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☒ Only the following plants: UKP

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Generic Site Report

UKP-GW-GL-025, Revision 1

Westinghouse Electric Company LLC
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REVISION HISTORY

Revision	Description of Changes
0	Initial Submittal.
1	Complete rewrite and reformatting to incorporate responses to Technical Queries and Regulatory Observations.

TABLE OF CONTENTS

LIST OF TABLES

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LIST OF FIGURES

LIST OF ACRONYMS

AP1000	AP1000 nuclear power plant (AP1000™ is a trademark of Westinghouse Electric Company LLC)
EA	Environment Agency
ERICA	Environmental Risk from Ionising Contaminants: Assessment and Management
GDA	Generic Design Assessment
HSE	Health and Safety Executive
UK	United Kingdom

1.0 INTRODUCTION

The United Kingdom (UK) nuclear regulators (the Environment Agency [EA] and Health and Safety Executive [HSE]) have developed a Generic Design Assessment (GDA) process for evaluating alternative designs for the next generation of nuclear power plants to be built in the UK. Westinghouse Electric Company LLC has submitted an application for its AP1000™ nuclear power plant design to be considered in this process.

The GDA allows companies to submit information on their reactor designs to the nuclear regulators in advance of the selection of any particular site for a nuclear power station. The nuclear regulators are required to make a detailed examination of the safety, security, and environmental aspects of the design. In order to speed up the evaluation process, the regulators have requested that interested parties specify generic siting characteristics against which the acceptability of the design can be assessed. The generic siting characteristics should, so far as possible, envelop or bound the characteristics of any potential UK site so that the assessment is relevant to a reactor built at a number of suitable locations.

This report develops the generic site characteristics based on information relevant to five coastal nuclear power stations around the UK. The generic site characteristics will facilitate the preliminary assessment of the safety, security, and environmental aspects of the AP1000 design.

2.0 OBJECTIVES AND SCOPE

The objective of this report is to develop the characteristics of a generic coastal site that broadly encompasses the range of conditions that are likely to occur at any coastal nuclear site located within the UK.

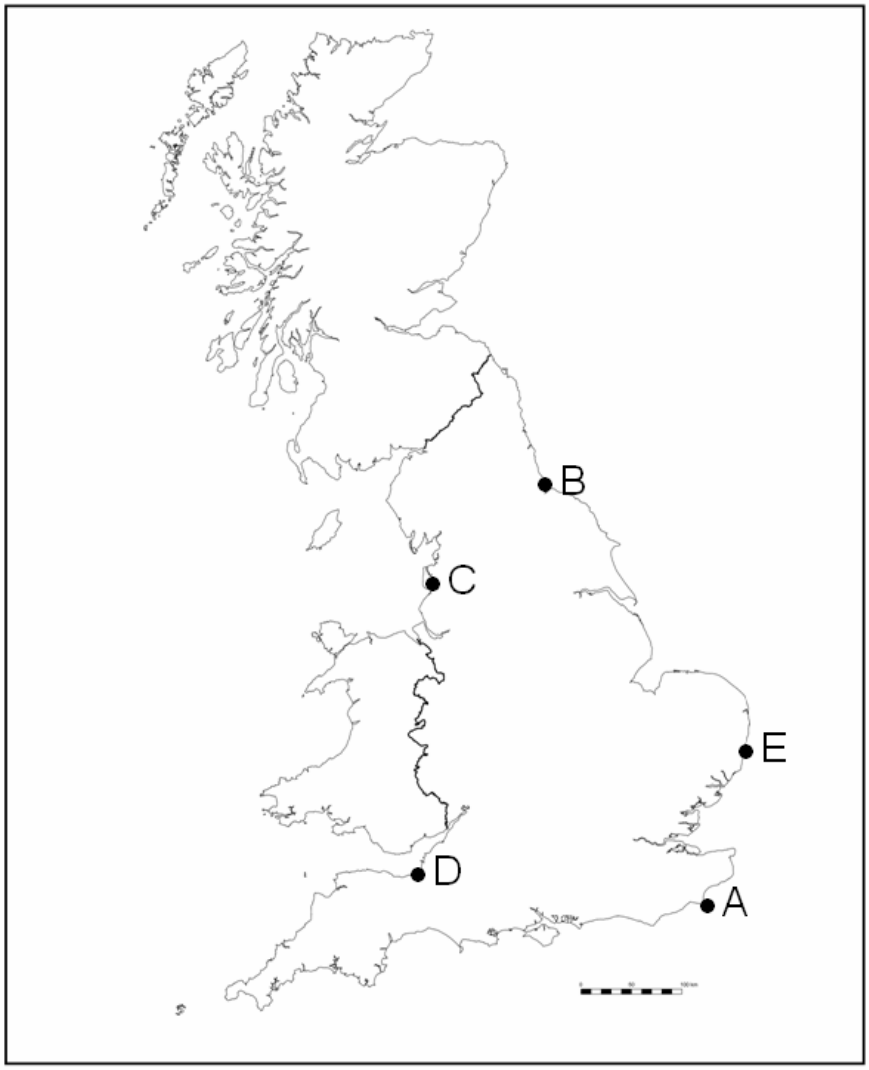
The information for the generic site will allow the UK regulators to review the safety, security, and environmental impact of the AP1000 nuclear power plant against environmental parameters that are typical of coastal nuclear sites in the UK.

Careful selection of the generic site characteristics will ensure that any safety, security, and environmental impact evaluation carried on the generic site will be relevant to any specific nuclear site that may be selected for the next generation of nuclear power plants in the UK.

3.0 BACKGROUND INFORMATION

The basis for the AP1000 design has been presented in a document consistent with the UK Design Acceptance Licensing process, EPS-GW-GL-700, "AP1000 European Design Control Document" (Reference 1). Much of the power station design information presented in this document is independent of the location chosen for its construction. However, some assumptions about the characteristics of the plant's environment must be considered in developing the design of certain safety and environmentally-related features. For this reason, characteristics for a generic site must be defined.

In order to characterise the generic site in the UK, information has been obtained from five coastal nuclear power stations around the UK. These power stations are Dungeness (A), Hartlepool (B), Heysham (C), Hinkley (D), and Sizewell (E). These sites are considered typical of the range of nuclear coastal sites in the UK. The sites are located around the English coast (see Figure 3-1).



Dungeness (A), Hartlepool (B), Heysham (C), Hinkley (D), and Sizewell (E)

Figure 3-1. Location of Nuclear Power Stations Used to Establish the Generic Design Case

4.0 GENERIC SITE CHARACTERISTICS

The information obtained in this section has been largely derived from the government's on-line geographical information system, www.magic.gov.uk (Reference 2).

4.1 Human Population

Analysis has been carried out on the centres of population within 20 km of the five coastal power stations used as a basis of this assessment.

4.1.1 Towns and Villages

The number of population centres within 2 km, 10 km, and 20 km of the five existing nuclear power stations used in this evaluation is shown in Tables 4-1, 4-2, and 4-3, respectively. The nearest population centre of a given size is shown in Table 4-4.

The number of population centres selected for the generic site is based on the 80th percentile number of the five sites evaluated. Using the 100th percentile produces an unrepresentative map, with an unrealistic number of population centres.

For the purpose of the generic site, it is assumed that the population centres of a given size are located at the nearest distance recorded for the five existing nuclear power stations.

