Isles of Scilly Sea Defences Environmental Statement

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Council of the ISLES OF SCILLY

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V3	Final Report	CIoS

Contract

This report describes work commissioned by The Council of the Isles of Scilly. JBA Consulting carried out this work.

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Purpose

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- *EIA Content*
- *EIA Presentation*
- *Improving EIA practice*

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Abbreviations

AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
ATL	Advance the Line
EA	Environment Agency
EC	European Commission
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
HRA	Habitat Regulations Assessment
HTL	Hold The Line
IEMA	Institute of Environmental Management and Assessment
CIoS	Isles of Scilly Council
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
MCZ	Marine Conservation Zone
MR	Managed Realignment
NAI	No Active Intervention
NPPF	National Planning Policy Framework
NTS	Non-Technical Summary
PDZ	Policy Development Zone
PIA	Policy Intent Area
PU	Policy Unit
SAC	Special Area of Conservation
SMP	Shoreline Management Plan
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest

Glossary

Term	Definition
Abstraction boreholes	Removal of water from natural water environment through boreholes.
AONB	Area of Outstanding Natural Beauty formally designated under the National Parks and Access to the Countryside Act 1949 to protect areas of the countryside of high scenic quality.
Archaeology	The study of material remains of past human life and activities.
Archipelago	An archipelago is a chain, cluster, or collection of islands.
Baseline data	Data collected to determine the existing conditions.

Term	Definition
Biodiversity	A variety of life found in a place.
Carbon sequestration	Natural or artificial process by which carbon dioxide is removed from the atmosphere.
Climate Change	The long-term shift in average weather patterns across the world.
Coastal squeeze	The process where coastal habitats are progressively caught between coastal defences and sea-level rise and lost as a result.
Conservation Area	An area designated for special architectural and historic interest.
Cumulative impacts	The combined effects of multiple projects within an area.
Erosion	The geological process in which materials are worn away and transported by natural forces.
Flood defence	A structure (or system of defences) that reduces flooding.
Geodiversity	The variety of rocks, minerals and landforms and the processes which have formed these features over time.
Greenhouse gas	A gas which contributes to the greenhouse effect.
Groundwater aquifer	A body of porous rock or sediment saturated with groundwater.
Groyne	A structure which extends from the shore into the sea, which interrupts water flow and limits the movement of sediment.
Headland	A narrow piece of land which extends from a coastline into the sea.
Impermeable	Not allowing movement of fluid through substance.
Intertidal	An area of land which is covered at high tide and uncovered at low tide.
LNR	Local Nature Reserves are statutory designations for their natural value.
MCZ	Marine Conservation Zones are areas which protect a range of nationally important, rare or threatened habitats and species.
Mitigation	The action of reducing the severity of something.
PM	Particulate Matter are very small parts of solids or liquid materials which are suspended in the atmosphere.
Ramsar	Wetlands of international importance.
Receptor	A component of the natural or man-made environment which could be affected by an impact from the proposed works.
Residual	A quantity left over at the end of a process.

Term	Definition
Revetment	A passive structure which protects against erosion caused by wave action.
SAC	Special Areas of Conservation are designated for conserving the habitats and species in need of conservation at a European level.
Saline intrusion	The movement of saline water into freshwater aquifers.
Scheduled Monument	A building, structure of work whether above or below the surface of the land of national importance.
SPZ	Source Protection Zones are areas of protection around large and public potable groundwater abstraction sites.
SPA	Special Protection Area, protected areas for birds in the UK, under the Wildlife and Countryside Act 1981 and the Conservation Regulations 2010.
SSSI	Sites of Scientific Interest, a conservation designation legally protected under the Wildlife and Countryside Act 1981 (as amended). These sites are selected for wildlife and natural features in England.
Tombolo	A tombolo is a deposited landscape by which an island by a narrow piece of land.

1 Introduction

1.1 Background to the development

The Isles of Scilly, its communities, wildlife, the visitor economy, freshwater habitats and scarce water supplies are all threatened by increasing flood, coastal and uncertain future flood risks and extreme storm events.

The Council of the Isles of Scilly (CIoS) is proposing to construct coastal flood protection works at nine sites on islands of the Isles of Scilly, collectively referred to as the 'proposed development'. The works aim to sensitively restore the natural strength and adaptive flexibility of the extensive dunes across inhabited islands to improve the value of flood protection (ecosystem) services they provide. Five of the sites: Great Popplestone, Stinking Porth, Great Porth (Great Par) North of Great Carn, Green Bay, and Kitchen Porth are located on the island of Bryher. Three of the sites: Porth Killier, Porth Coose, and Periglis are located on the island of St Agnes, and one site, Lower Town Beach, is located on the island of St Martin's. These defences will encompass a mixture of rock revetment structures, rock armour, and dune stabilisation works to protect residential and commercial properties and critical infrastructure on the three islands.

Environmental Impact Assessment (EIA) is a systematic process to identify, predict and evaluate the environmental effects of proposed actions and projects, undertaken by the developer where the characteristics and/or location of a proposed development project would result in likely significant effects on the environment (Department for Levelling Up, Housing and Communities, 2020).

The findings of the EIA process are documented in this Environmental Statement (ES), which forms part of the planning application and Marine Licence application for the development proposals. The circumstances under which the development project has been subject to the EIA process and the way in which the ES has been prepared, are a statutory requirement. A non-technical summary of the outcomes of the EIA has been prepared to summarise the findings reported in the ES. Information used to describe each of the sites and the existing defences has been obtained from background information documents provided by CIoS, a full list of which can be found in the references section of this ES.

1.2 Description of the sites

The Isles of Scilly are an archipelago of over 200 islands, located approximately 40 km south-west of Land's End (Cornwall) (see Figure 1-1).

Figure 1-1: Location of the Isles of Scilly

Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Only five of the estimated 200 islands are inhabited: Bryher, St Agnes, St Martin's, St Mary's and Tresco. According to ONS statistics, population estimates across the Isles of Scilly in mid-2020 indicated there to be a population of 2,226 people (ONS, 2021). Tourism is a significant component of the islands' economy (approximately 85% of Gross Value Added: the measure of the value of goods produced in an area) and the population of the islands increases to approximately 6,000 during the summer months, with the majority of visitors staying on St Mary's (CIoS, 2020). The largest settlement across the islands is Hugh Town, located on the south-east coast of St Mary's, which is also the islands' administrative centre. The Duchy of Cornwall owns much of the islands, with the main exception being the built-up area of Hugh Town. The island of Tresco is leased to the Tresco Estate.

The Isles of Scilly form part of the ceremonial county of Cornwall and some public services are combined with those of Cornwall. However, the CIoS is the local authority for the islands and has the status of a sui generis (unique type of) local authority, with many functions of both a county council and a district council.

The whole of the Isles of Scilly is an Area of Outstanding Natural Beauty (AONB), a Conservation Area and a Heritage Coast. Areas of the islands are also designated as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) under The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019) which provides legal protection for nationally important habitats and species. Following the UK's exit from the European Union, these sites are no longer considered part of the Natura 2000 Network and are instead considered within the UK National Site Network.

Areas of the islands are also designated as Ramsar Sites through the 1971 UNESCO Ramsar Convention, a Marine Conservation Zone (MCZ), 26 Sites of Special Scientific Interest (SSSIs), 238 Scheduled Monuments, 128 Listed Buildings and one Grade I Registered Park and Garden.

The islands display a striking diversity of landscape, including lowland heath and small pastures enclosed by stone walls and banks, plus tiny, hedged bulb fields, and a varied coastline. Surveys have shown the presence of 18 priority habitats across the Isles of Scilly, including lowland heathland, coastal sand dunes and coastal vegetated shingle, and over 200 priority species (Natural England, 2013).

The islands are generally low lying (30% of the land area is below 5m in elevation) and the coastal margins and low-lying interior of Bryher, St Agnes and St Martin's are vulnerable to flooding from coastal erosion, wave overtopping and storm surges. The risk of flooding could affect adjacent coastal residential and commercial properties and infrastructure, including main highways, sewerage network and the islands' freshwater supplies. The flood risk is likely to increase in the future as a result of sea level rise and increased extreme weather events due to climate change.

The risks to the islands have been highlighted by recent storm events, particularly those in 2014, 2004 and 1989. These events adversely impacted freshwater supplies, housing, commercial property, roads, sewerage, electrical and telecommunications infrastructure, and caused damage to quays on several of the smaller islands.

The CIoS is seeking to sensitively restore the natural strength and adaptive flexibility of the extensive systems of coastal dunes across the islands of Bryher, St Agnes and St Martin's through implementation of coastal protection works at nine sites (see Figure 1-2). Summary information on these nine sites is provided in the following sections.

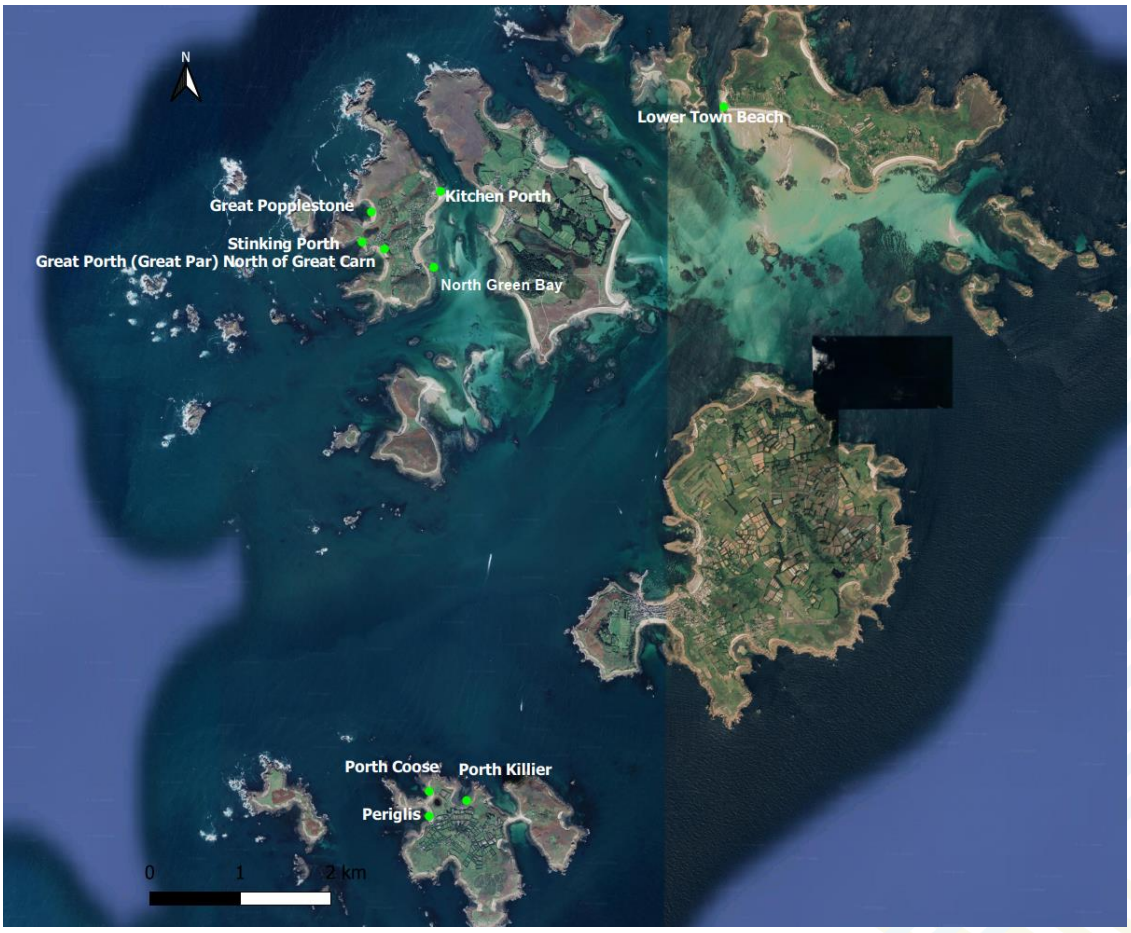

Figure 1-2: Site locations within the Isles of Scilly

Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Bryher

Bryher is the smallest inhabited island of the Isles of Scilly, located in the north-west of the archipelago. The permanent population of the island is approximately 84 people, and the economy is largely based around tourism and agriculture. Of the populated islands, Bryher is the most westerly and is directly exposed to the Atlantic Ocean on the western side, with sandy beaches on the eastern side.

The island's water supply is taken from three water abstraction boreholes located east of Great Popplestone. A timber building housing a water treatment plant is also located within the water meadow. To the south is a brackish pond called 'Great Pool' which is understood to be completely separate from the groundwater aquifer (CH2M, 2017).

Coastal defences exist in several areas on Bryher, all of which are designed to prevent erosion of the sand dunes and prevent flooding of the lower-lying hinterland. There are also several discrete lengths of revetment and embankment located at the beach in the lower-lying areas.

There are five sites where works are proposed across the island of Bryher, as outlined in Figure 1-3 below.

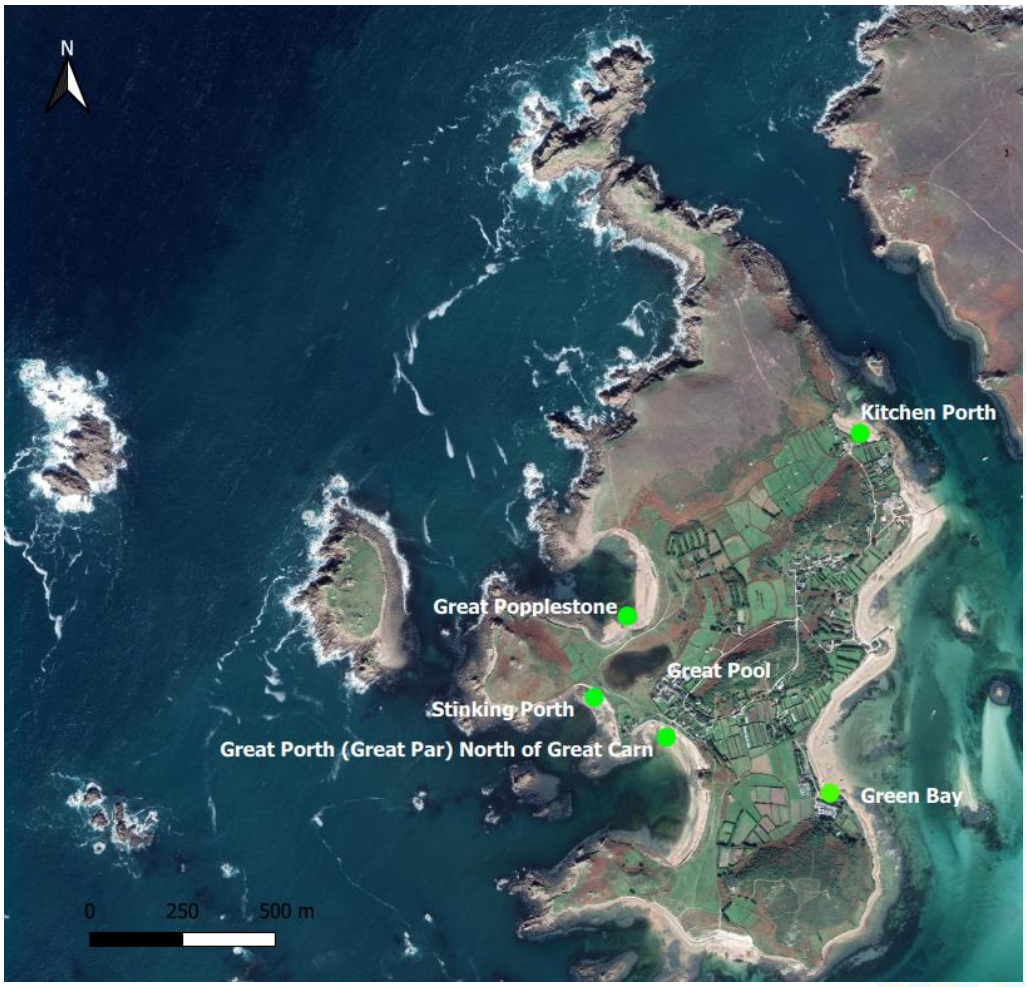

Figure 1-3: Location of proposed works across Bryher
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Great Popplestone

Figure 1-4: Great Popplestone Location Plan
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Great Popplestone is located on the west coast of the island of Bryher. The beach comprises rounded granite boulders and cobbles to the south, with a more typical sand dune towards the north of the beach, as shown on Figure 1-4. Due to its location on the west coast of the island, Great Popplestone is directly exposed to waves from the Atlantic Ocean which originate from deep water at the entrance to the bay.

The beach is located immediately adjacent to the Pool of Bryher and Popplestone Bank (Bryher) SSSI (a designated saline coastal lagoon) and Isles of Scilly Ramsar site, with Great Pool, a brackish lagoon, located 45m south of the beach. A track runs in a north south direction adjacent to the beach, approximately 40m south, with numerous holiday accommodation properties in the vicinity, including the Hell Bay Hotel approximately 180m south.

The existing defences in the area consist of a dilapidated sea wall with rock revetment, as shown in Figure 1-5 below. The rock revetment on the exposed face protects the sea wall and obscures detail of the seaward toe and exposed face of the sea wall. Rock armour has been installed to protect the defence on the exposed face. The crest of the wall comprises large boulders of the rock revetment in areas where previous breaches and destruction of the wall may have occurred in the past and the stone landward face of the wall has numerous cracks with some mortar missing.

Some rock revetment work was completed at the north end of Great Popplestone in the 1990s by burying approximately 1000m^3 of rock in the beach and dunes, with the upper surface of the rocks exposed. This rock is not protecting this part of the beach but appears instead to be focussing erosion adjacent to the exposed rock (CIoS, 2021).

Figure 1-5: Dilapidated sea wall at Great Popplestone

The dunes at Great Popplestone are known to be regularly overtopped by waves, with six recorded overtopping events between 1990 and 2014 (CH2M, 2017).

Amenity access has also eroded some dune sections across Great Popplestone. More recently, a significant quantity of rock armour has been added all along the southern half of Great Popplestone to increase protection. However, in the middle of Great Popplestone, where the rock armour addition finishes, there is another flood vulnerable low point. It appears from its profile and connection that it has been used for vehicular access and this may have compressed the dune, and significantly lowered its crest and therefore protective height (CIoS, 2020).

The defences at Great Popplestone serve in part to protect the island's water supply from seawater inundation. The low-lying water meadow at Great Popplestone, from which groundwater is abstracted, is the island's primary source of freshwater. The area is protected from the sea by sand dunes. Regular overtopping of the dunes leads to damage of water supply infrastructure and contamination of the groundwater, affecting the quality of drinking water on the island. During the 2014 storms, the water meadow was flooded for 2-3 weeks.

Stinking Porth

Figure 1-6: Stinking Porth Location Plan
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Stinking Porth is located on the west coast of Bryher, southwest of Great Pool, as shown in Figure 1-6. The beach at Stinking Porth is relatively narrow in comparison to other beaches on Bryher. Stinking Porth is protected by an embankment landward of the beach. The exposed face of the embankment comprises a mix of rounded beach pebbles, cobbles and small boulders. There are some low sections where overtopping has occurred, and many cobbles/small boulders have been washed over the crest (HR Wallingford, 2021). The landward face comprises soil and sand with relatively dense, but poor quality, vegetation. The crest of the embankment comprises a combination of soil and boulders and is less than 3m wide with recent evidence of overtopping.

Stinking Porth was affected by the winter storm of 2014 with scouring to the crest of the embankment, damage to the leat (an outfall for drainage) extending south from Great Pool, water ponding, and extensive back-beach sediment accumulations (Ambios Environmental Consultants Ltd, 2014).

Amenity access has also eroded some embankment sections. Sections of mixed rock/dune embankments have had rip rap, rock armour and a concrete crest wall added to resist recession and sustain protection (CIoS, 2020).

Stinking Porth is located approximately 60m southwest of Great Pool and from the water abstraction boreholes across the water meadow surrounding the pool, as shown in Figure 1-7. As such, the defences at Stinking Porth serve to protect the island's water supply from seawater inundation.

Figure 1-7: View of Stinking Porth and Great Porth from Gweal Hill

Great Porth (Great Par) North of Great Carn

Figure 1-8: Great Porth (Great Par) North of Great Carn Location Plan
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Great Porth (Great Par) is located on the western coast of the island of Bryher, as shown on Figure 1-8 above. Due to its location on the west coast of the island, Great Porth beach is directly exposed to the Atlantic Ocean.

The beach comprises of sand with rocks and cobbles. Great Porth (Great Par) is located immediately adjacent to the Pool of Bryher and Popplestone Bank (Bryher) SSSI and approximately 10m south of a scheduled monument: Gig shed on the north coast of Great Porth, Bryher.

Great Porth (Great Par) North of Great Carn is located approximately 130m from Great Pool and as such, the defences serve in part to protect the island's water supply from seawater inundation.

An embankment runs along the north of Great Porth with an imported granite rock revetment, comprising substantial 3-4 tonne angular boulders, extending further west of the embankment, adding protection to the old sea defence wall built alongside the garden of School House. The embankment crest is uneven and comprises soil with some vegetation starting to extend down onto the exposed face.

Figure 1-9: Embankment along the north of Great Porth

There are numerous holiday accommodation properties and residential properties in close proximity including The Moorings School House immediately adjacent, as shown on Figure 1-9 above.

Great Porth has been affected by historic storms, including the storm of winter 2014 which led to overtopping, severe dune face erosion and disturbance of revetments in Great Porth. The islands have low cliffs of unconsolidated head material, known locally as ram, overlying the granite which are prone to erosion (Arup, 2011). Historically, ram cliffs at Great Porth have been slowly receding with beach areas steadily retreating at rates of 25-30m per century (Ambios Environmental Consultants Ltd, 2014).

Amenity access has also eroded some dune sections. Sections of mixed rock/dune embankments have had rip rap, rock armour and a concrete crest wall added to resist recession and sustain protection. Anecdotal information provided by the CIoS indicates that local residents have been laying defences themselves in an attempt to reduce the risk of overtopping. These defences are unsuitable as a coastal defence and require replacement.

Further south along the frontage of Great Porth, up to the gig shed (a building restored and converted into an art studio), 1-3 tonne stones provide the decreasingly constrained dune with a form of wave energy absorbing/reflective toe, as shown in Figure 1-10 below. South of the gig shed, the dune is more naturalised and relatively free to recess. However, the hinterland is relatedly low lying here to the immediate south of Tommy's Hill and the remains of a 900m^2 breach offers evidence of the relative exposure of this section of frontage.

Figure 1-10: Protection provided by 1-3 tonne stones along the frontage of Great Porth

Green Bay

Figure 1-11: Green Bay Location Plan

Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Green Bay is located on the east coast of Bryher, as shown on Figure 1-11 above. The beach comprises sand and cobble with a well-established vegetated crest (HR Wallingford, 2020), as shown in Figure 1-12 below. Green Bay has a sheltered

orientation within Tresco Sound. However, it is vulnerable to the surge and swell in the channel between Tresco and Bryher (CIoS, 2020).

Figure 1-12: Green Bay beach

It is thought likely that this area of sand and vegetated crest is the area that is most vulnerable to the biggest volume of overtopping which would flood the boatyard within the immediate vicinity, due to the permeability of the crest and the likely inundation of the area under combined surge and long period wave events (HR Wallingford, 2021).

At present, there is a stone wall approximately 500m in length at Green Bay which protects the coastal path. However, there is a risk of flooding causing inconvenience to access roads and the boatyard (Arup, 2011).

The Green, located behind Green Bay and the frontage of Green Bay, hosts locally important community, cultural and commercial activities, but the low-level embankment (250mm) which runs around the southern end of the sheltered east-facing and shallow sandy bay within Tresco Sound is almost non-existent in numerous places (CIoS, 2020). In the north it is a soil bank protected by an informal rock armour revetment with an access track on the landward side. In the central section there are the remains of a wall at the top of the backshore protecting semi-cultivated land on the landward side. In the southern section the bank supports dense vegetation with beach material making up the foreshore area.

The embankment and wall reach heights up to 1-2m along the foreshore. Beach material (rounded granite cobbles) has been used to provide additional protection in some areas.

There is a scheduled monument located 40m north of Green Bay: 'Prehistoric field system and Romano-British cist in Green Bay, Bryher', with numerous other scheduled monuments located in the vicinity.

Flood vulnerability along the Green Bay Frontage arises from a westerly low pressure sea-level height 'surge' into the sound from waves diffracting from the open ocean around the southern margin of Samson Hill into the sound (rather than more generally dissipating around the islands), coinciding with a spring tide.

Green Bay was affected during the winter storms of 2014 including overtopping through slipways and the southern headland area in Green Bay, combining with overtopped water from the west coast to cause extensive ponding in The Green (Ambios Environmental Consultants Ltd, 2014). Flooding of The Green can also occur due to breaches of each access pathways and through and potentially over the low-level embankment around Green Bay (CIoS, 2020).

Floodwater pathways which inundate The Green are largely from overtopping and breaches of western frontages, but also from beach access pathways through and potentially over the low-level embankment around Green Bay (CIoS, 2020).

Kitchen Porth

Figure 1-13: Kitchen Porth
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Kitchen Porth is located on the northeast side of Bryher, shown in Figure 1-13. It is a small beach composed of mainly sand with some cobbles. The south corner of the beach is vulnerable to wave activity. Longer period waves from the Atlantic diffract around the north of the island into this area. This wave activity leads off the ram and embankment to the rear of the beach. There is clear erosion around tree roots along the edge of the beach, which can be seen exposed, and which in themselves make a contribution to the stability of the embankment (HR Wallingford, 2021).

There is a cluster of 4 residential and 8 non-residential properties at flood risk from overtopping of a low-level embankment including the post office and Harbour View and Fraggle Rock Bar. The access road to the high-tide quay runs through it (CIoS, 2020).

Shipman Head and Shipman Down (Bryher) SSSI (designated for 'waved' maritime heathland) and Isles of Scilly Ramsar are located at the back of the bay, with a small area to the north. A scheduled monument, 'prehistoric cairn cemetery and field system on Shipman Head Down and Great Bottom, Bryher' is located adjacent to Kitchen Porth.

St Agnes

St Agnes is located south-west of the largest inhabited island, St Mary's, and has a population of 85. It is very exposed to the Atlantic wave climate from most directions, although some shelter is provided to the west from uninhabited islands and islets. St Agnes is connected to Gugh to the east, by a tombolo which is exposed at low tides. St Agnes and Gugh are granite islands, with ram (head) and sand accumulation present in some areas.

The area described as Big Pool SSSI and Lower Town (Periglis, Porth Coose, Porth Killier) is located in the north west of the island and is vulnerable to erosion and breaching. The Big Pool SSSI (designated for flowering plants) is protected from the north and west by formal defences. Big Pool is adjacent to the island's main drinking water supply, which is obtained from the granite and the island depends on the aquifer for its freshwater supplies via borehole abstraction. Seawater inundation can pose a threat to Big Pool, along with coastal and freshwater habitats, and migrating birds which flock to the existing fresh water supply.

Sediment accumulations exist on St Agnes around Periglis Cove, Porth Conger and Porth Killier. However, there is no generally recognisable net trend for sediment transport, due to the exposure to waves and tidal currents from many directions.

The three sites across St Agnes where works are proposed are shown in Figure 1-14 below.

Figure 1-14: Location of the proposed works across St Agnes

Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Porth Killier

Figure 1-15: Porth Killier Location Plan
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Porth Killier is located at the northern extent of the island of St Agnes, approximately 120m east of Big Pool, as shown in Figure 1-15. Porth Killier is located immediately adjacent to Big Pool and Browarth Point (St Agnes) SSSI and Isles of Scilly Ramsar site, and a scheduled monument, 'prehistoric settlement and field system at Porth Killier, St Agnes'.

The bay is approximately 200m wide and is flanked on the east and west by rock outcrops. The beach is composed of granite cobbles and boulders. The rear of the beach is underlain at its western end by a mattress of concrete mesh, protecting an underlying cobble ridge. At the eastern end, the track behind the bay is protected by a concrete sea wall. The transition between the two elements is made by a small area of rock revetment (CIoS, 2020).

The granite stone faced mass concrete sea wall protects a ram cliff containing internationally important prehistoric remains (Arup, 2011). The seaward toe is exposed over the eastern 30m section. There is no revetment to this defence, and there are no obvious defects to the seaward face and no evidence of movement. However, the wall is undercut and the beach level is lowered at the eastern end.

It has experienced localised ram erosion and a 5m section of the SE sea wall is vulnerable to overtopping flood risk. There is also risk of overtopping of the embankment to the northwest side of Porth Killier.

Coastal erosion and flood risk at Porth Killier presents a risk of inundation and contamination of water abstraction boreholes surrounding the Big Pool. In addition to risk of inundation of Big Pool, there is a risk of undermining the road that runs along the southern extent of Porth Killier. On the other side of the road, there are numerous residential and non-residential properties located approximately 80m south of Porth Killier, along with Porthconger Quay, the main point of access to St Agnes, located approximately 150m east.

Porth Coose

Figure 1-16: Porth Coose Location Plan
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Porth Coose is located on the northwestern extent of the island of St Agnes, as shown on Figure 1-16. Porth Coose is located approximately 40m northwest of Big Pool. A low dune separates the beach from the Big Pool and Browarth Point SSSI and Isles of Scilly Ramsar site. Following the 1989/90 storms, 20 tonnes of boulders were placed in the weakest section of the dune, and a new defence was constructed in 1996. The defence comprises a tied concrete block revetment reinforced with erosion control matting (Arup, 2011). There is also a rail and boulder groyne connecting Porth Coose with Ginamoney Carn (Figure 1-17).

Porth Coose suffered severe overtopping during the 2014 storms and as a result, the crest and rear side were compromised and the elevation of the revetment was lowered, exposing the rear side to significant breach and inundation risks (HR Wallingford, 2021). Anecdotal information provided by the CIoS indicates that following the 2014 storms, informal defences were laid between Porth Coose and Periglis, as shown in Figure 1-17 below.

Figure 1-17: Formal rail and boulder groyne from Ginamoney Carn to the point between Porth Coose and Periglis beach

There are minor defects and some settlement on the exposed face of the dune, with some local erosion along the crest and landward face from informal pathways. In places, the ties to the concrete block revetment are exposed and the reinforcement matting is broken from general wear. The damaged, compromised and lowered sections of dunes are at risk of overtopping and pose significant breach and inundation risks to Big Pool (Arup, 2011).

A path runs along the edge of Porth Coose, however, there are no residential or non-residential properties in close proximity.

Periglis Beach

Figure 1-18: Periglis Location Plan
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Periglis is located in the northwestern extent of the island of St Agnes, adjacent to Porth Coose (as shown in Figure 1-18 above). The beach is composed of both sand and pebbles and there are numerous residential and non-residential properties located at the southern extent of Periglis beach in the settlement of Lower Town, including St Agnes church. At the northern end of the beach there is a scheduled monument, 'two early post-medieval quays in north and northwestern Periglis, St Agnes.' Big Pool and Browarth Point (St Agnes) SSSI and Isles of Scilly Ramsar site are located immediately adjacent to Periglis beach.

Periglis is located approximately 70m west of Big Pool and it has a natural embankment that helps to protect it. The outfall from Big Pool goes beneath the embankment.

The seaward face of the embankment suffers from frequent erosion at higher tides and the geotextile mesh and repairs to the bank after the 2014 storms are beginning to fail. One tonne dumpy bags filled with shingle form much of the central part of the bank where the bank was breached (CIoS, 2020). Additional rocks and boulders have been added to the defence near the beach entrance, as shown in Figure 1-19 below.

Figure 1-19: Additional rocks and boulders at entrance to Periglis Beach

Erosion has occurred along the top of the crest from its use as a coastal path around the bay. There are damaged, compromised, and lowered sections of dunes which are overtopped and present significant breach and inundation risks to the Meadow south of Big Pool, a small number of properties, local infrastructure, important freshwater habitat, wells and aquifer recharge area. A core section of Periglis slipway, which provides a protective breakwater, is suffering from scouring, along with the quay and beach entrance (CIoS, 2020).

There has also been vegetation removal at the southern end of the embankment. The northern end still has some areas with vegetation. There are sections where the shingle filled dumpy bags at the core of the structure are exposed. The landward face is in better condition with a good covering of vegetation that is continuing to recover following the 2014 storms. The crest of the embankment is relatively wide, up to 4m, and is generally well covered with vegetation.

St Martin's

St Martin's is the furthest east of the five inhabited islands of the Isles of Scilly and is one of the least developed with a population of 136. St Martin's is exposed to waves and swell from the northwest, north and northeast. It is more sheltered than many other islands since it lies in the lee of Tresco in terms of the prevailing south westerly storm direction. Here a ridge runs east to west along the centre of the island and the main road runs parallel along the south of it. The main settlements at Lower Town (on the west side), Middle Town and Higher Town (east side) follow this road.

St Martin's is composed entirely of granite, with overlying blown sand and head (ram) deposits. There is generally no dominant direction of net movement on St Martin's, due to the island's exposure to waves and currents from all directions. However, net accumulation of finer sediments is evident along the sheltered south and south-western shores where significant beaches have formed. These sand dunes represent an important habitat that should be protected, as well as protecting properties and infrastructure from wave inundation and potential flooding (Arup, 2011).

No formal sea or coastal defence structures exist on St Martin's. There are, however, several local quays and slipways on the more inhabited south/southwest side of the island.

Figure 1-20: St Martin's Location Plan
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Lower Town Beach

Figure 1-21: Lower Town Beach Location Plan
Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Lower Town Beach is located on the western extent of the island of St Martin's. It is located southwest of the village of Lower Town and immediately adjacent to St Martin's Sedimentary Shore SSSI, designated for presence of marine wildlife that is exceptionally undisturbed. The beach is composed of sand with vegetated dunes. The dunes at Lower Town Beach were damaged during the storms of 2014, however, they are showing signs of self-repair (HR Wallingford, 2021).

There are signs of erosion across Lower Town Beach that have occurred due to human activity from access to the beach and from cabling that has become exposed. The dunes are known to erode and accrete on an annual cycle.

In order to prevent severe erosion of the dunes, which may lead to weak points in the dune defences and increase risk of flooding of Lower Town, measures to manage and control access to the beaches through the dunes is required.

1.3 Legislative basis of the Environmental Statement

The requirement for assessment of the effects of certain public and private projects on the environment is set out in European and UK law. European Council (EC) Directive No. 85/337/EEC as amended by EC Directive No. 97/11/EC, EC Directive No. 2011/92/EU and EC No. Directive 2014/52/EU (hereafter collectively referred to as 'the EIA Directive') under Article 5(1): '*Where an environmental impact assessment is required, the developer shall prepare and submit an environmental impact assessment report*.'

The EIA Directive is transposed into UK law through the EIA Regulations and continues to apply following the UK's exit from the European Union. These are a series of statutory instruments that set out regulations for implementing the EIA Directive through specific consenting regimes. The development proposals require consent under the Town & Country Planning Act 1990 and the Marine & Coastal Access Act 2009, and therefore fall within the requirements of both the Town & Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2017/571), and the Marine Works (Environmental Impact Assessment) Regulations 2007 (SI 2007/1518) (as amended 2011, 2015, 2017, and by the Environment, Food and Rural Affairs (Environmental Impact Assessment (Amendment) (EU Exit) Regulations 2018).

Regulation 5 of the 2017 Town & Country Planning EIA Regulations sets out the provisions relating to screening EIA Development, and Regulations 7 and 8 of the 2007 Marine Works EIA Regulations set out the requirement for screening of EIA Directive Annex I and Annex II Projects.

A screening opinion request was made by CIoS to the CIoS Planning and Development department on 25th May 2021. It was determined on 3rd August 2021 that the proposed development would be EIA development. A scoping opinion request was prepared and submitted to the CIoS Planning and Development Department on 24th October 2017 for the proposed construction of sea defence works across the islands of St Mary's and Tresco. It was advised by the CIoS Planning Officer that the respective scoping opinion received on 15th November 2018 should be applied to the proposed construction of sea defence works across the islands of Bryher, St Agnes and St Martin's. Further detail on the outcome of the EIA screening and scoping is outlined in section 3.2.

1.4 Scope and Content of the Environmental Statement

The EIA screening opinion, and scoping opinion from 2018, considered the potential for likely significant effects associated with the emerging development proposals. On the basis of this, and in accordance with the requirements placed upon the developer in the EIA Regulations, an appropriate scope has been agreed between JBA Consulting and the CIoS and is presented herein.

In accordance with Regulation 18(3) of the aforementioned Town & Country Planning EIA Regulations, and Regulation 12(2) of the Marine Works EIA Regulations, the ES contains:

- *(a) a description of the proposed development comprising information on the site, design, size and other relevant features of the development;*
- *(b) a description of the likely significant effects of the proposed development on the environment;*
- *(c) a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;*
- *(d) a description of the reasonable alternatives studied by the developer, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment;*
- *(e) a non-technical summary of the information referred to in sub-paragraphs (a) to (d); and*
- *(f) any additional information specified in Schedule 4 relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected.*

The Non-Technical Summary (NTS) summarises the proposals, the likely significant environmental effects and the proposed mitigating measures in non-technical language. It is intended to inform those who have an interest in the development, but who are not concerned with the detail of the technical assessment provided in the ES. The NTS is provided as a stand-alone document in electronic format.

The ES is organised on an environmental topic basis as set out in Regulation 4 (2). For each environmental topic, a brief overview of the legislative and planning policy context is provided as required to set the context of the topic chapter. The topic-specific baseline conditions have been collected and used to inform the assessment plus any relevant additional information that has come to light. The potential impacts and likely significant effects of the proposed development on the environment have been determined for each of the scoped in environmental issues. Mitigation measures are proposed to reduce the significance of effects where possible, and the resulting residual effect is reported. The approach to EIA is iterative, whereby the assessment and ongoing consultation with stakeholders influence the design evolution of the development proposals. Further detail on the EIA process is provided in section 3.1.

For consistency and ease of cross reference, each environmental topic chapter presented in the ES is generally structured with the following headings:

1 Introduction
2 Legislative and Planning Policy Context
3 Baseline Conditions
4 Assessment Methodology and Significance Criteria
5 Potential Impacts & Significant Effects
6 Mitigation Measures
7 Residual Effects

The structure of the ES is set out in Table 1-1.

Table 1-1: Structure of the ES

ES section	Section title
Non-Technical Summary	
Chapter 1	**Introduction**
1.1	Background to the development
1.2	Description of the sites
1.3	Legislative basis of the Environmental Statement
1.4	Scope and content of the Environmental Statement
Chapter 2	**Proposed development**
2.1	Strategic need for the proposed development
2.2	Planning policy context
2.3	Environmental constraints
2.4	Option selection and alternatives
2.5	Stakeholder engagement
2.6	Description of the proposed development
2.7	Construction methodology
2.8	Operational requirements and decommissioning
Chapter 3	**Environmental impact assessment methodology**
3.1	The EIA process
3.2	EIA screening and scoping
3.3	The Environmental Statement
3.4	EIA method of assessment
Chapter 4	**Coastal processes, geomorphology and flood risk**
Chapter 5	**Biodiversity and nature conservation**
Chapter 6	**Landscape**
Chapter 7	**Historic environment**
Chapter 8	**Land use, tourism and recreation**
Chapter 9	**Climate change**
Chapter 10	**Other construction related effects**
Chapter 11	**Cumulative and in-combination effects**
Chapter 12	**Conclusions**
12.1	EIA outcomes
12.2	Concluding remarks
12.3	Mitigation and monitoring

2 The Proposed Development

2.1 Strategic need for the proposed development

The Isles of Scilly is the district in England with the greatest proportionate exposure to current and future climate change risks, especially water vulnerabilities. A particular risk for the Isles of Scilly is "coastal squeeze" where the coastal strip is trapped between rising sea levels and man-made defences, narrowing the foreshore as the mean high tides encroach landwards but the defences remain static.

The proposed development comprises the construction of new flood defence and coastal erosion infrastructure at nine sites on the Isles of Scilly: five sites on Bryher, three sites on St Agnes and one site on St Martin's. Together they form an overarching project for Sea Defence and Dune Management on the Isles of Scilly. The proposed works will strengthen the existing sea defences, which comprise a mix of manmade structures, natural dune systems, and other natural features. Together these defences protect a range of critical economic, social and environmental infrastructure.

Bryher

Much of Bryher is at an elevation safe from predicted coastal flooding, but several areas, including near the main population centre are currently at risk. With predicted climate change, further areas will become vulnerable.

Across the western side of the island of Bryher, the island's economy and freshwater supplies (including Great Pool freshwater pond) are currently at risk from saline intrusion and flood inundation of the dunes and meadows around Great Popplestone, Great Porth and across the southern lowlands.

Across the rest of the island there are properties and local infrastructure receptors at risk of flooding including an electricity substation, two wells and a water abstraction and existing micro-desalination and treatment plant.

There is a need to continue working with natural processes while protecting, improving and sustaining the coastal and freshwater habitats.

The works at five sites across the island will support the reduction of sea water inundation to preserve the island's freshwater supplies from further saline intrusion and flood inundation, whilst also protecting and sustaining residential properties and infrastructure, and protecting and helping sustain the island's economy.

St Agnes

Across the island of St Agnes, freshwater in Big Pool and the Meadow are currently at risk of further saline intrusion and flood inundation. Inundation of the Meadow poses a threat to the low-lying part of the island's main rainwater catchment. It is this area, rather than just Big Pool, that is understood to recharge low-level groundwater for wells in the granite, which supply the majority of the island's water. Also at risk are residential and non-residential properties, and infrastructure, including an electricity substation.

The exposure, erosion and relatively poor condition of the dune embankments on the northern coast of St Agnes, especially along Porth Coose, are allowing regular wave overtopping from northerly and westerly storms (along with the risk of breach inundation). The outflanking of the substantial sea wall at the back of Porth Killier, both via continued erosion of periglacial ram to the south east and/or overtopping and potentially breaching of a low bank of stones to the northeast, also pose an additional risk of flooding of the Meadow.

The works at three sites around the north of the island will support the reduction of flood risk and consequences arising from erosion and breaches to dunes and embankments, sustaining the island's freshwater supplies by protecting wells and the key aquifer recharge area of the islands' main rainwater 'catchment'. The works will sustain and protect and enhance the natural environment and landscapes, enhance natural capital, the recovery of biodiversity, cultural amenity and local economic value of the dunes, beaches, harbour, the Pool and the Meadow.

St Martin's

The dunes at Lower Town Beach are showing positive signs of self-repair following damage caused during the 2014 winter storms. However, human activity is leading to increased levels of erosion of the dunes and management measures are required to prevent further damage and weak points emerging in the dune defences.

In addition, the works across the islands will support protection of coastal and terrestrial habitats to attain better conservation status; these include areas protected under a range of international and national nature conservation legislation. Table 2-1 below identifies the critical infrastructure across the islands that will be protected by the proposed works

Table 2-1: Infrastructure that would be protected by the proposed developments

Service	Location	Description
Water and sewerage	Bryher: Kitchen Porth, Green Bay, Great Porth (Great Par) North of Great Carn	Groundwater abstraction wells and water treatment plan. Mains water supply route. Private septic tanks.
	St Agnes: Periglis, Porth Killier	Groundwater abstraction wells around Big Pool. Central bio-bubble at Island Hall.
	St Martin's: Lower Town Beach	Private borehole supplies. Rainwater collection tanks. Mains water supply route and borehole location. Private septic tanks.
Waste	Bryher, St Agnes	Island waste centres
Communications	St Agnes; south west end of the Bar	Telecommunications link for the islands
Energy	St Martin's; Neck of the Pool. Bryher; Town Beach	Sites of undersea electricity cable landing points
	St Agnes; Lower Town/Periglis	Electricity substations
	All islands; Quays	For diesel and bottled gas delivery and access by service engineers.
Emergency Services	Bryher, St Agnes, St Martin's	Fire and rescue, ambulance and coastguard services.
Transport – on island	Bryher; Church Quay access	For access and supplies to and from the quay.

Service	Location	Description
	St Agnes; Quay to Turks Head Pub	For access and supplies to and from the quay.
	St Martin's; Higher Town Quay access	For access and supplies to and from the quay.
Transport – off island and to the mainland	All islands; Quays	For access and supplies to, from and between the islands.

The Isles of Scilly are vulnerable to the impact of climate change, rising sea level, inundation and coastal erosion. The islands experience Atlantic storms and storm surges, which present a significant risk to much of the housing stock, critical infrastructure, freshwater resources and commercial property located on the narrow coastal strip. The risks to the islands have been highlighted by recent storms, particularly those of 2014, 2004 and 1989, and the impact these have had on key island infrastructure.

Previous works undertaken on the management of the dunes and flood defences have highlighted how the issues of flood and coastal erosion risk management at discrete sites are interlinked across the islands.

2.2 Planning Policy Context

2.2.1 National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities), July 2021

The National Planning Policy Framework (NPPF) forms the basis of development plan making in England and is a material consideration in planning decisions. The NPPF details the Government requirements for the planning system, as well as providing a framework within which councils and local communities should produce planning documents, reflecting the priorities and needs and the relevant community.

A core theme of the NPPF is the delivery of sustainable development and it confirms the three dimensions of sustainable development as economic, social, and environmental. The NPPF outlines UK Government policy relating to 16 key themes. Those that are applicable to the Isles of Scilly coastal protection schemes are summarised in Table 2-2.

Table 2-2: Themes within the NPPF of relevance to the proposed developments

Theme	Policy Summary	Relationship to the proposed development
Promoting health and safe communities	Planning policies and decisions should aim to achieve healthy, inclusive and safe places which: c) enable and support healthy lifestyles, especially where this would address local health and well-being needs – for example through the provision of safe and accessible green infrastructure, sports facilities, local shops, access to healthier food, allotments and layouts that encourage walking or cycling.	The proposed developments would protect residential properties and community facilities including areas of green infrastructure and coastal footpaths, thereby continuing to support a healthy and active lifestyle.

Theme	Policy Summary	Relationship to the proposed development
Meeting the challenge of climate change, flooding and coastal change	Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.	The proposed developments would reduce coastal erosion and flood risk to the sites and surrounding areas, including residential and commercial properties and other key infrastructure, increasing future community resilience to the effects of climate change.
Conserving and enhancing the natural environment	Planning policies and decisions should contribute to and enhance the natural and local environment by protecting and enhancing valued landscapes, recognising the intrinsic character and beauty of the countryside, maintaining the character of the undeveloped coast, minimising impacts on and providing net gains for biodiversity, and preventing new and existing development from contributing to, being put at risk from, or being adversely affected by, unacceptable levels of soil, air, water, or noise pollution or land instability.	The proposed developments would protect designated habitats. Any potentially significant effects on landscape quality or important or protected wildlife habitats will require effective mitigation through careful design and/or good construction practice so as to minimise the significance of any adverse effects.
Conserving and enhancing the historic environment	Local planning authorities should assess the significance of any effects on heritage assets (including effects on the setting of a heritage asset) taking account of the available evidence and any necessary expertise. They should avoid or minimise any conflict between the heritage asset's conservation and any aspect of a proposal. Any harm to, or loss of, the significance of a designated heritage asset (from its alteration or destruction, or from development within its setting), should require clear and convincing justification. Where a proposed development will lead to substantial harm to (or total loss of significance of) a designated heritage asset, local planning authorities should refuse consent, unless it can be demonstrated that the substantial harm is necessary to achieve substantial public benefits that outweigh that harm.	The proposed developments are located in close proximity to a range of designated heritage assets. The extent and nature of these assets and any setting requirements will need to be taken into account; appropriate mitigation through careful design and/or good construction practice will be necessary so as to minimise the significance of any adverse effects.

2.2.2 The UK Marine Policy Statement, HM Government, March 2011

The UK Marine Policy Statement of 2011 (last updated in 2020 to following the UK's withdrawal from the EU) is to be considered for marine development, providing high level objectives for which specific policies are included for in the South West Marine Plan (adopted in 2021).

The UK Marine Policy Statement sets out a UK vision for the marine environment. It states that:

'*The UK vision for the marine environment is for 'clean, healthy, safe, productive and biologically diverse oceans and seas.' The UK high level marine objectives published in April 2009 set out the broad outcomes for the marine area in achieving this vision and reflect the principles for sustainable development. The process of marine planning will contribute to the achievement and integration of sectoral/ activity specific policy objectives within a framework of economic, social and environmental considerations in order to deliver the high level marine objectives. This approach will help ensure the sustainable development of the UK marine area and deliver the UK vision*'.

The UK Marine Policy Statement also considers climate change adaptation and mitigation and coastal change and flooding, both of which are relevant to the proposed coastal protection schemes. The Policy Statement suggests the following;

- Marine Plan authorities should consider the opportunities to increase the resilience of the marine environment to adapt to the impacts of climate change including by encouraging development that takes account of the impacts of climate change over their estimated lifetime, in particular taking account of risks such as increased land and sea temperatures and sea level rise and possible increase in risk from extreme events such as flooding and coastal erosion.
- Account should be taken of the impacts of climate change throughout the operational life of a development including any de-commissioning period. Marine plan authorities should not consider development which may affect areas at high risk and probability of coastal change unless the impacts upon it can be managed. Marine plan authorities should seek to minimise and mitigate any geomorphological changes that a development will have on coastal processes, including sediment movement.
- The proposed development explicitly seeks to manage the environmental, social and economic risks to the Isles of Scilly both now and in the future due to climate change. The predicted impacts of climate change are therefore an inherent consideration in the design and operation of the schemes. Potential effects on coastal processes have been a key consideration throughout the development of the schemes and a formal assessment of these effects is provided in this ES.

2.2.3 South West Inshore and South West Offshore Marine Plan 2021

The South West Marine Plan is one of four marine plans developed concurrently. It introduces a strategic approach to planning within the English inshore and offshore waters between the Severn Estuary border with Wales and the River Dart in Devon. The South West Marine Plan covers the largest of England's marine plan areas and encompasses the Isles of Scilly, the largest oceanic archipelago in the UK.

The South West Marine Plan sets out policies within an economic, social and environmental framework, to help deliver the high level marine objectives set out in the UK Marine Policy Statement.

The South West Marine Plan sets out a vision 2041. It states that:

> *"As England's Ocean Peninsula, the south west marine plan areas are sustainably developed and thriving, based on their unique nature and close links to the maritime area in terms of economy, society, environment and governance. Across the region, fishing, tourism, port development and harbour regeneration, with the associated safeguarded or new infrastructure, support a strong and diversified marine economy that encourages sustainable economic growth and employment.*
>
> *Community well-being and cohesion, and the recognition, enhancement, protection and appreciation of natural assets, cultural heritage, and seascape and landscape, are being delivered through plan-led management.*
>
> *Decisions made in the south west marine plan areas apply an ecosystem approach and natural capital framework. The environment is in a better state than before, and Good Environmental Status is achieved. Biodiversity is conserved, enhanced and restored through applying well-established principles of biodiversity gain and delivery of a well-managed ecologically coherent network or marine protected areas."*

Policies contained in the South West Marine Plan support delivery of the plan objectives to achieve the vision and address issues. Policies of direct relevance to the Proposed Development include the below:

Climate Change

SW-CC-1: Proposals that conserve, restore or enhance habitats that provide flood defence or carbon sequestration will be supported. Proposals that may have significant adverse impacts on habitats that provide a flood defence or carbon sequestration ecosystem service must demonstrate that they will, in order of preference:

a) avoid

b) minimise

c) mitigate - adverse impacts so they are no longer significant

d) compensate for significant adverse impacts that cannot be mitigated.

SW-CC-2: Proposals in the south west marine plan areas should demonstrate for the lifetime of the project that they are resilient to the impacts of climate change and coastal change.

SW-CC-3: Proposals in the south west marine plan areas, and adjacent marine plan areas, that are likely to have significant adverse impacts on coastal change, or on climate change adaptation measures inside and outside of the proposed project areas, should only be supported if they can demonstrate that they will, in order of preference:

a) avoid

b) minimise

c) mitigate - adverse impacts so they are no longer significant.

The proposed works are in compliance with this policy. The proposed development is designed to manage flood risk across the islands by sensitively restoring the natural strength and adaptive flexibility of the extensive dunes across the inhabited islands to improve the value of flood protection they provide. This will protect a range of critical infrastructure from the impacts of climate change, sea level rise, inundation and coastal erosion.

Air Quality and Emissions

SW-AIR-1: Proposals must assess their direct and indirect impacts upon local air quality and emissions of greenhouse gases. Proposals that are likely to result in increased air pollution or increased emissions of greenhouse gases must demonstrate that they will, in order of preference:

a) avoid

b) minimise

c) mitigation – air pollution and/or greenhouse gas emissions in line with current national and local air quality objectives and legal requirements.

The proposed works are in compliance with this policy. It is not anticipated that the construction or operation of the proposed scheme will result in significant adverse effects on air quality or emissions of greenhouse gases (see Chapter 9: Climate Change and Chapter 10: Other Construction Related Effects).

Biodiversity

SW-BIO-1: Proposals that enhance the distribution of priority habitats and priority species will be supported. Proposals that may have significant adverse impacts on the distribution of priority habitats and priority species must demonstrate that they will, in order of preference:

a) avoid

b) minimise

c) mitigate – adverse impacts so they are no longer significant

d) compensate for significant adverse impacts that cannot be mitigated.

SW-BIO-3: Proposals that conserve, restore or enhance coastal habitats, where important in their own right and/or for ecosystem functioning and provision of ecosystem services, will be supported. Proposals must take account of the space required for coastal habitats, where important in their own right and/or ecosystem functioning and provision of ecosystem services, and demonstrate that they will, in order of preference:

a) avoid

b) minimise

c) mitigate

d) compensate for net habitat loss

The proposed works are in compliance with this policy. It is not anticipated that the construction or operation of the proposed scheme will result in significant adverse effects on biodiversity (see Chapter 5: Biodiversity and Nature Conservation).

Disturbance

SW-DIST-1: Proposals that may have significant adverse impacts on highly mobile species through disturbance or displacement must demonstrate that they will, in order of preference:

a) avoid

b) minimise

c) mitigate - adverse impacts so they are no longer significant.

The proposed works are in compliance with this policy. It is not anticipated that the construction or operation of the proposed scheme will result in significant effects on

mobile species through disturbance or displacement (see Chapter 5: Biodiversity and Nature Conservation)

Heritage Assets

SW-HER-1: Proposals that demonstrate that they will conserve and enhance the significance of heritage assets will be supported. Where proposals may cause harm to the significance of heritage assets, proponents must demonstrate that they will, in order of preference:

a) avoid

b) minimise

c) mitigate – any harm to the significance of heritage assets

If it is not possible to mitigate, then public benefits for proceeding with the proposal must outweigh the harm to the significance of heritage assets.

The proposed works are in compliance with this policy. It is not anticipated that the construction or operation of the proposed scheme will result in significant effects on heritage assets (see Chapter 7: Historic Environment).

Seascape and Landscape

SW-SCP-1: Proposals should ensure they are compatible with their surroundings and should not have a significant adverse impact on the character and visual resource of the seascape and landscape of the area. The location, scale and design of proposals should take account of the character, quality and distinctiveness of the seascape and landscape. Proposals that may have a significant adverse impact on the seascape and landscape of the area should demonstrate that

they will, in order of preference:

a) avoid

b) minimise

c) mitigate - adverse impacts so they are no longer significant.

If it is not possible to mitigate, the public benefits for proceeding with the proposal must outweigh significant adverse impacts to the seascape and landscape of the area. Proposals within or relatively close to nationally designated areas should have regard to the specific statutory purposes of the designated area. Great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks and Areas of Outstanding Natural Beauty.

The proposed works are in compliance with this policy. It is not anticipated that the construction and operation of the proposed scheme will lead to adverse landscape, seascape and visual impacts (see Chapter 8: Landscape and Visual).

Dredging and Disposal

SW-DD-1: In areas of authorised dredging activity, including those subject to navigational dredging, proposals for other activities will not be supported unless they are compatible with the dredging activity.

The proposed works are in compliance with this policy. Works will be compatible with any dredging activities.

Infrastructure

SW-INF-1: Proposals for appropriate marine infrastructure which facilitates land-based activities, or land base infrastructure which facilitates marine activities

(including the diversification or regeneration of sustainable marine industries) should be supported.

The proposed works will be in compliance with this policy. The nature of the proposed scheme is in line with the current use of the area.

Aggregates

SW-AGG-1: Proposals in areas where a licence for extraction of aggregates has been granted or formally applied for should not be authorised, unless it is demonstrated that the proposal is compatible with aggregate extraction.

The proposed works are in compliance with this policy. Works will be compatible with any aggregate extraction.

Cumulative effects

SW-CE-1: Proposals which may have adverse cumulative effects with other existing, authorised or reasonably foreseeable proposals must demonstrate that they will, in order of preference:

a) avoid

b) minimise

c) mitigate – adverse cumulative and/or in-combination effects so they are no longer significant.

The proposed works are in compliance with this policy. There are no known or planned permitted developments within the surrounding area of the works that are considered to have the potential to generate significant cumulative effects (see Chapter 11: Cumulative and Combined Effects).

2.2.4 Cornwall and Isles of Scilly Shoreline Management Plan (SMP2), Cornwall and Isles of Scilly Coastal Advisory Group, February 2011

Strategic policies guiding coastal flood and erosion protection on the Isles of Scilly are set out in the Cornwall and Isles of Scilly SMP (adopted in 2011), a non-statutory policy document developed by the Cornwall and Isles of Scilly Coastal Advisory Group.

The Cornwall and Isles of Scilly Shoreline Management Plan 2011 (SMP2) was adopted by Cornwall Council and is the current Shoreline Management Plan.

Specifically, the Isles of Scilly is situated within SMP2 Policy Development Zone (PDZ) 17 (PDZ17). Each of the five inhabited islands is covered by a separate SMP2 Management Area; five of the proposed schemes lie within MA45 Bryher, three of the proposed schemes lie within MA46 St Agnes and Gugh, and one proposed scheme lies within MA43 St Martin's.

These Management Areas are further divided into Policy Units (PUs), which comprise defined sections of coastline. The SMP2 builds upon the first iteration of the SMP, SMP1, published in 1999, which defined the preferred strategic approach to flood risk management for each PU area for the subsequent 50-year period. The SMP2 reviewed and revised (where necessary) the policies contained in the SMP1 and extended the plan period to 100 years. In doing so, it set out the preferred policy option in each PU for three epochs (0-20 years, 20-50 years and 50-100 years).

A mid-term review was undertaken of the SMP2 in 2016. This review recognised that greater connectivity across sections of the island, in terms of risk, use and impact, effectively linked PUs, leading to the grouping of certain PUs into Policy Intent Areas (PIAs). For example, across Bryher, sites on the western side of the island which front Great Pool have been grouped together. As such, the proposed works at each of the sites will address a range of issues affecting the PIA.

The SMP2 considers how the coastline of the Isles of Scilly would evolve in the absence of formal defences. As such, the SMP2 considers objectives, policy setting and management requirements for three main epochs; from the present day, medium-term and long-term, corresponding broadly to time periods of 0-20 years, 20-50 years and 50-100 years, respectively. Generic shoreline management policy options are considered within the SMP2, as defined by Defra. These are outlined as:

- No active intervention (NAI): a decision not to invest in providing or maintaining defences or natural coastline.
- Hold the Line (HTL): maintain or upgrade the level of protection provided by defences or natural coastline.
- Managed realignment (MR): manage the coastal processes to realign the 'natural' coastline configuration, either seaward or landward, in order to create a future sustainable shoreline position.
- Advance the line (ATL): build new defences seaward of the existing defence line where significant land reclamation is considered.

The SMP2 identifies the preferred policy for each site across the three islands.

Bryher

The Island of Bryher is split into 13 Policy Units, as illustrated on Figure 2-1 below.

Figure 2-1: Shoreline Management Plan Policy Units across Bryher

(Source: Royal Haskoning DHV, 2016)

There are two key Policy Intent Areas across Bryher, as outlined below.

Policy Intent Area PIA45 a (Great Popplestone, Stinking Porth, Great Porth North (Great Par)).

PIA45 a covers Policy Units 45.1, 45.2, 45.4, and 45.5, outlined on Figure 2-1 above.

The principal objective of these schemes is to reduce overtopping. Regular wave overtopping of the dunes that protect this area leads to unacceptably high chloride levels in drinking water supply and damage to residential and non-residential properties.

Great Popplestone, Stinking Porth and Great Porth North (Great Par) are all westerly facing and therefore vulnerable to wave action from the Atlantic Ocean. The PIA45 area focusses around the strategic management of the Great Pool and areas associated with the general lower lying areas around the Great Pool.

Great Popplestone is located on the northern frontage of the Great Pool area. The SMP2 identifies the preferred policy for Great Popplestone as HTL up to 2025, with NAI up to 2105. Initial HTL but the longer-term aim would be to move to NAI. Therefore, the SMP2 outlined the potential need to maintain/upgrade the level of protection provided at Great Popplestone.

Stinking Porth is located on the southern frontage of the Great Pool area. The SMP2 identifies the preferred policy for Stinking Porth as NAI up to 2105, with no significant erosion risks identified. However, due to its westerly aspect, Stinking Porth is vulnerable to wave action.

Great Porth North is located on the southern frontage of the Great Pool area. The SMP2 identifies the preferred policy for Great Porth North as HTL up to 2025, with NAI (with localised HTL) up to 2105. It was identified that holding the line up to 2025 would allow monitoring of the rate of shoreline recession (predicted to be up to 35m over 100 years). Therefore, the SMP2 outlined the potential need to maintain/upgrade existing defences at Great Porth North.

Policy Intent Area PIA45 b (Great Porth and Green Bay)

PIA45 b covers Policy Units 45.1, 45.13 and 45.11, outlined on Figure 2-1 above.

The principal objective of these schemes is protecting The Green, an area of greenspace in the middle of the island which hosts locally important community, cultural and commercial activities, from flooding as a result of overtopping.

The frontages of Great Porth and Green Bay back on to the area of The Green. Policy here is for NAI, and in particular Green Bay where there is greatest potential for flooding of the hinterland. However, there is the need to consider the potential future risks affecting The Green as a whole, specifically the risk that the southern section of the island might be separated from the northern part of Bryher.

The Green is predominantly at risk of flooding from the eastern side. However, there is a risk that more extensive flooding could occur in extreme conditions in future.

Kitchen Porth

Kitchen Porth is located within Policy Unit 45.8. The principal objective of this scheme is to protect a cluster of 4 residential and 8 non-residential properties from flood risk due to overtopping.

Kitchen Porth is not considered as part of either of the two PIAs across Bryher. The SMP2 identifies the preferred policy for Kitchen Porth as NAI up to 2105, with no significant risks identified. However, Kitchen Porth is vulnerable to wave activity since

longer period waves from the Atlantic diffract around the north of the island into this area.

St Agnes

The Island of St Agnes is split into 14 Policy Units, as illustrated on Figure 2-2 below.

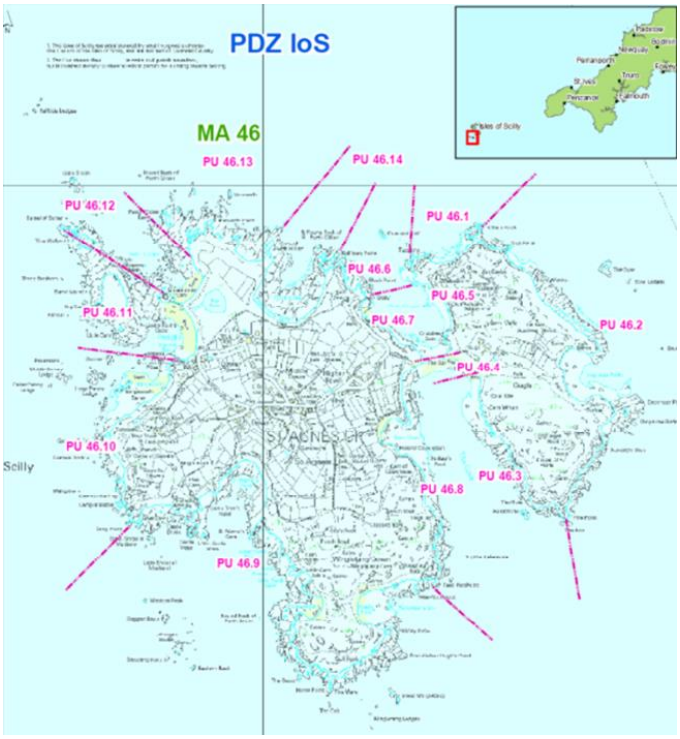

Figure 2-2: Shoreline Management Plan Policy Units across St Agnes

(Source: Royal Haskoning DHV, 2016)

There is one Policy Intent Area across St Agnes, as outlined below.

Policy Intent Area P1A46 a (Porth Killier, Porth Coose, Periglis)

Policy Intent Area P1A46 a included Policy Units 46.11, 46.12, 46.14.

The principal objective of these schemes is to manage the area around the Big Pool and the Meadow to minimise risk of inundation and saline contamination, along with minimising the associated flood risk to surrounding properties and infrastructure.

The SMP2 identifies the preferred policy for the PU within which Porth Killier is located as NAI up to 2025, with NAI (with localised HTL) up to 2105. No specific risks are identified within the SMP2 as the shoreline is resistant to erosion, however, there is the potential need for localised maintenance/upgrade of the level of protection provided at Porth Killier is advised by the SMP2.

The SMP2 identifies the preferred policy for Porth Coose and Periglis as HTL up to 2105 to manage risk to the Big Pool from erosion, inundation and possible saline contamination of drinking water supply. Therefore, there is the potential need to maintain/upgrade existing defences at Porth Coose and Periglis, as advised by the SMP2.

St Martin's

There are four Policy Units across St Martin's, as illustrated on Figure 2-3 below.

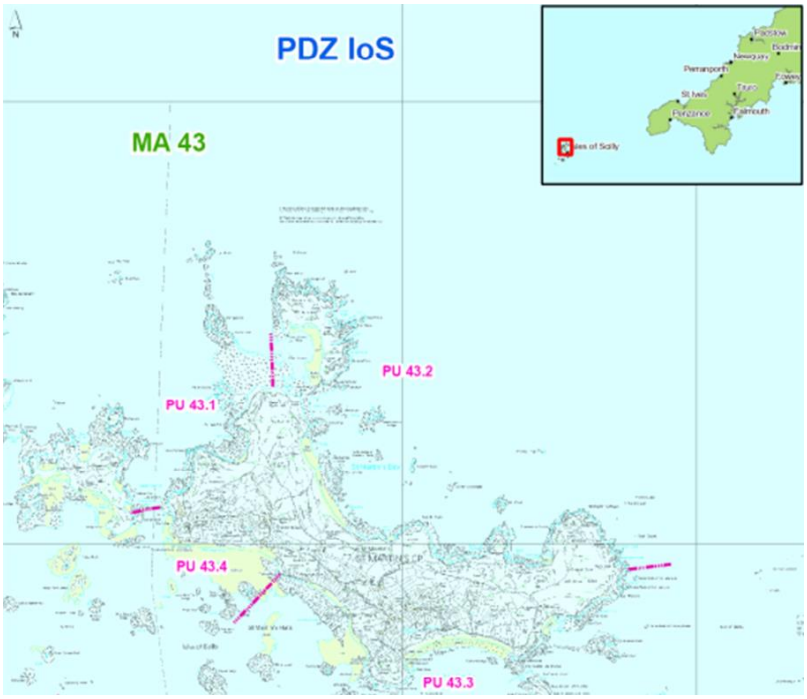

Figure 2-3: Shoreline Management Plan Policy Units across St Martin's

(Source: Royal Haskoning DHV, 2016)

There are not any Policy Intent Areas across St Martin's. The proposed works on St Martin's are located within Policy Unit 43.4.

Policy Unit 43.4 Middle Town

The principal objective of the Lower Town Beach scheme is to prevent further erosion caused by human activity which may erode and weaken dune defences.

Lower Town Beach falls within Policy Unit 43.4. The SMP2 identifies the preferred policy for PU 43.4 as NAI up to 2105. The overall intent of the policies within the SMP for St Martin's is to maintain and allow enhancement of the natural environmental landscape. The SMP outlines the importance of supporting the continued habitation of the island where possible in a sustainable manner and without disrupting natural process.

2.2.5 Isles of Scilly Local Plan, Council of the Isles of Scilly, 2021

The Isles of Scilly Local Plan sets out the proposals and policies for future development and use of land on the Isles of Scilly. The Local Plan (2015–2030) was adopted in March 2021. The Local Plan sets out planning policy for the local authority, which will be used to help determine planning decisions and also provides an indication of whether planning applications will be approved. It also sets out a vision for the local authority that states *The Isles of Scilly is a highly desirable place where people are able to live well, work productively, and move freely between islands and the mainland; they can also benefit from excellent education, leisure, health and social care facilities, within a world-class environment in harmony with nature. The distinctiveness and exceptional environment, with the influence of the sea, continue*

to provide a strong sense of community, identity and belonging; these remain vital assets for the islands' economy and well-being. The islands' infrastructure is a beacon of sustainability for the UK and beyond; it provides an affordable, innovative and low-carbon model for managing energy water and waste, with considerable benefits to the environment and residents' quality of life.

Paragraph 85 of the Local Plan sets out seven aims and objectives that it will seek to achieve, including *'adapting to the effects of climate change on people, wildlife and places by increasing resilience, matching the vulnerability of land uses to flood-risk and managing surface water in the most sustainable way'.*

This aim is underpinned by a set of objectives that the policies will enable through types of development that they can support:

- 'Ensure the sustainable use of natural resources and the full benefits of ecosystems are understood and harnessed.
- To mitigate against the inevitable local impacts of climate change to ensure that the environment, its community and businesses are conserved for future generations and help sustain the islands into the future.'

Paragraph 101 of the Local Plan outlines the importance of understanding climate change. For the Isles of Scilly this means *'a particular focus on securing sustainable energy and drinking water supplies, improved waste water treatment, more effective waste management and recycling and avoiding areas at risk of flooding, as part of the requirement to adapt to the effects of climate change. Development that protects against the impacts from coastal flooding or erosion will be encouraged, including measures that improve coastal defences, and protect water resources and the most productive agricultural land.'*

Policies relevant to the proposed developments include:

Policy SS1 – Principles of Sustainable Development

- (1) Development proposals will be permitted where they make a positive contribution to the social, economic and environmental needs of the Isles of Scilly in a manner that does not compromise the ability of future generations to meet their own needs and to enjoy the islands outstanding environment, by:
    - E) taking into account long-term implications of climate change and rising temperatures for flood risk, coastal change, water supply, biodiversity and landscapes.

Policy SS7 – Flood Avoidance

- (1) Development proposals to build below the 5-metre contour (5 metres above Ordnance Datum, Newlyn) or in other areas shown to be at risk of flooding or coastal erosion, as set out in the policies map, will not be permitted unless an appropriate and proportionate Flood Risk Assessment (FRA) demonstrates how the flood risk will be managed, and that;
    - A) the development, taking climate change into account, does not create a flood risk over its lifetime to existing or proposed properties and/or surrounding land;
    - B) appropriate acceptable mitigation and recovery measures can be undertaken to ensure no significant adverse impact on human health or the natural environment as well as cultural heritage; and
    - C) if there is any doubt, the precautionary principle (risk assessment and avoidance) will apply
- (2) All major developments, regardless of location, should also be accompanied by a proportionate FRA and appropriate sustainable drainage system.

- (3) Natural dune restoration and works connected with flood resilience and coastal defence will be supported where any natural and historic environment designations, that may be affected, have been adequately addressed in accordance with Policy OE2 (Biodiversity and Geodiversity) and OE7 (Historic Environment).

Policy OE1 – Protecting and enhancing the Landscape and Seascape

- (1) Development will only be permitted where it aligns with the statutory purpose of AONB, and therefore conserves, and where appropriate, enhances the island's landscape, seascape and scenic beauty; unless the benefits of the proposal are demonstrated to clearly outweigh any harm. Development must take into account and respect:
    - A) The distinctive character, quality, scenic beauty and sensitivity of the landscape and seascape;
    - B) The undeveloped and special character of the Heritage Coast;
    - C) Other qualities, such as important features and views, dark skies and tranquillity, and having regard to the AONB Management Plan; and
    - D) The Isles of Scilly Landscape Character Study and any successor or associated documents.

Policy OE2 – Biodiversity and Geodiversity

- (1) Development proposals will be permitted where they conserve and enhance biodiversity and geodiversity, giving particular regard to ecological networks and areas with high potential for habitat restoration or creation, and should:
    - A) Protect the hierarchy of international, national and local designated sites in accordance with their status;
    - B) Retain, protect and enhance features of biodiversity and geological interest (including supporting habitat and commuting routes through the site and taking due account of any use by migratory species) and ensure appropriate and long-term management of those features;
    - C) Contribute to the restoration and enhancement of existing habitats and the creation of wildlife habitats and linkages between sites to create and enhance local ecological networks;
    - D) Seek to eradicate or control any invasive non-native species present on site; and
    - E) Be required to contribute to the protection, management and enhancement of biodiversity and geodiversity.

Policy OE3 – Managing Pollution

- (1) A development proposal that has the potential to generate pollution, including of ground, water, noise, vibration, light or air, will only be permitted where it can be demonstrated that there would not be any adverse impact on human health, the natural environment or general amenity.

Policy OE7 – Development affecting Heritage

- (1) Great weight will be given to the conservation of the islands irreplaceable heritage assets. Where development is proposed that would lead to substantial harm to assets of the highest significance, including undesignated archaeology of national importance, this will only be justified in wholly exceptional circumstances, and substantial harm to all other nationally designated assets will

only be justified in exceptional circumstances. Any harm to the significance of a designated or non-designated heritage asset must be justified.

- (2) Proposals causing harm will be weighed against the substantial public, not private, benefits of the proposals, and whether it has been demonstrated that all reasonable efforts have been made to sustain the existing use, find new uses, or mitigate the extent of the harm to the significance of the asset; and whether the works proposed are the minimum required to secure the long-term use of the asset.

2.2.6 Local Flood Risk Management Strategy, Council of the Isles of Scilly, March 2017

Under the Flood and Water Management Act 2010, CIoS is Lead Local Flood Authority (LLFA) for the islands. Section 9 of the Act places a duty for a LLFA to develop, maintain, apply and monitor a strategy for local flood risk management in its area. The purpose of the strategy is to help reduce the number of people at risk of flooding, increase the resilience of our local communities and reduce the social and economic impact of flooding.

The Local Flood Risk Management Strategy (LFRMS) states that the following areas of concern are vulnerable to flooding, and the reasons why:

- Great Pool Area (Little Popplestones, Great Popplestones, Stinking Porth, Great Porth) – The Pool of Bryher and Popplestone Bank SSSI area is vulnerable to overtopping and breaching. Overtopping at Little Popplestones threatens the island's water supply.
- Green Bay and Bryher Lowlands – Green Bay is vulnerable to the surge and swell that flows along the channel between Tresco and Bryher. The lowlands area behind Green Bay floods via overtopping from both west and east and will act as a reservoir of salt water due to ground water saturation.
- Town Beach and Church Quay – the banks at the back of the beach have been breached in the past and erosion at the southern end of the bay and north end of Green Bay threatens access to Church Quay.
- Big Pool SSSI and Lower Town (Periglis, Porth Coose and Porth Killier) – the area is vulnerable to erosion and breaching. Sea water inundation of the area poses a threat to the water supply to Lower Town area and to the habitat and associated eco-tourism which is dependent on migrating birds flocking to the existing fresh water supply.
- Middle Town Bay/Neck of the Pool – the dynamic dune system here is 600m long and does show evidence of possible erosion but it is a dynamic system that repairs itself over time. The dunes protect a freshwater well and a campsite.

2.2.7 Isles of Scilly Area of Outstanding Natural Beauty Management Plan

Section 89 of the Countryside and Rights of Way Act 2000 places a statutory duty of local authorities with an Area of Outstanding Natural Beauty (AONB) in their area to produce a management plan and once adopted to review them at intervals of no more than 5 years. AONB Management Plans are intended to:

- Act as strategic guidance to assist the integration of other relevant plans and an integrated vision for the future of the AONB as a whole;
- Showcase the special qualities and significance of the AONB and the importance of its landscape features;

- Be a framework for action that has a positive influence on environmental quality, as well as on the vibrancy and sustainability of the local community, its economy, heritage and culture;
- To motivate and inspire action at the local level to encourage people to discover, appreciate, enjoy and understand the AONB landscape and its natural and cultural features; and
- Identify actions which will support economic and social activities that contribute to the conservation and enhancement of the AONB landscape and its special qualities.

The Isles of Scilly Area of Outstanding Natural Beauty Management Plan contains a vision for the designation, that it sets out to achieve through 18 objectives. The Vision states that *"The Isles of Scilly AONB will remain one of England's finest landscapes through the conservation and enhancement of its special features. The Islands will be valued and enjoyed by residents and visitors who will have an understanding of the AONB's special and unique qualities. The Islands will support a population with a strong sense of community, working together to achieve environmental, economic and community sustainability"*.

Applications for Planning Permission are primarily considered against these 18 objectives set out in the Management Plan. Those of relevance to the proposed sea defence schemes include:

- Objective 2: Ensure that conservation and enhancement of landscape, wildlife and geology underpin understanding and appreciation of the AONB environment whilst having regard to the conservation objectives of the Natura 2000 sites;
- Objective 5: Conserve and enhance Scilly's marine environment as an economic, cultural and social resource bringing benefit to the Island's communities;
- Objective 13: Conserve and enhance the AONB's natural and historic environment and ecosystem services as an economic, cultural and social resource bringing benefit to the Islands' communities;
- Objective 17: Ensure that development does not adversely affect the AONB designation and, wherever possible, enhances the special qualities of the AONB; and
- Objective 18: Ensure that all infrastructure and development contribute positive and sustainably to the AONB designation.

2.3 Environmental Constraints

Environmental constraints have been identified within up to 500m of the development sites, on the basis of a review of readily available environmental information. This includes statutory and non-statutory designated sites and other environmental features. These environmental constraints are illustrated in the Figure 2-4 to 2-9 below and summarised in Tables 2-3 to 2-11 below.

Figure 2-4, Figure 2-5 and Figure 2-6 present an overview of the key statutory and non-statutory environmental designations across the islands of Bryher, St Agnes, and St Martin's. The Isles of Scilly AONB and Isles of Scilly Heritage Coast cover the entire archipelago and have therefore been excluded from these figures for clarity.

