capillaris*, *Anthoxanthum odoratum*, *Festuca ovina agg.*, *Galium saxatile* and *Holcus mollis*. Also frequent are *Poa pratensis s.l.* and *Potentilla erecta* and there is occasional *Carex binervis* and *Nardus stricta*. For mosses *Hylocomium splendens* is abundant.

Target Notes for Lagoon Area

10 NH 79650 57616 Large patch of *Salix repens* which is sparse at this site. Here it represents a variant of SD17.

11 NH 79692 57638 Population of *Bidens cernua* (>100 plants) in S14 swamp. The invasive *Crassula helmsii* is abundant.

12 NH 79913 57753 Population of *Bidens cernua* (>50 plants) near edge of S19 swamp adjacent to an area of M23 marshy grassland. The invasive *Crassula helmsii* is abundant.

13 NH 79938 57755 Population of *Bidens cernua* (>150 plants) in S14 swamp adjacent to an area of M23 marshy grassland. The invasive *Crassula helmsii* is abundant.

14 NH 79720 57784 Population of *Bidens cernua* (>100 plants) in intermediate zone with S14 swamp and S12 swamp developed nearby. The invasive *Crassula helmsii* is abundant.

15 NH 79996 57672 Small stand of M27c mire with abundant *Filipendula ulmaria*.

16 NH 79716 57785 A strip of SD17 inundation swamp with abundant *Agrostis stolonifera*, *Carex arenaria*, *Hydrocotyle vulgaris*, *Juncus articulatus* and *Potentilla anserina*. There is also occasional to frequent *Epilobium palustre*, *Galium palustre*, *Juncus effusus*, *Ranunculus flammula*, *Rhinanthus minor* and *Schedonorus arundinaceus*.

17 NH 79654 57671 Area of S27 swamp with abundant *Carex rostrata* and frequent *Epilobium palustre*, *Myosotis laxa* and *Veronica scutellata*. There is also occasional to frequent *Cardamine pratensis*, *Galium palustre*, *Juncus articulatus*, *Ranunculus flammula* and *Ranunculus repens* and occasional *Typha latifolia*. For bryophytes there is occasional *Calliergon cordifolium*. Note, the invasive *Crassula helmsii* is abundant with cover >50 %.

18 NH 79640 57660 A strange patch which is close to SD17. Here *Agrostis stolonifera*, *Carex arenaria Potentilla anserina*, and *Viola palustris* are abundant and there is frequent *Eriophorum angustifolium*, *Epilobium palustre*, *Holcus lanatus*,

Ranunculus flammula and *Ranunculus repens*. The moss *Calliergonella cuspidata* is abundant and the invasive *Crassula helmsii* is also abundant.

19 NH 79643 57650 Small stand of S19 swamp with elements of S27. Here, *Agrostis stolonifera*, *Eleocharis palustris* and *Juncus articulatus* are abundant and there is frequent *Cardamine pratensis*, *Epilobium palustre*, *Galium palustre*, *Ranunculus flammula*, *Veronica scutellata* and *Viola palustris*. There is also occasional *Carex arenaria*, *Eriophorum angustifolium* and *Potentilla anserina* and the moss *Calliergonella cuspidata* is abundant. The invasive *Crassula helmsii* is also abundant.

20 NH 79821 57635 Area of S27 swamp with abundant *Carex rostrata* and frequent *Epilobium palustre* and *Myosotis laxa*. *Potamogeton polygonifolius* is conspicuous but the invasive *Crassula helmsii* is also abundant (>50% cover).

21 NH 79855 57686 Extensive area of Marshy grassland (M23b) abundant *Juncus effusus* (>70% cover) and frequent *Agrostis stolonifera*, *Epilobium palustre*, *Holcus lanatus*, *Myosotis laxa*, *Rumex acetosa*, *Senecio jacobaea* and *Viola palustris*. *Schedonorus arundinaceus* is locally frequent and the moss *Calliergonella cuspidata* is locally abundant. The invasive *Crassula helmsii* is also abundant. Nearby where M23b merges with S27 swamp there is frequent *Carex rostrata*.

Target Notes of dune system and saltmarsh west and north of Lagoon

22 NH 79820 58279 Area of semi-fixed SD7 grassland with abundant *Ammophila arenaria*, *Agrostis capillaris*, *Anthoxanthum odoratum*, *Carex arenaria* and *Festuca rubra agg.*. There is occasional to frequent *Hypochaeris radicata* and *Senecio jacobaea*. Bryophytes include *Dicranum scoparium*, *Hypnum cupressiforme*, *Hylocomium splendens* and *Rhytidiadelphus triquetrus* and there is occasional *Brachythecium albicans* and *Syntrichia ruraliformis*.

23 NH 79700 58143 Area of SD11 open lichen dune. Vascular plant cover is low but includes many of the species listed for TN 21 and TN 22. Additional species found include *Aira praecox*, *Calluna vulgaris* and *Sedum acre*. The main lichens include *Cladonia furcata*, *Cladonia rangiformis* and *Cladonia portentosa*. There is also frequent *Hypogymnia physodes* and occasional *Cetraria aculeata*. *Usnea subfloridana* was also noted. For mosses, *Syntrichia ruraliformis* is not uncommon and *Polytrichum juniperinum* is frequent.

24 NH 79612 57840 Area of SM13a saltmarsh with abundant *Puccinellia maritima* and frequent *Salicornia* and *Suaeda maritima*.

25 NH 79625 57828 SM13b saltmarsh with abundant *Glaux maritima* and *Puccinellia maritima* and frequent *Plantago maritima*, *Salicornia*, *Suaeda maritima* and *Spergularia media*.

26 NH 79666 57828 Area of SD9 fixed dune grassland with abundant *Ammophila arenaria* and *Arrhenatherum elatius*. Frequent associates include *Anthoxanthum odoratum*, *Festuca rubra agg.*, *Holcus lanatus*, *Plantago lanceolata*, *Poa pratensis s.l.* and *Senecio jacobaea*. Nearby there is occasional *Chamerion angustifolium*, *Pilosella officinarum* and *Veronica officinalis*. For mosses *Pseudoscleropodium purum* is abundant.

27 NH 80007 58103 Area of mobile SD6 dune with abundant *Ammophila arenaria* and occasional to frequent *Agrostis capillaris*, *Anthoxanthum odoratum*, *Chamerion angustifolium* and *Holcus lanatus*. Bryophytes are sparse but there is occasional to frequent *Brachythecium albicans* and *Ceratodon purpureus*.

Target Notes for Carse of Delnies

28 NH 81751 57741 Extensive area of SM13a saltmarsh similar to TN 24 but Salicornia and *Suaeda maritima* more abundant. Here there is also a prominent algal mat and the development of salt pans.

29 NH 81733 57809 Area of SM16 saltmarsh with abundant *Armeria maritima*, *Festuca rubra agg.*, *Glaux maritima* and *Suaeda maritima*. *Spergularia media* is frequent.

Target Notes for Whiteness Head

30 NH 81934 57763 Prominent patches of herb-rich SD8 dune grassland. The grasses *Agrostis capillaris*, *Anthoxanthum odoratum*, *Festuca rubra agg.* and *Holcus lanatus* are not uncommon and *Carex arenaria* is frequent. Forbs include *Cerastium fontanum*, *Euphrasia agg.*, *Hypochaeris radicata*, *Lotus corniculatus*, *Plantago lanceolata*, *Thymus polytrichus*, *Trifolium repens*, *Veronica officinalis* and *Viola tricolor*. Bryophytes are conspicuous with *Hylocomium splendens*, *Pseudoscleropodium purum* and *Rhytidiadelphus triquetrus* abundant. The presence of *Armeria maritima* suggest a transition to maritime grassland (MC8).