4.1.2 Isolated Properties and Farms

The number of isolated properties and farms within centres that are within 2 km of the five existing nuclear power stations are estimated in Table 4-5.

4.1.3 Exposed Population Groups

Five exposure groups are considered at a generic coastal site. These are selected to represent the full range of possible exposure pathways using reasonable habit patterns. The exposure groups are the local resident family, the fisherman family, the farming family, sewage treatment workers, and the child playing in a brook. See Science Report SC030162/SR2, "Initial Rediological Assessment Methodology, Part 2 Methods and Input Data" (Reference 7).

The habit data for these groups are assumed to be as shown in Tables 4-6, 4-7, 4-8, 4-9, and 4-10, respectively (Reference 7).

It is assumed that the members of the fisherman family exposure group consume fish, mollusks, and crustaceans at higher consumption rates than the local resident family exposure group. A fisherman family may be exposed to radiation through the following pathways:

- Internal irradiation from the consumption of seafood contaminated with radionuclides;
- External radiation from radionuclides in beach and shore sediment during bait collection.

For a farming family exposed to sludge used for land conditioning, the relevant pathways are:

- External radiation from radionuclides in sludge-conditioned soil;
- Internal irradiation from the inadvertent inhalation of resuspended soil;
- Internal irradiation from the inadvertent ingestion of soil;

- Internal irradiation from the consumption of appropriate food types produced on sludge-conditioned land.

For children playing in a brook that carries treated effluent, the relevant pathways are:

- External radiation from radionuclides in river bank sediments;
- Internal irradiation from the inadvertent ingestion of brook water;
- Internal irradiation from the inadvertent ingestion of sediments.

4.2 Terrestrial Environment

4.2.1 Topography

The ground elevations within 2 km and 10 km of the five nuclear power plants are shown in Table 4-11.

4.2.2 Geology/Hydrogeology

Information has not yet been obtained for the geology at the five nuclear sites considered. It is assumed that the land is stable and the presence of faults is minimal. It is assumed that the superficial geology is glacial clays, with sands and gravel lenses. Discontinuous, perched groundwater is assumed to be 2 m below the site surface. It is also assumed that the site overlies limestone bedrock, which is a major aquifer with groundwater level at 20 m below ground level.

The AP1000 is designed for a normal groundwater elevation to within 0.6 m of the plant grade elevation.

4.2.3 Seismology

The following information in this subsection has been obtained from the British Geological Survey website, www.earthquakes.bgs.ac.uk (Reference 3).

Twenty to thirty earthquakes are felt by people every year in the UK. Most of these are very small and cause no damage. However, some British earthquakes have caused some damage, although nothing like the devastation caused by large earthquakes in other parts of the world.

A magnitude 4 earthquake on the Richter scale happens in Britain roughly every two years. A magnitude 5 earthquake in the UK occurs roughly every 10 to 20 years. The largest recorded earthquake in the UK had a magnitude of 6.1 and occurred 60 miles off the Yorkshire coast beneath the North Sea. Research suggests that the largest possible earthquake in the UK is around magnitude 6.5. For the purpose of the generic site characterisation, it is assumed that the site has the potential to experience a magnitude 6.5 earthquake.

The AP1000 safe shutdown earthquake design is for a peak ground acceleration of 0.3g. This ground acceleration would be typical of a magnitude 6.7 to 8 earthquake. This design exceeds the largest recorded earthquake in the UK.

4.2.4 Landscape Typology

The characteristic landscape typology within 5 km of the five existing nuclear power station sites can be described as shown in Table 4-12.

Where three or more of the five nuclear power station sites have the same attribute, this attribute has been applied to the generic site.

4.2.5 Soils

The soils within 5 km of the sites are listed in Table 4-13.

Where three or more of the five nuclear power station sites have the same soil type, this soil type has been applied to the generic site.

4.2.6 Vegetation

The main land cover within 5 km of the sites is listed in Table 4-14. The characteristic natural habitats are identified in Table 4-15.

Where three or more of the five nuclear power station sites have the land cover type, this land cover type has been applied to the generic site.

Where three or more of the five nuclear power station sites have the semi-natural habitat, this habitat has been applied to the generic site.

4.2.7 Terrestrial Ecological Receptors

For the purpose of the generic site, it is assumed that these indicator species are present within the vicinity of the nuclear power plant:

- Amphibian (frog)
- Bird (duck)
- Bird egg (duck egg)
- Detritivorous invertebrate
- Flying insect (bee)
- Gastropod
- Grasses and herbs (wild grass)
- Lichen and bryophytes
- Mammal (rat, deer)
- Reptile
- Shrub
- Soil invertebrate (earthworm)
- Tree (pine tree)

These reference organisms are the same as those selected for the Environmental Risk from Ionising Contaminants: Assessment and Management (ERICA) Integrated Approach to the assessment of radiation effects in biota. See “D-ERICA: An integrated approach to the assessment and management of environmental risks from ionising radiation” (Reference 4). These entities provide a basis for the estimation of radiation dose rate to a range of organisms that are typical, or representative, of a contaminated environment.

4.2.8 Sensitive Sites

Various types of sensitive site lie within proximity of the five nuclear power stations. The number of these sites within 2 km, 10 km and 20 km are identified in Tables 4-16, 4-17, and 4-18, respectively. The nearest sensitive sites are shown in Table 4-19.

It has been assumed that the generic site has the 80th percentile number of sensitive sites within a given distance. For the purpose of the generic site, it is assumed that the sensitive sites are located at the nearest distance recorded for the five existing nuclear power stations.

4.3 Meteorology and Climate

4.3.1 Meteorology

The metrological data obtained for the five coastal nuclear sites are summarised in Table 4-20, together with UK extreme weather data and the AP1000 meteorological design basis. A generic site data set has been derived from the worst case maximum and minimum data and the average data from the five sites.

The meteorological data have been obtained from the unofficial weather stations (see www.wunderground.com [Reference 5]) nearest to the five nuclear power plants used in this evaluation.

The UK extreme weather data have been obtained from the Meteorological Office records. See www.metoffice.gov.uk (Reference 6). It is notable that the AP1000 design parameters encompass the generic site dataset and the UK extreme weather conditions.

4.3.2 Atmospheric Conditions

For the purpose of the generic site it is assumed that the atmospheric conditions are as shown in Table 4-21 (Reference 7). The Pasquill Stability Category is a measure of atmospheric turbulence, where A = extremely stable, G = extremely unstable.

4.4 Flooding

The EA's online flood maps (See maps.environment-agency.gov.uk [Reference 8]) were studied to determine whether there is a risk of the site flooding from rivers or the sea. The presence of adjacent flood defences was also identified. The results are shown in Table 4-22. As a worst case, the generic site is assumed to be subject to flooding, without flood defences or grade elevation.

Flooding of water intake structures, cooling canals, or reservoirs or channel diversions would not prevent safe operation of the AP1000 plant.

The AP1000 is designed for a normal groundwater elevation up to plant elevation 98' and for a flood level up to plant elevation 100', where grade elevation is also established as plant elevation 100'. The actual grade will be a few inches lower to prevent surface water from entering doorways.

4.5 Coastal Environment

4.5.1 Tidal Range

Tidal range data have been taken from the predicted data published by the Proudman Oceanographic Laboratory for the period 2005 to 2025. See www.pol.ac.uk (Reference 9). The data are summarised in Table 4-23. The generic site data assumes the 80th percentile value for the high tides and the 20th percentile value for the low tides.