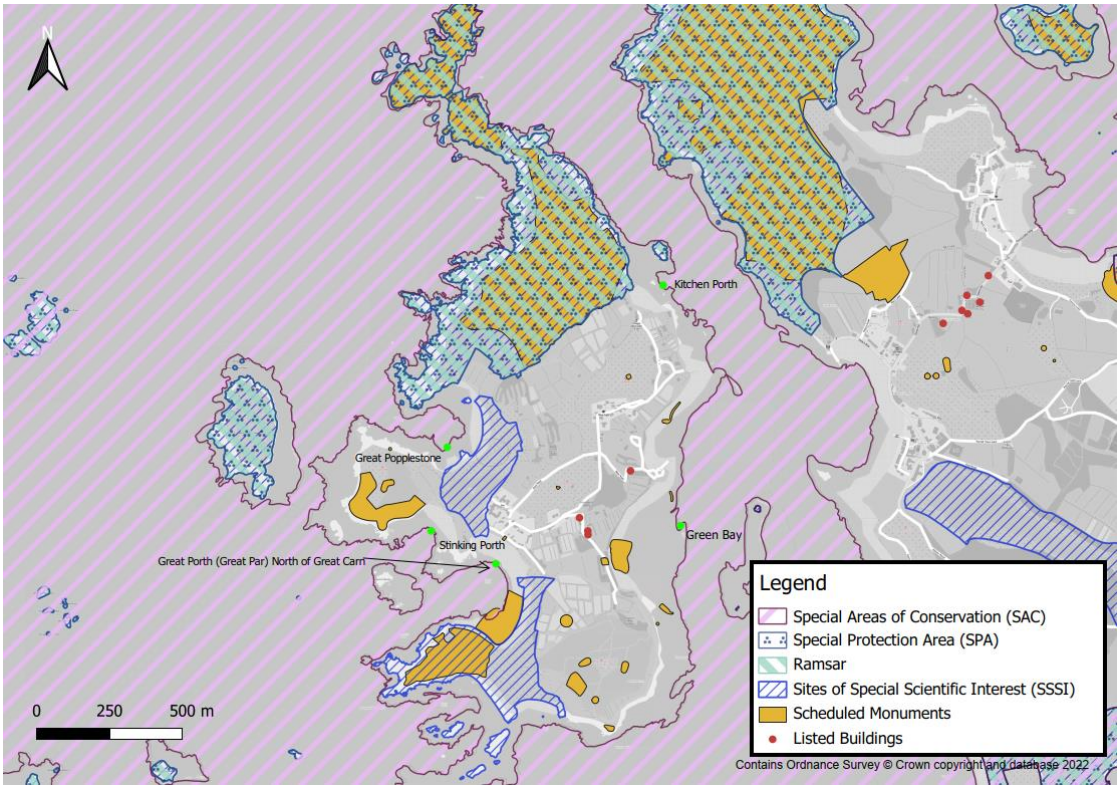

Figure 2-4: Key statutory and non-statutory environmental designations across Bryher

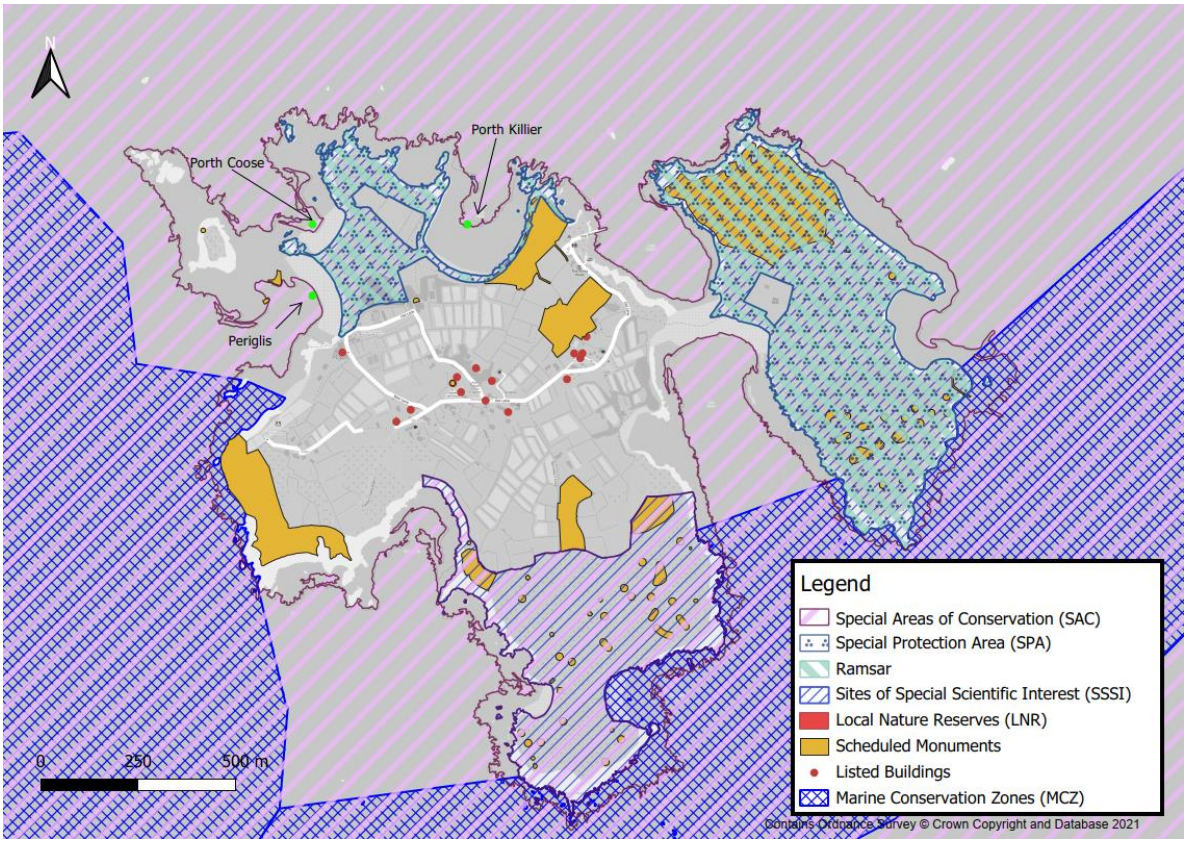

Figure 2-5: Key statutory and non-statutory environmental designations across St Agnes

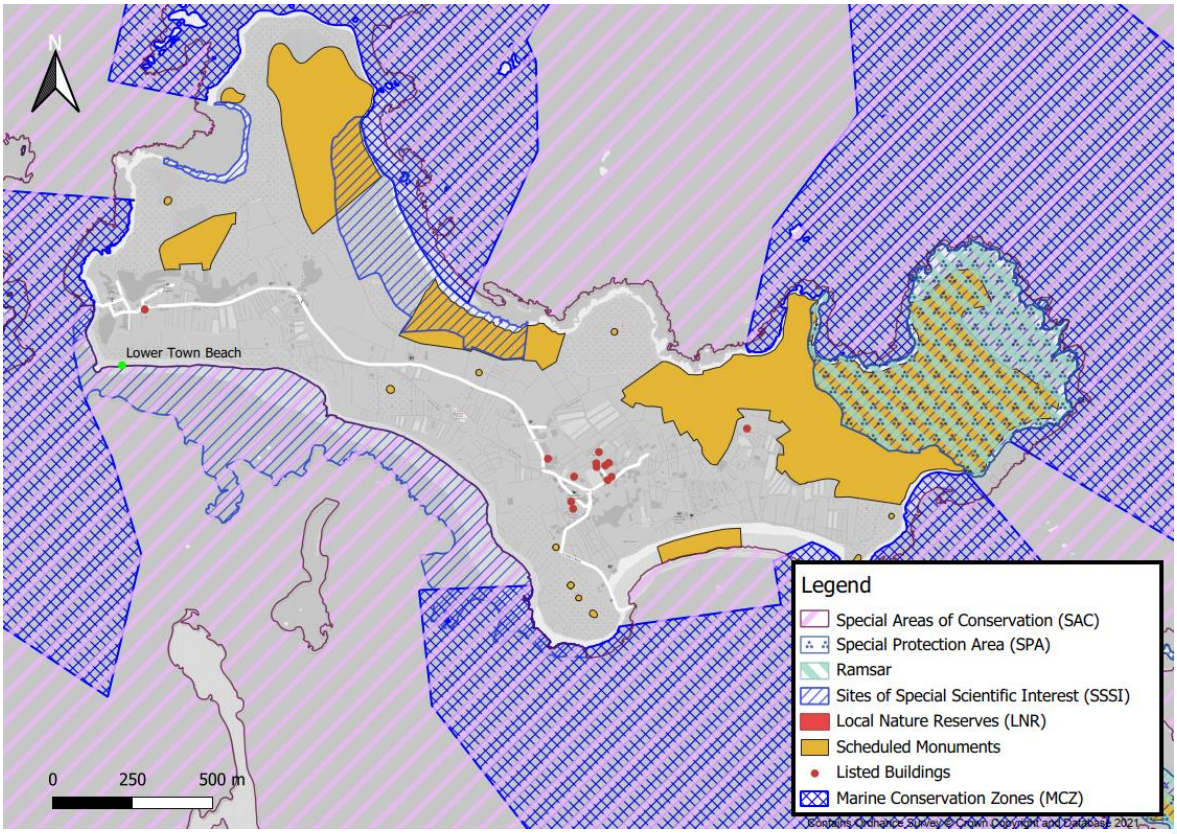

Figure 2-6: Key statutory and non-statutory environmental designations across St Martin's

Figure 2-7, Figure 2-8 and Figure 2-9 illustrate groundwater Source Protection Zones (SPZ) across the islands.

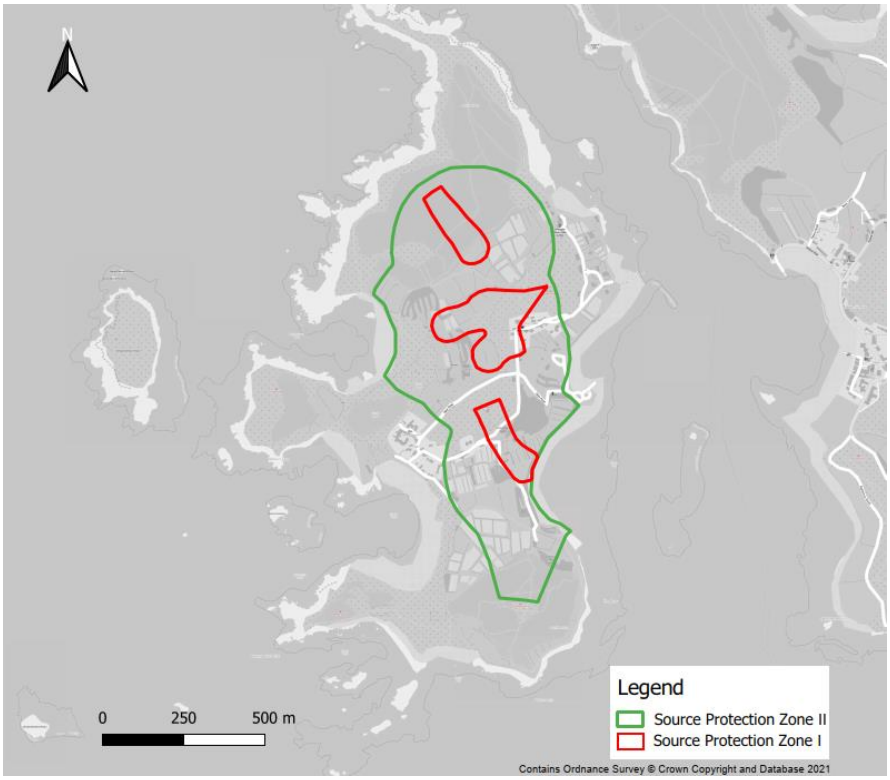

Figure 2-7: Groundwater Source Protection Zones across Bryher

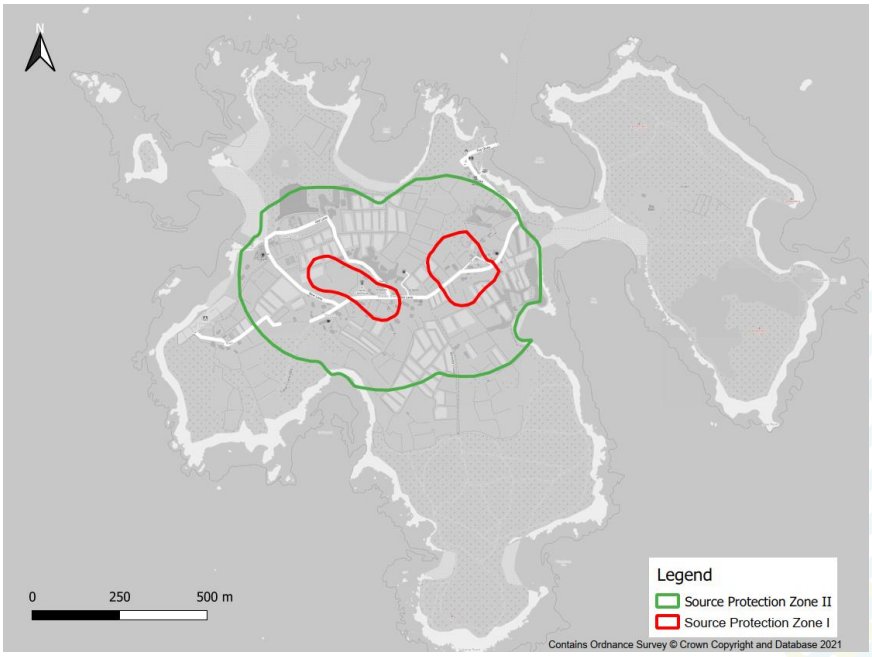

Figure 2-8: Groundwater Source Protection Zones across St Agnes

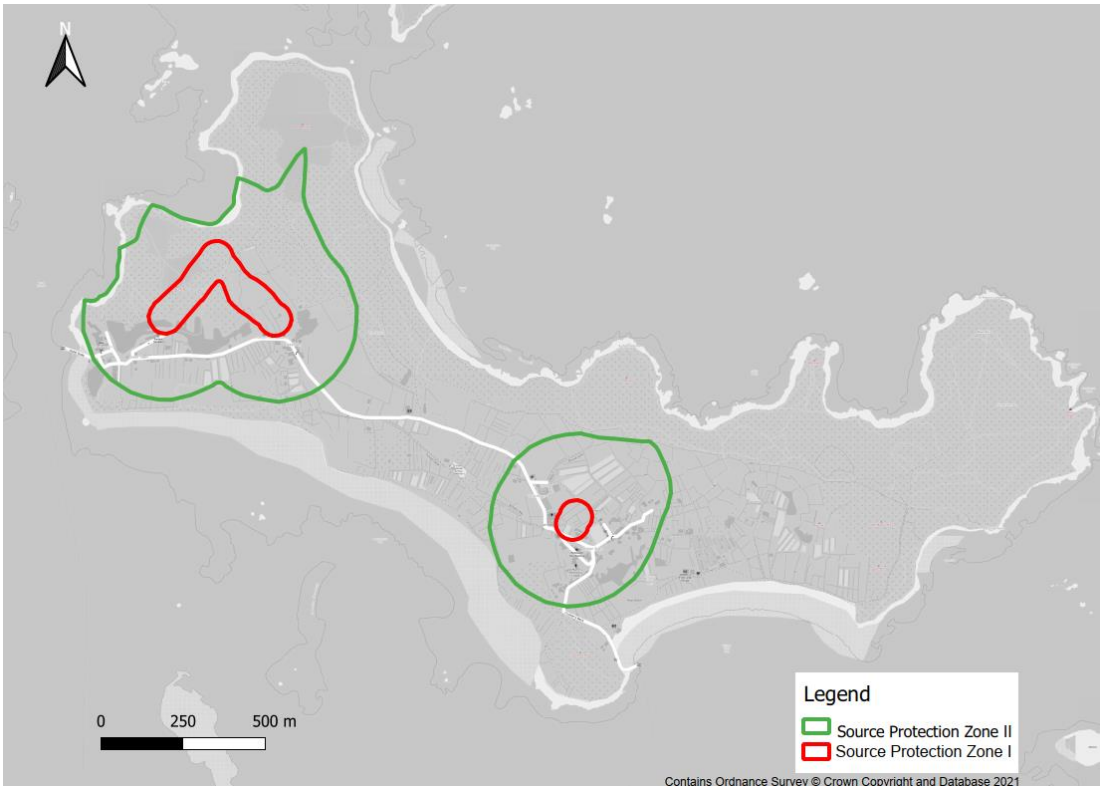

Figure 2-9: Groundwater Source Protection Zones across St Martin's

Tables 2-3 to Table 2-11 provide a summary of the key statutory and non-statutory designated sites and other environmental features within 500m of each development site.

Where relevant, further consideration is given to environmental constraints within the baseline section of each of the EIA topic chapters.

Table 2-3: Key statutory and non-statutory environmental designations within 500m of Great Popplestone

EIA Topic	Environmental Constraint	Description	Approximate Distance from Site Boundary
Biodiversity and nature conservation	**Special Protection Areas (SPA)**	Isles of Scilly SPA	60m north (at Shoreline)
	Special Area of Conservation (SAC)	Isles of Scilly Complex SAC	60m north (at Shoreline)
	Ramsar sites	Isles of Scilly Ramsar Site	220m north
	Sites of Special Scientific Interest (SSSI)	Pool of Bryher & Popplestone Bank (Bryher) SSSI	Immediately adjacent
		Shipman Head & Shipman Down (Bryher) SSSI	220m north
Historic environment	**Listed buildings**	The Forge (Grade II)	465m south east
	Scheduled monuments	Prehistoric cairn cemetery and field system on Shipman Head Down and Great Bottom, Bryher	400m north east
		Kerbed platform cairn 120m south east of Black Carn, Bryher	200m west
		Three prehistoric cairns on Gweal Hill, Bryher	190m west
		Prehistoric field system on Gweal Hill, Bryher	145m south west
		Gig shed on the north coast of Great Porth, Bryher	300m south
		Post-medieval pilot lookout on Timmy's Hill, Bryher	360m east
		Prehistoric field system and post-medieval quay in Great Porth, Bryher	480m south
Landscape	**Area of Outstanding Natural Beauty (AONB)**	Isles of Scilly AONB.	Covers IoS
	Heritage Coast	Isles of Scilly Heritage Coast.	Covers IoS
Water environment	**Source Protection Zone**	Zone II (Outer Protection Zone)	80m east
		Zone I (Inner Protection Zone)	275m east

Table 2-4: Key statutory and non-statutory environmental designations within 500m of Stinking Porth

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
Biodiversity and nature conservation	**Special Protection Areas (SPA)**	Isles of Scilly SPA	60m south (at shoreline)
	Special Area of Conservation (SAC)	Isles of Scilly Complex SAC	60m south (at shoreline)
	Ramsar sites	Isles of Scilly Ramsar Site	355m north
	Sites of Special Scientific Interest (SSSI)	Pool of Bryher & Popplestone Bank (Bryher) SSSI	90m north east
		Rushy Hill & Heathy Hill (Bryher) SSSI	355m south
		Shipman Head & Shipman Down SSSI	355m north
Historic environment	**Listed buildings**		
	Scheduled monuments	Prehistoric field system on Gweal Hill, Bryher	Adjacent
		Three prehistoric cairns on Gweal Hull, Bryher	145m north west
		Kerbed platform cairn 120m south east of Black Carn, Bryher	235m north west
		Gig shed on the north coast of Great Porth	210m east
		Prehistoric field system and post-medieval quay in Great Porth, Bryher	330 south east
		Prehistoric field system and settlement on Heathy Hill, Bryher	370m south
		Post-medieval pilot lookout on Timmy's Hill, Bryher	415m east
Landscape	**Area of Outstanding Natural Beauty (AONB)**	Isles of Scilly AONB.	Covers IoS
	Heritage Coast	Isles of Scilly Heritage Coast.	Covers IoS
Water environment	**Source Protection Zone**	Zone II (Outer Protection)	275m east
		Zone I (Inner Protection)	435m east

Table 2-5: Key statutory and non-statutory environmental designations within 500m of Great Porth (Great Par) North of Great Carn

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
Biodiversity and nature conservation	**Special Protection Areas (SPA)**	Isles of Scilly SPA	50m (at the shoreline)
	Special Area of Conservation (SAC)	Isles of Scilly Complex SAC	50m (at the shoreline)
	Ramsar sites		
	Sites of Special Scientific Interest (SSSI)	Pool of Bryher & Popplestone Bank (Bryher) SSSI	Adjacent
		Rushy Bay & Heathy Hill (Bryher) SSSI	145m south
Historic environment	**Listed buildings**	The Forge (Grade II)	315m east
		Veronica Farmhouse (Grade II)	314m east
		Brewhouse approximately 2m south west of Veronica Farmhouse (Grade II)	310m east
	Scheduled monuments	Gig shed on the north coast of Great Porth, Bryher	10m east
		Prehistoric field system on Gweal Hill, Bryher	225m north west
		Prehistoric field system and post-medieval quay in Great Porth, Bryher	100m south
		Three prehistoric cairns on Gweal Hill, Bryher	340m north west
		Kerbed platform cairn 120m south east of Black Carn, Bryher	430m north west
		Civil War battery on The Green, Bryher	290m east
		Prehistoric field system and Romano-British cist in Green Bay, Bryher	340m east
		Iron age cist on northern Samson Hill, 165m NNE of Western Carn, Bryher	235m south east
		Prehistoric entrance grave and round cairn on western Samson Hill, Bryher	400m south east
		Prehistoric field system on the south west flank of Samson Hill, Bryher	415m south east
		Prehistoric field system and settlement on Heathy Hill, Bryher	275m south west
		Post-medieval pilot lookout on Timmy's Hill, Bryher	295m east
Landscape	**Area of Outstanding Natural Beauty (AONB)**	Isles of Scilly AONB.	Covers IoS
	Heritage Coast	Isles of Scilly Heritage Coast.	Covers IoS
Water environment	**Source Protection Zone**	Zone II (Outer Protection)	100m east
		Zone I (Inner Protection Zone)	300m east

Table 2-6: Key statutory and non-statutory environmental designations within 500m of Green Bay

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
Biodiversity and nature conservation	**Special Protection Areas (SPA)**	Isles of Scilly SPA	100m east (at shoreline)
	Special Area of Conservation (SAC)	Isles of Scilly Complex SAC	100m east (at shoreline)
	Ramsar sites	Isles of Scilly Ramsar Site	495m east
	Sites of Special Scientific Interest (SSSI)	Pentle Bay, Merrick and Round Islands SSSI	495m east
		Rushy Bay & Heathy Hill (Bryher) SSSI	270m west
Historic environment	**Listed buildings**	Brewhouse approximately 2m south west of Veronica Farmhouse (Grade II)	210m north west
		Veronica Farmhouse (Grade II)	225m north west
		The Forge (Grade II)	280m north west
		Church of All Saints (Grade II)	380m north
	Scheduled monuments	Prehistoric field system and Romano-British cist in Green Bay, Bryher	40m north
		Civil War Battery on The Green, Bryher	105m north
		Prehistoric enclosure south east of The Brow, Bryher	110m south
		Prehistoric hut circle south of The Brow, Bryher	130m south
		Two kerbed platform cairns north of Bonfire Carn on eastern Samson Hill, Bryher	260m south
		Civil War battery at Works Point, Bryher	475m south
		Prehistoric entrance grave at Works Carn, Bryher	400m south west
		Prehistoric field system on the south west flank of Samson Hill, Bryher	355m south west
		Prehistoric entrance grave and round cairn on western Samson Hill, Bryher	290m south west
		Iron Age cist on northern Samson Hill, 165m NNE of Western Carn, Bryher	230m west
		Prehistoric field system and post-medieval quay in Great Porth, Bryher	365m west
		Gig shed on the north coast of Great Porth, Bryher	445m north west
		Prehistoric linear boundary SSE of The Island, Bryher	325m north east
		Post-medieval pilot lookout on Timmy's Hill, Bryher	415m north west
Landscape	**Area of Outstanding Natural Beauty (AONB)**	Isles of Scilly AONB.	Covers IoS
	Heritage Coast	Isles of Scilly Heritage Coast.	Covers IoS

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
Water environment	**Source Protection Zone**	Zone II (Outer Protection Zone)	Adjacent
		Zone I (Inner Protection Zone)	155m north west

Table 2-7: Key statutory and non-statutory environmental designations within 500m of Kitchen Porth

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
Biodiversity and nature conservation	**Special Protection Areas (SPA)**	Isles of Scilly SPA	85m east (at the shoreline)
	Special Area of Conservation (SAC)	Isles of Scilly Complex SAC	85m east (at the shoreline)
	Ramsar sites	Isles of Scilly Ramsar	Adjacent
	Sites of Special Scientific Interest (SSSI)	Shipman Head & Shipman Down (Bryher) SSSI	Adjacent
		Castle Down (Tresco) SSSI	370m east
Historic environment	**Listed buildings**		
	Scheduled monuments	Prehistoric cairn cemetery and field system on Shipman Head Down and Great Bottom, Bryher	Adjacent
		Post-medieval watch house and Coastguard lookout on Watch Hill, Bryher	265m south
		Prehistoric funerary, ritual and settlement remains; post-medieval defences, tin mine, lookouts and enclosures on Castle Down, Tresco	370m east
		Cromwell's Castle mid-17th century blockhouse and 18th century gun platform on the western coast of Castle Down, Tresco	325m east
		Prehistoric linear boundary and cairns south west of The Bar, Bryher	375m south
Landscape	**Area of Outstanding Natural Beauty (AONB)**	Isles of Scilly AONB.	Covers IoS
	Heritage Coast	Isles of Scilly Heritage Coast.	Covers IoS
Water environment	**Source Protection Zone**	Zone II (Outer Protection Zone)	50m west
		Zone I (Inner Protection Zone)	245m east

Table 2-8: Key statutory and non-statutory environmental designations within 500m of Porth Killier

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
Biodiversity and nature conservation	**Special Protection Areas (SPA)**	Isles of Scilly SPA	110m north (at the shoreline)
	Special Area of Conservation (SAC)	Isles of Scilly Complex SAC	110m north (at the shoreline)
	Ramsar sites	Isles of Scilly Ramsar	Adjacent
	Sites of Special Scientific Interest (SSSI)	Big Pool & Browarth Point (St. Agnes) SSSI	Adjacent
Historic environment	**Listed buildings**	Rosenhill (Grade II)	290m south east
		Atlantic Cottage (Grade II)	295m south east
		Rose Cottage (Grade II)	305m south east
		Myrtle Cottage (Grade II)	315m south east
		Outbuilding at SV 8831 0819 (Grade II)	340m south east
		The Parsonage (Grade II)	230m south
		Farmbuilding approximately 20m north east of Annet Farmhouse (Grade II)	265m south
		House attached to north east of the lighthouse (Grade II)	265m south
		Building to the south east of the lighthouse (Grade II)	300m south
		K6 Telephone Kiosk (Grade II)	315m south
		Avenue House (Grade II)	355m south
		Tamarisk Farmhouse (Grade II)	380m south
		Barn to the West of Tamarisk Farmhouse (Grade II)	410m south
		Church of St Agnes (Grade II)	385m south west
	Scheduled monuments	Prehistoric settlement and field system at Porth Killier, St Agnes	Adjacent
		Prehistoric to Romano-British field system and settlement at Higher Town, St Agnes	180m south east
		Nineteenth century horse engine and thresting machine at Lower Town Farm, St Agnes	125m south
		St Agnes lighthouse	290m south
		Two early post-medieval quays in north and north western Periglis, St Agnes	410m west

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
		Prehistoric cairns, entrance graves, field system and settlements and post-medieval kelp pits on Kittern Hill, Gugh	410m east
Landscape	**Area of Outstanding Natural Beauty (AONB)**	Isles of Scilly AONB	Covers IoS
	Heritage Coast	Isles of Scilly Heritage Coast	Covers IoS
Water environment	**Source Protection Zone**	Zone II (Outer Protection Zone)	45m south
		Zone I (Inner Protection Zone)	225m south east

Table 2-9: Key statutory and non-statutory environmental designations within 500m of Porth Coose

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
Biodiversity and nature conservation	**Special Protection Areas (SPA)**	Isles of Scilly SPA	55m west (at shoreline)
	Special Area of Conservation (SAC)	Isles of Scilly Complex SAC	55m west (at shoreline)
	Ramsar sites	Isles of Scilly Ramsar	Adjacent
	Sites of Special Scientific Interest (SSSI)	Big Pool & Browarth Point (St. Agnes) SSSI	Adjacent
Historic environment	**Listed buildings**	Church of St Agnes (Grade II)	280m south
		Barn to the west of Tamarisk Farmhouse (Grade II)	490m south
		Tamarisk Farmhouse (Grade II)	470m south
		House attached to North East of the Lighthouse (Grade II)	470m south east
		The Parsonage (Grade II)	495m south east
		Building to the South East of the Lighthouse (Grade II)	
	Scheduled monuments	Platform cairn on Burnt Island	270m west
		Two early post-medieval quays in north and north western Periglis, St Agnes	90m south
		Nineteenth century horse engine and thresting machine at Lower Town Farm, St Agnes	265m south
		Prehistoric settlement and field system at Porth Killier, St Agnes	410m south east

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
		St Agnes lighthouse	480m south
Landscape	**Area of Outstanding Natural Beauty (AONB)**	Isles of Scilly AONB.	Covers IoS
	Heritage Coast	Isles of Scilly Heritage Coast.	Covers IoS
Water environment	**Source Protection Zone**	Zone II (Outer Protection Zone)	155m south
		Zone I (Inner Protection Zone)	350m south

Table 2-10: Key statutory and non-statutory environmental designations within 500m of Periglis

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
Biodiversity and nature conservation	**Special Protection Areas (SPA)**	Isles of Scilly SPA	55m west (at the shoreline)
	Special Area of Conservation (SAC)	Isles of Scilly Complex SAC	55m west (at the shoreline)
	Ramsar sites	Isles of Scilly Ramsar	Adjacent
	Sites of Special Scientific Interest (SSSI)	Big Pool & Browarth Point (St. Agnes) SSSI	Adjacent
Historic environment	**Listed buildings**	Church of St Agnes (Grade II)	50m south
		Barn to the west of Tamarisk Farmhouse (Grade II)	275m south east
		Tamarisk Farmhouse (Grade II)	280m south east
		House attached to north east of the Lighthouse (Grade II)	335m south east
		Building to the south east of the Lighthouse (Grade II)	355m south east
		The Parsonage (Grade II)	365m south east
		K6 Telephone Kiosk (Grade II)	420m south east
		Farmbuilding approximately 20m north east of annet farmhouse (Grade II)	420m south east
		Avenue House (Grade II)	485m south east
	Scheduled monuments	Two early post-medieval quays in north and north western Periglis, St Agnes	70m west
		Platform cairn on Burnt Island	265m north west

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
		Nineteenth century horse engine and threshing machine at Lower Town Farm, St Agnes	200m east
		Prehistoric field system and post-medieval breastwork and maze on Castella Down, St Agnes	325m south
		St Agnes lighthouse	335m south east
Landscape	**Area of Outstanding Natural Beauty (AONB)**	Isles of Scilly AONB.	Covers IoS
	Heritage Coast	Isles of Scilly Heritage Coast.	Covers IoS
Water environment	**Source Protection Zone**	Zone II (Outer Protection Zone)	Adjacent
		Zone I (Inner Protection Zone)	180m south east

Table 2-11: Key statutory and non-statutory environmental designations within 500m of Lower Town Beach

EIA Topic	Environmental Constraint	Description	Distance from Site Boundary
Biodiversity and nature conservation	**Special Protection Areas (SPA)**	Isles of Scilly SPA	30m south (at shoreline)
	Special Area of Conservation (SAC)	Isles of Scilly Complex SAC	30m south (at shoreline)
	Ramsar sites	Isles of Scilly Ramsar site	370m west
	Sites of Special Scientific Interest (SSSI)	St. Martin's Sedimentary Shore SSSI	30m south (at shoreline)
Historic environment	**Listed buildings**	Ashvale Farmhouse (Grade II)	170m north
	Scheduled monuments	Prehistoric cairn cemetery and field system on Tinkler's Hill, St Martin's	310m north
		Post-medieval kelp pit on the western coast of Tinkler's Hill, St Martin's	495m north
Landscape	**Area of Outstanding Natural Beauty (AONB)**	Isles of Scilly AONB.	Covers IoS
	Heritage Coast	Isles of Scilly Heritage Coast.	Covers IoS
Water environment	**Source Protection Zone**	Zone II (Outer Protection Zone)	60m north
		Zone I (Inner Protection Zone)	240m north

2.4 Option selection and alternatives

A range of alternative options were identified to manage the coastal erosion and flood risk at each of the sites.

A short-list of options: do nothing, do minimum, do something (option 1), and do something (option 2) was identified for each location at Outline Business Case stage.

A detailed options appraisal of these options was undertaken during the preliminary design stage by designers, HR Wallingford. This options appraisal considered the following criteria: performance; monitoring and maintenance; constructability; impact on natural processes; impact on the environment; construction schedule; and costs.

Impacts on the environment considered: potential visual impacts; amenity value/access to the beach; impact of construction (including noise and dust); potential impact on marine designations for construction as well as design solution; potential impact on land designations for construction as well as design solution; and potential impact on Water Framework Directive (WFD) waterbodies.

This options appraisal, along with the preferred options for each site are outlined within the RIBA Stage 3 Design Engineering Report produced by HR Wallingford (HR Wallingford, 2021).

Do nothing and do minimum options were considered for each location. However, these options were discounted as they would not adequately address issues surrounding current flood and erosion risks. Therefore, the do nothing and do minimum options that were considered are not discussed further. A summary of the outcomes of this options appraisal for the do something options, and the preferred option (i.e. the scheme taken forward at each location), for each site is provided in Tables 2-12 to 2-20 below. The preferred option for each site is highlighted in green.

Bryher

Table 2-12: Summary of options considered for the Great Popplestone scheme

Option		Description	Key risks
1	**Do something (dune restoration)**	This option involves recharging and restoring 90m of dune inclusive of repositioning of 50m^3 of in-situ existing 'rock armour'.	This option utilises the existing rock on the face and leeward of the wall so no new rock is required. The risk of this option is that without increasing the crest height, the wall may continue to be overtopped and the rocks may be displaced. This would not provide adequate protection to the island's water supply. In addition, there would be risk of saline intrusion to Pool of Bryher and Popplestone Bank SSSI, which may adversely affect a range of sensitive ecology .These risks would increase in future due to sea level rise and increased likelihood of storm conditions due to climate change. This option is therefore less preferable.
2	**Do something (rebuild the wall)**	Southern end, rebuild wall with existing rock, increasing crest elevation possibly through a masonry wall.	This option would provide further protection against overtopping. It is assumed that the existing wall can be built upon as a full new wall would be too expensive to construct. However, the raising of sea wall through a masonry wall may compromise its integrity. This would provide greater protection to the island's drinking water supply and sensitive ecology than Option 1.
Alternative preferred option (1)		Alternative preferred option is a modification of Option 2 to raise the rock crest level of the sea wall at the south of the bay over approximately 85m	

Option	Description	Key risks
	to reduce overtopping. This would require import of approximately 750m^3 of 1-3 tonne rock. This option would lead to increased embodied carbon associated with the scheme compared to alternative preferred option (2) due to the need to import rock. This option would provide further protection against overtopping, providing protection to Great Pool and Pool of Bryher and Popplestone Bank (Bryher) SSSI behind.	
Alternative preferred option (2)	Alternative preferred option is modification of Option 2 to raise the rock crest level of sea wall at the south of the bay over approximately 85m to reduce overtopping. Movement of scattered rocks from further north in the bay for this purpose. The dune in the north would be re-graded and allowed to adjust to the new situation naturally. Reusing rocks will reduce the need for import of any rock. This option would provide further protection against overtopping, providing protection to Great Pool and Pool of Bryher and Popplestone Bank (Bryher) SSSI behind.	

Table 2-13: Summary of options considered for the Stinking Porth scheme

Option		Description	Key risks
1	**Do something (dune restoration)**	This option involves reducing overtop and breach risk at a 20m southern section with 20m^3 of localised dune restoration.	Sand recharge would provide additional protection for the crest. The beach is not a traditional dune so recharge would not likely provide long term protection and may require recharge. Risk that the island's drinking water supply would remain vulnerable to inundation. Lack of increased protection for ecologically sensitive area. However, this option would allow natural coastal processes to operate and is aligned with the NAI policy in the SMP2.
2	**Do something (revetment)**	This option involves increasing elevation and building a revetment using geobags protected seaward by cobbles/natural materials and planting at low points with susceptibility to overtopping/flooding.	Hard protection would be a robust solution to provide long term protection to Great Pool and is proposed over the length of the beach most vulnerable to wave overtopping. The footprint of the proposed raised embankment would need consideration for footpath access and for vegetating to encourage native plants and provide erosion protection. Potential adverse impacts on landscape character and visual amenity as a result of the increased elevation.
Alternative preferred option		Modification of Option 2 to construct a new revetment along a section of Stinking Porth where the crest levels are below 5.5m to ameliorate overtopping. Rock armour and underlayer/geotextile will replace the top of the beach. Existing and reclaimed material to be used to bring the leeward side of the structure up to match the crest and help re-establish the footpath behind. This option is considered preferable since the proposed revetment is a robust solution that will provide resilience against extreme storm events and the seeding/planting of grasses will help to quickly re-establish the habitat and integrate into the surrounding landscape. This option will provide protection to the island's drinking water supply and will protect the sensitive surrounding ecology. However, this option would effectively constitute a HTL approach.	

Table 2-14: Summary of options considered for the Great Porth (Great Par) North of Great Carn scheme

Option		Description	Key risks
1	**Do something (dune nourishment)**	This option involves 80m of linear dune nourishment and restoration along with negotiated changes to access and vehicular routes to enable the dune to recover and recess.	The nourishment and managed access should limit erosion by human action and would provide some protection against overtopping. As this is not a traditional dune, long-term benefits of the restoration could not be assured and may require regular maintenance and recharge to maintain the level of protection. Risk that the island's drinking water supply would remain vulnerable to inundation. Lack of increased protection for adjacent properties and infrastructure.
2	**Do something (rebuild the wall)**	This option involves rebuilding a section of the sea wall using local rocks. The revetment would be extended south to the boat house.	The raised crest would limit overtopping and erosion at the south of the beach. A demountable flood barrier can be incorporated into the crest at the boat ramp. This would be a change to the appearance of the beach, but as it would only be at the top of the beach it would not impact the amenity. This would be a long-term stability solution and as such is the preferred option for this site.
Alternative preferred option		Modification of Option 2. Construction of a new revetment with an impermeable core. The revetment would incorporate a boat/ramp access along its length, along with a demountable barrier. Material is proposed to be placed on the rear of the rock crest to tie into existing ground levels. This material will provide some initial resistance to any overtopping discharges and will help the rear of the crest tie into the area behind. This option is preferable since the construction of this revetment would provide a robust solution to provide resilience against extreme storm events. The revetment would reduce the flood risk affecting adjacent residential and commercial properties. The seeding/planting of grasses behind the crest will help to quickly re-establish habitat. However, the defence will likely alter local landscape character and visual amenity for residents and visitors.	

Table 2-15: Summary of options considered for the Green Bay scheme

Option		Description	Key risks
1	**Do something (dune restoration)**	This option would involve 100m of 'dune' restoration and nourishment with sand to raise dune height by 250mm.	Raising the crest level would increase the level of protection and the sand can readily be sourced. Any replenishment is likely to be a temporary measure and further recharge is likely to be required over the design life. Risks associated with increase in flood risk in future due to sea level rise and increased likelihood of storm conditions due to climate change.
2	**Do something (Geobags)**	This option would involve placing geobags at the southern end of the boatyard to the south of the boathouse (ramp) to raise the level along the footpath.	Geobags would provide a solid and durable core to stabilise the embankment and the matting would provide protection whilst vegetation establishes. There would be more construction works required with this option as the ground would need to be prepared ahead of placement.

Option	Description	Key risks
Alternative preferred option	Modification of Option 2 to implement impermeable geobags at the crest and then covered with natural reclaimed embankment material along a stretch of 70m. The re-vegetated crest would provide an embankment with a natural appearance and will reduce flooding into the boatyard. Earthworks would be required to bring up the crest. This option is preferable since there would be minimal visual difference and the vegetating of the embankment will provide additional erosion protection as well as replicating existing habitats.	

Table 2-16: Summary of options considered for the Kitchen Porth scheme

Option		Description	Key risks
1	**Do something (raise front edge)**	This option would involve raising the front edge and across 75mm of informal pathway by 500mm to provide protective embankment between dune area and properties.	The raised edge would provide additional protection to the properties behind the crest. This footpath protection would not protect the Ram that is being eroded at the top of the beach (as can be seen by visible roots), which could undermine the footpath protection. There would be a risk of saline intrusion of Shipman Head & Shipman Down SSSI /Ramsar at the top of the beach, adversely affecting a range of sensitive ecology.
2	**Do something (rebuild the wall)**	This option involves the southern section of bay (to be re-built) with local rocks and geobags to provide core.	A targeted rebuild of the extent of the embankment most at risk would protect against further erosion and the rock would reduce overtopping. Reusing rocks will reduce the need for import of any rock armour. Only a short section would be rebuilt so some of the front would still be at risk from overtopping, a full revetment is not proposed so the Ram may still get eroded by the wave run up, albeit at a slower rate. Risk of saline intrusion of Shipman Head & Shipman Down SSSI / Ramsar at the top of the beach, adversely affecting a range of sensitive ecology.
Alternative preferred option		Modification of Option 2. Embankment protection for 40m using 1 to 3 tonne armourstone either reclaimed from existing resources on the island or imported to tie into existing levels at each end to dissipate wave energy and prevent direct attack. However, this structure does not include an impermeable layer and so some overtopping discharge may still reach/percolate the gardens of the leeward properties. Potential adverse impact on visual amenity. Likely to prevent saline intrusion of Shipman Head & Shipman Down SSSI / Ramsar. This would likely constitute HTL.	

St Agnes

Table 2-17: Summary of options considered for the Porth Killier scheme

	Option		Description	Key risks
Seawall	1	**Do something (Rock fill)**	Reduce scouring of toe/foundation of 10m section of retaining sea wall by protecting it with 1.5m^3 of rock armour per linear metre.	The option provides the protection required, though it may be under designed (required greater berm). In addition, any localised solution may move the problem downdrift. Less preferable due to inadequate protection.
	Alternative preferred option (toe/scour protection)		Rock scour protection at the foundation of the sea wall.	The toe protection will be designed to be wider and higher to reduce wave overtopping and will also improve overall stability of the wall. The largest rocks are to be placed at the seaward end of the toe to increase its stability, with the material removed as part of the preparation for the placement of rock from the beach placed in front of the new rock toe. This would protect the adjacent Big Pool and Browarth Point SSSI/Ramsar from saline inundation.
Eastern end	**Do something (rock revetment)**		To reduce the cutback of the ram, a rock revetment will be placed to at least the height of the underside of the ram/outcrop. Rock armour will be protected by a cobble toe that will make use of existing materials.	Rock revetment top level should be adjusted to match ram and reduce cutback towards road. This would provide protection from overtopping to Big Pool & Browarth Point SSSI/Ramsar and adjacent infrastructure.
Western end	1	**Do something (Rock fill)**	Add 20m^3 of rock armour to existing to raise height and address overtopping risk on NW side of Porth Killier.	This approach does not address any of the flood and erosion risk management issues. Failure of the existing defence is possible at any time, as evidenced by previous storms and the requirement for preventative measures during the storms. This approach does not address any of the flood and erosion risk management issues. Failure of the existing defence is possible at any time, as evidenced by previous storms and the requirement for preventative measures during the storms. This option provides a valuable solution, though it may be over designed.
	Alternative preferred option		No works proposed. It is unlikely that any intervention here would be of significant benefit.	

Table 2-18: Summary of options considered for the Porth Coose scheme

Option		Description	Key risks
1	**Do something (granite/biomatting restoration)**	Restore the dunes, locally recharging 125m of it with imported granite 'crush'. Naturally and flexibly strengthen, raise and protect low sections with biomatting and by planting and establishing with varied palette of coastal dune flora. Achieve a consistent profile of 750mm above the current low points.	The option provides a solution which can blend with the environment, though the material may get moved during storms and the already exposed steel wires confirm that erosion of the crest occurs during severe storms. Therefore, this solution may require regular monitoring and maintenance in order to make sure that crest levels are maintained at the elevation required. Potential risk of saline intrusion of drinking water supply and Big Pool & Browarth Point SSSI / Ramsar in the instance of a severe storm.
Preferred alternative option (geomatting and engineered crest)		This option is preferable since it would provide a more robust and wider ridge crest through rock mattress protection (rock bag). The crest would be elevated through recharge using local material, with a protective rock mattress (rock bag) directly on the existing crest. The proposed crest would reduce overtopping and provide protection against erosion at both the seaward and rear side of the bank. This would provide protection to the island's drinking water supply and Big Pool & Browarth Point SSSI/ Ramsar. Seeding and planting of grasses would help to quickly re-establish the habitat and would fix the topsoil/sand to protect the rear of the crest line from any erosion. This would help reduce potential adverse visual impacts.	

Table 2-19: Summary of options considered for the Periglis scheme

Option		Description	Key risks
1	**Do something (granite/biomatting restoration)**	This option includes restoring the dunes, locally recharging 125m of it with imported granite 'crush'. Naturally and flexibly strengthening, raising and protecting low sections with biomatting and by planting and establishing with varied palette of coastal dune flora. Achieve a consistent profile 750mm above the current low points. Repair Periglis slipway (6m^3 concrete) and enhance rock armour at quay and tie-in with beach entrance . Add stop log fitting and supply stop log to slipway.	Biomatting is a natural material, which would make it compatible with the environment at the location, though it would not provide a long term solution and is likely to be subject to erosion if directly exposed to wave action. The repair to the slipway and the armour appeared to have been already carried out. Potential risk of inundation of drinking water supply and indundation of Big Pool & Browarth Point SSSI / Ramsar in long term.
2	**Do something (concrete block protection)**	Protect 220m length and 8m width of dunes on Periglis beach with concrete block revetment. Repair Periglis slipway and associated works as per option 3.	Concrete block revetment was considered as an option. However, this option would be more expensive than the use of other solutions as for example geocontainers/geobags. It would also have a potential adverse impact on landscape character and visual amenity.

Option		Description	Key risks
3	**Do something (Tecco Cell protection)**	Protect 220m length and 8m width of dunes on Periglis beach with Tecco Cell proprietary erosion protection matting. Repair Periglis slipway and associated works.	This soft engineering solution may be subject to rapid deterioration with poor aesthetic results. This could lead to risk of inundation of drinking water supply and Big Pool & Browarth Point SSSI / Ramsar.
Alternative preferred option (geocontainers)		Preferred option to protect Periglis beach using geocontainers and cover with cobble/sand material along most of the bay. This solution would provide more robust results in terms of erosion and would enhance the dune stability at the seaward side of the slope. The geocontainers would be covered by fill material so they would not be exposed directly to the waves and would not have adverse visual impacts. Elevation of the crest along the beach to protect against overtopping discharges using local materials with biodegradeable matting to retain the material whilst grasses and plants establish. This would prevent saline intrusion of Big Pool and Big Pool & Browarth Point SSSI/Ramsar.	

St Martin's

Table 2-20: Summary of options considered for the Lower Town Beach scheme

Option		Description	Key risks
1	**Do something (sensitively restore)**	Fencing off the most sensitive area of dunes at the rear of the beach to help recovery by limiting access to this area and encouraging accreditation of sand at the foot of the dunes.	The dunes would still remain at risk from large storms and erosion may still occur. Active management of the access to the dunes would be required with regular inspections. However, dunes have been showing signs of self-repair following previous storms.
Alternative preferred option		As per option 1 (fencing off most sensitive area of dunes) with the addition of protection to the east of the beach access track where cabling has become exposed, and also to the west of the beach. This would be an open grid product appropriate for vehicle loading that would be filled with sand to match the existing appearance, to reduce visual impacts, and provide erosion protection in this area by limiting any further lowering of crest level. Pedestrian footpath management through signage and fencing would also be used to limit and control access to the beach. Dunes have been showing signs of self-repair following previous storms and therefore this option is considered appropriate to allow them to self-repair. Works to the beach access point were not included in the preliminary design but following feedback from residents, a temporary slipway to launch and retrieve boats has been included since the presence of a permanent hard structure may affect the dune's natural processes.	

2.5 Stakeholder Engagement

Engagement has been undertaken with a range of stakeholders to inform the development of the nine schemes. In particular, a series of meetings were held in 2016 with several key stakeholders to discuss the project proposals and allow stakeholder input into their detailed design.

Discussions surrounding the overall project, incorporating all nine of the proposed schemes, are currently ongoing with all landowners, the local community, members of the CIoS, the Duchy of Cornwall, the Isles of Scilly Wildlife Trust, the Isles of Scilly AONB Partnership, Natural England, the Environment Agency and Historic England.

An Outline Business Case for the proposed schemes was prepared by the CIoS and submitted to the Environment Agency for approval in December 2016. Approval was subsequently granted in December 2018 to enable to project to progress to detailed design and preparation of a Full Business Case.

Consultation with the CIoS Planning Department has been undertaken and an EIA screening opinion request was submitted to the Department on 25th May 2021. An EIA screening opinion was received on 3rd August 2021.

Further engagement with the community took place in November 2021, when the draft detailed designs for local coastal works were exhibited on each of the off-islands and the community were invited to discuss them with CIoS staff. The detailed designs were also placed on the CIoS website at the same time for viewing, and feedback was accepted by email until 21 January 2022.

Engagement was undertaken with the Isles of Scilly Wildlife Trust, Natural England and the RSPB in Spring 2022 to discuss potential impacts of the project and agree appropriate mitigation measures.

Modifications were made to the draft detailed designs for the project as a result of the feedback received. This included inclusion of a temporary slipway at Lower Town Beach to enable movement of boats.

2.6 Description of the Proposed Development

Tables 2-12 to 2-20 above outline the options considered for each of the nine sites across the islands of Bryher, St Agnes and St Martin's. Further design details for the preferred options for each site, identified by HR Wallingford, are detailed below. Detailed design drawings for each of the sites are included in Appendix 2.1, with an extract of each included below.

Bryher

2.6.1 Great Popplestone

Works are required at Great Popplestone to protect the island's water supply from seawater inundation and consequently contamination of the island's drinking water supply (Great Pool and the low-lying water meadow at Great Popplestone).

The proposed development will comprise the following elements:

- Raising of rock armour crest level to reduce overtopping (protecting Great Pool). Two options are being considered for this, option 1: import rock required to raise crest level, option 2: movement of scattered rocks from further north in the bay for this purpose.
- The proposed development would make use of the existing protection and enhance it rather than require any demolition works. If option 2 were to be chosen, these rocks would not be replaced, however, the dune behind will be re-graded to allow it to adjust to the new situation naturally and reduce the risk of wave overtopping. This option would avoid the need to import rock.

There is also an area, approximately 20m in length, in the north of the beach where some local erosion to the crest has occurred due to pedestrian access to the beach. Soft measures are proposed in this area to control access to the beach including:

- A potential board walk over this area to retain access to the beach with infill of locally sourced rocks and cobbles to help establish the beach crest.

At the northern extent of the beach where previously buried Cornish granite rocks are exposed, the proposed development will involve removal of these rocks for re-use elsewhere across Bryher.

Details of the proposed development are shown on drawing DKR6499-210-D113 and cross-sections are shown on drawing DKR6499-210-D340 included in Appendix 2.1, extracts of which are shown on Figure 2-10 and Figure 2-11 below.

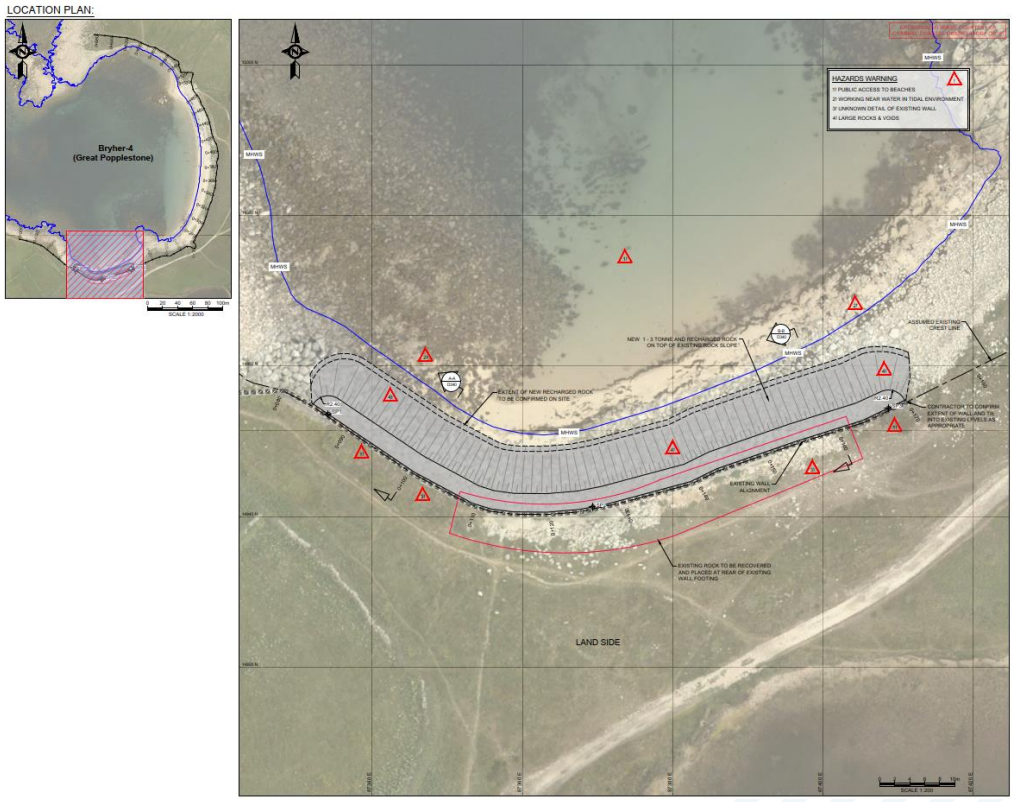

Figure 2-10: Extent of proposed raising of rock crest level sea wall at Great Popplestone (HR Wallingford, 2022)

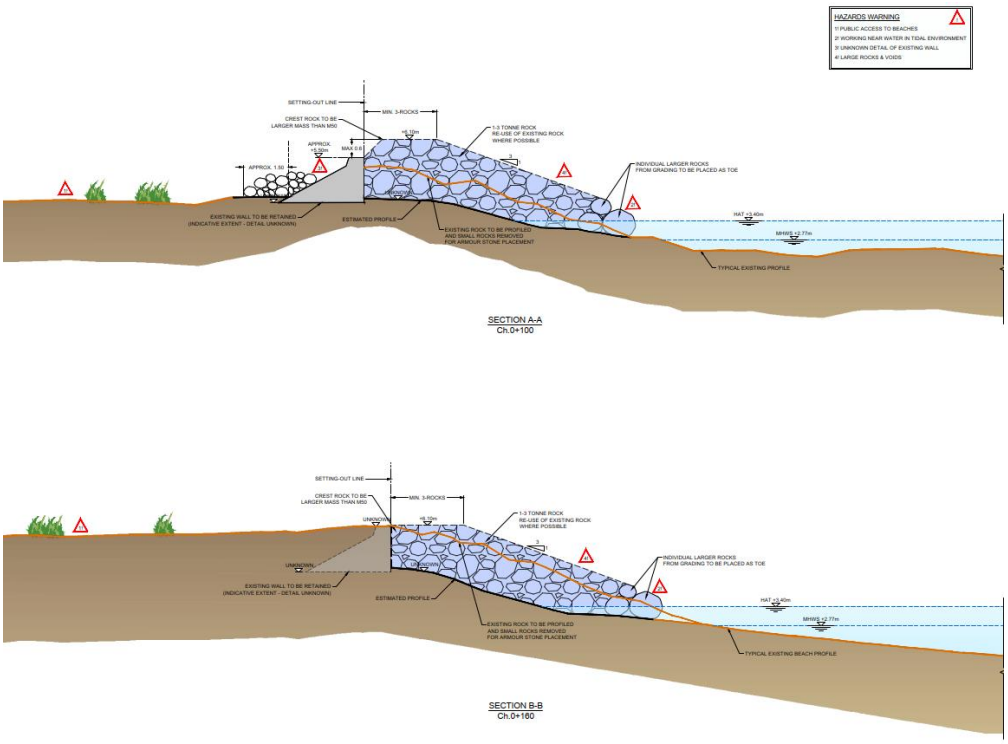

Figure 2-11: Cross-section of proposed works at Great Popplestone (HR Wallingford, 2022)

2.6.2 Stinking Porth

At Stinking Porth there is a need to increase the crest height above the present level of the crest of the beach, along with a requirement for a stable structure resistant to wave attack, to protect the island's water supply (Great Pool) from seawater inundation.

The proposed works include:

- A new revetment with a higher crest level along a 55m section of Stinking Porth, where the existing crest levels are below 5.5m. The rear of the structure here needs to be increased in width and level to provide resistance to overtopping discharges. The proposed revetment is a robust solution that will provide resilience against extreme storm events and protection for Great Pool.
- The slope of the main armour will be 1:2, comprising of a mix of 1 to 3 tonne rocks. It is anticipated that some rock can be sourced from the islands themselves, however, there may be a requirement to import some rock.
- The crest of the armour layer will be set at +6.5m to prevent overtopping. Using existing and reclaimed material, the leeward side of the structure can be brought up to +6.5m to match the crest and also help re-establish the footpath behind.
- The rock armour and underlayer/geotextile will replace the top of the beach and provide a suitable structure to resist overtopping and maintain the required crest level.
- The seeding/planting of grasses behind the crest will help to quickly re-establish the habitat and will fix the topsoil/sand to protect the rear of the crest line from any erosion.
- Whilst the revetment is a change to the appearance of the beach from the existing dune appearance, it will provide the necessary protection.

Details of the proposed development are shown on drawing DKR6499-210-D112 and cross-sections are shown on drawing DKR6499-210-D330 included in Appendix 2.1, extracts of which are shown on Figure 2-12 and Figure 2-13 below.

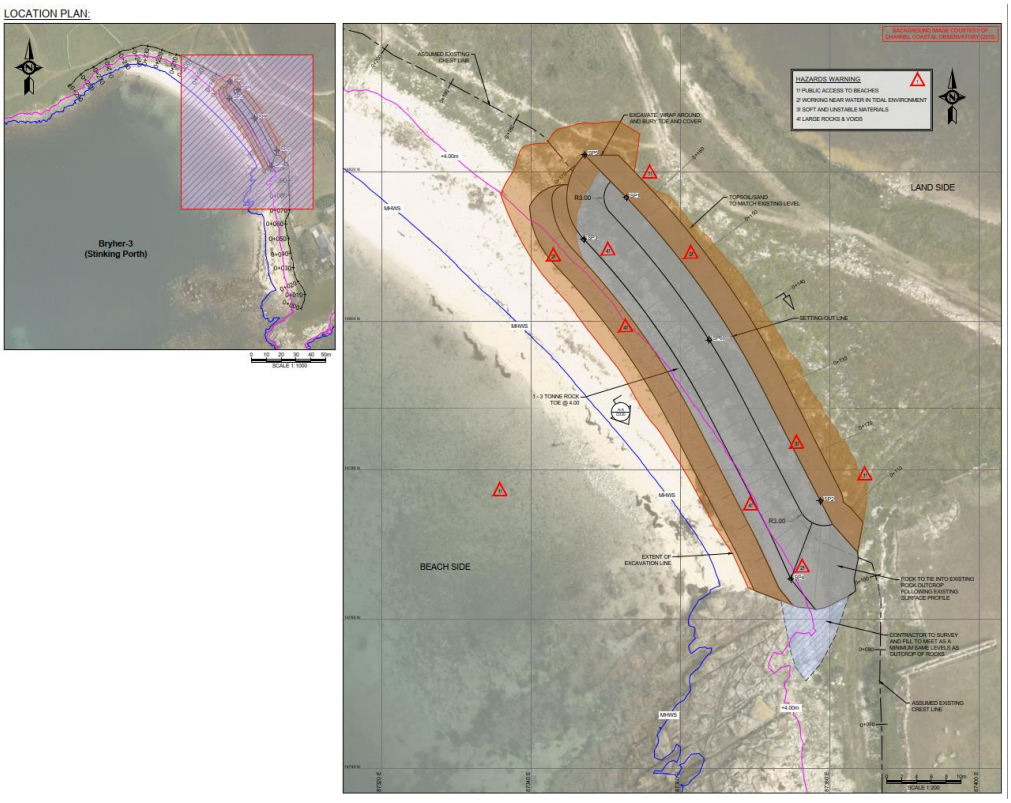

Figure 2-12: Extent of proposed new revetment at Stinking Porth (HR Wallingford 2022)

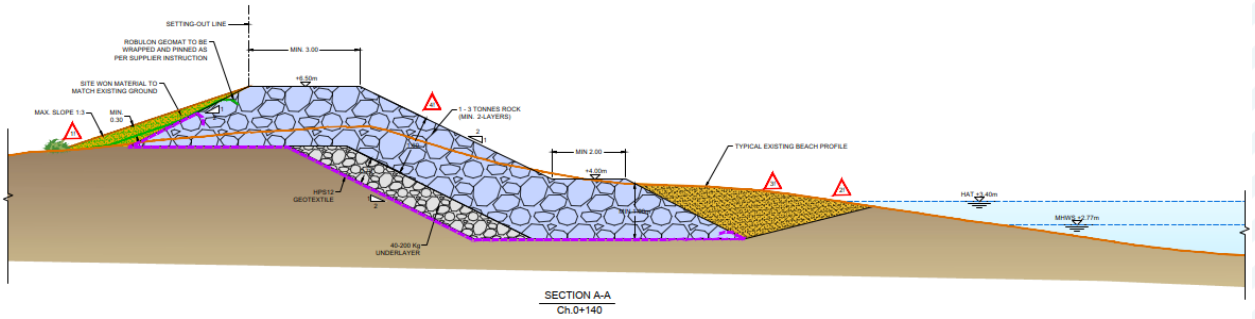

Figure 2-13: Cross-section of proposed works at Stinking Porth (HR Wallingford, 2022)

2.6.3 Great Porth (Great Par) North of Great Carn

There is a need to increase defences at Great Porth (Great Par) north of Great Carn to protect the island's water supply (Great Pool) from seawater inundation, and also to maintain the protection of people and property, infrastructure, and the Pool of Bryher and Popplestone Bank (Bryher) SSSI. There is also a need to replace unsuitable informal defences that have been laid.

The proposed development comprises the following elements:

- Design and construction of a new 80m rock revetment with an impermeable core, incorporating a vehicle and boat access point through a storm gate or similar demountable storm barrier. The new revetment would be a robust solution that will provide resilience against extreme storm events.
- The slope of the main armour will be 1:2, comprising of a mix of 1 to 3 tonne rocks. It is anticipated that some rock can be sourced from the islands themselves, however, there may be a requirement to import some rock.
- The crest of the armour will be set at +6.0m, with a 3m wide crest to prevent overtopping.
- It is proposed that material will be placed on the rear of the rock crest to tie into existing ground levels. The material will provide some initial resistance to any overtopping discharges and will help the rear of the crest tie into the area behind.
- A demountable flood barrier is proposed to protect the lower level crest of the boat ramp. This would be a steel frame and stop log panel that can easily be erected by one person. The frame will need to be fixed to the rock crest at both ends. This flood barrier will rely on human intervention and as such, an appropriate warning system will be required so that the stop logs are inserted to provide the required protection.
- Seeding/planting of grasses behind the crest will help to quickly re-establish the habitat and will fix the topsoil/sand to protect the rear of the crest line from any erosion.
- Whilst the revetment presents a change to the appearance of the beach from the existing dune appearance, the proposed extents are however similar to the existing revetment at the north of the beach.

Details of the proposed development are shown on drawing DKR6499-210-D111 and cross-sections are shown on drawing DKR6499-210-D320 included in Appendix 2.1, extracts of which are shown in Figure 2-14 and Figure 2-15 below.

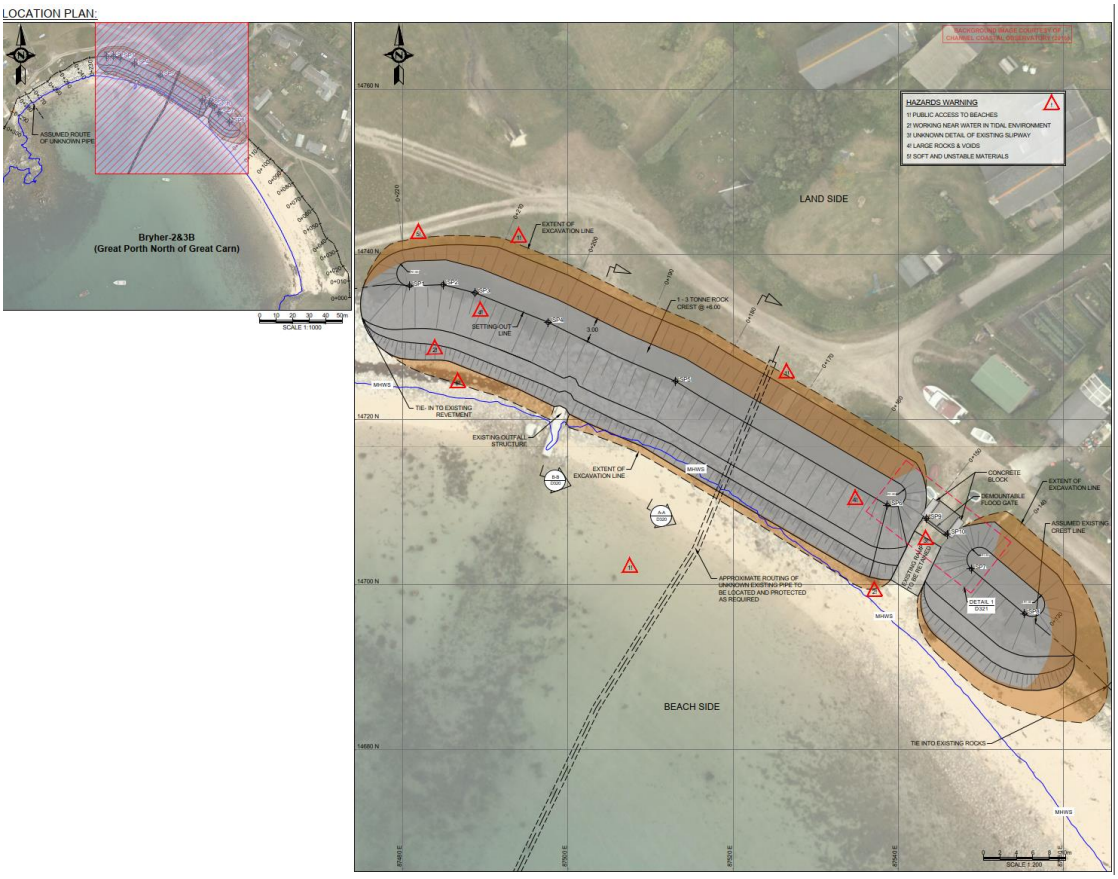

Figure 2-14: Extent of proposed rock revetment at Great Porth (Great Par) North of Great Carn (HR Wallingford, 2022)

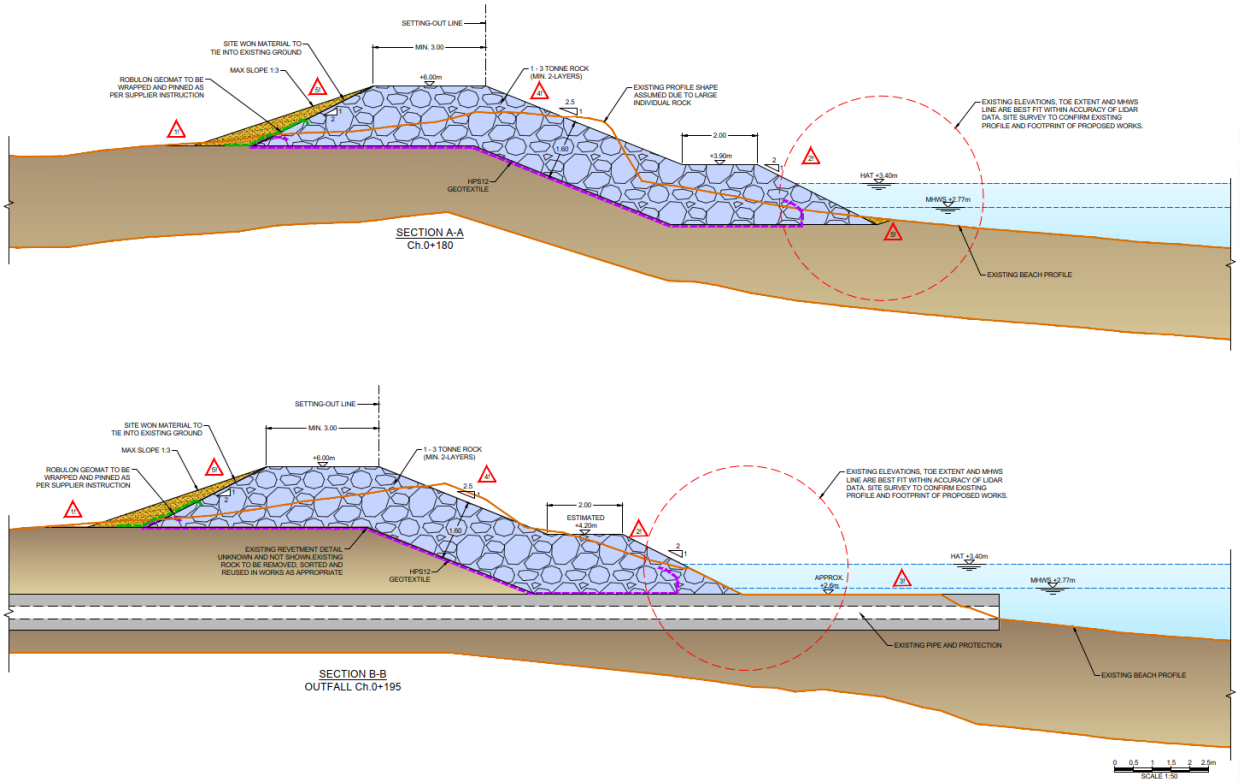

Figure 2-15: Cross section of proposed works at Great Porth (Great Par) North of Great Carn (HR Wallingford, 2022)

2.6.4 Green Bay

At Green Bay there is a need to improve the permeability of the crest to manage the risk of overtopping since it can lead to flooding of the boatyard in the immediate vicinity.

The proposed works include:

- Implementation of a resistant impermeable barrier at the crest to reduce the discharges reaching the boatyard. The crest will be excavated and impermeable geobags placed at a level of +5.5m, and then covered with natural reclaimed embankment along a stretch of 70m, to provide a permanent barrier layer.
- Reclaimed material will be replaced around the geobags with a minimum 0.3m cover to provide protection for them.
- The embankment will be vegetated to provide additional erosion protection as well as replicating existing habitats. The revegetated crest will be 5m wide, and contoured to blend into the immediate hinterland, to provide an embankment with a natural appearance and an ability to reduce flooding into the boatyard. A geomat will be implemented on the rear slope of the fill to help stabilise the slope whilst vegetation establishes itself.

Details of the proposed development are shown on drawing DKR6499-210-D116 and cross sections are shown on drawing DKR6499-210-D370 included in Appendix 2.1, extracts of which are shown on Figure 2-16 and Figure 2-17 below.

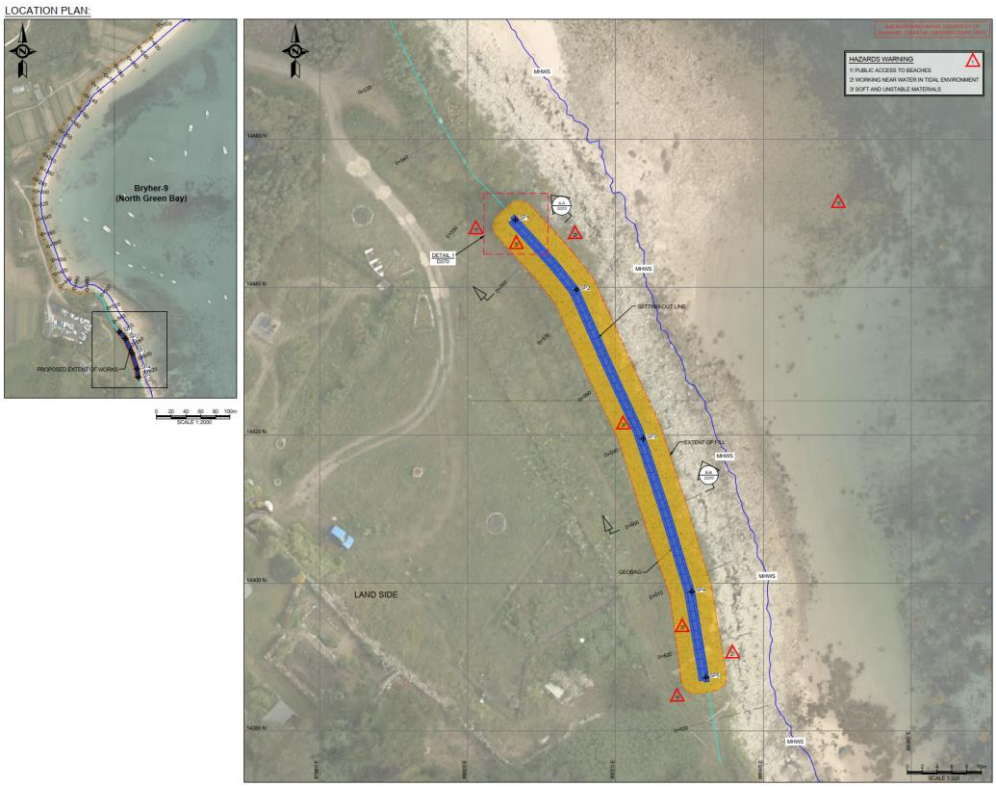

Figure 2-16: Extent of resistant impermeable barrier at Green Bay (HR Wallingford, 2022)

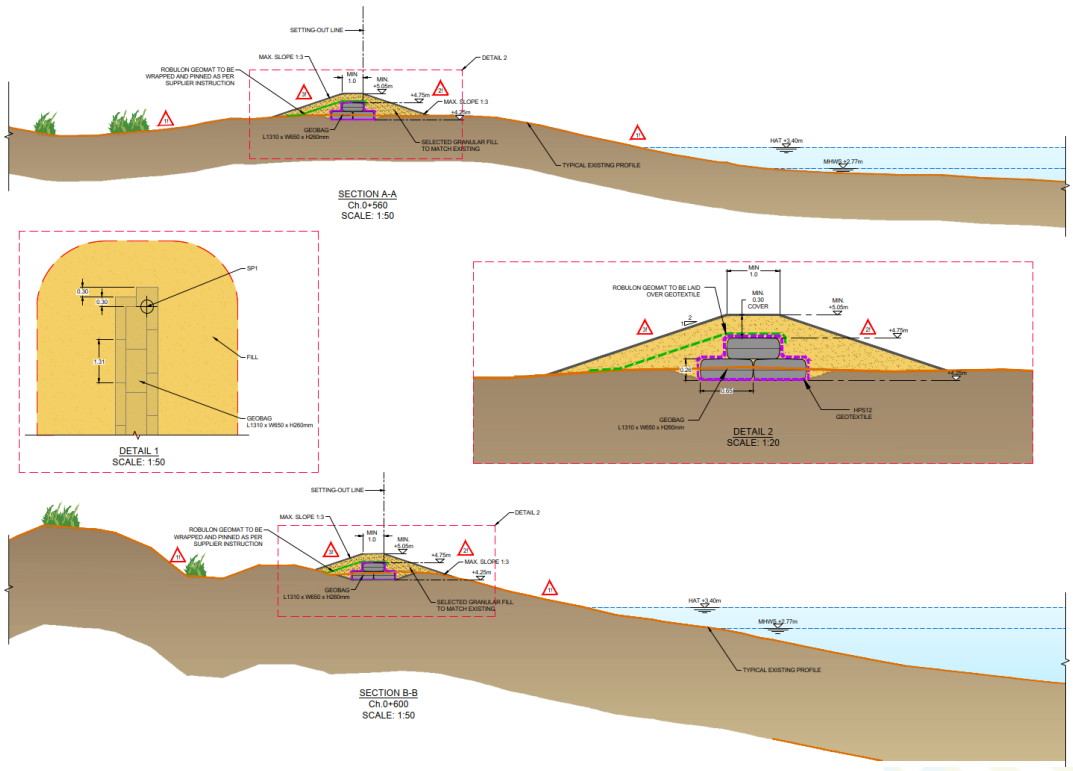

Figure 2-17: Cross section of proposed works at Green Bay (HR Wallingford, 2022)

2.6.5 Kitchen Porth

At Kitchen Porth there is a need to increase defences to protect a cluster of residential and non-residential properties from flood risk from overtopping, along with the access road to the high-tide quay, the Shipman Head and Shipman Down (Bryher) SSSI and the Isles of Scilly Ramsar.

The proposed works include:

- The provision of additional armourstone in front of the existing structures for approximately 40m from the eastern corner of the beach up to the exit from the beach to the west to protect the exposed embankment and Ram from wave attack.
- The slope of the armourstone will be 1:2, comprising of a mix of 1 to 3 tonne rocks, either reclaimed from existing resources on the island or imported. It will tie into existing levels at each end, into the existing bank to the north and into the rock outcrop to the south. The implementation of this armourstone should dissipate the wave energy and prevent direct attack on the Ram.
- The proposed armourstone does not include an impermeable layer, nor is the crest level proposed to be increased, and so some overtopping discharge is still expected to reach/percolate to the gardens of the leeward properties.