31 NH 81782 57850 This area has developed SD12 dune grassland which is acidic and contains abundant *Agrostis capillaris*, *Anthoxanthum odoratum*, *Festuca ovina agg.*, *Holcus lanatus* and *Plantago lanceolata*. There is frequent *Viola riviniana* and occasional to frequent *Ammophila arenaria* and *Carex arenaria*. There is occasional *Calluna vulgaris* and *Viola canina*. Key bryophytes are *Dicranum scoparium*, *Hylocomium splendens* and *Rhytidiadelphus triquetrus*.

32 NH 81766 57858 Small strip of H11 heath with abundant *Calluna vulgaris* and occasional *Erica cinerea*. Associates include *Agrostis capillaris*, *Anthoxanthum odoratum*, *Carex arenaria*, *Festuca ovina agg.*, *Lotus corniculatus*, *Pilosella officinarum* and *Veronica officinalis*. There is occasional *Viola canina* nearby. Bryophytes are composed chiefly by *Dicranum scoparium*, *Hylocomium splendens* and *Rhytidiadelphus triquetrus* and the lichen *Cladonia portentosa* is conspicuous.

33 NH 81832 57816 Prominent patch of *Empetrum nigrum* which could be a variant of H11 maritime heath. Other patches occur at NH 81863 57802 and near NH 81757 57876.

34 NH 79685 58664 Strandline with abundant *Cakile maritima* and occasional to frequent *Atriplex laciniata* and *Elytrigia juncea*.

35 NH 79892 58700 Fore dune with abundant *Elytrigia juncea* and occasional *Atriplex littoralis*, *Atriplex prostrata*, *Honckenya peploides*, *Sedum acre*, *Sonchus arvensis* and *Tripleurospermum maritimum*.

36 NH 80192 58742 Area of MC8 maritime grassland developed over shingle and sand with abundant *Armeria maritima* and *Festuca rubra agg.*. Frequent associates include *Aira praecox*, *Hypochaeris radicata*, *Koeleria macrantha*, *Lotus corniculatus* and *Plantago lanceolata*. *Hypnum cupressiforme* and *Rhytidiadelphus triquetrus* are abundant. *Trifolium arvense* occurs nearby.

37 NH 80556 58594 Area of dune grassland with abundant *Ligusticum scoticum*. This coastal plant is not uncommon along this headland.

Target Notes for Disused Construction Platform Area

38 NH 80099 57702 Disturbed area with scattered vascular plants including *Agrostis capillaris*, *Erodium cicutarium*, *Festuca ovina agg.*, *Hypericum perforatum*, *Plantago major*, *Rumex acetosella*, *Senecio jacobaea* and *Trifolium dubium*.

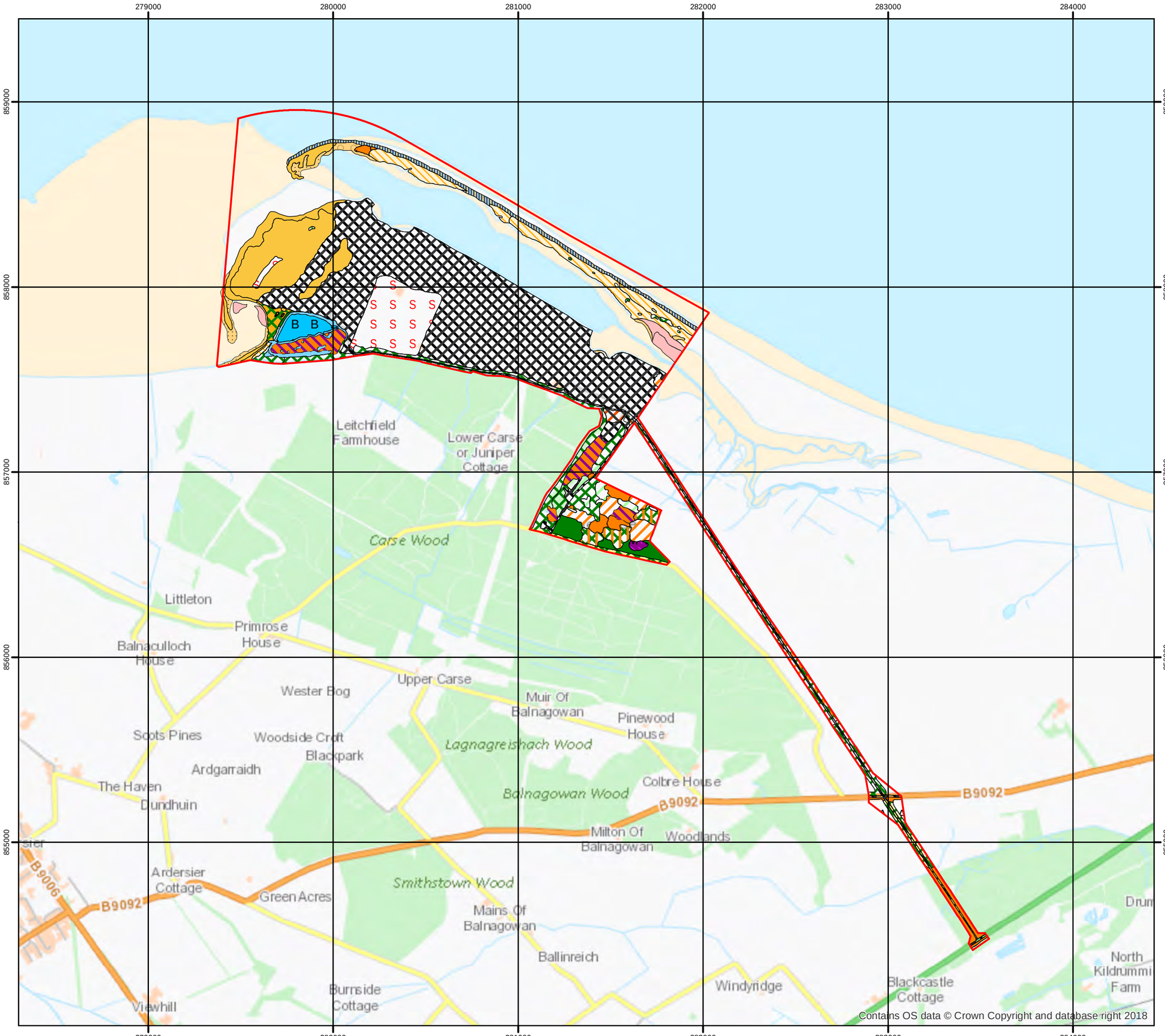
39 NH 81563 57609 Disturbed area with frequent *Rumex acetosella* and occasional to frequent *Agrostis capillaris*, *Aira praecox*, *Filago minima* and *Senecio jacobaea*.

40 NH 81591 57608 Disturbed area with lichen assemblages developed. Key lichens include *Cladonia furcata*, *Cladonia rangiformis* and *Hypogymnia physodes*. For bryophytes *Polytrichum juniperinum* is not uncommon.

APPENDIX D

Phase 1 Habitat Maps of Ardersier Port

The following four pages illustrate the Phase 1 Habitats of the Ardersier Port site. The first page is an overview of the site.