4.5.2 Intertidal Tidal Zone

The substrates of the intertidal zones within 10 km of the five coastal power stations used in this evaluation are shown in Tables 4-24 and 4-25 for the foreshore and backshore, respectively. The generic site assumes that all intertidal substrates are present within 10 km of the site.

4.5.3 Bathymetry

The water depths off the coast of the five nuclear power plants are summarised in Table 4-26. The elevation and shape of the seabed data is extracted from nautical charts and the water depths are referenced to chart datum. The generic site is assumed to have the shallowest sea depth.

4.5.4 Exchange Rates for Estuary/Coastal Water

Typical exchange rates for estuary/coastal water are shown in Table 4-27. See Science Report SC030162/SR1, "Initial Radiological Assessment Methodology, Part 1 User Report" (Reference 10). The generic site has been allocated the most conservative (lowest) exchange rate.

4.5.5 Coastal Ecological Receptors

For the purpose of the generic site, it is assumed that these indicator species are present within the vicinity of the nuclear power plant:

- (Wading) bird (duck)
- Benthic fish (flat fish)
- Bivalve mollusc
- Crustacean (crab)
- Macroalgae (brown seaweed)
- Mammal
- Pelagic fish
- Phytoplankton
- Polychaete worm
- Reptile
- Sea anemones/true corals
- Vascular plant
- Zooplankton

These reference organisms are the same as those selected for the ERICA Integrated Approach to the assessment of radiation effects in biota (Reference 3). These entities provide a basis for the estimation of radiation dose rate to a range of organisms that are typical, or representative, of a contaminated environment.

4.5.6 Marine Biology

The marine biological features identified within 10 km of the five nuclear power plants are listed in Table 4-28. The 80th percentile number of each feature is designated for the generic site.

Table 4-1

NUMBER OF POPULATION CENTRES WITHIN 2 KM

Population	Site A	Site B	Site C	Site D	Site E	Generic Site
>100000	0	0	0	0	0	0
>20000	0	1	1	0	0	1
>5000	1	0	0	0	1	1
>1000	0	0	0	0	0	0
≤1000	0	0	0	0	0	0

Table 4-2

NUMBER OF POPULATION CENTRES WITHIN 10 KM

Population	Site A	Site B	Site C	Site D	Site E	Generic Site
>100000	0	1	0	0	0	0
>20000	0	5	2	1	0	3
>5000	2	0	1	0	1	1
>1000	1	0	3	3	2	3
≤1000	0	1	0	0	0	0

Table 4-3

NUMBER OF POPULATION CENTRES WITHIN 20 KM

Population	Site A	Site B	Site C	Site D	Site E	Generic Site
>100000	0	1	1	0	0	1
>20000	0	7	5	4	0	5
>5000	3	9	5	0	2	6
>1000	8	14	14	14	6	14
≤1000	0	1	0	0	0	0

Table 4-4

NEAREST POPULATION CENTRES

Population	Site A	Site B	Site C	Site D	Site E	Generic Site
>100000	-	8.5 km	25.5 km	-	-	8.5 km
>20000	-	5.4 km	5.2 km	10.5 km	-	5.2 km
>5000	4.8 km	13.3 km	11.8 km	-	3.0 km	3.0 km
>1000	5.3 km	17.2 km	3.5 km	6.6 km	5.9 km	3.5 km
≤1000	-	7.9 km	-	-	-	7.9 km

Table 4-5

PROPERTIES AND FARMS WITHIN 1 KM AND 2 KM

Distance	Site A	Site B	Site C	Site D	Site E	Generic Site
Nearest to Site Boundary	**80 m**	**1350 m**	**734 m**	**1160 m**	**250 m**	**80 m**
<1 km	~25	0	~50	0	~10	50
<2 km	~100	1	>100	~30	~20	100

Table 4-6

HABIT DATA OF LOCAL RESIDENT FAMILY EXPOSURE GROUP

Food Consumption Rates (kg/y)	Infant (1y)	Child (10y)	Adult
Green vegetables	15	35	80
Root vegetables	45	95	130
Fruit	35	50	75
Sheep meat	3	10	25
Sheep liver	2.75	5	10
Cow meat	10	30	45
Cow liver	2.75	5	10
Milk	320	240	240
Breathing Rates (m^3/h)	0.22	0.64	0.92
Occupancy at Habitation (h/y)	8760	8760	8760
Fraction of Time Spent Indoors	0.9	0.8	0.5
Cloud Shielding Factor	0.2	0.2	0.2
Shielding Factor for Deposited Radionuclides	0.1	0.1	0.1

Table 4-7

HABIT DATA OF LOCAL FISHERMAN FAMILY EXPOSURE GROUP

Food Consumption Rates (kg/y)	Infant (1y)	Child (10y)	Adult
Fish	5	20	100
Crustaceans	0	5	20
Molluscs	0	5	20
Occupancy on the Beach (h/y)	30	300	2000

Table 4-8

HABIT DATA OF FARMING FAMILY EXPOSURE GROUP

Food Consumption Rates (kg/y)	Infant (1y)	Child (10y)	Adult
Green vegetables	15	35	80
Root vegetables	45	95	130
Sheep meat	3	10	25
Sheep liver	2.75	5	10
Cow meat	10	30	45
Cow liver	2.75	5	10
Milk	320	240	240
Breathing Rates (m^3/h)	0.22	0.64	0.92
Inadvertent Ingestion Rate (kg/h)	8.4E-08	3.4E-08	1.6E-08
Occupancy at Habitation (h/y)	8760	8760	8760
Fraction of Time Spent Indoors	0.9	0.8	0.5
Indoor Shielding Factor	0.1	0.1	0.1

Table 4-9

HABIT DATA OF SEWAGE TREATMENT WORKS WORKER EXPOSURE GROUP

Exposure Data	Adult Sewage Worker
Occupancy adjacent sewage tanks (h y^{-1})	1500
Occupancy adjacent sludge tanks (h y^{-1})	500
Sewage Worker Inhalation Rates (m^3 h^{-1})	1.2
Inadvertent Sludge Ingestion Rate (kg h^{-1})	5.0E-06
Sewage Treatment Works Parameters	Value
Flow Rate Raw Sewage (m^3 d^{-1})	60
Effluent Residence Time (h)	15
Sludge Processing Time (h)	306
Sludge Storage Time (h)	350
Total Sludge Residence Time (h)	656
Sewage Treatment Works Parameters (cont)	Value
% Solid Content of Raw Sewage	0.05
% Solid Content of Treated Sludge	5
Density of Raw Sewage and Treated Sludge (kg l^{-1})	1
Airborne Concentration of Sewage Sludge at Sewage Treatment Works (kg m^{-3})	1.0E-07
Parameters Characterising the Application of Treated Sewage Sludge to Agricultural Land	Value
Delay between Spreading of Sludge and Animal Grazing (d)	21
Delay between Spreading of Sludge and Crop Harvest (d)	300
Spreading Rate of Sludge to Land (kg m^{-2} y^{-1})	8
Density of Soil (kg m^{-3})	1250
Transfer of Strontium to Next Soil Layer (y^{-1})	0.464
Transfer of Other Radionuclides to Next Soil Layer (y^{-1})	0.243
Airborne Soil Concentration (kg m^{-3})	1.0E-07