Details of the proposed development are shown on drawing DKR6499-210-D114 and cross-sections are shown on drawings DKR6499-210-D350 included in Appendix 2.1, extracts of which are included in Figure 2-18 and Figure 2-19.

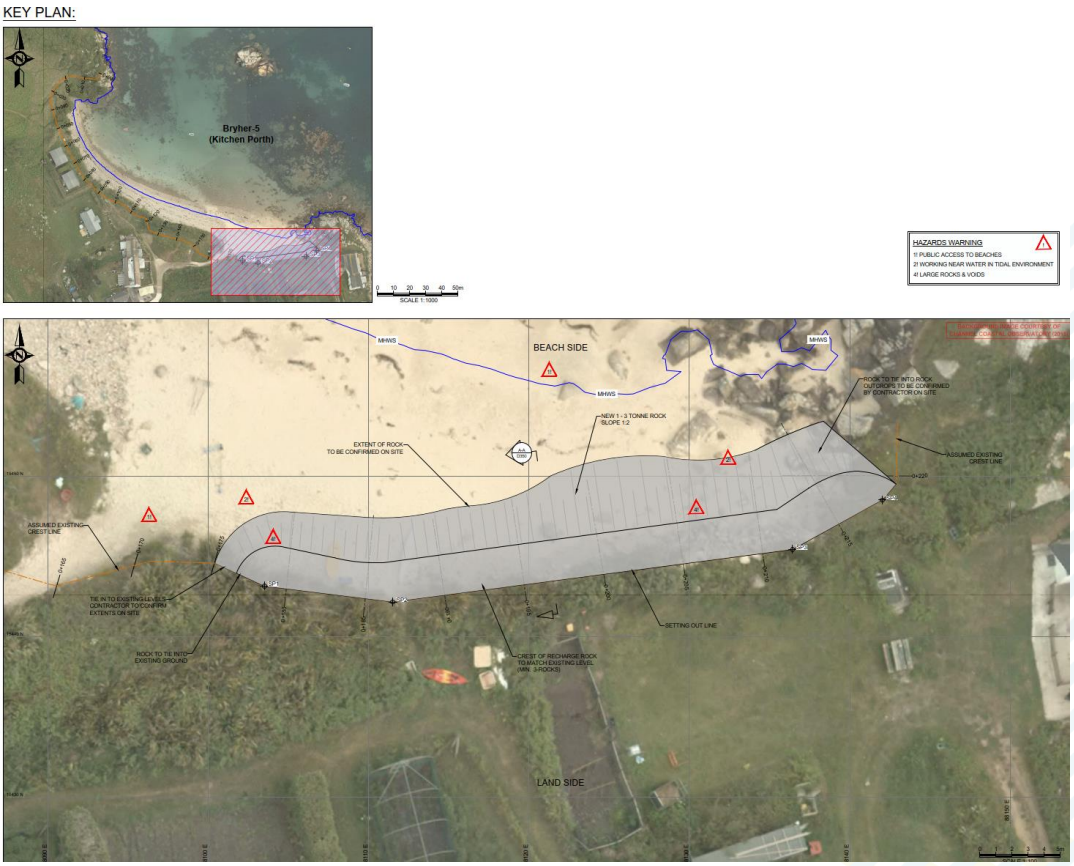

Figure 2-18: Extent of proposed armourstone at Kitchen Porth (HR Wallingford, 2022)

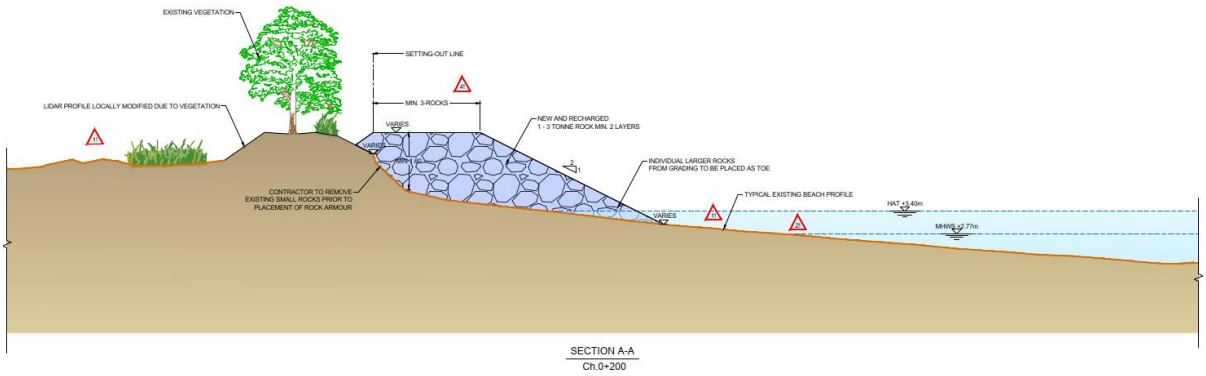

Figure 2-19: Cross-section of proposed works at Kitchen Porth (HR Wallingford, 2022)

St Agnes

2.6.6 Porth Killer

Coastal erosion and flood risk at Porth Killier presents a risk of inundation and contamination at the Big Pool, along with a risk of undermining the road that roads along the southern extent of Porth Killier and residential and non-residential properties and infrastructure in the vicinity.

The Porth Killier site has been divided into three areas of intervention: the sea wall; the eastern end; and the western end. Overtopping has not occurred at the western end and therefore no works are proposed there. The proposed works for the sea wall and the eastern end are outlined below.

The seawall

- Implementation of a rock scour protection at the foundation of the seawall. Wider toe protection of 1 to 3 tonne rock size with a minimum width of 3m is recommended to protect the wall from undermining and failure, and also to reduce overtopping.
- A 30m section of the eastern side of the wall has been identified as the most damage and as such, a 3m toe-berm of 1 to 3 tonne rock armour toe berm is proposed here. In some locations where damage is more severe, local repairs may be required prior to placing the rocks.
- A 35m section on the western side has been identified as the least damaged and as such, the rock toe here will be characterised by 1.9m wide 1 to 3 tonne rocks and 1.1m of cobbles, which will tie into the existing rock headland.
- Rock material will be sourced locally where possible but will need to be imported if unavailable.

Eastern end

- Construction of a rock structure revetment with 1 to 3 tonne material to reduce halt ram erosion. The rock revetment would be placed up to the crest of the underside of the ram/outcrop to reduce the cut back towards the road. In order to minimise the volume of rock required, rock armour will be protected by a cobble toe that will make use of existing materials.
- The presence of the revetment will improve the stability of the halt ram and also act as a reduction to wave overtopping events.

Details of the proposed development are shown on drawing DKR6499-100-D112 and cross-sections are shown on drawing DKR6499-100-D330 included in Appendix 2.1, extracts of which are included in Figure 2-20 and Figure 2-21.

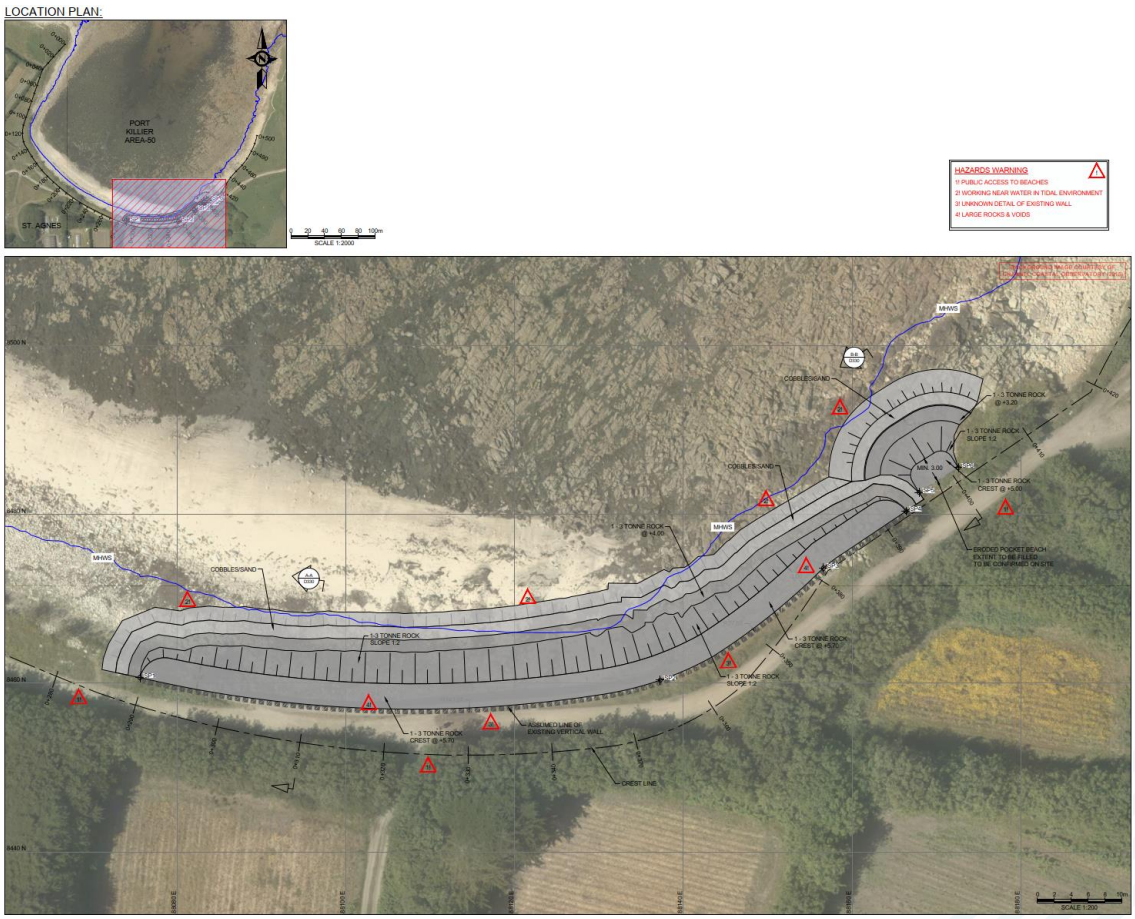

Figure 2-20: Extent of proposed works at Porth Killier (HR Wallingford, 2022)

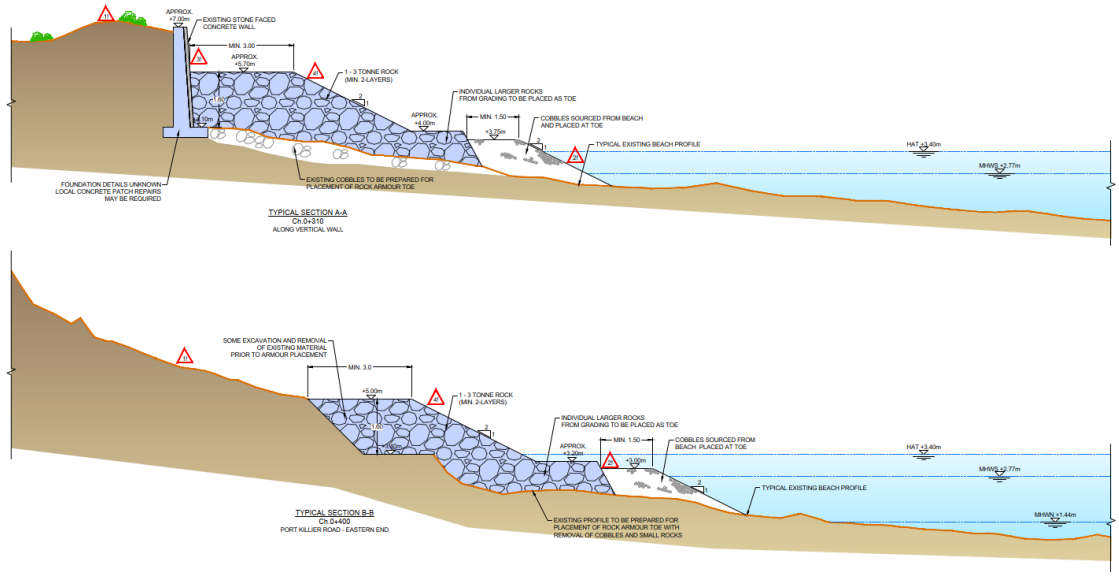

Figure 2-21: Cross-section of proposed works at Porth Killier (HR Wallingford, 2022)

2.6.7 Porth Coose

Porth Coose provides protection to Big Pool, important freshwater habitat, wells, aquifers and local infrastructure. Defences have historically been severely overtopped and as such enhanced defences are required.

The proposed works include:

- Provision of a more robust and wider ridge crest along the entire length of the Porth Coose. The crest elevation would be increased through recharge using local and imported material, with rock bags with the rear filled with site won material to grade to existing levels.
- The bags will be placed on a prepared geotextile surface at the top of the slopes and fill material is to be placed behind to tie in the top of the bags to the ground behind. A geomat will be placed to stabilise this slope and encourage establishment of vegetation.
- The crest elevation will be increased to prevent overtopping and should be at approximately +7.3m.

Details of the proposed development are shown on drawing DKR6499-100-D111 and cross-sections are shown on drawing DKR6499-100-D320 included in Appendix 2.1, extracts of which are shown in Figure 2-22 and Figure 2-23 below.

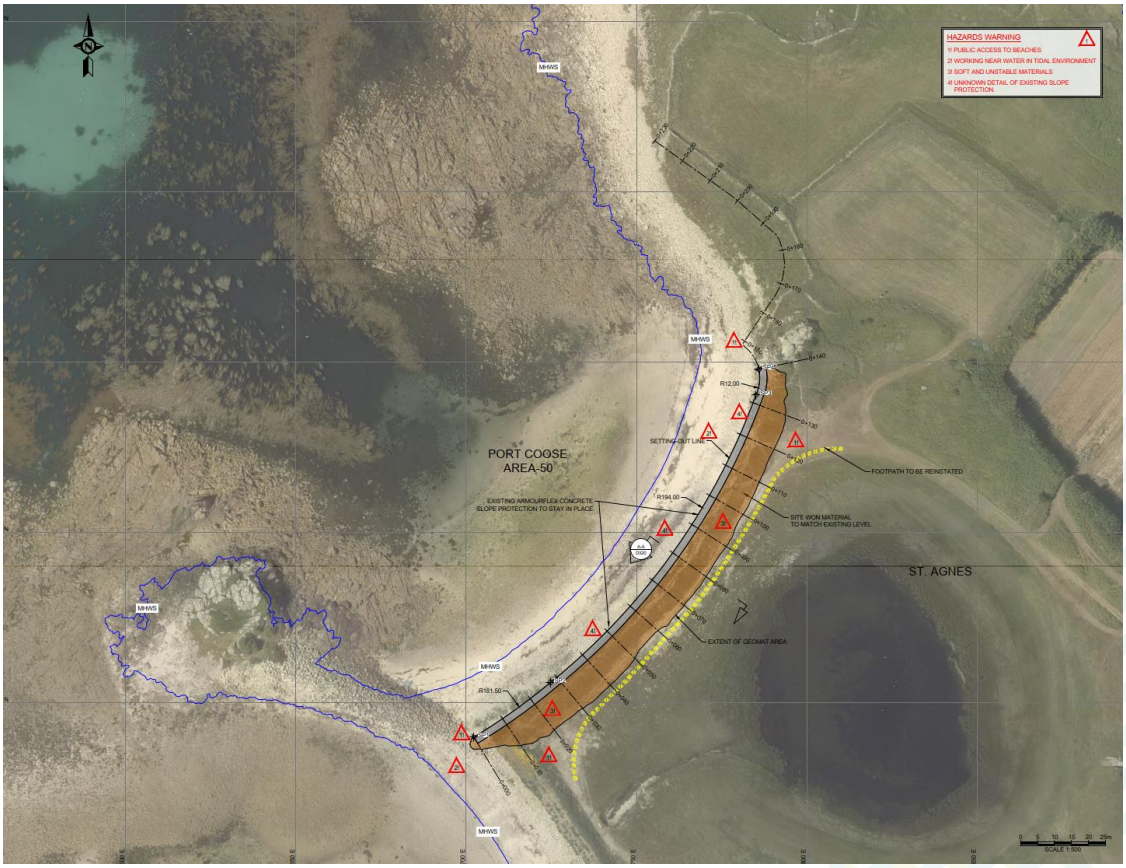

Figure 2-22: Extent of proposed works at Porth Coose (HR Wallingford, 2022)

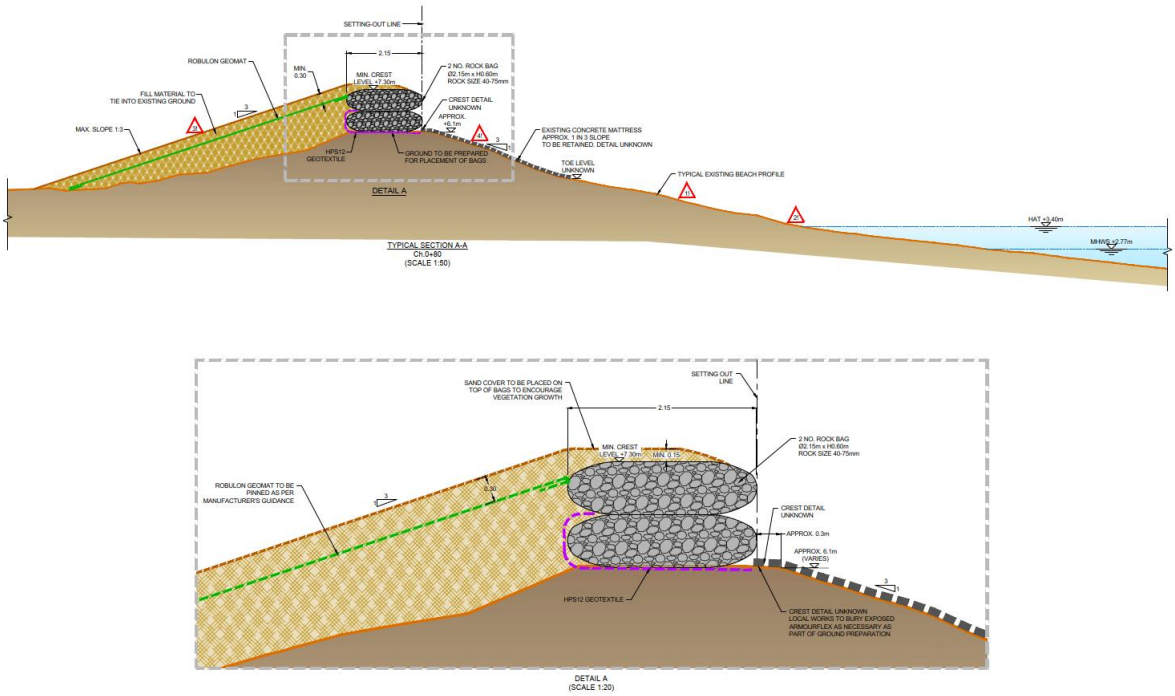

Figure 2-23: Cross-section of proposed works at Porth Coose (HR Wallingford, 2

2.6.8 Periglis

Defences at Periglis provide protection for residential and non-residential properties, infrastructure and Big Pool. As such, there is a need to increase these defences which suffer from frequent erosion.

The proposed development includes:

- Protection of Periglis beach through use of geobags, laid on a geomat and wrapped in geotextile, and covered with excavated cobble/sand material along most of the bay. Part of the existing material at the top of the beach (mix of sand and cobbles) will be excavated, from the seaward face, to allow the positioning of geobags in the existing footprint in the core of the dune/bank. The geobags will be filled with dry sand of density around 1600kg/m^3. If sand material is not available, the geobags may be filled with graded local or imported rocks using high performance nets.
- The geobags will be covered/protected by a mix of local sand and cobbles and topped up by locally excavated material where available. As such, the geobags will not be exposed directly to the waves and will not be directly visible. The fill will be protected with a matting to encourage establishment of vegetation and to provide additional erosion protection. The new reshaped seaward slope will follow the natural slope of the existing dune/bank.
- Crest elevations will be raised to approximately +7.5m, and crest widths increased to reach a minimum of 4m to prevent overtopping. In order to achieve this increase in elevation, the existing dune/bank will be topped up and covered using local materials with biodegradable matting to retain the material whilst the grasses and plants establish. The natural plant fibres will provide a system of erosion control of the material positioned over the top of the dune/bank, while local flora gets naturally established. A local source of recharge sediment will be used for the dunes/banks. If no local material is available, filling material will be imported, possibly from local quarries in Cornwall.

- The slipway already has a stop log fitting and stop logs and therefore no further action is required.
- This approach will enhance the dune/ bank stability and will provide a robust and permanent approach in terms of protection from coastal erosion.

Details of the proposed development are shown on drawing DKR6499-100-D110 and cross-sections are shown on drawing DKR6499-100-D310 included in Appendix 2.1, extracts of which are shown on Figure 2-24 and Figure 2-25 below.

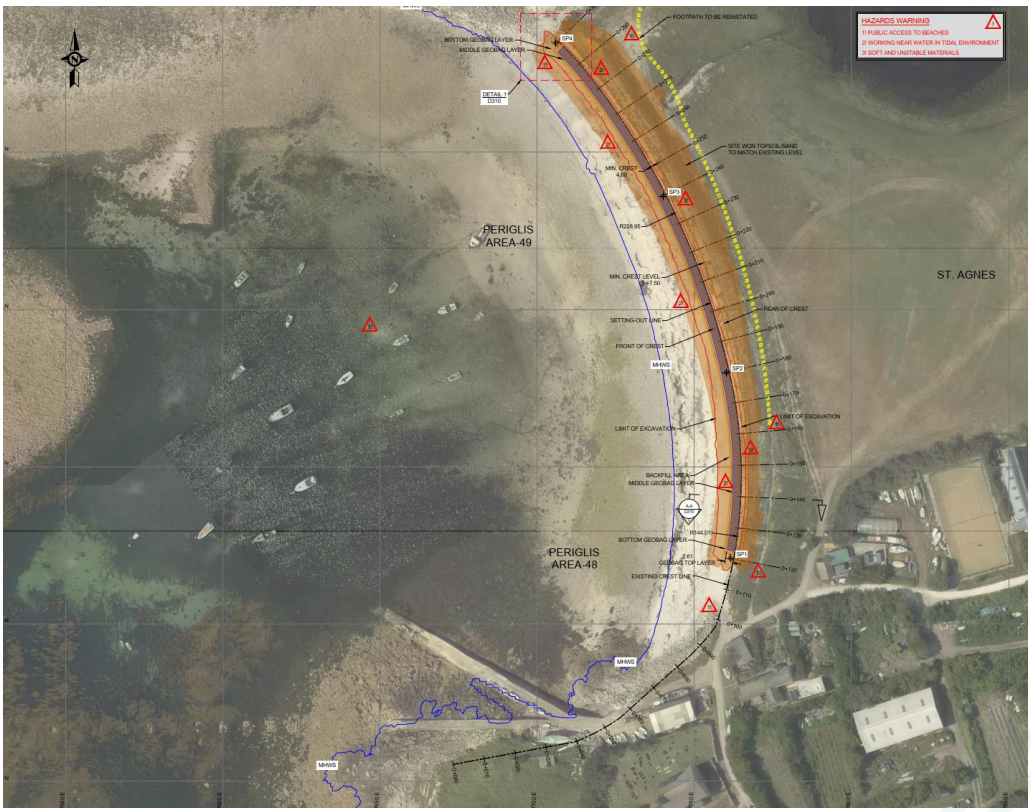

Figure 2-24: Extract of extent of proposed works at Periglis (HR Walllingford, 2022)

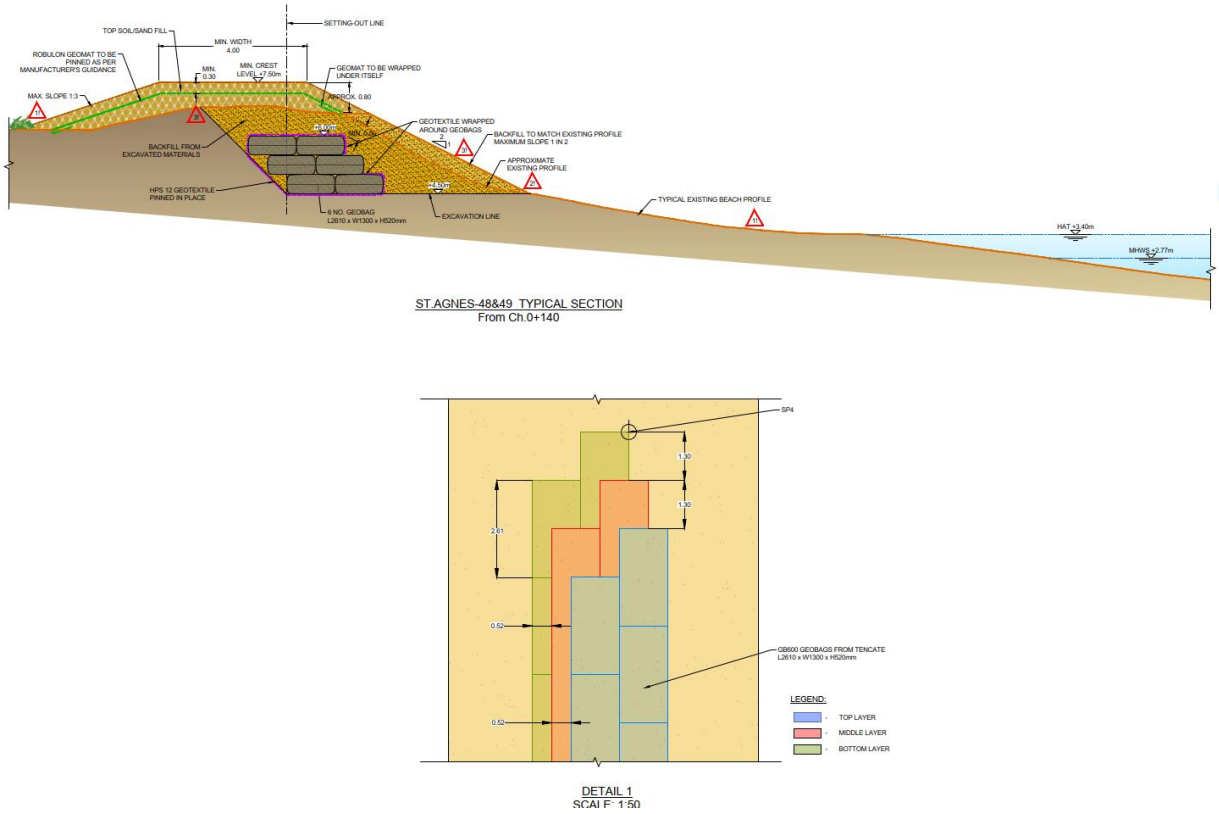

Figure 2-25: Cross-section of extent of proposed works at Periglis (HR Wallingford, 2022)

St Martin's

2.6.9 Lower Town Beach

The main objective of the proposed works at Lower Town Beach are to prevent further erosion caused by human activity which may erode and weaken dune defences.

The proposed works include:

- Fencing off the most sensitive area of dunes at the rear of the beach, including the area to the east of the access track where cabling has become exposed to help recovery by limiting access to this area and encouraging accretion of sand at the foot of the dunes.
- Additional erosion protection for the beach access at the west of the beach. This is proposed to be an open grid product appropriate for vehicle loading that will fill with sand to match the existing appearance whilst providing erosion protection to this area.
- General pedestrian footpath management to limit and control access to the beach through provision of signage and short sections of fencing to allow access locations through the dunes along the beach time to recover, whilst still providing different access points through the dunes, without the need for any restoration or other intervention.
- Provision of removable slipway that can be lain as needed and removed and stored during winter to enhance beach access. This will be an aluminium mat that can be rolled out and back up as required with a maximum axle load of 13 tonnes to meet the requirements of the tractors and boat trailers typically used here.

Details of the proposed development are shown on drawing DKR6499-310-D110 and cross-sections are shown on drawing DKR6499-300-D310 included in Appendix 2.1, extracts of which is shown on Figure 2-26 and Figure 2-27 below.

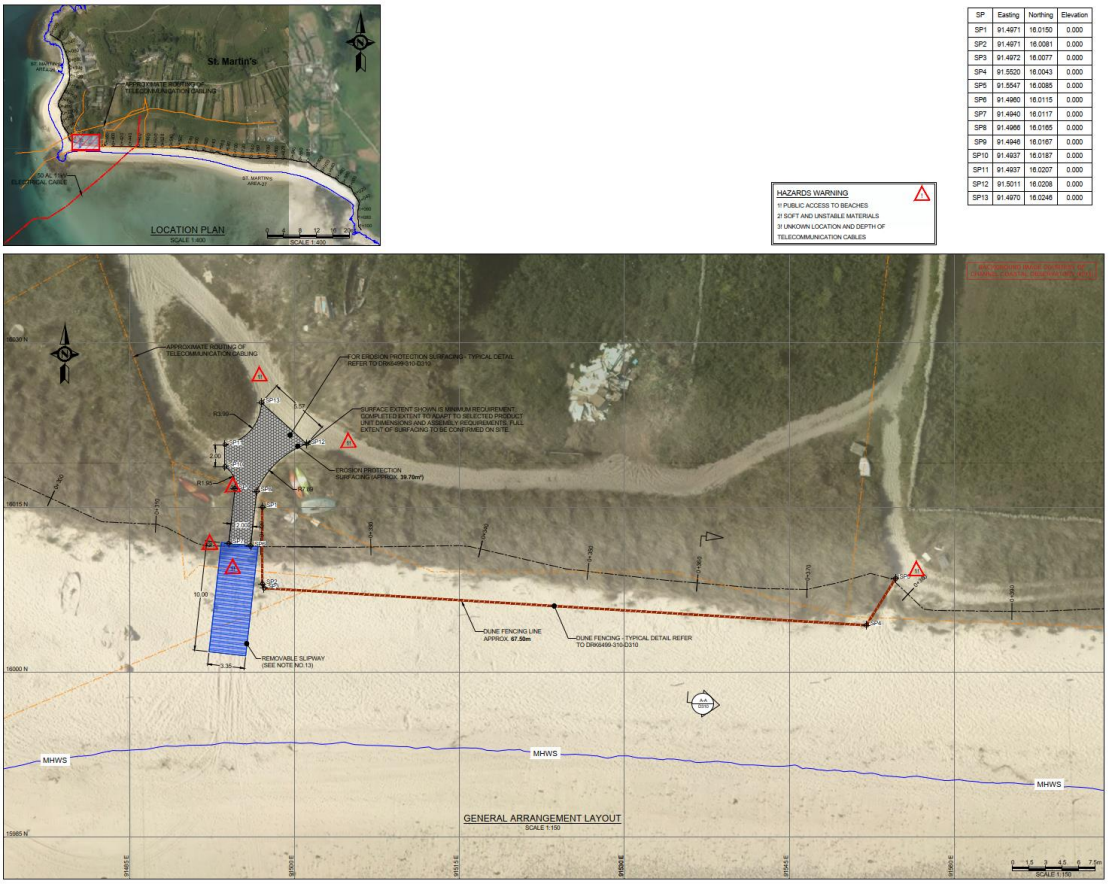

Figure 2-26: Extract of extent of proposed works at Lower Town Beach (HR Wallingford, 2022)

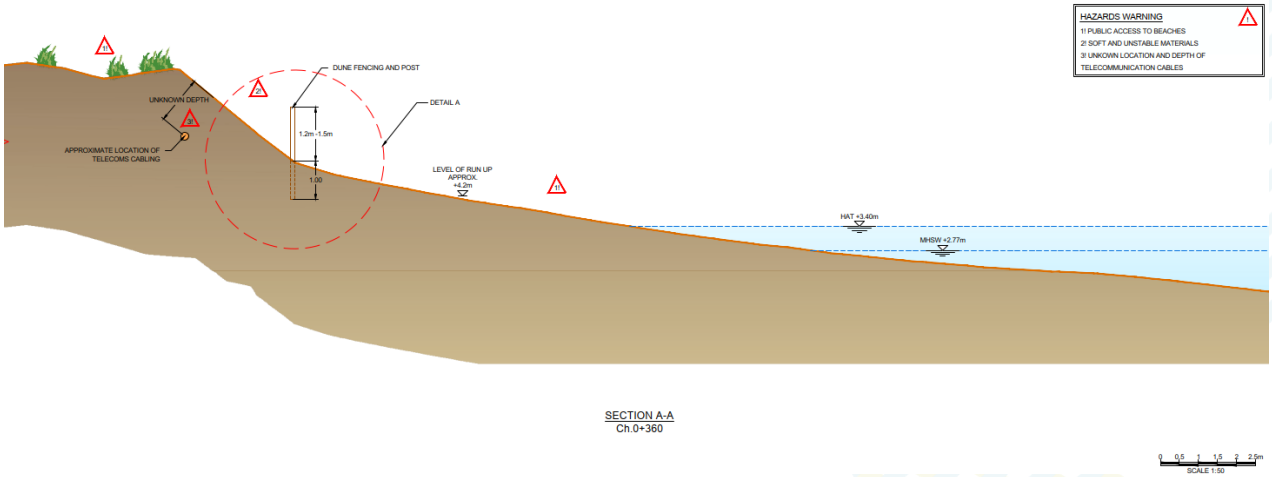

Figure 2-27: Cross-section of extent of fencing at Lower Town Beach (HR Wallingford, 2022)

2.7 Construction methodology

An outline construction methodology has been prepared for the proposed works, as summarised below. This is subject to obtaining the necessary permissions and licences. Where specific details are not yet available, such as types of construction machinery, assumptions have been made based on experience gained on similar schemes and professional judgement. The outline construction programme for each scheme is provided in Table 2-21 below.

Table 2-21: Outline construction programme

Site	Start of construction	Finish construction
Bryher		
Great Porth (Great Par) North	12/04/23	02/05/23
Stinking Porth	04/05/23	17/05/23
Great Popplestone	22/05/23	09/06/23
Kitchen Porth	24/05/23	26/05/23
Green Bay	12/06/23	16/06/23
St Agnes		
Periglis	04/01/23	10/02/23
Porth Coose	13/02/23	03/03/23
Porth Killier	06/03/23	17/03/23
St Martin's		
Lower Town Beach	05/06/23	08/06/23

It is anticipated that construction of the proposed schemes across the islands of Bryher, St Agnes and St Martin's will commence in the winter of 2022/23, subject to obtaining the necessary permissions and consents, and will be completed by March 2024. Materials will be delivered to the islands in advance of this, with rock armour and rock bag fill/sand delivered to St Agnes, and rock armour and underlayer rock delivered to Bryher in Autumn 2022.

Indicative durations for construction of each of the proposed schemes is outlined in the sections below.

Due to site constraints, each island will have its own methodology for plant/material deliveries, some via floating pontoon, dropped off adjacent to the worksite, while others will be delivered using the nearby causeways/slipways and driven to site. These will be determined by the appointed contractor in advance of the construction commencing.

It is anticipated that all construction materials and welfare units will be transported to the islands via a 350 tonne loaded barge. Where rock armour is proposed, the rock armour will be shipped from Falmouth, Cornwall. In advance of the first delivery, a 'shore' crew will be mobilised with a harbour tug, two dumpers and a 13 tonne tracked excavator on a landing craft. This crew will prepare the beach to receive the rock supply barge, clearing any large stones and rocks from the foreshore to enable to barge to sit safely aground. Fencing will be set up to create an exclusion zone for public safety just before the vessel is due.

The barge will be brought to the laid mooring, where the tow will be separated, and a harbour tug will take over and manoeuvre the barge at high tide up the beach.

Once secured, using a 20-tonne excavator with grab attachment on the barge, rock will be unloaded through the water column onto the beach. As the tide regresses, a 13-tonne excavator will start picking the rock from the beach and load it into dumpers to transport to the materials storage area. Once unloaded, and the tide has re-floated the barge, the tug will withdraw the barge and return it to the laid mooring.

Materials will be delivered to St Agnes first where the beach landing area will be prepared for the rock barge to take receipt of circa 1,200 tonnes of rock and 3,600 tonnes of rock-bag fill and granite sand. After a 4 week period, the landing craft, excavator and dumpers will be relocated to Bryher to complete the importation of circa 5,250 tonnes of rock and 1,000 tonnes of hearting material. On completion of this import, the laid mooring will be removed and the two barges will be demobilised along with the tug.

Welfare units will also be delivered to be offloaded and moved to the relevant site. Towable 'Groundhog' style welfare facilities will be used by the contractor which can be moved to each site in turn. The unit will provide messing facilities, with a microwave and kettle. Two 'Port-a-loo' units will be used which can be lifted and transported back to St Mary's for servicing on the inter-island freight service.

Where possible, work sites will be fully fenced with Heras fencing, including the seaward face. Where Heras fencing cannot be used, other suitable forms of fencing will be used, such as Chapter 8 barriers or orange plastic netting on suitable driven posts. Signage will be applied to fencing warning of the dangers of construction sites.

A Construction Environmental Management Plan (CEMP) will be prepared by the contractor prior to construction. This will cover works across the islands of Bryher, St Agnes and St Martin's and will set out the key measures to be employed to control and minimise the impacts on the environment. An Outline CEMP is included as Appendix 2.2 in this ES. The Final CEMP will be prepared by the contractor in accordance with the Outline CEMP.

Bryher

Construction of the proposed schemes across the island of Bryher will be facilitated through the access routes, landing sites and temporary storage areas illustrated on Figure 2-28 below. A working area will be defined at each of the scheme locations for the duration of the construction period.

A landing site is located at each of the five sites to allow materials to be brought directly into the beaches where they will be used, where feasible. Landing craft will moor at the landing sites at mid to high tide with materials offloaded onto the foreshore and moved to temporary storage areas. Any construction materials that cannot be landed at the site where they will be used will instead be landed at the nearest accessible site. Materials will be stored in the adjacent laydown areas at the respective sites prior to their use.

Welfare units will be offloaded at an appropriate landing site and set up in the forward working area (construction compound) adjacent to Great Popplestone. The welfare units will be self-contained units and will not be connected to mains drainage. All waste collected will be transported to the existing sewage treatment facility at Old Town on the island of St Mary's for disposal.

It is anticipated that it will take a total of 48 working days to complete the construction of the five schemes across the island of Bryher. A programme of construction works is outlined in Table 2-21 above. Most of the works will be undertaken separately, with works completed at one site before moving on to the next. However, there will be some overlap between the construction works at Great Popplestone and Kitchen Porth. Whilst works are ongoing at Great Popplestone to

raise the existing sea wall, the rock revetment at Kitchen Porth will be built. Following this, the contractor will drop back to complete the rock revetment construction at Great Popplestone once the masons have completed.

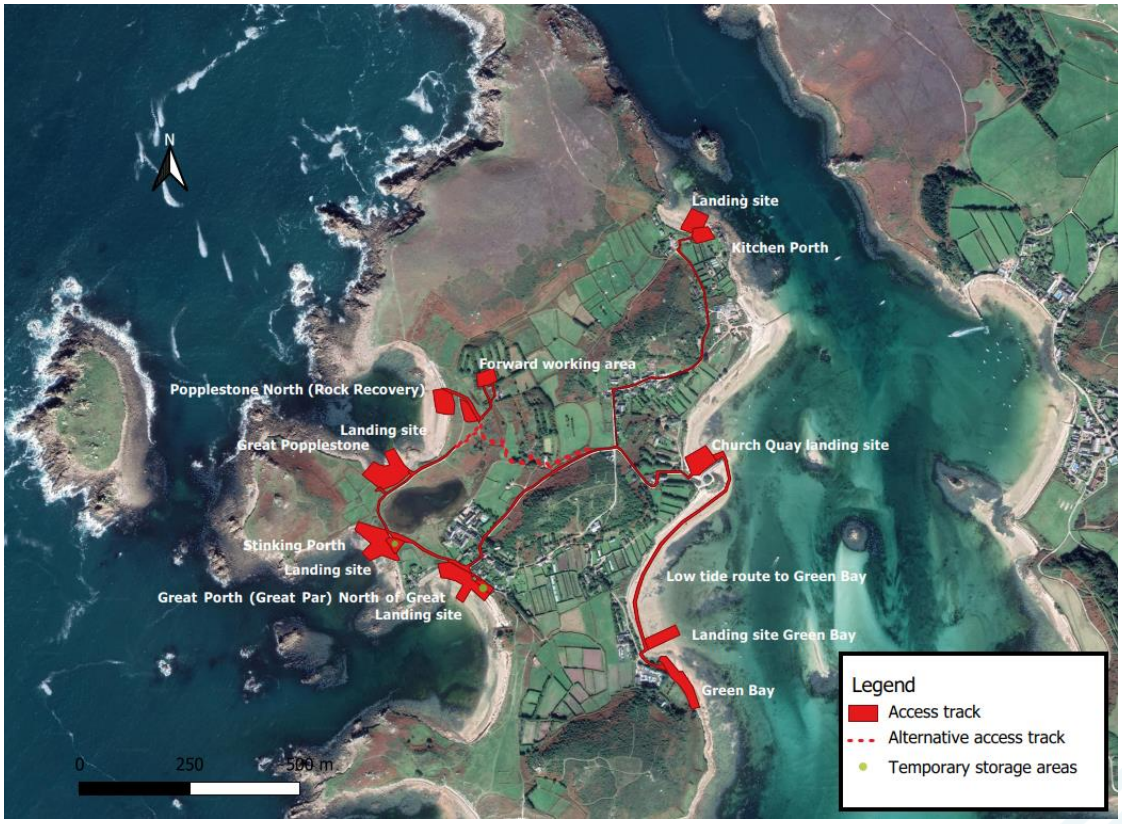

Figure 2-28: Construction access routes across the island of Bryher

Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Outline construction details for each of the proposed schemes are outlined below.

2.7.1 Great Popplestone

It is anticipated that construction of the proposed scheme at Great Popplestone will be undertaken over approximately 15 days in May 2023. It is acknowledged that tourists use the adjacent path and therefore works will avoid July and August.

The working area will be demarcated and secured using perimeter security fencing (Heras fencing or similar).

Materials will either be transported by barge using the landing site at Great Popplestone beach and moved to the adjacent materials storage area, or if not feasible, landed at the closest site and transported along the access track which runs along New Road and connects to an existing track to the west of Great Pool. There is also an alternative access track running across the island to the north of Great Pool.

It is assumed that after delivery, materials will be transported to the temporary storage area using a 20 tonne truck, or alternative smaller vehicle if required. It is anticipated that deliveries will be staggered.

There are currently two options under consideration for the construction of the scheme at Great Popplestone. Option 1 would entail the movement of scattered rocks at the northern extent of the bay to be deposited against the existing sea wall. Option 2 would be to import the required 750m^3 of 1-3 tonne rock required for this. It is

assumed that a 20 tonne excavator will be used to either move exposed Cornish granite rocks from the north of the beach or move the imported rocks into position. It is anticipated that any additional recovered rock will be transported to the adjacent materials storage area for re-use elsewhere across Bryher.

Following the excavation at the northern extent of the beach, a board walk will be constructed to return access to the beach, infilled with excavated rocks and cobbles. Once complete, the working area will be demobilised and all plant and construction materials will be removed from site.

2.7.2 Stinking Porth

It is anticipated that construction of the proposed scheme at Stinking Porth will be undertaken over approximately 10 days in May 2023. The working area will be demarcated and secured using perimeter security fencing (Heras fencing or similar).

Materials will either be transported by barge using the landing site at Stinking Porth beach and moved to the adjacent materials storage area, or if not feasible, landed at the closest site and transported along the access track along New Road. There is also an alternative access track running across the island to the north of Great Pool.

It is assumed that after delivery, materials, including rock armour, will be transported using a 20 tonne truck, or alternative smaller vehicle if required. It is anticipated that deliveries will be staggered.

Construction works across the Stinking Porth site will entail use of rock armour material, along with hearting stone, to construct a new revetment. It is assumed that the rock armour revetment will be constructed using a 360° 20 tonne excavator and 6 tonne dumper truck. The excavator will excavate the revetment toe trench and all arisings will be placed on a dumper truck. It is anticipated that all arisings, including any clay material encountered, will be reused on site as backfill along the revetment toe and elsewhere within the revetment footprint. However, any excess material will be transported from site to a licenced waste management facility for reuse or disposal.

The existing bank will be regraded to the required revetment angle (1:2) from bank crest to the toe trench. A geotextile membrane will be installed by overlaying the regarded bank to form the base of the revetment and biodegradable matting will be laid over the dune face. The excavator will place individual smaller rocks (40-200 kg) onto the geotextile membrane as an underlayer before placing 1 to 3 tonne rocks on top. It is assumed that the revetment will be constructed from the toe to the crest along its length. The toe excavation will be backfilled with site won sand.

Site won material will be moved to the leeward side of the revetment to build up the land to the same height of the crest of the armour, and the rear of the crest will be seeded with a native grass seed mix.

Once complete, the working area will be demobilised and all plant and construction materials will be removed from site.

2.7.3 Great Porth (Great Par) North of Great Carn

It is anticipated that construction of the proposed scheme at Great Porth (Great Par) North of Great Carn will be undertaken over approximately 15 days in April and May 2023. It is acknowledged that boat users and fishermen use the beach and therefore works will avoid June and September (inclusive).

The working area will be demarcated and secured using perimeter security fencing (Heras fencing or similar).

Materials will either be transported by barge using the landing site at the beach at Great Porth (Great Par) North of Great Carn and moved to the adjacent materials

storage area, or if not feasible, landed at the closest site and transported along the access track along New Road. It is assumed that after delivery, materials, including rock armour, will be transported using a 20 tonne truck, or alternative smaller vehicle if required. It is anticipated that deliveries will be staggered.

Construction works across the Great Porth (Great Par) North of Great Carn site will entail use of rock armour material to construct a new revetment. It is assumed that the new revetment will be constructed using a 360° 20 tonne excavator and 6 tonne dumper truck. The excavator will remove existing rock rubble along the length of the revetment and excavate the revetment toe trench. All excavated material will be placed in a designated area for temporary storage prior to reuse in the revetment or removal from site for disposal.

The existing bank will be regraded to the required revetment angle (1:2) from bank crest to the toe trench. A geotextile membrane will be installed by overlaying the regraded bank to form the base of the revetment. Biodegradable matting will be laid over the dune face. The excavator will then place individual smaller rocks (40-200kg) onto the geotextile membrane as an underlayer before placing 1 to 3 tonne rocks on top. It is assumed that the revetment will be constructed from the toe to the crest along its length.

The revetment will be constructed either side of the existing ramp access point. At this point, a storm gate or similar demountable storm barrier will be constructed. This would be a steel frame fixed to the rock crest at both ends, with a stop panel that can be inserted. Site won material will be moved to the leeward side of the revetment to build up the land to the same height of the crest of the armour, and the rear of the crest will be seeded with a native grass seed mix.

Once complete, the working area will be demobilised and all plant and construction materials will be removed from site.

2.7.4 Green Bay

It is anticipated that construction of the proposed scheme at Green Bay will be undertaken over approximately 5 days in June 2023. It is acknowledged that tourists use the adjacent path, and therefore works will avoid July and September (inclusive).

The working area will be demarcated and secured using perimeter security fencing (Heras fencing or similar).

Materials will either be delivered directly to the beach via barge using the landing site on the beach, or if not feasible, will be landed and stored at the closest site and transported from Church Quay southwards along the beach at Green Bay to the location at the south of the beach. It is assumed that materials, including rock armour, will be transported using an appropriately sized vehicle. It is anticipated that deliveries will be staggered. All intertidal works, including vehicle movements on the beach will cease three hours prior to the anticipated high tide time.

Construction works across the Green Bay site will entail the implementation of geobags. A 20 tonne excavator will undertake all excavation of the crest, stripping back the existing beach berm, with the excavated material stored on site for reuse as backfill material.

Impermeable geobags will be placed within the crest for a stretch of 70m and covered with natural reclaimed embankment. Reclaimed material will also be replaced around the geobags with a minimum 0.3m cover to provide protection for them. The crest will then be planted.

Once complete, the construction site will be demobilised, and all plant and construction materials will be removed from site, and all disturbed areas will be reinstated to their former condition.

2.7.5 Kitchen Porth

It is anticipated that construction of the proposed scheme at Kitchen Porth will be undertaken over approximately 3 days in May 2023. It is acknowledged that the beach is used by tourists and therefore works will avoid June and September (inclusive).

The working area will be demarcated and secured using perimeter security fencing (Heras fencing or similar).

Materials will either be delivered directly to the beach via barge, using the landing site on Kitchen Porth beach, or if not feasible, landed and stored at the closest site and be transported along the proposed access track. It is assumed that materials, including rock armour, will be transported to the site using a 20 tonne truck, or alternative smaller vehicle if required. It is anticipated that deliveries will be staggered.

Construction works across Kitchen Porth entail the provision of additional armourstone in front of existing structures. It is assumed that the 1 to 3 tonne armourstone will be moved into position using a 360° 20 tonne excavator.

Once complete, the construction site will be demobilised, and all plant and construction materials will be removed from site, and all disturbed areas will be reinstated to their former condition.

St Agnes

Construction of the proposed schemes across the island of St Agnes will be facilitated through the access routes, landing sites and temporary storage areas illustrated on Figure 2-29 below.

In addition to the forward working area adjacent to Porthconger Quay, there will be an additional area for the storage of spare sand and materials located to the east of Porth Coose. A temporary storage area and working area will be defined at each of the scheme locations for the duration of the construction period.

The construction compound and materials storage area for the proposed works on St Agnes will be located adjacent to Porthconger Quay. It is anticipated that all welfare units will be transported to the island via a landing craft which will arrive at Porthconger Quay. The welfare units will be offloaded and set up in the forward working area. These will be self-contained units and will not be connected to mains drainage. All waste collected will be transported to the existing sewage treatment facility at Old Town on the island of St Mary's for disposal.

Landing of materials at Porthconger Quay is constrained by moorings on the quay being rated to 55 tonne loads maximum. Since the landing craft will likely have a larger mooring load than this, the only way for Porthconger Quay to be used for the landing craft is to have 'spud' (dropdown) legs that it can drop on the seaward side and rest against the quay to stabilise the vessel while uploading. An alternative landing location under consideration is located at the quay adjacent to Turks Head.

A landing site is located at each of the sites to allow materials to be brought directly into the beaches where they will be used, where feasible. Landing craft will moor at the landing sites at mid to high tide with materials offloaded onto the foreshore and moved to temporary storage areas. Any construction materials that cannot be landed at the site where they will be used will instead be landed at the nearest accessible site.

The primary access route will run along the northern extent of the island, however, there are two locations along this route where, during wet conditions, vehicles may cause excessive track wear and get bogged in the route from the forward working area to the west of the island. During wet periods, matting and gravel may need to

be laid to support heavy vehicles. An alternative approach to this is to utilise an alternative access route over the existing concrete road over the island ridge, as illustrated on Figure 2-29 below.

It is anticipated that it will take a total of 53 working days to complete the construction of the three schemes across the island of St Agnes. A programme of construction works is outlined in Table 2-20. It is not envisaged that works will be undertaken simultaneously, rather, works will be completed at one site before moving on to the next.

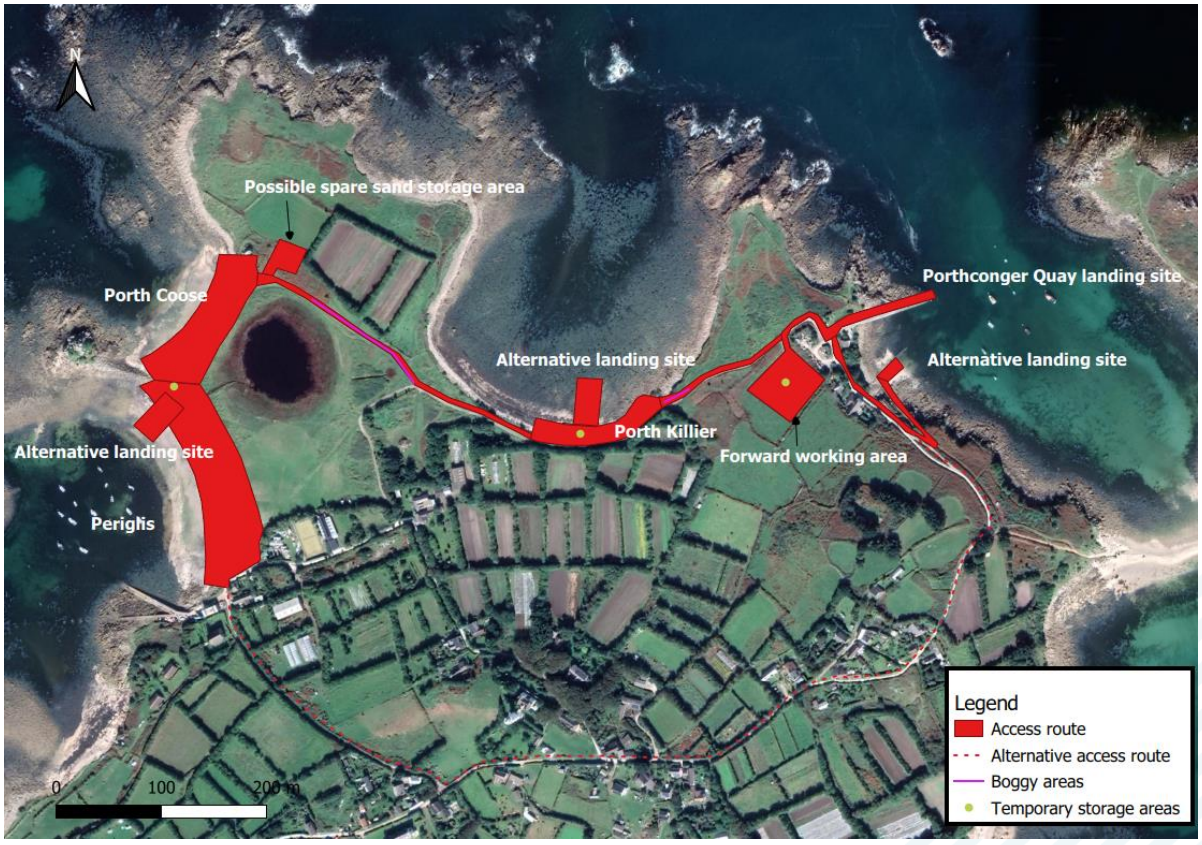

Figure 2-29: Construction access routes across the island of St Agnes

Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

Construction details for each of the proposed schemes is outlined below.

2.7.6 Porth Killier

It is anticipated that construction of the proposed scheme at Porth Killier will be undertaken over approximately 10 days in March 2023. It is acknowledged that tourists use the adjacent path and therefore the woks will avoid June and September (inclusive).

The working area will be demarcated and secured using perimeter security fencing (Heras fencing or similar).

Materials will either be delivered directly to Porth Killier beach by barge using the landing site on the beach, and moved to the adjacent temporary storage area, or if not feasible, landed at the closest site and transported along the access track.

It is assumed that after delivery, materials, including rock armour, will be transported using a 20 tonne truck, or alternative smaller vehicle if required due to the width of the track and stored in the temporary storage area. It is anticipated that deliveries will be staggered.

Construction works at Porth Killier will entail implementation of a rock scour protection at the foundation of the sea wall, and construction of a rock structure revetment at the eastern end through placement of rock armour and cobbles which will tie into the existing rock headland on the western side.

It is assumed that a 360° 20 tonne excavator and a 6 tonne dumper truck will be used for the construction works. 1 to 3 tonne rocks will be placed at the foundation of the seawall, with a minimum width of 3m. On the eastern side of the seawall which is most damaged, an excavator will move 1 to 3 tonne rocks to create a 3m toe-berm at the bottom of a 30m section of the seawall. On the western side of the seawall which is the least damaged, an excavator will move 1 to 3 tonne rocks to create a 1.9m toe along a 35m section of the seawall. Cobbles sourced from the beach will also be moved to the western side of the seawall and will tie into the existing rock headland.

At the eastern end of Porth Killier, an excavator and dumper truck will be used to construct a rock structure revetment with 1 to 3 tonne material. Cobbles sourced from the beach will be moved to provide a protective cobble toe to the rock revetment.

Once complete, the working area will be demobilised and all plant and construction materials will be removed from site.

2.7.7 Porth Coose

It is anticipated that construction of the proposed scheme at Porth Coose will be undertaken over approximately 15 days in February 2023. It is acknowledged that tourists use the beach and therefore the works will avoid June and September (inclusive).

The working area will be demarcated and secured using perimeter security fencing (Heras fencing or similar).

Materials will either be delivered directly to Porth Coose beach by barge using the landing site on the adjacent Periglis beach, and moved to the adjacent temporary storage area, or if not feasible, landed at the closest site and transported along the access track (using the alternative access track during wet periods).

It is assumed that after delivery, materials will be transported using a 20 tonne truck, or alternative smaller vehicle if required. It is anticipated that deliveries will be staggered.

Construction works at Porth Coose will entail the increase of crest elevation through recharge using movement of material, with a rock mattress (rock bag) laid directly on the existing crest on top of a geotextile. It is assumed that a 360° 20 tonne excavator will be used to move material.

Site won material from the excavation will be used to tie into existing ground. It is assumed that any excess material will be moved to the spare sand storage area to the north east.

Once complete, the working area will be demobilised and all plant and construction materials will be removed from site. The footpath running behind the crest will be reinstated.

2.7.8 Periglis

It is anticipated that construction of the proposed scheme at Periglis will be undertaken over approximately 28 days in January and February 2023. It is acknowledged that tourists use the beach and therefore works will avoid June and September (inclusive).

The working area will be demarcated and secured using perimeter security fencing (Heras fencing or similar).

Materials will either be delivered directly to Periglis by barge using the landing site on the Periglis beach, and moved to the adjacent temporary storage area, or if not feasible, landed at the closest site and transported along the access track (using the alternative access route during wet periods).

It is assumed that after delivery, materials will be transported using a 20 tonne truck, or alternative smaller vehicle if required due to access constraints. It is anticipated that deliveries will be staggered.

Construction works at Periglis will entail the excavation and movement of existing material at the top of the beach (mix of sand and cobbles) on the seaward face using a 360° 20 tonne excavator. A geotextile will be laid in the excavation with geocontainers filled with dry sand or rocks placed into the core of the dune/bank and covered/protected by a mix of local sand and cobbles, topped up by excavated material. A geomat will be laid on top of the existing bank, and it will be raised through deposition of excavated materials, or other local recharge, on top of it.

Once complete, the working area will be demobilised and all plant and construction materials will be removed from site. The footpath running behind the crest will be reinstated.

St Martin's

2.7.9 Lower Town Beach

Construction of the proposed scheme on the island of St Martin's will be facilitated through the access route illustrated on Figure 2-30 below. Specific details for the proposed construction works at Lower Town Beach are outlined below.

Construction materials will be transported to St Martin's by an appropriate vessel which will arrive either at St Martin's quay and transported via Lower Town ramp, or at the beach landing site approximately 120m south. Construction materials will be offloaded and transported to the temporary storage area behind the beach. It is anticipated that deliveries will be staggered. Any intertidal works will cease three hours prior to the anticipated high tide time.

It is anticipated that it will take a total of approximately 4 working days in June 2023 to complete the construction of the proposed scheme at Lower Town beach. It is acknowledged that the beach access ramp is used for boating purposes and therefore works will avoid April and October.

Construction works will entail the construction of timber fencing at the most sensitive area of the dunes at the rear of the beach, including the area east of the access track where cabling has become exposed. At the western extent of the beach, excavation will be undertaken for the installation of geotextile and Type 1 sub-base to the access track. A 30mm layer of 5 to 20mm aggregate will be placed and compacted, with grid erosion protection matting will be placed and filled with 5-20mm granite aggregate.

It is assumed that a 360° 20 tonne excavator will be used to fill the open grid protection matting. Signs and fencing will be erected around the dune for pedestrian footpath management.

A removable aluminium mat slipway will also be installed which can be lain and removed as needed.

Once complete, the working area will be demobilised and any plant and construction materials will be removed from site.

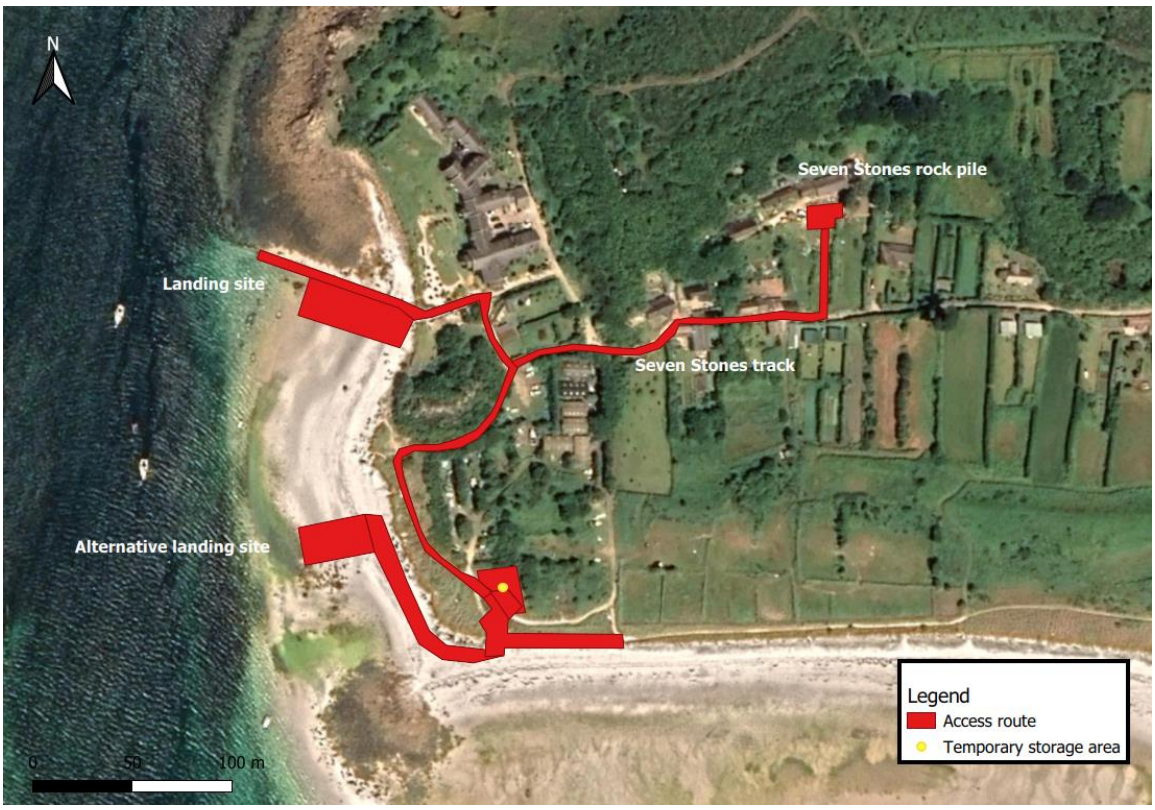

Figure 2-30: Construction access routes across the island of St Martin's

Maps Data: Google Earth CNES / Airbus Maxar Technologies © 2022

2.8 Operational requirements and decommissioning

The operational design life for each of the proposed schemes is 25 years. It is anticipated that maintenance of the sea defences will be minimal throughout their design life and will be limited to periodic visual inspection of the works to identify any defects and/or damage caused by tidal or storm conditions. It is noted that the operational design life of 25 years at Periglis can only be assured if the geocontainers remain covered.

The sand storage area on St Agnes will hold a range of materials suitable for repairing sand dunes and other materials in the works. These materials will be used following storms to reinstate damaged works to their previous condition. The storage of these materials on the off-islands will reduce the time required to repair damaged works following storms, which reduces the risk that multiple storms in one season may lead to exceedance of the level of protection of the works, and flooding through the works.

3 Environmental Impact Assessment Methodology

3.1 The EIA Process

Regulation 4 of the Town & Country Planning (Environmental Impact Assessment) Regulations 2017 sets out that the environmental impact assessment is a process consisting of

(1) (a) the preparation of an environmental statement by the person seeking or initiating planning permission…

(2) The environmental impact assessment must identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of proposed development on the following—

(a)population and human health;

(b) biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC(1) and Directive 2009/147/EC(2);

(c) land, soil, water, air and climate;

(d) material assets, cultural heritage and the landscape; and

(e) the interaction between the factors listed in sub-paragraphs (a) to (d).

EIA is defined as *'a systematic process to identify, predict and evaluate the environmental effects of proposed actions and projects'*. Online Government guidance (IEMA, 2016) defines the aim of Environmental Impact Assessment *'to protect the environment by ensuring that a local planning authority, when deciding whether to grant planning permission for a project which is likely to have significant effects on the environment, does so in the full knowledge of the likely significant effects, and takes this into account in the decision-making process' and 'to ensure that the public are given early and effective opportunities to participate in the decision making procedures'*.

The EIA process is closely aligned with the design process (Figure 3-1). This effectively begins with EIA Screening, whereby the developer makes the decision whether EIA is required for the project in question. Suitable environmental alternatives (primary mitigation) should be considered at this early stage, but if it is decided that the potential likely significant effects on the environment cannot be avoided through mitigation measures, an EIA Screening Opinion should be sought from the appropriate authority by the developer. As noted above, formal EIA screening was undertaken in May 2021.

Following consultation with consultees, it was agreed that the scope of the EIA should be based on the scoping responses provided previously for similar flood and coastal erosion works carried out on St Marys and Tresco (scoped in 2018). The iterative nature of the EIA process and interaction with consultees and the design team is set out below.

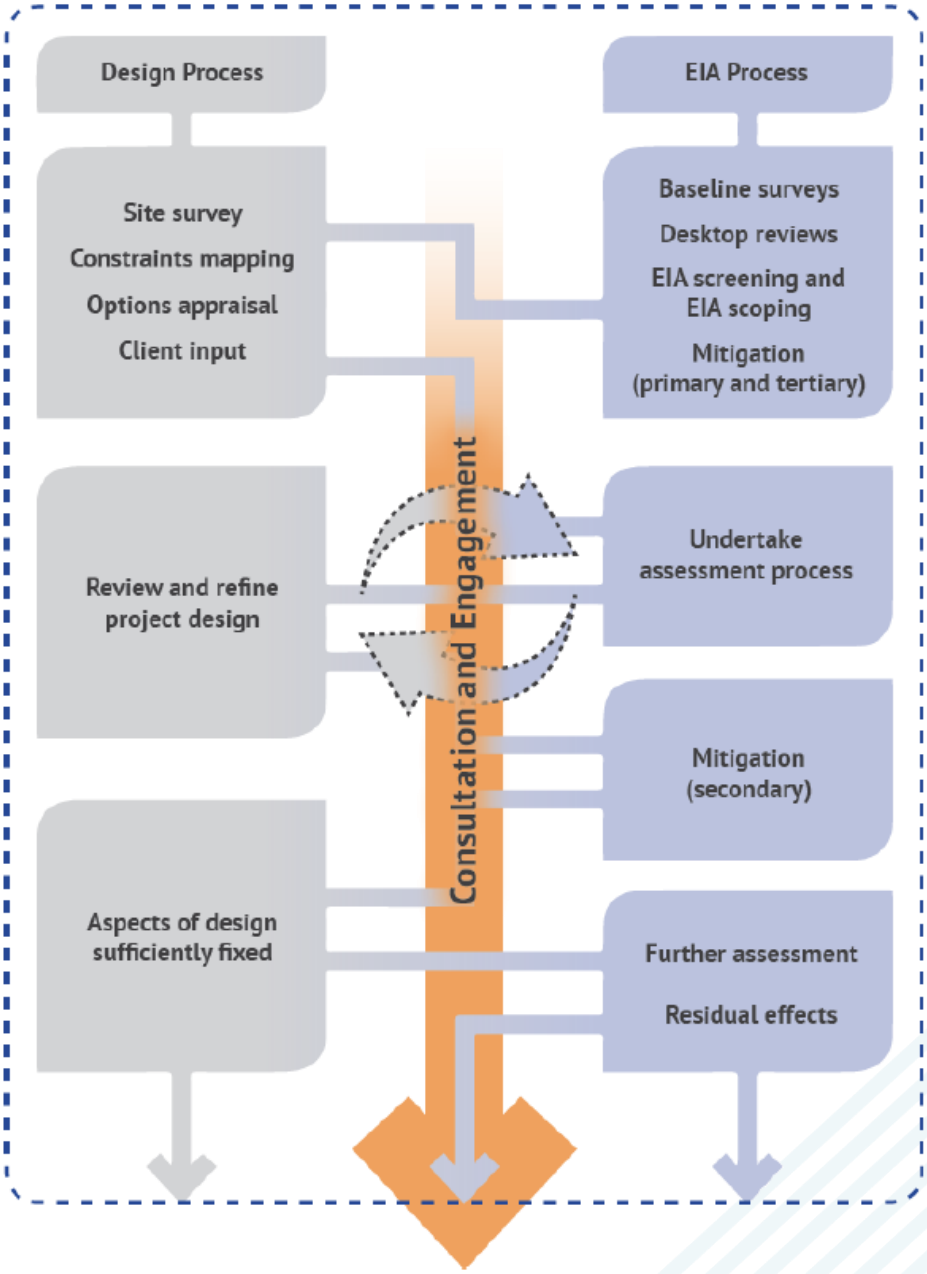

Figure 3-1 The interaction of design and EIA processes

On the basis of the EIA screening opinion and scoping opinion responses, further detailed baseline information is collected to inform the detailed impact assessments. The assessments involve firstly characterising the potential impacts and then the assessment of likely significant effects. At this stage Primary, Secondary and Tertiary Mitigation can be recommended to reduce or eliminate significant effects. This is an iterative process, whereby impact assessment process and design of the development process interact with one another to produce a mutually acceptable solution. This can also involve stakeholder engagement of the emerging design, to further minimise environmental effects. The results of the EIA process are documented in the Environmental Statement (ES), which should be well structured, proportionate and concise document. The ES is supplemented with a Non-Technical Summary, which is intended to make the findings of EIA publicly accessible.

Secondary and Tertiary Mitigation recommendations and commitments reported in the ES topic chapters often require separate environmental management plans in

order to achieve the desired outcome. These are usually prepared during discharge of planning conditions or during pre-construction stage of the approved development.

With reference to IEMA (2016) a summary of the steps involved in the EIA process is set out as follows:

1. Identify aspects of environment likely to be significantly affected (preliminary baseline)
2. Propose primary mitigation (impact avoidance measures)
3. Define impact assessment methodology
4. Collect environmental baseline
5. Assess likely significance of the effects
6. Propose secondary mitigation (iterate design to reduce or eliminate effects)
7. Report residual effects (in the relevant ES chapter)
8. Set out follow up measures (tertiary measures and environmental management plan)

3.2 EIA Screening and Scoping

3.2.1 EIA Screening Opinion Request

The scheme falls within Schedule 2 of the Town & Country Planning Environmental Impact Assessment Regulations 2017 ('the EIA Regulations') section 10(m) Coastal work to combat erosion and maritime works capable of altering the coast through the construction, for example, of dykes, moles, jetties and other sea defence works, excluding the maintenance and reconstruction of such works – All development. Under Regulation 5(8) of the EIA Regulations the proposals must therefore be screened for EIA development by the Local Planning Authority. Given that the proposals would affect an area below Mean High Water Spring (MHWS), the proposals also fall within Regulation 8(1) of the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).
Habitats Regulations Assessment (HRA) Screening is undertaken in coordination with the EIA, in accordance with Regulation 27 (1) of the aforementioned EIA Regulations. The HRA screening for the proposed development is included as Appendix 5.1 (a-i). A separate HRA screening has been undertaken for each of the nine sites.

An EIA Screening opinion was requested in May 2021 on the concept designs for the proposed projects. It was determined by the LPA, in this case CIoS, that the sea defence works on each of the sites would constitute EIA development in accordance with the EIA Regulations. This confirmed that the proposals would require the preparation of an ES to support the planning applications for the scheme. The EIA Screening Opinion is provided in Appendix 3.1.

3.2.2 EIA Scoping Opinion Request

The objective of EIA Scoping is to consider the scope and level of detail of the information to be provided in the ES (Regulation 14(1)). It is not a statutory requirement to undertake EIA Scoping.

An EIA Scoping Report has not been prepared for the proposed development. However, an EIA Scoping Request for similar proposed coastal and flood defence schemes across the islands of St Mary's and Tresco was made to CIoS on 24th October 2017. CIoS planners have advised that the scope identified for these works should also be applied to the proposed development. Discussion with relevant Statutory Consultees about the specific issues and constraints to be considered within the EIA for the proposed scheme (to meet both planning and Marine Licence requirements) is ongoing.

Environmental issues that are 'scoped in' will require further detailed technical studies and these will be presented in the ES. Where environmental issues have been 'scoped out' these will not be considered further unless there is a material change in the outline scheme proposals.

3.2.3 EIA Scoping Opinion Response

As noted above, CIoS planning team have directed that the previous EIA Scoping response provided by CIoS for similar work on St Marys and Tresco should be applied (as received on 15th November 2018 by CIoS). In forming their scoping opinion, CIoS consulted with Natural England, the Environment Agency and Historic England. A summary of the comments raised by the consultees is provided in Table 3-1 below, with the full responses provided in Appendix 3.2.

Table 3-1: Summary comments raised in the EIA Scoping Opinion Response and where the comment is addressed in the ES

Summary of comment	Where addressed in the ES
Establish the potential landscape and visual impact of the proposed development during both the construction and operation phases in the context of the AONB, Heritage Coast and Conservation Area.	Chapter 6: Landscape
Potential adverse amenity impacts associated with the development could occur during construction. This should be addressed in the ES.	Chapter 8: Land use, tourism and public amenity
The proposed sea defence areas include several Scheduled Monuments. In addition, there are other designated heritage assets in the vicinity. Any EIA should identify any designated or undesignated heritage assets and consider them in relation to the proposals.	Chapter 7: Historic environment
The ES should consider direct and indirect impacts of each proposal on any designated sites, including the Scilly Complex SAC, Isles of Scilly SPA, Isles of Scilly Ramsar	Chapter 5: Biodiversity and nature conservation and Appendix 5.1 (a-i): HRA
The ES should explain how the proposed works for each site meets the policies of the SMP.	Chapter 4: Coastal processes, geomorphology and flood risk
The following should be included in the ES: The influence of the proposed structures on the intertidal and nearshore wave climate. The influence of proposed structures on beach-dune sediment exchange within the upper beach area. Potential impacts on sediment transport (cross-shore, long-shore etc.) within the intertidal and nearshore zones. Potential for enhanced risk of outflanking of existing and/or new structures.	Chapter 4: Coastal processes, geomorphology and flood risk
The ES should identify how the introduced structures and materials will help facilitate the future transition to managed realignment of the frontage.	Chapter 4: Coastal processes, geomorphology and flood risk
The ES should detail the following: What will be used as an indicator of adverse impacts? What response will be made to such impacts? How will this be monitored? Will this response be controlled through planning conditions? Is it meaningful to adopt a monitor and adapt approach for a structure which only has a 5-10 year design life?	Chapter 4: Coastal processes, geomorphology and flood risk
The EIA will need to consider impacts upon locally designated wildlife and geological sites.	Chapter 5: Biodiversity and Nature Conservation

Summary of comment	Where addressed in the ES
	Chapter 8: Land use, tourism and public amenity
The ES should thoroughly assess the impact of the proposal on protected species and the impact of the proposals on habitats and/or species listed as 'Habitats and Species of Principal Importance' within the England Biodiversity List, published under S41 of the Natural Environment and Rural Communities (NERC) Act 2006.	Chapter 5: Biodiversity and Nature Conservation
The EIA should consider potential impacts on access land, public open land, rights of way and coastal access routes in the vicinity of the development.	Chapter 8: Land use, tourism and public amenity It is a requirement under 296 (2) of the Marine & Coastal Access Act 2009 to establish a route along the whole of the English Coast.
The England Biodiversity strategy published by Defra (and more recently the Environment Act 2021) established principles for the consideration of biodiversity and the effects of climate change. The ES should reflect these principles.	Chapter 5: Biodiversity and Nature Conservation Chapter 9: Sustainability & Climate Change
The EIA should consider how the proposed works contribute to local environmental initiatives and initiatives to reduce the spread of invasive plant species on the island complex.	Chapter 5: Biodiversity and Nature Conservation
The ES should include an impact assessment to identify, describe and evaluate the effects likely to result from the project in combination with other projects and activities that are being, have been or will be carried out.	Chapter 11: Cumulative Impacts

3.3 The Environmental Statement

With reference to Regulation 17(3) of the Town & Country Planning (Environmental Impact Assessment) Regulations 2017/ Regulation 12(2) Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), the ES must contain the information specified in Schedule 4 '*relevant to the specific characteristics of the particular development or type of development and to the environmental features likely to be significantly affected'*. Table 3-2 sets out the sections of the ES in which this information is addressed.

Table 3-2: Requirement of Schedule 4/ Schedule 3 and where the requirements are addressed in the ES

Paragraph No.	Requirement	Where addressed in the ES
1	A description of the development, including in particular: (a) A description of the location of the development; (b) A description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases; (c) A description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used; (d) An estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases.	Section 1.2, 2.6 – Section 2.8, and Chapters 8, 9 & 10
2	A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	Section 2.4
3	A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	Section 2.3 and section 2 of Chapters 4 – 10
4	A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health	Chapters 8 & 10
	biodiversity (for example flora and fauna)	Chapter 5
	land (for example land take), soil (for example organic matter, erosion, compaction, sealing), material assets	Chapter 8
	air,	Chapter 10
	water (for example hydromorphological changes, quantity and quality)	Chapter 4

Paragraph No.	Requirement	Where addressed in the ES
	climate (for example greenhouse gas emissions, impacts relevant to adaptation)	Chapter 9
	cultural heritage, including architectural and archaeological aspects	Chapter 7
	landscape	Chapter 6
5	A description of the likely significant effects of the development on the environment resulting from, inter alia: (a) The construction and existence of the development, including, where relevant, demolition works; (b) The use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources; (c) The emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste; (d) The risks to human health, cultural heritage or the environment (for example due to accidents or disasters; (e) The cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources; (f) The impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change; (g) The technologies and substances used. The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term or long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(a) and Directive 2009/147/EC(b).	Section 5.3 of Chapters 4 – 10, Chapter 11, and section 2.6.
6	A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical difficulties or lack of knowledge) encountered compiling the required	Chapter 3 & within section X.3 of each topic chapter

Paragraph No.	Requirement	Where addressed in the ES
	information and the main uncertainties involved.	
7	A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.	Section 2.3 & within section X.5 of each topic chapter
8	A non-technical summary of the information provided under paragraphs 1 to 8.	Non-technical summary
9	A reference list detailing the sources used for the description and assessments included in the environmental statement.	As footnotes throughout the ES

3.4 EIA Method of Assessment

As noted above Regulation 17(4)(d) states that the ES must 'include the information reasonably required for reaching a reasoned conclusion on the significant effects of the development on the environment, taking into account current knowledge and methods of assessment'. Reference is made to the current EIA practice guidance, primarily:

- Online Government Guidelines (Department for Levelling Up, Housing and Communities, 2021).
- Guidelines for Environmental Impact Assessment (IEMA, 2004) & 2006 Updates (IEMA, 2006).
- State of Environmental Impact Assessment Practice in the UK. Special Report (IEMA, 2011).
- Environmental Impact Assessment Guide to Shaping Quality Development (IEMA, 2016b).
- Environmental Impact Assessment Guide to Delivering Quality Development (IEMA, 2016b).