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B1.1	H6.5	
B2.1	H6.5/A2.1	
B5	H6.6	
C3.1	H6.7	
E3.2	H6.8	
F1	H8.4	
F2.1	I2.2	
G1.6	J1.1	

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Project
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Title
Phase 1 Habitat - Map Overview

Status
FINAL

Drawing No.
670191-007

Revision

Scale
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A3

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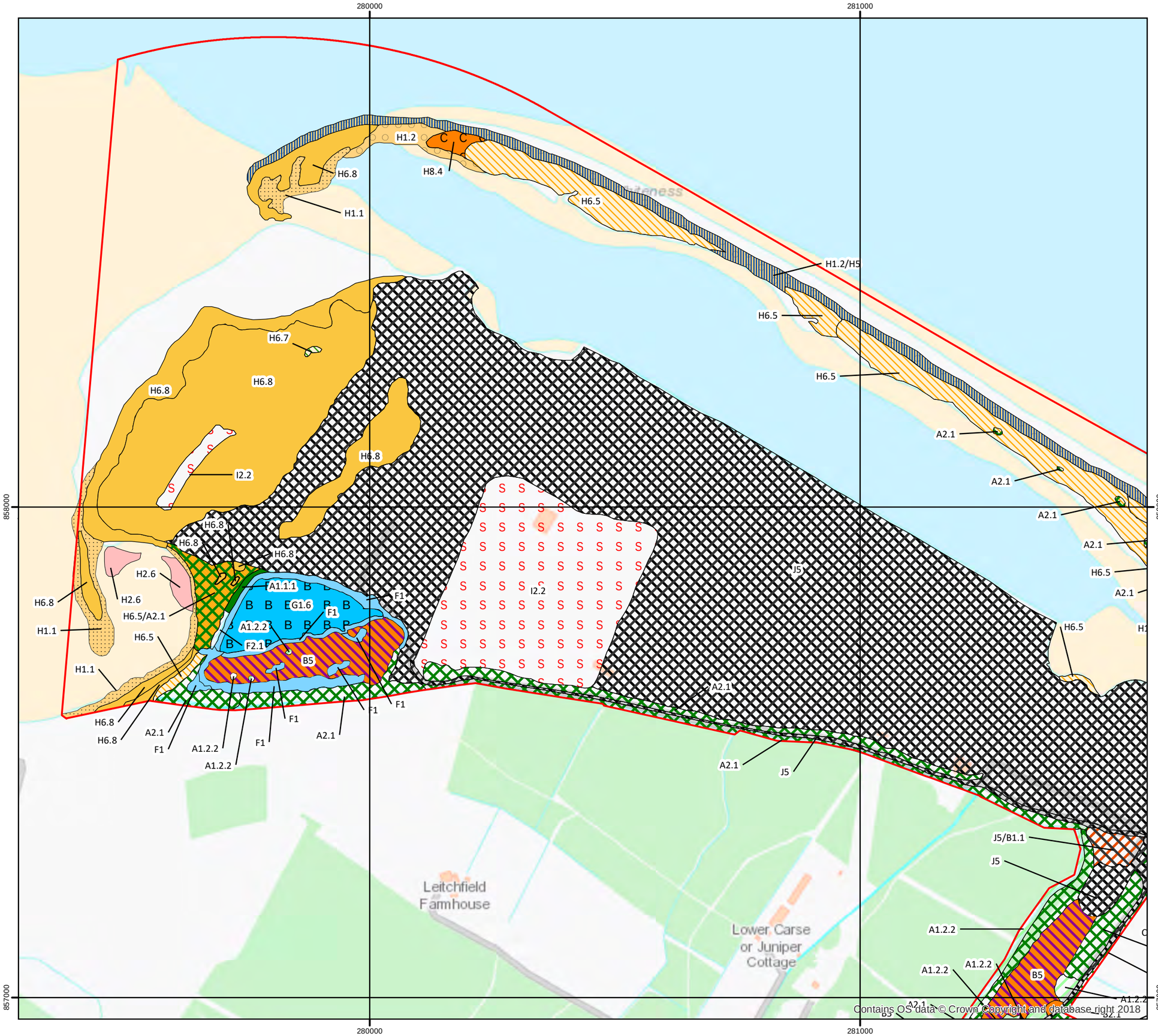

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E3.2	H6.8	
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G1.6	J1.1	

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Phase 1 Habitat - Map 1 of 3

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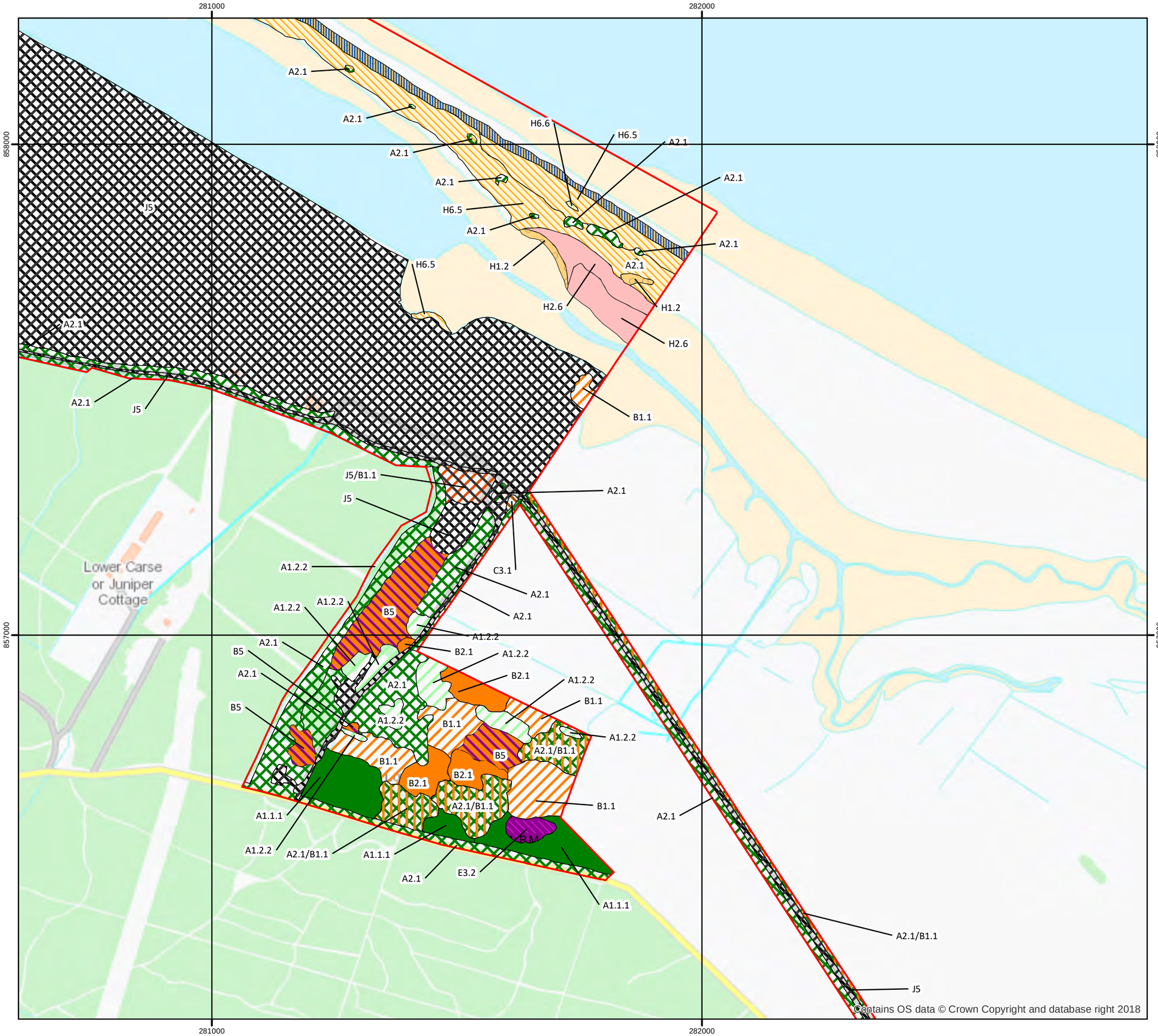