Table 4-10

HABIT DATA OF CHILDREN PLAYING IN BROOK EXPOSURE GROUP

Exposure Data	Child Playing in Brook
Occupancy (h y^{-1})	500
Inadvertent Sludge Ingestion Rate of Water (ml h^{-1})	10
Inadvertent Sludge Ingestion Rate of Sediment (mg h^{-1})	10
Parameters Characterising the Brook	Value
Brook Flow Rate (m^3 s^{-1})	0.1
Suspended Sediment Load (kg l^{-1})	4.0E-05

Table 4-11

ELEVATION

Elevation	Site A	Site B	Site C	Site D	Site E	Generic Site
2 km	<10 m	<10 m	30 m	30 m	<10 m	30 m
10 km	<10 m	242 m	140 m	358 m	30 m	358 m

Table 4-12

CHARACTERISTIC SEMI-NATURAL HABITATS WITHIN 5 KM

National Landscape Typology Definitive Attributes	Site A	Site B	Site C	Site D	Site E	Generic Site
Physiography						
Lowlands – Low-lying areas, mainly below 300 ft, including descriptive landform classes 'levels' and 'lowland vales & valleys' (see below), associated with Mesozoic (Cretaceous, Jurassic, Triassic, and Permian) or Tertiary rocks of sedimentary origin, and glacial or fluvial (marine, riverine, lacustrine, or wind-blown) drift.	+	+	+	+	+	+
Intermediate – Rolling/undulating areas, below 1000 ft, including descriptive landform classes 'low hills – plateau' and 'rolling lowland' (see below); associated mainly with Mesozoic (Cretaceous, Jurassic, Triassic, and Permian) or Tertiary rocks of sedimentary origin and glacial till.				+		
Landcover						
Chalk and Limestone – Light land associated with shallow, free-draining soils developed directly on chalk; or limestone bedrock – typically distinguished by stoney soils with relic calcareous grassland on steeper slopes in soft rock areas and rock outcrops/limestone pavement with dry species-rich pasture/hay meadow in hard rock areas.	+				+	
Clayland – Heavy, often poorly draining land associated with base-rich, clayey and loamy soils developed on soft (Mesozoic & Tertiary) clay and chalky till. Seasonal waterlogging is the main constraint to agricultural production and, although utilized extensively for cereal growing in Eastern England, this ground type is mainly under permanent grassland in central and western areas where neutral grassland is the characteristic associated habitat.		+				
Heath and Moorland – Land associated with nutrient-poor mineral and/or peaty soils, supporting dwarf shrub heath, acidic grassland and bog habitats, or relic heathy/moorland vegetation (bracken, gorse, etc.). This ground type is normally associated with sandstone, or sandy drift in the lowlands, but it is widespread on mixed sedimentary and igneous rocks in upland/hard rock areas. Often marginal in agricultural terms.	+					

Table 4-12 (cont.)

CHARACTERISTIC SEMI-NATURAL HABITATS WITHIN 5 KM

National Landscape Typology Definitive Attributes	Site A	Site B	Site C	Site D	Site E	Generic Site
Other Light Land – Light land associated with free-draining loamy and sandy solid developed on permeable rocks (sandstones, siltstones, and mudstones), or sandy drift at elevations below about 300 metres. Within the soft rock zone, where there are few constraints to agricultural production, this ground type is strongly associated with arable cultivation. Mixed farming predominates on the shallower soils found in western hard rock areas.			+	+		
Wetland – Low-lying land associated with fluvial (marine/riverine) drift and supporting wetland (wet pasture, marsh, fen, or relic wetland vegetation characterised by lines of willow, reeds in ditches, etc.). Land may be seasonally or perennially wet; often associated with ditches.		+	+	+		+
Attribute						
Dispersed Unwooded – Settled agricultural landscapes characterised by a moderate to high level of dispersal, comprising scattered farmsteads and frequent clusters of wayside dwellings. Although typically unwooded, hedgerow, streamside, and other trees are often a prominent feature.	+	+	+	+		+
Unsettled/Open Land – Extensive areas of uncultivated, mainly unenclosed land (including moorland, heath, and coastal grazing marsh) characterised by the virtual absence of human habitation.	+					
Urban – Extensive areas of predominantly built land where the rural settlement pattern has been completely subsumed by urban development (see urban land use).		+	+			
Wetland/Waste Unwooded – Open, sparsely settled agricultural landscapes characterised by a surveyor enclosed pattern of large rectilinear fields and isolated farmsteads. Tree cover is usually restricted to watercourses, or groups of trees around buildings.	+	+	+	+	+	+
Wooded (Ancient Woods) – Settled agricultural landscapes (dispersed or nucleated settlement) characterised by an assorted pattern of ancient woodlands which pre-date the surrounding enclosure pattern; in places associated with densely scattered hedgerow trees (typically oak).				+		

Table 4-13

CHARACTERISTIC SEMI-NATURAL HABITATS WITHIN 5 KM

Soil Type	Drainage	Site A	Site B	Site C	Site D	Site E	Generic Site
Base Rich (Slightly acidic)	Free					+	
Fen Peat Soils						+	
Loamy & Clayey (Coastal Flats)	Naturally Wet	+	+		+	+	+
Loamy & Clayey (Lime rich)	Impeded				+		
Loamy & Clayey (Slightly Acid)	Slightly impeded				+		
Loamy & Clayey (Slightly Acid)	Impeded		+		+	+	+
Loamy & Sandy with Peaty surface	Naturally Wet			+	+		
Loamy (Slightly Acid)	Free			+	+		
Saltmarsh Soils				+			
Sand Dune Soils	Free	+	+	+	+	+	+
Sandy Soils (Slightly Acidic)						+	

Table 4-14

MAIN LAND COVER WITHIN 5 KM

Main Land Cover	Site A	Site B	Site C	Site D	Site E	Generic Site
Arable					+	
Arable and grassland			+	+	+	+
Arable and horticulture					+	
Arable, some grassland	+	+		+	+	+
Dune vegetation	+	+	+	+	+	+
Grassland and arable some woodland		+		+	+	+
Mostly arable			+	+		
Saltings and coastal grazing marshes			+			

Table 4-15

CHARACTERISTIC SEMI-NATURAL HABITATS WITHIN 5 KM

Characteristic Semi-Natural Habitats	Site A	Site B	Site C	Site D	Site E	Generic Site
Acid dry pastures; acid deciduous woodland and coniferous woodland					+	
Base-rich pastures and classic chalky boulder clay ancient woodlands; some wetter areas and lime rich flush vegetation				+		
Base-rich pastures and deciduous woodlands					+	
Coastal salt marsh vegetation subject to tidal flooding			+			
Lowland seasonally wet pastures and woodland		+		+	+	+
Neutral and acidic pastures and deciduous woodlands; acid communities such as bracken and gorse in the uplands			+	+		
Sand dune vegetation ranging from pioneer dune vegetation through to low shrub	+	+	+	+	+	+
Wet brackish coastal flood meadows and grazing marsh	+	+		+		+
Wet fen and carr woodlands					+	
Wet meadows with pastures with wet fen communities			+	+		
Wide range of pasture and generally broad-leaved and mixed woodland types				+		