Other environmental topic-specific guidance is detailed in the methodology section of each ES chapter.

3.4.1 Statement on Competent Expertise

As noted above, Regulation 17(4)(b) requires that the ES must set out a 'statement by or on behalf of the applicant or appellant describing the expertise of the person who prepared the environmental statement'.

The JBA Consulting EIA Policy Statement requires that the appropriately qualified and experienced competent experts have the authority to technically review and approve EIA deliverables forming part of statutory ES reports coordinated by JBA. The EIA has been prepared by a multi-disciplinary team of environmental specialists as set out in Table 3-3 Overall coordination of the ES was overseen by Harriet Thomlinson and technically reviewed by Tim Carter.

Table 3-3: EIA team & qualifications.

EIA Topic Chapter	EIA Chapter Author	EIA Chapter Reviewer
Coastal Processes, Geomorphology and Flood Risk	Anissia Halwyn BSc PhD Linley Hastewell BSc PhD CGeog FRGS	Matthew Hird BSc MCIWEM C.WEM CEnv CSi
Biodiversity and Nature Conservation	Jonathan Harrison BSc MSc MCIEEM	Laura Thomas BA MRes PG Cert CEcol MCIEEM
Landscape	Simon Watkins BSc MSc (Eng) MSc CMLI	Peter Harrison BA Grad Dip Larch CMLI
Historic Environment	Kristian Evans BA MSc	Kirsten Holland BSc MCIfA
Land Use, Tourism and Public Amenity	Lydia Price BSc MSc Harriet Thomlinson BA MSc MIEMA CEnv	Tim Carter BSc MSc CMLI MIEMA CEnv
Sustainability and Climate Change	Gabriel Pearson BSc MSc Katie Chorlton BSc MSc	Rachelle Ngai BASc MSc MIEMA CEnv
Other Construction Related Effects	Lydia Price BSc MSc Harriet Thomlinson BA MSc MIEMA CEnv	Tim Carter BSc MSc CMLI MIEMA CEnv
Cumulative Effects	Lydia Price BSc MSc Harriet Thomlinson BA MSc MIEME CEnv	Tim Carter BSc MSc CMLI MIEMA CEnv

3.4.2 Defining the temporal & spatial scope of EIA

Regulation 18(3) states that the ES includes at least (a) 'a description of the proposed development comprising information on the site, design, size and other relevant features of the development…'

The temporal scope of the EIA is considered in terms of the following principal stages of development:

- existing conditions (baseline);
- construction (Winter 2022/3 – March 2024)
- operation (including maintenance) of the development; and
- future decommissioning of the development.

The spatial scope of the EIA is considered on the basis of:

- the physical extent of the proposed works, as defined by the limits of land to be acquired or used (temporarily or permanently);
- the nature of the existing baseline environment, including the location of sensitive receptors;
- the geographical extent of impacts beyond the site, e.g. effects on traffic, or watercourses that might extend some distance from the development site; and
- the geographical boundaries of the political and administrative institution and authorities, which provide the planning and policy context for the project.

3.4.3 Defining impacts and effects

Schedule 4 of the EIA Regulations sets out the requirement of Regulation 18(3) that the ES provides both a description of the characteristics of the proposed development together with a description of the aspects of the environment likely to be significantly affected, including the following: *'population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter,*

erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.'

With reference to Schedule 3, which sets out the Regulation 5(4) selection criteria for EIA screening, the requirement for EIA is set out on the basis of:

1. The characteristics of the development;

2. The environmental sensitivity of geographical areas likely to be affected by the development; and

3. The types and characteristics of the potential impact to identify the likely significant effects of the development on the environment.

The EIA should seek to identify the value, sensitivity or importance of the aspects of the environment, where they are likely to be affected by the development proposals, characterise the nature of any impacts on these aspects of the environment, and then assess the overall significance of the effect that would result if left unmitigated.

Distinction is drawn between the characteristics of 'impacts' and the significance of 'effects', as not all impacts identified will necessarily have a likely 'significant' effect on the environment. Impacts and effects are defined in the ES as follows:

- *Impacts* are the predicted changes to the baseline environment attributable to the development; and
- *Effects* are consequences of impacts on environmental resources or receptors of a particular value, sensitivity or importance.

3.4.4 Assessment of significance

Schedule 4 of the EIA Regulations also requires a description of the factors likely to be significantly affected by the development using the following terms, which are defined for the purpose of this EIA thus:

- *Direct effects* – arise from the impact of activities that form an integral part of the project;
- *Indirect or secondary effects* – arise from the impact of activities that do not form part of the project, but are a consequence of it;
- *Cumulative effects* – result from multiple impacts or effects on a particular environmental resource or receptor, which would otherwise not occur or would be less severe;
- *Short-term, medium-term or long-term effects* – refer to the temporal scale of an effect;
- *Permanent effects* – result from an irreversible change to the baseline environment or which persist for the foreseeable future;
- *Temporary effects* – persist for only a limited period or which may disappear due to natural recovery of the environment or assimilation into it;
- *Positive effects* – have a beneficial influence on environmental receptors and resources; and
- *Negative effects* – have an adverse influence on receptors or resources.

Consideration of transboundary effects are also a requirement of Schedule 4, which in the UK are considered with regard to the geographical boundaries of the political and administrative institution and authorities, which provide the planning and policy context for the project (refer to section 3.4.2).

Significance of environmental effects is assessed herein on the basis of the magnitude, intensity or irreversibility of impacts versus the value, sensitivity or importance of the impacted environmental resource or receptor. Where applicable,

Table 3-4 will be used to assist in the judgement of significance. This matrix-based approach helps to provide consistent significance terminology throughout the ES and improves the judgement of significance scoring by pre-defining the relationship between impacts and effects. For consistency the significance of environmental effects assessment scores will be described using these terms where possible, with topic specific terminology set out in individual ES chapters where guidelines deviate from the standard approach.

Table 3-4: Matrix of significance of effect scoring terms

		Magnitude, intensity, or irreversibility of impact			
		No Change	Minor	Moderate	Major
Magnitude, intensity or irreversibility of impact	Low	Not Significant or Neutral	Slight	Slight or Moderate	Moderate
	Medium		Slight or Moderate	Moderate	Moderate or Large
	High		Moderate	Moderate or Large	Large

Examples of impact magnitude criteria are given as follows:

Major – complete loss or the intensive alteration to an aspect of the baseline, which may be irrecoverable, slow to recover or if negative cannot be easily mitigated.

Moderate – some loss or change to the baseline situation that occurs over a period of time and has limited potential to recover or if negative to be mitigated.

Minor – a small change in the baseline situation that may not be immediately obvious, but which would have a perceptible impact on the receptor, and may be fully recoverable or if negative easily mitigated.

No Change or Negligible – no perceptible change in the baseline situation. Receptors would not require mitigation for negative impacts, but may be positively enhanced.

3.4.5 Mitigation, enhancement and reporting of residual effects

Schedule 4 of the EIA Regulations sets out the requirement for inclusion in the ES: 'A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases'.

Mitigation measures should be both reasonable and practicable, taking account of the following criteria:

- current best practice guidance;
- precedents set by similar projects;
- the effectiveness of different technical solutions;
- their feasibility in construction and operational terms; and
- their incremental costs.

When identifying the best possible design measures available to achieve the required mitigation within a scheme, the principles of the hierarchy of mitigation should be employed as follows (in order of preference):

- *Avoidance* – making changes to the project's design to avoid or prevent adverse effects on an environmental feature;
- *Reduction* – where avoidance is not possible, adverse effects can be reduced through sensitive environmental treatments/design;
- *Remediation* – where adverse effects are unavoidable, management measures can be introduced to limit their influence;
- *Compensation* – where avoidance on reduction measures are not available, it may be appropriate to provide compensatory measures to seek to offset the adverse effect with a comparable positive one.

Consideration to mitigation should be undertaken from the earliest possible design stage, after the baseline data has been collected, and throughout the EIA process. EIA mitigation can also therefore be characterised depending on the stage of the assessment when it is considered.

- *Primary* – Changes made in the pre-application phase of the development, that modify the location or design of the development. This mitigation has the greatest ability to avoid impacts. They are the most effective when applied as early as possible, as it is often difficult to act on primary mitigation measures as the design begins to stabilise.
- *Secondary* – Actions that require activity to achieve a desired mitigation. These can be imposed in the ES in order to achieve planning consent.
- *Tertiary* – Actions that would have been undertaken regardless of the EIA process, due to other legislative requirements or standard practices. This mitigation is the least flexible – either the legislation exists to create the mitigation or does not (i.e. Protected Species Licencing).

Where positive effects can be voluntarily introduced without the requirement to mitigate an effect, this is termed 'enhancement'.

Any environmental effects that remain significant after mitigation are termed 'residual effects'. Residual effects are a convenient way of reporting the overall significance of environmental effects of a proposed development scheme and would therefore be reported in the ES conclusion and non-technical summary.

3.4.6 Limitations and Assumptions

The following assumptions and limitations are relevant to the ES:

- At this stage, construction details including methodologies have not yet been finalised. An outline construction methodology has been provided by the appointed contractor and where information is not currently available, assumptions have been made based on experience gained on similar schemes, including proposed sea defence works on the island of St Mary's, and professional judgement.
- An indication of the duration of the construction phase is available, however, this may be subject to change when finalised. As a result, temporally reliant construction impacts in specialist chapters were based on assumptions of the occurrence of certain aspects of works at certain times.

Topic chapter specific limitations and assumptions are set out in in the methodology section of the relevant topic chapter.

4 Coastal Processes, Geomorphology, Flood Risk and Erosion

4.1 Introduction

This chapter assesses the potential for the proposed schemes to cause likely significant effects on geomorphology, coastal processes, flood risk and erosion. In addition to the issues defined at the scoping stage, a range of environmental issues were raised in the EIA scoping response for previous coastal defence works on St. Mary's, provided by the CIoS in November 2018. These issues also apply to the proposed works and those of relevance to this chapter include:

- The influence of the proposed structures on the intertidal and nearshore wave climate;
- The influence of proposed structures on beach-dune sediment exchange within the upper beach area;
- Potential impacts on sediment transport within the intertidal and nearshore zones; and
- Potential for enhanced risk of outflanking of existing and/or new structures.

4.2 Baseline Conditions

4.2.1 Introduction

Gaining an appreciation of the baseline conditions at, and in the vicinity of, each site is essential to identify ongoing physical processes. By using this information, potential impacts of the scheme can then be identified and assessed. Proxies from nearby coastline have been used where site-specific information is unavailable. The key interest areas for this chapter are:

- Hydrodynamics (wave climate and tidal regime)
- Coastal morphology
- Sediment dynamics (erosion/accretion) and transport
- Flooding

4.2.2 Tidal regime

The Isles of Scilly have a semi-diurnal tidal regime. The coastline is classified as macrotidal, with mean spring and neap tidal ranges at 5m and 2.3m respectively. The principal tidal levels relative to chart datum and local datum are presented in Table 4-1.

Table 4-1: Critical tidal levels for the Isles of Scilly

Return period	Water Level (mACD)	Water Level (mAOD)
Highest Astronomical Tide (HAT)	6.30	3.39
Mean High Water Spring (MHWS)	5.70	2.79
Mean High Water Neap (MHWN	4.30	1.39
Mean Sea Level (MSL)	3.19	0.28
Mean Low Water Neap (MLWN)	2.00	-0.91
	0.7	-2.21

Return period	Water Level (mACD)	Water Level (mAOD)
Mean Low Water Spring (MLWS) Lowest Astronomical Tide (LAT)	0.1	-2.81

Water flow is complex between the islands. The pattern of flow through the islands is as follows (from English Heritage, 2004):

"FIRST FLOOD (HW-4 to HW-2). Flow is from the south through south-west. Water is funnelled into St Mary's Sound and leaves via all other exits. At the end of the period flow is starting to enter between Tresco and St Martin's.

LATE FLOOD (HW-2 to HW+2). Flow is from south-west, west, north-west, and then west.

Water enters St Mary's Sound and between Bryher and Tresco and Tresco and St Martin's, exits between St Mary's and St Agnes and St Mary's and St Martin's. After HW there is little flow into St Mary's Sound, and flow reverses in the Bar Point area carrying water southwards.

EARLY EBB (HW+2 to HW+4). Flow is from north to north-east. Water enters between Bryher and Tresco, Tresco and St Martin's and exits by all other routes.

LATE EBB (HW+4 to HW-4). Flow is from north-east, east, and then south-east. Water enters between St Mary's and St Martin's, and exits by all other routes."

Tidal diamond data from Admiralty TotalTide Software for each location is presented in the below sections. Figure 4-1 indicates the location of the tidal diamonds around the islands.

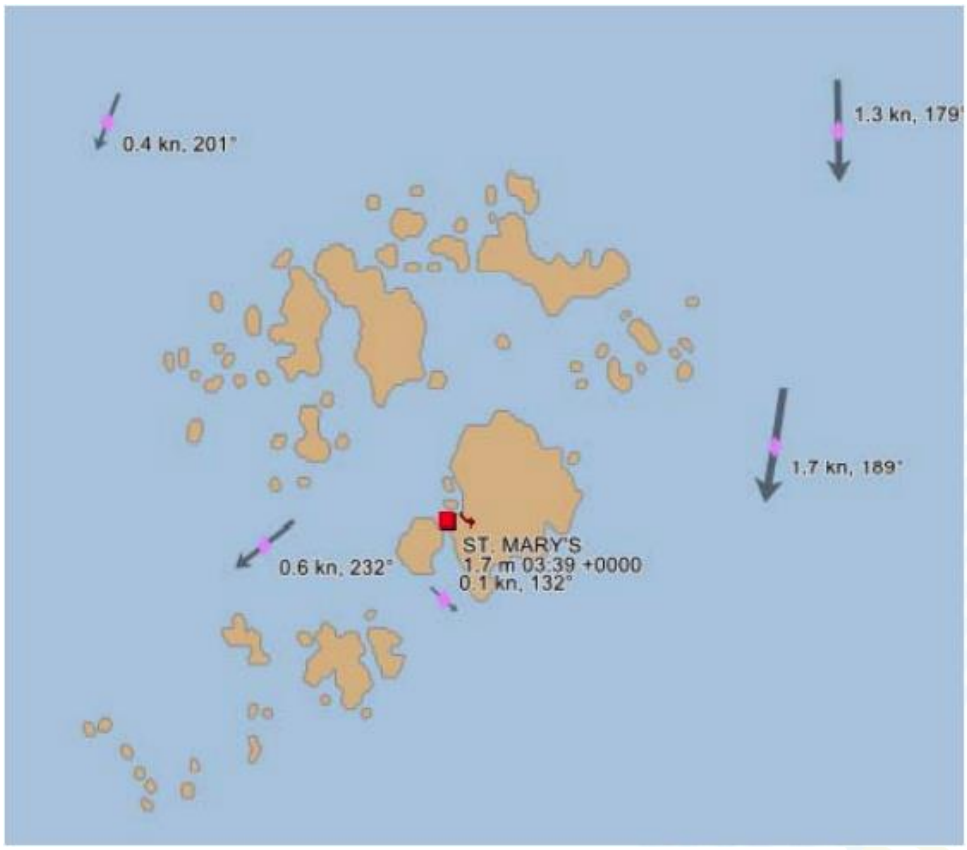

Figure 4-1: Tidal diamonds around the Isles of Scilly (ATT)

Relevant tidal diamond data for each site is presented in Appendix 4.1 Spring tidal rates are higher than neap tidal rates for all sites, with a similar degree of variation between sites. Tidal currents are relatively weak, although slightly higher in the vicinity of St Martin's. Most of the sites are ebb-dominant, indicating that coarser sediments may be transported more readily by ebb direction currents than flood, causing erosional tendencies. However, the Isles of Scilly have a wave-dominated coastline; therefore, the majority of nearshore sediment processes are likely to be dominated by wave activity, as discussed in the following sections.

4.2.3 Wave climate

The Isles of Scilly generally has a high energy wave climate due to the exposed location of the islands in the Atlantic Ocean. The biggest waves are from between the south-west and north-west, but significant waves can also come from the east. Therefore, the north and west of Bryher is very exposed to Atlantic waves and swell, whilst the eastern coast is very sheltered by Tresco. The west of St. Agnes is most exposed to wave action, whilst the north east is less exposed, on the inner side of the archipelago. Similarly, the south of St Martin's is less exposed, on the inside of the archipelago. Waves with short wave lengths are not efficiently refracted. Therefore, during these conditions, wave energy is mostly lost as waves break on the outer coast of the archipelago, causing calm conditions on the inner coast (e.g. Porth Killier on St Agnes and Lower Town on St Martin's). However, waves with longer wave lengths are more likely to refract between the islands, which can cause strong wave conditions even on the inside of major inlets (English Heritage 2004).

The Channel Coastal Observatory (CCO) has been monitoring wave data to the south of St Mary's since 2014. The directional Waverider Buoy is located in approximately 53m (CD). Table 4-2 shows the recorded monthly averages of significant wave height (Hs), wave period (Tp), significant wave period (Ts) and wave direction for the period between May 2014 and September 2021.

Table 4-2: Monthly averages of significant wave height (Hs), wave period (Tp), significant wave period(Tzs) and wave direction (June 2019-August 2021) (CCO 2021)

Month	Hs	Tp	Tz	Direction
January	2.75	15.85	9.25	383.00
February	3.35	16.25	9.70	366.00
March	2.57	16.30	9.20	375.00
April	1.92	15.03	8.60	346.00
May	1.70	14.58	8.35	379.00
June	1.80	16.58	9.97	459.83
July	1.61	16.30	9.70	505.50
August	1.82	16.18	10.02	515.67
September	2.09	17.65	10.25	483.17
October	2.41	14.88	8.90	363.50
November	2.70	15.50	9.08	369.50
December	3.12	16.23	9.55	386.25

The wave climate is naturally variable, on a seasonal, interannual and longer-term basis, which has subsequent impacts on the nearshore wave climate and sediment transport processes at each location. Storm frequency and sequencing will also affect these processes.

For each location, numerical modelling by JBA Consulting (2021) has allowed the prediction of the joint probability combinations of water levels, wave heights and periods, and the single probability estimates of wave heights for a range of return periods, as presented in the below sections.

Bryher

Bryher is more exposed, particularly along its indented west coast, where Great Porth (Great Par), Great Popplestone and Stinking Porth are located. Modelled sites are shown in Figure 4-2.

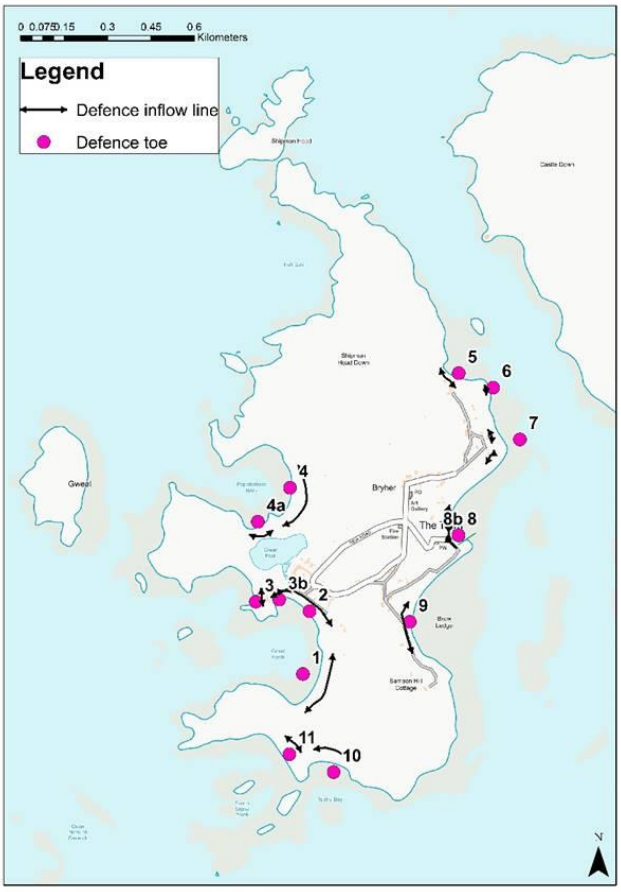

Figure 4-2: Wave modelling sites on Bryher

Great Porth Site 2 and 3

Numerical modelling of the nearshore wave conditions at Great Porth site 2 and 3 show 1 in 1-year wave heights of 0.63m and 1 in 200-year storm waves of 0.92m (Table 4-3). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-4). This indicates that the predicted 200-year event (design event) would be 3.68m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 0.91m.

Table 4-3: Significant wave height return periods for Great Porth sites 2 and 3.

Return Period (years)	Significant Wave Height (m)
1	0.63
2	0.69
5	0.75
10	0.79
25	0.83
50	0.86
75	0.88
100	0.89
200	0.92
1000	1.00

Table 4-4: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Great Porth sites 2 and 3.

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	3.09	0.61	9.34
2	3.12	0.69	9.66
5	3.33	0.77	8.72
10	3.47	0.81	8.41
25	3.56	0.86	8.42
50	3.77	0.88	7.53
75	3.48	0.90	10.18
100	3.56	0.87	10.63
200	3.68	0.91	9.84
1000	3.88	1.03	8.65

Stinking Porth Site 3b

Numerical modelling of the nearshore wave conditions at Great Porth site 2 and 3 show 1 in 1-year wave heights of 0.47m and 1 in 200-year storm waves of 0.70m (Table 4-5). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-6). This indicares that the predicted 200-year event (design event) would be 3.82m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 0.63m.

Table 4-5: Significant wave height return periods for Great Porth site 3b

Return Period (years)	Significant Wave Height (m)
1	0.47
2	0.51
5	0.55
10	0.58
25	0.62
50	0.64
75	0.66
100	0.67
200	0.70
1000	0.74

Table 4-6: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Great Porth site 3b.

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	3.05	0.48	9.61
2	3.31	0.54	6.91
5	3.33	0.59	8.30
10	3.57	0.53	9.47
25	3.66	0.57	7.61
50	3.60	0.64	10.25
75	3.67	0.64	8.77
100	3.70	0.66	7.56
200	3.82	0.63	7.99
1000	3.83	0.74	9.59

Great Popplestone Site 4

Numerical modelling of the nearshore wave conditions at Great Popplestone site 4 show 1 in 1-year wave heights of 0.54m and 1 in 200-year storm waves of 1.10m (Table 4-7). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-8). This indicates that predicted 200-year (design) event would be 3.85m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 1.15m.

Table 4-7: Significant wave height return periods for Great Popplestone site 4.

Return Period (years)	Significant Wave Height (m)
1	0.54
2	0.80
5	0.88
10	0.93
25	0.99
50	1.03
75	1.05
100	1.07
200	1.10
1000	1.21

Table 4-8: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Great Popplestone site 4.

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	3.13	0.64	11.73
2	3.38	0.86	8.26
5	3.43	0.80	11.55
10	3.49	0.89	10.41
25	3.67	1.00	8.59
50	3.67	1.03	9.51
75	3.62	0.98	11.16
100	3.64	0.95	11.25
200	3.85	1.15	8.71
1000	3.78	1.18	11.84

Kitchen Porth Site 5

Numerical modelling of the nearshore wave conditions at Kitchen Porth site 5 show 1 in 1-year wave heights of 0.6m and 1 in 200-year storm waves of 0.80m (Table 4-9). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-10). This indicates that the predicted 200-year (design) event would be 3.71m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 0.75m.

Table 4-9: Significant wave height return periods for Kitchen Porth site 5.

Return Period (years)	Significant Wave Height (m)
1	0.60
2	0.64
5	0.68
10	0.71
25	0.74
50	0.76
75	0.77
100	0.78
200	0.80
1000	0.84

Table 4-10: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Kitchen Porth site 5.

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	3.22	0.50	10.09
2	3.09	0.67	8.51
5	3.36	0.68	8.03
10	3.39	0.69	8.98
25	3.63	0.64	9.72
50	3.46	0.77	11.29
75	3.61	0.72	9.82
100	3.51	0.84	8.95
200	3.71	0.75	9.26
1000	4.05	0.68	9.02

Kitchen Porth Site 6

Numerical modelling of the nearshore wave conditions at Kitchen Porth site 6 shows 1 in 1-year wave heights of 0.6m and 1 in 200-year storm waves of 0.80m (Table 4-11). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-12). This indicates that the predicted 200-year event would be 3.63m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 0.82m.

Table 4-11: Significant wave height return periods for Kitchen Porth site 6.

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	no overtopping		
2	no overtopping		
5	no overtopping		
10	no overtopping		
25	no overtopping		
50	3.59	0.74	7.28
75	3.48	0.76	9.96
100	3.53	0.76	11.28
200	3.63	0.82	8.98
1000	3.75	0.83	11.15

Table 4-12: Joint probability of significanr wave heights, water levels and significant wave periods for a range of return periods for Kitchen Porth site 6.

Return Period (years)	Significant Wave Height (m)
1	0.56
2	0.61
5	0.66
10	0.70
25	0.74
50	0.78
75	0.80
100	0.81
200	0.85
1000	1.35

Green Bay Site 9

Numerical modelling of the nearshore wave conditions at Green Bay site 9 show 1 in 1-year wave heights of 0.56m and 1 in 200-year storm waves of 0.85m (Table 4-13). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-14). This indicates that the predicted 200-year (design) event would be 3.92m still water level (tide plus storm surge), with wave heights of 0. 71m

Table 4-13: Significant wave height return periods for Green Bay site 9

Return Period (years)	Significant Wave Height (m)
1	0.56
2	0.61
5	0.66
10	0.70
25	0.74
50	0.78
75	0.80
100	0.81
200	0.85
1000	1.35

Table 4-14: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Green Bay site 9.

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	2.88	0.60	9.50
2	3.19	0.60	8.83
5	3.29	0.73	7.38
10	3.35	0.71	9.16
25	3.54	0.74	7.73
50	3.67	0.68	8.82
75	3.76	0.71	6.59
100	3.63	0.81	8.17
200	3.92	0.71	5.72
1000	3.57	1.52	8.08

St Agnes

St Agnes is very exposed to the Atlantic wave climate from most directions, although some shelter is provided to the west from uninhabited islands and islets. Wave modelling is presented for the sites indicated in Figure 4-3.

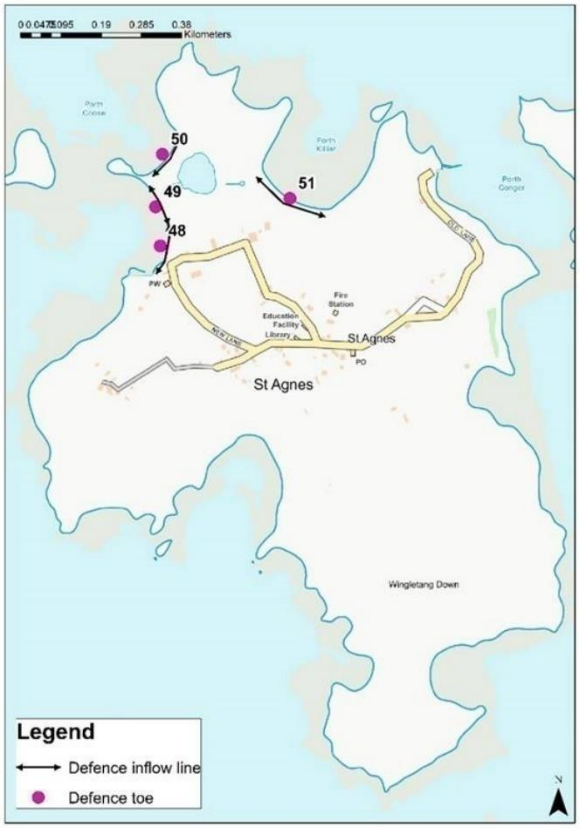

Figure 4-3: Wave modelled sites on St Agnes

Porth Killier site 51

Numerical modelling of the nearshore wave conditions at Porth Killier site 51 shows 1 in 1-year wave heights of 0.79m and 1 in 200-year storm waves of 1.15m (Table 4-15). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-16). This indicates that the predicted 200-year (design) event would be 3.63m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 1.17m.

Table 4-15: Significant wave height return periods for Porth Killier site 51

Return Period (years)	Significant Wave Height (m)
1	0.79
2	0.87
5	0.95
10	0.99
25	1.04
50	1.08
75	1.10
100	1.11
200	1.15
1000	1.21

Table 4-16: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Porth Killier sites A and B.

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	2.90	0.80	9.75
2	3.30	0.85	9.10
5	3.27	0.99	9.03
10	3.35	1.01	9.59
25	3.47	1.04	10.06
50	3.65	1.04	9.65
75	3.62	1.09	9.87
100	3.58	1.10	10.55
200	3.63	1.17	10.04
1000	3.89	1.18	9.63

Porth Coose Site 50

Numerical modelling of the nearshore wave conditions at Porth Coose Site 50 shows 1 in 1-year wave heights of 1.02m and 1 in 200-year storm waves of 1.39m (Table 4-17). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-18). This indicates that the predicted 200-year event would be 3.56m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 1.40m.

Table 4-17: Significant wave height return periods for Porth Coose site 50

Return Period (years)	Significant Wave Height (m)
1	1.02
2	1.10
5	1.17
10	1.22
25	1.27
50	1.31
75	1.33
100	1.34
200	1.39
1000	1.46

Table 4-18: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Porth Coose site 50

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	3.02	0.99	9.26
2	3.13	1.10	9.45
5	3.67	1.11	7.44
10	3.5	1.16	8.87
25	3.52	1.27	9.15
50	3.55	1.34	9.07
75	3.68	1.31	8.63
100	3.77	1.37	8.07
200	3.56	1.40	10.01
1000	3.90	1.45	8.92

Periglis Site 49

Numerical modelling of the nearshore wave conditions at Periglis Site 49 shows 1 in 1-year wave heights of 1.07m and 1 in 200-year storm waves of 1.46m (Table 4-19) Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-20). This indicates that the predicted 200-year (design) event would be 3.54m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 1.41m.

Table 4-19: Significant wave height return periods for Periglis site 49

Return Period (years)	Significant Wave Height (m)
1	1.07
2	1.15
5	1.23
10	1.28
25	1.35
50	1.39
75	1.40
100	1.41
200	1.46
1000	1.54

Table 4-20: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Periglis site 49

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	3.29	1.14	6.92
2	3.15	1.16	9.75
5	3.40	1.26	8.93
10	3.29	1.28	10.92
25	3.29	1.35	11.77
50	3.49	1.39	10.55
75	3.62	1.37	10.06
100	3.63	1.40	10.06
200	3.54	1.41	11.91
1000	3.92	1.47	9.16

Periglis Site 48

Numerical modelling of the nearshore wave conditions at Periglis Site 48 shows 1 in 1-year wave heights of 1.2m and 1 in 200-year storm waves of 1.61m (Table 4-21). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-22). This indicates that the predicted 200-year event would be 3.93m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 1.47m.

Table 4-21: Significant wave height return periods for Periglis Site 48

Return Period (years)	Significant Wave Height (m)
1	1.20
2	1.27
5	1.35
10	1.40
25	1.46
50	1.51
75	1.53
100	1.55
200	1.61
1000	1.68

Table 4-22: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Periglis site 48.

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	2.92	1.26	8.81
2	3.56	1.49	5.17
5	3.36	1.35	9.00
10	3.52	1.32	9.16
25	3.57	1.52	8.51
50	3.61	1.47	9.07
75	3.57	1.46	10.14
100	3.60	1.51	9.79
200	3.93	1.47	8.70
1000	4.05	1.57	8.31

St Martin's

St Martin's is exposed to waves and swell from the north west, north and north east. It is very sheltered along its south facing shorelines and this is the reason why beaches of sediment have established. However, during stormy conditions, waves with long periods can be diffracted between the archipelago, impacting locations such as Lower Town. Wave modelling is presented for the sites indicated in Figure 4-4.

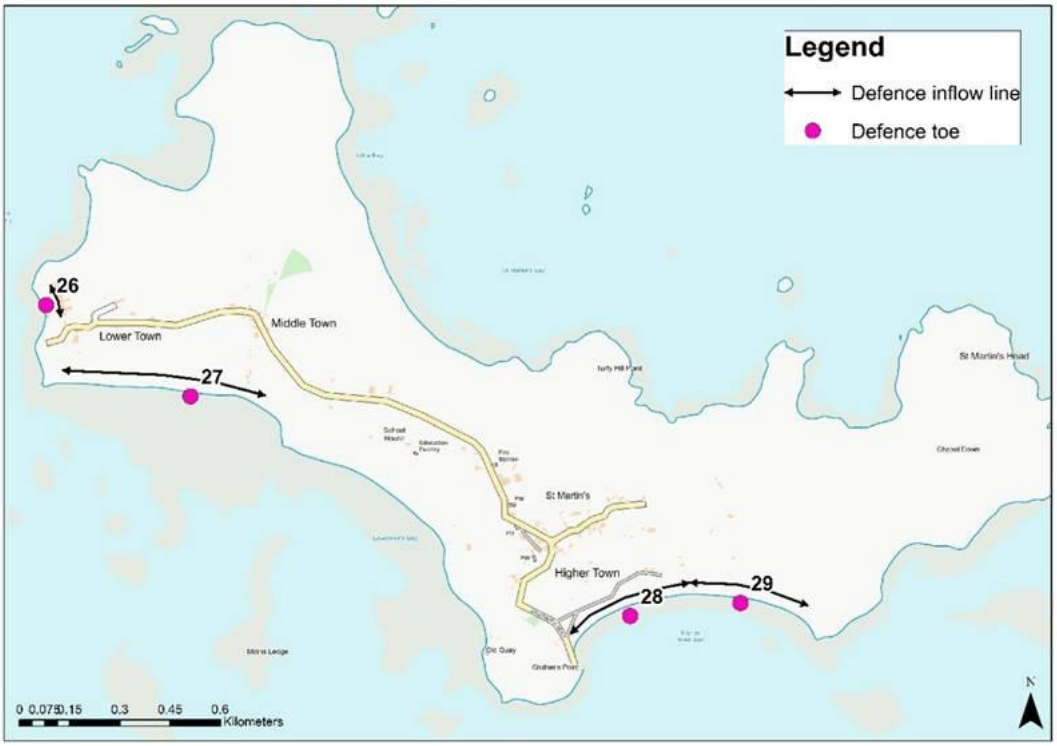

Figure 4-4: Wave modelled sites on St Martin's

Lower Town Site 27

Numerical modelling of the nearshore wave conditions at Lower Town site 27 show 1 in 1-year wave heights of 1m and 1 in 200-year storm waves of 1.47m (Table 4-23). Joint probability estimates of significant wave heights and periods and water levels have also been calculated for a range of return periods (Table 4-24). This indicates that the predicted 200-year event would be 3.74m still water level (tide plus storm surge) coinciding with waves with long periods, with wave heights of 1.37m

Table 4-23: Significant wave height return periods for Lower Town site 27.

Return Period (years)	Significant Wave Height (m)
1	1.00
2	1.09
5	1.18
10	1.24
25	1.31
50	1.36
75	1.40
100	1.42
200	1.47
1000	1.61

Table 4-24: Joint probability of significant wave heights, water levels and significant wave periods for a range of return periods for Lower Town site 27.

Return Period	Water Level (m)	Significant Wave Height (m)	Significant Wave Period (s)
1	3.34	0.96	5.96
2	3.38	1.13	6.39
5	3.49	0.98	10.90
10	3.36	1.21	9.56
25	3.47	1.22	10.33
50	3.74	1.33	6.68
75	3.66	1.36	8.40
100	3.73	1.43	6.86
200	3.74	1.37	9.48
1000	3.80	1.44	10.75

4.2.4 Coastal morphology

Bryher

Great Popplestone

Great Popplestone is a small, swash-aligned bay on the western shore of Bryher. It is the most northerly bay on Bryher and is a mixed sand and rock beach backed by a mobile storm beach. Great Popplestone beach has a change in backshore material from sand to cobbles running south to the north. The dune system behind the storm beach is dominated by Marram, which is backed by a small area of dune grassland. The sand dune system separates the sea and the small brackish lagoon situated behind the beach.

The dunes are free from any significant defects with the majority covered with long grass. Some areas are used as footpaths across the north part of the dunes and have shorter grass but the covering is still generally good. The dunes are not part of an extensive dune system running landwards, however, they are wide and can therefore cope with regression during storm events provided they naturally accrete during more benign weather periods. There is minimal erosion of the seaward dune slope. The strand line appears to be high up the beach close to the base of the dunes suggesting the dune face will be regularly exposed to wave action.

Great Popplestone profile locations are illustrated in Figure 4-5. The dunes are broadest along the central section of the bay whilst to the north the dune face is steeper. The southern profile, taken to the east of the masonry wall, shows a broad, stable profile (Figure 4-6). All of the profiles have shown an accretionary trend between 2007 and 2020: Survey unit 6eB1-4 & 6eB1-5 have an accretion rate of 0.1 m2 y-1 and 0.9 m2 y-1, equating to 0.02% and 0.3%, respectively, of the average combined profile area per year. Profiles 6e1817A and 6e01820 have increased in volume at the mid-lower half of the beach, whilst profile 6e01823 has accreted at the dune crest.

It is possible that storm waves from the north-west could enter through a breach, particularly affecting the south-east side of Great Popplestone. At this point the distance between Great Popplestone bay and Great Pool would be at its shortest and a breach could eventually occur. Because the Great Pool would be inundated from the north, the long-term effects would be for Gweal Hill to become an island at high tide

Within the site at the south of Great Popplestone, there is a dilapidated masonry wall in front of the dune crest, which has been damaged during storm events in the 1990s.

The wall was supplemented by rock armour in 1995, but this was displaced during the 2014 event. Rock material is present on the landward side of the masonry wall, which has been thrown there during large storm events (e.g. 2014). During the 2014 storm event, significant overtopping occurred at the south of Great Popplestone, which ponded in the water meadows behind the defence.

Figure 4-5: Great Popplestone profile locations

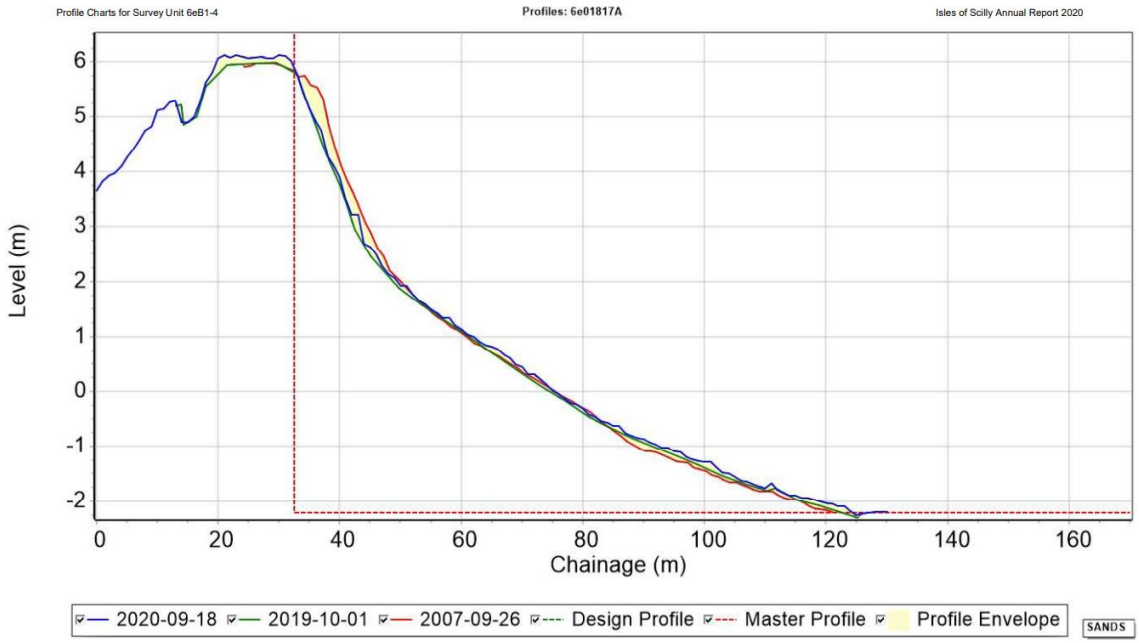

Figure 4-6: Great Popplestone beach profiles 6e1817A (2007, 2019, 2020) (from CCO 2020)

Great Porth (Great Par)

Great Par beach is a semi-circular, swash-aligned sandy beach, located on the western side of Bryher, orientated south-west to the North Atlantic. It is often referred to as Great Porth. Great Par beach consists of two sandy sweeps separated by the rocky outcrop of Great Carn. This part of the coastline is generally subject to high storms and extreme wind and wave conditions as it takes the full brunt of Atlantic storms. However, a significant portion of the beach is protected by the headland to the south.

Within the site to the north of Great Carn, the beach crest is rapidly retreating, and the Mean High-Water Mark (MHWM) has significantly retreated within the site since the 1970s.

This could imply that sedimentation levels are low within the site. However, the beach cross section appears to have been generally accreting between 2007 and 2020, with a layer of material having accumulated across the profile including on top of the dune crest. An ad-hoc embankment has been maintained within the site over a long period of time, constructed from larger armour stone interspersed with smaller rock and earth, which may have contributed to dune narrowing by reducing aeolian transport from the beach onto the dune face. Therefore, the profile of the dune face within the site is now cliffed and the crest is narrow (4.5m at low points) (Figure 4-7 and Figure 4-8).

The placing of ad-hoc revetments on the seaward face of the dune systems within the site has likely caused further dune narrowing, as sediment connectivity between the beach and dunes has been broken.

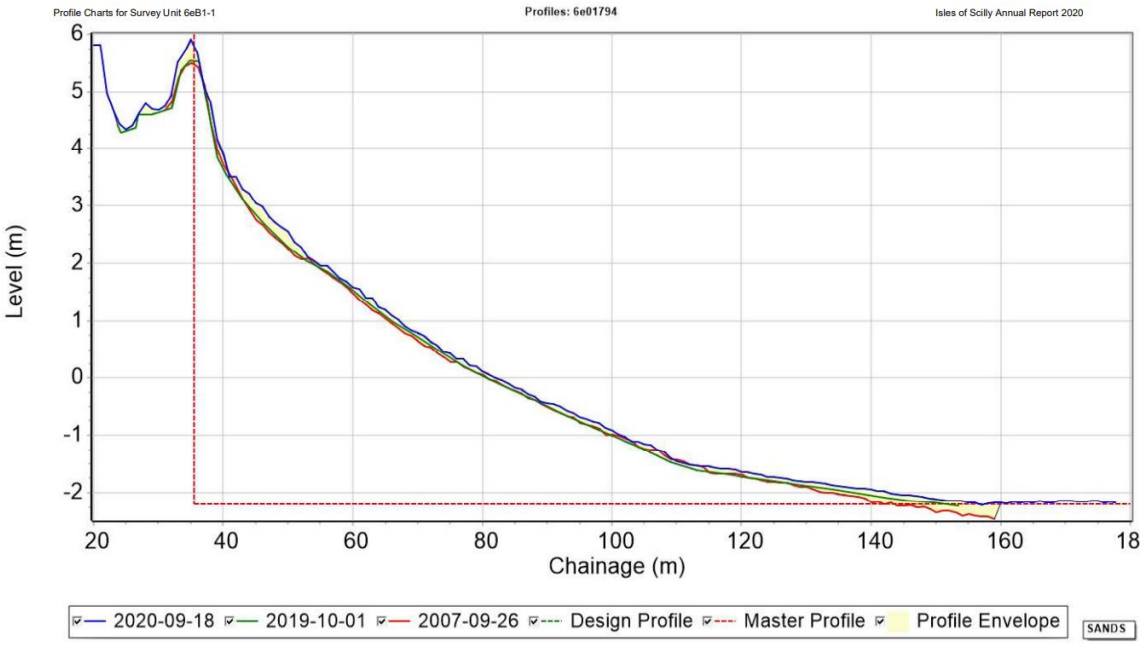

Figure 4-7: Great Porth (Great Par) North of Great Carn Beach Profile (from CCO 2020)

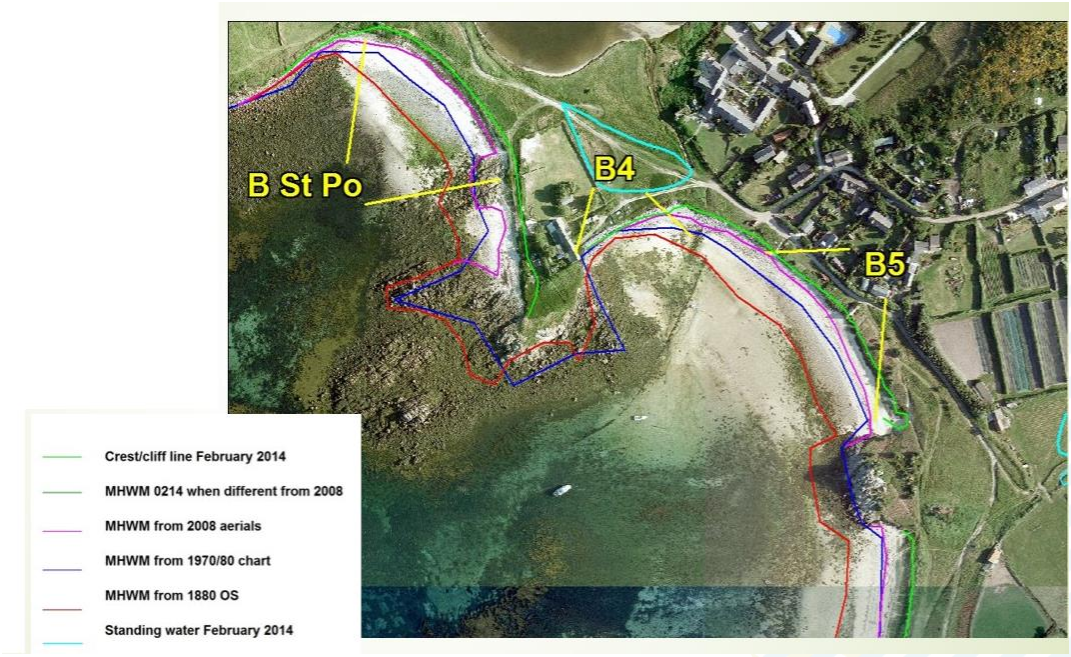

Figure 4-8: Great Par North MHWM (from Ambios Environmental Consultants Ltd (2014))

Stinking Porth

Stinking Porth is a small narrow beach on the western side of Bryher. Great Pool is a saline coastal lagoon situated approximately 30m behind Stinking Porth Beach. Gweal Hill headland sits adjacent Great Pool and separates Stinking Porth beach and Popplestone Bay.

Stinking Porth is a natural sand/cobble beach with a partially vegetated embankment backing the beach consisting of pebbles, cobbles and boulders, with an average crest

height of 5.5m. No formal revetments are currently present. The beach is relatively narrow but is at its widest in front of the proposed site, indicating the predominant direction of longshore drift is to the south-east. The MHWM has retreated significantly since the 1970s and there are many low points on the beach crest which are vulnerable to overtopping. Significant erosion to the crest occurred following the 2014 storm and overtopping caused many cobbles/ small boulders to be washed over the crest (Figure 4-9). This suggests that with no intervention, the beach crest would rollover landwards and the beach itself would accrete further inland.

During January 2014 storms the storm banks/track behind Stinking Porth had been overtopped and significantly eroded. This is now much more likely to have a major breach causing significant flooding of the whole area right up to the hotel.

Figure 4-9: Overwashed cobbles following 2014 winter storm at Stinking Porth (Ambios Environmental Consultants Ltd, 2014)

Green Bay

Green Bay is located on the east side of Bryher and is an elongated, narrow, drift-aligned beach composed of a gently sloping sandy beach face, with large areas of mixed angular-smooth cobbles. Green Bay faces Tresco across New Grimsby Sound and the bay provides good shelter from wave exposure. The alignment of the elongated bay indicates that sediment transport occurs in a predominantly north-easterly direction, with accretion occurring on the southerly side of protruding structures.

Within the site, above the high tide line, there is a semi-constructed embankment composed of sand, overlain by mixed cobbles, with a densely vegetated crest. The embankment is prone to overtopping during storm surge events by waves refracting around the south coast of Bryher, due to its permeability and low crest height in certain locations. This occurred in 2014, when overtopping caused pooled water to accumulate landwards of the embankment.

Within Green Bay, there are some locations where the MHWM has advanced due to the installation of structures or the seaward placement of cobbles for defence purposes (Figure 4-10). This is the case at the site location within Green Bay, where the MHWM in the 1970s is further seaward than the MHWM in 1880. However, since 1970, the MHWM has significantly retreated, indicating that erosion is occurring on this section of the coastline. The beach crest no longer has a functioning dune system, as it has been historically highly modified; therefore, it is unable to naturally accrete and form a robust natural coastal defence.

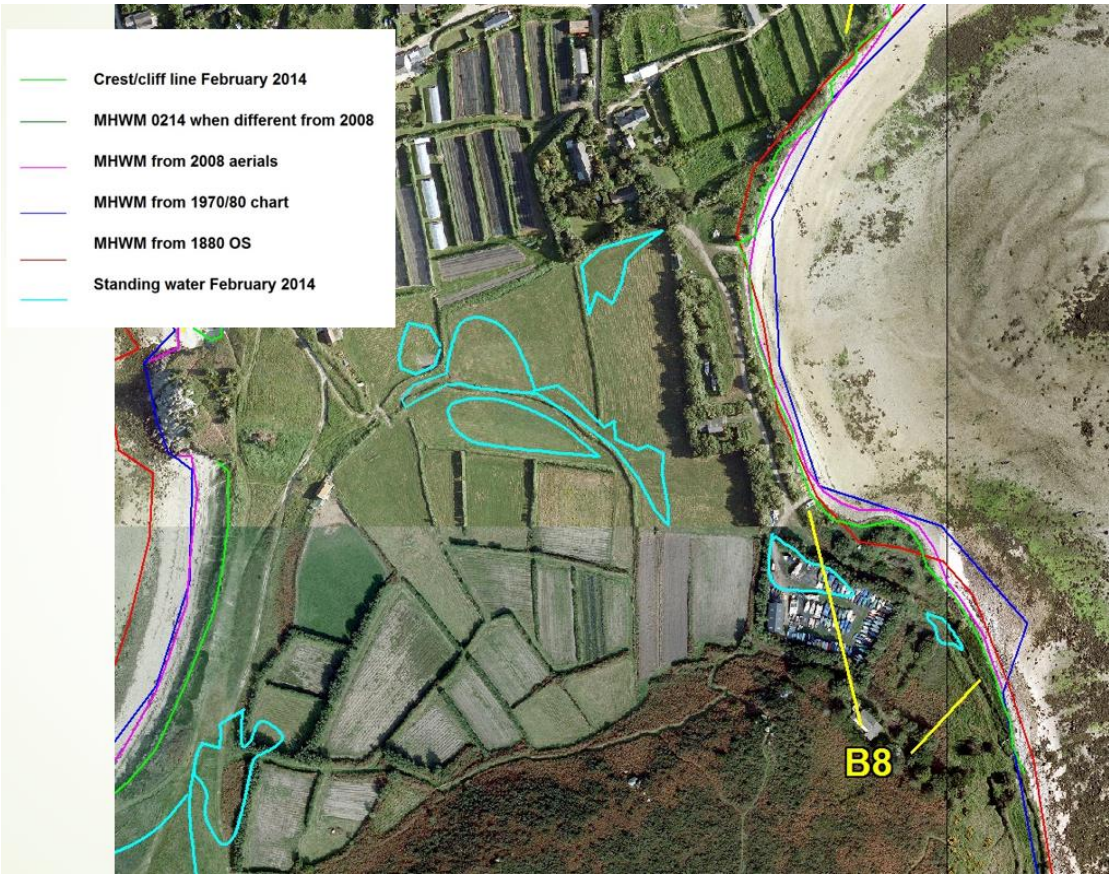

Figure 4-10: Green Bay Mean High Water Mark (MHWM) (from Ambios Environmental Consultants Ltd (2014))

Kitchen Porth

Kitchen Porth is a small embayment located on the eastern side of Bryher. It is comprised of mixed sand and cobbles, with large rocky outcrops as close as 80m offshore. The beach is fairly exposed to long period waves from the north, which has caused the sorting of beach material into a ridge composed of cobbles above MHWS level. Along the majority of the beach, this ridge is gently sloping and dissipative. However, the southern section of the beach (in the vicinity of the site) is extremely exposed during storm conditions (see modelled wave data in section 4.2.3), and the beach crest is steep and narrow, with sections of exposed Ram cliff.

The profile within the site indicates ongoing erosion within the site, which may have been exacerbated by the removal and reprofiling of existing beach material to allow beach access. During storm conditions, overtopping can cause cobbles to wash over the beach crest to accumulate behind the -beach and to create large areas of ponded water. With no intervention, it is likely that the existing crest would continue to erode during storm events, as the beach rolls landwards.

St Agnes

Porth Killier

Porth Killier is a deep embayment located on the north eastern corner of St Agnes, which is exposed to waves with a relatively long fetch. Porth Killier includes rock foreshores, granite cliffs and slopes, with limited areas of sand deposition. A gently sloping cobble ridge is present at the back of the entire beach. In the south-eastern corner of the bay, the back of the beach includes an 85m masonry sea wall, which transitions to a fronting cobbled slope. There is a concrete mattress present between

the end of the masonry sea wall and the northern end of the bay, to provide protection to the coastline particularly during the winter storms.

In previous years the concrete revetment at the toe of the masonry wall has been exposed and the softer beach sediment eroded adjacent to the toe. During the 2014 storm, moderate cobble displacement over the masonry sea wall occurred.

Within Porth Killier Bay there is evidence of a raised beach. The beach materials are overlain by up to 2m of windblown beach deposits and colluvium (Figure 4-11).

The cobbles exposed in the cliff faces are predominantly well rounded. In some parts of the beach they are packed together, and in others held in a sandy and silty matrix which could have been filtered into position at some stage following the beach. The boulders and cobbles are vertically inclined and the arrangement of the long axes is chaotic, suggesting that post depositional disturbance has occurred. Most of the raised beach deposits are found around the extreme high-water mark, but some are found down to the mid-tide mark beneath the cobbles and boulders of the present-day beach. No raised beaches were found more than 5m above the HWM (Quaternary Research Association 2018). At the eastern end of the defence, these ram deposits are subject to erosion and beach lowering as a result of wave reflection and increased velocities in the vicinity of the hard defence.

Figure 4-11: Raised beach exposure at Porth Killier (from Ambios Environmental Consultants Ltd (2014))

The beach profiles show the extensive presence of large, coarse material in the intertidal zone, indicating the high exposure of this beach aspect to wave action (Figure 4-12; Figure 4-13; Figure 4-14). The prevalence of coarse material makes it difficult to analyse beach profile changes in detail, but in general the profiles appear to be accretionary (Figure 4-12). Profile 6e02205 shows a slight reduction and steepening of material at the toe of the wall (Figure 4-13). In profile 6e02203, the crest is relatively broad and tall – this area has not experienced overtopping to date (Figure 4-14).

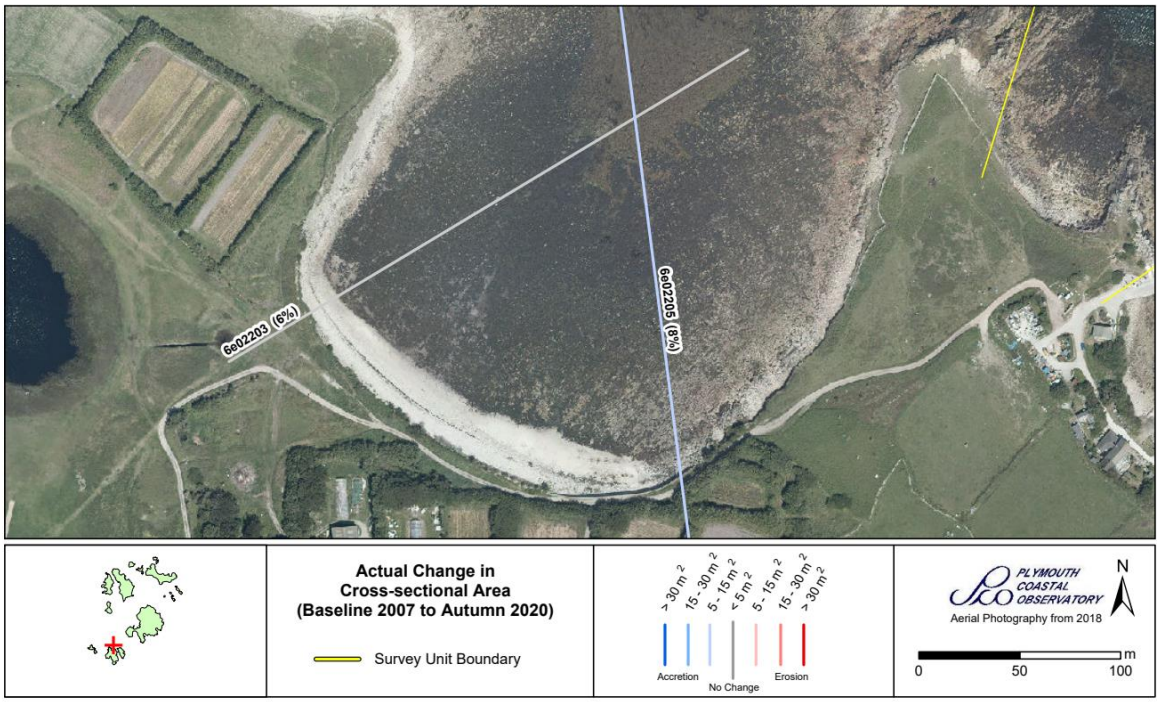

Figure 4-12: Actual change in cross-sectional area (2007-2020), Porth Killier

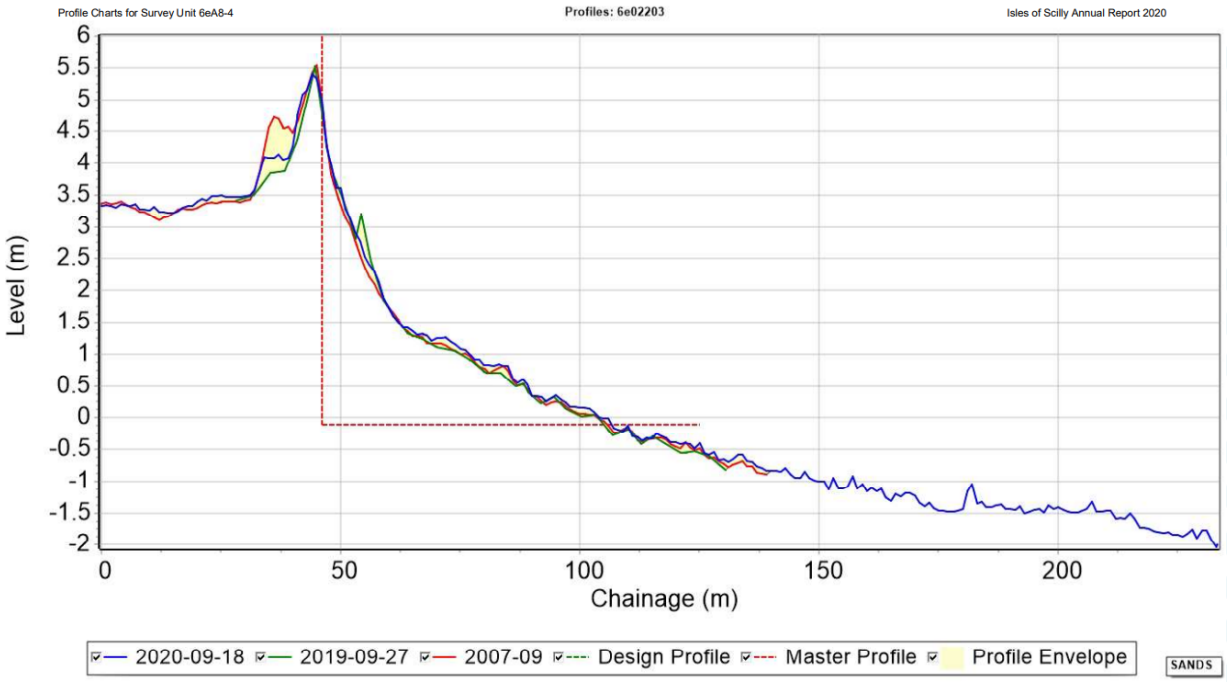

Figure 4-13: Beach profile change between 2007-2020, Porth Killier 6e02203 (from CCO 2020)

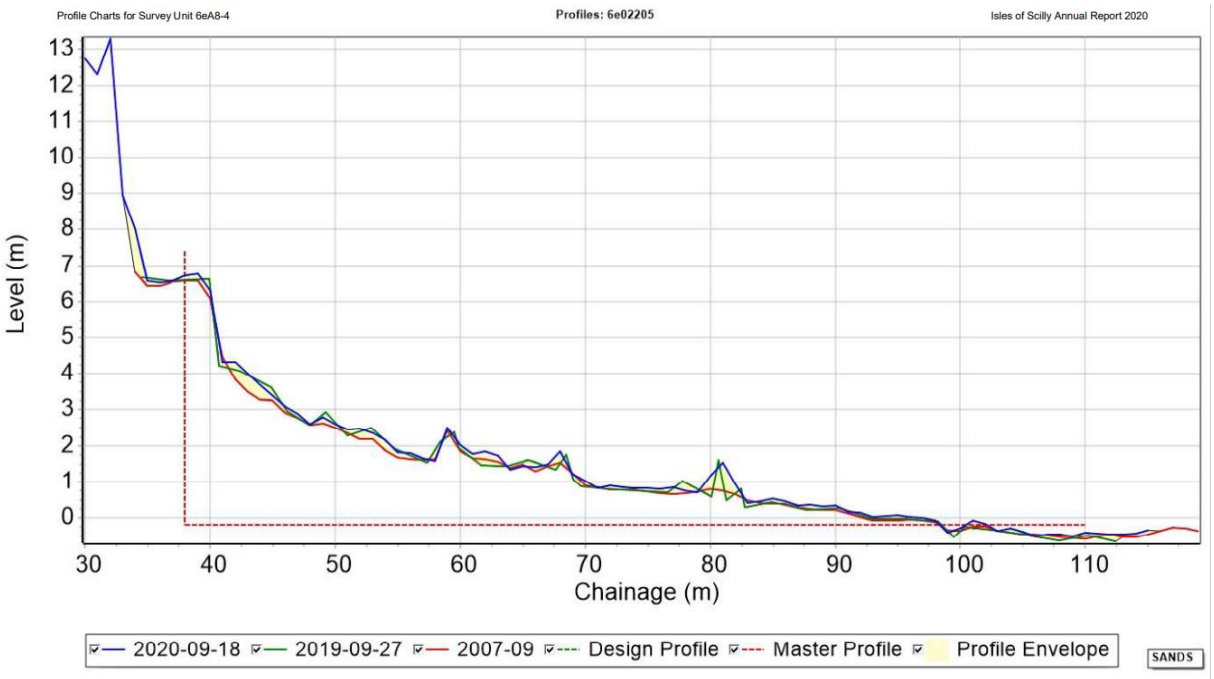

Figure 4-14: Beach profile change between 2007-2020, Porth Killier 6e02205 (from CCO 2020)

Porth Coose

Porth Coose is located on the north western corner of St Agnes. Porth Coose is a small bay consisting of a rocky granite foreshore which faces north west. The beach is relatively small and straight in length, the centre of the bay consists of a mix of sand and cobbles, whilst the edges of the bay are rocky outcrops. An artificial cobbled berm lies to the south of the bay, which acts as a barrier between Periglis and Porth Coose beach, this joins the rock outcrop (Ginamoney Carn) which stretched across the southwest opening of the bay, possibly providing some protection from storms.

The back of the beach includes a cobble slope onto a grassed area behind. Underlying the cobbled slope lies a concrete mattress to provide protection to the coastline particularly during the winter storms. This beach can be seen to undergo severe disturbance with the cobbles and small boulders on the foreshore being washed away and washed over the crest of the beach onto the grassland area behind. The concrete revetment, geomat underlay and geogrid that extend over the back slope of the crest have remained intact with just some local disturbance and exposed areas.

Behind the beach lies just 40m of low-lying grassland separating the beach from a freshwater pool (Big Pool).

Periglis

Periglis beach is located on the western side of St Agnes and is slightly curved to the south west. At each side of the beach, boulder and back stones have been placed to protect the foreshore around the slip and rock revetment to Ginamoney Carn. Over the main length of the beach there is a sandy foreshore dune crest fronted by a large expanse of accumulated rounded cobbles and small boulders at the north end of the beach (see Figure 4-15). The low crest is sparsely vegetated and shows evidence of erosion and steepening in some locations (e.g. Profile 6e02292 in Figure 4-16).

During winter storms, boulders and cobbles from the beach are entrained and deposited behind the beach crest. This overtopping causes severe erosion and recession of the dune foreshore. Following the 2014 storms, a series of sand filled

dumpy bags were placed around the head of the bay. Since placement, there appears to have been a partial recovery of the fore dunes as there are small indications of sand accretion around and over the bags. However, recovery is slow due to limited sand inputs from the predominantly coarse beach face and it is unlikely that a robust and resilient dune profile will be attained naturally in the short term.

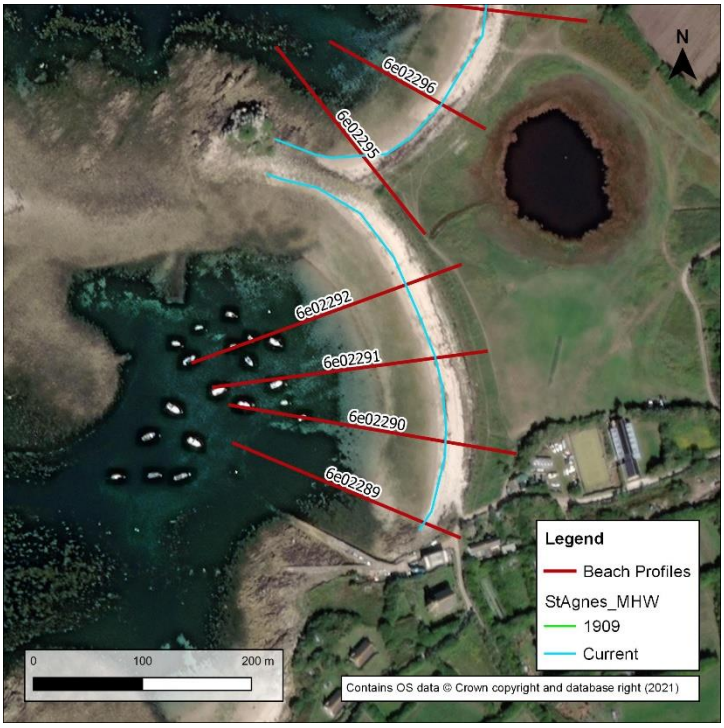

Figure 4-15: Periglis beach profile locations

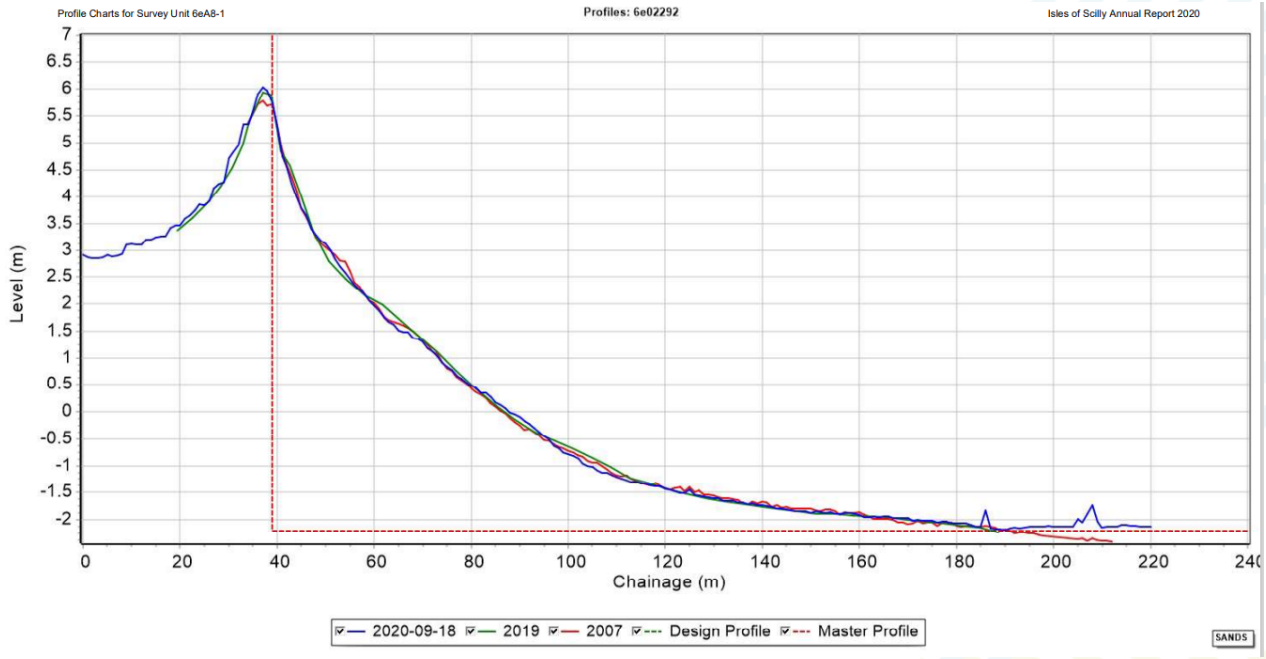

Figure 4-16: Periglis beach profile 6e02292 (data from CCO 2020)

St Martin's

Lower Town

Neck of the Pool is located along the south-western coast of St Martin's and stretches from Lower Town to Jack's Ledge. The beach is long and thin, backed by a mature dune system, as shown in Figure 4-17. Neck of the Pool is separated from Lawrence's Bay to the east by a small promontory.

The sand dune system on the south-western coast is well developed and extensive, which is unlike the dune embankments at the back of the beaches on many other islands. The modelled wave data in Section 4.2.3 indicates that the beach is much less exposed than any of the other sites, being located on the inside of the archipelago. However, waves with long periods are able to diffract between the islands, leaving the dune system at Neck of the Pool vulnerable to wave attack during more extreme events. The dune system was impacted by the 2014 storms, but the system is generally showing signs of self-repair as vegetation re-establishes. Erosional areas are patchy and isolated along the frontage, with the western section of beach at Lower Town showing signs of significant erosion and exposed cables.

The eastern end of the bay has a wider and higher beach protecting the dune system. This can be seen when comparing Figure 4-18 (western profile, in the vicinity of the site) and Figure 4-19 (eastern profile). The dune crest on the western end of the bay reaches a peak height of 7m whereas the eastern beach profile reaches peak of over 8m. This is significantly higher than the 1 in 200-year event modelled in Section 4.2.3.

Figure 4-17: Location of CCO Beach Profiles in Middle Town

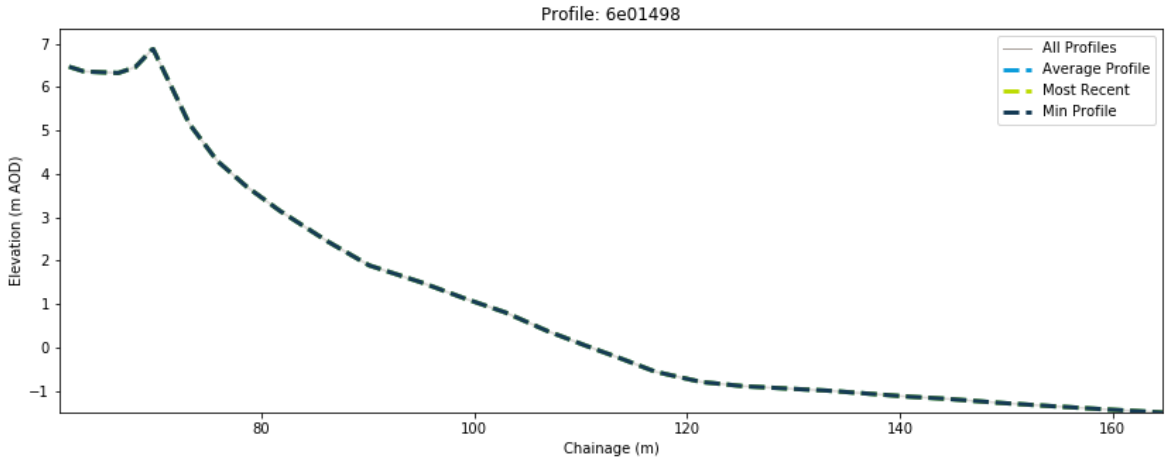

Figure 4-18: Neck of the Pool Western Beach Profiles (6e1498)- defence location (CCO 2021)

The beach profile on the eastern side of the bay shows a rock outcrop adjacent to Neck of the Pool beach. The rock outcrop provides shelter from waves and a build-up of sediment behind, building the beach. Figure 4-19 shows the beach is much steeper at this end of the bay, with a higher beach level and width stretching up to 400m offshore.

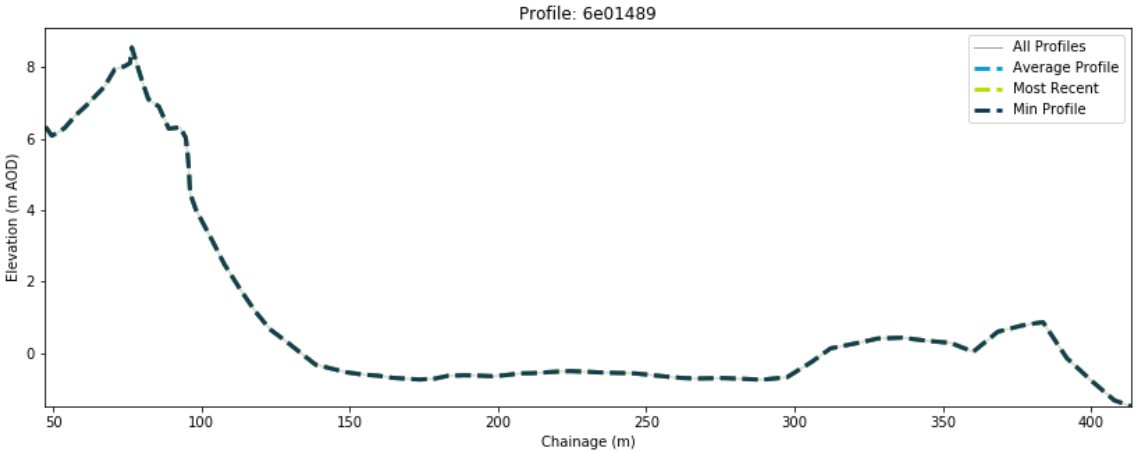

Figure 4-19: Neck of the Pool Eastern Beach Profile (6e01489) (CCO 2021)

4.2.5 Flooding

Bryher

Great Popplestone

Great Popplestone is exposed to south-westerly storms and waves. The beach crest is vulnerable to overtopping and breaching. Flood mapping in Figure 4-20 shows the extent of tidal inundation of the low-lying land behind the sand/shingle ridge during the 1 in 100, 200 and 1000-year events in 2117.

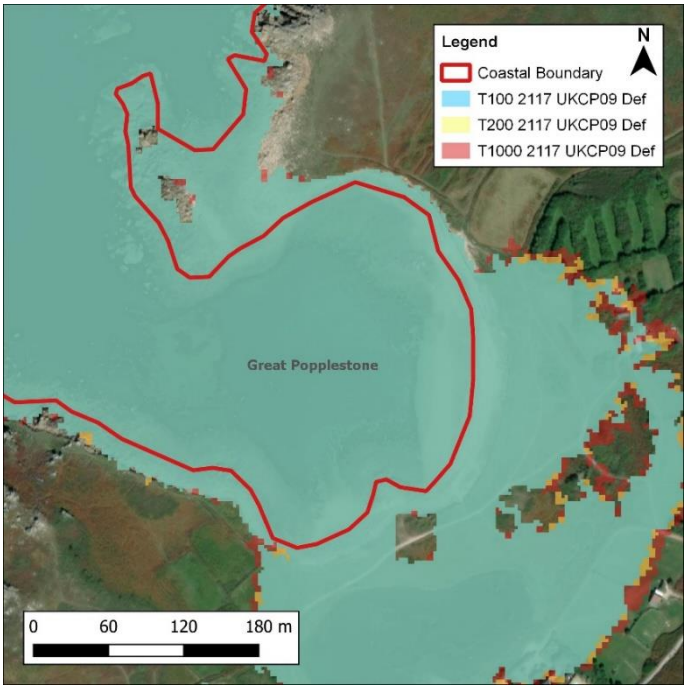

Figure 4-20: Flood risk map, showing inundation at Great Popplestone with climate change to the year 2117 using UKCPO9 guidance for sea level rise (JBA Consulting 2016)

Great Porth

Great Porth is exposed to south westerly waves and swell, as can be seen in the numerical wave modelling data presented in Section 4.2.3.

The dune crest is prone to overtopping and subsequent erosion, as shown in large storm events in 2014 and 1989. The land behind Great Porth is relatively low in elevation; therefore, the overtopping of water leads to standing water behind the beach as shown in Figure 4-21.