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Project
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Title
Phase 1 Habitat - Map 2 of 3

Status
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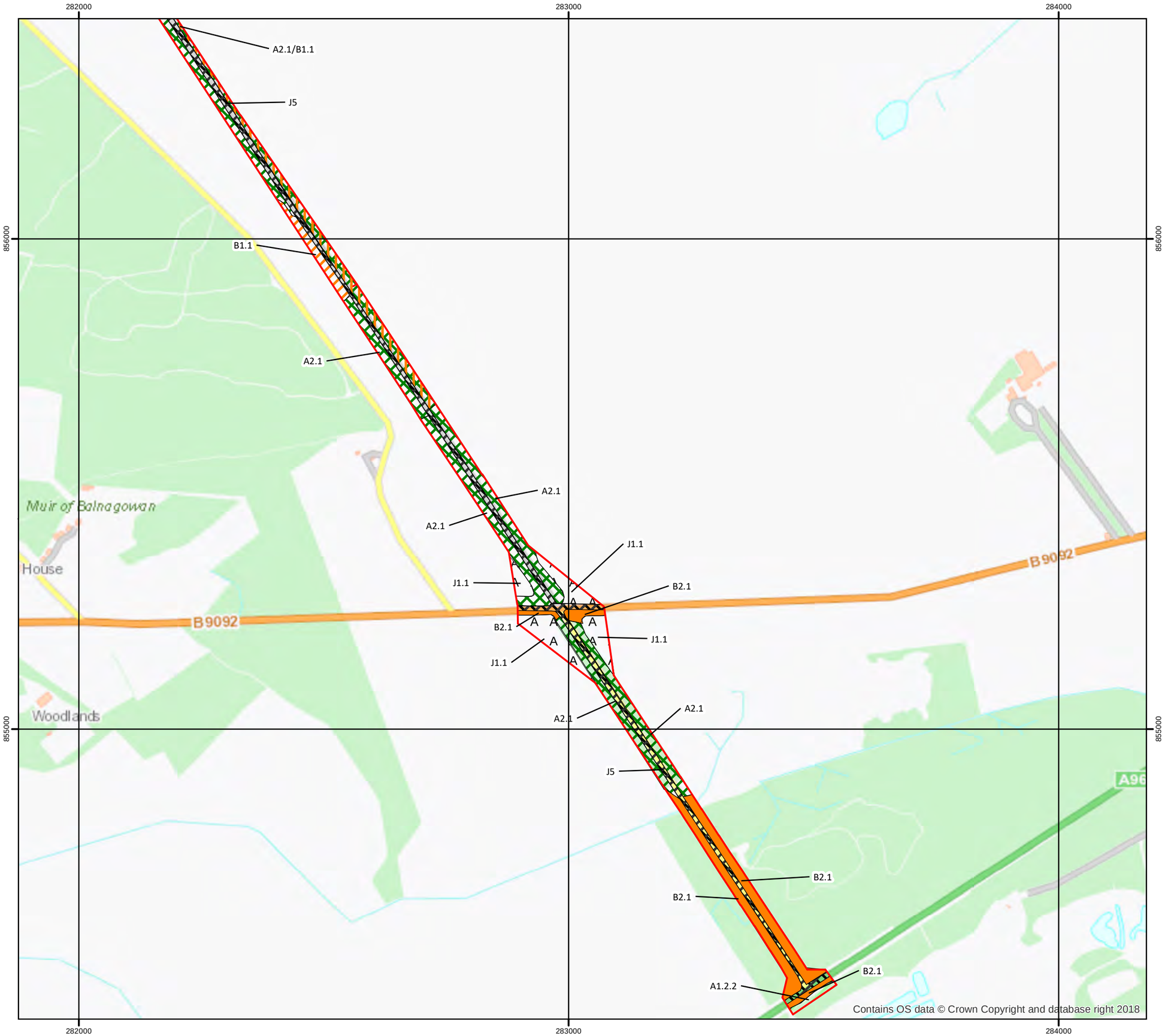

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E3.2	H6.8	
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G1.6	J1.1	

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Phase 1 Habitat - Map 3 of 3

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A3

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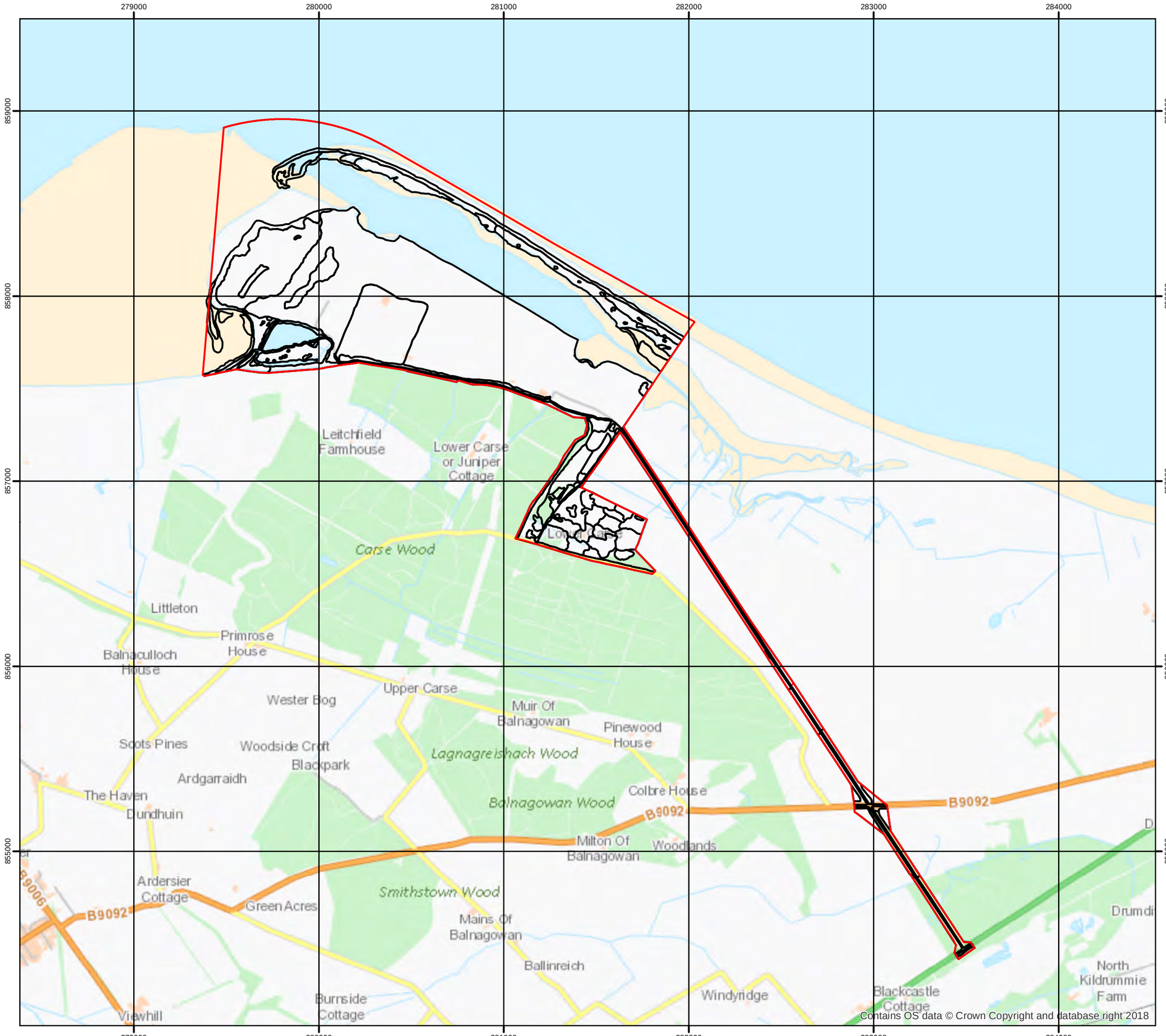
APPENDIX E

NVC Polygon Map of Ardersier Port

The following four pages illustrate the NVC Communities of the Ardersier Port site. The first page is an overview of the site.