Table 4-16

SENSITIVE SITES WITHIN 2 KM

Type	Site A	Site B	Site C	Site D	Site E	Generic Site
Forestry Commission Woodland (England)	0	0	0	0	0	0
Grassland Inventory (England)	0	0	0	2	0	0
Green Belt (England)	0	0	0	0	0	0
Important Bird Areas (England)	1	1	1	1	2	1
Local Nature Reserves (England)	0	1	0	0	0	0
Lowland Grazing Marsh (England)	0	3	1	1	2	2
National Parks (England)	0	0	0	0	0	0
Ramsar Sites (England)	0	1	1	1	1	1
RSPB Reserves (England)	1	1	0	0	2	1
Sites of Special Scientific Interest (England)	1	4	2	1	3	3
Special Areas of Conservation (England)	1	0	1	1	1	1
Special Protection Areas (England)	1	1	1	1	2	1

Table 4-17

SENSITIVE SITES WITHIN 10 KM

Type	Site A	Site B	Site C	Site D	Site E	Generic Site
Forestry Commission Woodland (England)	0	0	0	5	4	4
Grassland Inventory (England)	0	0	1	4	13	6
Green Belt (England)	0	0	2	0	0	0
Important Bird Areas (England)	1	1	1	2	3	2
Local Nature Reserves (England)	1	9	0	0	1	3
Lowland Grazing Marsh (England)	8	11	10	4	13	11
National Parks (England)	0	0	0	0	0	0
Ramsar Sites (England)	0	1	1	1	2	1
RSPB Reserves (England)	1	1	1	0	4	2
Sites of Special Scientific Interest (England)	1	8	4	5	13	9
Special Areas of Conservation (England)	1	-	1	2	3	2
Special Protection Areas (England)	1	1	1	1	3	1

Table 4-18

SENSITIVE SITES WITHIN 20 KM

Type	Site A	Site B	Site C	Site D	Site E	Generic Site
Forestry Commission Woodland (England)	2	10	8	14	14	14
Grassland Inventory (England)	4	23	41	30	32	34
Green Belt (England)	0	0	6	0	0	1
Important Bird Areas (England)	1	2	3	3	4	3
Local Nature Reserves (England)	3	31	3	7	1	12
Lowland Grazing Marsh (England)	55	12	41	29	42	45
National Parks (England)	0	1	1	1	0	1
Ramsar Sites (England)	0	2	2	2	2	2
RSPB Reserves (England)	1	1	1	1	5	2
Sites of Special Scientific Interest (England)	10	29	35	24	28	30
Special Areas of Conservation (England)	1	3	3	4	6	4
Special Protection Areas (England)	1	3	3	2	4	3

Table 4-19

SENSITIVE SITES (M)

Type	Site A	Site B	Site C	Site D	Site E	Generic Site
Forestry Commission Woodland (England)	19250	12980	10600	8300	5460	5460
Grassland Inventory (England)	17380	10650	7600	700	3170	700
Green Belt (England)	0	0	7000	0	0	7000
Important Bird Areas (England)	870	250	380	330	1120	250
Local Nature Reserves (England)	8700	850	15300	10700	4470	850
Lowland Grazing Marsh (England)	2310	550	1610	380	340	340
National Parks (England)	0	13000	18500	16200	0	13000
Ramsar Sites (England)	0	360	430	290	1150	290
RSPB Reserves (England)	1200	1780	9280	19200	1042	1042
Sites of Special Scientific Interest (England)	180	250	470	320	330	180
Special Areas of Conservation (England)	330	15410	450	330	1010	330
Special Protection Areas (England)	1170	380	360	300	1210	300

Table 4-20

METEREOROLOGY

Parameter		Unit	Site A 2005-7	Site B 2005-7	Site C 2007	Site D 2005-7	Site E 2006-7	Generic Site	UK	AP1000 Design Basis
Temp	Max	C	37.7	30.6	27.3	33.8	34.0	37.7	38.5	46
	Min	C	-0.7	-6.9	-4.6	-4.5	-3.6	-6.9	-27.2	-40
	Avg	C	13.0	11.1	11.1	11.4	12.0	11.8		
Dew Point	Max	C	21.7	19.3	17.1	21.4	19.1	21.7		22.7
	Min	C	-6.2	-9.6	-6.9	-7.8	-12.3	-12.3		
	Avg	C	9.3	6.8	7.2	7.9	4.1	7.3		
Humid-ity	Max	%	100.0	93.0	98.0	100.0	97.0	100.0		
	Min	%	27.0	31.0	27.0	24.0	12.0	12.0		
	Avg	%	79.6	76.4	78.3	81.0	62.2	76.2		
Wind Speed	Max	km/h	51.5	93.3	80.4	40.2	88.5	93.3		
	Min	km/h	7.4	7.6	9.8	5.7	16.0	8.7		
Wind Speed	Gust	km/h	85.3	94.9	80.4	127.8	113.0	127.8	228(1)	233
Wind Direc-tion	Avg	Deg	225.0	202.5	202.5	202.5	180.0	200.5		
	Gust	Deg	225.0	360	315.0	270.0	270.0	241.9		
Rainfall	Max	mm/y	641.6	702.8	816.9	998.5	550.4	998.5		
	Max	24h							279	
	Max	1h							92	493
	Max	5 min							~32	

Note:

1. Lowland maximum (Fraserburgh, Scotland)

Table 4-21

ATMOSPHERIC CONDITIONS

Pasquill Stability Category	Frequency of Occurrence (%)	Wind Speed at 10 m Height (ms^{-1})
A	1	1
B	9	2
C	21	5
D	50	5
E	8	3
F	10	2
G	2	1

Table 4-22

FLOOD RISK

	Site A	Site B	Site C	Site D	Site E	Generic Site
Flood Risk	Near	Yes	Near	No	Near	Yes
Flood Defences	No	Yes	No	No	No	No

Table 4-23

TIDAL RANGE

Tidal Range	Site A	Site B	Site C	Site D	Site E	Generic Site
Highest Astronomical Tide	7.03 m	5.71 m	10.72 m	12.98 m	4.18 m	11.17 m
Mean High Water Springs	6.69 m	5.09 m	9.63 m	11.79 m	3.83 m	10.06 m
Mean High Water Neaps	5.22 m	4.05 m	7.46 m	8.91 m	3.15 m	7.75 m
Mean Low Water Springs	2.10 m	1.88 m	3.05 m	3.57 m	1.09 m	1.72 m
Mean Low Water Neaps	0.77 m	0.72 m	1.16 m	0.92 m	0.48 m	0.67 m
Lowest Astronomical Tide	0.16 m	-0.03 m	0.19 m	-0.20 m	0.16 m	-0.06 m

Table 4-24

INTERTIDAL ZONE FORESHORE

Intertidal Substrate	Site A	Site B	Site C	Site D	Site E	Generic Site
Sand	+	+	+	+		+
Gravel	+	+	+	+	+	+
Sand and Gravel	+	+			+	+
Rock Platform		+		+		+
Mud		+	+	+	+	+
Sand and Mud		+	+			+
Mud and Gravel			+			+
Made Ground		+	+			+

Table 4-25

INTERTIDAL ZONE BACKSHORE

Intertidal Substrate	Site A	Site B	Site C	Site D	Site E	Generic Site
Sand		+	+	+		+
Gravel	+		+	+		+
Rock Platform			+	+		+
Mud			+	+		+
Sand and Mud						+
Made Ground		+	+			+