Flood mapping shows inundation of the low-lying land behind the sand/shingle ridge during the 1 in 100, 200 and 1000-year events in 2117 (Figure 4-22). A large amount of low-lying land behind the beach is predicted to flood during a 1 in 100 events in 2117.

Figure 4-21: Standing water from overtopping, Great Pool Leat in 2014 (from Ambios Environmental Consultants Ltd (2014))

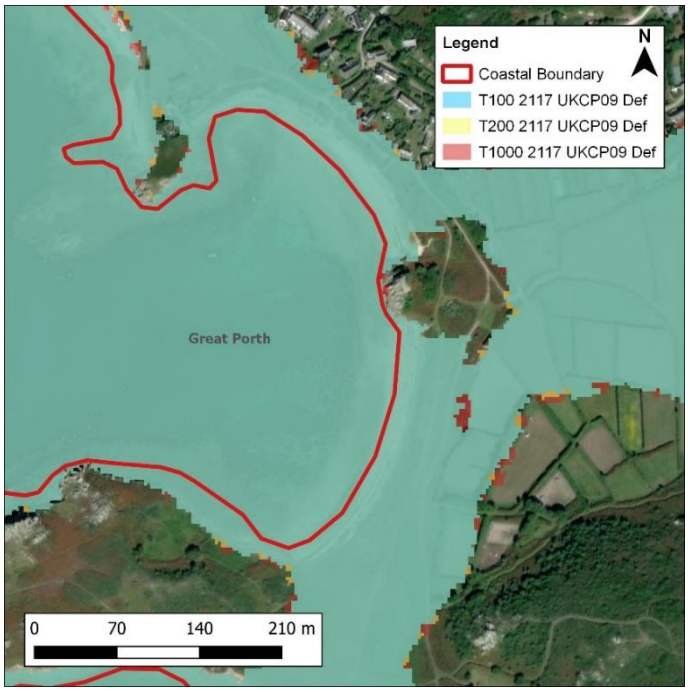

Figure 4-22: Flood risk map, showing inundation at Great Porth with climate change to the year 2117 using UKCPO9 guidance for sea level rise (JBA Consulting, 2016)

Stinking Porth

Similar to Great Porth, Stinking Porth is extremely exposed to Atlantic swells, as shown in the numeral wave modelling data in Section 4.2.3.

Figure 4-23 shows the 100, 200 and 1000-year tidal flood events at Stinking Porth Beach. This highlights how complete inundation occurs through from Great Porth, Stinking Porth and Great Popplestone, with just a small barrier of higher land at the back of Stinking Porth beach protecting Shipman's head Down (the headland north of the site) from further inundation. Areas inundated include the Great Pool SSSI and several homes in the area.

Storms recorded in recent years support the climate projections showing Stinking Porth to be under great threat of coastal erosion and flooding. In the 2014 winter storms, Stinking Porth experienced severe erosion, including over washed garden walls and scour to the crest (Figure 4-24).

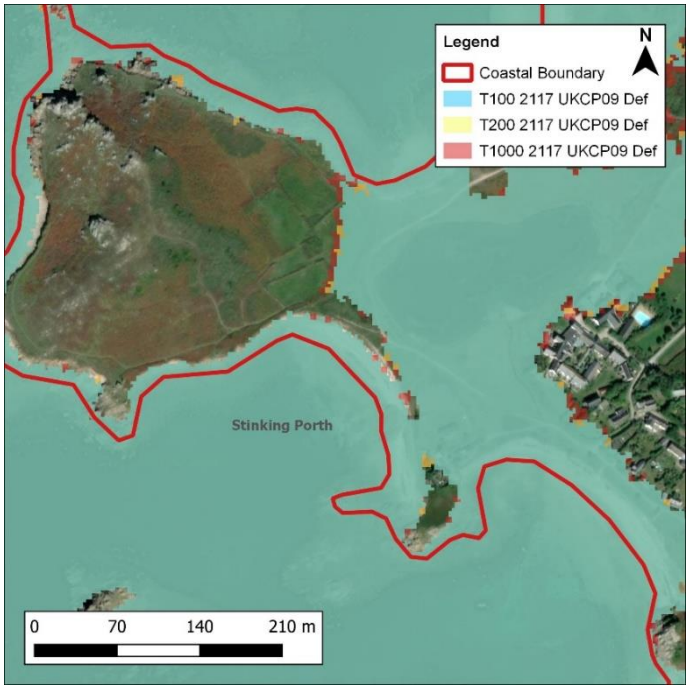

Figure 4-23: Flood risk map, showing inundation at Stinking Porth with climate change to the year 2117 using UKCPO9 guidance for sea level rise (JBA Consulting 2016)

Figure 4-24: Over washed garden wall at Stinking Porth in 2014 (Ambios Environmental Consultants Ltd 2014)

Green Bay

The southern section of Green Bay is much less exposed to wave action due to its sheltered location (Section 4.2.3). However, the area is vulnerable to storm swell surge that diffracts along the channel between Tresco and Bryher. The lowland area behind Green Bay floods by overtopping from both the west and east and will act as a reservoir of salt water. Overtopping and resulting flood risk is the main issue in the southern section of Green Bay. Erosion at the southern end of the bay and north end of Green Bay threatens access to the quay.

Figure 4-25 shows the 100, 200 and 1000-year tidal flood events at Green Bay. Green Bay is projected to the be inundated by coastal flooding over 50m inland in the 100-year scenario.

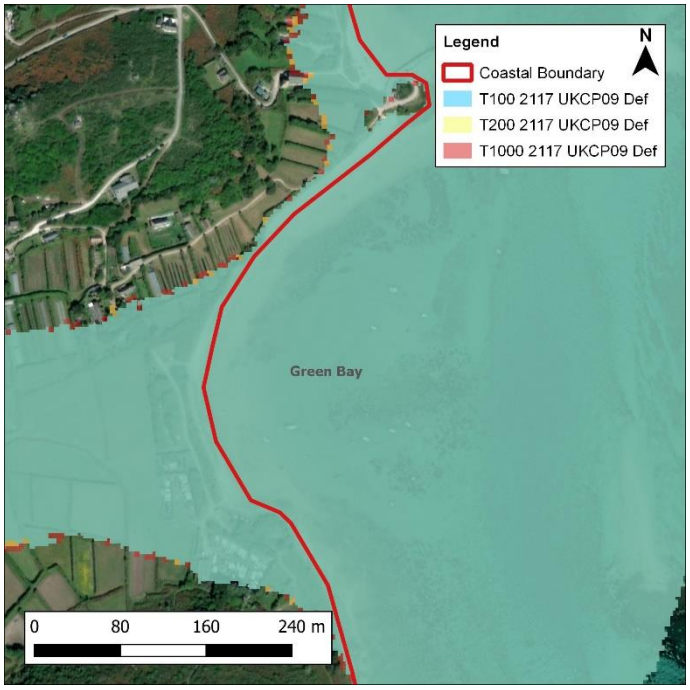

Figure 4-25: Flood risk map, showing inundation at Green Bay with climate change to the year 2117 using UKCPO9 guidance for sea level rise (JBA Consulting 2016)

Kitchen Porth

Figure 4-26 shows Kitchen Porth is inundated by coastal flooding by up to 65m in the south of the bay during the 100-year, 200 year and 1000-year defended flood event.

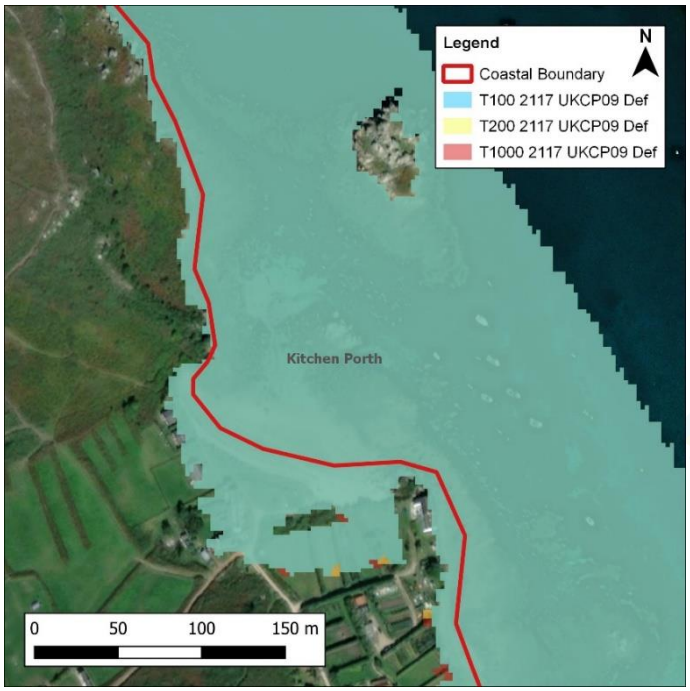

Figure 4-26: Flood risk map, showing inundation at Kitchen Porth with climate change to the year 2117 using UKCPO9 guidance for sea level rise (JBA Consulting 2016)

St Agnes

Porth Killier

Porth Killier is exposed to north-easterly swells, as can be seen in the numerical modelled wave data in Section 4.2.3.

Overtopping of the beach crest/sea wall at Porth Killier beach floods land to the south western side of the bay. During the 100-year, 200-year and 1000-year defended flood events, flooding extends to the western coastline of St Agnes due to the combined inundation from Porth Killier, Porth Coose and Periglis (Figure 4-27).

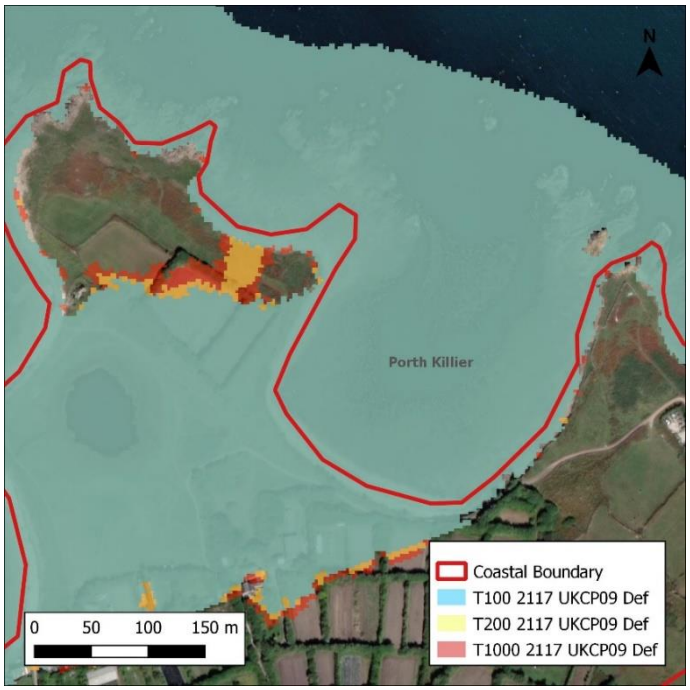

Figure 4-27: Flood risk map, showing inundation at Porth Killier with climate change to the year 2117 using UKCPO9 guidance for sea level rise (JBA Consulting 2016)

It is evident that Porth Killier is vulnerable to coastal erosion and weakening of defences through recent storm impacts. Porth Killier has undergone moderate to severe damage and displacement of beach material in winter storms. This includes the exposure of concrete mattress and local damage, particularly in the northern end of the bay. Vegetation is growing through the mattress, suggesting it has been damaged for some time (Figure 4-28).

Figure 4-28: Damage to mattress and exposure of geomat (JLA 2014)

Porth Coose

Porth Coose is exposed to north-westerly swells, as can be seen in the numerically modelled wave data in Section 4.2.3.

Figure 4-29 shows that flooding from Porth Coose contributes to inundation across the northern part of St Agnes. During the 100-year, 200-year and 1000-year events, the flood extents encroach up to 270m inland behind Porth Coose beach, due to the combined inundation from the three neighbouring bays positioned in the northern section of the St Agnes.

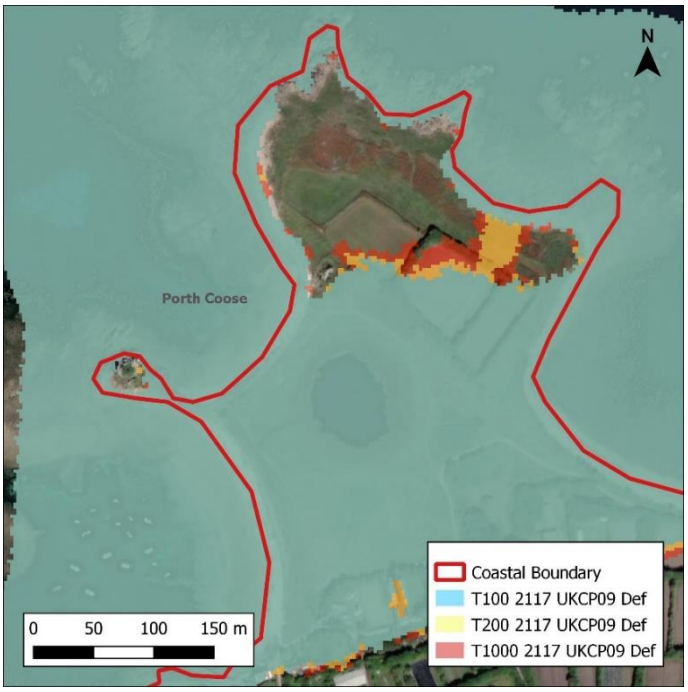

Figure 4-29: Flood risk map, showing inundation at Porth Coose with climate change to the year 2117 using UKCPO9 guidance for sea level rise (JBA Consulting 2016)

Evidence from winter storms suggests that Porth Coose had severe damage and disturbance, with cobbles and boulders washed over the crest of the beach. The concrete mattress underlying the cobble backshore has not been damaged. However, local disturbance of the cobbles now leaves some areas of the mattress exposed (Figure 4-30).

Figure 4-30: Backshore condition after winter storms (JLA 2014)

Periglis

Periglis is exposed to westerly swells, as can be seen in the numerically modelled wave data in Section 4.2.3.

During the 100-year, 200-year and 1000-year 2117 defended event, flood extents encroach across the north eastern corner of St Agnes. Figure 4-31 shows that the Periglis flood extent joins flooding from Porth Killier and Porth Coose beaches. Flood extents encroach no further than the northern end of Periglis bay.

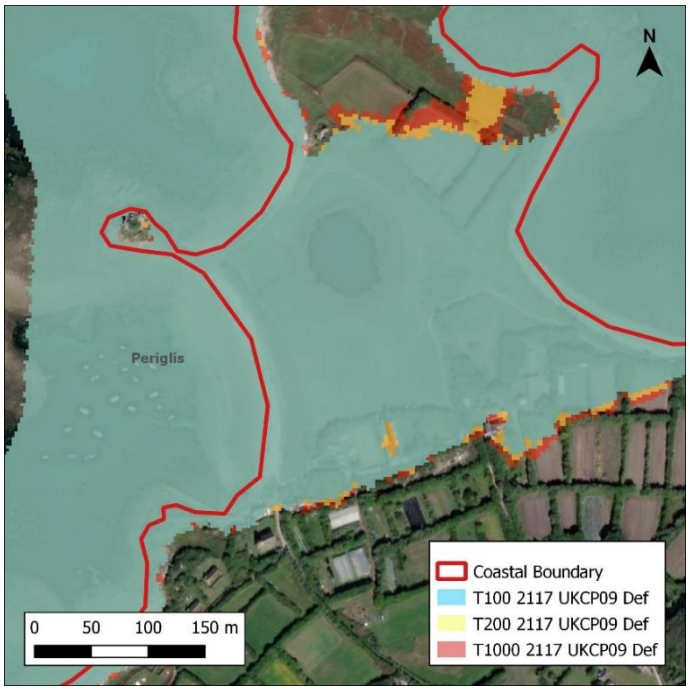

Figure 4-31: Flood risk map, showing inundation at Periglis with climate change to the year 2117 using UKCPO9 guidance for sea level rise (JBA Consulting 2016)

Periglis has benefitted from emergency responses to slow down rates of erosion during storms. Emergency responses implemented include boulders, backstones and sand filled bags to aid recovery of the dunes (Figure 4-32). While these initiatives offer some stability to the sand dune system, they do not offer reliable resilience against future storm damage.

Figure 4-32: Sand filled bags placed around eroded dunes (JLA 2014)

St Martin's

Lower Town

Lower Town is sheltered from short period waves due to its location on the inside of the archipelago. The dune system is extensive and generally in good condition, capable of providing flood defence against smaller to moderate storm events. However, the dune system is vulnerable to overtopping during more extreme events. Following the 2014 storms, some erosion of the dune system occurred.

Figure 4-33 shows the 100, 200 and 1000-year storm flood events at Lower Town (west of Middle Town Bay) in 2117. A significant portion of land behind the dune system is flooded during the 1 in 100-year event.

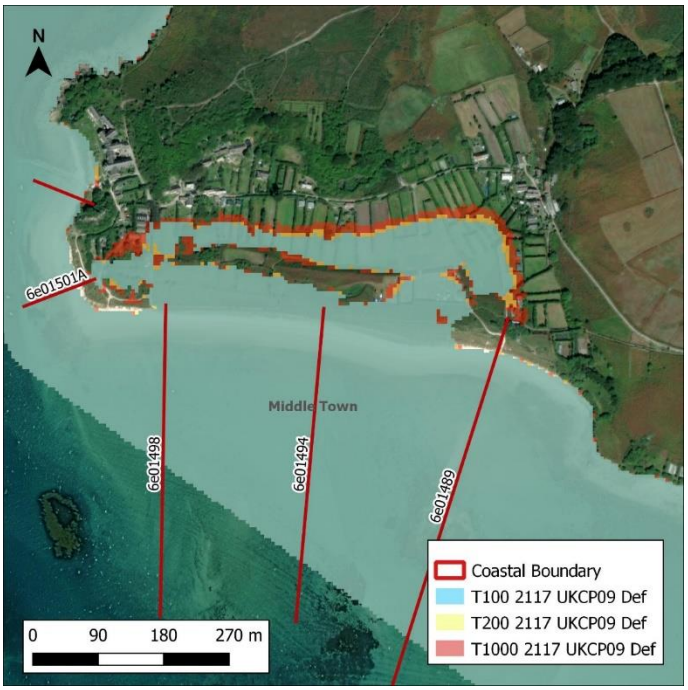

Figure 4-33: Flood risk map, showing inundation at Lower Town (west Neck of the Pool) in particular storms with climate change to the year 2117 using UKCPO9 guidance for sea level rise (JBA Consulting, 2016)

4.1 Assessment Methodology & Assessment Criteria

This assessment considers the potential short-term (construction) and long-term (operational) impacts of the proposals on the local and regional coastal processes.

The assessment of the coastal processes, geomorphology and flood risk has been undertaken as a desk-based assessment utilising the following sources:

- Existing literature, including Shoreline Management Plans, flood and erosion reports;
- Available data and reports on the Channel Coastal Observatory (https://www.channelcoast.org/);
- Remote assessment via photographs, aerial imagery and LiDAR imagery (https://www.channelcoast.org/);
- Historical maps (https://maps.nls.uk/) and geological maps (https://www.bgs.ac.uk/data/mapViewers/home.html?src=topNav);
- Baseline flood data based on UKCP09 scenarios;
- Information from the ecology site visit and photographs (see Chapter 5: Biodiversity and Nature Conservation).

UKCP09 flood risk data has been used for the flood inundation extents as flood modelling was conducted for the sites in 2016, pre-dating the release of UKCP18. The flood extents should therefore be viewed as a conservative underestimation.

A number of sources of potential impacts on coastal processes have been identified from activities associated with defence construction, presented in Table 4-25.

Table 4-25: Sources of potential impacts on coastal processes

	Storage of material on the foreshore	Excavation for defence construction	Tracked vehicle movements on the beach	Physical defence presence: Modification of natural beach morphology	Physical defence presence: Modification of beach face gradients
Great Popplestone			X	X	?
Great Par/Porth north of Great Carn	X	X	X	X	X
Green Bay	X	X	X	X	X
Stinking Porth	X	X	X	X	X
Kitchen Porth	X		X	X	
Porth Killier Seawall	X		X	X	X
Porth Killier (Eastern end)	X	X	X	X	X
Porth Coose				X	X
Periglis	X	X	X	X	X
Lower Town Beach					

The assessment criteria used to determine the magnitude of impact arising from the scheme and the scale at which those impacts occur is highlighted in Table 3-4 of Chapter 3 the Environmental Statement. Definitions of the terminology used within the table are detailed in Tables 4-26 and 4-27.

The criteria for establishing the degree of magnitude are defined in Table 4-26: Criteria for defining the magnitude of impacts on coastal processes. These activities have been assessed with regards to their potential to impact on coastal processes; namely, changes to nearshore wave climate, beach-sediment exchange (erosion and/or accretion) in the upper shore and sediment transport within the intertidal and nearshore zones.

The consequences of these impacts, defined as a sensitivity score, have been assessed with regards to the scale at which they naturally operate. The definition of the scale of sensitivity is provided in Table 4-27. The criteria defined in the tables below have been used in combination to determine the significance of the impact arising from the scheme proposals. Where the consequences of the changes in coastal processes would impact on specific environmental receptors of value (i.e.,

ecological receptors), these are addressed as secondary effects in the relevant section of the Environmental Statement.

Table 4-26: Criteria for defining the magnitude of impacts on coastal processes

Magnitude score	Criteria
Major	Major change in the magnitude of the process operating.
Moderate	Moderate change in the magnitude of the process operating.
Minor	Minor change in the magnitude of the process operating.
Negligible / No Change	No perceptible change in the magnitude of the process operating.

Table 4-27: Criteria for defining the sensitivity of coastal processes

Sensitivity score	Criteria
High	Coastal processes operating at the scale of PDZ18 (Isles of Scilly)
Medium	Coastal processes operating at the scale of MA43 (St. Martin's)/MA45 (Bryher)/MA46(St Agnes and Gugh)
Low	Coastal processes operating at the scale of the site or limited to the immediate nearshore zone

4.2 Potential Impacts & Significant Effects

Bryher

Great Popplestone

Construction impacts

Most of the works to raise the crest level of the existing sea wall and recharge the rock armour would be conducted above the Mean High-Water Spring (MHWS) tide level. All works requiring beach access would be conducted under dry conditions (i.e., when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the tide each day. Based on the low magnitude of disturbance, and the limited, local scale at which any impact will occur, the effect on the sediment regime is anticipated to be neutral **(Not Significant).**

It is proposed to use rock displaced by the 2014 storm from behind the existing wall (above MHWS) to recharge the armour in front of the wall. The movement of rock from behind the wall will not impact beach hydrodynamics as the area is above MHWS. Reusing existing material will avoid the need to store material on the sandy beach below MHWS and will negate the need for importing additional material sourced from elsewhere. This will provide benefits with regards a reduced carbon expenditure for the scheme. As a result, the low magnitude of the impact and the limited effect on the local hydrodynamic regime it is anticipated the consequence will be neutral **(Not Significant).**

The proposed relocation of the existing rock armour from the north of the bay to the south and subsequent defence construction will require vehicle movements along and

upon the beach. The movement of these vehicles is likely to produce tracks in the beach sands. The rate of beach material disturbance by the vehicles will be dependent on various factors, such as vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion, etc.). The movement of the vehicles on the beach will be along designated routes, thereby limiting the potential impact area and allowing continual visual monitoring. Based on the minor magnitude of the disturbance, and the low sensitivity of the scale at which coastal processes are impacted, the effect on the sediment regime is anticipated to be neutral **(Not Significant).**

Operational impacts

The footprint of the works is to be minimised, as improvements to the existing wall and armour are to be conducted rather than constructing new defences. The works are to be undertaken on a relatively small section of the bay in order to protect the Great Pool where the dunes are least resilient to storm impacts. Although the dune system across the bay is generally stable and resilient to more extreme events, the dunes to the south (in the vicinity of the site) are undergoing the fastest rates of erosion and are approximately 10m narrower than the dunes in the northern section of the site. The site is exposed to north-westerly swells and is vulnerable to future breach due to the incapacity of the dunes to naturally accrete and rollover in their confined location between the existing sea defence and the Great Pool.

Enhancing the hard structures in this location will reduce toe erosion of the dune system during extreme events but will also maintain the disconnection of the dunes from the beach, preventing natural accretion and rollover. However, the dunes are already narrowed and are likely to breach during a future storm event. The proposed works are likely to prevent the future breaching of the dunes as the potential for storm overtopping will be reduced, whilst they are unlikely to significantly increase the rate of dune narrowing. The slope of the rock armour is likely to be slightly increased as it is recharged with rock from behind the wall. However, this is unlikely to be a significant change from existing conditions. The proposed slope gradient will act to dissipate wave energy during storm events. As the proposed defence is an enhancement to an existing structure, the bay has already been modified and morphology of the beach has adjusted accordingly.

Additionally, the rock revetment is to be positioned above the intertidal zone, (the footprint of the design is located above MHWS) resulting in limited interaction with the structure during the tidal cycle. Therefore, the release of sediment from short-term scour of the beach is unlikely to be significant in volume. The coastal processes at this scale are of a low sensitivity and the magnitude of disturbance is not significant. It is considered that the proposed coastal defences will have Negligible impact **(Not Significant)** on the hydrodynamic regime and sediment dynamics at Great Popplestone.

Beach reprofiling following removal of rock armour from the northern revetment should be undertaken using existing beach sediment. Any proposal of sand redistribution from the adjacent dune system should be avoided in order to maintain the present dune morphology. Removal of sand from the established dune network is expected to have a detrimental impact on dune resilience against future rollback in response to climate change. Whilst beach reprofiling may, in the short-term, lower beach levels in the area this will assist in reinstating natural beach sedimentary processes. As reported in Section 4.2.4 the northern end of the bay is reportedly accreting sediment (between 2007 and 2020). This process is expected to continue, following the removal of the rock armour, helping to replenish any sediment losses. Over time, this may result in beach aggradation increasing resilience against future storm activity and having a favourable impact on natural flood defence. The removal of rock armour in the north will increase the level of connectivity between the beach

and dune. With increased sand deposition on the foreshore this may provide source material for the supply of wind-blown sands to the foredune system backing the beach thus providing opportunity for habitat stabilisation/resilience and increased biodiversity. It is considered that the proposed removal/relocation of rock armour will have a favourable, **Minor Impact** (not significant) on sedimentary processes.

Cross-beach transfer of sediment will not be impacted by the recharged revetment. Onshore/offshore movement of beach material by waves will only be impacted during extreme conditions and aeolian transport onto the dunes will be reduced, although this impact is anticipated to be minimal due to the existing stabilising presence of rubble revetment in the area. It is considered that the proposed defence will have **Negligible Impact** (Not significant) on the sediment regime within the area.

The proposed defence will reduce the potential for future breaching of the dunes to the south of Great Popplestone, which could result in contamination of the groundwater aquifer. Flood mapping with no intervention shows inundation of the low-lying land behind the sand/shingle ridge during the 1 in 100, 200 and 1000-year events in 2117. The proposed works will reduce these risks, whilst allowing seawater to drain seaward following any overtopping event. The processes impacted at this scale are medium sensitivity and the magnitude of the disturbance is medium. The works are anticipated to have a **Moderate Positive Effect** on flood risk during extreme events.

Great Porth (Great Par) North of Great Carn

Construction impacts

All works requiring beach access would be conducted under dry conditions (i.e., when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the tide each day. The rock revetment would be constructed from the toe to the crest in sections along its length so that the toe excavation can be backfilled with site won sand within a single tidal window (before the next incoming tide) to minimise the potential for mobilisation of construction materials or excavated materials. As the proposed toe of the revetment is above the Highest Astronomical Tide, the potential for sediment mobilisation during construction is of low magnitude and any impacts are expected to be of low sensitivity. Therefore, the construction of the rock revetment itself will have an effect that is deemed to be neutral **(Not Significant)** on the local sediment regime.

During construction, existing boulders will be used within the revetment, but additional rock will also be delivered to the beach by barge or land. The rock may be temporarily stored in the adjacent materials storage area or on the foreshore of the working area prior to installation. Existing rock rubble will be removed and placed in a designated area within the working area (such as the adjacent materials storage area) prior to re-use in the revetment or removal from site. The storage of the material could cause small-scale changes to current flows over and around the rock piles during extreme events, which could increase turbulence around the rock piles, resulting in increased localised sediment mobilisation on the lee side of the piles. The potential rate of erosion will depend on the current velocity, and will therefore be dependent on the tidal state, wave height and the duration that the piles remain on the beach. The proposed works are small-scale and coastal processes at this scale are low sensitivity - following removal of the rock pile, it is anticipated that the beach profile will return to its previous state. It is therefore considered that the temporary storage of rock material on the beach will have an effect that is deemed to be **Not Significant** on the local hydrodynamic and sediment regimes.

There is a limited risk that excavation during construction could mobilise beach sediment into the sea. The excavation will take place above HAT, generally reducing the potential for sediment mobilisation. The excavator will excavate a small section of the revetment toe trench within a tidal window. All arisings will be placed on a

dumper truck and then used as backfill along the revetment toe, within the same tidal window. This will reduce the potential for sediment mobilisation. A geotextile membrane will also underlie the rock armour, which will reduce erosion at the toe and base of the revetment and prevent leaching of underlying substrate. It is unlikely that significant volumes of sediment will be mobilised during construction and the processes are considered as low sensitivity; therefore, the effect on the sediment regime is anticipated to be **Not Significant.**

Vehicles will transport the rock across the beach to the revetment location ready for placing. The movement of these vehicles is likely to produce tracks in the beach sands. The rate of beach material disturbance by the vehicles will be dependent on various factors, such as vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion, etc.). The movement of the vehicles on the beach will be along designated routes, thereby limiting the potential impact area and allowing continual visual monitoring. Based on the minor magnitude of the disturbance, its localised nature, and the low sensitivity of the coastal processes, it is considered that the effect of the works on the sediment regime will be neutral **(Not Significant).**

Operational impacts

The placement of the rock armour will be undertaken on a relatively small section of the bay (70m), where erosion rates are at their highest. Rubble and boulders are already present in this section of the bay; therefore, the natural morphology of the beach has already been modified within the footprint of the proposed defence. The revetment crest level will be approximately 6m AOD and site won material will be used to tie the crest into the backing dunes. The revetment will have a 1:2 slope, which is similar to the existing ad-hoc defence. The shallow gradient of the revetment face is designed to dissipate wave energy and minimise wave reflection. This, as well as the existing presence of rubble and boulders at this high elevation in the tidal frame, should reduce the potential for the scour of beach material at the toe of the defence. Erosion of the backing dunes during overtopping events will be reduced by the placement of material in between the crest and the adjacent dunes, where they occur. This material will provide some frictional resistance to overtopping discharges and will be seeded to further raise the critical erosion threshold of the material. The coastal processes at this small scale are of low sensitivity. It is considered that the proposed coastal defences will have an effect on the hydrodynamic and sediment regime at Great Porth that is deemed to be neutral **(Not Significant).**

The proposed works will disconnect the face of the dunes from the beach by preventing cross-shore sediment transport, which will compromise the natural functioning of the dune system. The dune face is so severely eroded in the vicinity of the works that it now resembles a steep bank rather than a functioning dune face able to trap and retain sediment. Due to the position of the existing ad-hoc defence and adjacent infrastructure, particularly the local road between the dune and buildings, there is no potential for the beach crest to roll back and recover to become a natural dune system in this area. In the absence of defence improvement works, the dune face will further erode with future sea level rise, which will cause overtopping and breaching of the bank during storm events. Longshore processes will not be impacted by the proposed works. The coastal processes at this scale are of low sensitivity and the magnitude of the disturbance minor. It is considered that the proposed coastal defences will have an effect on the hydrodynamic regime and sediment dynamics at Great Porth that is deemed to be neutral **(Not Significant).**

The proposed works will increase the crest level of the defence, which will reduce the risk of overtopping which has formerly occurred in 2014. Overtopping of the defence could affect a range of assets, including saline intrusion into the Great Pool SSSI. The height of the formalised defence will prevent overtopping during a 1 in 200-year

event. A demountable storm barrier will be used to prevent the propagation of wave energy and flooding at the vehicle/boat access point. Therefore, it is not considered that the development proposals will cause any significant negative impact on flood risk. The processes impacted at this scale are of medium sensitivity and the magnitude of the disturbance medium. The works are anticipated to have a **Moderate Positive Effect** on flood risk during extreme events.

Stinking Porth

Construction impacts

All works requiring beach access would be conducted under dry conditions (i.e., when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the tide each day. The rock revetment would be constructed from the toe to the crest in sections along its length so that the toe excavation can be backfilled with site won sand within a single tidal window (before the next incoming tide) to minimise the potential for mobilisation of construction materials or excavated materials. As the proposed toe of the revetment is above the Highest Astronomical Tide, the potential for sediment mobilisation during construction and the magnitude and sensitivity of any impact is deemed to be low. Therefore, the construction of the rock revetment itself will have an effect that is considered neutral **(Not Significant)** on the local sediment regime.

During construction, existing boulders will be used within the revetment, but additional rock will also be delivered to the beach by barge or land. The rock may be temporarily stored on the foreshore of the working area prior to installation, or in the adjacent materials storage area. Existing rock rubble will be removed and placed in a designated area within the working area prior to re-use in the revetment or removal from site. The storage of the material could cause small-scale changes to current flows over and around the rock piles during extreme events, which could increase turbulence around the rock piles, resulting in increased localised sediment mobilisation on the lee side of the piles. The potential rate of erosion will depend on the current velocity, and will therefore be dependent on the tidal state, wave height and the duration that the piles remain on the beach. The impact of the proposed works on coastal processes are expected to be of low magnitude and at this scale are of low sensitivity; following removal of the rock pile, it is anticipated that the beach profile will return to its previous state. It is therefore considered that the temporary storage of rock material on the beach will have an effect that is considered to be neutral **(Not Significant)** on the local hydrodynamic and sediment regimes.

There is a limited risk that excavation during construction could mobilise beach sediment into the sea. The excavation will take place above HAT, generally reducing the potential for sediment mobilisation. The excavator will excavate a small section of the revetment toe trench within a tidal window. All arisings will be placed on a dumper truck and then used as backfill along the revetment toe, within the same tidal window. This will reduce the potential for sediment mobilisation. A geotextile membrane will also underlie the rock armour, which will reduce erosion at the toe and base of the revetment and prevent leaching of underlying substrate. It is unlikely that significant volumes of sediment will be mobilised during construction and the processes are considered as low sensitivity and the magnitude of disturbance minor; therefore, the effect on the sediment regime is anticipated to be neutral **(Not Significant).**

Vehicles will transport the rock across the beach to the revetment location ready for placing. The movement of these vehicles is likely to produce tracks in the beach sands. The rate of beach material disturbance by the vehicles will be dependent on various factors, such as vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion, etc.). The movement of the vehicles on the beach will be along designated routes,

thereby limiting the potential impact area and allowing continual visual monitoring. Based on the minor magnitude of the disturbance, its localised nature, and the low sensitivity of the coastal processes at this scale, it is considered that the works will have an effect on the sediment regime that is neutral **(Not Significant).**

Operational impacts

The placement of the rock armour will be undertaken on a relatively small section of the bay (55m), where the beach crest is low (<5.5m) and vulnerable to overtopping. The embankment is not a natural dune structure, as it consists of a mixture of cobbles, pebbles and boulders; therefore, measures to enhance dune accretion would not be effective at this location. The revetment crest level will be approximately 6.5mAOD and will be constructed above HAT; therefore, the revetment will only be inundated during extreme events. The revetment will have a 1:2 slope, which is similar to the existing embankment. The shallow gradient of the revetment face and the many varied angles the rock presents to incoming waves is designed to dissipate wave energy and minimise wave reflection. All of these factors, as well as the existing widespread presence of coarse material within the site, should reduce the potential for beach lowering at the toe of the defence. Erosion of the backing dunes during overtopping events will be reduced by the placement of material in between the crest and land on the leeside. This material will provide some frictional resistance to overtopping discharges and will be seeded to further raise the critical erosion threshold of the material. The impact on coastal processes at this small scale are of low magnitude and sensitivity. It is considered that the proposed coastal defences will have an effect on the hydrodynamic and sediment regime at Stinking Porth that is neutral **(Not Significant).**

The area where the rock armour is to be placed is already composed of a mixture of rock material, therefore, the defence will not significantly alter the composition of existing beach material. It is anticipated that with no intervention, cobble overwashing would continue to take place during extreme events, which would, over time, allow the beach crest to roll landwards, putting adjacent assets at risk of flooding from overtopping and breaching. Longshore processes will not be impacted by the proposed works. The impacts on coastal processes at this scale are deemed to be of low magnitude and sensitivity. It is therefore considered that the proposed coastal defences will have an effect on the hydrodynamic regime and sediment dynamics at Stinking Porth that is neutral **(Not Significant).**

The proposed works will increase the crest level of the defence, which will reduce the risk of overtopping which has formerly occurred in 2014. Overtopping of the defence could affect a range of assets, including saline intrusion into the Great Pool SSSI and flooding of coastal residences. The height of the formalised defence will prevent overtopping during a 1 in 200-year event. Therefore, it is not considered that the development proposals will cause any significant negative impact on flood risk. The processes impacted at this scale are of medium sensitivity and the disturbance is medium. The works are anticipated to have a **Moderate Positive Effect** on flood risk during extreme events.

Green Bay

Construction impacts

All works requiring beach access would be conducted under dry conditions (i.e., when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the tide each day. As the proposed toe of the revetment is above the Highest Astronomical Tide and excavation works are taking place on the beach crest, the potential for sediment mobilisation during construction and the magnitude and sensitivity of any associated impacts are

deemed to be low. Therefore, the construction of the raised embankment itself will have an effect on the local sediment regime that is neutral **(Not Significant).**

During construction, geobags will also be delivered to the beach by barge or land. The geobags may be temporarily stored on the foreshore of the working area prior to installation. The storage of the geobags could cause small-scale changes to current flows over and around the geobags during extreme events, which could increase turbulence around the rock piles, resulting in increased localised sediment mobilisation. The potential rate of erosion will depend on the current velocity, and will therefore be dependent on the tidal state, wave height and the duration that the piles remain on the beach. The impact of the proposed works on coastal processes are expected to be of a low magnitude and at this scale are of low sensitivity; following removal of the stored material, it is anticipated that the beach profile will return to its previous state. It is therefore considered that the temporary storage of rock material on the beach will have an effect on the local hydrodynamic and sediment regimes that is neutral **(Not Significant).**

There is a limited risk that excavation during construction could mobilise beach sediment into the sea. The excavation will take place above HAT, generally reducing the potential for sediment mobilisation. The excavator will excavate a small section of the embankment crest within a tidal window. All arisings will be used as backfill on top of the geobags to tie into existing land, within the same tidal window. This will reduce the potential for sediment mobilisation. A geotextile membrane will also underlie the geobags, which will reduce erosion at the toe and base of the crest and prevent leaching of underlying substrate. It is unlikely that significant volumes of sediment will be mobilised during construction and any impacts are considered to be of low magnitude and sensitivity. Therefore, the effect on the sediment regime is anticipated to be neutral **(Not Significant).**

Vehicles will transport the geobags across the beach to the revetment location ready for placing. The movement of these vehicles is likely to produce tracks in the beach sands. The rate of beach material disturbance by the vehicles will be dependent on various factors, such as vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion, etc.). The movement of the vehicles on the beach will be along designated routes, thereby limiting the potential impact area and allowing continual visual monitoring. Based on the low magnitude of the disturbance, its localised nature, and the low sensitivity of the coastal processes, it is considered that the works will have an effect on the sediment regime that is neutral **(Not Significant).**

Operational impacts

Raising the embankment crest will be undertaken on a relatively small section of the bay (20m), where the beach crest is low (<5.5m) and vulnerable to overtopping during storm surge events. The raised crest will only be inundated during extreme storm surge events and the gradient of the beach face will not be modified. The seaward face of the embankment will be backfilled and planted to increase its critical erosion threshold and reduce lowering of adjacent beach levels from erosion associated with storm wave reflection and run-up. Wave exposure is fairly limited within the site; therefore erosion of adjacent beach material poses a low risk. The impacts on coastal processes at this small scale are of low magnitude and sensitivity. It is considered that the proposed coastal defences will have an effect on the hydrodynamic and sediment regime at Green Bay that is neutral **(Not Significant).**

The proposed works will prevent erosion and steepening of the face of the cobble ridge. The existing embankment is not a functioning dune system and would not have the capability to accrete into an effective natural flood defence structure, as it is a highly modified structure due to historic advancing of the line. It is anticipated that with no intervention, overwashing would continue to take place during extreme

events due to the high permeability of the embankment. This could cause erosion to the existing embankment and potential future breach. The coastal processes at this scale are of low sensitivity and as the works are taking place in a highly modified location the magnitude of any impacts are expected to be low. It is considered that the proposed raised embankment will have an effect on the hydrodynamic regime and sediment dynamics at Green Bay that is neutral **(Not Significant).**

The proposed works will increase the crest level of the embankment, which will reduce the risk of overtopping which has formerly occurred in 2014. Overtopping of the defence could affect a range of assets and lead to potential future breach. The height of the formalised defence will prevent overtopping during a 1 in 200-year event. Therefore, it is not considered that the development proposals will cause any significant negative impact on flood risk. The processes impacted at this small scale are of medium sensitivity and the magnitude of disturbance is medium. The works are anticipated to have a **Moderate Positive Effect** on flood risk during extreme events.

Kitchen Porth

Construction impacts

The majority of the works to recharge the rock armour would be conducted above HAT. All works requiring beach access would be conducted under dry conditions (i.e., when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the tide each day. Based on the low magnitude of disturbance and the low sensitivity at a local scale, the effect on the sediment regime is anticipated to be neutral **(Not Significant).**

During construction, rock will also be delivered to the beach by barge or land. The rock may be temporarily stored on the foreshore of the working area prior to installation. The storage of the material could cause small-scale changes to current flows over and around the rock piles during extreme events, which could increase turbulence around the rock piles, resulting in increased localised sediment mobilisation on the lee side of the piles. The potential rate of erosion will depend on the current velocity, and will therefore be dependent on the tidal state, wave height and the duration that the piles remain on the beach. The impact of the proposed works on coastal processes are expected to be of low magnitude and at this local scale are of low sensitivity; following removal of the rock pile, it is anticipated that the beach profile will return to its previous state. It is therefore considered that the temporary storage of rock material on the beach will have an effect on the local hydrodynamic and sediment regimes that is neutral **(Not Significant).**

Vehicles may need to transport material across the beach to the recharge area. The movement of these vehicles is likely to produce tracks in the beach sands. The rate of beach material disturbance by the vehicles will be dependent on various factors, such as vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion, etc.). The movement of the vehicles on the beach will be along designated routes, thereby limiting the potential impact area and allowing continual visual monitoring. Based on the minor magnitude of the disturbance, its localised nature and the low sensitivity of the coastal processes considered, the effect on the sediment regime is anticipated to be neutral **(Not Significant).**

Operational impacts

The footprint of the works is minimal, as improvements to the existing ridge are to be conducted rather than constructing new defences. The works are to be undertaken on a relatively small section of the bay (25m) where the beach is most exposed to long period waves from the north. The beach crest within the site is undergoing the

most significant erosion across the beach. The full exposure of the site to northerly swells and the incapacity of the beach crest to naturally migrate landwards means that the existing embankment is vulnerable to increased future overtopping.

Placing rock in this location will reduce erosion of the Ram cliff during extreme events but will prevent natural morphological change and cross-beach transfer of sediment. However, the beach crest is already narrowing and a combination of natural and anthropogenic modification has caused it to be unable to naturally adapt and rollover in response to sea level rise. The proposed works are not increasing the crest height, slope angle or permeability of the existing crest face, in addition, the proposed works are well above HAT. Therefore, the risk of adjacent beach erosion is low. The coastal processes at this scale are of low sensitivity and the magnitude of disturbance is minor. It is considered that the proposed coastal defences will have an effect on the hydrodynamic regime and sediment dynamics at Kitchen Porth that is neutral **(Not Significant).**

The proposed defence will reduce the potential for overtopping of the beach crest. However, as the crest level is to remain at the same height as existing, and the permeability of the barrier is not decreasing, it is likely that the land behind the defence will remain vulnerable to overtopping during extreme events. The processes impacted at this small scale are of medium sensitivity and the magnitude of disturbance is minor. The works are anticipated to have a **Slight Positive Effect** on flood risk during extreme events.

St Agnes

Porth Killier Seawall

Construction impacts

The majority of the works to recharge the rock armour would be conducted around HAT. All works requiring beach access would be conducted under dry conditions (i.e., when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the tide each day. Based on the low sensitivity of coastal processes at this local scale and the low magnitude of any impact, the effect on the sediment regime is anticipated to be neutral **(Not Significant).**

During construction, cobbles and sand will be sourced from the beach where possible to provide additional scour protection for the toe of the defence and reduce the amount of additional rock that will need to be transported to and stored on the beach. Sediment re-distribution on the beach is anticipated to be small-scale, as only the toe of 10m of the retaining wall requires protection. Therefore, beach lowering and significant changes in beach morphology as a result of sediment re-distribution is not anticipated. Additional rock will be delivered to the beach by land. The rock may be temporarily stored on the foreshore of the working area prior to installation, or in the adjacent material storage area. If on the foreshore, the storage of the material could cause small-scale changes to current flows over and around the rock piles during extreme events, which could increase turbulence around the rock piles, resulting in increased localised sediment mobilisation on the lee side of the piles. The potential rate of erosion will depend on the current velocity, and will therefore be dependent on the tidal state, wave height and the duration that the piles remain on the beach. The impact of the proposed works on coastal processes are expected to be of low magnitude and at this local scale are of low sensitivity; following removal of the rock pile, it is anticipated that the beach profile will return to its previous state. It is therefore considered that the temporary storage of rock material on the beach will have an effect on the local hydrodynamic and sediment regimes that is **Not Significant.**

Vehicles may need to transport material across the beach to the recharge area. The movement of these vehicles is likely to produce tracks in the beach sands. The rate

of beach material disturbance by the vehicles will be dependent on various factors, such as vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion, etc.). The movement of the vehicles on the beach will be along designated routes, thereby limiting the potential impact area and allowing continual visual monitoring. Based on the minor magnitude of the disturbance, its localised nature and the low sensitivity of the coastal processes considered, the effect on the sediment regime is anticipated to be neutral **(Not Significant).**

Operational impacts

The footprint of the works is minimal, as improvements to the existing toe protection are to be conducted rather than constructing new defences. The works are to be undertaken on a relatively small section of the bay, where a 10m retaining wall is present. The majority of rock is to be placed within the existing footprint of the defence, so that the footprint of the defence is unlikely to be significantly extended and the morphology of the beach relatively unaltered.

Placing rock in this location will reduce beach lowering at the toe of the wall. The previous arrangement of cobbles was displaced by the 2014 storm and now requires additional rock to maintain and improve protection at the toe. Beach lowering is caused by increased wave reflection and increased run-up velocities in the vicinity of hard defences, particularly where the natural beach gradient is significantly altered. The additional rock will slightly increase the existing gradient of the beach to 1:2; therefore, there is some potential for beach lowering at the toe of the rock, particularly during extreme events. However, this risk is small in comparison with the high potential for wave reflection and resulting beach erosion risk caused by the existing vertical wall. Therefore, the recharged toe protection is expected to reduce the overall rate of beach lowering within the vicinity of the wall and should also reduce the risk of wall collapse. The coastal processes at this scale are of low sensitivity and the magnitude of disturbance is minimal. It is considered that the proposed coastal defences will have an effect on the hydrodynamic regime and sediment dynamics at Porth Killier Seawall that is neutral **(Not Significant).**

The proposed defence will reduce the potential for overtopping of the sea wall. The processes impacted at this local scale are of medium sensitivity and the magnitude of disturbance is considered to be medium. The works are anticipated to have a **Moderate Positive Effect** on flood risk during extreme events.

Porth Killier: Eastern End

Construction impacts

All works requiring beach access would be conducted under dry conditions (i.e., when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the tide each day. Although the toe of the revetment will be below MHWS, excavation will not be taking place at this lower elevation in the tidal frame, which minimises the potential for sediment mobilisation. The excavation will take place above HAT, generally reducing the potential for sediment mobilisation providing the recommended mitigation measures are adhered to. The excavator will excavate a small section of the trench within a tidal window. All arisings will be placed on a dumper truck and then used as backfill along the revetment toe, within the same tidal window. This will reduce the potential for sediment mobilisation. It is unlikely that significant volumes of sediment will be mobilised during construction, thus the impacts on coastal processes are considered to be of low magnitude and sensitivity. Therefore, any effect on the sediment regime is anticipated to be neutral **(Not Significant).**

During construction, cobbles and sand will be sourced from the beach where possible to provide additional scour protection for the toe of the defence and reduce the amount of additional rock that will need to be transported to and stored on the beach. Sediment re-distribution on the beach is anticipated to be small-scale; therefore, beach lowering and significant changes in beach morphology as a result of sediment re-distribution is not anticipated. Additional rock will be delivered to the beach by barge or land. The rock may be temporarily stored on the foreshore of the working area prior to installation, or in the adjacent materials storage area. The storage of the material on the foreshore could cause small-scale changes to current flows over and around the rock piles during extreme events, which could increase turbulence around the rock piles, resulting in increased localised sediment mobilisation on the lee side of the piles. The potential rate of erosion will depend on the current velocity, and will therefore be dependent on the tidal state, wave height and the duration that the piles remain on the beach. The impact of the proposed works on coastal processes are expected to be of low magnitude and at this scale are of low sensitivity; following removal of the rock pile, it is anticipated that the beach profile will return to its previous state. It is therefore considered that the temporary storage of rock material on the beach will have an effect on the local hydrodynamic and sediment regimes that is neutral **(Not significant).**

Vehicles will transport the rock across the beach to the revetment location ready for placing. The movement of these vehicles is likely to produce tracks in the beach sands. The rate of beach material disturbance by the vehicles will be dependent on various factors, such as vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion, etc.). The movement of the vehicles on the beach will be along designated routes, thereby limiting the potential impact area and allowing continual visual monitoring. Based on the low magnitude of the disturbance, its localised nature, and the low sensitivity of the coastal processes, it is considered that the works will have an effect on the sediment regime that is neutral **(Not significant).**

Operational impacts

The placement of the rock armour will be undertaken on a relatively small section of the bay, where the Ram cliff is at high erosion risk due to (a) its full exposure to diffracted waves from the north-east and (b) the soft, erodible geological nature of the deposits. The proposed revetment is to be placed on the upper beach face, tying in with the land behind. The beach face in this vicinity is composed primarily of cobbles and rocky outcrop. This will be replaced with a rock revetment; therefore, the natural beach morphology will not be significantly altered, particularly as the design incorporates the re-use of existing coarse beach material.

The proposed revetment would have a 1:2 slope, which is fairly similar to the average existing gradient and ties in with the existing beach profile on the lower section. The relatively gentle gradient and rough dissipative surface of the recharged cobbles should reduce wave reflection. Longshore processes will not be significantly impacted by the proposed works as the rock revetment will tie in with the adjacent rocky outcrop, with only cobbles and sand protruding slightly further into the intertidal zone, which may accrete further or be re-distributed. Therefore, the impact on coastal processes is considered to be of low magnitude and low sensitivity at this localised scale. Thus, the proposed coastal defences will have an effect on the hydrodynamic regime and sediment dynamics at Porth Killier that is neutral **(Not significant).**

The proposed works will reduce the risk of wave overtopping. The processes impacted at this scale are medium sensitivity and the magnitude of disturbance is minor. The works are anticipated to have a **Slight Positive Effect** on flood risk during extreme events.

Porth Coose

Construction impacts

The works to raise the crest level of the low dune would be conducted on the landward side of the dune; therefore there would be **No Significant Effect** on the hydrodynamic and sediment regime is anticipated during construction.

Operational impacts

Works are proposed on the crest and leeward side of the existing dune only; therefore, coastal processes will only be impacted during extreme events. Increasing the height of the crest with rock bags may increase wave reflection during extreme events, but the risk of beach lowering is minimal due to the existing presence of a concrete mattress.

The dunes are already modified in this location, which has most likely contributed to their weakening by reducing their ability to roll back and accrete naturally. Reinforcing the dune will reduce leeward erosion of the dune during extreme events. Recharging the leeward side of the dune and vegetating it may encourage the dune to accrete and further raise and broaden its profile. Therefore, the proposed works are likely to prevent the future breaching of the dune as the potential for storm overtopping will be reduced, whilst run-off velocities on the leeward side of the dune should also be dissipated by the improved profile and vegetated surface. The impact on coastal processes are considered to be of low magnitude and low sensitivity; consequently, it is considered that the proposed defence will have an effect on the hydrodynamic and sediment regime within the area that is neutral **(Not significant).**

Longshore transfer of sediment will not be impacted by the recharged revetment. Onshore/offshore movement of beach material by waves will only be impacted during extreme conditions. Although aeolian transport onto the dunes will be reduced, this impact is anticipated to be minimal due to the existing stabilising presence of a concrete mattress and rock armour in the area. Given the low magnitude and low sensitivity at this scale, it is considered that the proposed defence will have an effect on the sediment regime within the area that is neutral **(Not significant).**

The proposed defence will reduce the potential for future breaching of the modified dune ridge at Porth Coose, which could put assets such as the infrastructure and the Big Pool SSSI at risk. The proposed works will protect against a 1 in 200-year event. The processes impacted at this scale are of medium sensitivity and the magnitude of disturbance is medium. The works are anticipated to have a **Moderate Positive Effect** on flood risk during extreme events.

Periglis

Construction impacts

All works requiring beach access would be conducted under dry conditions (i.e., when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the astronomical tide. As the excavation will be taking place above the Highest Astronomical Tide, the potential for sediment mobilisation during construction is low. The proposed works to reinforce the dune would take place in sections along its length, so that excavated material can be backfilled on top of the geocontainers within a single tidal window (before the next incoming tide) to minimise the potential for mobilisation of construction materials or excavated materials. All arisings will be placed on a dumper truck and then used as backfill to reinstate the natural beach profile. The crest will be raised using local or imported fine sediment, which will be well above HAT; therefore, reducing the potential for sediment mobilisation It is unlikely that significant volumes of sediment will be mobilised during construction, therefore the magnitude of impact is low and

at this scale any impact is considered to be of low sensitivity. Subsequently, **No Significant Effect** on the sediment regime is anticipated (neutral).

During construction, fine sediment for the crest recharge and geocontainers will be delivered to the beach by land: filled, or to be filled on site with local material. The recharge sediment will not be stored on the foreshore to reduce the potential of sediment mobilisation. The geocontainers may be temporarily stored on the foreshore of the working area prior to installation. The storage of the material could cause small-scale changes to current flows over and around the geocontainers during extreme events, which could increase turbulence around the geocontainers, resulting in increased localised sediment mobilisation on the lee side of the geocontainers. The potential rate of erosion will depend on the current velocity, and will therefore be dependent on the tidal state, wave height and the duration that the geocontainers remain on the beach. The impact of the proposed works on coastal processes are expected to be of low magnitude and at this scale are of low sensitivity; following removal of the geocontainers, it is anticipated that the beach profile will return to its previous state. It is therefore considered that the temporary storage of geocontainers on the beach will have an effect on the local hydrodynamic and sediment regimes that is neutral **(Not significant).**

Vehicles will transport the recharge material and geocontainers across the beach to the works location ready for placing. The movement of these vehicles is likely to produce tracks in the beach sands. The rate of beach material disturbance by the vehicles will be dependent on various factors, such as vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion, etc.). The movement of the vehicles on the beach will be along designated routes, thereby limiting the potential impact area and allowing continual visual monitoring. Based on the low magnitude of the disturbance, its localised nature, and the low sensitivity of the coastal processes, it is considered that the works will have an effect on the sediment regime that is neutral **(Not significant).**

Operational impacts

The dunes are already modified in this location, after works in 1996 to raise the height of the embankment and the placement of bulk bags in 2014. Although the general trend of the foredunes is erosional, due to the low and narrow crest height and vulnerability to breaching, there have been some signs of accretion on the dune face and recovery since 2014. The proposed works intend to re-profile and recharge the dunes into a profile that is naturally more robust and resilient to extreme wave conditions, which should enhance the recovery of the dunes.

The height of the crest will be increased to +7.5m, in line with broadening the crest to a minimum of 4m. Increasing the height of the crest has the potential to increase wave reflection and adjacent beach erosion during extreme events. However, the crest is designed to continue the existing profile of the lower dune; therefore, the risk of adjacent beach lowering is reduced due to matching to the naturally-adjusted sloping profile. The natural beach gradient on the dune face will be reinstated with excavated material following placement of the geocontainers. It is not therefore anticipated that the works will cause adjacent beach lowering. The loose sediment will be mobile, but as the dune face is currently unvegetated, this will reinstate the status quo. Over time, it is likely that the dune face will continue along its current trajectory of progressive accretion.

The gradient of the leeward slope will be restored to no steeper than 1:3; this, alongside sediment recharge and vegetation planting, will reduce overtopping velocities during extreme events. It is not anticipated that the proposed works will impact longshore or cross-shore sediment transport. The impact on coastal processes is deemed to be of low magnitude and at this small scale be of low sensitivity. It is

considered that the proposed coastal defences will have an effect on the hydrodynamic and sediment regime at Periglis that is neutral **(Not significant).**

The proposed works will increase the crest level of the defence, which will reduce the risk of overtopping which has formerly occurred in 2014 and other years. The height of the crest will prevent overtopping during a 1 in 200-year event. Therefore, it is not considered that the proposals will cause any significant negative impact on flood risk. The processes impacted at this scale are medium sensitivity and the magnitude of disturbance is minor. The works are anticipated to have a **Moderate Positive Effect** on flood risk during extreme events.

St Martin's

Lower Town

Construction impacts

All works requiring beach access would be conducted under dry conditions (i.e., when tide levels expose the work areas). The length of the tidal cycle and therefore the working window would vary depending on the level of the astronomical tide. As the excavation will be taking place above the Highest Astronomical Tide, the potential for sediment mobilisation during construction is low. It is unlikely that significant volumes of sediment will be mobilised during construction therefore the magnitude of any impacts on coastal processes is expected to be low and at this scale be of low sensitivity Subsequently, the effect on the sediment regime is anticipated to be neutral **(Not significant).**

Vehicles will transport the fencing and erosion protection matting across the beach/through the dunes to the works location ready for placing. The movement of these vehicles is likely to produce tracks in the beach sands. The rate of beach material disturbance by the vehicles will be dependent on various factors, such as vehicle type, drive type (tracked or wheeled), track/wheel type and dimensions, weight of vehicle (including loads), friction angle between wheels/tracks and the beach and the nature of the sediment (cohesion and adhesion, etc.). The movement of the vehicles on the beach will be along designated routes, thereby limiting the potential impact area and allowing continual visual monitoring. Based on the low magnitude of the disturbance, its localised nature, and the low sensitivity of the coastal processes, it is considered that the works will have an effect on the sediment regime that is neutral **(Not significant).**

Operational impacts

The dunes are showing signs of erosion on this 80m section, whilst the general condition of the dune system on St. Martin's is showing fairly good signs of recovery after the 2014 storm. The erosion is predominantly caused by human access; therefore, the proposed works intend to limit access and enhance the natural recovery of the dunes in this location.

The fencing is to be installed well above HAT; therefore, its direct impact on coastal processes is limited to impacts on the dunes. The fencing may be subject to wave attack during extreme events, but its semi-permeable nature reduces the likelihood of erosion around the fence line. The infrequency of these more extreme events should allow windblown sand to successfully accumulate and contribute to the growth and stability of the foredunes. As a result, the dune profile will over time become naturally more robust and resilient to extreme wave conditions.

47m^2 erosion protection matting will be installed through the cross section of the dune. Although the access point reduces the geomorphological and ecological connectivity of the foredunes, installing matting will prevent further erosion and lowering of the crest in a location that is regularly used for public access. During extreme events, waves are likely to run-up the access point. However, the velocity

of the waves is unlikely to be significantly impacted by the erosion protection matting, as the existing beach gradient will be maintained and the matting is semi-permeable, with its open grid surfacing to be filled with sand, in keeping with the natural dune and beach morphology. Therefore the impact on coastal processes is deemed to be of low magnitude and at this small scale, be of low sensitivity. It is considered that the proposed coastal defences will have an effect on the hydrodynamic and sediment regime at Lower Town that is neutral **(Not significant).**

Sustainable management of the dune areas most vulnerable to erosion (such as at Lower Town) will provide continued flood protection to important assets on St. Martin's beyond the 25-year design life of the works. However, the dunes may still be eroded and overtopped during extreme events, such as that seen in 2014. It is not considered that the proposals will cause any significant negative impact on flood risk. The processes impacted at this scale are of medium sensitivity and the magnitude of disturbance is minor. The works are anticipated to have a **Slight Positive Effect** on flood risk during extreme events.

4.3 Cumulative effects

No cumulative effects are anticipated on any of the islands from the proposed works at the different locations. The works are all small-scale, localised and will cause no major obstruction to longshore sediment supply. Therefore, at each site no impacts are anticipated outside of the nearshore zone. There are no planned coastal developments that could interact with the impacts on coastal processes.

4.4 Mitigation Measures

The following measures apply for all sites:

Potential coastal process impacts would be mitigated through the adoption of good construction practices. As much work as possible will be non-tidal (i.e. undertaken above MHWS or during periods that allow for dry working), and all intertidal work will cease 1.5 hours prior to the anticipated high tide time. These practices will eliminate the potential for excavation operations introducing sediment into the water column.

All tidal work schedules will be assessed two weeks in advance of the works. Works will also cease during storm events, where the beach is facing the predominant wind/wave direction. These practices will again assist in reducing the amount of material available for entrainment within the water column.

Great Popplestone

Construction traffic pathways on the beach will be periodically visually assessed and beach levels reinstated if significant lowering and compaction is observed. This will assist in maintaining the natural profile of the beach.

The slope of the recharged rock armour must be maintained at a gentle, dissipative gradient, as similar to existing conditions as possible, to reduce the risk of local scour of beach material.

Great Porth (Great Par) North of Great Carn

The presence of any rock storage areas on the foreshore will be limited to the construction period only. The potential storage area must be located as high as possible in the tidal range, preferably above MHWS. Beach levels around the rock storage area will be visually monitored and reinstated if necessary. Any areas of erosion evident following the removal of the rock storage area will be reinstated using any excess excavated material.

Similarly, construction traffic pathways on the beach will be periodically assessed and beach levels reinstated using the excavated material. This will assist in maintaining the natural profile of the beach.

Beach level surveys will be undertaken at the same time of the year at least bi-annually to identify changes. If changes are taking place, further coastal works may be necessary to remediate these impacts.

Stinking Porth

The presence of any rock storage areas on the foreshore will be limited to the construction period only. The potential storage area must be located as high as possible in the tidal range, preferably above MHWS. Beach levels around the rock storage area will be visually monitored and reinstated if necessary. Any areas of erosion evident following the removal of the rock storage area will be reinstated using any excess excavated material.

Similarly, construction traffic pathways on the beach will be periodically assessed and beach levels reinstated using the excavated material. This will assist in maintaining the natural profile of the beach.

Beach level surveys will be undertaken at the same time of the year at least bi-annually to identify changes. If changes are taking place, further coastal works may be necessary to remediate these impacts.

Green Bay

The presence of any geobag storage areas on the foreshore will be limited to the construction period only. The potential storage area must be located as high as possible in the tidal range, preferably above MHWS. Beach levels around the geobag storage area will be visually monitored and reinstated if necessary. Any areas of erosion evident following the removal of the geobag storage area will be reinstated using any excess excavated material. Excavated material from the beach crest should not be stored on the beach.

Similarly, construction traffic pathways on the beach will be periodically assessed and beach levels reinstated using the excavated material. This will assist in maintaining the natural profile of the beach.

Kitchen Porth

The presence of any rock storage areas on the foreshore must be limited to the construction period only. The potential storage area will be located as high as possible in the tidal range, preferably above MHWS. Beach levels around the rock storage area will be visually monitored and reinstated if necessary. Any areas of erosion evident following the removal of the rock storage area will be reinstated using any excess excavated material.

Similarly, construction traffic pathways on the beach will be periodically assessed and beach levels reinstated using the excavated material. This will assist in maintaining the natural profile of the beach.

Porth Killier

The presence of any rock storage areas on the foreshore will be limited to the construction period only. The potential storage area must be located as high as possible in the tidal range, preferably above MHWS. Beach levels around the rock storage area will be visually monitored and reinstated if necessary. Any areas of erosion evident following the removal of the rock storage area will be reinstated using any excess excavated material.

Cobbles and sediment will be taken from across the entire longshore profile of the beach to reduce depleting specific areas of sediment. This will assist in maintaining the natural profile of the beach.

Similarly, construction traffic pathways on the beach will be periodically assessed and beach levels reinstated using the excavated material. This will assist in maintaining the natural profile of the beach.

Beach level surveys will be undertaken at the same time of the year at least bi-annually to identify changes. If changes are taking place, further coastal works may be necessary to remediate these impacts.

Porth Coose

N/A

Periglis

The presence of any storage areas on the foreshore will be limited to the construction period only. The potential storage area will be located as high as possible in the tidal range, preferably above MHWS. Fine sediment will not be stored on the foreshore, to prevent sediment mobilisation. Beach levels around the storage area will be visually monitored and reinstated if necessary. Any areas of erosion evident following the removal of the storage area will be reinstated using any excess excavated material.

Similarly, construction traffic pathways on the beach will be periodically assessed and beach levels reinstated using the excavated material. This will assist in maintaining the natural profile of the beach.

Beach level surveys will be undertaken at the same time of the year at least bi-annually to identify changes. If changes are taking place, further coastal works may be necessary to remediate these impacts.

Lower Town

Construction traffic pathways on the beach will be periodically assessed and beach levels reinstated using the excavated material. This will assist in maintaining the natural profile of the beach.

Beach level surveys will be undertaken at the same time of the year at least bi-annually to identify changes. If changes are taking place, further coastal works may be necessary to remediate these impacts.

4.3 Residual Effects

Bryher

Great Popplestone

No significant effects on coastal processes are predicted, whilst any impacts on beach habitat, including damage and disturbance during construction, would be temporary in nature and therefore not significant. The proposed works are likely to have a **positive effect** on flood risk.

Great Par (Great Par) North of Great Carn

The proposals are considered to have **no significant residual effect** on coastal processes and geomorphology. Any alterations to the hydrodynamic and sediment regime during construction and operation are considered to be negligible, whilst the mitigation measures detailed above will reduce these potential risks further. There is predicted to be **no significant effect** on the sediment budget or on beach morphology. The proposed works are likely to have a **positive effect** on flood risk.

Stinking Porth

The proposals are considered to have No Significant Residual Effect on coastal processes and geomorphology. Any alterations to the hydrodynamic and sediment regime during construction and operation are considered to be negligible, whilst the mitigation measures detailed above will reduce these potential risks further. There is predicted to be **no significant effect** on the sediment budget or on beach morphology. The proposed works are likely to have a **positive effect** on flood risk.

Green Bay

The proposals are considered to have No Significant Residual Effect on coastal processes and geomorphology. Any alterations to the hydrodynamic and sediment regime during construction and operation are considered to be negligible, whilst the mitigation measures detailed above will reduce these potential risks further. There is predicted to be **no significant effect** on the sediment budget or on beach morphology. The proposed works are likely to have a **positive effect** on flood risk.

Kitchen Porth

The proposals are considered to have No Significant Residual Effect on coastal processes and geomorphology. Any alterations to the hydrodynamic and sediment regime during construction and operation are considered to be negligible, whilst the mitigation measures detailed above will reduce these potential risks further. There is predicted to be **no significant effect** on the sediment budget or on beach morphology. The proposed works are likely to have a **positive effect** on flood risk.

St Agnes

Porth Killier

The proposals are considered to have No Significant Residual Effect on coastal processes and geomorphology. Any alterations to the hydrodynamic and sediment regime during construction and operation are considered to be negligible, whilst the mitigation measures detailed above will reduce these potential risks further. There is predicted to be **no significant effect** on the sediment budget or on beach morphology. The proposed works are likely to have a **positive effect** on flood risk.

Porth Coose

N/A

Periglis

The proposals are considered to have No Significant Residual Effect on coastal processes and geomorphology. Any alterations to the hydrodynamic and sediment regime during construction and operation are considered to be negligible, whilst the mitigation measures detailed above will reduce these potential risks further. There is predicted to be **no significant effect** on the sediment budget or on beach morphology. The proposed works are likely to have a **positive effect** on flood risk.

St Martin's

Lower Town Beach

The proposals are considered to have No Significant Residual Effect on coastal processes and geomorphology. Any alterations to the hydrodynamic and sediment regime during construction and operation are considered to be negligible, due to the nature-based approach of the design. There is predicted to be **no significant effect** on the sediment budget or beach morphology. The proposed works are likely to have a **positive effect** on flood risk.

5 Biodiversity and Nature Conservation

5.1 Introduction

This chapter is structured with the key headings recommended in the Chartered Institute of Ecological and Environmental Management (CIEEM) guidelines on Ecological Impact Appraisal (EcIA).

EcIA is a process of identifying, quantifying and evaluating the potential effects of development-related or other proposed actions on habitats, species and ecosystems. EcIA can be used for the appraisal of projects of any scale: it is a systematic, repeatable process applicable to a wide range of projects.

5.2 Methods

5.2.1 Desk-based assessment

A desk-based study was undertaken to collate information on statutory and non-statutory conservation sites located within the Isles of Scilly where a pathway to a potential impact could be identified. Records of species that are afforded legal protection or are otherwise of nature conservation importance within this area. Information has also been sought on Habitats and Species of Principal Importance as detailed in section 41 of the Natural Environment and Rural Communities (NERC) Act (2006) and other notable species within the study area e.g. local Biodiversity Action Plan (BAP) habitats and species.

Data for the desk-based study were collected from the following sources:

- Multi-agency Geographical Information Centre (MAGIC) website;
- Natural England's website;
- The Environmental Records Centre for Cornwall and the Isles of Scilly (ERCCIS); and
- EMODnet – European Marine Observation Data Network (EMODnet) Seabed Habitats project

5.3 Baseline Conditions

5.3.1 Desk based study results

Statutory designated sites

A number of statutory designated sites are located within close proximity to the proposed work sites, with several of the designations overlapping. The statutory sites are as follows;

- Isles of Scilly Special Protection Area (SPA)
- Isles of Scilly Complex Special Area of Conservation (SAC)
- Isles of Scilly Ramsar site
- Isles of Scilly Marine Conservation Zone (MCZ), particularly sections:
  - Plympton to Spanish Ledge MCZ (St Agnes)
  - Smith Sound Tide Swept Channel MCZ (St Agnes)
  - Hanjague to Deep Ledge MCZ (St Martin's)
  - Higher Town MCZ (St Martin's)
  - Tean MCZ (St Martin's)
  - Men a Vaur to White Islands MCZ (St Martin's)
  - Lower Ridge to Innisvouls MCZ (St Martin's)

St Agnes

- Big Pool and Browarth Point Site of Special Scientific Interest (SSSI)
- Wingletang Down SSSI
- Gugh SSSI

Bryher

- Shipman Head and Shipman Down SSSI
- Pool of Bryher & Popplestone Bank SSSI
- Rushy Bay & Heathy Hill SSSI

St Martin's

- Chapel Down SSSI
- St Martin's Sedimentary Shore SSSI
- Porth Seal SSSI
- Tean SSSI
- Plains and Great Bay SSSI

The following site descriptions were compiled using Natura 2000 Site Synopsis, Standard Data Form and draft generic conservation objectives available from Natural England and the JNCC, as well as other readily accessible internet resources concerning the nature and wildlife value of the sites.

Isles of Scilly SPA and Ramsar site

The proposed work sites are located within the Isles of Scilly SPA and Ramsar site. The SPA and Ramsar cover the archipelago of the low-lying granite islands and rocks of the Isles of Scilly. The islands included within the SPA support a breeding seabird assemblage of European importance. The isolated nature of the islands, along with their low levels of disturbance, makes them suitable for nesting seabirds such as Storm Petrel *Hydrobates pelagicus* and Lesser Black-backed Gull *Larus fuscus*. The SPA boundary encompasses both areas used for nesting, and the surrounding marine environment.

The site qualifies for SPA designation by supporting populations of European importance of the following Annex I species from the Birds Directive (Directive 2009/147/EC on the Conservation of Wild Birds) during the breeding season:

- Storm Petrel
- Lesser Black-backed Gull

In addition, the area qualifies for SPA designation under Article 4.2 of the Directive by regularly supporting at least 20,000 seabirds during the breeding season, including Great Black-backed Gull *Larus marinus*, Shag *Phalacrocorax aristotelis*, Lesser Black-backed Gull and Storm Petrel.

The site qualifies for Ramsar designation under Ramsar criterion 6; species/populations occurring at levels of international importance. Qualifying species/populations (as identified at designation) are:

- **Species regularly supported during the breeding season:**
  - European Storm Petrel, World – 71 apparently occupied sites, representing an average of 0.2% of the GB population (Seabird 2000 Census)
  - Lesser Black-backed Gull *Larus fuscus graellsii*, W Europe/Mediterranean/W Africa - 3603 apparently occupied nests, representing an average of 2.4% of the breeding population (Seabird 2000 Census).

Species/populations identified subsequent to designation for possible future consideration under criterion 6 include:

Species regularly supported during the breeding season:

- European Shag *Phalacrocorax aristotelis aristotelis*, Coastal N Europe 1091 apparently occupied nests, representing an average of 1.3% of the breeding population (Seabird 2000 Census)

Impacts for these designated sites will be considered further for the proposed works at all the work sites.

Isles of Scilly Complex SAC

All work sites are located adjacent to the Isles of Scilly Complex SAC, which comprises 75% marine areas and sea inlets, 20% tidal rivers, estuaries, mudflats, sandflats and lagoons (including saltwork basins) and 5% shingle, sea cliffs and islets. Annex I habitats under the Habitat Regulations that are a primary reason for the selection of this SAC are:

- Sandbanks which area slightly covered by sea water all the time
- Mudflats and sandflats not covered by seawater at low tide
- Reefs

Annex II species that are a primary reason for selection of this site are:

- Shore dock *Rumex rupestris*

Annex II species present as a qualifying feature, but not a primary reason for site selection are:

- Grey seal *Halichoerus grypus*

Impacts for this designated site will be considered further for the proposed works at all work sites. No works will take place within the SAC boundary, however, indirect impacts to the SAC features will be considered. Shore Dock was not recorded during the site surveys and has not been recorded on any of the islands where works will take place. Therefore, impacts to this species will not be considered.

Isles of Scilly MCZ

Connected to the three islands where works are proposed are seven of eleven areas that make up the Isles of Scilly MCZ. This is a collection of inshore sites covering a total of over 30km^2. These sites display a broad range of physical conditions that support a high diversity of habitats and species.

The area from **Plympton to Spanish Ledge MCZ** (St Agnes) is designated for 5 main features. These are:

- high energy intertidal rock
- intertidal sand and muddy sand
- intertidal underboulder communities
- moderate energy intertidal rock
- UK priority species Pink Sea Fan *Eunicella verrucos,* Sunset Cup Coral *Leptopsammia pruvoti,* Devonshire Cup Coral Caryophyllia smithii, and Spiny Lobster Palinurus *elephas.*

The **Smith Sound Tide Swept Channel area of the MCZ** (St Agnes) protects a large area of high energy intertidal rock on the west coast of St Agnes, and supports a number of important species for conservation. Its designated features are:

- high energy intertidal rock
- moderate energy intertidal rock
- UK priority species Pink Sea Fan, Sea Fan Anemones *Amphianthus dorhni,* Stalked Jellyfish *Calvadosia cruxmelitensis,* and Spiny Lobster.

The rocky reefs support mixed kelp forests which are colonised by a mix of algal species, encrusting sponges and jewel anemones. Other notably important species include Burgundy Maerl Paint Weed *Cruoria cruoriaeformis*. The MCZ also supports Giant Goby *Gobius cobitis* (schedule 5 WCA 1981).

The **Hanjague to Deep Ledge area of the MCZ** (St Martin's) supports a wide range of intertidal habitats, as well as UK priority species. The designated features of the Hanjague to Deep Ledge MCZ are:

- high energy intertidal rock
- intertidal coarse sediment
- intertidal under boulder communities
- moderate energy intertidal rock
- UK priority species Pink Sea Fan, Sea Fan Anemones, Sunset Cup Coral and Spiny Lobster.

The deeper water section of the MCZ has reefs with fragile sponge and anthozoan communities, including Plumose Anemones *Metridium senile*, Jewel Anemones *Corynactis viridis* and Ross Coral *Pentapora foliacea*. Rocky reefs support mixed kelp forests and in deeper water are colonised by a mix of algal species, encrusting sponges and jewel anemones. Other notably important species include Burgundy Maerl Paint Weed.

The **Higher Town area of the MCZ** (St Martin's) is designated for the following features:

- intertidal coarse sediment
- intertidal sand and muddy sand
- intertidal under boulder communities
- low energy intertidal rock
- moderate energy intertidal rock
- UK priority species stalked jellyfish species *Haliclystus auricula, Calvadosia campanulate,* and *Calvadosia cruxmelitensis*

The **Teän area of the MCZ** (St Martin's) is designated for the following features:

- intertidal coarse sediment
- intertidal sand and muddy sand
- intertidal under boulder communities
- moderate energy intertidal rock.
- UK priority species Stalked Jellyfish *Haliclystus auricula*

The site has diverse intertidal habitat, offshore rocky reefs provide habitat for sponge and anthozoan communities, and large seagrass beds provide habitat for stalked jellyfish and numerous fishes. Substrate areas support diverse fauna, such as the Red Speckled Anemone *Anthopleura ballii* and Glaucous Limpet Anemone *Anthopleura thalli*.

The area from **Men a Vaur to White Islands MCZ** (St Martin's) is designated for six main features. These are:

- intertidal coarse sediment
- intertidal sand and muddy sand
- moderate energy intertidal rock
- intertidal under boulder communities
- high energy intertidal rock

- Rare and UK priority species Spiny Lobster, Pink Sea Fan, Sea Fan Anemones, and stalked jellyfish species *Haliclystus auricula* and *Calvadosia campanulate.*

The MCZ also supports Giant Goby (schedule 5 W&CA 1981).