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Planning Boundary

NVC

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Title

NVC Map Overview

Status

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671090-005	

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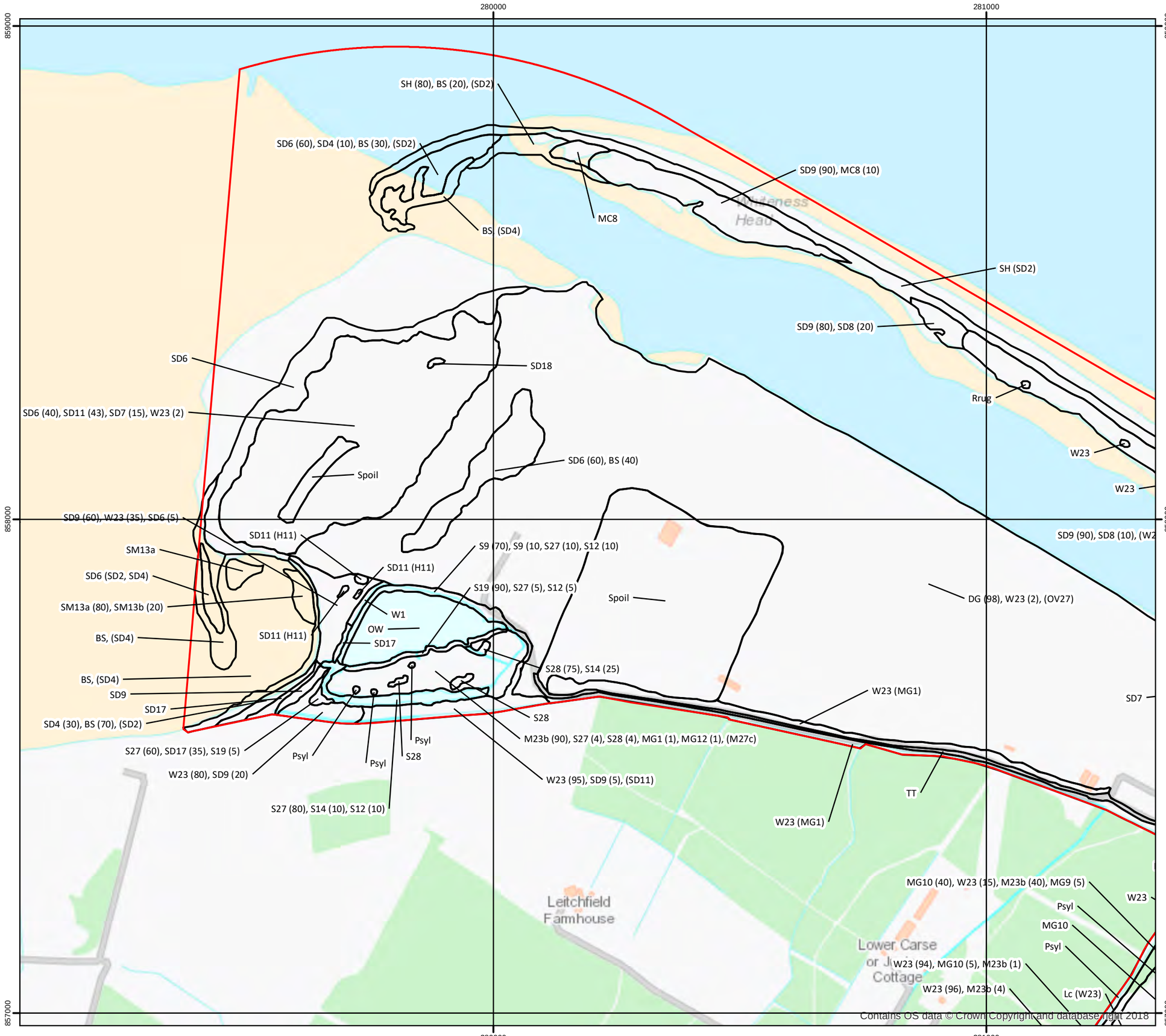

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Planning Boundary

NVC

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Project
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Title
NVC Map 1 of 3

Status
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Drawing No.	Revision
671090-005	

Scale		Date
1:7,500	A3	05 Sept 2018

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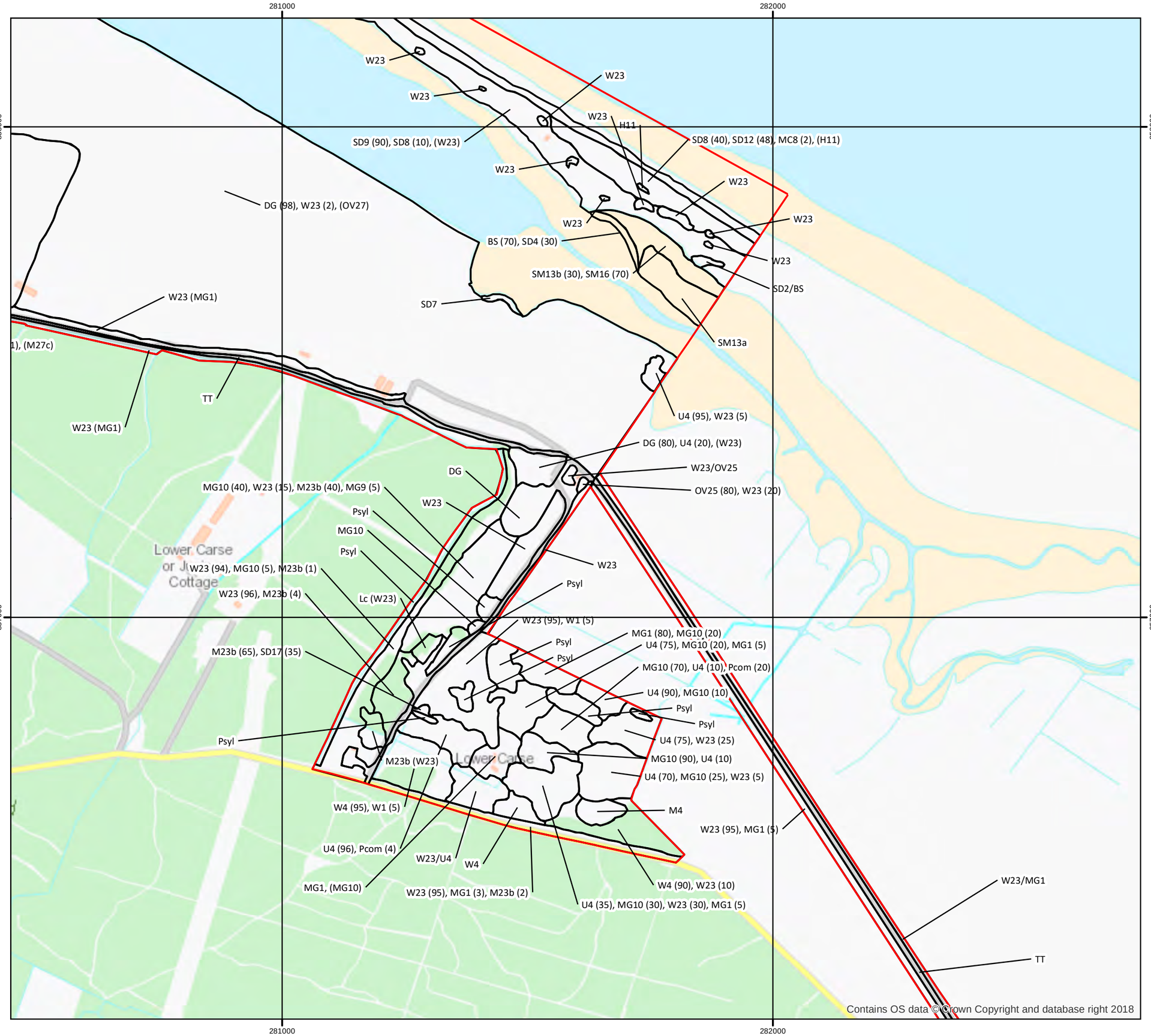