Table 4-26

BATHYMETRY

Distance from Site	Depth (Max/Min)	Site A	Site B	Site C	Site D	Site E	Generic Site
1 km	Max	30 m	10 m	10 m	5 m	10 m	5 m
	Min	-10 m	-10 m	-10 m	-15 m	-5 m	-15 m
2 km	Max	50 m	15 m	15 m	5 m	10 m	5 m
	Min	-10 m	-10 m	-10 m	-15 m	-5 m	-15 m
10 km	Max	50 m	50 m	15 m	15 m	50 m	15 m
	Min	-10 m	-10 m	-10 m	-15 m	-5 m	-15 m

Table 4-27

VOLUMETRIC EXCHANGE RATES (M/S)

Site A	Site B	Site C	Site D	Site E	Generic Site
-	130	250	3200	350	130

Table 4-28

MARINE BIOLOGICAL FEATURES WITHIN 10 KM

Parameter	Site A	Site B	Site C	Site D	Site E	Generic Site
Biosphere Reserves	0	0	0	0	0	0
Grey Seal Colonies	0	0	0	0	0	0
Harbour Porpoise	0	0	0	0	0	0
Minke Whales	0	0	0	0	0	0
Seabird Nesting Colonies	5	12	2	3	4	6
Sensitive Fish Areas	1	1	0	0	1	1
Waders and Wildfowl Areas	1	1	0	0	1	1
White Beaked Dolphin	0	0	0	0	0	0

5.0 GENERIC SITE MAP

Maps have been generated from the generic site characteristics selected from the information in Section 4. The maps are not unique solutions to the generic site, but they are consistent with the information and do help to visualise the generic site.

The nomenclatures used in each figure are displayed in a key on each page. Figure 5-1 shows the population density within 20 km of the generic site. Figure 5-2 shows the individual properties and farms within 2 km of the generic site. Figure 5-3 shows the land use and habitat areas within 5 km of the generic site. Figure 5-4 shows the sites of special interest within 5 km of the site.

A typical cross-section has been developed for the generic site. This is shown in Figure 5-5.

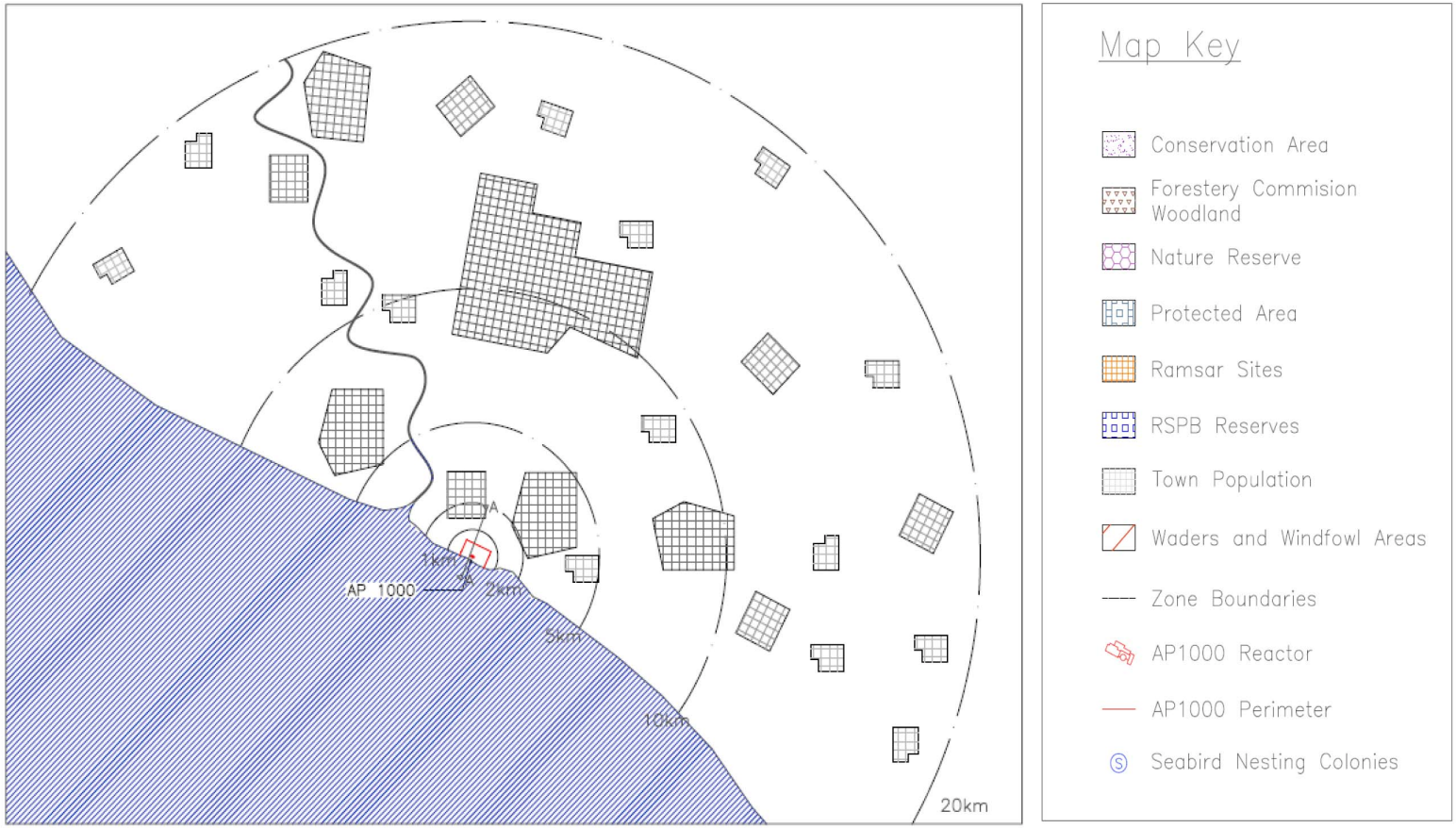
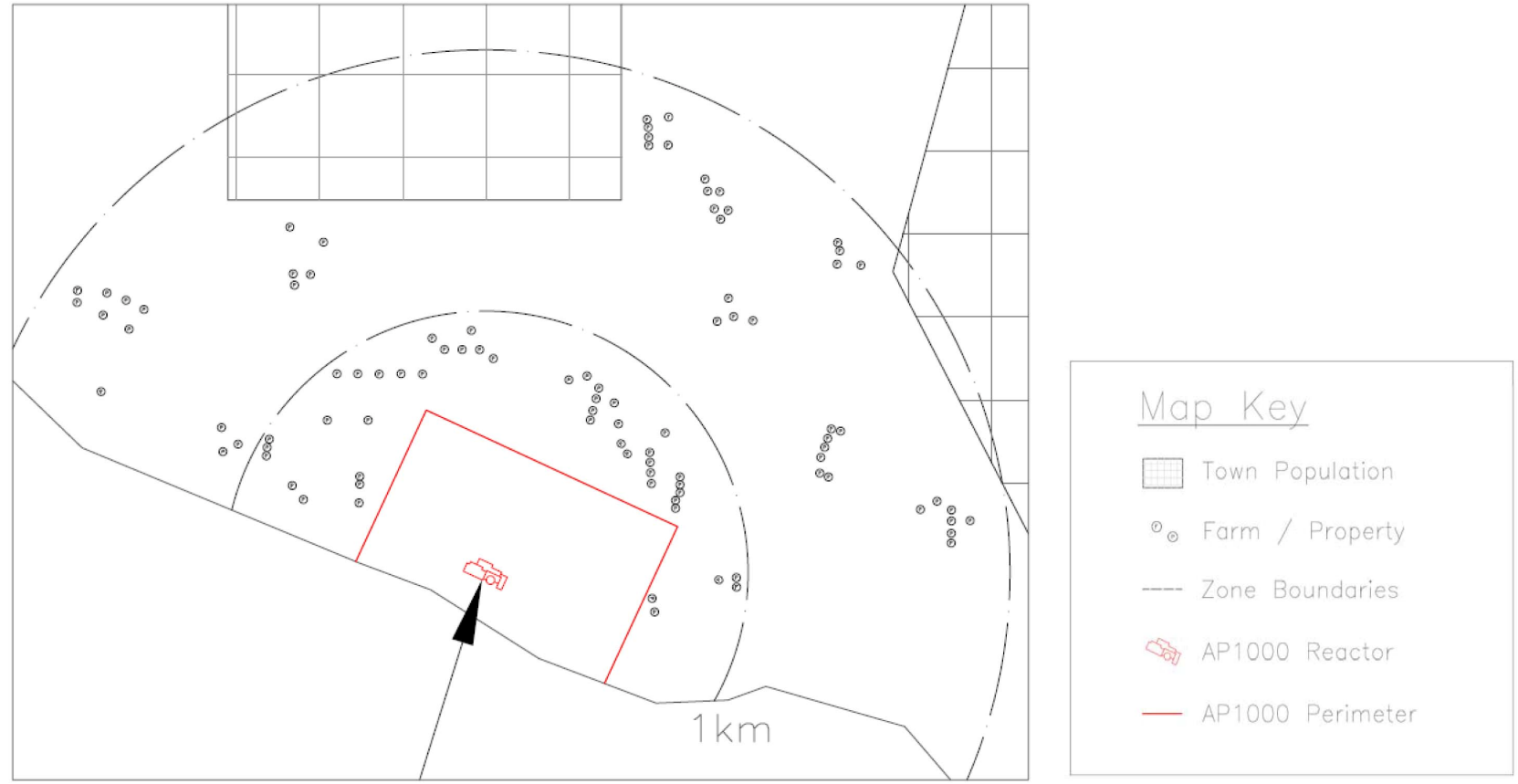