The area from **Lower Ridge to Innisvouls MCZ** (St Martin's) is designated for two main features. These are:

- moderate energy intertidal rock
- UK priority species Spiny Lobster, Pink Sea Fan, Sea Fan Anemones, and Sunset Cup Coral.

The site also has sponge, anthozoan and bryozoan communities on rocky reefs, as well as seagrass beds and tide swept channels. The MCZ has dense kelp forests.

Big Pool & Browarth Point SSSI

Big Pool and Browarth Point SSSI is located at the north of St Agnes island and encompasses the work sites of Periglis Beach (site 48, 49), Porth Coose (site 50), and Porth Killier (site 51).

The designated features of the SSSI are its species rich wet grassland, which supports communities of flowering plants, including the nationally rare species Early Meadow-grass *Poa infirma*. The site also supports breeding populations of Ringed plover *Charadrius hiaticula*, Mallard *Anas platyrhynchos*, Coot *Fulica atra* and Moorhen *Gallinula chloropus*. The site is an important feeding site for birds on passage and supports small flocks of wintering wildfowl such as Wigeon *Anas penelope* and Pochard *Aythya ferina*.

Impacts for this designated site will be considered further for the proposed works at Periglis Beach (site 48, 49), Porth Coose (site 50), and Porth Killier (site 51).

Wingletang Down SSSI

Wingletang Down SSSI is located at the south of St Agnes, approximately 500m south of the St Agnes work sites (Periglis Beach, Porth Coose, and Porth Killier). These downs form an extensive area of low lying, maritime 'waved' heathland, dune grassland and rocky coast on the south side of St Agnes. It is a designated SSSI for its communities of flowering plants. In particular, these downs support Least Adder's Tongue *Ophioglossum lusitanicum* (protected under Schedule 8 of the Wildlife and Countryside Act 1981), Orange Bird's-foot *Ornithopus pinnatus* (nationally rare), Bristle Clubrush *Scirpus setaceus* (locally rare), Sea-milkwort *Glaux maritima* (locally rare), and Early Meadow-grass (nationally rare). The SSSI also supports breeding populations of Ringed Plover, Herring Gull *Larus argentatus*, and Storm Petrel.

Given the scale of the works and the distance to this site it is not considered that there will be an impact upon the SSSI and it is not considered further.

Gugh SSSI

Gugh SSSI is a small, inhabited island connected to the east side of St Agnes by a tombolo. It is located approximately 400m to the east of the Porth Killier work site. Its designated features include its wind pruned, 'waved' maritime heathland, maritime grassland, and dune grassland habitats that dominate the area. Notable species that Gugh SSSI supports include Orange Bird's-foot (nationally rare), Viper's-bugloss *Echium vulgare* (the only Scilly record), Balm-leaved Figwort *Scrophularia scorodonia* (nationally rare), and Early Meadow-grass (nationally rare). The low-lying heathland provides habitat for rare lichen species *Lobaria pulmonaria* and *Teloschistes flavicans*.

The site also supports breeding populations of Common Tern *Sterna hirundo*, Herring Gull, Great Black-backed Gull, Ringed Plover, and Storm Petrel. The only remaining colony of Kittiwakes *Rissa tridactylain* on the archipelago is present within Gugh SSSI (Isles of Scilly Wildlife Trust).

Given the scale of the works and the distance to this site it is not considered that there will be an impact upon the SSSI and it is not considered further.

Shipman Head and Shipman Down SSSI

Shipman Head and Shipman Down SSSI is located at the north of Bryher and is north of the work sites on Bryher. The closest work site is Great Popplestone, which lies approximately 200m to the south. Its designated features include its 'waved' maritime heathland, an important habitat for several rare lichen species, and maritime grassland. The site supports nationally rare Orange Bird's-foot. It also supports populations of the protected lichen species (schedule 8, Wildlife and Countryside Act 1981) Ciliate Strap-Lichen *Heterodermia leucomela*, Coralloid Rosette-Lichen *Heterodermia japonica*, and Golden Hair Lichen *Telocschistes flavicans*.

The site is also an important seabird colony, supporting populations of Herring Gull, Great Black-backed Gull, Lesser Black-backed Gull , Razorbill *Alca torda,* Shag, Storm Petrel , and Ringed Plover. At the time of designation, the SSSI also supported breeding populations of Kittiwake. Since then, kittiwakes have experienced decline on the Isles of Scilly and the only remaining colony of Kittiwake present on the archipelago is within Gugh SSSI, on St Agnes (Isles of Scilly Wildlife Trust).

Impacts for this designated site will be considered further for the proposed works at Great Popplestone, Great Porth North of Great Carn, Green Bay, Stinking Porth, Kitchen Porth.

Pool of Bryher & Popplestone Bank SSSI

Pool of Bryher and Popplestone Bank SSSI is located on the west side of Bryher, and encompasses work sites at Great Popplestone, Popplestone South, and Great Porth North. It lies directly adjacent to the work site at Stinking Porth. Its designated features include its brackish lagoon, the only true one within the Isles of Scilly. The site also supports the nationally rare species Early Meadow-grass within its dunes behind the storm beach.

Impacts for this designated site will be considered further for the proposed works at Great Popplestone, Great Porth North of Great Carn, Green Bay, Stinking Porth, and Kitchen Porth work sites.

Rushy Bay & Heathy Hill SSSI

Rushy Bay and Heathy Hill SSSI is located at the southern and south-western tip of Bryher adjacent to the Great Porth (Great Par) North of Great Carn work site. Its designated features include its populations of rare plant species within its dune grassland, and 'waved' heathland. The site supports notable plant species Dwarf Pansy *Viola kitaibeliana* (grows only on Scilly within the UK), nationally rare Orange Bird's-foot, and nationally scarce Sea Spurge *Euphorbia paralias*.

Impacts for this designated site will be considered further for the proposed works at Great Popplestone, Great Porth North of Great Carn, Green Bay, Stinking Porth, and Kitchen Porth work sites.

Chapel Down SSSI

Chapel Down is located at the south easterly end of St Martin's. It is located 2km south-east of the Lower Town Beach work site. Its designated features include its 'waved' maritime heathland, breeding bird colonies, and rare plant species populations. The granite rocks provide habitat for *Roccella fuciformis*, a rare maritime lichen species. The site supports breeding populations of Fulmar *Fulmarus glacialis,* Herring Gull and Lesser Black-backed Gull. The site also supports the notable plant species Orange Bird's foot (nationally rare), Hairy Bird's-foot-trefoil *Lotus subuliflorus* and Pignut *Conopodium majus*. At the time of designation, the SSSI also supported breeding populations of Kittiwake. Since then, kittiwakes have experienced decline on the Isles of Scilly and the only remaining colony of Kittiwake present on the archipelago is within Gugh SSSI on St Agnes (Isles of Scilly Wildlife Trust).

Given the scale of the works and the distance to this site it is not considered that there will be an impact upon the SSSI and it is not considered further.

St Martin's Sedimentary Shore SSSI

St Martin's Sedimentary Shore runs along the eastern shore of St Martin's. The northern edge of this SSSI lies adjacent to the Lower Town Beach work site. The SSSI is designated for its geological interest and is not actively managed.

Impacts for this designated site will be considered further for the proposed works at Lower Town Beach.

White Island (off St Martin's) SSSI

White Island is located on the north-west of St Martin's. It is located approximately 1km east of the Lower Town Beach work site. Its designated features include its geological interest, maritime heathland, grassland and breeding seabirds. The site supports breeding populations of Lesser Black-backed Gull, Herring Gull, Great Black-backed Gull, and Fulmar *Fulmarus glacialis*. At the time of designation, the SSSI also supported breeding populations of Kittiwake. Since then, kittiwakes have experienced decline on the Isles of Scilly and the only remaining colony of Kittiwake present on the archipelago is within Gugh SSSI, on St Agnes (Isles of Scilly Wildlife Trust).

Given the scale of the works and the distance to this site it is not considered that there will be an impact upon the SSSI and it is not considered further.

Tean Site of Special Scientific Interest

Tean is an island located to the east of St Martin's, to the approximately 250m west of the Lower Town Beach work site. Its designated features include its rare plant species populations. The site supports the notable plant species Dwarf Pansy (rare), Four-leaved Allseed *Polycarpon tetraphyllum* (rare). The site supports breeding populations of Puffin *Fratercula artica*, Lesser Black-backed Gull, Herring Gull, and Greater Black-backed Gull. At the time of designation, the SSSI also supported breeding populations of Kittiwake. Since then, kittiwakes have experienced decline on the Isles of Scilly and the only remaining colony of Kittiwake present on the archipelago is within Gugh SSSI, on St Agnes (Isles of Scilly Wildlife Trust).

Given the scale of the works and the distance to this site it is not considered that there will be an impact upon the SSSI and it is not considered further.

Porth Seal St Martin's SSSI (St Martin's)

Porth Seal is located on the north-east coast of St Martin's, approximately 400m north of the Lower Town Beach work site. It is designated for its geological interest and is not actively managed.

Given the scale of the works and the distance to this site it is not considered that there will be an impact upon the SSSI and it is not considered further.

Plains and Great Bay Site of Special Scientific Interest (St Martin's)

Great Bay is an east facing beach on the north side of the island of St Martin's. It is located approximately 600m east of the Lower Town Beach work site. The site is sheltered from westerly gales by St Martin's and White Island enabling a dune system to develop on the wind-blown granite sand. The dune, dune grassland and heathland habitats support several nationally rare and uncommon plant species. The site also supports a breeding colony of Ringed Plover.

Given the scale of the works and the distance to this site it is not considered that there will be an impact upon the SSSI and it is not considered further.

5.1.1 Bird Surveys

The Isles of Scilly are important for a range of bird species, recognised in the many designations the islands have receive. A number of bird studies have been carried out and the most relevant have been summarised in the below sections.

Seabird Monitoring & Research Project Isles of Scilly 2021

St Agnes

A full survey of all seabird species breeding on St Agnes has been conducted annually since 2012 by the Isles of Scilly Wildlife Trust with the results summarised in the Seabird Monitoring & Research Project Isles of Scilly 2021 Report. Table 5-1 below highlights the number of breeding seabirds on St Agnes across the time period of the study.

Table 5-1: Summary of breeding seabirds recorded annually

	FUL	MX	SH	LBBG	HG	GBBG	KIT	COT	SP	RPL	OYC
2000	0	5	0	2	25	0	0	0	0	-	-
2006	0	8	0	0	15	1	0	0	0	-	-
2012	0	8	0	8	61	0	24	0	-	2	9
2013	2	5	0	8	32	0	38	0	0	1	8
Rat Removal											
2014	3	9	0	16	27	1	62	0	0	1	10
2015	4	12	0	14	11	1	75	0	6	1	7
2016	6	22	0	15	12	1	5	0	9	2	8
2017	8	23	0	1	7	0	0	0	11	2	10
2018	5	23	0	2	7	0	0	0	8	1	7
2019	6	27	0	1	8	0	0	0	2	0	6
2021	9	36	0	0	6	0	0	0	6	1	8

Breeding seabirds on St Agnes (SH – shag; GBBG – great black-backed gull; LBBG – lesser black-backed gull; HG – herring gull; RAZ – razorbill; FUL – fulmar; KIT – kittiwake; COT – common tern; SP – storm petrel; MX – Manx shearwater; PUF – puffin; OYC – oystercatcher; RPL – ringed plover)

Manx Shearwater

The numbers of apparently occupied Manx Shearwater *Puffinus puffinus* burrows on St Agnes and Gugh have increased dramatically since the removal of rats in the winter of 2013-2014 with the breeding population increasing from 22 pairs in 2013 (pre rat eradication) to at least 82 pairs in 2021.

The active Manx Shearwater burrow areas recorded in 2021 included Castella Down, Wingletang Down and South of Porth Askin on St Agnes and Kittern Hill and Clapper Rocks on Gugh.

Storm Petrel

Since the return of Storm Petrels as a breeding bird to St Agnes & Gugh in 2015 following rat removal, numbers have been increasing with breeding birds spreading into new areas including Pedney Brow and Wingletang. Known Storm Petrel breeding areas include Castella Down, Porth Askin and Wingletang Down on St Agnes and Kittern Hill on Gugh.

Lesser Black-backed Gull

The number of Lesser Black-backed Gulls breeding in Scilly has fallen dramatically in recent years, with a decline of 26% between 2006 and 2015 to just under 2,500 breeding pairs. The majority of the birds in Scilly now breed in three main subcolonies; Samson, St Helen's and Gugh with no breeding pairs being recorded on St Agnes in 2021. Since 2012 the numbers and productivity at the Gugh sub-colony, where breeding numbers have halved since 2006, have been recorded annually with the number of pairs reaching 397 in 2021.

Summary

The areas identified as having active burrows occupied by breeding birds on St Agnes included Castella Down, Porth Askin and Wingletang Down. All these areas had records of both breeding Manx Shearwater and Storm Petrel. On the island of Gugh the areas Kittern Hill and Clapper Rocks contained active burrows supporting breeding Manx Shearwater with Kittern Hill also supporting active burrows of Storm Petrel.

None of the areas outlined above are in close proximity to any proposed site works, with the closest known active burrow site located approximately 600m from the closest proposed works site. In this case it is considered unlikely that the proposed works will have any significant effect on burrowing seabirds or any nesting colonies on St Agnes. However, this will continue to be reviewed in line with the latest survey data and mitigation measures are still included in the below sections.

Bryher

Manx Shearwater

Results from this study showed that a number of Manx Shearwater breeding pairs have been attempting to breed at sites with continued rat presence across the years. One of these sites included Shipman Head on Bryher. In August and September 2021, a number of evening checks were made at this site to record breeding activity and fledglings. As in previous years no fledglings were recorded at the Bryher site, however, a nocturnally active rat was sighted around the burrows. Although the occasional chick may survive from these nesting attempts, it seems likely that the populations seen on Bryher are only being maintained at a low level by immigration, either from other rat free islands in Scilly or further afield.

Storm Petrel

No records of breeding Storm Petrel were recorded on Bryher

Summary

According to the results found in the Seabird Monitoring and Research Project, no successful breeding pairs of Manx Shearwater or Storm Petrel are present on Bryher. Whilst some Manx Shearwater have been recorded burrowing and attempting to breed at Shipman Head, these haven't resulted in any successful fledglings with rat presence thought to be the reason for this.

With no Storm Petrel breeding on the island the proposed works on Bryher will not have a significant impact on nesting Storm Petrel. Whist some Manx Shearwater are burrowing at Shipman Head this is approximately 800m from the closest proposed works and therefore we can conclude that it is unlikely that the proposed works will have any significant effect on nest burrowing seabirds or any nesting colonies on Bryher. However, this will continue to be reviewed in line with the latest survey data and mitigation measures are still included in the below sections.

Breeding Birds on the Isles of Scilly incorporating the results of the Breeding Bird Atlas (2000 and 2001) and Seabird 2000 (1999 and 2000)

This report presents a historical appraisal of the status of breeding birds of the Isles of Scilly along with the results of both Seabird 2000 and Breeding Bird Atlas surveys.

In total 9,378 territories of 13 species were recorded from 53 islands.

Manx Shearwater

Results from this report estimated a population of 201 Manx Shearwater pairs based on apparently occupied burrows across six islands. The majority of the breeding population were recorded on Annet with burrowing pairs also found on St Agnes, Round Island, Gugh and Bryher. Comparing numbers to historical data this report highlighted the decline in the number of breeding pairs on islands with rat presence namely St Agnes, Gugh and Bryher.

Storm Petrel

Results from this report estimated a population of 1,475 breeding pairs of Storm Petrel across 11 islands. It was noted that the Storm Petrel population across the Isles of Scilly was restricted to the rat-free outer islands with 73% of the population breeding on Annet.

Lesser Black-backed Gull

In 2000 it was estimated that there were 3,608 breeding Lesser Black-backed Gulls across the Isles of Scilly breeding on 26 islands. It was noted that the species tended to favour the 'inland' parts of the islands with main colonies found on Gugh, Samson, St Helen's and Annet accounting for 90% of the population.

Herring Gull

The Herring Gull population in 2000 was estimated to be 903 pairs breeding across 34 islands. It was noted that whilst Herring Gulls were wide spread across the islands, most islands only support a few pairs. The largest colonies were found on Gugh, Samson and Tresco.

Great Black-backed Gull

The Great Black-backed Gull population in 2000 was estimated to be 808 breeding pairs across 38 islands. Great Black-backed Gulls were the most widespread seabird in the Isles of Scilly according to the Seabird survey conducted in 2000. The main colonies were in the Eastern Isles, Annet and Rosevear.

Seabird Recovery Project: Seabird Monitoring and Research Project Isles of Scilly 2013-2017

St Agnes

A full survey of all seabird species breeding on St. Agnes has been conducted annually since 2012 with the results from this and the two previous SPA counts included in the table below. During this time period the big event is the removal of rats from St. Agnes in the winter of 2013/14 (although not officially declared rat free until February 2016). The most obvious change following this has been the increase in both breeding numbers, productivity and range of Manx Shearwaters and the first recording in living memory of Storm Petrels breeding on St. Agnes in 2015. Anecdotally, both Ringed Plover and Oystercatcher *Haematopus ostralegus* appear to be having more success in fledging chicks also, although gull predation, tide inundation and human disturbance continue to be limiting factors here (Dawson 2012).

Table 5-2: Breeding seabirds on St Agnes

Species	2000	2006	2012	2013	2014	2015	2016	2017
Fulmar	0	0	0	2	3	4	6	8
Manx Shearwater	5	8	8	5	9	12	22	23
Lesser Black-backed Gull	2	0	8	8	16	14	15	1
Herring Gull	25	15	61	32	27	11	12	7
Great Black-backed Gull	0	1	0	0	1	1	1	0
Kittiwake	0	0	24	38	62	75	5	0
Common Tern	3	0	0	0	0	0	0	0
Storm Petrel	0	0	-	0	0	6	9	11
Ringed Plover	-	-	2	1	1	1	2	2
Oystercatcher	-	-	9	8	10	7	8	10

5.1.2 Field surveys

The Extended Phase 1 Habitat Survey identified the presence of a number of habitats, as described in the following sections. All coastal habitats are identified as Habitats of Principal Importance within the England Biodiversity List, published under the requirements of section 41 of the NERC Act 2006.

Bryher

Bryher is the smallest inhabited island of the Isles of Scilly, located in the north-west of the archipelago. There are five sites where works are proposed across the island of Bryher, as outlined in Figure 1-3 included in Chapter 1 of this Environmental Statement. Access to all of the sites will be via the respective landing sites, or the via the closest alternative landing site and existing roads and access tracks where this is not feasible. Where sealed roads are used, ecological impacts are considered to be negligible, however, impacts arising from the increased use of dirt tracks are considered and the habitats impacted are described in the below sections. It should be noted that this section presents a worst case scenario since the preferred option is to access sites directly via barge using their respective landing sites.

Great Popplestone

Great Popplestone is located on the west coast of the island of Bryher on the north-west margins of the Isles of Scilly archipelago. The beach comprises rounded granite boulders and cobbles to the south, with a more typical sand dune towards the north of the beach.

Boulders/rocks above the high tide mark

Rock armour has historically been added to the beach within and adjacent to the work site. A number of lichens that would normally be associated with splash zones of rocky shore habitats were observed during the survey.

Sea wall

The existing sea wall is dilapidated allowing a number of coastal plant species to colonise including Sea Beet *Beta vulgaris* subsp. *maritima*. However, the invasive non-native Hottentot Fig *Carpobrotus edulis* is dominant.

Open dune

Behind the area of works there is a relatively large area of coastal dune habitat present. The habitat is indicative of fore dune or yellow dune habitat with a predominantly open plant cover. Marram Grass *Ammophila arenaria* dominates for the most part. At the forefront of the dunes the invasive non-native Hottentot Fig is locally dominant with Sea Beet also common. The dunes quickly grade to a fixed grey dune habitat with Sand Sedge *Carex arenaria*, Red Fescue *Festuca rubra*, Buck's-horn Plantain *Plantago coronopus*, Thrift *Armeria maritima* and Wild Carrot *Daucus carota* all present.

Intertidal sand

The bay consists predominantly of coarse to medium sand and it is considered that the beach is largely unsuitable for benthic species. A walk along the intertidal zone revealed relatively few worm casts or evidence of any other benthic invertebrates, A drift line approximately 5m wide of decomposing seaweed was present. A community of Sandhoppers *Talitrid* sp. amphipods appeared to have developed throughout much of this habitat. It is likely that the base remains permanently wet and may provide habitat for intertidal species such as periwinkle.

Sand above the high tide mark

The bay consists predominantly of coarse to medium sand, which, above the high tide mark, is devoid of vegetation.

Intertidal rocky habitat

To the north and south corners of the bay is a mixed substratum of boulders on pebbles and sand.

A band of sand in the littoral fringe leads to bedrock with a broad barnacle and limpet zone, before graduating into Spiral Wrack Fucus spiralis and shallow rockpools in the upper eulittoral zone. In the mid-shore, there are narrow bands of Bladder Wrack Fucus vesiculosus and Serrated Wrack F. serratus with Thongweed Himanthalia elongata dominant lower down the shore.

The under boulder zone on the lower shore was dominated by abundant Thongweed and to a lesser extent Brown Forking Weed Bifurcaria bifucata. Pink encrusting coralline algae was common in the understorey and rockpools with a number of red algae including Irish Moss Chondrus crispus and Bunny Ears Lomentaria articulata.

Protected Species

Birds

Suitable nesting habitat for passerine bird species in the form of scrub and broadleaved trees is not present within or adjacent to the scheme. Habitats within or adjacent to the site do not provide nesting opportunities for bird species associated with the SPA or Ramsar site. Terrestrial habitats approximately 600m to the north of the site are protected under the Ramsar designation, however, the studies outlined in section 5 show that this area is not currently utilised by nesting seabirds associated with the SPA and Ramsar.

The existing rock defences provide nesting opportunities for species such as Oystercatcher, some gull and tern species.

Bats

No structures or trees that have the potential to be impacted by the works were considered suitable for bats.

The areas of sand dune and the intertidal areas provide foraging potential for bat species.

Marine mammals

A number of marine mammals have been recorded within the waters around Bryher. However, the works will not require piling or percussive construction techniques which can cause significant disturbance. As all works will also take place out of the water it is not considered that they will cause a disturbance to marine mammals and impacts arising from disturbance are not considered further. Impacts with regards to changes in water quality are considered within impacts to marine designations and subtidal habitats.

Reptiles

No terrestrial reptile species have been recorded on Bryher.

Terrestrial invertebrates

Habitats present within the proposed site provide foraging opportunities for a range of terrestrial invertebrates, including endemic species that are found only on the Scillies, such as the Scilly Bumblebee.

Marine macroinvertebrates

Areas adjacent to the proposed work site provide habitats for a range of marine macroinvertebrate species, including those associated with intertidal rocky habitat and intertidal sand habitat.

Invasive non-native species

Hottentot Fig is locally abundant adjacent to the works area, although none was recorded within the site boundary.

Stinking Porth

Stinking Porth is located on the west coast of Bryher, southwest of Great Pool, as shown in Figure 1-7. The beach at Stinking Porth is relatively narrow in comparison to other beaches on Bryher.

Boulders/rocks above the high tide mark

The existing embankment comprises a mix of rounded beach pebbles, cobbles and small boulders. There are some low sections where overtopping has occurred, and many cobbles/small boulders have been washed over the crest. A number of lichens that would normally be associated with splash zones of rocky shore habitats were observed during the survey.

Scattered Scrub

A number of small scrub species were present along the bank including Tamarisk.

Coastal Grassland

Behind the area of works there is a narrow strip of coastal grassland. The grassland is similar to MG1 with False Oat-grass Arrhenatherum elatius dominant. The community is typical of areas where they grade to an urban or more disturbed environment. Garden waste was present in this area resulting a number of exotic plants also being present. Hottentot Fig was locally dominant.

Intertidal sand

The bay consists predominantly of coarse to medium sand and it is considered that the beach is largely unsuitable for benthic species. A drift line approximately 5m wide of decomposing seaweed was present. A community of Sandhoppers Talitrid sp. amphipods appeared to have developed throughout much of this habitat. It is likely that the base remains permanently wet and may provide habitat for intertidal species such as periwinkle.

Intertidal rocky habitat

To the north and south corners of the bay is a mixed substratum of boulders on pebbles and sand.

Protected Species

Birds

Suitable nesting habitat for passerine bird species in the form of scrub and broadleaved trees is not present within or adjacent to the scheme. Habitats within or adjacent to the site do not provide nesting opportunities for bird species associated with the SPA or Ramsar site.

Bats

No structures or trees that have the potential to be impacted by the works were considered suitable for bats.

The areas of sand dune and the intertidal areas provide foraging potential for bat species.

Marine mammals

A number of marine mammals have been recorded within the waters around Bryher. However, the works will not require piling or percussive construction techniques which can cause significant disturbance. As all works will also take place out of the water it is not considered that they will cause a disturbance to marine mammals and impacts arising from disturbance are not considered further. Impacts with regards to changes in water quality are considered within impacts to marine designations and subtidal habitats.

Reptiles

No terrestrial reptile species have been recorded on Bryher.

Terrestrial invertebrates

Habitats present within the proposed site provide foraging opportunities for a range of terrestrial invertebrates, including endemic species that are found only on the Scillies, such as the Scilly Bumblebee.

Marine macroinvertebrates

Areas adjacent to the proposed work site provide habitats for a range of marine macroinvertebrate species, including those associated with intertidal rocky habitat and intertidal sand habitat.

Invasive non-native species

Hottentot Fig is dominant in areas adjacent to the works area, although none was recorded within the site boundary, however, it was not possible to record the extent of the species due to the timing of the survey. Three-cornered Garlic was also recorded.

Great Porth (Great Par) North of Great Carn

Great Porth (Great Par) is located on the western coast of the island of Bryher.

It is also located adjacent to Rushy Bay and Heathy Hill SSSI (designated for presence of the rare Dwarf Pansy and Orange Birds-foot).

Boulders/rocks above the high tide mark

The existing embankment comprises a mix of rounded beach pebbles, cobbles and small boulders. There are some low sections where overtopping has occurred, and many cobbles/small boulders have been washed over the crest. A number of lichens that would normally be associated with splash zones of rocky shore habitats were observed during the survey.

Scattered Scrub

A number of small scrub species were present along the bank including Tamarisk.

Coastal Grassland

Behind the area of works there is a narrow strip of coastal grassland. The grassland is similar to MG1 with False Oat-grass *Arrhenatherum elatius* dominant. The community is typical of areas where they grade to an urban or more disturbed environment. Garden waste was present in this area resulting a number of exotic plants also being present. Hottentot Fig was locally dominant.

Intertidal sand

The bay consists predominantly of coarse to medium sand and it is considered that the beach is largely unsuitable for benthic species. A drift line approximately 5m wide of decomposing seaweed was present. A community of Sandhoppers *Talitrid* sp. amphipods appeared to have developed throughout much of this habitat. It is likely that the base remains permanently wet and may provide habitat for intertidal species such as periwinkle.

Intertidal rocky habitat

To the north and south corners of the bay is a mixed substratum of boulders on pebbles and sand.

Protected Species

Birds

Suitable nesting habitat for passerine bird species in the form of scrub and broadleaved trees is not present within or adjacent to the scheme. Habitats within or adjacent to the site do not provide nesting opportunities for bird species associated with the SPA or Ramsar site.

Bats

No structures or trees that have the potential to be impacted by the works were considered suitable for bats.

The areas of sand dune and the intertidal areas provide foraging potential for bat species.

Marine mammals

A number of marine mammals have been recorded within the waters around Bryher. However, the works will not require piling or percussive construction techniques which can cause significant disturbance. As all works will also take place out of the water it is not considered that they will cause a disturbance to marine mammals and impacts arising from disturbance are not considered further. Impacts with regards to changes in water quality are considered within impacts to marine designations and subtidal habitats.

Reptiles

No terrestrial reptile species have been recorded on Bryher.

Terrestrial invertebrates

Habitats present within the proposed site provide foraging opportunities for a range of terrestrial invertebrates, including endemic species that are found only on the Scillies, such as the Scilly Bumblebee.

Marine macroinvertebrates

Areas adjacent to the proposed work site provide habitats for a range of marine macroinvertebrate species, including those associated with intertidal rocky habitat and intertidal sand habitat.

Invasive non-native species

Hottentot Fig is dominant in areas adjacent to the works area, although none was recorded within the site boundary, however, it was not possible to record the extent of the species due to the timing of the survey. Three-cornered Garlic was also recorded.

Green Bay

Green Bay is located on the east coast of the island of Bryher. It comprises a large sandy bay backed by an area of boulders and cobbles which rise steeply to an area of coastal grassland and dense scrub.

Boulders/rocks above the high tide mark

The existing embankment comprises a mix of rounded beach pebbles, cobbles and small boulders. There are some low sections where overtopping has occurred, and many cobbles/small boulders have been washed over the crest.

Coastal Grassland

The land surrounding the bay is relatively high and sheltered from the maritime environment and as such, contains species synonymous with MG1 grasslands. False Oat-grass *Arrhenatherum elatius* is dominant with some areas where scrub species are beginning to colonise and proliferate.

Intertidal sand

The bay consists predominantly of medium to fine sand. The bay has the potential to support a range of macroinvertebrates and a number of ragworm casts were recorded along the lower extent of the beach. A drift line approximately 5m wide of decomposing seaweed was present.

Protected Species

Birds

Suitable nesting habitat for passerine bird species in the form of scrub and broadleaved trees is not present within or adjacent to the scheme. Habitats within or adjacent to the site do not provide nesting opportunities for bird species associated with the SPA or Ramsar site.

The coastal grassland does provide nesting habitat for a range of ground nesting species.

The intertidal sediments provide a food source for a range of wading bird species and it has been reported that the southern end of the beach is utilised as a high tide roost for Oystercatcher.

Bats

No structures or trees that have the potential to be impacted by the works were considered suitable for bats.

The areas of sand dune and the intertidal areas provide foraging potential for bat species.

Marine mammals

A number of marine mammals have been recorded within the waters around Bryher. However, the works will not require piling or percussive construction techniques which can cause significant disturbance. As all works will also take place out of the water it is not considered that they will cause a disturbance to marine mammals and impacts arising from disturbance are not considered further. Impacts with regards to changes in water quality are considered within impacts to marine designations and subtidal habitats.

Reptiles

No terrestrial reptile species have been recorded on Bryher.

Terrestrial invertebrates

Habitats present within the proposed site provide foraging opportunities for a range of terrestrial invertebrates, including endemic species that are found only on the Isles of Scilly.

Marine macroinvertebrates

Areas adjacent to the proposed work site provide habitats for a range of marine macroinvertebrate species, including those associated with intertidal rocky habitat and intertidal sand habitat.

Invasive non-native species

Hottentot Fig is dominant in areas adjacent to the works area, although none was recorded within the site boundary, however, it was not possible to record the extent of the species due to the timing of the survey.

Kitchen Porth

Kitchen Porth is located on the north-east side of Bryher.

It is a small beach composed of mainly sand with some cobbles. There is clear erosion around tree roots along the edge of the beach, which can be seen exposed, and which in themselves make a contribution to the stability of the embankment.

Introduced Scrub

Backing the beach appears to be remnant sand dune which now consists of a mixture of artificially placed and natural material, a large part of which is garden waste from adjacent houses. As a result, the bank is a mixture of native and ornamental flower species. Two invasive non-native species were identified in this bank, Hottentot Fig and Three-cornered Garlic. The shrub Pittosporum *Pittosporum crassifolium* and a species of Coprosma are also present along the top of the bank.

Boulders/rocks above the high tide mark

The existing embankment comprises a mix of rounded beach pebbles, cobbles and small boulders. Some areas of bedrock are present at the southern extent of the beach.

Strandline Vegetation

In amongst the lower sections of the existing rock revetment common strandline plants have colonised, including, Curled Dock *Rumex crispus*, Rock Samphire *Crithmum maritimum*, and Sea Beet Beta vulgaris ssp. maritima.

Intertidal sand

The bay consists predominantly of coarse clean sand and as such opportunities for benthic invertebrate species is limited. Particularly in the area of the works. Towards the low tide mark the sand is finer and has the potential to support a range of macroinvertebrates. A small drift line of decomposing seaweed was present.

Protected Species

Birds

The scrub present along the top of the exiting bank provides a small amount of habitat for nesting passerine species.

Habitats within or adjacent to the site do not provide nesting opportunities for bird species associated with the SPA or Ramsar site.

The existing rock revetment as well as rocky outcrops to the north of the bay provides nesting opportunities for a range of sea birds.

Bats

No structures or trees that have the potential to be impacted by the works were considered suitable for bats.

The areas of sand dune and the intertidal areas provide foraging potential for bat species.

Marine mammals

A number of marine mammals have been recorded within the waters around Bryher. However, the works will not require piling or percussive construction techniques which can cause significant disturbance. As all works will also take place out of the water it is not considered that they will cause a disturbance to marine mammals and impacts arising from disturbance are not considered further. Impacts with regards to changes in water quality are considered within impacts to marine designations and subtidal habitats.

Reptiles

No terrestrial reptile species have been recorded on Bryher.

Terrestrial invertebrates

Habitats present within the proposed site provide foraging opportunities for a range of terrestrial invertebrates.

Marine macroinvertebrates

Areas adjacent to the proposed work site provide habitats for a range of marine macroinvertebrate species.

Invasive non-native species

The majority of the vegetation on the existing bank is non-native. However, no species listed on schedule 9 were recorded during the survey.

St Agnes

St Agnes is located south-west of the largest inhabited island, St Mary's, and has a population of 85.

Porth Killier

Porth Killier is located at the northern extent of the island of St Agnes.

Intertidal Rock

The bay consists predominantly of large intertidal boulders with bedded planes, interspersed with rock pools. Large grooves in the bedrock are permanently wet, creating large areas of water with species usually found lower down the shore. The following biotopes were casually recorded; however, this is not an exhaustive list of the biotopes present.

- *Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock [LR.MLR.BF.Fser.R].

Towards the lower limit of the intertidal area the habitat is indicative of moderately exposed lower eulittoral bedrock characterised by mosaics of the wrack *Fucus serratus* and red seaweeds including *Corralina officinalis*, which is dominant in some places, *Osmundea pinnatifida*, and *Mastocarpus stellatus*.

- - *Ascophyllum nodosum* on full salinity mid eulittoral rock. [LR.LLR.F.Asc.FS]

Above the *Fucus serratus* dominated zone a dense canopy of Egg Wrack *Ascophyllum nodosum* has developed although in some areas this is replaced in the canopy by Bladder Wrack *Fucus vesiculosus*. Characteristically the epiphytic red seaweed *Polysiphonia lanosa* is present on many of the Egg Wrack fronds. Beneath the canopy a number of filamentous and foliose red seaweeds were recorded, including *Mastocarpus stellatus* and *Chondrus crispus*.

- *Fucus spiralis* on exposed to moderately exposed upper eulittoral rock [LR.MLR.BF.FspiB]

Higher up the shore and up to the existing sea defences the biotope consists of exposed to moderately exposed upper eulittoral bedrock characterised by a band of the spiral wrack *Fucus spiralis*. Underneath the fronds of *Fucus spiralis* there is a community consisting of the limpet *Patella vulgata*, the winkles *Littorina saxatilis* and *Littorina littorea*, and the barnacle *Semibalanus balanoides*.

- Green seaweeds (*Enteromorpha* spp. and *Cladophora* spp.) in shallow upper shore rockpools [LR.FLR.Rkp.G].

In a few places are rockpools in the littoral fringe or upper eulittoral zone where they are subject to fluctuating temperatures and salinity. They are characterised by ephemeral green alga of the genus *Enteromorpha*, along with *Cladophora* spp. and *Ulva lactuca*.

Boulders/rocks above the high tide mark

Fringing the bay are a number of large boulders that are above MHWS. A number of lichens that would normally be associated with splash zones of rocky shore habitats were observed during the survey.

Soft Cliff

At the there is a drop onto the foreshore of approximately 2 metres. This cliff is predominantly bare sand with vegetation from above eroding and dropping onto the cliff face. *Beta vulgaris* subsp. Maritima has also established in some areas of bare sand.

Birds

Suitable habitat for passerine bird species in the form of scrub and broadleaved trees is present immediately along the track immediately to the south of the track. The intertidal areas provide foraging opportunities for a range of bird species.

Bats

The broadleaved trees located to the south of the scheme did not provide any potential roosting opportunities for bats as the trees were all small in size and lacked cracks, crevices or Ivy cover that would provide roosting opportunities.

The areas of scrub and the intertidal areas provide foraging potential for bat species.

Marine mammals

A number of marine mammals have been recorded within the waters around the Isles of Scilly. However, the works will not require piling or percussive construction techniques which can cause significant disturbance. As all works will also take place out of the water it is not considered that they will cause a disturbance to marine mammals and impacts arising from disturbance are not considered further. Impacts with regards to changes in water quality are considered within impacts to marine designations and subtidal habitats.

Terrestrial invertebrates

Habitats present within the proposed site provides foraging opportunities for a range of terrestrial invertebrates, including endemic species that are found only on the Scillies.

Marine macroinvertebrates

Areas adjacent to the proposed work site provide habitats for a range of marine macroinvertebrate species, including those associated with intertidal rocky habitat and intertidal sand habitat.

Invasive non-native species

Hottentot Fig is locally abundant adjacent to the works area, although none was recorded within the site boundary, however, it was not possible to record the extent of the species due to the timing of the survey. Three-cornered Garlic was also recorded.

Porth Coose

Porth Coose is located on the northern extent of the island of St Agnes. A low dune separates the beach from the Big Pool and Browarth Point SSSI and Isles of Scilly Ramsar site.

Boulders/rocks above the high tide mark

Ad-hoc rock armour has historically been added to the beach within the work site. A number of lichens that would normally be associated with splash zones of rocky shore habitats were observed during the survey.

Open dune

To the south of the proposed scheme a narrow band of dune habitat is present. The habitat is indicative of fore dune or yellow dune habitat with a predominantly open plant cover. Marram Grass dominates for the most part. At the forefront of the dunes the invasive non-native Hottentot Fig is dominant in places with Sea Beet also common.

Coastal grassland

Within the footprint of the proposed works is a small area of coastal grassland. This area slopes directly down to the beach and is being eroded, creating areas of bare earth adjacent to the beach.

Intertidal sand

The bay consists predominantly of fine to medium sand. A walk along the intertidal zone revealed relatively few worm casts or evidence of any other benthic invertebrates, although conditions were considered suitable for a range of benthic species.

Sand above the high tide mark

The bay consists predominantly of fine to medium sand, which, above the high tide mark, is devoid of vegetation.

Birds

Suitable habitat for passerine bird species in the form of scrub and broadleaved trees is present immediately to the east of the site. Habitats within or adjacent to the site

do not provide nesting opportunities for bird species associated with the SPA or Ramsar site.

Bats

No structures or trees suitable for bats were recorded within or adjacent to the scheme.

The areas of scrub and the intertidal areas provide foraging potential for bat species.

Marine mammals

A number of marine mammals have been recorded within the waters around the Isles of Scilly. However, the works will not require piling or percussive construction techniques which can cause significant disturbance. As all works will also take place out of the water it is not considered that they will cause a disturbance to marine mammals and impacts arising from disturbance are not considered further. Impacts with regards to changes in water quality are considered within impacts to marine designations and subtidal habitats.

Terrestrial invertebrates

Habitats present within the proposed site provides foraging opportunities for a range of terrestrial invertebrates, including endemic species that are found only on the Scillies.

Marine macroinvertebrates

Areas adjacent to the proposed work site provide habitats for a range of marine macroinvertebrate species, including those associated with intertidal rocky habitat and intertidal sand habitat.

Invasive non-native species

Hottentot Fig is locally abundant adjacent to the works area, although none was recorded within the site boundary.

Periglis Beach

Periglis is located in the northern extent of the island of St Agnes, adjacent to Porth Coose. Big Pool and Browarth Point (St Agnes) SSSI and Isles of Scilly Ramsar site are located immediately adjacent to Periglis beach. Periglis has a natural embankment helping to protect Big Pool, the outfall from which goes beneath the embankment.

Boulders/rocks above the high tide mark

Ad-hoc rock armour has historically been added to the beach within the work site. A number of lichens that would normally be associated with splash zones of rocky shore habitats were observed during the survey. Sea Beet has established in some of the gaps in the armour.

Open dune

To the south of the proposed scheme a narrow band of dune habitat is present. Netting has been placed along the dune front in an attempt to prevent erosion. The habitat is indicative of fore dune or yellow dune habitat with a predominantly open plant cover. Marram Grass dominates for the most part. At the forefront of the dunes the invasive non-native Hottentot Fig is dominant in places with Sea Beet also common.

Coastal grassland

Within the footprint of the proposed works is a small area of coastal grassland. This area slopes directly down to the beach and is being eroded, creating areas of bare earth adjacent to the beach. Above the beach the area is subject to large amount of erosion from human traffic. The invasive non-native species, Three-cornered Garlic has also colonised this area.

Intertidal sand

The lower bay consists predominantly of fine to medium sand. In the eastern corner of the bay is a drift line approximately 5m wide of decomposing seaweed. A community of Sandhoppers *Talitrid* sp. amphipods appeared to have developed throughout much of this habitat. It is likely that the base remains permanently wet and may provide habitat for Oligochaete species such as enchytraeids.

Sand above the high tide mark

The bay consists predominantly of fine to medium sand, which, above the high tide mark, is devoid of vegetation.

Intertidal rocky habitat

To the north and south corners of the bay is a mixed substratum of boulders, cobbles and pebbles and sand.

A band of sand in the littoral fringe leads to bedrock with a broad barnacle and limpet zone, before graduating into Spiral Wrack and shallow rockpools in the upper eulittoral zone. In the mid-shore, there are narrow bands of Bladder Wrack and Serrated Wrack with Thongweed dominant lower down the shore.

The under boulder zone on the lower shore was dominated by abundant Thongweed and to a lesser extent Brown Forking Weed. Pink encrusting coralline algae was common in the understorey and rockpools with a number of red algae including Irish Moss.

Protected Species

Birds

Suitable habitat for passerine bird species in the form of scrub and broadleaved trees is present immediately to the east of the site. Habitats within or adjacent to the site do not provide nesting opportunities for bird species associated with the SPA or Ramsar site.

Bats

The broadleaved trees located to the east of the scheme did not provide any potential roosting opportunities for bats as the trees were all small in size and lacked cracks, crevices or Ivy *Hedera helix* cover that would provide roosting opportunities.

The areas of scrub and the intertidal areas provide foraging potential for bat species.

Marine mammals

A number of marine mammals have been recorded within the waters around the Isles of Scilly. However, the works will not require piling or percussive construction techniques which can cause significant disturbance. As all works will also take place out of the water it is not considered that they will cause a disturbance to marine mammals and impacts arising from disturbance are not considered further. Impacts with regards to changes in water quality are considered within impacts to marine designations and subtidal habitats.

Terrestrial invertebrates

Habitats present within the proposed site provides foraging opportunities for a range of terrestrial invertebrates, including endemic species that are found only on the Scillies.

Marine macroinvertebrates

Areas adjacent to the proposed work site provide habitats for a range of marine macroinvertebrate species, including those associated with intertidal rocky habitat and intertidal sand habitat.

Invasive non-native species

Hottentot Fig is locally abundant adjacent to the works area, although none was recorded within the site boundary, however, it was not possible to record the extent

of the species due to the timing of the survey. Three-cornered Garlic was also recorded.

Saint Martin's

Open dune

The works will take place at the western extent of a band of dune habitat that rises steeply away from the foreshore. The habitat is indicative of fore dune or yellow dune habitat with a predominantly open plant cover. Marram Grass dominates for the most part. At the forefront of the dunes Glasswort species have begun to colonise. *Sand above the high tide mark*

The bay consists predominantly of fine to medium sand, which, above the high tide mark, is devoid of vegetation.

5.4 Potential Impacts & Significant Effects

5.4.1 Assessment methodology and assessment criteria

The assessment of ecological impacts has been undertaken following current best practice provided by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2018).

Ecological features include nature conservation sites, habitats, species assemblages/ communities or populations or groups of species. The assessment of the significance of predicted impacts on ecological features is based on both the 'importance' of a feature and the nature and magnitude of the impact that the project will have on it. Impacts may be direct (e.g. the loss of species or habitats), or indirect (e.g. effects due to noise, dust or disturbance).

The impact assessment process involves:

- Identifying and characterising impacts;
- Incorporating measures to avoid and mitigate (reduce) these impacts;
- Assessing the significance of any residual effects after mitigation;
- Identifying appropriate compensation measures to offset residual effects; and
- Identifying opportunities for ecological enhancement

The assessment includes potential impacts (direct, indirect, secondary and cumulative) on each ecological feature determined as important from all phases of the project and describes in detail the impacts that are likely to be significant, making reference to the following characteristics:

- Positive or negative
- Extent Magnitude
- Duration
- Timing
- Frequency
- Reversibility

Important ecological features

Various characteristics contribute towards the importance of ecological features, for example, naturalness, rarity, diversity and connectivity.

The importance of an ecological feature should be considered within a defined geographical context. For the purposes of this assessment the following frame of reference has been used:

- International and European

- National
- Regional/County
- Local

Consideration of impacts at all scales is important, and essential if objectives for no net loss of biodiversity and maintenance of healthy ecosystems are to be achieved. Ecological features have been valued using the scale set out in Table 5-1, with examples provided of criteria used when defining the level of importance.

Table 5-1: Examples of the criteria used to define the importance of ecological features

Level of importance	Examples of criteria
International and European	An internationally important site e.g. SPA, SAC, Ramsar (or a site considered worthy of such designation); A regularly occurring substantial population of an internationally important species (The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK. The national site network includes existing SACs and SPAs and new SACs and SPAs designated under these Regulations).
National	A nationally designated site e.g. SSSI, or a site considered worthy of such designation; A viable area of a habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; A regularly occurring substantial population of a nationally important species, e.g. listed on Schedules 5 and 8 of the Wildlife and Countryside Act 1981 (as amended).
Regional/County	Viable areas of S41 list or LBAP priority habitat, or smaller areas of such habitat which are essential to maintain the viability of a larger whole; A site designated as a non-statutory designated site e.g. Local Wildlife Site; A regularly occurring substantial population of a nationally scarce species, including species listed on the S41 list or local BAP.
Local	Areas of internationally or nationally important habitats which are degraded and have little or no potential for restoration; A good example of a common or widespread habitat in the local area; Species of national or local importance, but which are only present very infrequently or in very low numbers within site area.

The approach of this assessment is to consider the value of the site for the species under consideration, rather than the nature conservation importance of the species itself. While the importance of the species present is taken into account, in order to assess nature conservation importance, the number of individuals of that species using the site, and the nature and level of this use, is also taken into account, and an assessment is made of the value of the site to that species.

Legally protected species

There is also a need to identify all legally protected species that could be affected by the proposed works in order that measures can be taken to ensure that contravention of the legislation is avoided.

Determining ecological significant effects

Significant effects encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution). Table 5-2 details the factors that have been considered in the determination of significant effects on ecological features.

Table 5-3: Determining ecologically significant effects

Ecological feature	Consideration
Designated sites	Will the project undermine the site's conservation objectives? Will the project positively or negatively affect the conservation status of habitats or species for which the site is designated? Will the project have positive or negative effects on the condition of the site or its interest/qualifying features? Will the project remove or change any key characteristics? Will there be an effect on the nature, extent, structure and function of component habitats? Will there be an effect on the average population size and viability of component species? Will there be an impact on wider ecosystem functions and processes?
Habitats	Will the project positively or negatively affect the conservation status of the habitat? Will it affect its extent, structure and function as well as its distribution and its typical species within a given geographical area?
Species	Will the project positively or negatively affect the conservation status of the species? Will it affect its abundance and distribution within a given geographical area?

5.4.2 Evaluation

This section evaluates the nature conservation importance of the area of the works and its locality in terms of its relative importance in a geographical context.

The nature conservation sites, habitats and species that have been identified as important ecological features have been evaluated based on the criteria given in the following tables. The importance of the feature is defined with reference to the geographical context of the Isles of Scilly.

Table 5-4: Evaluation of nature conservation importance on St Agnes

Ecological feature	Evaluation rationale	Importance of feature or importance of site to feature
Isles of Scilly SPA and Ramsar site	Qualifying species regularly supported during breeding season: European Storm Petrel; representing average 0.2% of UK population, and Lesser Black-backed Gull; representing average 2.4% of the breeding population.	International
Isles of Scilly Complex SAC	Designated for habitats: Sandbanks which are slightly covered by sea water all the time; Mudflats and sandflats not covered by seawater at low tide; and Reefs. Also designated for populations of Shore Dock.	International
Plympton to Spanish Ledge MCZ	Qualifying features: high energy intertidal rock, intertidal sand and muddy sand, intertidal under boulder communities, moderate energy intertidal rock, Spiny Lobster, Pink Sea Fan, Sunset Cup Coral, and Devonshire Cup Coral.	National
Smith Sound Tide Swept Channel MCZ	Qualifying features: high energy intertidal rock, moderate energy intertidal rock, Spiny Lobster, Pink Sea Fan, Sea Fan Anemones, Stalked Jellyfish *Calvadosia cruxmelitensis*, and Giant Goby *Gobius cobitis.*	National
Subtidal Habitats	Sub-tidal habitats that are not protected as features of the SAC	National

Ecological feature	Evaluation rationale	Importance of feature or importance of site to feature
	within 2km of the scheme area are protected through various national designations.	
Intertidal Habitats	Intertidal mixed habitats and intertidal rocky habitats have the potential to support a number of marine invertebrates.	National
Big Pool and Browarth Point SSSI	Only open water on St Agnes. Notified for its species rich grassland.	National
Subtidal Habitats	Sub-tidal habitats within 2km of the scheme area are protected through various international and national designations.	International/National
Intertidal Habitats	Intertidal mixed habitats and intertidal rocky habitats have the potential to support a number of marine invertebrates.	National
Coastal Grassland	Coastal grassland is adjacent to Great Carn.	Regional
Strandline Vegetation	The works will directly impact areas where strandline vegetation has developed.	Regional
Breeding Birds	Schedule 1 birds and their breeding sites are protected under the Wildlife and Countryside Act 1981 (as amended) from disturbance during the breeding season. A number of designations detailed above provide protection for breeding bird species; this section will deal with any direct impacts to breeding birds species that are not protected under those designations.	International
Bats	Bat species and their roosting sites are protected under the Conservation of Habitats and Species Regulations 2010 (as amended) and the Wildlife and Countryside Act 1981 (as amended). Bats are also a Section 41 list and LBAP species. The wider habitats of the coastal grassland and sand dunes, as well as intertidal areas are suitable for foraging bats.	National
Marine Mammals	All dolphin, porpoise and whale species are protected under Conservation of Habitats and Species Regulations 2010 (as amended) and the Wildlife and Countryside Act 1981 (as amended). All Seals found in the UK also receive protection under the Wildlife and Countryside Act 1981 (as amended).	International
Marine Invertebrates	Sediments present to many of the sites provide suitable conditions for marine macroinvertebrates which in turn provide a food source for wading bird species.	National
Rare Plant Species	A number of nationally rare plant species	National

Ecological feature	Evaluation rationale	Importance of feature or importance of site to feature
	have been recorded within the adjacent coastal dune and grassland habitats.	

Table 5-5: Evaluation of nature conservation importance on Bryher

Ecological feature	Evaluation rationale	Importance of feature or importance of site to feature
Isles of Scilly SPA and Ramsar site	Qualifying species regularly supported during breeding season: European Storm Petrel; representing average 0.2% of UK population, and Lesser Black-backed Gull; representing average 2.4% of the breeding population.	International
Isles of Scilly Complex SAC	Designated for habitats: Sandbanks which are slightly covered by sea water all the time; Mudflats and sandflats not covered by seawater at low tide; and Reefs. Also designated for populations of Shore Dock.	International
Subtidal Habitats	Sub-tidal habitats within 2km of the scheme area are protected through various international and national designations.	International/National
Intertidal Habitats	Intertidal mixed habitats and intertidal rocky habitats have the potential to support a number of marine invertebrates.	National/County
Shipman Head and Shipman Down SSSI	Designated features: 'waved' maritime heathland, an important habitat for some rare lichen species, and maritime grassland. It also supports important seabird colonies.	National
Pool of Bryher and Popplestone Bank SSSI	Site has the only true brackish lagoon within the Scilly Isles. Interest features also include coastal grassland species adjacent to Great Carn.	National
Rushy Bay and Heathy Hill SSSI	Its designated features include its populations of rare plant species.	National
Sand Dune habitat	Nationally important Sand Dune Habitat located adjacent to Stinking Porth.	National
Subtidal Habitats	Sub-tidal habitats within 2km of the scheme area are protected through various international and national designations.	International/National
Intertidal Habitats	Intertidal mixed habitats and intertidal rocky habitats have the	National

Ecological feature	Evaluation rationale	Importance of feature or importance of site to feature
	potential to support a number of marine invertebrates.	
Coastal Grassland	Coastal grassland is adjacent to Great Carn and will be potentially impacted upon by the proposed works.	Regional
Strandline Vegetation	The works will directly impact areas where strandline vegetation has developed.	Regional
Breeding Birds	Schedule 1 birds and their breeding sites are protected under the Wildlife and Countryside Act 1981 (as amended) from disturbance during the breeding season. A number of designations detailed above provide protection for breeding bird species; this section will deal with any direct impacts to breeding birds from the proposed works.	International
Bats	Bat species and their roosting sites are protected under the Conservation of Habitats and Species Regulations 2010 (as amended) and the Wildlife and Countryside Act 1981 (as amended). Bats are also a Section 41 list and LBAP species. The wider habitats of the coastal grassland and sand dunes, as well as intertidal areas are suitable for foraging bats.	National
Marine Mammals	All dolphin, porpoise and whale species are protected under Conservation of Habitats and Species Regulations 2010 (as amended) and the Wildlife and Countryside Act 1981 (as amended). All Seals found in the UK also receive protection under the Wildlife and Countryside Act 1981 (as amended).	International
Marine Invertebrates	Sediments present to many of the sites provide suitable conditions for marine macroinvertebrates which in turn provide a food source for wading bird species.	National
Rare Plant Species	A number of nationally rare plant species have been recorded within the adjacent coastal dune and grassland habitats.	National

Table 5-6: Evaluation of nature conservation importance on St Martin's

Ecological feature	Evaluation rationale	Importance of feature or importance of site to feature
Isles of Scilly SPA and Ramsar site	Qualifying species regularly supported during breeding season: European Storm Petrel; representing average 0.2% of UK population, and Lesser Black-backed Gull; representing average 2.4% of the breeding population.	International
Isles of Scilly Complex SAC	Designated for habitats: Sandbanks which are slightly covered by sea water all the time; Mudflats and sandflats not covered by seawater at low tide; and Reefs. Also designated for populations of Shore Dock.	International
Hanjague to Deep Ledge MCZ	Qualifying features: high energy intertidal rock, intertidal coarse sediment, intertidal under boulder communities, moderate energy intertidal rock, UK priority species. The site supports the following UK Priority species: Spiny Lobster, Pink Sea Fan, Sea Fan Anemones, and Sunset Cup Coral.	National
Higher Town MCZ	Qualifying features: intertidal coarse sediment, intertidal sand and muddy sand, intertidal under boulder communities, low energy intertidal rock, moderate energy intertidal rock, UK priority species, the site supports the following UK Priority species: stalked jellyfish species *Haliclystus auricula, Calvadosia campanulate,* and *Calvadosia cruxmelitensis*	National
Tean MCZ	Qualifying features: intertidal coarse sediment, intertidal sand and muddy sand, moderate energy intertidal rock, intertidal under boulder communities, high energy intertidal rock, rare and UK priority species. Priority species supported: Spiny Lobster, Pink Sea Fan, Sea Fan Anemones, and stalked jellyfish species *Haliclystus auricula*, and *Calvadosia campanulate.*	National
Man a Vaur to White Island MCZ	Qualifying features: intertidal coarse sediment, intertidal sand and muddy sand, moderate energy intertidal rock, intertidal under boulder communities, high energy intertidal rock, rare and UK priority species. UK Priority	National

Ecological feature	Evaluation rationale	Importance of feature or importance of site to feature
	Species supported include Spiny Lobster, Pink Sea Fan, Sea Fan Anemones, ad stalked jellyfish species *Haliclystus auricula* and *Calvadosia campanulate*.	
Subtidal Habitats	Sub-tidal habitats within 2km of the scheme area are protected through various international and national designations.	International/National
Intertidal Habitats	Intertidal mixed habitats and intertidal rocky habitats have the potential to support a number of marine invertebrates.	National/County
Chapel Down SSSI	Designated features: maritime heathland, breeding bird colonies, and rare plant species populations. The site supports breeding populations of Fulmar, Herring Gull and Lesser Black-backed Gull. The site supports the nationally rare plant species Orange Bird's foot, and rare lichen species *Roccella fuciformis.*	National
Plains and Great Bay SSSI	Designated features: the dune, dune grassland and heathland habitats support several nationally rare and uncommon plant species. The site also supports a breeding colony of Ringed Plover.	National
White Island SSSI	Designated features: geology, maritime heathland, grassland and breeding seabird colonies. Lesser Black-backed Gull, Herring Gull, Great Black-backed Gull, and Fulmar.	National
Tean SSSI	Designated features: dune grassland habitat, which supports rare plant species populations including Dwarf Pansy.	National

5.1.3 Assessment of Effects

This assessment of effects includes all protected sites and protected and priority species considered relevant to each site and the proposed works, based on the baseline conditions for each site.

5.4.3 St Agnes Sites – All sites

Isles of Scilly SPA and Ramsar site

The proposed work sites do not provide suitable habitat for the bird features of the SPA and Ramsar. Nesting sites for these species are well studied and as detailed in the above sections all known nesting sites are sufficiently far away from the proposed works sites that disturbance impacts are unlikely.

Isles of Scilly SAC

No works will take place within the SAC, however, it is intended that materials will be delivered by barge that will be landed in the intertidal area at Periglis Beach or at Porth Killier beach. The intertidal area in this area consists predominantly of boulders and cobbles. However, between the cobbles and in areas closer to the low tide mark intertidal sands are present. Intertidal sandflats are a feature of the SAC, although habitats described in the site description refer to sheltered sandflats present between the islands and these will not be impacted. There is also the potential for alternative sites to be used if Periglis beach and Porth Killier beach are unavailable. There will be a temporary negative impact upon intertidal habitats at landing sites and where haul routes are established.

There is the potential for direct damage to maritime habitats via pollution and run-off during the construction of the scheme.

Big Pool and Browarth Point SSSI

The works at Periglis and Porth Coose will take place adjacent to the SSSI and it is proposed to use areas within the SSSI for site compounds and material storage.

The following operations which may form part of the works have been identified as having the potential to damage the site.

- Dumping, spreading or discharge of any materials.
- Erection of sea defences or coast protection works, including cliff or landslip drainage or stabilisation measures.
- Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, or the laying, maintenance or removal of pipelines and cables, above or below ground.
- Storage of materials.
- Erection of permanent or temporary structures, or the undertaking of engineering works, including drilling.
- Modification of natural or man-made features (including cave entrances), clearance of boulders, large stones, loose rock or scree and battering, buttressing or grading rock-faces and cuttings, infilling of pits and quarries.
- Use of vehicles or craft likely to damage or disturb features of interest.

The works will directly impact the strandline vegetation located on the existing banks at Porth Killier, Porth Coose and Periglis Bay. This will lead to the temporary loss of this habitat. However, it is expected that this habitat will re-establish following the completion of the works.

Pollution incidents during the construction phase could impact upon habitats in the SSSI.

As discussed in the coastal processes chapter the small scale placement and renewal of rock armour at each of the proposed sites on St Agnes will not impact upon coastal sediment transport at any of the sites or the wider environment.

Habitats

Some temporary and minor loss of intertidal rock will occur at each of the schemes, but for the most part the new rock armour will lead only to a reduction in sandy beach area. The minor loss of sandy beach will be permanent, or at least for the duration of the operational phase of the project.

The works will involve the landing of a barge in the intertidal area at the sites where works will be undertaken.

The scheme will likely result in the small-scale loss of intertidal sediment, which will likely be replaced by intertidal rocky shore habitat. Sediments in this area are predominantly clean coarse sand around MHWS and do not provide suitable habitat

for large assemblages of marine benthic invertebrate species. It is not considered that the small-scale loss of this habitat will be significant given the large amount of similar habitat locally.

Adjacent to the works, the marine habitats and the flora and fauna in which they support could be impacted upon through pollution incidents impacting upon water quality, although any discreet incidents would be temporary and not continue to cause damage through the operational phase of the project.

Plant movement in the foreshore area also has the potential to negatively impact habitats through compaction of the foreshore.

Breeding Birds

Mallard *Anas platyrhynchos*, Coot *Fulica atra* and Moorhen *Gallinula chloropus* have been recorded breeding at Big Pool. There is also the potential for ground nesting birds to utilise habitats immediately adjacent to the pool, although this is considered unlikely given the levels of pedestrian access during the summer season. Areas of existing rock revetment provide habitat suitable for a range of nesting seabirds. The works will not have a permanent impact upon the amount of habitat available to nesting birds.

The works have the potential to disturb any nesting birds utilising the habitats in the immediate area.

Any vegetation clearance could impact upon breeding birds and their nests.

These species, and other migratory species could be impacted upon through visual and noise disturbance during the construction phase, particularly in the colder winter months, although birds are already likely to be somewhat habituated to visual and noise disturbance within and near the works footprint due to the urban environment and popular beach location. Birds may be temporarily subject to displacement during some construction activities, although this temporary disturbance will not be significant at the population level.

There will be no impacts to birds resulting from the operational phase of the project.

Bats

The sites are not considered to be of importance to bats, but there is a minor risk of increased lighting during construction works impacting upon commuting and foraging bats. There will be no loss of linear features to impact upon commuting bats during the operational phase, and no significant vegetation clearance to potentially impact upon long term foraging opportunities for bats. No structures or trees with bat roost potential have been identified within the works footprint, so there is no risk of impacting directly upon any bat roosts as a result of the construction works.

Marine fauna

During construction works, there is a risk of disturbance to marine mammals through visual impacts, noise and vibration, although impacts would be short term and would not extend to the operational phase of the project. During construction works, it is possible, on occasion, that Common Seal could haul up on to the land within the vicinity of the construction works, although the site is not known to be an important haul out site.

Marine fauna could be impacted upon by pollution incidents during the construction phase of the project.

There are no suitable habitats for spawning fish within the proposed works footprint so spawning fish will not be impacted upon. The construction works and operational phase of the project will not impede fish passage.

Amphibians

Should a site compound be located within the habitats designated within the SSSI, there is a potential risk of impacting upon Common Frog, although no specific surveys have been undertaken to assess these impacts in detail. It is likely that the main

populations of Common Frog are in the wider habitats of the adjacent SSSI, which will not be impacted upon during the construction phase.

The permanent works will not impact upon populations of amphibians.

Terrestrial invertebrates

The site compound and site access will avoid the SSSI, so there will be no impacts upon the habitats supporting important populations of terrestrial invertebrates adjacent to site. Given that the works footprint is not considered to be of importance to terrestrial invertebrates, no impacts are anticipated as a result of the construction or operational phases of the project.

Marine invertebrates

The works will not directly impact sediments suitable for marine benthic invertebrates. However, pollution incidents could impact upon marine invertebrates during the construction phase. No significant impacts during the operational phase of the project have been identified as habitats suitable for large benthic invertebrate assemblages were only noted at the lower end of the beach away from the works footprint.

INNS

A large number of Invasive Non-native species were recorded at a number of the sites. The works have the potential to further spread these species.

5.4.4 Mitigation measures and enhancements

The following section outlines the mitigation and enhancement measures that will be undertaken for all construction work at all of the sites to avoid or reduce impacts upon the ecological features identified. Following this, site specific mitigation measures are provided. This information will be recorded in an outline Construction Environmental Management Plan (CEMP) (Appendix 2.2).

Habitats

A vegetation survey should be undertaken immediately prior to the works taking place and will set out the limits of all site compounds and access roads. The site limits will seek to avoid damage to areas of the more sensitive areas of the SSSI and any rare plants recorded can be avoided. An Ecological Clerk of Works should then ensure that the site limits are adhered to. Suitable track matting will be used where tracks do not already exist and will be monitored following the works to ensure that the vegetation cover is recovering sufficiently.

Plant movement along the foreshore has the potential to negatively impact habitats through compaction of the foreshore. To minimise disturbance and habitat degradation plant will keep to agreed haul routes and not stray outside of these areas. It is considered that in this case the haul routes will rapidly recover following the completion of the works.

Pollution prevention and incident response

There is the potential to negatively impact intertidal and subtidal habitats through pollution incidents. Therefore, appropriate mitigation measures will be implemented through the construction phase to ensure that the water quality is not adversely affected through pollution incidents and the release of contaminants from the site. This will specifically cover dynamic marine environments. No refuelling of machinery will occur within 7m of any waterbody. A toolbox talk will be given to all site staff for pollution prevention and incident response. All site staff will undertake emergency drills for incident response.

Biosecurity

Brown Rats pose a threat to nesting seabirds and St Agnes and Gugh are rodent-free following the Isles of Scilly Seabird Recovery Project. All local biosecurity measures to ensure that the works do not facilitate the spread of Brown Rats will need to be

adhered to such as using rope guards on the boat and ensuring food and waste onboard are all contained in rodent proof containers are key to keeping invasive predators off boats. These measures should be documented in a biosecurity risk assessment.

To ensure that no INNS are spread onto any of the construction sites as a result of plant movement or contaminated PPE, strict biosecurity measures will be implemented to ensure all machinery and PPE is clean before it enters the site. A toolbox talk will be given to all site staff regarding the importance of biosecurity on site.

Birds

As described in the above sections the proposed works are sufficiently far away from known nesting sites of seabirds associated with the SPA and Ramsar sites that it is not considered that the works will result in disturbance to these species.

At most of the sites nesting opportunities for species such as Oystercatcher is present in the form of existing rock armour or small amounts of existing bedrock or sea wall. The works will not result in a net reduction in the availability of this habitat, and it is considered that impacts will be limited to disturbance during the construction phase of the works. A nesting bird check will be carried out immediately prior to the works taking place.

Nesting opportunities for passerine species within and adjacent to all of the sites are limited. The works will not involve the removal of habitat suitable for passerine bird species and it is considered appropriate that a nesting bird check by a suitable qualified ecologist is carried out immediately prior to the works taking place.

Any clearance of vegetation required to permit works and access that is due to be undertaken during the main breeding season (March to September inclusive) will require a pre-works check no sooner than two weeks in advance of work commencing at each site to identify whether nesting birds are present or not.

Should any nests be found, they will have an appropriate exclusion zone put in place to safeguard the nests until the chicks have successfully fledged.

Impacts to wintering birds through noise and visual impacts should be managed through sequential working, where works are completed at one site before moving to the next, to minimise energy use by wintering birds as they move to an alternative undisturbed location. Sequential working will minimise energy loss that would occur as a result of repeatedly moving between local beaches in response to multiple sources of disturbance.

Marine fauna

All works will be undertaken at low tide where possible to minimise disturbance from noise and vibration. A toolbox talk will be given to all site staff regarding marine mammals and potential construction disturbance impacts.

None of the sites are known to be important haul out sites for seals, but if any seals are encountered within proximity to the proposed works then works will be halted until the individual has moved on. In the unlikely event of this being a regular occurrence, further advice will be sought from an experienced marine ecologist.

No piling techniques are being considered for any of the schemes and therefore disturbance through vibration of the water column is considered negligible.

General avoidance measures

General avoidance measures that will be incorporated at each site, where possible, will include:

- Limiting the hours of working to daylight hours, to limit disturbance to nocturnal and crepuscular animals;
- The use of lighting at night will be avoided. If the use of lighting is essential, then a directional cowl will be fitted to all lights to prevent excess light spill.
- Contractors will ensure that no harm comes to wildlife by maintaining the site efficiently and clearing away materials which are not in use, such as wire or bags in which animals can become entangled; and
- Any pipes will be capped when not in use (especially at night) to prevent animals becoming trapped. Any excavations outside of the intertidal zone will be covered overnight to prevent animals from falling and getting trapped. If that is not possible, a strategically placed plank will be placed to allow animals to escape.

Table 5-7: Details on potential impacts on St Agnes

Ecological feature	Potential impact	Effect without mitigation	Mitigation	Significance of residual effect
Isles of Scilly SPA and Ramsar site	Damage to habitats utilised by breeding bird species via pollution and run-off.	Habitat degradation and reduction in suitable habitat for foraging. Temporary **adverse** effect at an international scale.	Strict pollution prevention measures will be implemented on site, as outlined.	**No significant** adverse effect on conservation status of the site.
Isles of Scilly Complex SAC	The works will not take place within the SAC boundary, However, the delivery of materials will be via barge that will land in the intertidal zone within the SAC. There is the potential for the compaction of intertidal sediments within the SAC through the landing of the barge and the provision of haul routes. There is also the potential for indirect damage to maritime habitats via pollution and run-off.	Temporary **adverse** effect at international scale.	An Ecological Clerk of Works should be present when the landing site is set up to ensure that any sensitive marine habitats are avoided. To minimise disturbance and habitat degradation, plant will keep to agreed haul routes and no stray outside of these areas. Strict pollution prevention measures will be implemented on site to prevent pollutants entering the water.	**No significant** adverse effect on conservation status of the site
Subtidal Habitats	Indirect damage via pollution and run-off	Temporary **adverse** effect at national scale.	Strict pollution prevention measures	**No significant** adverse effect on conservation

Ecological feature	Potential impact	Effect without mitigation	Mitigation	Significance of residual effect
			will be implemented on site, as outlined.	status of the habitat.
Intertidal habitats	Indirect damage via pollution and run-off.	Temporary **adverse** at regional scale.	Strict pollution prevention measures will be implemented on site, as outlined in above sections.	**No significant** adverse effect on conservation status of the habitat.
Breeding Birds	Potential destruction of active nests (construction).	Temporary **adverse** negative effect.	Any vegetation clearance or works to rock revetments during the main breeding season (March to September inclusive) will require a pre-works check no sooner than two weeks in advance of works commencing to identify whether nesting birds are present or not. If nests found, appropriate exclusion zone to be erected to safeguard nests until chicks have successfully fledged.	**No significant** effect.
Big Pool and Browarth Point SSSI	The works sites are immediately adjacent to the SSSI and access and lay down areas will be within the SSSI. There is therefore, the potential for damage and loss to habitats supporting rare plant species.	**Adverse** effect on the site.	Use of barge or existing roads and tracks will be used to bring materials into the area. The laydown area has been surveyed and does not contain features for which the SSSI is designated. However, a further survey will be carried out at a suitable time of year immediately prior to the works taking place. The laydown area will be strictly marked out and no materials or plant will be stored outside of this area.	**Temporary adverse** effect on conservation status of the site.
Marine fauna	Water Pollution (construction).	Temporary **significant adverse** effect.	Appropriate Pollution Prevention Measures.	**No significant** effect.
	Disturbance (construction).	Temporary **significant adverse** effect.	All rock armour placement work undertaken in dry working conditions. No	**No significant** effect.

Ecological feature	Potential impact	Effect without mitigation	Mitigation	Significance of residual effect
			working if seals approach works site.	
Bats	Potential disturbance (night time construction).	Temporary **adverse** effect.	No night-time working or minimal/directional lighting.	**No significant** effect.
Amphibians, terrestrial invertebrates; Protected Flora	Habitat loss.	**Adverse** effect.	Placement of all site compounds to be agreed following surveys undertaken by ECoW.	**Small temporary adverse** effect
Invasive non-native species (INNS)	killing, injuring, uprooting (construction). Brown rats have previously been eradicated from the island.	**Significant adverse** effect.	Hottentot Fig has been recorded on site. An invasive species management plan will be written in order to ensure that the works do not cause the spread of any INNS and strict biosecurity and mitigation measures will be put in place. All local biosecurity measures to ensure that the works do not facilitate the spread of Brown Rats will be adhered to and documented in a biosecurity risk assessment.	**No significant** adverse effect on conservation status of adjacent habitats.

5.4.5 Bryher – All sites

Isles of Scilly SPA and Ramsar site

The proposed work sites do not provide suitable habitat for the bird features of the SPA and Ramsar. Nesting sites for these species are well studied and as detailed in the above sections all known nesting sites are sufficiently far away from the proposed works sites that disturbance impacts are unlikely.

Isles of Scilly SAC

No works will take place within the SAC however, it is intended that materials will be delivered by barge that will be landed in the intertidal area at the site where they will be used. The intertidal area at these areas consists of intertidal sands. Intertidal sandflats are a feature of the SAC, although habitats described in the site description refer to sheltered sandflats present between the islands and these will not be impacted. There will be a temporary negative impact upon intertidal habitats at landing sites and where haul routes are established. There is also the potential for direct damage to maritime habitats via pollution and run-off during the construction of the scheme.

Pool of Bryher & Popplestone Bank (Bryher) SSSI

The works will take place within the SSSI and it is proposed to use areas within the SSSI for site compounds and material storage.

The following operations which may form part of the works have been identified as having the potential to damage the site.

- The introduction of mowing or other methods of cutting vegetation and changes in the mowing or cutting regime (including hay making to silage and cessation).
- Dumping, spreading or discharge of any materials.
- Erection of sea defences or coast protection works, including cliff or landslip drainage or stabilisation measures.
- Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, or the laying, maintenance or removal of pipelines and cables, above or below ground.
- Storage of materials.
- Erection of permanent or temporary structures, or the undertaking of engineering works, including drilling.
- Modification of natural or man-made features (including cave entrances), clearance of boulders, large stones, loose rock or scree and battering, buttressing or grading rock-faces and cuttings, infilling of pits and quarries.
- Use of vehicles or craft likely to damage or disturb features of interest.

The works will directly impact the vegetation for which the site is designated through the provision of access tracks to the proposed work sites at Great Popplestone. There is the potential for the tracks to directly damage rare plants for which the SSSI is designated.

The works will further protect the SSSI from salt water incursion which has the potential to damage the freshwater habitats currently present.

The installation of coastal defences could have an indirect effect on the beach habitats through changes in sediment movement around the coastline as a result of the installation of the rock armour.

Rushy Bay and Heathy Hill (Bryher) SSSI

The works will take place within the SSSI and it is proposed to use areas within the SSSI for site compounds and material storage.

The following operations which may form part of the works have been identified as having the potential to damage the site.

- Erection of sea defences or coast protection works, including cliff or landslip drainage or stabilisation measures.
- Construction, removal or destruction of roads, tracks, walls, fences, hardstands, banks, ditches or other earthworks, or the laying, maintenance or removal of pipelines and cables, above or below ground.
- Storage of materials.
- Erection of permanent or temporary structures, or the undertaking of engineering works, including drilling.
- Modification of natural or man-made features (including cave entrances), clearance of boulders, large stones, loose rock or scree and battering, buttressing or grading rock-faces and cuttings, infilling of pits and quarries.
- Use of vehicles or craft likely to damage or disturb features of interest.

The works will directly impact the vegetation for which the site is designated through the provision of access tracks to the proposed work sites at Great Porth. There is the potential for the tracks to directly damage rare plants for which the SSSI is designated.

Pollution incidents during the construction phase could impact upon habitats in the SSSI.

Habitats

Some temporary and minor loss of intertidal rock will occur at the western end of the scheme, but for the most part the new rock armour will lead only to a reduction in sandy beach area. The minor loss of intertidal rock will be permanent, or at least for the duration of the operational phase of the project.

The scheme will likely result in the small-scale loss of intertidal sediment, which will likely be replaced by intertidal rocky shore habitat. Sediments in this area are predominantly clean coarse sand around MHWS and do not provide suitable habitat for large assemblages of marine benthic invertebrate species. It is not considered that the small-scale loss of this habitat will be significant given the large amount of similar habitat locally.

Adjacent to the works, the marine habitats and the flora and fauna in which they support could be impacted upon through pollution incidents impacting upon water quality, although any discreet incidents would be temporary and not continue to cause damage through the operational phase of the project.

Plant movement in the foreshore area also has the potential to negatively impact habitats through compaction of the foreshore.

Breeding Birds

There is also the potential for ground nesting birds to utilise habitats immediately adjacent to the works at Great Carn or in the freshwater habitats surrounding the Bryher Pool, although this is considered unlikely given the levels of pedestrian access during the summer season. Areas of existing rock revetment provide habitat suitable for a range of nesting seabirds. The works will not have a permanent impact upon the amount of habitat available to nesting birds.

The works have the potential to disturb any nesting birds utilising the habitats in the immediate area.

Any vegetation clearance could impact upon breeding birds and their nests.

These species, and other migratory species could be impacted upon through visual and noise disturbance during the construction phase, particularly in the colder winter months, although birds are already likely to be somewhat habituated to visual and noise disturbance within and near the works footprint due to the urban environment and popular beach location. Birds may be temporarily subject to displacement during some construction activities, although this temporary disturbance will not be significant at the population level.

There will be no impacts to birds resulting from the operational phase of the project.

Bats

The sites are not considered to be of importance to bats, but there is a minor risk of increased lighting during construction works impacting upon commuting and foraging bats. There will be no loss of linear features to impact upon commuting bats during the operational phase, and no significant vegetation clearance to potentially impact upon long term foraging opportunities for bats. No structures or trees with bat roost potential have been identified within the works footprint, so there is no risk of impacting directly upon any bat roosts as a result of the construction works.

Marine fauna

During construction works, there is a risk of disturbance to marine mammals through visual impacts, noise and vibration, although impacts would be short term and would not extend to the operational phase of the project. During construction works, it is possible, on occasion, that Common Seal could haul up on to the land within the vicinity of the construction works, although the site is not known to be an important haul out site.

Marine fauna could be impacted upon by pollution incidents during the construction phase of the project.

Amphibians

Should a site compound be located within the habitats designated within the SSSI, there is a potential risk of impacting upon Common Frog, although no specific surveys have been undertaken to assess these impacts in detail. It is likely that the main populations of Common Frog are in the wider habitats of the adjacent SSSI, which will not be impacted upon during the construction phase.

The permanent works will not impact upon populations of amphibians.