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Planning Boundary

NVC

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Project

Arderseir Port Redevelopment

Title

NVC Map 2 of 3

Status

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Drawing No.	Revision
671090-005	

Scale		Date
1:7,500	A3	05 Sept 2018

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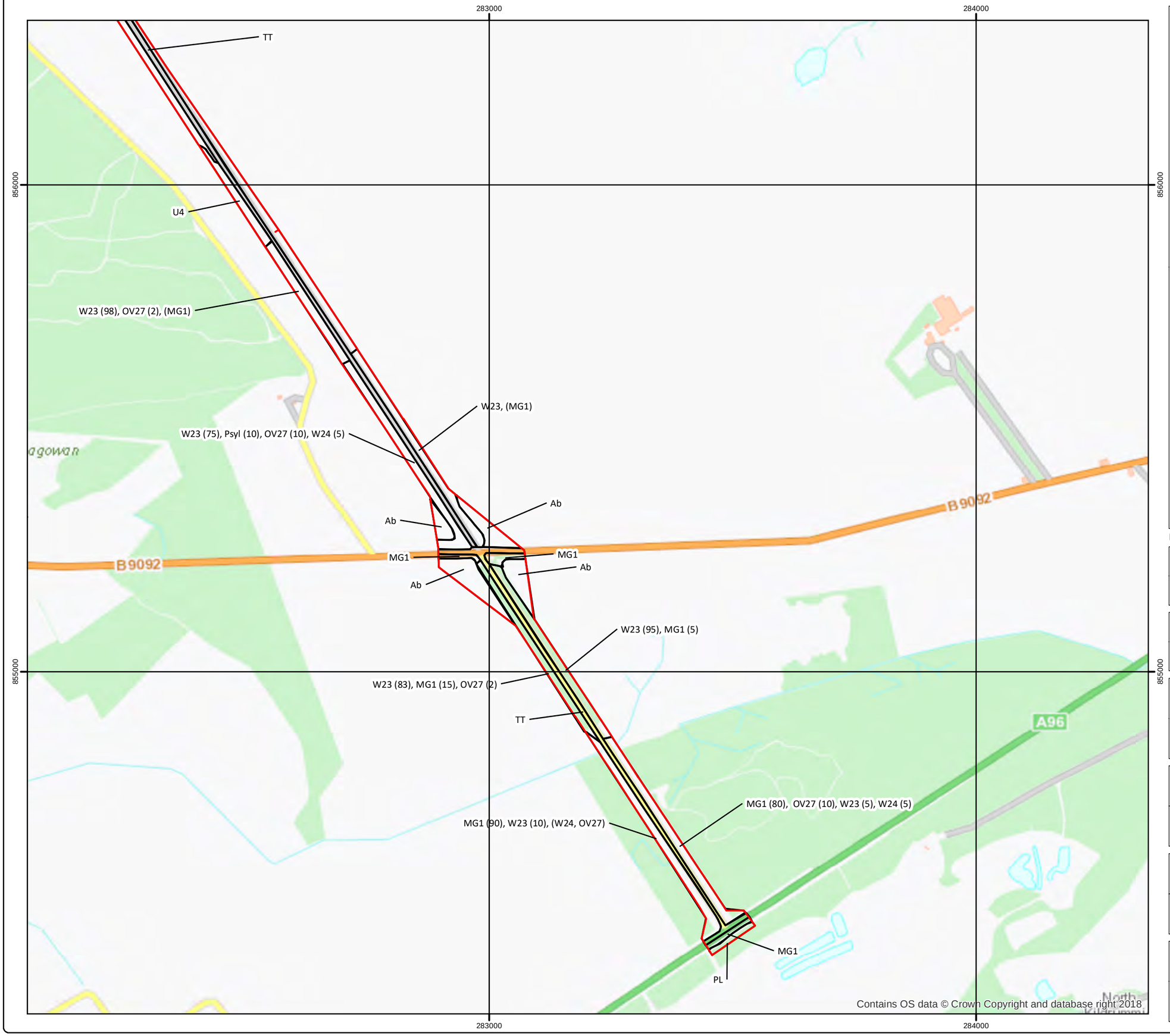

Legend

Planning Boundary

NVC

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Client

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Project

Arderseir Port Redevelopment

Title

NVC Map 3 of 3

Status

FINAL

Drawing No.	Revision
671090-005	

Scale		Date
1:7,500	A3	05 Sept 2018

Drawn	Checked	Approved
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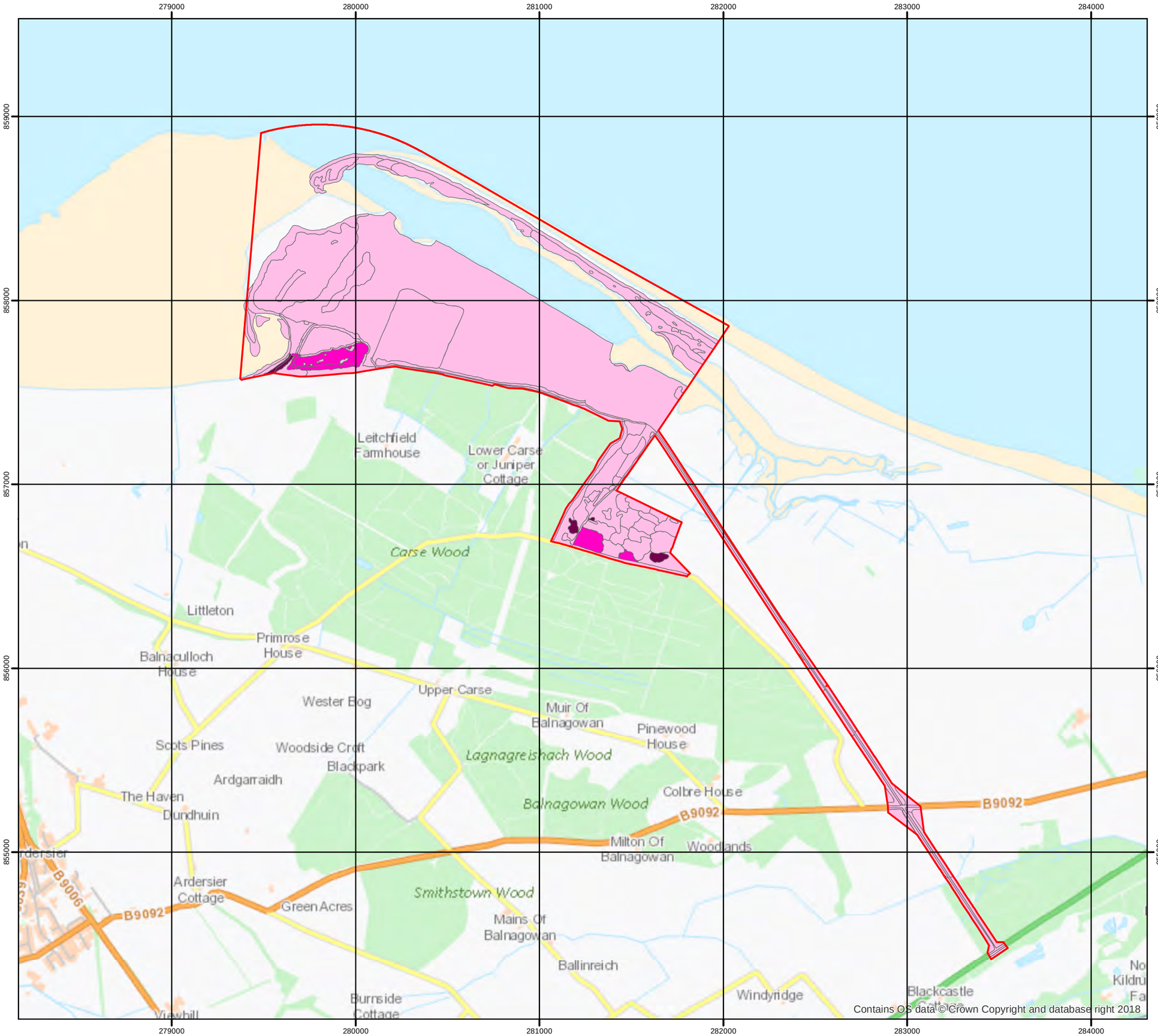
Appendix F GWDTE Map