Figure 5-1. Population Centers for the Generic Design Case



e

Figure 5-2. Individual Properties and Farms within 2 km for the Generic Design Case

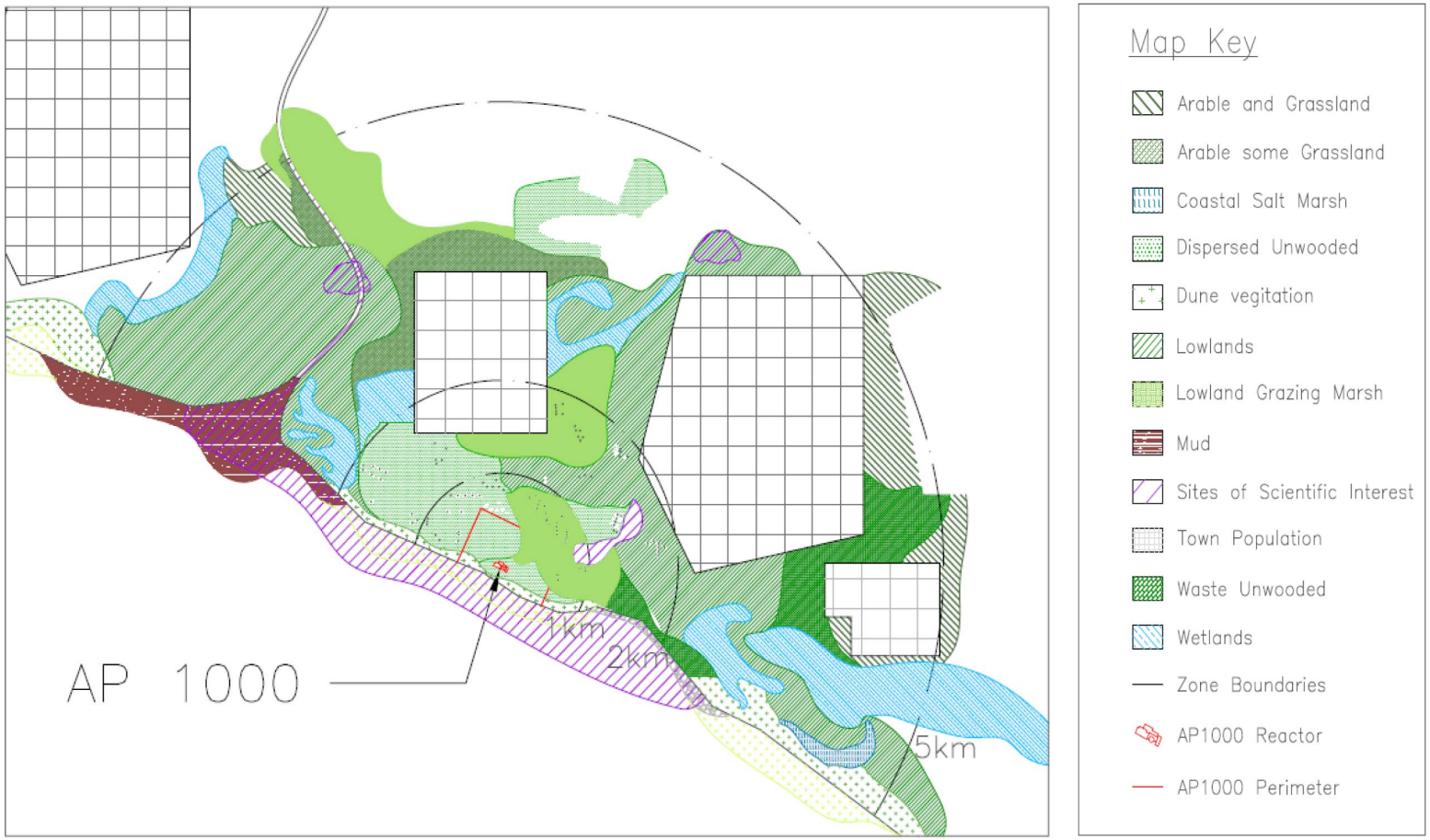


Figure 5-3. Land Use and Habitat Data for the Generic Design Case

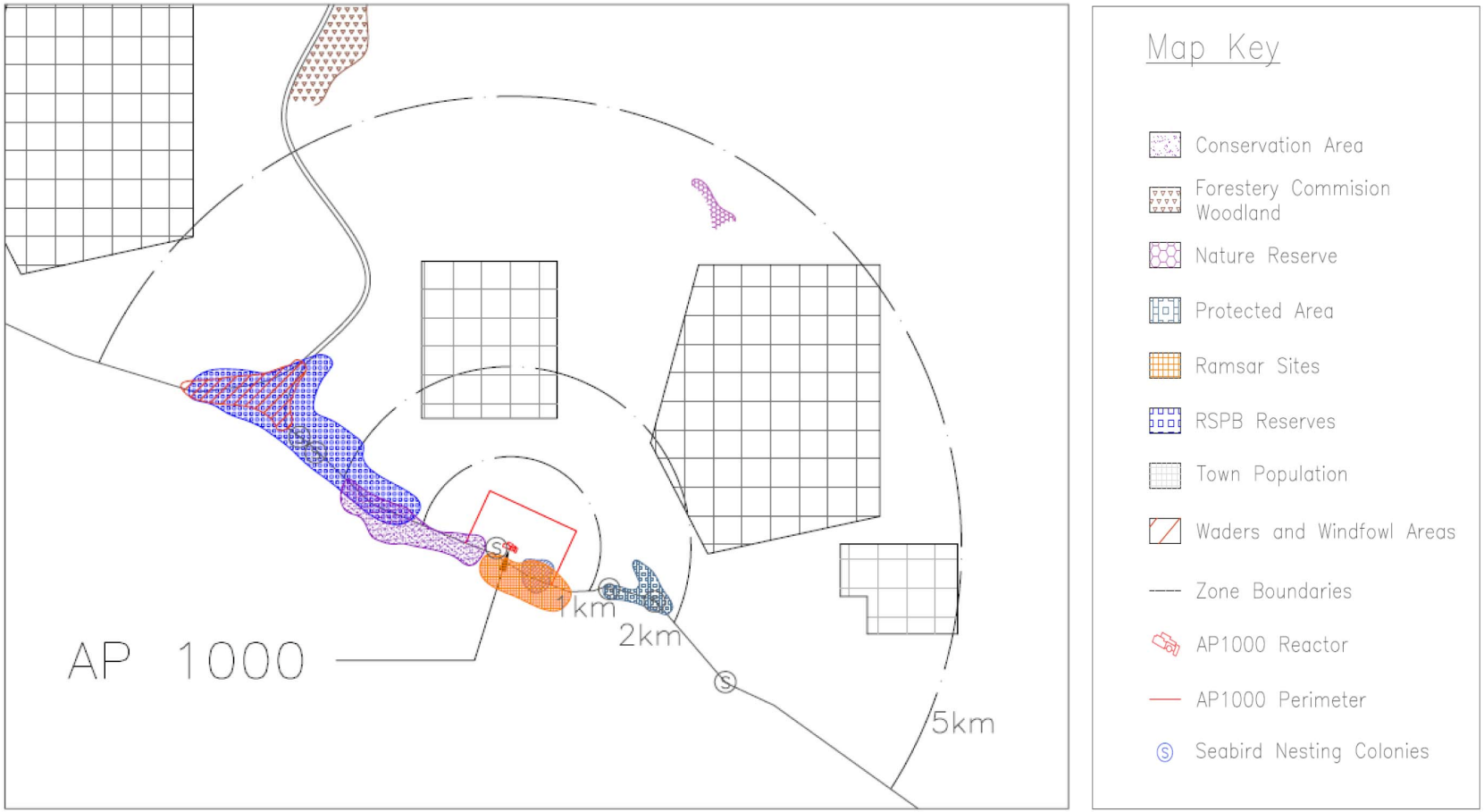


Figure 5-4. Sites of Special Interest for the Generic Design Case

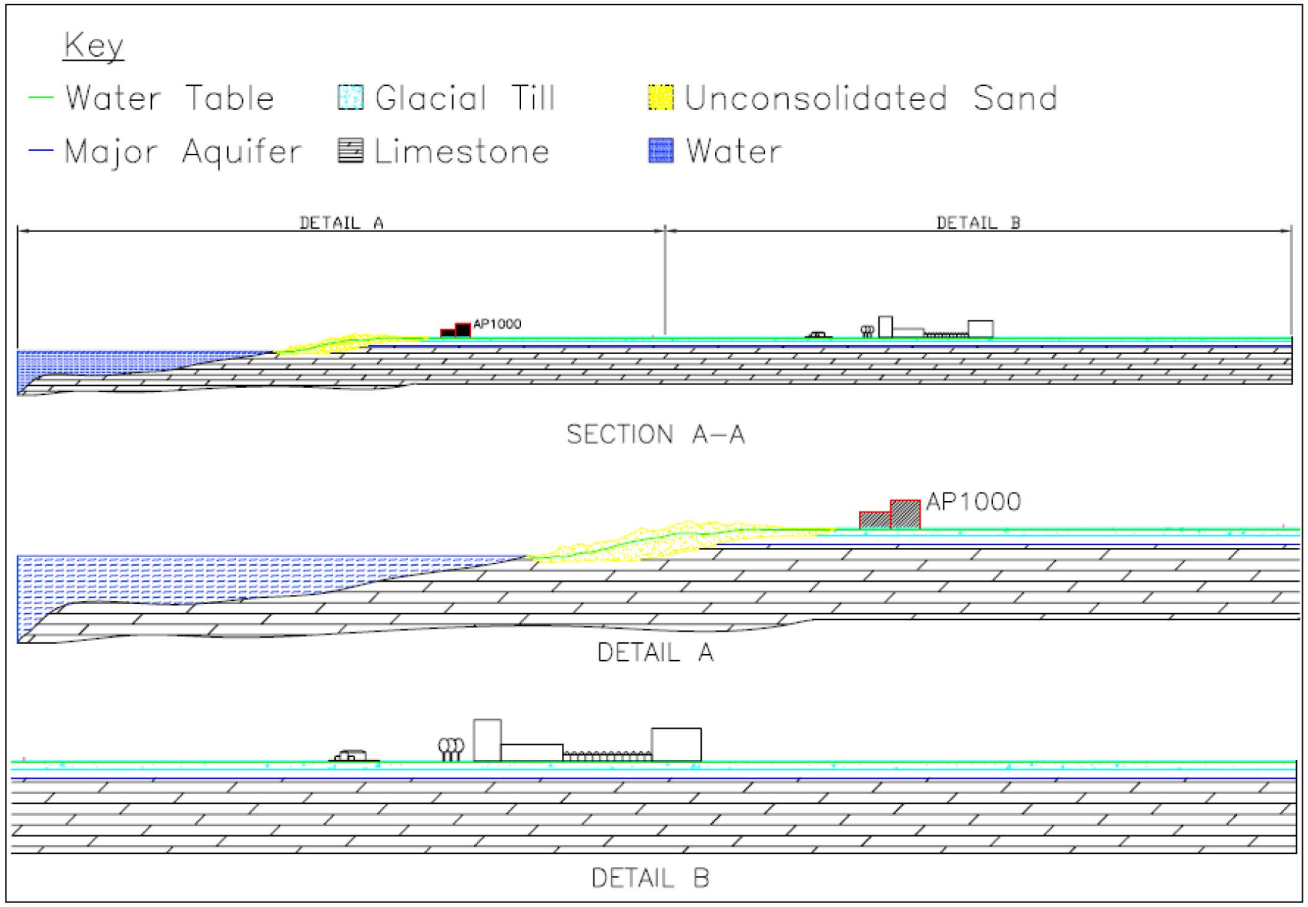


Figure 5-5. Cross-Section A-A for the Generic Design Case

6.0 CONCLUSIONS

A range of generic site characteristics has been established that describe a typical coastal location for the next generation nuclear power plant in the UK. The characteristics have been developed from information pertaining to five existing nuclear power plants located around the UK.

The generic site characteristics can be used to assist in the preliminary assessment of the safety, security, and environmental impacts of the AP1000 nuclear power plant. The final assessment of these impacts will require site specific data, which will only be available following selection of the site.

7.0 REFERENCES

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