Terrestrial invertebrates

The site compound and site access will avoid the SSSI, so there will be no impacts upon the habitats supporting important populations of terrestrial invertebrates adjacent to site. Given that the works footprint is not considered to be of importance to terrestrial invertebrates, no impacts are anticipated as a result of the construction or operational phases of the project.

Marine invertebrates

The works will not directly impact sediments suitable for marine benthic invertebrates. However, pollution incidents could impact upon marine invertebrates during the construction phase. No significant impacts during the operational phase of the project have been identified as habitats suitable for large benthic invertebrate assemblages were only noted at the lower end of the beach away from the works footprint.

INNS

A large number of Invasive Non-native species including Hottentot Fig were recorded at a number of the sites. The works have the potential to further spread these species.

5.1.4 Mitigation measures and enhancements

The following section outlines the mitigation and enhancement measures that will be undertaken for all construction work at all of the sites to avoid or reduce impacts upon the ecological features identified. Following this, site specific mitigation measures are provided. This information will be recorded in a Construction Environmental Management Plan (CEMP), an outline of which is provided in Appendix 2.2.

Habitats

It is recommended that a vegetation survey should be undertaken immediately prior to the works taking place and will set out the limits of all site compounds and access roads. The site limits will seek to avoid damage to areas of the more sensitive areas of the SSSI and any rare plants recorded can be avoided. An Ecological Clerk of Works should then ensure that the site limits are adhered to. Suitable track matting will be used where tracks do not already exist and will be monitored following the works to ensure that the vegetation cover is recovering sufficiently.

Landing the delivery barge and plant movement along the foreshore has the potential to negatively impact habitats through compaction of the foreshore. An Ecological Clerk of Works should be present when the landing site is set up to ensure that any sensitive marine habitats are avoided. To minimise disturbance and habitat degradation, plant will keep to agreed haul routes and not stray outside of these areas. It is considered that in this case the haul routes will rapidly recover following the completion of the works. In this case the impact to intertidal sediments is likely to be short lived and benthic invertebrates will quickly recolonise from adjacent habitat.

Pollution prevention and incident response

There is the potential to negatively impact intertidal and subtidal habitats through pollution incidents. Therefore, appropriate mitigation measures will be implemented through the construction phase to ensure that the water quality is not adversely affected through pollution incidents and the release of contaminants from the site. This will specifically cover dynamic marine environments. No refuelling of machinery will occur within 7m of any waterbody. A toolbox talk will be given to all site staff for pollution prevention and incident response. All site staff will undertake emergency drills for incident response.

Biosecurity

Brown Rats pose a threat to nesting seabirds and St Agnes and Gugh are rodent-free following the Isles of Scilly Seabird Recovery Project. All local biosecurity measures to ensure that the works do not facilitate the spread of Brown Rats will need to be adhered to such as using rope guards on the boat and ensuring food and waste onboard are all contained in rodent proof containers are key to keeping invasive predators off boats. This will be documented in a biosecurity risk assessment.

To ensure that no INNS are spread onto any of the construction sites as a result of plant movement or contaminated PPE, strict biosecurity measures will be implemented to ensure all machinery and PPE is clean before it enters the site. A toolbox talk will be given to all site staff regarding the importance of biosecurity on site.

Birds

As described in the above sections the proposed works are sufficiently far away from known nesting sites of seabirds associated with the SPA and Ramsar sites that it is not considered that the works will result in disturbance to these species.

At most of the sites nesting opportunities for species such as Oystercatcher is present in the form of existing rock armour or small amounts of existing bedrock or sea wall. The works will not result in a net reduction in the availability of this habitat and it is considered that impacts will be limited to disturbance during the construction phase of the works. A nesting bird check for should be carried out immediately prior to the works taking place.

Nesting opportunities for passerine species within and adjacent to all of the sites are limited. The works will not involve the removal of habitat suitable for passerine bird species and it is considered appropriate that a nesting bird check by a suitable qualified ecologist is carried out immediately prior to the works taking place.

Any clearance of vegetation required to permit works and access that is due to be undertaken during the main breeding season (March to September inclusive) will require a pre-works check no sooner than two weeks in advance of work commencing at each site to identify whether nesting birds are present or not. Should any nests be found, they will have an appropriate exclusion zone put in place to safeguard the nests until chicks have fully fledged.

Impacts to wintering birds through noise and visual impacts should be managed through sequential working, where works are completed at one site before moving to the next, to minimise energy use by wintering birds as they move to an alternative undisturbed location. Sequential working will minimise energy loss that would occur as a result of repeatedly moving between local beaches in response to multiple sources of disturbance.

Marine fauna

All works will be undertaken at low tide where possible to minimise disturbance from noise and vibration. A toolbox talk will be given to all site staff regarding marine mammals and potential construction disturbance impacts.

None of the sites are known to be important haul out sites for seals, but if any seals are encountered within proximity to the proposed works, then works will be halted

until the individual has moved on. In the unlikely event of this being a regular occurrence, further advice will be sought from an experienced marine ecologist.

No piling techniques are being considered for any of the schemes and therefore disturbance through vibration of the water column is considered negligible.

General avoidance measures

General avoidance measures that will be incorporated at each site, where possible, will include:

- Limiting the hours of working to daylight hours, to limit disturbance to nocturnal and crepuscular animals;
- The use of lighting at night will be avoided. If the use of lighting is essential, then a directional cowl will be fitted to all lights to prevent excess light spill.
- Contractors will ensure that no harm comes to wildlife by maintaining the site efficiently and clearing away materials which are not in use, such as wire or bags in which animals can become entangled; and
- Any pipes will be capped when not in use (especially at night) to prevent animals becoming trapped. Any excavations outside of the intertidal zone will be covered overnight to prevent animals from falling and getting trapped. If that is not possible, a strategically placed plank will be placed to allow animals to escape.

Table 5-8: Details of potential impacts on Bryher

Ecological feature	Potential impact	Effect without mitigation	Mitigation	Significance of residual effect
Isles of Scilly SPA and Ramsar site Isles of Scilly Complex SAC	Damage to habitats utilised by breeding bird species via pollution and run-off.	Habitat degradation and reduction in suitable habitat for foraging. Temporary **adverse effect** at an international scale.	Strict pollution prevention measures will be implemented on site.	**No significant** adverse effect on conservation status of the site.
	The works will not take place within the SAC boundary. However, the delivery of materials will be via barge that will land in the intertidal zone within the SAC. There is the potential for the compaction of intertidal sediments within the SAC through the landing of the barge and the	Temporary **adverse effect** at international scale.	An Ecological Clerk of Works should be present when the landing site is set up to ensure that any sensitive marine habitats are avoided. To minimise disturbance and habitat degradation plant will keep to agreed haul routes and not stray outside of these areas.	**Small scale temporary adverse** effect. **No significant** adverse effect on conservation status of the site

Ecological feature	Potential impact	Effect without mitigation	Mitigation	Significance of residual effect
	provision of haul routes. There is also the potential for indirect damage to maritime habitats via pollution and run-off.		Strict pollution prevention measures will be implemented on site to prevent pollutants entering the water.	
	Indirect damage via pollution and run-off	Temporary **adverse effect** at national scale.	Strict pollution prevention measures will be implemented on site.	**No significant** adverse effect on conservation status of the habitat.
Intertidal habitats	Indirect damage via pollution and run-off.	**Temporary adverse** effect at regional scale.	Strict pollution prevention measures will be implemented on site, as outlined in above sections.	**No significant** adverse effect on conservation status of the habitat.
Breeding Birds	Potential destruction of active nests (construction).	**Temporary adverse** effect.	Any clearance of vegetation required for works and access that is due to be undertaken during the main breeding season (March to September inclusive) will require a pre-works check no sooner than two weeks in advance of work commencing to identify whether nesting birds are present or not. Should any nests be found, they will have an appropriate exclusion zone put in place to safeguard the nests until the chicks have successfully fledged.	**No significant** effect.
Pool of Bryher and Popplestone Bank SSSI	Direct damage if alternative access track is used	Temporary **adverse impact** at the national scale.	A full vegetation survey of the dunes to be impacted should be carried out at an appropriate time of year.	**Temporary adverse** impact at the national scale. **No significant** adverse effect on the

Ecological feature	Potential impact	Effect without mitigation	Mitigation	Significance of residual effect
			Any rare plants found will need to be suitably translocated prior to the works taking place.	conservation status of the habitat.
Rushy Bay & Heathy Hill (Bryher) SSSI	Direct damage to brackish lagoon via pollution and run off.	Temporary **adverse effect** at national scale.	Strict pollution prevention measures will be implemented on site, as outlined in above sections.	**No significant** adverse effect on conservation status of the site.
	The works sites are immediately adjacent to the SSSI and access routes will be required within the SSSI. There is therefore, the potential for damage and loss to habitats supporting rare plant species.	Small scale **adverse effect** on the site.	Existing roads and tracks will be used to bring materials into the area. The laydown area has been surveyed and does not contain features for which the SSSI is designated. However, a further survey will be carried out at a suitable time of year immediately prior to the works taking place. The laydown area will be strictly marked out and no materials or plant will be stored outside of this area.	**Temporary adverse** effect on conservation status of the site.
Invasive non-natives (INNS)	Further spread of non-native invasive species	**Small scale adverse** effect at local scale	Hottentot Fig has been recorded within the proposed site. An invasive species management plan will be written in order to ensure that the works do not cause the spread of any INNS and strict biosecurity and mitigation measures will be put in place as outlined.	**No significant** adverse effect on conservation status of adjacent habitats.

5.4.6 St Martin's – All sites

The works at St Martin's are limited to the installation of a timber fence along the sand dune and the construction of a temporary boat ramp.

Isles of Scilly SPA and Ramsar site

The proposed work sites do not provide suitable habitat for the bird features of the SPA and Ramsar. Nesting sites for these species are well studied and as detailed in the above sections all known nesting sites are sufficiently far away from the proposed works sites that disturbance impacts are unlikely.

Isles of Scilly SAC

No works will take place within the SAC, however, if materials are delivered by barge they will be landed on Lower Town beach. The intertidal zone here consists of littoral sandflats. Intertidal sandflats are a feature of the SAC, although habitats described in the site description refer to sheltered sandflats present between the islands and these will not be impacted. There will be a temporary negative impact upon intertidal habitats at landing sites and where haul routes are established.

There is the potential for direct damage to maritime habitats via pollution and run-off during the construction of the scheme.

Adjacent to the works, the marine habitats and the flora and fauna in which they support could be impacted upon through pollution incidents impacting upon water quality, although any discreet incidents would be temporary and not continue to cause damage through the operational phase of the project.

Plant movement in the foreshore area also has the potential to negatively impact habitats through compaction of the foreshore.

Breeding Birds

The works will not impact upon habitats suitable for breeding birds.

There will be no impacts to birds resulting from the operational phase of the project.

Bats

The sites are not considered to be of importance to bats, but there is a minor risk of increased lighting during construction works impacting upon commuting and foraging bats. There will be no loss of linear features to impact upon commuting bats during the operational phase, and no significant vegetation clearance to potentially impact upon long term foraging opportunities for bats. No structures or trees with bat roost potential have been identified within the works footprint, so there is no risk of impacting directly upon any bat roosts as a result of the construction works.

Marine fauna

It is not considered that the works will have a direct impact upon marine species.

Marine species could be impacted upon by pollution incidents during the construction phase of the project.

There are no suitable habitats for spawning fish within the proposed works footprint so spawning fish will not be impacted upon. The constructions works and operational phase of the project will not impede fish passage.

Marine invertebrates

The works will not directly impact sediments suitable for marine benthic invertebrates. However, pollution incidents could impact upon marine invertebrates during the construction phase. No significant impacts during the operational phase of the project have been identified as habitats suitable for large benthic invertebrate assemblages were only noted at the lower end of the beach away from the works footprint.

5.1.5 Mitigation measures and enhancements

The following section outlines the mitigation and enhancement measures that will be undertaken for all construction work at all of the sites to avoid or reduce impacts

upon the ecological features identified. Following this, site specific mitigation measures are provided. This information is recorded in an outline CEMP (appendix 2.2).

Habitats

The works will temporarily impact a small band of sand dune habitat.

Plant movement along the foreshore has the potential to negatively impact habitats through compaction of the foreshore. To minimise disturbance and habitat degradation, it is recommended that plant keep to agreed haul routes and not stray outside of these areas. It is considered that in this case the haul routes will rapidly recover following the completion of the works.

Pollution prevention and incident response

There is the potential to negatively impact intertidal and subtidal habitats through pollution incidents. Therefore, appropriate mitigation measures will be implemented through the construction phase to ensure that the water quality is not adversely affected through pollution incidents and the release of contaminants from the site. This will specifically cover dynamic marine environments. No refuelling of machinery will occur within 7m of any waterbody. A toolbox talk will be given to all site staff for pollution prevention and incident response. All site staff will undertake emergency drills for incident response.

Biosecurity

To ensure that no INNS are spread onto any of the construction sites as a result of plant movement or contaminated PPE, strict biosecurity measures will be implemented to ensure all machinery and PPE is clean before it enters the site. A toolbox talk will be given to all site staff regarding the importance of biosecurity on site.

General avoidance measures

General avoidance measures that will be incorporated at each site, where possible, will include:

- Limiting the hours of working to daylight hours, to limit disturbance to nocturnal and crepuscular animals;
- The use of lighting at night will be avoided. If the use of lighting is essential, then a directional cowl will be fitted to all lights to prevent excess light spill.
- Contractors will ensure that no harm comes to wildlife by maintaining the site efficiently and clearing away materials which are not in use, such as wire or bags in which animals can become entangled.

Table 5-9: Details on potential impacts on St Martin's

Ecological feature	Potential impact	Effect without mitigation	Mitigation	Significance of residual effect
Isles of Scilly SPA and Ramsar site Isles of Scilly Complex SAC	Damage to habitats via pollution and run-off.	Habitat degradation and reduction in suitable habitat for foraging. Temporary **adverse effect** at an international scale.	Strict pollution prevention measures will be implemented on site.	**No significant** negative effect on conservation status of the site.

Ecological feature	Potential impact	Effect without mitigation	Mitigation	Significance of residual effect
	The works will not take place within the SAC boundary, However, there is the potential to use the beach at Lower Town for the delivery of materials via barge that will land in the intertidal zone within the SAC. There is the potential for the compaction of intertidal sediments within the SAC through the landing of the barge and the provision of haul routes. There is also the potential for indirect damage to maritime habitats via pollution and run-off.	Temporary **adverse effect** at international scale.	To minimise disturbance and habitat degradation plant will keep to agreed haul routes and not stray outside of these areas. Strict pollution prevention measures will be implemented on site to prevent pollutants entering the water.	**Small scale temporary adverse** effect.
	Indirect damage via pollution and run-off	Temporary **adverse effect** at national scale.	Strict pollution prevention measures will be implemented on site.	**No significant** adverse effect on conservation status of the habitat.
Isles of Scilly Marine Conservation Zone complex	Indirect damage via pollution and run-off	Temporary **adverse effect** at regional scale.	Strict pollution prevention measures will be implemented on site, as outlined in above sections.	**No significant** adverse effect on conservation status of the habitat.
Sand Dune Habitat	Direct damage during construction. Small amounts of sand will be excavated to install fence posts.	Temporary **adverse effect** at national scale.	All sand will be replaced following the completion of the scheme. It is considered that given the small scale of the works that recovery will be rapid following the completion of the works. The fence will restrict access to the sand dunes and reduce erosion pressure from visitors.	**Temporary adverse effect** at national scale. **Permanent positive effect** at the national scale.
Intertidal habitats	Indirect damage via pollution and run-off.	Temporary **adverse effect** at regional scale.	Strict pollution prevention measures will be implemented on site, as outlined in above sections.	**No significant** adverse effect on conservation status of the habitat.
Invasive non-natives (INNS)	Further spread of non-native invasive species	Small scale **adverse effect** at local scale	Hottentot Fig has been recorded within the proposed site. An invasive species management plan will be written in order to ensure that the works do	**No significant** adverse effect on conservation status of adjacent habitats.

Ecological feature	Potential impact	Effect without mitigation	Mitigation	Significance of residual effect
			not cause the spread of any INNS and strict biosecurity and mitigation measures will be put in place as outlined	

5.5 Cumulative effects

Other plans and projects with potential in-combination impacts were reviewed. No plans were identified that could potentially act in-combination with the proposed works. All of the planning applications within 1km of each of the sites are all small-scale works that have no direct connection to the site. There are no Nationally Significant Infrastructure projects within 1km of the site.

The proposed works assessed are included within the Local Plan. Other coastal management works included within the Local Plan include proposed works for repairs to existing structures. The rest of the proposed works within the Local Plan include dune management and management of cliff recession. In-combination impacts with these projects and between the assessed projects has already been assessed in the Local Plan HRA.

5.6 Residual effects

This EcIA identifies the potential ecological impacts of the proposed coastal defence schemes on the Islands of Bryher, St Agnes and St Martin's. For the most part, impacts arising from the schemes will be small in scale and limited to the construction phase of the project. Appropriate mitigation during the construction phase has been recommended to minimise impacts to an acceptable level.

The schemes will result in the small scale loss of maritime vegetation (including vegetated shingle plants) present within the existing flood defence structures or in sediments built up against them. It is likely that the same plants will recolonise the new defence structures, however, a small scale residual loss is possible.

The schemes will result in the small scale loss of sand above the high tide mark, this habitat does not hold high ecological value.

There is the potential for small-scale impacts to coastal birds through construction-related visual and noise disturbance in the winter months.

Compaction of the foreshore will be temporary and will recover quickly once the works have been completed.

6 Landscape and Visual Impact

6.1 Introduction

This chapter discusses the effects of the proposed works in each location upon the setting of each site, considering this in terms of changes to landscape character and changes in the way each site is perceived, i.e. the visual impact of the proposals. To establish the significance of these effects, it first includes a baseline study of both landscape character and views. The methodology for both the baseline study and the assessment of impacts is given at **Section 6.3**.

'Landscape character' is defined as the combination of attributes, features, functions and cultural associations which contribute to the 'sense of place' to be found in any one location.

'Views' are the visual perception of the environment; in this case the specific areas likely to be altered by the proposals. Visual Impact Assessment considers the potential significance of these changes to different viewers.

Both elements of this assessment are by their nature subjective. The purpose of this assessment is to provide a framework for the description and analysis of the impacts of the proposal upon landscape character and views which, whilst derived by an individual whose perceptions are also subjective, may be interrogated in their own terms.

The objectives of the assessment are to:

- describe and evaluate the character of each site and its context as well as the visual amenity of the existing environment that may be affected by the proposals; and
- identify and assess the significance of the potential effects of the proposals on landscape character and visual amenity, including their construction, appearance and operation.

In order to realise these objectives, the assessment includes the following elements:

- Desk-based research to determine the scope of the study and any key landscape designations influencing the importance and sensitivity of the existing environment.
- Desk study of existing character assessments.
- Field survey to identify the most significant aspects of landscape character within the study area and to record key views towards each of the sites concerned.
- Assessment of the potential effects of the proposals.
- Presentation of proposals for potential additional mitigation.
- Assessment of the residual effects after mitigation is taken into account.

Areas which fall within the intertidal zone (between high and low water marks – MHWS and MLWS respectively) may be subject to either seascape or landscape assessment. In most cases, the footprint of the completed proposals falls within or on the landward side of this zone. Whilst some construction will take place or involve haulage routes passing through the intertidal zone, any potential impacts upon the seascape are considered sufficiently minor that a landscape character assessment is the more appropriate form for this report. The intervisibility of areas of landscape on opposite sides of regions of sea has however been considered, as have views from the sea where relevant.

The study area for this assessment is shown at **Figure 6.1** at **Appendix 6A**.

6.2 Legislative and Planning Policy Context

6.2.1 National Planning Policy

National Planning Policy Framework (NPPF) (2021)

The NPPF sets out the Government's planning policies and how these are expected to be applied. It also details the land use planning policies and is supported by Planning Practice Guidance (PPG). Under Section 2 *Achieving sustainable development*, Paragraph 7 states:

The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level, the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Underpinning the NPPF is the importance of the planning system to contribute to the achievement of sustainable development. Within Section 2 – Achieving sustainable development, three overarching objectives are outlined (so that opportunities can be taken to secure net gains across each of the different objectives): an economic objective, a social objective and an environmental objective.

Section 14 outlines the objectives for 'Meeting the challenge of climate change, flooding and coastal change'. Paragraph 166 states that:

> *…in coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement and marine plans. Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.*

Paragraph 168 also states that:
Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that:

a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;
b) the character of the coast including designations is not compromised;
c) the development provides wider sustainability benefits; and
d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast.

Section 15 deals with 'Conserving and enhancing the natural environment.' Paragraph 170 states that:

Planning policies and decisions should contribute to and enhance the natural and local environment by:

a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan);
b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of the best and most versatile agricultural land, and of trees and woodland;
c) maintaining the character of the undeveloped coast, while improving public access to it where appropriate;
d) minimising impacts on and providing net gains for biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;

e) *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and*
f) *remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.*

Paragraph 172 deals with conserving and enhancing landscape and scenic beauty in National Parks, the Broads and Areas of Outstanding Natural Beauty and states that:

The conservation and enhancement of wildlife and cultural heritage are also important considerations in these areas. Consideration of such applications should include an assessment of:

a) *the need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy;*
b) *the cost of, and scope for, developing outside the designated area, or meeting the need for it in some other way; and*
c) *any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated*.

Paragraph 170 states that within areas defined as Heritage Coast:

Planning policies and decisions should be consistent with the special character of the area and the importance of its conservation. Major development within a Heritage Coast is unlikely to be appropriate, unless it is compatible with its special character.

Planning Practice Guidance: Flood risk and coastal change (2021)

This document provides advice about how to reduce risk from coastal change by avoiding inappropriate development in vulnerable areas or adding to the impacts of physical changes to the coast. Guidance can also be found on the application of an integrated Coastal Zone Management, in which it outlines the key guiding principles in implementing an integrated approach to the management of coastal areas. These are:

- A long term view
- A broad holistic approach
- Adaptive management
- Working with natural processes
- Support and involvement of all relevant administrative bodies
- Use of a combination of instruments
- Participatory planning
- Reflecting local characteristics

It also states that, in coastal areas, local planning authorities should collaborate with the Marine Management Organisation (MMO) to ensure that plans and policies across the land/sea boundary are coordinated.

Planning Practice Guidance: Natural Environment (2019)

Landscape is covered within this guidance as it refers to the principle that planning should recognise the intrinsic character and beauty of the countryside and indicates that local plans should have policies for the conservation and enhancement of the natural environment, including landscapes, both designated and the wider countryside. The guidance refers to the use of landscape character assessment at a national and local level as a tool to help inform, plan and manage change.

The guidance also refers to the duty of considering development proposals that are situated outside National Park or Area of Outstanding Natural Beauty boundaries, but which might have an impact on the setting of, and implementation of, the statutory purposes of these protected areas. With reference to Areas of Outstanding Natural Beauty (AONB) it states that:

Planning policies and decisions should be based on up-to-date information about the natural environment and other characteristics of the area. As part of this, local planning authorities and neighbourhood planning bodies should have regard to management plans for National Parks and Areas of Outstanding Natural Beauty, as these documents underpin partnership working and delivery of designation objectives. The management plans highlight the value and special qualities of these designations to society and show communities and partners how their activity contributes to protected landscape purposes.

National Parks and Areas of Outstanding Natural Beauty (AONB) management plans may also be material considerations in making decisions on individual planning applications, where they raise relevant issues.

With reference to Heritage Coasts, the guidance states:

Local planning authorities should maintain the character of the undeveloped coast, protecting and enhancing its distinctive landscapes, particularly in areas defined as Heritage Coast, and improve public access to and enjoyment of the coast. Heritage Coasts are stretches of our most beautiful, undeveloped coastline which are managed to conserve their natural beauty and, where appropriate, to improve accessibility for visitors. Most of the defined Heritage Coast is covered (on land) by either Area of Outstanding Natural Beauty or National Park designations. Natural England has published advice on Heritage Coasts. The Marine Management Organisation produces guidance on marine planning which may also be relevant to protecting Heritage Coasts.

UK Marine Policy Statement 2011 (MPS)

The Marine Policy Statement (MPS) is the framework for preparing Marine Plans and taking decisions affecting the marine environment. It will contribute to the achievement of sustainable development on the United Kingdom marine area, and defines how marine planning will:

- achieve integration between different objectives;
- enable the co-existence of compatible activities wherever possible;
- integrate with terrestrial planning.

The Statement highlights importance of the landscape, seascape and historic environment of coastal areas, with reference to potential effects that might arise from activities and developments in the marine and coastal areas.

6.2.2 Regional Planning Policy

South West Marine Plan 2021 (DEFRA)

The MMO is responsible for preparing Marine Plans in England. These are 20-year plans with a review period of 3 years, intended to govern the management of the seas within UK coastal waters around England. They set out the priorities and directions for future development within the plan area, inform sustainable uses of resources and inform the best location for activities and development. The proposal sites lie within Area 8, South West inshore.

The South West Marine Plan includes the following objectives relevant to landscape and seascape:

- *People appreciate the diversity of the marine environment, its seascapes, its natural and cultural heritage and its resources and can act responsibly.*

- *The use of the marine environment is benefiting society as a whole, contributing to resilient and cohesive communities that can adapt to coastal erosion and flood risk, as well as contributing to physical and mental wellbeing.*
- *The coast, seas, oceans and their resources are safe to use.*
- *The marine environment plays an important role in mitigating climate change.*
- *There is equitable access for those who want to use and enjoy the coast, seas and their wide range of resources and assets and recognition that for some island and peripheral communities the sea plays a significant role in the community.*
- *Healthy marine and coastal habitats occur across their natural range and are able to support strong, biodiverse biological communities and the functioning of healthy, resilient and adaptable marine ecosystems.*

Policy SW-SCP-1 states:

Proposals should ensure they are compatible with their surroundings and should not have a significant adverse impact on the character and visual resource of the seascape and landscape of the area.

The location, scale and design of proposals should take account of character, quality and distinctiveness of the seascape and landscape.

Proposals that may have a significant adverse impact on the seascape and landscape of the area should demonstrate that they will, in order of preference:

a) avoid
b) minimise
c) mitigate
- adverse impacts so they are no longer significant.

If it is not possible to mitigate, the public benefits for proceeding with the proposal must outweigh significant adverse impacts to the seascape and landscape of the area.

Proposals within or relatively close to nationally designated areas should have regard to the specific statutory purposes of the designated area. Great weight should be given to conserving and enhancing landscape and scenic beauty in National Parks and Areas of Outstanding Natural Beauty.

Similarly, policy SW-ACC-1 states that proposals should avoid, minimise or mitigate against any significant adverse impacts on public access. The potential impacts of the proposals on Land use, tourism and recreation are assessed in Chapter 8 of this Environmental Statement.

6.2.3 Local Planning Policy

Isles of Scilly Local Development Plan (2021)

The current Isles of Scilly Local Plan was adopted in 2021, revoking the former plan adopted November 2005. A 'Final Design Proof' of the 2021 plan is currently being produced, although a 'Lite' version is available to view. The stated aims include the following of relevance to landscape character and visual amenity in the context of the proposals:

- Maintaining an outstanding and world-class environment and ensuring that its distinctive and significant landscape and seascape, heritage and nature conservation assets are protected, valued and enhanced.
- Ensuring the provision of infrastructure utilities to create a more sustainable, resilient and self-sufficient Scilly.
- Adapting to the effects of climate change on people, wildlife and places by increasing resilience, matching the vulnerability of land uses to flood-risk and managing surface water in the most sustainable way.

Accordingly, its objectives include to:

- ensure new development is appropriate located, sited and designed to maintain and enhance the environment avoiding any significant environmental impacts, or provide appropriate mitigation.
- improve the quality of the natural environment, including coastal waters, through the provision of better infrastructure and appropriate management.
- protect the distinct identities and characteristics of individual islands and settlements.
- mitigate against the inevitable local impacts of climate change to ensure the environment, its community and businesses are conserved for future generations and help sustain the islands into the future.

Relevant policies include those outlined below.

SS1: Principles of Sustainable Development
Favours development proposals which 'make a positive contribution to the social, economic and environmental needs' of the islands, requiring them amongst other objectives, to conserve and enhance the 'outstanding natural, built and historic environment' and to take into account 'the long-term implications of climate change and rising temperatures for flood risk, coastal change, water supply, biodiversity and landscapes'.

SS2: Sustainable Quality Design and Place-Making
Rules out development considered to be 'of poor or unsustainable design,' favouring instead proposals which respect and reinforce character, identity and local distinctiveness; do not interrupt important public views, key landmark buildings or significant cultural heritage features; makes efficient use of land whilst respecting the character of sites and surrounding areas; safeguards amenity; provides high-quality public spaces including recreational facilities and green infrastructure; among other requirements.

SS5: Physical Infrastructure
Proposals are supported with an appropriate evidence base or where they make a positive contribution to the sustainability of the islands.

SS7: Flood Avoidance and Coastal Erosion
Supports natural dune restoration and works connected with flood resilience and coastal defence where any natural and historic designations that may be affected have been adequately addressed.

OE1: Protecting and Enhancing the Landscape and Seascape
The first part of this policy is wholly relevant:

(1) Development will only be permitted where it aligns with the statutory purpose of Areas of Outstanding Natural Beauty (AONB), and therefore conserves and enhances the islands' landscape, seascape and scenic beauty. Development must take into account and respect:

a) the distinctive character, quality, scenic beauty and sensitivity of the landscape and seascape;

b) the undeveloped and special character of the Heritage Coast;

c) other qualities, such as important features and views, dark skies and tranquillity, and having regard to the AONB Management Plan; and

d) the Isles of Scilly Landscape Character Study and any successor or associated documents.

OE6: Minerals
Supports proposals which make use of construction materials 'already on the islands, through the use of recycled and secondary materials to minimise the requirement for any direct extraction'.

OE7: Development affecting Heritage
Sets a requirement for development to enhance the character or appearance of the

Conservation Area or non-designated heritage assets and their setting; for design and siting take account of the context of the area including its spaces, landscapes and views into or out of the area; enhances the setting of Scheduled Monument or Archaeological Sites. Heritage considerations are reported in full at Chapter 7 of this Environmental Statement.

Isles of Scilly Area of Outstanding Natural Beauty (AONB)

The Isles of Scilly Area of Outstanding Natural Beauty Management Plan 2021-2025 is produced by Isles of Scilly Wildlife Trust on behalf of the Council of the Isles of Scilly (CIoS). As of November 2021 it is awaiting adoption by the CIoS. The plan notes the diversity and distinctiveness of the existing landscape of the islands as well as their tranquillity and the accessibility for leisure and recreation. It identifies the following threats relevant to landscape and visual amenity resulting from climate change:

- Rising sea levels over the remainder of the 21st century, impacting on the low-lying areas of the islands and intensifying coastal erosion.
- Impacts on soil quality due to climate change and resulting in increased erosion.
- Damage to terrestrial waterbodies due to increased inundation by seawater and limited rainwater.
- Increased prevalence of exotic and invasive species due to warmer mean temperatures.

The plan also describes the role of the existing landscape in providing a range of ecosystem services, including amongst other services:

- Green recreation
- Natural heritage
- Symbolic value
- Coastal protection
- Soil fertility
- Soil erosion protection
- Absorption of noise, wind and visual pollution

It sets out a policy framework based upon an ecosystems services approach, including the following objectives of relevance to landscape character and visual amenity:

C1 Develop and contribute to safe and inclusive access to landscapes in ways that preserve the integrity of conservation and historic sites and features;
D4 Promote, encourage and showcase sustainable land management practices;
E1 Ensure improvement to water level management structures and approaches across wetland sites which assist in maintaining or enhancing biodiversity, water storage, water quality and flood alleviation/mitigation.

6.3 Methodology

6.3.1 Parameters

Best practice guidance

The assessment of landscape and visual effects has been prepared with reference to Guidelines for Landscape and Visual Impact Assessment, 3rd edition (GLVIA3), published by the Landscape Institute and the Institute of Environmental Management and Assessment in 2013.

GLVIA3 is the principal guidance document used in this assessment. However, other reports are also referenced and have been used to inform the methodology where appropriate. Whilst these in general relate to larger-scale developments than that covered by this assessment, some principles and guidance were of relevance. These include:

- National Planning Policy Framework (2021), Ministry of Housing, Communities and Local Government;
- Technical Guidance Note 06/19 – Visual Representation of Development Proposals (2019), Landscape Institute; and
- Landscape Character Assessment – Guidance for England and Scotland (2002), Scottish Natural Heritage and The Countryside Agency.

Assessment terminology

Where such effects are considered to be of relevance or importance within the planning process, these are described as significant.

In order to determine the scale of effects, two key aspects should be established. These are the nature of the landscape or visual receptor likely to be affected, often referred to as its sensitivity and the nature of the effect likely to occur, which is often referred to as the magnitude of the likely change. These two results are combined to form a judgement of the scale of the effect. Consideration of the scale of the effect then enables a judgement to be made as to whether the effect is significant.

Professional judgement

GLVIA3 recognises that professional judgement is an important concept within LVIA. Whilst there is scope for quantitative measurements of some factors, in many situations the assessment must rely on qualitative judgements that are based on reasoned and informed justifications.

Limitations of the assessment

The assessment and the prediction of effects during the lifespan of the development are based on the available background information and supplied drawings of the proposal and involve a degree of informed professional judgement.

Assessment of residential visual receptors

No Residential Amenity Assessment has been included in this assessment. Views and the effect of the proposals upon views from residential properties are however described in general terms. An assessment of Land Use, Tourism and Recreation is included in Chapter 8.

Timing of survey

The site visits and survey were carried out from 2nd-4th November 2021. The majority of deciduous vegetation present was without leaves at the time. However, most tall vegetation present was evergreen.

Glossary

Some of the terms used within the assessment have a specific meaning. A glossary of these terms is provided in Chapter 1 of this Environmental Statement. The definitions are based on those provided within GLVIA 3.

Scope

The scope of the LVIA was initially defined through desk-based research. Key matters reviewed in determining the scope were:

- The extent of the draft study area.
- Sources of relevant landscape and visual information.
- The nature of the possible landscape and visual effects.
- The main receptors and any specific viewpoints.

- The extent and appropriate level of detail for the baseline studies to be proportionate to the scale and type of development proposed.
- The type of visual materials to be generated and the methods to be used for their production and presentation.

Study area

The extent of the study area for landscape character and visual impact was initially drafted on the basis of mapping combined with an understanding of the proposals and refined as a result of the survey. The study area is in three portions: one relating to the proposals for Bryher, one for St. Agnes and one for St. Martin's. Bryher's study area includes the sound between Bryher and Tresco in order to take in the view from Tresco harbour towards the Quay (formally known as Church Quay) and the associated haulage route. St. Agnes' study area only includes the northern part of the island due to the localised nature of any potential impacts. Likewise, the study area for St. Martin's only includes the southern half of the island. The areas considered are devised to enable a wide perspective on the proposals to be taken so that significant impacts can be ruled out; they are not intended to imply significant impacts throughout.

The proposed study area was communicated to the Council of the Isles of Scilly on 29th November 2021.

6.3.2 Viewpoints and other photography

General

The assessment process is supported using 'viewpoints' to illustrate and evaluate effects at key sites relevant to the proposal. Other 'context images' are provided to illustrate aspects of existing landscape character. However, the assessment of effects is not confined to these context images.

Viewpoints

A viewpoint is a location from where a view of the proposal may be gained. Several viewpoints have been chosen in order to support the assessment of landscape and visual effects and illustrate effects at key locations.

The viewpoints are carefully selected to be either:

- Representative viewpoints: those selected to represent the experience of different types of visual receptors, where a large number of viewpoints cannot all be included individually and where significant effects are unlikely to differ. For example, viewpoints may be chosen to represent views of users of several footpaths or bridleways. Viewpoints may also be selected to reflect visual elements that inform the landscape resource.
- Specific viewpoints: important key viewpoints within the landscape. Examples of these may include local visitor attractions, settlements, routes valued for their scenic amenity, or places with cultural landscape associations.
- Illustrative viewpoints: those chosen specifically to demonstrate a particular effect or specific issues, e.g. restricted visibility at certain locations.

A candidate list of viewpoints was initially devised based upon those locations from which the proposed development is likely to be visible and would result in discernible effects on the view and the receptors. This was informed by maps, fieldwork observations and information on other relevant issues such as access and popular vantage points, including some suggested by the planner officer at the Council of the Isles of Scilly responsible for landscape and visual considerations. A range of views and viewers were represented through the choice of these viewpoints. This list was refined in the light of information gathered during the survey, ensuring that the final

selection incorporated a range of conditions and enabled the experience of different types of viewer to be considered.

For all viewpoints taken from land, photographs were taken with a digital SLR camera with a 35mm equivalent lens. Where time and physical constraints allowed, the camera was tripod mounted in either a portrait or landscape orientation depending on the nature of the surroundings (for example where views were largely horizontal in character, landscape orientation was used). A series of images suitable to stitch together to form a panoramic image was taken in accordance with the Landscape Institute's guidance for 'Type 1' visualisations. The following information was recorded and is supplied:

- Location identified via features in situ cross referenced to mapping.
- Viewing height in metres.
- Horizontal field of view (in degrees).
- Distance to development.
- Date and time.
- Weather conditions and visual range.

It was not feasible to follow every aspect of the above procedure in the case of viewpoints taken from the water, for example with regard to the use of a tripod. In these cases, a handheld 48MP camera phone was used set to factory standard settings.

The following information is described in the assessment:

- Description of location (receptor).
- Description of nature of existing view and likely change during development lifespan.
- Description of magnitude of impact and sensitivity of visual receptors.
- Summary of the significance of the potential impact during construction, on completion and after 15 years.

Each viewpoint is displayed on a single page of A3 including a location plan and a panorama containing the extent of the proposed development.

Context images

Context images are not governed by the same Landscape Institute guidance set out for viewpoints. Both the same 35mm equivalent Digital SLR camera and handheld 48MP camera phone were used to capture images for the general illustration of characteristics and features of the landscape described in the assessment.

6.3.3 Baseline landscape assessment methodology

Introduction

For the purposes of LVIA, the landscape is a resource in its own right. The European Landscape Convention (2000) provides the following definition of landscape:

Landscape means an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors.

The assessment of landscape effects considers the effects the proposed development or change will have on this landscape resource. Landscape effects that may arise include a change, loss or addition of elements; features, aesthetic or perceptual aspects that contribute to the distinctiveness or character of the landscape.

Defining the baseline landscape character

The purpose of the baseline study is to identify the key characteristics and features of the existing landscape to assess how these would be affected by the proposed development. In Landscape Character Assessment, landscape characteristics and

features are termed landscape receptors; the potential effects on these receptors are what is subsequently assessed. In this study the landscape baseline studies consider the following:

- Landscape character: the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement but also encompasses its perceptual and aesthetic qualities. It creates the particular sense of place of different areas of the landscape. Assessment of the effect of the development on landscape character is a crucial element of the landscape assessment.
- Landscape designations: sites with landscape designations are considered in addition to the overall landscape character areas, to enable site specific judgements of effects on particularly valued sites.

Initially, a desk-based study was carried out to establish what is already understood about the landscape within which the sites are located, and the value attached to that landscape. This was augmented by information collected during the survey.

Determining landscape sensitivity

The next stage is to determine the sensitivity of the landscape receptors to the type and scale of development proposed. To do this, the susceptibility and value of the receptor are considered according to the principles below.

Susceptibility is the ability of the landscape receptor to accommodate the proposed development without undue consequences for the maintenance of the baseline and/or the achievement of planning policies and strategies (GLVIA3). Susceptibility is described as set out in **Table 6-1** below.

Table 6-1: Susceptibility to change

High	Development of the nature proposed is likely to lead to negative consequences for this receptor.
Medium	Development of the nature proposed may lead to negative consequences.
Low	Development of the nature proposed is unlikely to lead to negative consequences.
Null	Development of the nature proposed would not lead to negative consequences; or this receptor does not fall within the site boundary.

Susceptibility may be informed by existing Landscape Character Assessments, which often note sensitivity. However, this is frequently 'intrinsic' or 'inherent' sensitivity, which may not directly relate to the type of development proposed. In this assessment, sensitivity is directly linked to the nature of the proposals.

The value of a landscape receptor is informed by designations, planning policy and documents, the contribution of cultural, historic or conservation factors or associations, scenic quality, rarity, recreational value and aesthetic, perceptual and experiential qualities. These are again underpinned by professional judgement, particularly where no designations are established. Designations confer importance at international, national, regional or local scale. The definitions of landscape value considering all these factors and used in this assessment are described as set out in **Table 6-2**.

Table 6-2: Landscape value

High	Landscapes with national or international designations on account of landscape value, such as National Parks, Areas of Outstanding Natural Beauty, Heritage Coasts or World Heritage Sites.
Medium	Landscapes of local value, subject to additional policy protection (such as Areas of High Landscape Value), or where it is considered that particular features or appreciation of the landscape is of greater value than other nearby areas.
Low	Landscapes that are not subject to designation but may be valued at a community or local level.
Minimal	Landscapes that are degraded or exhibit little or no community or local value.

Sensitivity combines the judgements made for susceptibility and value in relation to the type of changes represented by the proposals. Three levels of sensitivity are recorded, as set out in **Table 6-3** below.

Table 6-3: Landscape sensitivity

High	A landscape of high value and a particularly distinctive character that is susceptible to relatively small changes of the type proposed.
Medium	A landscape of valued characteristics reasonably tolerant of change of the type proposed.
Low	A landscape of relatively low value or importance which is potentially tolerant of substantial change of the type proposed.
Nil	A landscape of any value unlikely to be susceptible to changes of the type proposed.

Other landscape considerations

The considerations noted above are further informed by general observations regarding the condition and quality of the landscape. These support the overall narrative and judgement of sensitivity. Landscape quality or condition may relate to the level of management, distinctiveness, number of detracting features, pattern, unity, structure, sense of place, function, definition and aesthetic value.

Areas of landscape quality may not necessarily correlate directly with landscape character areas or designated sites as defined by statutory agencies or local planning authorities. Where it is considered that this is the case, mention is made within the description and sensitivity evaluation.

6.3.4 Baseline visual assessment methodology

Introduction

The Visual Impact Assessment is concerned with how the proposed development may affect visual amenity: the visual quality of a site or area as experienced by people. Visual Impact Assessment primarily considers visual amenity as experienced by people out of doors in publicly accessible areas, including residents of the area or visitors including tourists, people engaging in recreation, travelling through or working within the area. Residents within private dwellings are also referenced collectively in this assessment. These groups of people are termed 'visual receptors' for the purpose of the assessment.

Establishing the visual baseline

Identification of potential visual receptors is informed by desk and field studies, to identify places where people might be expected to receive a view of the proposed development. Once receptors have been identified, it is necessary to document the following information, though the degree of detail required will vary depending on the nature of the receptor and the view experienced.

- Type, relative numbers and activities of potential receptors.
- The nature, composition and characteristics of the existing views, for example
  - the nature and extent of the skyline
  - aspects of vertical scale and proportion
  - key foci
  - elements which interrupt, filter of otherwise influence the view.

Determining visual receptor sensitivity

The sensitivity of visual receptors is determined by considering the susceptibility of the receptor and the likely value of the view to those receptors. Susceptibility is a function of receptor type, location and activity. Factors which influence this judgement include:

- Activities – the extent to which the receptor is engaged in an activity for which the experience of the view is a key part.
- Movement/duration – whether receptors are likely to be stationary or moving, determining how long they will experience the view concerned.
- Orientation and aspect – whether the site is located centrally to the receptors' field of view in relation to the development.

The value of the view that is experienced may relate to associated landscape or planning designations, cultural references or the presence of facilities (car parking, interpretation boards, signage) that may emphasise importance.

Visual sensitivity is considered as a combination of susceptibility and value in relation to the type of changes represented by the proposals. It is categorised as set out in **Table 6-4** below.

As with all aspects of the methodology, these definitions are not rigid; where professional judgement has been applied, this would be noted in the narrative.

Table 6-4: Visual sensitivity

High	Visitors to promoted or valued viewpoints especially those with panoramic views; visitors to heritage or tourism sites where views are important; viewpoints noted within planning guidance or policy; users of Public Rights of Way - in particular those receiving high numbers of visitors or signposted trails.
Medium	Receptors experiencing views of moderately high value, or who are travelling along cycle routes or local roads particularly those in rural areas where speeds are slower.
Low	Receptors experiencing views of lower value, or who are fast-moving (due to speed on roads and motorways) or because they are engaged in an activity not concerned with the landscape or view (such as work or sport).

6.3.5 Assessment methodology for landscape effects

Magnitude of landscape change

The significance of effects upon landscape character is evaluated by considering together the sensitivity (or nature) of the landscape or visual receptor and the magnitude (or nature) of change.

Effects on landscape receptors are assessed in terms of their magnitude of change. This is a combination of the size or scale, geographic extent of the area influenced and the duration and reversibility of the impact. Within the assessment, size and scale or extent may not always be noted. In many cases, it is considered sufficient to describe only the magnitude of change, which is informed by an overall professional judgement.

Size and scale concern the quantity of existing landscape elements that would be lost together with the extent to which these represent or contribute to the character of the landscape. It also relates to the degree to which aesthetic or perceptual aspects of the landscape are altered through removal or addition of new features, such as hedge loss or introduction of tall features on skylines.

Size and scale are defined in the terms set out in **Table 6-5**.

Table 6-5: Size and scale of landscape change

Large	Major change to the existing landscape including key elements, characteristics and qualities.
Medium	Partial or noticeable change to key elements, characteristics and qualities.
Small	Some discernible but largely minor change to key elements, characteristics and qualities.
Negligible	Very minor or virtually imperceptible change to key elements, characteristics and qualities.

The geographical extent over which landscape effects are felt is distinct from the size or scale. For example, large scale effects may be limited to the immediate site area. Extent is subject to a degree of professional judgement. The terms in **Table 6-6** below are used in this assessment.

Table 6-6: Terms used to describe the geographical extent of landscape effects

Widespread	Effects influencing a large area of landscape of different types including areas a significant distance from the site.
Broad	Effects influencing the majority of a single discernible area of coherent landscape character.
Localised	Effects influencing the site and surrounding area.
Site	Effects influencing character only within the site.

The duration of the effect relates to the time period during which the changes to the landscape will occur. This is rated as follows:

Long-term – beyond 10 years.
Medium-term – 2 to 10 years.
Short-term – up to 2 years.

The *magnitude of change* is a product of the size/scale, extent and duration of the impacts. This is judged as a four-point scale as set out in **Table 6-7**.

Table 6-7: Magnitude of landscape change

Large	Significant and long-term change in landscape characteristics over an extensive area, or very intensive, long-term change over a more limited area.
Medium	Moderate, short-term change over a large area or moderate long-term change in localised area.
Small	Slight long term or moderate short-term change in landscape components.
No change / negligible	No discernible/virtually imperceptible change to the landscape's resources.

Effects can be classed as Beneficial, Neutral or Adverse.

Significance of landscape effects

Adverse landscape effects occur when features or key landscape characteristics such as established planting, old buildings or structures which — when considered singularly or collectively — help to define the character of an area are lost, or where new structures out of scale or character with the surroundings are introduced.

Substantial adverse landscape effects occur where the proposals are at considerable variance with the landform, scale and pattern of the landscape and would be a dominant feature, resulting in considerable reduction in scenic quality and large-scale change to the intrinsic landscape character of the area, including widespread impacts upon landscape receptors.

Moderate adverse landscape effects occur where proposals are out of scale with the landscape, or inconsistent with the local pattern and landform and may be locally dominant and/or result in a noticeable reduction in scenic quality and a degree of change to the intrinsic landscape character of the area, including impacts upon multiple landscape receptors.

Slight adverse landscape effects occur where the proposals do not quite fit with the scale, landform or local pattern of the landscape and may be locally intrusive but would result in a minor reduction in scenic quality or change to the intrinsic landscape character of the area, including impacts upon a small number of landscape receptors.

Negligible landscape effects arise when the change proposed results in little or no discernible improvement or deterioration to the landscape resource. The proposals sit well within the scale, landform and pattern of the landscape and / or would not result in any discernible reduction in scenic quality or change to the intrinsic landscape character of the area and no significant effects upon landscape receptors.

Beneficial landscape effects occur where derelict buildings, land or poorly maintained landscape features are repaired, replaced and maintained or where new features are introduced such as new tree planting which helps to define landscape structure where none currently exists. Beneficial landscape effects can be slight, moderate or substantial.

6.3.6 Assessment methodology for visual effects

Magnitude of changes to views

Development can change people's experience and perception of the view depending on existing context, the scale, form, colour and texture of the proposals, the nature of the activity associated with the development, and the distance and angle of view. Visual effects largely result from changes to existing views experienced by visual

receptors, such as intrusion of new development, or loss of or change to the appearance of existing features.

The assessment of the magnitude of change on visual receptors follows similar principles to landscape assessment in terms of size or scale, the geographic extent of the area influenced and its duration and reversibility.

Size and scale concern the relative change in the elements, features, qualities and characteristics that make up the view. They are classified as set out in **Table 6-8** below.

Table 6-8: Size and scale of changes to views

Large	Major change to the features and qualities of the existing view.
Medium	Partial or noticeable change to the features and qualities of the existing view.
Small	Some discernible but largely minor change to the features and qualities of the existing view.
Negligible	Very minor or virtually imperceptible change to the features and qualities of the existing view such that the view essentially remains unchanged.

The geographical extent over which visual effects upon each receptor is described as set out in **Table 6-9**.

Table 6-9: Terms used to describe the geographical extent of visual effects

Comprehensive	Effects influencing most of a view experienced by a visual receptor.
Substantial	Effects influencing generally between one quarter or one half of a view experienced by a receptor.
Moderate	Effects influencing generally less than one quarter of a view experienced by a receptor.
Minor	Effects influencing generally only a small part of the view experienced by the receptor.

The duration of the effect relates to the time period during which the changes to the view will occur. This is rated as follows:

Long-term – beyond 10 years.
Medium-term – 2 to 10 years.
Short-term – up to 2 years.

The magnitude of change is a product of the size/scale, extent and duration of the impacts. This are expressed in a four-point scale as set out in **Table 6-10** below.

Table 6-10: Magnitude of visual impacts

Large	Where the development would cause a comprehensive long-term change in the existing view.
Medium	Where the development would cause a substantial long-term change in the existing view; or a medium-term comprehensive change.

Large	Where the development would cause a comprehensive long-term change in the existing view.
Small	Where the development would cause a moderate, short-term change in the existing view or a minor change over the medium-term.
No change / negligible	Where the development would cause a barely perceptible medium to long-term change in the existing view; or where a minor change occurs over the short-term.

Significance of visual effects

Adverse Visual Effects occur when the proposed development will introduce new, non-characteristic, discordant or intrusive element/s into views. The significance of these effects is expressed as follows:

Substantial adverse visual effects occur where the proposed development would cause a considerable deterioration in a highly valued existing view or visual amenity.

Moderate adverse visual effects occur where the proposed development would cause a noticeable deterioration in a highly or moderately valued existing view or visual amenity.

Slight adverse visual effects occur where the proposed development would cause a barely perceptible deterioration in an existing view or visual amenity that is of medium or lower value.

Negligible visual effects occur where the change proposed results in little or no discernible improvement or deterioration to views or visual amenity.

Beneficial visual effects occur when the proposed development would enhance the quality of the receptor's view e.g. by creating a new focal point in a degraded landscape that includes a range of existing detractors. Beneficial visual effects can be slight, moderate or substantial. Beneficial and adverse effects may balance against each other – for example where proposals include both the removal of existing vegetation and an improvement in the appearance of existing degraded infrastructure. Effects may also be neutral, for example changes which are moderate or high in magnitude but which involve a rearrangement within the existing footprint of a site using locally appropriate materials.

Overall importance of effects

The terms describing significance of effects for landscape and visual impact are also used to judge the overall importance of impact for the purposes of planning.

Substantial effects are those which are very important in the planning decision-making process.

Moderate effects are material if not overriding considerations in the planning decision-making process.

Slight effects, whilst noticeable, are not in themselves material in the planning decision-making process.

Negligible/No Change indicates effects that are trivial, hence not relevant to the planning decision-making process.

It should be noted that whilst an effect may be significant, it does not necessarily mean it would be unacceptable. Account is also taken of the effect of any mitigation measures — for example planting or landform may have in terms of minimising potentially detrimental effects or improving the landscape character, views or the resilience of the landscape to changes beyond the scope of a development (for example those noted as part of the baseline assessment).

6.3.7 Incorporating mitigation

Mitigation within the existing proposals

Some mitigation and offset measures are already incorporated into the proposals. The assessment takes account of these measures in the overall significance of effects reported. This is referred to as *embedded* mitigation.

6.4 Baseline landscape and visual assessment

Introduction

This section provides a description of the baseline landscape character and visual amenity, along with an assessment of the potential effects of the proposed development.

Additional mitigation

Some mitigation may not be determined prior to an impact assessment being made. This may be because the issues which may be mitigated or offset may only be brought to light by the assessment; or because the mitigation suggested by the assessment relies upon a later, more detailed stage of design than it is reasonable to have carried out prior to the assessment. Measures described at the end of this assessment fall into this category. The effect of incorporating these measures in the proposals is judged and a revised assessment of significance is given based on this judgement.

Assessing residual effects

The assessment concludes by reviewing the significance of landscape and visual effects reported in the light of the mitigation proposed. This is judged for the period during construction and upon completion; and where relevant for periods 15 years after completion, to allow for temporal factors such as the growth of plants, weathering of materials etc.

In the interests of proportionality and clarity, effects listed as negligible during the initial impact assessment are not revisited for residual effect except where mitigation would result in a potentially significant beneficial effect.

6.4.1 Landscape character

Desk study: Designations

Area of Outstanding Natural Beauty (AONB)

The Isles of Scilly AONB is a designation which covers the whole of the Isles of Scilly. The Isles of Scilly are the smallest AONB designation in the UK measuring only 16km^2; however, the islands possess a diversity of scenery and designations that belies their small scale. The archipelago combines granite cliffs and headlands, sandy bays, hidden coves, shifting dunes and saline lagoons.

Other Designations

Certain areas within Bryher, St. Agnes and St. Martin's are designated as SSSI and SPA. The significance of these designations with respect to the proposals is discussed in **Chapter 5: Biodiversity and nature conservation**.

There are a total of 238 Scheduled monuments in 250 locations across the islands, some of these covering extensive areas including entire islands such as Samson. There are also 129 Listed Buildings. In total scheduling affords protection to over 900 individual sites. The significance of heritage designations with respect to the proposals is discussed in **Chapter 7: Historic Environment**.

Desk study: existing character assessments

National Character Areas

The National Character Area (NCA) map is devised for the whole of England by the government agency Natural England. This map provides a broad level description of landscape character within 159 areas, defined by their distinctive attributes and

functionality. The sites in which the proposals are located lie within **NCA 158: Isles of Scilly**.

The key characteristics of the area which are considered relevant to the proposals are as follows:

- The area is made up of low-lying granite islands with a strong maritime influence.
- Isolated from the UK mainland, with a strong sense of remoteness and tranquillity.
- White sandy beaches, embryonic sand dunes and unenclosed areas of maritime heath and grassland fringe the islands; some heathland is dominated by gorse and bracken.
- The sea is a dominant influence that both unites and divides the islands; the crystal white sand and the turquoise sea of summer contrasts with a grey thundering sea that is typical of autumn and winter in the western rocks.

The NCA profile defines four Statements of Environmental Opportunity (SEO), of which SEO2 is relevant to this proposal:

> *Understand, plan for and manage the impact of climate change on the Isles of Scilly, especially securing sustainable management of biodiversity and the historical, marine and coastal environments. In particular, consider the implications on the islands' water and use.*

SEO2 examples cited include:

- Adapting to identified threats, including engineering works in accordance with the Shoreline Management Plan, strategic coastal realignment and conservation of natural and cultural resources.
- Recognising that planning for change due to natural processes, such as sea level rise and increased rainfall events and periods, may also be required, though some losses may be offset by habitat creation.

These characteristics and statements of environmental opportunity provide the context in which character assessments are carried out.

Cornwall and Isles of Scilly Character Assessment

The most recently published Landscape Character assessment of relevance to the site is the Cornwall and Isles of Scilly Character Assessment, published in 2007. Although a Local Landscape Character Assessment was completed and subsequently published for Cornwall and the Isles of Scilly in 2007, no findings are available for the Isles of Scilly. Cornwall Council refers to the following note on the publication of the 2007 local character assessment for Cornwall and the Scillies:

'Please note that at this stage the work for the Isles of Scilly has not been completed and therefore the Landscape Description Unit Profiles and Landscape Character Area Descriptions for the Isles of Scilly are not yet available.'

Local landscape character assessments

The most recent character assessment considering landscape at a detailed level is contained within the Isles of Scilly Conservation Area Character Statement (Conservation Area Character Statement Supplementary Planning Document – Draft of Consultation, 2015). This document remains in consultation form; however, it relies upon completed work in the form of the Isles of Scilly Design Guide (Buchanan, 2006), sharing an assessment of landscape character types with that document. It also refers to an earlier Historic Landscape Assessment and Management Strategy *(Historic Landscape Assessment and Management Strategy*, 1996) (HLA), drawing on and adapting that assessment's characterisation of the contemporary and historic landscape.

The draft Conservation Area statement describes the landscape character in the following general terms:

Scilly is predominantly rural, and a post war decline in land management with a reduction in livestock numbers and agricultural production has led to abandonment of much farmland. The early years of the 21st century have witnessed a rise in herd numbers in Scilly. A number of individual farmers have contributed to the rise in stock numbers as have the Isles of Scilly Wildlife Trust through the introduction of conservation grazing on the heathland. The result of this programme has been a marked improvement in biodiversity and historic environment management within the Wildlife Trust's tenanted land.

An isolated archipelago, the character of Scilly is hugely influenced by its maritime surroundings. Each of the islands has its own unique character and distinctive feel derived from its position, shape, topography, landscape and relationship to the other islands and the sea. Subtle differences create the distinctiveness of each island and the richness and diversity to be found within the Isles of Scilly. The headlands can be broadly divided into exposed heathland, low lying southern headlands and on St Mary's fortified headlands (the main example of this being the Garrison with 17th and 18th century defensive walls). The coastal edge generally breaks down into rocky shore, cliffs and sandy or boulder beaches. The extent of the tidal range creates a constantly changing landscape, atmosphere and character. Other coastal habitats include sandflats, dune systems and coastal heathland. The interior of the Islands is a mosaic of unenclosed hills supporting heathland and gorse scrub, a small number of wooded hills such as those on Tresco and agricultural land typified by small enclosed strips surrounded by evergreen hedges or by larger pasture fields enclosed by native hedgerows.

Along with the Design Guide, it presents localised character types, although these are not described in detail. However, these character types roughly map onto those identified by the HLA, of which those coinciding with the study area are summarised below. The character types listed in the Design Guide and Conservation Area Character Statement are reproduced at **Figure 6.2a-c** at **Appendix 6A**; those devised in the Historic Landscape Assessment are shown at **Figure 6.2d-f**.

Exposed headland heaths. This type is present within the study area for Bryher. It lies adjacent to the site boundary but does not coincide with it. Windswept granite headlands surrounded by sheer rugged cliffs and sea, typically north or north-east facing and covered by thin soils and wind-pruned vegetation with rocky outcrops. Small in scale, uniform and relatively isolated, rising above 36m. Containing remnant prehistoric structures. Pressure from incursion by gorse and bracken, eroded footpath routes and a need to integrate conservation and recreation.

Sandy coast with dune and grassland. This landscape type is the most common coinciding with the proposal sites, accounting for every area in which construction would be taking place on all three islands. The HLC report describes it as formed by areas of blown sand, often uniting separate granite masses, or accumulated in sheltered areas and forming low-lying coastal strips, frequently backed by dune systems with marram grass and exotic plants. Long white quartz sandy beaches containing numerous submerged relict settlements and field systems. Brackish freshwater pools are SSSI including Great Pool and Big Pool within turf swards. Pressures and changes cited in the 1996 HLC report include:

- footpath erosion
- vehicle tracking destabilising dunes
- sand extraction resulting in dune destabilisation and re-exposure of archaeological sites
- invasion of bracken and bramble
- the need to maintain water levels and quality in SSSI pools
- coastal defence works
- coastal erosion

Current pressures noted during the site visit are discussed under 'Survey' Observations below.

Rocky coast with heathland. This landscape type is present within the study area for St. Agnes and St. Martin's and is traversed by proposed haulage routes and compounds on St. Agnes only but no intrusive works. Comprises a strip of rocky coastline of small-scale granite edges and rough heathland separating managed interiors from the sea. Includes small parcels of enclosed land with stone wall or boundaries of hedgerows comprising introduced shrub species. Important areas for recreation, resulting in erosion pressure on footpaths. Other pressures and trends include encroachment of bracken and bramble, coniferous planting and loss of traditional grazing practices.

Sandy coastal strip with fields. This landscape type is present within the study area for St. Martin's, coinciding with the main area of work on that island (Neck of the Pool Bay south of Lower Town). Sheltered low-lying land behind blown sand dunes with marram grass. Light, sandy soils previously supported bulb cultivation in now largely abandoned fields resulting in locally distinctive wild flora.

Unenclosed hills. This landscape type is present within the study area for Bryher and St. Martin's. It lies adjacent to both site boundaries corresponding to haulage only but neither site area crosses into this landscape type. Comprised of gentle rounded granite hills rising from agricultural land, reaching between 30 and 40 metres. Vegetated with acid grassland/heathland and gorse scrub with fringes of bracken. Often forms sheltering backdrop to settlement on adjacent lower ground. Trends include ongoing bracken and gorse encroachment and absence of traditional grazing.

Valley and hillslopes with fields. This landscape type is present within the study area for all three islands and coincides with proposed haulage routes on Bryher. Comprising anciently and more recently enclosed land with stone and earth or drystone wall boundaries. Distinct field systems from different periods result in a patchwork character. Vegetation is mainly grassland with some areas of bracken and gorse encroachment resulting from reduced grazing management.

Valley and hillslopes with bulbstrips. This landscape type is present within the study area for each of the three islands and is traversed by haulage routes within the proposal sites for Bryher and St. Martin's. An intimate, domestic landscape contrasting with neighbouring rugged coastline and open ocean; often located in sheltered hollows on south facing slopes. One of the most distinctive features of the islands. Strips divided by sheltering hedges of Pittosporum and other introduced species – particularly Euonymus and Fuchsia on St. Martin's. Stone walls of older enclosures often visible where hedges have been lost. Vegetation within enclosures includes both bulbs and arable weeds; or where no longer managed, encroaching bracken and scrub. Trends and pressures include declining prevalence of flower farming and growth of unmanaged hedgerows into less sharply defined outlines.

In addition to the character types summarised above, a character type conveying the seascape character of coastal areas within the study area is included under 'Survey Observations' below.

Survey Observations

Overview

The following descriptions relate to the three components of the study area corresponding to the islands of Bryher, St. Agnes and St. Martin's. There is no significant visual intervisibility between the three parts of the study area. Photographs given for context are reproduced at **Appendix 6B** and referenced below.

Bryher

Bryher is a small, settled island of indented bays clustered around three main areas of high ground to the north, west and south. It is closely associated via a narrow strip of water with the larger island of Tresco (**photograph 1**). Topography is undulating and for the most part low-lying, including the large natural brackish Great Pool which forms the only open water on the island (**photograph 2**). The higher ground in the

west of the island is generally open and covered by a mix of bracken, heath and grassland, with occasional rocky outcrops. To the middle and south, higher ground includes tree cover and scrub. The highest points on the island are on Shipman Head Down in the north and Samson Hill in the south, both of which rise to 42m; elsewhere levels lie within a few metres of MHWS.

The shoreline is comprised alternately of irregular rocky headlands and beaches of sand and natural cobbles (**photograph 3**). In places, these are replaced or supplemented by constructed revetments or imposed granite rock armour, some of which is informally placed. Sand tends to be gritty in texture except in a few places on the west of the island.

Vegetation is mixed and often dominated by introduced species, especially within settled areas (**photograph 4**) such as tree Pittosporum species, New Zealand Flax, Hottentot Fig or Chilean Bromeliads. Elsewhere, Bramble, Bracken and Marram Grass are dominant.

A central swathe of the island is settled with irregular, village and suburban residential development of mixed ages and architectural character, generally fringed with enclosed gardens and backing onto bulb strips or former bulb strips defined by tall hedgerows (**photograph 5**). A simple network of concrete or metalled roads, dirt or sand tracks and grass footpaths provides access to most areas, with the roads traversing the island and the other paths and trackways accessing the coast. Some areas are set aside for light industrial or commercial purposes including building materials compounds (**photograph 6**) and boatyards. Levels of activity on the island are determined by the tourist season, which lasts from spring to mid-autumn. There is a regular flow of small boat traffic carrying passengers to and from Church Quay, connecting with other locations in the Isles of Scilly.

The overall character is generally informal and pleasant. The western half of the island has an expansive feel, influenced by its association with the open ocean; on the eastern side the relatively close proximity of Tresco creates a stronger sense of enclosure and intimacy.

St. Agnes

The region of St. Agnes, north of the tombolo to Gugh, is a strongly undulating hillscape falling to a series of deeply indented rocky coastal bays to the west, north and east (**photograph 7**). Including the small settlements of St. Agnes and Middle Town, this part of the island is nonetheless mostly undeveloped, incorporating rough grassland, small hedgerow-bound paddocks, a low-lying marsh including a brackish pool and vegetated dunes (**photograph 8**). The highest point in this area lies above Higher Town in the east, rising to 29m AOD.

The shoreline alternates between rocky headlands and beaches mainly comprising cobbles and gritty sand, with finer sand in places. One beach – Porth Killier – is wholly comprised of rocks; combined with the very shallow incline and wide intertidal margin, this results in an unusual area of coastal landscape (**photograph 9**). This bay, as well as Porth Coose and Periglis to the west, are backed by sea defences of types specific to location, whose construction is visible to varying degrees.

Vegetation on the island is dominated by exotics such as tree forms of Pittosporum and Mirror Bush (Coprosma repens), with stands of Cambria Pine (Pinus radiata macrocarpa) on the high ground; although native Elms, Tamarisk, Broom, Ivy, Bramble and Bracken are also common.

St. Agnes Middle Town and Higher Town form a single swathe of dispersed development crossing the island, comprising a mix of house types and materials (**photograph 10**); including the striking lighthouse visible from most areas and St. Agnes' church near the southern tip of Periglis Bay (**photograph 11**). Bulb strips or former bulb strips defined by tall hedgerows are associated with these areas of development. A simple network of mostly concrete roads, dirt or sand tracks and grass footpaths provides access to most areas, with the roads traversing the island

and the other paths and trackways accessing the coast. Levels of activity on the island are determined by the tourist season, which lasts from spring to mid-autumn. There is a regular flow of small boat traffic carrying passengers to and from the quay at St. Agnes (Porthconger Quay), connecting with other locations in the Isles of Scilly.

The character is generally informal and pleasant. For the most part the sense of scale in the northern part of the island is governed by the expansive ocean views and open spaces.

St. Martin's

The elongated island of St. Martin's lies on a broadly north-west to south-east axis, arranged around a central ridge of low, undulating hills rising to between 30 and 40m. The southern coastline is largely comprised of two wide, shallow bays either side of the headland which forms the southern tip of the island. The bays themselves are mostly sandy, with some areas of seaweed covered rock and gravel, and sloping very gradually resulting in extensive intertidal areas at low tide (**photograph 12**). These are backed by moderately high vegetated dunes mainly covered with marram grass.

Inland, the southern portion of the island is well vegetated with hedgerows, stands of trees, scrub and areas of Bramble and Bracken. Introduced species including Pittosporum and Mirror Bush dominate locally (**photograph 13**), although Elm and Tamarisk are also present.

Much of the tree and shrub cover is associated with gardens and bulb strips or former bulb strips arranged around the southern perimeter of the island and associated with the three organised settlements of Lower, Middle and Higher Town. A single concrete surfaced lane connects these settlements, with supplementary unsurfaced tracks leading to the coast. Buildings are of styles and materials (**photograph 14**), largely residential but including a luxury hotel at the western end and some utilitarian structures and outbuildings in other locations. A semi-enclosed paddock near the western end forms a boatyard and a larger open area near to the Higher Town quay is used for storage of marine and construction materials. Levels of activity are strongly governed by the tourist season.

Overall, the character is informal and pleasant. The scale inland is intimate, contrasting with the expansive views to St. Mary's, Tresco and the many other smaller islands scattered around the intervening water available from the shoreline.

Additional character types

Sheltered sounds and bays

This area of seascape is included to acknowledge the visual coherence between the landscape on opposite sides of the sound between Bryher and Tresco, as well as other parts of the study area incorporating marine areas. Overall, these areas do not constitute a large proportion of the study area and no intrusive works are proposed within them. Landscape receptors within this character type are detailed in **Table C1h** at **Appendix 6C**.

Shallow, slightly undulating seabed with sandbars and isolated granite islets, framed by rocky shorelines and beaches of fine to coarse sand. The areas concerned are often sheltered, or at most exposed on one side – particularly those on the west and north coasts of St. Agnes and Bryher. Vegetation is mostly coastal grasses and scrub. Settlement where present is small in scale, using mixed materials. Features include offshore rocky islets, quays and harbours.

Character local to the sites

Bryher Kitchen Porth

A pleasant, sheltered north-east facing bay of fine sand and rocks backed by low dunes and shelterbelt vegetation. Closely associated with nearby housing, lending it a domestic, intimate feel, intensified by the close proximity of Shipman Head Down to the north and the landmass of north Tresco across the sound.

Bryher Church Quay and Brow Ledge bay

Church Quay is a relatively busy location on the sheltered east side of Bryher, comprising a concrete slipway, waiting room building, a wide beach of coarse sand and small rocks, and small-scale service infrastructure. The quay area also backs onto a relatively dense area of settlement and associated hedged enclosures, served by concrete access lanes and including the ancient stone All Saints Church. Around the headland to the immediate south, Brow Ledge bay opens out as a wide, gently sloping beach of coarse sand, backed by shrubby vegetation. There are clear views across the sound to the waterfront at Tresco and of passing and moored boats on the inshore. A compound near Church Quay contains large quantities of building materials and is the only detracting feature.

Bryher Green Bay

A low plateau of bracken and bramble with small trees traversed by a footpath, this area looks out across the Bryher/Tresco sound. Consequently, the hills of southern Tresco influence the character of the area as much as its semi-wild nature. The site is adjacent to the path passing through Veronica Farm as it passes the boat hire cabin, where it comprises a strip of scrubland transitioning to rocky shoreline.

Bryher Great Porth (also known as Great Par) and Stinking Porth

Two west-facing deeply incurved bays between Gweal Hill in the north and the lower lying Heathy Hill in the south. Narrow beaches of coarse sand and a mixture of natural stone, emplaced rock armour and informally scattered stones. Framed by rocky headlands and with views to open sea interrupted by nearby islets, there is a sense of intimacy, reinforced by the close proximity to The Town. The existing rock armour at the north end of Great Porth is a clearly artificial emplacement contrasting with more natural formations nearby; however, this does not detract from the overall character and aesthetic appeal. The site coincides with these beaches in several places.

Bryher Great Popplestone

A strongly incurved bay flanked on two sides by rounded hills each of which tapers to rocky headlands. The foreshore is comprised of a narrow beach of coarse sand and rock of uniform size, much of which is emplaced or scattered and partially buried having been previously placed. The beach rises steeply to a grass-covered dune, topped at the southern end by a low concrete and masonry wall. The overall outlook is dramatic, with a sense of wildness and remoteness in spite of its close proximity to the nearest areas of settlement. In one place the soil and any grass on the inland side of this wall have been washed away to reveal its sloping concrete foundation, with a large area of grassland littered with rocks trailing behind. This forms part of the site and is easily accessible from the public areas.

Porthconger Quay, St. Agnes

Steeply sloped area falling to a rocky inshore and supporting various elements of infrastructure including the Quay itself, a concrete access road, public toilets, a building compound and the Turk's Head Inn beer garden. This relative complexity contrasts with the open, panoramic views across Porth Conger bay towards the mass of the northern Gugh headland and open sea to the north.

St. Agnes Porth Killier

A deeply incurved north-facing shallow rock-strewn bay backing onto an existing seawall, informally surfaced lane and shelterbelt vegetation. The dense rock field and seawall reduce accessibility to and of the bay as well as its leisure value so that most people are likely to experience the area as viewers from the lane only.

St. Agnes Porth Coose and Periglis

Two deeply incurved west-facing sandy bays framed with rocky headlands and backing onto dunes of medium height. The dune above Porth Coose is clearly trafficked along its crest, whereas the dense groundcover vegetation along the crest

of Periglis' dune indicates it is not as popular a route. The scattering of islets not far from shore forecloses the focus of attention in views from these beaches, lending an intimate feel, enhanced by the small scale of the landscape inland comprising the immediate area around Big Pool and the rising tree covered ground behind. The lighthouse at Middle Town and St. Agnes' Church add points of interest and focus. Exposed and torn engineering fabric in the existing dune at Periglis constitutes the only detracting feature.

St. Martin's Lower and Higher Town

A tranquil area of intimate spaces, settlement, sand-covered lanes, hedged compounds and fields, separated by high dunes from the far simpler, open and equally attractive landscape of wide beaches and sandy flats. No significant detracting features.

Landscape change

Current trends

The ongoing pressure from coastal erosion which prompts the proposals under consideration represents a significant underlying trend affecting character in the study area. This manifests in different forms depending on the conditions at each location. Recent breaches of existing sea defences include the displacement of rock from the foreshore to behind the wall at Great Popplestone (**photograph 15**). In some areas, erosion is potentially aided by human activity such as the use of 'desire lines' across dunes to access beaches, creating weaknesses which may be vulnerable to storm surge ingress and additional wind erosion (**photograph 16**). Monitoring of threats to sea defences has prompted the proposals forming the subject of this assessment.

Other general trends include the gradual adoption of solar energy in the form of small-scale field generation and rooftop systems.

Specific imminent changes

Ongoing and planned changes within the study area unrelated to the proposals may have a very limited effect on landscape character:

- House construction at New Grimsby, Tresco – slightly increasing the visual density of the shoreline viewed from Bryher and the water between the islands.
- Removal of a short line of trees west of Porth Killier on St. Agnes (**photograph 17**). These include introduced species typical of the shelterbelts on the islands. The trees are relatively small and unremarkable. Their removal will result in a slight increase in the sense of openness within the area concerned.

Landscape receptors and sensitivity

A detailed analysis of landscape receptors within the study area is given in **Tables C1a-h Appendix 6C**. These tables refer to the landscape character types described above, augmented by survey observations. Many receptors which are likely to be highly valued are unlikely to be susceptible to the type of changes proposed. Others of particular relevance to the proposals and the sites involved include the following of medium sensitivity, many of which support landscape character whilst some may be considered to detract from existing quality:

- dunes of blown sand – due to the shoreline siting of the proposals
- Great Pool and Big Pool on Bryher and St. Agnes respectively – due to the intention of the proposals to protect these features
- worn / gravelled foot tracks – due to the overlap of the proposals with some routes
- unobtrusive leisure uses – due to the overlap of the site with footpath routes
- emplaced rocks – due to the presence of this surface within the site

- concrete – due to the presence of some areas of concrete within the site
- engineered fabrics – due to the presence of these within some areas of the site

The aesthetic qualities of sandy dune and grassland coastal areas and other areas coinciding with proposed haulage routes are also considered to be of medium sensitivity to the nature of the changes proposed.

A large number of landscape receptors are considered to be of low sensitivity to the type of change represented by the proposals. These are also listed in tables C1a-h.

Overall, it is considered that landscape character within the study area is at most of *medium* sensitivity to the nature of the changes represented by the proposals.

6.4.2 Visual baseline assessment

Viewpoints

The viewpoints described below provide a representation of views in the direction of the site likely to be experienced by visual receptors.

Viewpoint Bryher 1: Kitchen Porth. Pleasant view of a sandy beach with scattered rocks backed by tall evergreen shrubs and large boulders. The sloped roof and upper section of a single house is visible above this backdrop. Kitchen Porth works fully visible, including clearance and construction phase as well as the completed installation. The site takes up the majority of the view, although the viewer will also be aware of the more open and dramatic view towards the bay, water and nearby headlands in the opposite direction.

Viewpoint Bryher 2: Church Quay. Pleasant and interesting view across sandy bay taking in open water, boats, quayside and waiting room and distant views of Tresco shore. Occasionally partially obscured by shrubby vegetation. Church Quay fully visible, including delivery of materials. The view develops as viewers progress along beach-side road in the direction of the proposals.

Viewpoint Bryher 3: Church Quayside. Pleasant and engaging views from quayside across beach and bay to island landscape including attractive cluster of dwellings and surrounding vegetated rolling hills. The ancient All Saints church forms an appealing focal point at the periphery of the view. The quay infrastructure detracts marginally. Delivery and movement of materials and machinery would be fully visible.

Viewpoint Bryher 4: Brow Ledge Bay. Very pleasant view of long sandy beach opening onto narrow stretch of open water to Tresco shoreline opposite. Construction vehicles would be visible from this location when tide allows during part of programme.

Viewpoint Bryher 5: Green Bay. Pleasant views with grassy footpath in foreground, adjacent scrubby vegetation with scattered rocks and distant views across narrow stretch of open water to Tresco shoreline opposite. The site is currently barely visible due to intervening tall shrubs and small trees. Clearance, construction phase and potentially some of the completed works would be visible from this location.

Viewpoint Bryher 6: Great Porth (Great Par) North of Great Carn. An expansive view of the bay, the eye being drawn to the open sea framed by headlands and rocky islets. Nearer at hand, the beach forms an attractive sweeping band which also encompasses the viewer. However, in this location, the existing rock armour forms a slightly stark area of uniformly textured, albeit natural material at the periphery of the view. The construction phase and the completed installation for this part of the site would be fully visible.

Viewpoint Bryher 7: Stinking Porth. Open view across gently sloping area of grassland, beach and open sea, framed by tall headland to right and isolated house to left. The site is visible in the form of the back of the dune and part of the beach. Construction phase, haulage and any completed installations would be clearly visible.