The following map details the areas containing GWDTE. For the legend the following four classes are recognized:

1 Highly Groundwater Dependent
2 Moderately Groundwater Dependent
3 Partially Groundwater Dependent
4 Not Groundwater Dependent

However, category 1 is not significant for this site as there are no highly groundwater dependent terrestrial ecosystems present at this site.



Legend

Planning Boundary

GWDTE Number

- 2
- 3
- 4

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Client
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Project
Arderseir Port Redevelopment

Title
GWDTE

Status
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Scale
1:20,000

A3

Date
05 Sept 2018

Drawn
SMC

Checked
KC

Approved
KC

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Appendix G: Conservation Score for Site

The following three maps illustrate the areas that have the highest conservation value for this site. This assessment is based on several criteria that include the following:

Condition of habitat: If habitat is deemed to be in good condition this is likely to increase the conservation score of that habitat. Conversely if the habitat has been disturbed (for example, by spoil), this will tend to decrease the value of the habitat.

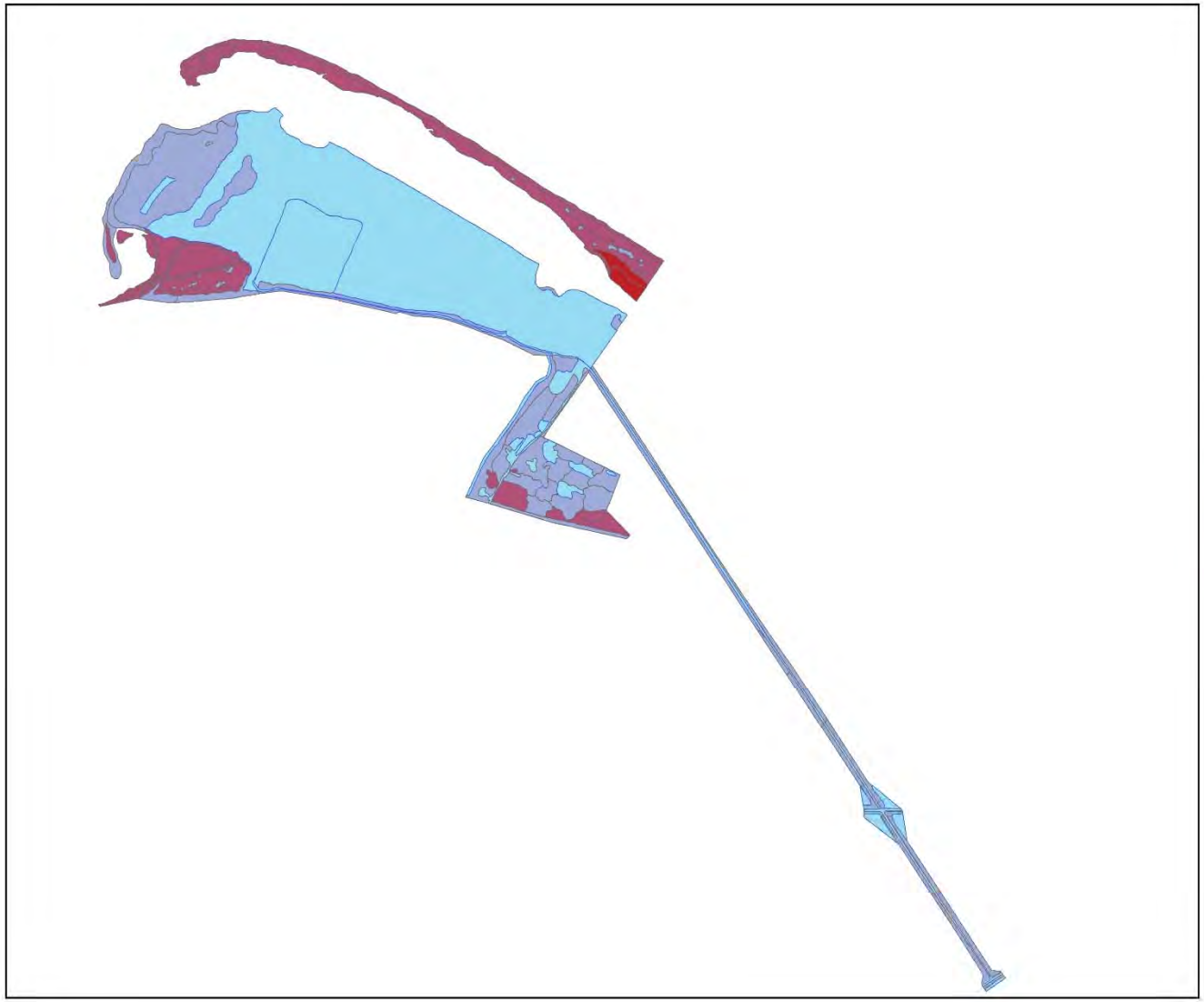
Ground Water Dependent Terrestrial Ecosystems: Those habitats that have a high groundwater dependency score are also likely to have a higher conservation value.

Conservation status of habitat: UK Bap Habitats and all European Annex 1 Habitats identified at this site will generally have a higher conservation score than those that are not.

Presence of Rare Plants or Protected species: The presence of rare vascular plants or bryophytes or lichens will tend to increase the conservation score for the habitat or polygon area in question.

The following scores have been applied for the maps:

1. Low conservation value but possibly can be improved
2. Fair conservation value. The areas in question have some conservation value but habitats may be disturbed or are not particularly rare. These areas may be enhanced.
3. Moderate to high conservation value. These areas probably contain Annex 1 Habitats or UK Bap Habitats or contain rare plant species or a rare plant community. Artificial disturbance is typically low.
4. High conservation value. Similar to three above. Habitat in good condition and represent an important feature of the site.



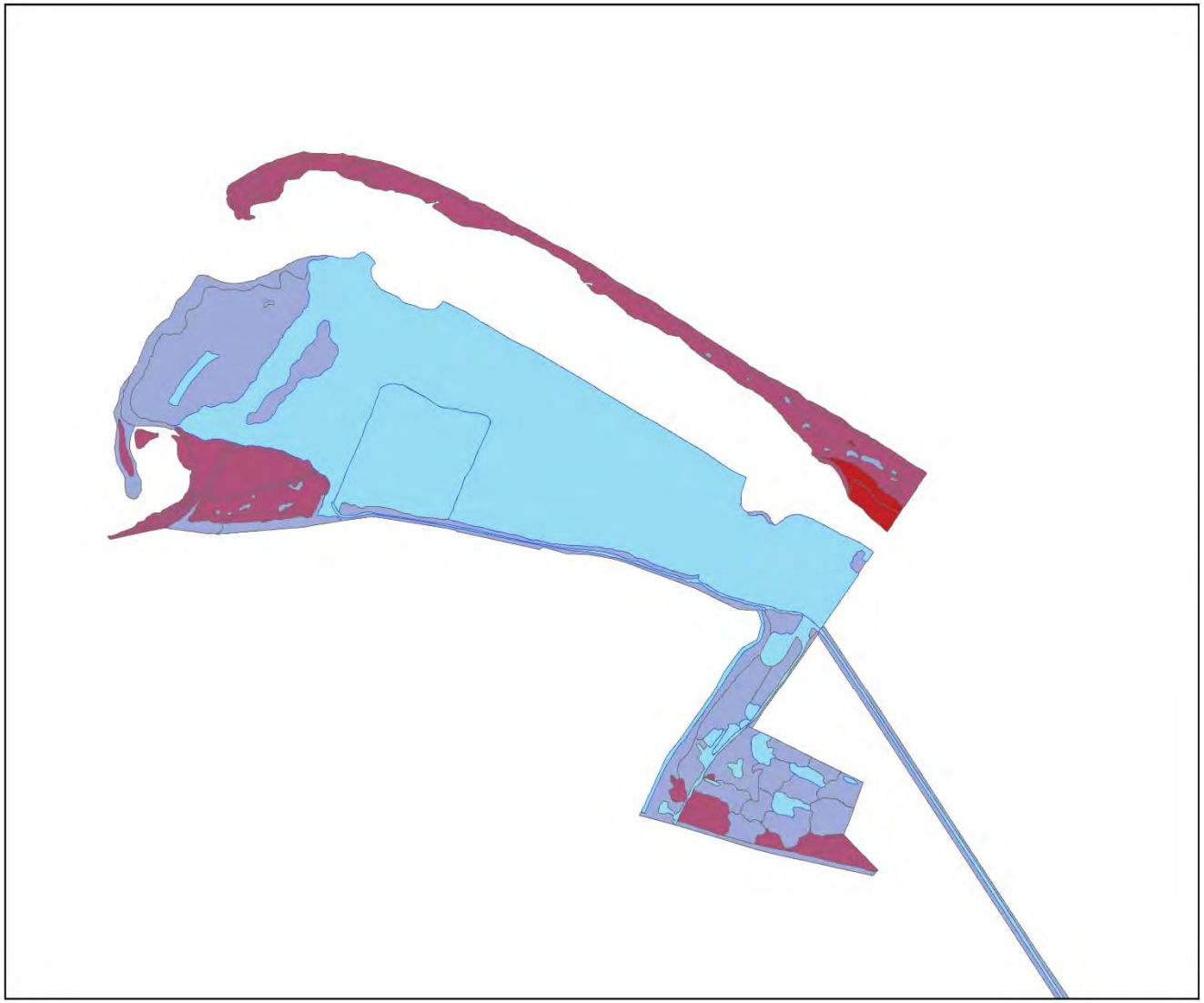
Legend

Arderseir_

Conservation Value

- 1
- 2
- 3
- 4

Overview



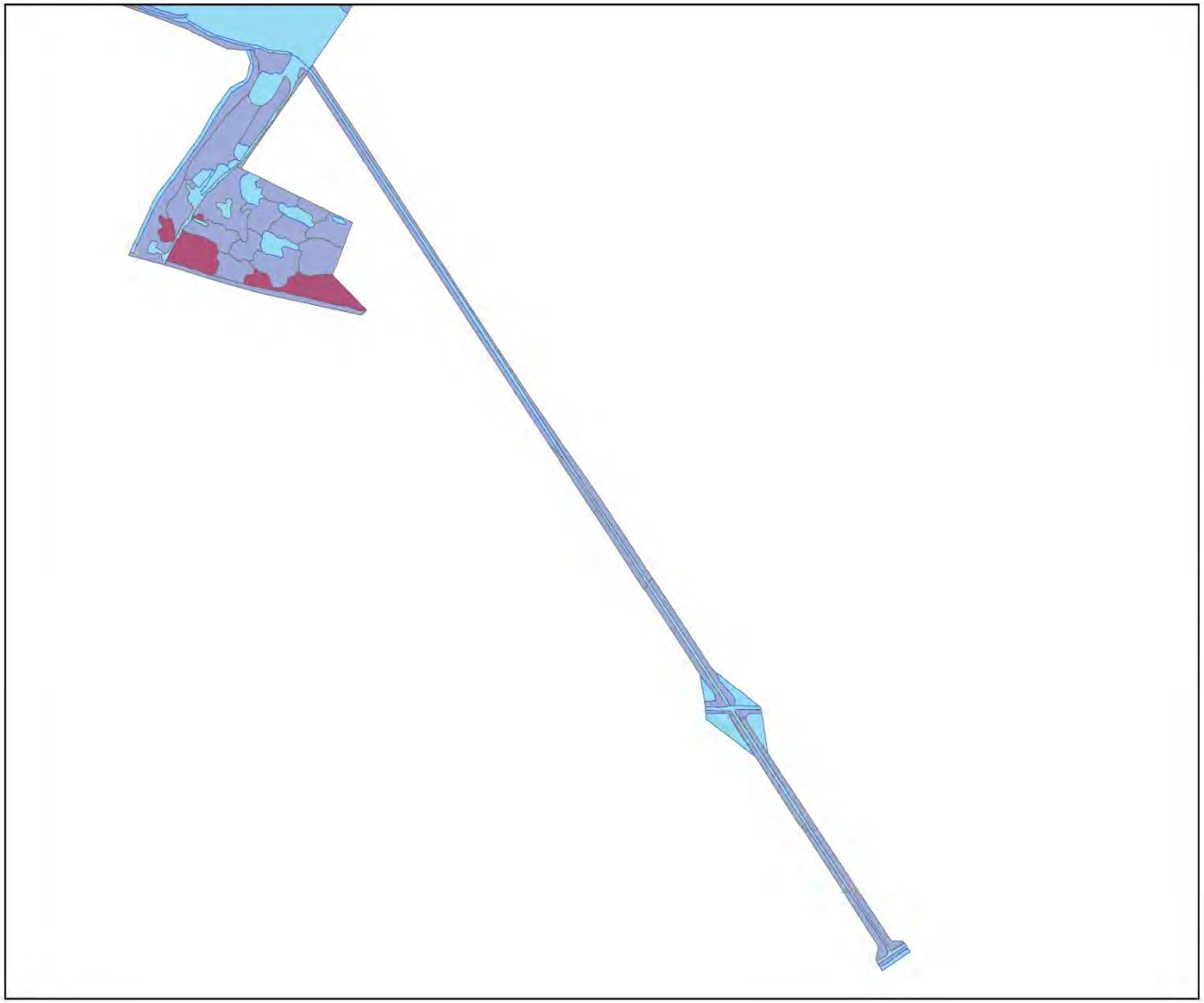
Legend

Arderseir_

Conservation Value

- 1
- 2
- 3
- 4

Map 1 of 2



Legend

Arderseir_

Conservation Value

- 1
- 2
- 3
- 4

Map 2 of 2