Viewpoint Bryher 8: Gweal Hill. Stunning panoramic view across Bryher towards Tresco and St. Mary's in the far distance. Provides a unique appreciation of the

Scillonian landscape and seascape. Clear view of all Great Popplestone, Stinking Porth and Great Porth sites within a much wider landscape context. Construction phase, haulage and any completed works would be fully visible.

Viewpoint Bryher 9: south of Great Popplestone. Uninspiring view to rear of existing concrete seawall and eroded ground, framed by mass of Gweal Hill and Shipman Head Down. Wider context of grassland, heath and bracken/bramble. The Great Popplestone site would be visible including the area of wall to be enhanced, construction and haulage.

Viewpoint Bryher 10: east of Great Popplestone. Dramatic, expansive view of the bay, the eye being drawn to the open sea framed by headlands and rocky islets. Nearer at hand, the beach forms an attractive sweeping band which also encompasses the viewer. The construction phase and the completed installation for this part of the site would be fully visible.

Viewpoint Bryher 11: track east of Great Popplestone. Unremarkable view of bracken and bramble covered dunescape, backed by Shipman Head Down in middle distance. Area proposed for clearance and sand extraction would be fully visible, as would construction, clearance and haulage.

Viewpoint Bryher 12: New Road. Intricate and pleasant streetscape comprising a narrow residential road passing between attractive individual houses, domestic outbuildings and ornamental garden vegetation. Terminated by trimmed hedgerows, mature exotic planting and sloping hillside. Haulage only would be visible from this location.

Viewpoint Bryher 13: opposite New Grimsby quay, Tresco. Attractive sheltered seascape comprising sound between Bryher and Tresco, foreground and distant shore. Near distance includes seawall and at the time of visit, stored construction materials. Middle distance occupied by harbour, associated buildings and low headlands, boats on water and islets. Distant shore includes striking outline of Bryher. Beaches on Bryher appear as a thin line in centre of view, albeit clearly. Haulage landings and routes from Church Quay would be fully visible, including around the headland to the immediate south.

Viewpoint Bryher 14: from water, passing Green Bay. View experienced by boat passengers on the approach to Bryher from St. Mary's. A pleasant, clear view of the shoreline, including low heathland hillside, isolated dwelling and rocky foreshore. The construction phase for the Green Bay works would be visible, as would the completed installation.

Viewpoint Bryher 15: from water on approach to Church Quay. View experienced by passengers about to land on or leaving Bryher. Pleasant view of sandy, articulated foreshore backed by low lying ground with tall vegetation and individual dwellings. Buoys in the foreground and the quay in the middle distance are prominent, and the tower of All Saints church can be made out amongst the trees. Haulage landing at and distributed from Church Quay would be clearly visible.

Viewpoint St. Agnes 1: above Porthcongar. Dramatic, attractive view across Porth Congar bay towards northern Gugh, open sea and more distant Scillonian islands. Framed by vegetation and in places incorporating built structures including the Turk's Head beer garden platform, the quay and associated toilet block. Walkers also pass a compound of stored building materials. Haulage routes only would be visible from this location.

Viewpoint St. Agnes 2: between Quay and Porth Killier. Pleasant, open view towards gently sloping hillside terminated by tall vegetation and crest of hill. Bulk of view comprised of fields with hedgerows. St. Agnes' lighthouse forms a striking focal point to the right. View is framed by tall shrubs on left. Storage compound and haulage only would be visible; bare areas pending reinstatement upon completion.

Viewpoint St. Agnes 3: Porth Killier east. Quickly evolving, constrained but interesting view framed by tall evergreen shrubs adjacent to viewer. The viewpoint is

selected because the vegetation frames a clear view towards part of the area which would be affected by the proposals, drawing the eye into this area. However, the proposals themselves would occur below the normal line of sight of most viewers; hence, this viewpoint is taken at a downward angle to take in the area likely to be affected. The construction phase and the completed installation would be visible.

Viewpoint St. Agnes 4: Porth Killier. Quickly evolving, constrained but interesting view framed by tall evergreen shrubs adjacent to viewer. Surfaced path and rear of concrete seawall are prominent in centre of view; however, eye is drawn to rocky shore and curving bay beyond. The Porth Killier site would be fully visible, including construction, any clearance, haulage and the completed works.

Viewpoint St. Agnes 5: north of Big Pool. Pleasant, if curtailed view to tall shrubs, framed by rear of dune to left and higher ground inland to right. Big Pool is also visible to right. Haulage to and from the proposed materials compound would be visible.

Viewpoint St. Agnes 6: Porth Coose. Panoramic, open view taking in the bay and open sea beyond, the sweeping curve of the dune, rocky islets and low headlands, the bowl of land below the dune including Big Pool and higher ground inland. Visually interesting contrast of colours and textures between the landward and seaward elements. Construction, haulage and the finished installation would all be clearly visible.

Viewpoint St. Agnes 7: Periglis south. Panoramic, open view taking in the bay and open sea beyond, the sweeping curve of the dune, rocky islets and low headlands and the bowl of land below the dune including Big Pool. Visually interesting contrast of colours and textures between the landward and seaward elements. The tombolo to the rocky headland and islets are interesting focal points in the view. Construction, haulage and the finished installation would all be clearly visible from this location.

Viewpoint St. Agnes 8: Periglis north. View along beach-side of the dune looking south towards Middle Town and the St. Agnes lighthouse, which forms an appealing visual focus left of centre. St. Agnes' Church tower is a secondary focal point to the right. Sweeping parallel lines of dune vegetation, large pebbles and seaweed forms an interesting array of textures and colours. Existing degraded erosion protection fabric detracts significantly from the quality of the view. Construction, haulage and the completed installation would all be clearly visible from this location.

Viewpoint St. Agnes 9: New Lane Middle Town. Small-scale, pleasant streetscape comprising a narrow residential road passing between vegetated garden boundaries, paddocks and interesting individual buildings. Open space draws the eye in the direction of the site in the middle distance and the sea beyond. Distant view of construction at Porth Coose bay only; finished works not perceptible.

Viewpoint St. Martin's 1: Karma Hotel. Partially constrained, attractive view along lanes, framed by gardenesque vegetation and stone walls, opening out in the middle distance to an intriguing seascape of sheltered waters and small, low-lying islands. Haulage only would be visible from this location.

Viewpoint St. Martin's 2: Lower Town Quay. Attractive view of wide, white sandy beach and narrow quay, falling to a narrow area of water and low-lying islands. View framed to left by low rocky dunes and tall vegetation. Haulage using the quay only would be visible from this location.

Viewpoint St. Martin's 3: Lower Town. Attractive, near-distance views of houses, gardens and the lane threading between. Views to one side are terminated by tall garden hedgerow; to the other the line of sight is draw upwards along sloping gardens towards houses at the next level. Haulage route and building materials compound only would be visible from this location.

Viewpoint St. Martin's 4: Neck of the Pool beach. Stunning, expansive views across a wide stretch of sand, sloping down towards shallow intertidal area and backed by a high grass-covered dune. Rocks in foreground and distant headlands at the east of

St. Martin's bookend the view. Construction and the completed works would be fully visible.

Visual receptors and sensitivity

A detailed analysis of views from potential visual receptors is given at **Appendix 6C**. Viewpoint images representing views from these receptors are given in **Figures 6.4.1-28** at **Appendix 6A**.

The majority of potential visual receptors are walkers and pedestrians using the roads and footpaths near to the proposal sites and along haulage routes. Due to the importance of the visual quality of the environment to people walking for leisure and the relatively high value of views within the study area, the sensitivity of these receptors to any changes in views is in some cases high.

People using beaches form the next most common group of potential visual receptors. The importance of visual quality and the value of views to these receptors also combines with a closer proximity to the proposals, resulting in their being highly sensitive to changes in views for the purpose of this assessment. Similarly, patrons of hospitality including inns and hotels are of medium or high sensitivity to changes in views.

Boat passengers, which are likely to include both tourists and commuters, are likely to be of low to medium sensitivity to changes in views of the nature proposed, this being moderated by the short-lived nature of views in the direction of any one part of the site.

Road users in vehicles and on bicycles are of least sensitivity to change, although in the context of a highly valued landscape such as the Isles of Scilly they are likely to be more sensitive than in locations less recognised for their visual quality.

The sensitivity of people in private dwellings to changes on the site of the nature proposed varies according to proximity, with those in the nearest houses such as at Stinking Porth and Periglis being of high sensitivity.

Overall visual sensitivity

As described above, the sensitivity of individual visual receptors to the type of changes proposed is likely to range from low to high. Overall, the visual sensitivity of views to the nature of changes proposed in the direction of the site is considered to be *medium*.

6.5 Assessment of Landscape and Visual Impacts

Impacts upon landscape receptors

Bryher Kitchen Porth

Removal of small area of existing mature shrubs to facilitate construction of rock armour revetment comprised of Cornish or Scillonian granite including site-won materials. Impacts include:

- minor loss of vegetation
- increase in massing of uniformly graded and sized rocks
- temporary disruption during construction including moving vehicles

Bryher Church Quay to Brow Ledge bay

Use of beach adjacent to Church Quay and headland as haulage route. Impacts include:

- temporary disruption during construction including moving vehicles and haulage tracks on beach at low tide

Bryher Green Bay

Removal of a strip approximately 70m of rough herbaceous vegetation to facilitate the addition of geobags and the raising of the existing dune crest by 250mm using locally sourced excavated material matching the immediate surrounding materials.

Re-vegetation to restore appearance and provide additional erosion control. Impacts include:

- minor loss of existing vegetation
- temporary disruption during construction including moving vehicles and disturbance to footways

Bryher Great Porth and Stinking Porth

New revetment of rock armour to existing dune height along 90m length at the northern end of Great Porth, incorporating new demountable flood gate. New revetment of cobbles and sand along 55m length at Stinking Porth, raising the dune height by approx. 1m and natural regrowth on landward side. Impacts include:

- increase in massing of uniformly graded and sized rocks
- introduction of flood gate structure at Great Porth north
- slight adjustment to landform whilst maintaining prevailing pattern
- temporary disruption during construction including moving vehicles and disturbance to trackways

Bryher Great Popplestone

Noticeable raising of rock crest level next to seawall over approx. 85m length, recharging with site-won materials. Movement of scattered rocks from further north in bay for this purpose. Winning of sand from back area of dune to recharge beach voided of stones, resulting in removal of localised area of bracken and bramble. Impacts include:

- 'tidying' of existing area of degraded concrete wall and exposed foundation
- clearance of poorly distributed stones from sandy part of beach
- localised control of encroaching bracken and bramble
- creation of slightly anomalous landform to rear of dunes as a result of sand extraction
- temporary disruption during construction including moving vehicles and disturbance to trackways; some of haulage route may suffer churn due to softness of ground conditions

Porthconger Quay St. Agnes

Use of quay for haulage, along with a secondary route including part of inshore south of the quay, a surfaced track and a section of road running past the Turk's Head inn. Impacts include:

- temporary disruption during construction including moving vehicles

St. Agnes Porth Killier

Additional emplacement of rock armour against seawall over 35m length, sand and cobbles over 65m length and infilling of eroded embankment with skirt of new rock armour. Impacts include:

- increase in massing of uniformly graded and sized rocks
- covering of eroded embankment
- temporary disruption during construction including moving vehicles

St. Agnes Porth Coose and Periglis

Reconstructed revetments comprising addition of webbed 'rock bags' over 140m length at Porth Coose raising dune height by 1.2m and buried geobags and geomats over 180m length at Periglis raising height by 750mm. Recharged sand behind both dunes and above crest at Periglis will be revegetated with locally appropriate species. Impacts include:

- introduction of engineered structure slightly at odds with surrounding character at Porth Coose
- removal or burial of degraded engineering fabric from Periglis
- slight adjustment to landform whilst maintaining prevailing pattern

- enhancement of vegetation through restoration of species appropriate to environment
- temporary disruption during construction including moving vehicles and disturbance to trackways
- some areas become boggy during wet periods and may require additional gravel or temporary matting to be placed to ensure they are passable by haulage vehicles, although the works will be programmed to avoid using these routes during the wetter part of the year

St. Martin's Lower and Higher Town

Installation of 1.4m high paling style dune fencing along 67.5m length to rear of beach together with erosion mat comprising geogrid filled with crushed aggregate. Information provided on notice boards at quays and in leaflet form for visitors to discourage accessing beaches via 'desire lines' across dunes. Impacts include:

- introduction of fencing into beach landscape, likely to become at least partially absorbed in dune over time
- introduction of visible aggregate-filled grid structure into surfacing on approach to beach
- reduced foot traffic pressure on dune at Higher Town bay – improvements anticipated to be recorded anecdotally
- temporary disruption during construction including moving vehicles and disturbance to trackways

A full list of landscape receptors impacted by the proposals is given in **Table C2** at **Appendix 6C**.

Significance of landscape effects

The significance of effects upon landscape receptors during construction and upon completion is considered to be *slight adverse*. The overall significance of landscape effects is considered to be *slight adverse*.

Impacts upon visual receptors

Visual receptors impacted by the proposals are listed in **Table C5** at **Appendix 6C**.

The visual impacts likely to result from the proposals are localised in scale and for the most part at most slight adverse in significance, with some more moderate adverse effects.

Construction impacts are the most common, comprising views of haulage vehicles, stored materials and movements of vehicles on site. These are greatest for receptors in close proximity to the sites; particularly those present for leisure purposes such as walkers, beach users and hotel guests.

Upon completion, few receptors are likely to experience significant adverse visual effects due to the small scale of the proposals, their nature as features likely to be seen in a lowland coastal context and the choice of natural stone, sand and vegetated control measures for most of the installations. Where artificial materials or formats are likely to impinge on views these are noted in the assessment table. The most significant of these are:

- the use of two-tiers of 'rock bags' along the length of the dune at Porth Coose, whose upper surface is unlikely to support regrowth of vegetation and whose enclosing webbing will be visible to people accessing the beach;
- the appearance of the reprofiled crest of the defences at Bryher North Green Bay before replacement vegetation has established;
- the appearance of the raised rock crest at Great Popplestone; *and*
- the erosion control mat at the entrance to Neck of the Pool beach.

In one location, the installation is considered to have a moderate beneficial effect upon location – this being the measures taken at Periglis resulting in the removal of unsightly worn erosion control fabrics from the view at the northern end of the beach.

Significance of visual effects

The significance of effects upon visual receptors during construction ranges between negligible and moderate adverse and upon completion between moderate beneficial and slight adverse. Overall, the significance of visual effects is considered to be *slight adverse*.

6.6 Additional mitigation and offset measures

6.6.1 Additional mitigation

Mitigation in addition to the designed features of the proposals is listed at **Tables C3** and **C6** at **Appendix 6C**. In summary, it includes:

- replanting any areas of shrubs, shelterbelts and groundcovering vegetation removed during the construction phase, especially where these perform a visual screening function;
- ensuring that where available Scillonian granite is used for revetments and that where adjacent to existing emplacements of Cornish granite, this is graded into the existing in order to create a softer transition between the two masses;
- using locally sourced aggregate or aggregate of a colour complementary to the surrounding sands as the fill material for the geomat at the entrance to Neck of the Pool beach;
- cover rear of concrete sloping sea wall at Great Popplestone with small rocks and soil to reduce incongruity and untidiness and partially restore naturally occurring land cover.
- extract sand from the rear of the dune at Great Popplestone over the widest feasible area in order to reduce the depth of the incursion, thereby softening the eventual incongruity of the reprofiled landform and in consequence controlling a greater area of encroaching bracken and bramble;
- carefully plan programme and haulage routes in order to minimise the length of time any one area is exposed to the visual impact of vehicle movements and that visual impacts are experienced by viewers within a limited field of view.

6.6.2 Additional offset measures

No offset measures are considered necessary or appropriate in relation to the nature and scale of these proposals.

6.7 Residual effects

Significance of residual effects

Overall, it is considered that the measures suggested would result in the proposals having effects of *negligible* or *slight beneficial* long-term significance upon landscape character and effects of *slight adverse*, *negligible* or *neutral or moderate beneficial* significance upon views.

These effects should be considered against the possibility that in the absence of the proposals, the effect upon landscape character and views of the current trend towards increased coastal erosion may be much greater and more damaging.

7 Historic Environment

7.1 Introduction

This chapter sets out the heritage significance of the proposed development areas (PDA) and assesses the impact that the proposed works would have on that significance. The assessment is in line with Paragraph 194 of the NPPF which states:

'In determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance.'

The significance of a heritage asset is defined as:

'The value of a heritage asset to this and future generations because of its heritage interest. The interest may be archaeological, architectural, artistic or historic. Significance derives not only from a heritage asset's physical presence, but also from its setting. For World Heritage Sites, the cultural value described within each site's Statement of Outstanding Universal Value forms part of its significance.' (NPPF Glossary).

7.2 Legislative and Planning Policy Context

The assessment aims to address the requirements of relevant legal frameworks and planning policy pertinent to the site and its proposed development. The following apply:

- Ancient Monuments and Archaeological Areas Act, 1979;
- Town and Country Planning (Listed Buildings and Conservation Areas) Act, 1990;
- National Planning Policy Framework (NPPF) 2021; and
- The Isles of Scilly Local Plan 2015-2030.

7.2.1 Ancient Monuments and Archaeological Areas Act 1979

The Ancient Monuments and Archaeological Areas Act 1979 provides statutory protection for archaeological sites and historic structures of national importance. The Act states that any works affecting a scheduled monument require permission from the Secretary of State in the form of scheduled monument consent.

7.2.2 Planning (Listed Buildings and Conservation Areas) Act 1990

The Planning (Listed Building and Conservation Areas) Act 1990 provides statutory protection for built heritage. In considering whether to grant planning permission for a development that affects a Listed Building or its setting, Sections 16 and 66 of the Act require authorities to have special regard to the desirability of preserving the Listed Building, or its setting, or any features of special architectural or historic interest that it possesses. Section 72 of the Act states that special attention shall be paid to the desirability of preserving or enhancing the character or appearance of Conservation Areas.

7.2.3 National Planning Policy Framework 2021

The National Planning Policy Framework sets out the vision for sustainable development based on interdependent economic, social and environmental roles, of which protecting and enhancing the historic environment is one element. Section 16 outlines policies for the protection and enhancement of the historic environment in plan-making and decision taking. Decisions affecting heritage assets should be undertaken based on an understanding of the significance of any heritage asset affected by development, based on a proportionate evidence base. Where sites include archaeological potential field evaluation may also be required (para 194).

For designated assets, or assets of demonstrable equivalent significance, substantial harm or loss to heritage assets and their settings should be wholly exceptional for assets of the highest significance (including World Heritage Sites, scheduled monuments, protected wrecks, registered battlefields, Grade I and II* registered parks and gardens, Grade I and II* listed buildings) and exceptional for other designated assets (including Grade II listed buildings and Grade II registered parks and gardens) (para 200). Harm to these assets must be weighed against the public benefit of development (para 201).

For non-designated heritage assets, a balanced judgement regarding the scale of harm or loss to the asset and its significance must be made (para 203). Where development results in loss or harm to a heritage asset, developers will be required to record and advance understanding of the significance of the asset (para 205).

7.2.4 Isles of Scilly Local Plan 2015-2030

There is one policy within the Local Plan relating to the historic environment:

Policy OE7 Development Affecting Heritage

(1) Great weight will be given to the conservation of the islands irreplaceable heritage assets. Where development is proposed that would lead to substantial harm to assets of the highest significance, including undesignated archaeology of national importance, this will only be justified in wholly exceptional circumstances, and substantial harm to all other nationally designated assets will only be justified in exceptional circumstances. Any harm to the significance of a designated or non-designated heritage asset must be justified.

(2) Proposals causing harm will be weighed against the substantial public, not private, benefits of the proposal, and whether it has been demonstrated that all reasonable efforts have been made to sustain the existing use, find new uses, or mitigate the extent of the harm to the significance of the asset; and whether the works proposed are the minimum required to secure the long-term use of the asset.

(3) In those exceptional circumstances where harm to any heritage asset can be fully justified, and development would result in the partial or total loss of the asset and/or its setting, the applicant will be required to secure a programme of recording and analysis of that asset, and archaeological excavation where relevant, and ensure the publication of that record to an appropriate standard in a public archive.

(4) Proposals that will help to secure a sustainable future for the islands' heritage assets, especially those identified as being at greatest risk of loss or decay, will be supported.

(5) Conservation Area

Development within the Isles of Scilly Conservation Area will be permitted where:

a) it preserves or enhances the character or appearance of the area and its setting;

b) the design and location of the proposal has taken account of:

I. the development characteristics and context of the area, in terms of important buildings, spaces, landscapes, walls, trees and views within, into or out of the area; and

II. the form, scale, size and massing of nearby buildings, together with materials of construction.

(6) Listed Buildings

Development affecting Listed Buildings, including alterations or changes of use, will be supported where:

a) it protects the significance of the heritage asset and its setting, including impacts on the character, architectural merit or historic interest of the building; and

b) materials, layout, architectural features, scale and design respond to and do not detract from the Listed Building; and

c) a viable use is proposed that is compatible with the conservation of the fabric of the building and its setting.

(7) Scheduled Monuments and Archaeology

Proposals that preserve or enhance the significance of Scheduled Monuments or Archaeological Sites, including their setting, will be supported where measures are to be taken to ensure their protection in situ based upon their significance. Where development would involve demolition or removal of archaeological features, this must be fully justified, and provision must be made for excavation, recording and archiving by a suitably qualified person(s) prior to work commencing, to ensure it is done to professional standards. Development within the Garrison on St Mary's (i.e. any land or building within the Garrison Wall Scheduled Monument) and its setting should accord with the Garrison Conservation Plan 2010 (or any successor plan). Proposals that would result in harm to the authenticity and integrity of the Garrison as a strategically important coastal defensive site should be wholly exceptional. If the impacts of a proposal are neutral, either on the site's significance or setting, then opportunities to enhance or better reveal significance should be taken.

(8) Registered Parks and Gardens

Planning permission for development that preserves or enhances the special historic landscape character and interest of the Tresco Abbey Garden, including its setting, will be granted where:

a) It is demonstrated that the proposal seeks to protect original or significant designed landscapes, their built features and setting; or

b) The proposal includes restoration or reinstatement of historic landscape features to original designs using appropriate evidence, or that the proposed works better reveal their setting.

(9) Non-designated Local Heritage Assets

Development proposals that positively sustain or enhance the significance of any local heritage asset and its setting will be permitted. Alterations, additions and changes of use should respect the character, appearance and setting of the local heritage asset in terms of the design, materials, form, scale, size, height and massing of the proposal. Proposals involving the full or partial demolition, or significant harm to a local heritage asset will be resisted unless sufficient justification is provided and the public benefits outweigh the harm caused by the loss of the asset.

(10) All development proposals should be informed by proportionate historic environments assessments and evaluations (such as heritage impact assessments, desk-based appraisals, field evaluation and historic building reports) which identify the significance of all heritage assets that would be affected by a proposal, and the nature and degree of any effects; and which demonstrate, in order of preference, how any harm will be avoided, minimised or mitigated.

7.2.5 Isles of Scilly Conservation Area Character Statement (Draft for Consultation)

The entirety of the Isles of Scilly is designated as a Conservation Area. The purpose of the appraisal is to summarise the elements that combine to form the distinctive character of the Isles of Scilly. The appraisal is indented as supplementary planning guidance. The Character Appraisal will become a working Supplementary Planning Guidance upon adoption. It supports the policies of the Isles of Scilly Local Plan and is to be used as a material consideration in the assessment and determination of applications for development within Conservation Area and to help guide its future management.

7.3 Baseline Conditions

7.3.1 Data Collection

A study area of a 500m buffer for designated assets (extended to 750m on Bryher in order to capture prominent assets on Tresco) and 250m for non-designated assets was established around each of the red line boundaries for Bryher, St Agnes and St Martins to assess the nature of the surrounding heritage sites and to place the recorded sites within context. Monuments from the HER that relate to specific features within Scheduled Monuments (such as individual cairns within a cairn cemetery) have not been considered separately here and are not shown on the relevant figures.

This study has taken into consideration the historical and archaeological background of the PDA. The sources consulted were:

- Cornwall and Isles of Scilly Historic Environment Record (HER);
- National Record of the Historic Environment (NRHE);
- Historic England and Local Planning Authority for designated sites;
- Aerial photographs;
- Historic mapping including relevant Ordnance Survey Maps (online); and
- Appropriate documentary sources and archaeological journals.

A site visit was undertaken by Kristian Evans, Archaeology and Heritage Consultant between 2nd November 2021 - 4th November 2021 to assess the condition of known heritage assets, the potential impacts on setting of heritage assets and the suitability of the PDAs for the implementation of further programmes of assessment, evaluation and mitigation. Photographs from the site visit are available in Appendix 7.3.

An assessment of the historic landscape of the Isles of Scilly was undertaken by Land Use Consultants the results of which were presented in a report published in 1996 . The study identified 13 distinct landscape types on the Isles of Scilly, each with their own key characteristics. Figures showing historic landscape character (HLC) is available in Appendix 7.1.

7.3.2 Isles of Scilly Historic Overview

Palaeolithic (c 700,000 - 10,000 BP)

The earliest evidence for vegetation in the Devensian in south-west England comes from the Isles of Scilly as part of research into the extension of the Irish Sea glacier undertaken by Scourse (1985; 1986; 1991). This research suggests that glacial ice reached the northern flanks of Tresco, Bryher and St Martin's and the resulting glacial deposits included flint that was subsequently exploited by prehistoric communities in Scilly (SHERF 2019, 56). The only artefact of potential Palaeolithic date discovered on the Isles of Scilly is an unprovenanced curved-backed point held at the Royal Cornwall Museum (SHERF 2019, 56).

Mesolithic (c 10,000 - 6000 BP)

Sub-surface bathymetry has shown that the Isles of Scilly may have been surrounded by the sea by as early as 12,000BP (SHERF 2019, 57). Around 10,000BP the Isles of Scilly likely consisted of a single land mass roughly 17km long and 8.5km wide stretching from the Western Rocks to the Eastern Isles and from Penninis to Shipman Head (SHERF 2019, 57 and Ratcliffe and Johns 2003, 5). St Agnes was likely separated from the main island by around 5,000BC, though the area between St Agnes and St Mary's would have remained as tidal flats.

Prior to excavations in 2013, the known Mesolithic archaeology on the Isles of Scilly was very sparse, restricted to a dozen worked flints (Ratcliffe and Johns 2003. 5) and it was thought that the islands were not occupied on a permanent basis until the Bronze Age (Anderson-Whymark et al 2015). Generally evidence for hunter gatherers in Scilly is sparse as they utilised materials such as skin, gut, bone, wood and

vegetable fibre that do not normally survive in the archaeological record (Ratcliffe and Johns 2003, 5).

Excavations were carried out in 2013 at Old Quay, St Martin's in order to investigate the Mesolithic-Neolithic transition within the western seaways of Britain (Anderson-Whymark et al 2015, 961). The excavations recovered 57 microliths within a larger spread of worked flint (5738 pieces), many of which were of Neolithic or Bronze Age date (Anderson-Whymark et al 2015). The work at Old Quay demonstrates definite Mesolithic presence on Scilly but does not indicate permanent occupation. Given the known size of the island at the time and according to predicted population densities for hunter gatherers in an area of this size five to eight individuals would be low and nine to sixteen would be high (Gamble et al 1999; Binford 2001; Warren 2015).

Neolithic (c 4000 BC - 2500 BC)

By the end of the Mesolithic St Agnes and other western islands had separated from the northern island, and an extensive intertidal zone continued to develop through the Neolithic (SHERF 2019, 73). Around 3,000 BC a major changed occurred to the Isles, with tidal flooding taking place between the islands at high tide. The environmental evidence for this period has been summarised in the South West Archaeological Research Framework (Wilkinson and Straker 2008, 72). The longest pollen sequence is from Higher Moors on St Mary's which indicated the environment consisted of oak woodland with an understorey of hazel (Wilkinson and Straker 2008, 72). The Lyonesse pollen records from Porth Mellon on St Mary's contained a diverse range of tree species, dominated by oak, birch and hazel but including alder, ash, willow, ivy, honeysuckle and mountain ash (SHERF 2019, 73).

The beginning of the Neolithic in Britain is marked by the increased domestication of animals and cultivation of food plants for farming. Similar to the preceding Mesolithic, prior to the excavations undertaken at Old Quay in 2013, the archaeological record for the Neolithic on the Isles of Scilly was sparse (SHERF 2019, 71), consisting only of a handful of stone axes and flint arrowheads, a flint adze and a few sherds of pottery (Ratcliffe and Johns 2003, 6). Excavations at Old Quay in 2013 revealed Neolithic settlement features represented by a dense cluster of postholes and pits, and a high concentration of artefacts in the nearby buried soils (SHERF 2019, 71). The postholes likely relate to a small number of temporary structures perhaps used as shelters during visits to the site (Garrow and Sturt 2017 75, 82).

Early Bronze Age (c 2500 BC - 1500 BC)

Compared to the rather sparse records from the Mesolithic and Neolithic, there is a large amount of archaeological evidence from the Early Bronze Age on the Isles of Scilly. There are numerous Early Bronze Age burial and ceremonial monuments scattered across the Isles, including entrance graves, cairns and standing stones (menhirs). The Cornwall and Scilly HER records 92 entrance graves, 384 cairns (the majority of which occur within cairn-fields such as Shipman Head Down on Bryher, the largest of the cairn-fields) and thirteen possible standing stones or menhirs (SHERF 2019, 94). A possible stone row was also identified on Par Beach, St Martin's (SHERF 2019, 95).

Early Bronze Age activity on the Isles of Scilly is evidenced in the archaeological record by a few items of Early Bronze Age metal work (including a dagger, a copper alloy awl, the terminal of a bronze armlet and a clip from a bronze earring), Bronze Age pottery (from the Old Quay excavations likely to be of Early Bronze Age or Middle Bronze Age date) and worked flint. Only one sherd of Beaker pottery has been discovered on Scilly (from Bonfire Carn, Bryher) (SHERF 2019, 71).

Middle Bronze Age to Late Bronze Age (c 1500 BC - 800 BC)

By the Middle Bronze Age the islands were beginning to resemble their current form, though there were still vast intertidal areas between the islands which could have been utilised for grazing. Soil pollen analyses have shown that the main phase of woodland clearance in the Islands took place during the Late Bronze Age, and open

ground comprised mainly grazed grassland, although there is some evidence of arable land. Evidence of heathland plants is rare, but the charcoal of heather and gorse/broom at sites at Bonfire Carn and Porth Killier evidence their use as a source of fuel (SHERF 2019, 105).

The Isles of Scilly contain a range of Late Bronze Age sites, including: settlements, field systems, cemeteries, pottery and metalwork. Stone tools also continued to be utilised into the Bronze Age due to a lack of local raw materials for metal production (the Isles of Scilly were not a source of tin like Cornwall). Only eight Late Bronze Age metal objects have been recorded on the Islands, including a socketed adze, two heavy torcs and a rapier blade fragment (Ratcliffe and Johns 2003, 7). Flint tools during the second millennium BC are cruder than earlier examples, perhaps suggesting they were of less importance (SHERF 2019, 114).

Late Bronze Age settlements have been identified at Normandy Farm, St Mary's and Higher Town, St Agnes. Houses in this period were small circular structures built of local granite with thick walls (SHERF 2019). There are over one hundred and fifty of these houses on the Islands, though only fifteen can be conclusively dated to the Bronze Age (Ratcliffe and Johns 2003, 6). Settlements during this period favoured low-lying land and many will have been submerged or destroyed by the sea (Ratcliffe and Johns 2003, 6).

Field systems are recorded at Burnt Hill, St Martin's; Halangy Down and Bar Point, St Mary's; and Gimble Porth, Tresco. Field enclosures are also located at Shipman Head Down and Heathy Hill on Bryher. Fowler and Thomas, who recorded field systems in the 1970s, described the fields as 'small, adjacent, rectangular enclosures, fairly definitely used as arable plots and for grazing…' (Fowler and Thomas 1979, 186).

Iron Age (c 800 BC - 43 AD)

The divisions between the Bronze Age and the Iron Age are less clear than previously thought as there is likely to have been a strong continuity in earlier traditions and way of life (Ratcliffe and Johns 2003). Clear changes may not have occurred until the 5th century BC, when changes in pottery are accompanied by the appearance of fortified settlements (known as 'cliff castles' on the Isles of Scilly), such as the Giant's Castle on St Mary's (SHERF 2019, 122).

Burials under cairns or in cists continued into the Iron Age. The cist grave burials of the Late Iron Age are known as Porthcressa-type cist graves. Approximately 36 of these cist graves have been discovered at thirteen sites in Scilly, including Green Bay, Bryher and Churchtown Farm, St Martins (SHERF 2019, 127).

Few iron objects survive in the acidic soils of Scilly. The first evidence of Iron Age metalwork in the Isles of Scilly came from the discovery of the Bryher Sword and Mirror cist burial in 1999. Within the cist were remains of a crouched burial, flint and stone artefacts of Iron Age date as well as the iron artefacts (SHERF 2019, 123; Johns 2002). Other evidence for Iron Age activity on the Isles of Scilly comes from plant remains, animal remains and trackways (SHERF 2019, 167).

Romano-British (43AD - 410AD)

The 1st century AD writer Pomponious Mela speaks of the holy inhabitants of Sena, one of a group of islands known as the Cassiterides, interpreted as the Isles of Scilly. Sena has been speculated to refer to either Tresco or Bryher (Green 1997, 103). The Isles of Scilly are first referred to by classical Roman writers of the first to third centuries AD as Insula Silina, though the name is of pre-Celtic origin and may refer to a Celtic female deity (SHERF 2019).

There is strong continuity from earlier traditions during this period, and it is thought that the influence of the Roman Empire was lesser on the Isles of Scilly compared to the mainland (Ratcliffe and Johns 2003). Settlements dated to this period are still characterised by simple stone houses, although a settlement at Halangy Down featured a large structure similar in form to courtyard houses found in West Cornwall (SHERF 2019). The Porthcressa cist burial tradition continued into this period; a cist

excavated at Churchtown Farm, St Martin's was dated to the 1st century AD by a T-shaped bronze brooch (Johns and Taylor 2016).

Artefacts of Roman date from the Isles of Scilly include Roman coins, brooches, ceramics, glass and amber beads (SHERF 2019). A large number of Roman artefacts dating from the 1st to 4th centuries AD were found at a settlement site at Nornour, which has been interpreted as a potential shrine (SHERF 2019, 137).

Early medieval (410AD - 1066AD)

Work by the Lyonesse Project indicates that by the early medieval period, the islands had been established in their current topographical form for at least 2000 years, although intertidal areas of saltmarsh between the islands became less extensive due to erosion (SHERF 2019, 148).

Traditions from the Romano-British period continued into the early medieval, with evidence that settlements continued to be utilised, although settlements of early medieval date have been identified featuring rectangular buildings (SHERF 2019, 150). Some significant changes did occur between these two periods, notably the introduction of Christianity, which may have been introduced from Cornwall, Gaul or the Mediterranean (SHERF 2019, 150). Excavations at ecclesiastical sites or hermitages have been one of the main sources of evidence for this period on Scilly. The earliest evidence for Christianity on the Isles of Scilly is a 6th century inscribed tombstone discovered as a re-used threshold stone at Tresco Abbey. The stone may have been associated with a nearby early medieval cist cemetery (SHERF 2019, 157). The remains of rectangular chapels of 8th to 10th century date have been found on St Helens, Teän and Chapel Brow, St Martin's (SHERF 2019, 158).

Artefactual evidence for early medieval activity includes new types of pottery found at occupation sites. Native pottery continued to evolve in the late fifth and sixth centuries AD into a style referred to as Gwithian. Imported wares include wheel-made wares of Mediterranean origin, D and E wares from Gaul (D wares being fine table wares and E wares a range of 'kitchen' wares) and grass-marked wares (SHERF 2019, 152-153). Other remains include decorated bone implements, flint tools, iron smelting slag and animal and plant remains (SHERF 2019, 154).

Medieval (1066 AD - 1547 AD)

Not long after the Norman Conquest the islands became property of the Crown of England, from 1141 they became part of the Earldom of Cornwall and after 1337 the Duchy of Cornwall (Ratcliffe and Johns 2003, 14). From the 12th century the administration of Scilly was split between Tavistock Abbey, which controlled the northern islands and secular properties on St Mary's and St Agnes. The main centre of ecclesiastical administration was St Nicholas' Priory, the ruins of which can still be seen today in the Gardens of Tresco (Ratcliffe and Johns 2003, 14). Under Tavistock Abbey's influence Christianity saw a revival on the Isles of Scilly from the 11th century and a subsequent decline from the 12th century onwards; St Nicholas Priory was in a ruinous state by 1461 (Ratcliffe and Johns 2003, 15). Raids by pirates and Vikings during the 12th century likely contributed to the decline of religious establishments on the Isles of Scilly (Ratcliffe and Johns 2003, 16). There are numerous documentary sources evidencing Viking activity on the Isles of Scilly, such as the Orkneyinga Saga, which records how a Viking, Thorbjorn Clerk 'Won a great victory and a massive share of plunder' by attacking the island of St Mary's, Maríuhöfn, in 1151 (Orme 2010, 268).

The main settlement was at Old Town, St Mary's, known during the medieval period as 'Ennor' (SHERF 2019, 166). The locations of other settlements can be determined from documentary and place name evidence, as well as medieval pottery scatters, such as: Churchtown and Lower Town on St Martin's; Norrard and Southard on Bryher; and Middle Town on St Agnes. There is documentary evidence for a chapel on St Agnes; the Lighthouse Chapel on St Martin's Head was used throughout the medieval period and is shown on Captain Greenville Collin's navigation chart of the Isles of Scilly between 1691 and 1698 (SHERF 2019, 176).

Artefactual evidence for medieval activity on the Isles of Scilly comes from finds such as: a Richard II penny, bronze objects, a copper pilgrim's medallion, the rim of a cauldron, a lead net sinker and a whalebone tool (SHERF 2019, 168).

Post-medieval and Modern (1547 AD - Present)

From the 16th century onwards English foreign policy exerted much greater influence over the Isles as it became involved with matters such as defence (SHERF 2019, 180). Strategically placed fortifications were constructed to guard the main approaches, harbours and anchorages. They included King Charles' Castle, and three blockhouses: one on the site of Cromwell's Castle, another south of Old Grimsby, and a third on the north-east coast of St Mary's (Ratcliffe and Johns 2003, 17). The islands became a Royalist stronghold during the English Civil War (1642 - 1651), the Hugh (the peninsula on the west side of St Mary's upon which the Garrison now sits) on St Mary's was strengthened and batteries and breastworks constructed around the coast (Ratcliffe and Johns 2003, 18). During the war of Spanish Succession (1701 - 1714) England strengthened its defences against France and Spain, resulting in the curtain wall around the Hugh being rebuilt and extended around most of the Headland, which became known as the Garrison (Ratcliffe and Johns 2003, 18). During the Napoleonic Wars (1803 - 1815) further defences were constructed at various sites across the islands including two watchtowers on St Mary's and a signal station on St Martin's. During World War I a naval and seaplane base was established, first on St Mary's and then rebuilt on Tresco. During WWII Scilly was heavily fortified, machine gun posts were built around the coast of St Mary's, and Hurricane fighter planes and air-sea rescue launches were also stationed here (Ratcliffe and Johns 2003, 19).

Farming was the main economy on the Isles of Scilly during the Post-medieval period, with pigs and cattle being raised and potatoes and wheat being the main crop (SHERF 2019, 186). Field boundaries are a characteristic feature of Scilly's farmed landscape, and whilst current boundaries are likely to date to the post-medieval period, some may have prehistoric origins (SHERF 2019, 181). Fishing was also an important industry, as well as the kelp industry, which is evidenced by surviving kelp pits (SHERF 2019).

There are numerous surviving post-medieval buildings on the Isles of Scilly. Scillonian granite and in some cases Cornish granite are the principal building material used (Berry 2011, 5). There are very few surviving buildings that pre-date 1700 and do not relate to the defence of the islands; most vernacular buildings date from the late 18th century to the middle of the 19th century (Berry 2011, 7). Scilly is also famous for its lighthouses. The lighthouse on St Agnes is one of the oldest lighthouses in Britain, built in 1680 (SHERF 2019). Other post-medieval buildings relating to maritime activity include gig sheds, quay walls and harbour walls are common.

7.3.3 Bryher

Designated Assets

There are no World Heritage Sites, Registered Parks and Gardens, Protected Wreck Sites or Registered Battlefields within the study area on Bryher. The locations of designated heritage assets on Bryher are shown on Figure 1, Appendix 7.1, details of the assets are available in the gazetteer in Appendix 7.2.

Conservation Area

The entirety of the Isles of Scilly is designated as a Conservation Area, and as such the whole of Bryher is a Conservation Area. The Conservation Area Appraisal (Council of the Isles of Scilly, 2015) describes Bryher as having a distinct character; its westerly location facing the Atlantic gives it a rugged character that is reinforced by a deeply indented western shoreline. The landscape of Bryher is characterised by high ground and round top hills including, Shipman Head Down, Watch Hill, Timmy's Hill and Samson Hill. The hills are characterised by unenclosed heathland with rocky outcrops. There are significant views from the top of Watch Hill looking out across

Bryher and Tresco, as well as views south from Samson Hill looking towards Samson. Bryher and Tresco are visually united by the enclosed seascape of New Grimsby Sound and Tresco Channel. Within the study area the most significant visual and historic features are the rocky outcrop 'Hangman's Island' and the blockhouse known as 'Cromwell's Castle'. Both are located on Tresco, but visually prominent when looking out from Bryher across the straight to the east.

Scheduled Monuments

There are 25 Scheduled Monuments within the 750m study area, 21 of which are located on Bryher itself and four located on Tresco. Of the monuments on Bryher the largest Scheduled Monument is Shipman Head Down (1017784), located approximately 150m to the north-west of Kitchen Porth in the north of the island. The monument comprises a cairn cemetery containing at least 148 cairns, and also includes a prehistoric field system. On the east of Bryher between Kitchen Porth and Church Quay are a post-medieval boat house (1016171) located inland and a prehistoric linear boundary and cairns (1016170) located on the foreshore. Moving south along the east coast a prehistoric linear boundary (1014991) is located on the foreshore approximately 100m south-east of Church Quay.

A civil war battery (1010176) and prehistoric field system and Romano-British cist (1014989) are located to the north of the Green Bay site. The prehistoric field system is located on the foreshore and the red line boundary overlaps with the scheduled area. A prehistoric hut circle (1014990) and prehistoric enclosure (1015649) are located approximately 70m to the southwest of the Green Bay site. Between the Green Bay and Great Par site there are six Scheduled Monuments located on or around Samson Hill, comprising an Iron Age cist (1017089), prehistoric field system (1014988), prehistoric entrance grave (1013797), two kerbed platform cairns (1013796), a prehistoric entrance grave and round cairn (1013811) and a civil war battery (1010163).

There are two Scheduled Monuments located to the South of the Great Par site: a prehistoric field system and settlement on Heathy Hill (1015005)and a prehistoric field system and post-medieval quay located on the foreshore(1014987). Moving north along the coast a post-medieval gig shed or boathouse (1016173) is located partly within the Great Par site. There are three Scheduled Monuments located on or adjacent to Gweal Hill, to the west of the Popplestone site: a kerbed platform cairn (1015544), prehistoric field system (1015004) and three prehistoric cairns (1015648). The final Scheduled Monument on Bryher is a post-medieval pilot lookout on Timmy's Hill (1016172) in the centre of the island.

The four Scheduled Monuments located on Tresco within the study area comprise: Cromwell's Castle (1013275), a mid-17th century blockhouse and 18th century gun platform; King Charles' Castle (1013667), a mid-16th century artillery castle and civil war earthen artillery defence; Castle Down (1017783), which contains prehistoric funerary, ritual and settlement remains, post-medieval defences, tin mine, lookouts and enclosures; and, a prehistoric to early medieval field system and settlement at Dial Rocks (1017781).

Listed Buildings

There are six Listed Buildings within the study area, comprising four Grade II buildings located on Bryher, and two Grade II* buildings located on Tresco. The closest Listed Building to the works is the Grade II listed Church of All Saints (1141234) located approximately 90m to the west of Church Quay, immediately adjacent to the access road. The remaining three Grade II listed buildings on Bryher are all located approximately 300m to the east of the Great Par site and consist of Veronica Farmhouse (1292061), a Brewhouse (1141236) and The Forge (1141235). The Grade II* Listed Buildings on Tresco are the gun tower at Cromwell's Castle (1141198) and the fortification at King Charles' Castle (1328850), both located within the associated Scheduled Monuments.

Non-Designated Assets

The locations of non-designated heritage assets on Bryher are shown on Figure 2, Appendix 7.1, details of the assets are available in the gazetteer in Appendix 7.2.

There are forty-eight non-designated assets within the 250m study area on Bryher. There are no non-designated assets within the red line boundary for the site.

There are twenty-three records of monuments and findspots dating to the prehistoric period in the study area. The records, comprise find spots of lithics, (MCO30217), flints (MCO30596, MCO30602, MCO31553, MCO31602, MCO31668, MCO31758), a granite mortar (MCO30710), a granite post-holed or socket stone (MCO31502), a broken saddle quern (MCO31555), a two-holed stone (MCO31601) and a post-holed stone (MCO31609). Monument records include hut circles (MCO31552, MCO31556, MCO44731, MCO56775), a hut floor (MCO30195), a boundary wall (MCO31551), an area of land surface (MCO31669), a cist (MCO31764), and the remains of two or more lynchets (MCO31765).

There are no records of assets of Romano-British date within the study area.

Five records of monuments within the study area date to the early medieval period. An early medieval quay (MCO30728) constructed of boulders and heavily damaged by wave action was discovered at Kitchen Porth in 1976. The site of a potential early medieval settlement is indicated by a concentration of pottery, which dates the settlement to as early as the 6th century AD close to Veronica Farmhouse (MCO31760). Other records of early medieval date include a limpet midden (MCO31503), a trackway visible on aerial photographs (MCO41934) and three linear features located 40m below mean low water, which may be a structure on the seabed or wreckage (MCO41938). The prehistoric rectangular enclosure (MCO41955) may also date to the early medieval period.

Medieval activity in the study area is evidenced by three recorded sites. Two potential medieval settlements suggested by concentrations of medieval pottery are recorded within the study area: one at Norrard (MCO30900) and the other at the Town (MCO31603). A potential early 14th century wreck (MCO65726) located in Tresco Channel is the final site of medieval date within the study area.

There are thirteen recorded sites of post-medieval date within the study area. Five of the post-medieval records are shipwrecks (MCO43005, MCO43012, MCO43013, MCO43038, MCO43072), known only from documentary evidence and the location of the wrecks in the HER is indicative. The remaining records comprise the remains of gig sheds (MCO30593, MCO30595), a small slipway (MCO30597), a Baptist chapel now a private dwelling known as 'Staddon' (MCO31504), field boundaries (MCO41931, MCO41932), a probable quarry (MCO41933), the remains of stone splitting, consisting of a massive boulder 2.0m high, with drill marks along two of its edges (MCO31607), a drystone wall (MCO30411) and two middens (MCO30934, MCO30787).

Only one asset of modern date is recorded within the study area, a linear feature visible on the beach south-east of Watch Hill (MCO41997).

The remaining two features are undated and consist of a limpet midden (MCO30935) and an ox jaw bone found in a cliff face on the north side of Popplestone (MCO30788).

Historic Mapping

The earliest historic map reviewed is not dated and the cartographer is not known but the lettering suggests it was made during the reign of Elizabeth I, possibly in 1558. Bryher is shown on this map with the name 'BRYADR' and 'BREAR', though no further details are shown.

The next available map is the 1794 map by John Cary, from Cary's New Map of England and Wales, With Part of Scotland. Bryher is shown here in a form similar to the present but with little other detail, and is annotated 'Bryer'. The 1803 map entitled 'Heather's New and Improved Chart of the Isles of Scilly' by William Heather shows

Bryher in more detail compared to previous maps. No settlements are shown on Bryher but various landmarks are annotated such as 'Salt Pt.', 'Guahall Pt.', and 'Rocky Pt.'. Hangman's Isle is shown across from Kitchen Porth, and on Tresco the site of Cromwell's Castle is annotated as 'Blockhouse' and the site of King Charles' Castle is annotated as 'Olivers Castle'.

The first edition OS map of 1889 shows Bryher with a similar layout and character to present, featuring enclosed fields, small settlements, upland rough ground and coastal areas. Hangman Island, Cromwell's Castle and King Charles' Castle are all shown to the north of the Kitchen Porth site. At the Church Quay a quay is depicted; this was likely to have been a boulder-built quay that preceded the current modern quay. All Saints Church and its associated graveyard is shown to the west. There is little of heritage interest shown at Green Bay, though a footpath is shown running to the south of the site. At Great Par the scheduled Boat House (1016173) is shown along with another structure which may be the non-designated boathouse (MCO30595). The Stinking Porth site is similar to the present and no features of heritage interest are visible at the Popplestone site.

There are no significant changes at any of the sites on Bryher on the 2nd edition OS map of 1909.

Historic Landscape Characterisation

The intertidal area of Bryher is characterised as 'Foreshore', and further subdivided into sandy foreshore and rocky foreshore. Sandy foreshore areas are rich in archaeological remains including prehistoric settlements, field systems, graves, ritual monuments and peat deposits. Rocky foreshore areas by comparison are relatively barren in terms of historic remains. All of the sites are either partly within or have a view of this landscape character type.

The majority of sites are within or close to the 'Rough Ground: blown sand/dunes'. character type, with the exception of Kitchen Porth. Most of Scilly's above ground archaeological remains are found on rough ground, and remains can comprise, prehistoric field systems, prehistoric houses, ritual and burial monuments, early Christian chapels, churches and cemeteries, and post-medieval defences. Blown sand/dunes are areas of high ground covered by blown sand and low-lying dune systems, covered primarily in marram grass. Sand can conceal prehistoric monuments and landscapes, which are subsequently exposed during coastal erosion or sand extraction. All of the sites are either within or have views of this character type. Kitchen Porth lies partly within the 'Rough Ground: Heathland' character area, though this may be a mis-characterisation within the HLC, as the area does not appear to be heathland, but blown sand/dunes.

Outside of Rough Ground the majority of Bryher is characterised as 'Farmland', either 'anciently enclosed land', 'bulb strips, late 19th/20th century', 'late post-medieval enclosures' or 'modern enclosures'. The Kitchen Porth and Green Bay sites lie partly within the anciently enclosed land character area. Archaeological remains typically found within anciently enclosed land include prehistoric houses, scatters of prehistoric and medieval pottery, flint or other occupation material.

Site Visit

Kitchen Porth

The site lies to the rear of a wide sandy beach situated in a bay (Photograph 1). To the immediate rear of the site are gardens belonging to residential properties. The site is occupied by mixed boulders, cobbles and sand. The ruins of a small rectangular structure were noted within the site footprint (Photograph 2). The structure was constructed of stone blocks and stone likely taken from the surrounding environment, and stood approximately 15cm high, 1m wide and 1m long. The purpose of this structure is unknown though it is likely to be of modern date.

Cromwell’s Castle sits on the coast of Tresco across the straight from Bryher (Photograph 3) approximately 500m to the northeast of the site. The Castle occupies

a prominent position in the landscape, although from within the site boundary views towards the Castle are blocked by an intervening island known as "Hangman's Island". The Castle could not be visited during the site visit due to time and tide constraints, but it is likely views towards the site are similarly screened by the intervening landmass.

King Charles Castle is visible from the site, surviving as a low-lying ruin on top of the hill on Tresco.

The limpet midden (MCO30935) and early medieval quay (MCO30728), both recorded within the bay were not visible.

Shipmen Head Down Scheduled Monument (1017784) is visible from the site, although individual cairns that make up the cemetery were mostly not visible, being hidden by bracken or other vegetation.

No other features of archaeological interest were noted within the site boundary.

Green Bay

The site comprises of an area of mixed, scrub-like vegetation to the rear of a stony beach featuring piles of disordered boulders (Photograph 5). The ruins of a dry-stone wall were noted within the site boundary, it seems likely that the wall was robbed in the past and stones deposited on the beach as a make-shift sea defence. A single wooden fence post of likely modern date was the only other manmade feature within the site. The site is backed by a grassy footpath and the access to the site runs partly along this track.

No features of archaeological interest were noted within the site.

Great Porth (Great Par)

At Great Porth (Great Par) (Photograph 6) the site sits partly within the Scheduled post-medieval boat house (1016173) that currently survives in a derelict state (Photograph 7), quite different to the described condition in the Scheduling description. The boathouse is a low lying ruin covered in grass, scrub vegetation and two small trees. The drystone walls survive on the northeast, northwest and southeast sides to a height of approximately 40cm. No evidence of the southwest wall remains, and it appears that some of the stones that once made up the boat house have been re-used for a make-shift flood defence on the beach. An up-turned trailer and rusted winch have been placed or discarded within the boathouse. The Scheduled Monument is on the Historic England Heritage at Risk Register. The Scheduled Monument is in a poor state of survival.

The site itself comprises a rock beach backed by large boulders. The site has views looking towards the south of Great Porth bay and the Scheduled Monuments beyond this.

No features of archaeological interest were noted within the site.

Stinking Porth

The site comprises a bank of medium to small size boulders leading down to a sandy beach (Photograph 8). There is a large area of outcropping rock just to the south of the site. The rear of the site comprises of rough ground, a dirt track and beyond is the Great Pool.

No features of archaeological interest were noted within the site.

Great Popplestone

The site comprises a modern concrete sea wall protected by a rock armour revetment (Photograph 9). The rear of the site is suffering from erosion as a result of wave overtopping that has eroded the earth bank and exposed the concrete structure of the sea wall. There are numerous medium to large size boulders littering the rear of the sea wall, which have been deposited there by overtopping waves. There were no features of archaeological interest noted within the site.

The rock recovery area on the north side of Popplestone Bay comprises a sandy bank featuring numerous disordered boulders, backed by sand dunes (Photograph 10). No features of archaeological interest were noted in this area.

Access

Access between Church Quay and Green Bay runs through the Scheduled Monument of a prehistoric field system and Romano-British cist burial (1014989) (Photograph 11). Communication with the client indicates this beach is already tracked by vehicles. A row of stones were visible on north boundary of the Scheduled Monument, however the majority of features within the Scheduled Monument were either buried or in the intertidal area and so not visible during the site visit.

Access to Church Quay runs adjacent to Grade II Listed All Saints Church (1141234) (Photograph 12).

At Great Porth North the access route runs partly within the scheduled area of the post-medieval boat house (1016173). However, the access runs along a pre-established track and does not impact on the physical remains of the boathouse, which are quite dilapidated (Photograph 13).

7.3.4 St Agnes

There are no World Heritage Sites, Registered Parks and Gardens, Protected Wreck Sites or Registered Battlefields within the study area on St Agnes. The locations of designated heritage assets on St Agnes are shown on St Agnes Figure 1, Appendix 7.1, details of the assets are available in the gazetteer in appendix 7.2.

Designated Assets

Conservation Area

The Isles of Scilly Conservation Area Appraisal (Isles of Scilly Council 2015) describes St Agnes as the smallest and most intimate in character of all the Islands. The most dominant feature in the landscape is the St Agnes Lighthouse (a Scheduled Monument and Listed Building, see below), which sits on the central high point of the Island and is visible from numerous locations. The coastal areas comprise sandy heathlands containing granite outcrops weathered into tors; the shoreline is indented and rocky with a mixture of headlands and bays. Gugh is connected to St Agnes by a tombolo, and features numerous prehistoric monuments. Settlement on the island is concentrated around Lower Town, Middle Town and Higher Town linked by a tracked road that runs over the high point of the Island. Key views are identified within the Conservation Area character appraisal looking north from Big Pool towards Porth Coose and west towards Periglis.

Scheduled Monuments

There are nine Scheduled Monuments within the 500m study area, eight of which are located on St Agnes and one on Gugh. A prehistoric settlement and field system (1014998) is located at Porth Killier, whose scheduled area overlaps with the red line boundary. A prehistoric to Romano-British field system and settlement (1015003) is located close to Higher Town approximately 100m south of the red line boundary.

The St Agnes Lighthouse (1014999, also a Listed Building, see below) built in 1680 is still in use as a daymark. The lighthouse is located on the highest point of Middle Town approximately 250m to the south of Porth Killier. A nineteenth century horse engine and threshing machine (1015000) is located at Lower Town Farm, approximately 100m south of the red line boundary. The horse engine survives within a raised circular platform abutting the northern wall of a barn.

Two Scheduled Monuments are located to the west of Periglis, a pair of post-medieval quays (1016512) located in the intertidal area and a platform cairn (1016510) on Burnt Island. Approximately 350m to the southwest of Periglis a prehistoric field system and post-medieval breastwork and a maze (1015697) are located on Castella Down. On Gugh the single Scheduled Monument encompasses most of Kittern Hill

within its scheduled area and contains; prehistoric cairns, entrance graves, field system and settlements, and post-medieval kelp pits (1014792).

Listed Buildings

There are fifteen Listed Buildings within the 500m study area, all located within either Lower Town, Middle Town or Upper Town on St Agnes. St Agnes Lighthouse (1328835) is the only Grade II* Listed Building and all remaining buildings are Grade II listed. The buildings are primarily farmhouses and cottages. The closest Listed Building to the red line boundary is the Grade II listed Church of St Agnes (1141238), located approximately 50m to the south of the Periglis site. Every other Listed Building is located over 180m from the red line boundary, full details of the Listed Buildings are available in the gazetteer in Appendix 7.2.

Non-Designated Assets

The locations of non-designated heritage assets on St Agnes are shown on St Ages Figure 2, Appendix 7.1, details of the assets are available in the gazetteer in Appendix 7.2.

There are forty-four non designated assets within the 250m study area on St Agnes. Only one asset lies within the red line boundary, the 20th century sea wall built in 1996 at Porth Coose (MCO64519).

Sixteen of the asset records date to the Prehistoric period. They comprise: Granite objects, including pivot stones, a pig trough and rotary querns, found at St Agnes Lighthouse and Atlantic Cottage (MCO31495, MCO30135, MCO53004), part of a granite bowl quern (MCO31076), a drystone wall that may be part of a field system (MCO31117), a 'structure' and Bronze Age pottery found on west side of Porth Conger (MCO31118, MCO31119), a vertical pillar of granite resembling a standing stone (now destroyed)(MCO31173), worked flints (MCO31429), findspot of a granite mortar (MCO31431), an old land surface and limpet midden exposed in the low cliff face at Periglis (MCO31173, MCO52966), an extant Prehistoric hut circle (MCO64520), a granite saddle quern and other stone objects found at Grinlinton Farm (MCO30604), and a prehistoric pond known as “Big Pool” (MCO64518). Seven waste flints and a scraper (MCO31626) were recovered on Gugh.

There is one recorded asset of Romano-British date within the study area, a well-made grieson mortar within a carved handle (MCO31496), found in the gardens of St Agnes Lighthouse. Some of the monuments of prehistoric date may have continued in use into this period.

There are seven monument and findspot records of early-medieval date within the study area. Early medieval pottery discovered at Middle Town may indicate the presence of a settlement (MCO30837), and further evidence at Middle Town includes an early medieval well (MCO31096) and early medieval stone objects found at Grinlinton Farm (MCO30605). A collection of granite objects of early-medieval date were found at Atlantic Cottage including cresset stones, pivot stones, a rotary quern and a trough (MCO30136). A limpet midden 3m long was recorded as being visible in the cliff face below the lifeboat house at Periglis (MCO31072), the midden contained grass-marked pottery and fragments of animal bone. An inscribed stone bearing the letters 'TH' was found in Porth Conger, Gugh (MCO31116). Eight granite querns and two granite columns were found amongst the stones in the garden of the Lighthouse (MCO31500).

There is one recorded monument of medieval date in the study area, the site of a possible medieval chapel and burial ground (MCO31073), located to the south of Periglis.

Thirteen records date to the post-medieval period within the study area, comprising; a Bible Christian chapel built in 1832 at Lower Town (MCO30819), a disused lifeboat house used between 1890 -and 1920 (MCO31074), seven buildings at Periglis, probably boathouses which had gone out of use by 1890 (MCO31075), a broken trough and granite anchor stone found the garden on the Lighthouse (MCO31499), a

small pit 3.4m in diameter, identified from aerial photographs (MCO41983), an eighteenth century cottage at Middle Town (MCO62965), burnt clay, limpets and finely dressed granite potentially indicative of a post-medieval occupation site (MCO30663), and St Agnes School which dates to the 19th century (MCO31433). Five records relate to the old coastguard station at Porth Conger, including the station itself (MCO31734), the Old Turk's Head public house, once the coastguard house (MCO31735), a slipway (MCO31736), quay (MCO31737) and two ruined buildings, possibly boathouses (MCO317378).

Three records within the study area are of undated remains. A short length of wall (MCO30809), two courses high was discovered in 1979 during digging out of sand for use in building work, an extensive limpet midden discovered to the rear of Troy Town (MCO31730) and an undated holed stone (MCO30607).

Historic Mapping

The Elizabethan map of 1558 annotated St Agnes as 'ANGNES', though there are no detailed features of the island mapped. The 1794 map by John Cary depicts St Agnes in a similar topographic form to present, with Gugh also depicted and annotated as 'Gue or Gough'. The channel between St Agnes and Gugh is annotated 'The Cove'. The 1803 map entitled 'Heather's New and Improved Chart of the Isles of Scilly' depicts Porth Killier, Porth Coose and Periglis in a similar form to present. The St Agnes Lighthouse is depicted and a church is also depicted at the location of the Grade II Listed St Agnes Church (1141238).

On the first edition OS map of 1889 Porth Killer is depicted in a similar form to present, the intertidal area being rocky foreshore and the inland areas occupied primarily by enclosed fields. The intertidal area at Porth Coose is sandy foreshore and the 'Big Pool' is depicted to the rear. At Periglis (annotated as Porth Iglis) the two scheduled quays are annotated (1016512) and a row of boathouses are shown to the rear of the site (MCO31075). There are few changes at Porth Killier or Porth Coose on the second edition OS 1909, but at Periglis two slipways have been constructed at the south end of the beach, one of which (labelled as Gunner Slip) extends for some 300m out into the bay.

Historic Landscape Characterisation

The intertidal area at Porth Killier is characterised as 'Foreshore: Rock Foreshore', whilst at Porth Coose and Periglis the area is characterised as 'Foreshore: Sandy Foreshore'. Inland of the foreshore at Porth Killier the land is characterised as 'Rough Ground: Heathland' and 'Rough Ground: Blown Sand/Dunes'. Inland of the Porth Coose and Periglis sites the land is characterised as 'Rough Ground: Blown Sand/Dunes'. To the east of Porth Killier the proposed compound area is within the 'Farmland: Anciently Enclosed Land' character type.

Site Visit

Quay Access and Storage Area

The site will be accessed via a modern quay constructed of concrete (Photograph 14). A secondary landing site is located to the south of the quay on an area of sandy beach. To the rear of the beach are two access ramps. The first is a historic lifeboat slipway leading directly up towards the Turk’s Head, currently a pub but historically a coastguard station (MCO31734). The second slipway curves around to the south, this slipway is also associated with the old coastguard station (MCO31736)(Photograph 15). An old quay (MCO31737) appears to have been built into the side of this slipway and partially survives.

The location proposed for a forward working area is located on an open field located to the south west of the quay (Photograph 16). The field is accessed via a pre-existing track that is frequently utilised by vehicles and agricultural machinery. The field has been subject to an archaeological investigation consisting of a strip and map in 2007. The field is bounded on its northeast, northwest and southwest side by a prehistoric Scheduled Monument comprising a settlement and field system (1014998). The St

Agnes Lighthouse (1014999) is visible from the working area as it occupies a very prominent position on the hilltop, other Listed Buildings in Middle Town were not visible.

Porth Killier

The access track to Porth Killier (Photograph 17) runs within the scheduled prehistoric field system and settlement (SM 1014998 mentioned above) but utilises a pre-established gravel track that is used by vehicles and agricultural machinery.

Where the "fan" shaped rock armour is proposed at Porth Killier East, the site consists of an area of heavily eroded cliff face that is exposing rounded cobbles (Photograph 18). There are numerous small to medium size boulders within the site. No archaeological features were noted, although the area is partly within the boundary of the Scheduled Monument (1014998).

The remainder of the site is occupied by a modern sea wall defence, constructed in 1996, comprising an 85m long concrete wall with granite cladding (Photograph 19). Each end of the wall is reinforced with a rock armour 'roundhead'. A row of trees behind the footpath to the rear of the wall blocks views inland, the only designated asset visible from the site is the aforementioned scheduled prehistoric settlement and field system (1014998).

No features of archaeological interest were noted in this area.

Porth Coose

The Porth Coose site comprises a rocky bank piled up against a sea defence embankment constructed in 1996 (MCO64519) (Photograph 20). This sea wall was originally buried but erosion has partially revealed the concrete structure beneath (Photograph 21). The top of the embankment is suffering from both coastal erosion and erosion from walkers. There are scattered boulders behind the embankment, the result of tidal action throwing boulders from the beach over the embankment. The beach is a mixture of white sand and stones. There is a rock armour spit separating Porth Coose from Periglis. The St Agnes Lighthouse (1014999) is visible from the site as it occupies a very prominent position on the hilltop (Photograph 22), other Listed Buildings in Middle Town were not visible.

No features of archaeological interest were noted in this area.

Periglis

The sea defence wall /embankment (MCO64519) continues from Porth Coose into this site area (Photograph 23); it is heavily eroded, revealing geomatting containing boulders and geobags (Photograph 24). The top of the embankment is also suffering erosion from walkers. There is a bank of medium to small boulders in front of the embankment, which gradually reduces to the south until the bank ties-in directly with the beach. The two scheduled post-medieval quays (1016512) were not visible during the site visit due to the height of the tide. The Grade II* listed St Agnes Lighthouse is visible from the site (1014999), as is the Grade II listed St Agnes Church (1141238) (Photograph 25), which is located approximately 50m to the south of the site.

7.3.5 St Martin's

There are no World Heritage Sites, Registered Parks and Gardens, Protected Wreck Sites or Registered Battlefields within the study area on St Martins. The locations of designated heritage assets on St Martin's are shown on St Martin's Figure 1, Appendix 7.1, details of the assets are available in the gazetteer in Appendix 7.2.

Designated Heritage Assets

Conservation Area

St Martin's is a long narrow island with a ridge line running east to west through the centre of the island. The southern shoreline features two distinctive curved beaches, Lawrence's Bay and Par Beach, the site being located at Lawrence's Bay. The southern

side of the island is more sheltered in character compared to the more rugged and exposed north. The landscape comprises small fields enclosed by hedgerows and the three settlements of Lower Town, Middle Town and Higher Town. Key views are identified within the Conservation Character Appraisal, which includes a view westwards over the site from just south of Middle Town in the direction of Tresco.

Scheduled Monuments

There are five Scheduled Monuments within the 500m study area, two of which are located on the nearby island of Teän. The closest Scheduled Monument to the site is the prehistoric cairn cemetery and field system on Tinkler's Hill (1018109), located approximately 50m to the north of the red line boundary. Further north a post-medieval kelp pit is located on the coast, on the western side of Tinkler's Hill (1013810), approximately 300m to the north of the red line boundary. A small section of a large Scheduled Monument lies just inside the north-east edge of the 500m study area. The monument comprises a prehistoric cairn cemetery, field system and settlements on Top Rock Hill (1018111).

The Scheduled Monuments on Teän comprise a prehistoric cairn group (1016178) and a large monument that contains prehistoric cairns, prehistoric to post-medieval settlements & field systems, an early Christian focus, post-medieval kelp pits and a post-medieval quay (1016179).

Listed Buildings

There is one Listed Building within the 500m study area, the Grade II Listed Ashvale Farmhouse (1141203). The farmhouse is mid-19th century in date, constructed of granite rubble. The farmhouse is located adjacent to an access route.

Non-designated Assets

The locations of non-designated heritage assets on St Martin's are shown on St Martin's Figure 2, Appendix 7.1, details of the assets are available in the gazetteer in Appendix 7.2.

There are thirty non-designated heritage assets within the 250m study area on St Martin's. A ruined post-medieval quay (MCO31598) is recorded within the boundary of a proposed materials landing area.

Seven records relate to assets dating to the Prehistoric period. The remains of three huts were discovered in 1978 on the beach south of Point of Fields, though no remains resembling hut circles were found in this location in 1988 (MCO31098).The remaining records are all find spots and comprise; a flint scraper (MCO30810), a flint scatter (MCO30812), a flint scraper and flake (MCO30860), a possible flint awl (MCO30861), worked flints including tools and cores (MCO31463) and a small assemblage of Late Bronze Age / Early Iron Age artefacts (MCO30817).

There are no recorded assets of Romano-British date within the study area.

Five records are of assets dating to the early-medieval period. The site of a 10th to 16th century settlement (MCO30814) is indicated by the presence of a midden containing a grave and pottery (MCO30815). An early Christian grave was uncovered during trenching on the south side of the road at Lower Town (MCO30816). The remains of a small structure (MCO41918) and stone field walls (MCO41919) were identified from aerial photographs.

There is one recorded monument of medieval date within the study area, the remains of a ruined quay recorded on the 1888 OS map and still visible as ruins now (MCO31097).

The remaining eight records all relate to assets from the post-medieval period. One of the records is a find spot of pot sherds, bottle glass and clay pipe fragments found in a cliff face at Point of Fields (MCO31099). All the other post-medieval records are monuments, and comprise: a granite well with steps lead down to it (MCO30232), a stone-lined well (MCO30811), a group of four kelp pits (MCO30813), the remains of a boathouse (MCO301100), the remains of a building which is probably a boathouse

(MCO31101), a ruined quay (MCO31598, within the redline boundary) and boathouses shown on old photographs at The Porth, though there are now no remains (MCO31597).

Historic Landscape Character

The intertidal area at St Martin's is characterised as 'Foreshore: Sandy Foreshore' in the south and Foreshore: Rocky Foreshore. The site lies within the 'Rough Ground: Blown Sand/Dunes', character area. Farmland to the rear of the site is primarily characterised as 'Farmland: bulb strips, late 19th/20th century', which are small narrow enclosures designed for the cultivation of flowers (daffodils and Narcissi).

Historic Mapping Overview

St Martin's is depicted on the Elizabethan map of 1558 and annotated as 'S. Martin'. Two churches are depicted: one on the very south-east of the island and one at the very north. The 1794 map by John Cary depicts the topography of the coastline of St Martins in a similar form to present but with no further detail. The 1803 map entitled 'Heather's New and Improved Chart of the Isles of Scilly' also depicts the coastline of St Martin's in a form quite close to present. A small settlement labelled 'The Town' is shown at the south-east end of the island along with a church. The area in which the site is proposed is annotated as 'Tinklers Point'.

On the first edition OS map of 1889 the area to the rear of the beach is occupied by sand dunes, as opposed to the current small enclosed fields. There is a row of boathouses depicted on the west side of the island close to the track that gives access to the site. The ruined quay (MCO31598) is depicted on the first edition OS map. There are few changes between the first edition OS and second edition maps, a large rectangular building has been constructed to the north of the sand dunes, some 60m to the north of the site and the ruined quay (MCO31598) is no longer depicted.

Site Visit

The proposed access point to the island for construction and the importation of materials is via a modern concrete quay on the west of the island (Photograph 26) or via the area of beach immediately to the south of the quay (Photograph 27). This beach area was walked by the surveyor, but no features of archaeological interest were noted.

Access from the quay onto the island is via a pre-established concrete track. An area inland, which is currently used as a stone storage area by a local individual, is proposed as a source of stone. Access to this area runs adjacent to the Grade II Listed Ashvale House (1141203) (Photograph 28) via a concrete track. Access to the beach is via a pre-established sandy track that appears to be currently utilised by vehicles (Photograph 29). The site comprises a wide sandy beach with medium size rounded pebbles backed by sand dunes which show evidence of coastal erosion and a cobble reinforced sand ramp that appears to be of modern date (Photograph 30).

No features of archaeological interest were identified during this site visit.

7.4 Assessment Methodology & Assessment Criteria

The assessment methodology is based on the Principles for Cultural Heritage Impact Assessment (IEMA/CIfA/IHBC, 2021). The basis for assessing impacts on the historic environment is an understanding of the heritage assets that might be affected by a proposal. Planning policy and guidance emphasise the need to understand the cultural significance of heritage assets, including their setting, reflecting that the primary purpose is to preserve significance rather than no change. The process of gaining this understanding can be broken down into three distinct stages:

Description: Research leading to a preliminary factual statement that establishes the location, nature and setting of the asset;

Cultural significance: Analysis of what we value about the asset and the contribution made by its setting, leading to a statement of cultural significance. Cultural

significance is not scaled but can be expressed in terms of four key 'heritage values' as outlined in Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage, 2008):

- Evidential value: the potential of a place to yield evidence about past human activity. Sites of evidential value will include those which have archaeological interest.
- Historical value: the ways in which past people, events and aspects of life can be connected through a place to the present. Heritage assets can either illustrate, or be associated with, past people and events.
- Aesthetic value: the ways in which people draw sensory and intellectual stimulation from a place. Aesthetic value can arise from conscious design or fortuitously from the way the heritage asset has evolved.

Communal value: the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory.

Importance: A conclusion regarding the level of protection or consideration that the asset merits in planning policy and cultural heritage legislation. A judgement on importance is scaled and can therefore be expressed in terms of the following criteria:

Importance	Examples
Very High	World Heritage Sites Places of international importance due to their 'outstanding universal value'.
High	Scheduled Monuments Grade I or II* Listed Buildings Grade I or II* Registered Parks and Gardens Battlefields Places or structures of national importance Non-designated heritage assets of equivalent national importance or potential to contribute significantly to national research objectives
Medium	Grade II Listed Buildings Grade II Registered Parks and Gardens Conservation Areas Non-designated assets with potential to contribute significantly to regional and local research objectives. This includes assets which have particular regional associations or may have important associations or significance in a local context (e.g. they have significance to local population or embody something of the special identity of a locality).
Low	Locally Listed Buildings Non-designated assets which are relatively poorly preserved or have limited importance in a local context and low potential to add to local and regional research objectives.
Negligible	Assets that have very limited or no archaeological, historical or cultural importance.
Uncertain	Sites where there is evidence that a heritage asset may exist, but where there is insufficient information to

Importance	Examples
	determine its nature, extent and degree of survival given current knowledge.

Having understood cultural significance the next step is to understand the proposed change(s) and the impact they would have on cultural significance. The process of evaluating the consequences of change can be usefully broken down into three distinct analytical stages:

Change: A factual statement of how a proposal would change an asset or its setting including physical, visual appearance, scale, nature and duration;

Impact: An assessment of the degree to which any changes would increase or decrease the cultural significance of an asset. Impact is scaled and the magnitude of impact is a reflection of the extent to which the cultural significance of an asset is changed by a proposal. A judgement of magnitude of impact can be made based on the following criteria:

Magnitude of Impact	Criteria
Major Negative	Causes total destruction or change to, most key elements of the asset that results in substantial loss of integrity and cultural significance. Comprehensive change to the setting of the asset which this is a critical aspect of the assets cultural significance. Any such change would not normally be reversible.
Moderate Negative	Causes change to, or loss of many key elements which result in a moderate loss of integrity and cultural significance of the asset. Moderate changes to the setting of the asset where this makes an important contribution to the cultural significance of the asset.
Minor Negative	Change to some elements which lead to a limited loss of integrity and cultural significance of the asset. Change to the setting of the asset where this makes a limited contribution to the cultural significance of the asset.
Negligible / No change	No appreciable change to the cultural significance of the asset or its setting.
Minor Positive	Change to some elements which leads to limited improvement in integrity and cultural significance of the asset, or arrests decline. Change to the setting of the asset where this makes a limited contribution to the cultural significance of the asset.
Moderate Positive	Causes change to many key elements which result in a moderate enhancement to integrity and cultural significance of the asset or reverses decline. Moderate changes to the setting of the asset where this makes an important contribution to the cultural significance of the asset.
Major Positive	Causes significant change to most key elements of the asset that results in substantial enhancement of cultural significance. Comprehensive change to the setting of the asset which this is a critical aspect of the assets cultural significance.

Effect: A conclusion regarding whether an impact matters or not, reflecting the importance of the affected heritage asset. The effect is the measure that brings together the magnitude of the impact and the heritage asset's importance. This a critical stage of the assessment process as this determines the weight that should be given to the matter in either influencing the design of the proposal or ultimately in the test as to whether the proposal will be acceptable and permitted. The effect can be articulated through the use of a matrix which brings together the importance of an asset and the magnitude of impact on the assets significance. Where there are two options for a level of effect it is a matter of professional judgement which should be articulated in the text description as to the level of effect appropriate:

Importance of Asset	**Magnitude of Impact**			
	Major	Moderate	Minor	Negligible / No Change
Very High	Very Large	Very Large/Large	Large/Moderate	Slight/Neutral
High	Very Large/Large	Large/Moderate	Moderate/Slight	Slight/Neutral
Medium	Large/Moderate	Moderate	Slight	Neutral
Low	Moderate/Slight	Slight	Slight/Neutral	Neutral
Negligible	Slight/Neutral	Slight/Neutral	Slight/Neutral	Neutral

7.5 Potential Impacts & Significant Effects

7.5.1 Bryher

Assessment of Significance – Designated

The Scheduled Monuments within the study area represent two distinct phases of the heritage of the Islands: firstly, the early settlement of the land and the introduction of monumental funerary architecture during the Early Bronze Age; and secondly, the development of the Isles of Scilly as a strategic fortified military location between the 16th - 20th centuries. All of the Scheduled Monuments are considered to be of high importance.

The largest Scheduled Monument in the study area is Shipman Head Down (1017784), a cairn cemetery containing at least 148 funerary cairns. The scheduled area also contains a prehistoric field system comprising turf covered rubble banks. The cemetery contains one of the largest and most concentrated groups of prehistoric funerary cairns. The scale of survival of remains on Shipman Head Down allows significant insights into wider landscape organisation during the prehistoric period and gives the monument high evidential value.

The prehistoric field system and Romano-British cist in Green Bay (1014989) lies in the intertidal zone on the east coast of Bryher. The monument survives primarily below ground, and contains evidential value through surviving remains of the field system including walls that define a pattern of small rectilinear plots, which can inform on prehistoric agricultural activity on the Isles of Scilly. The Romano-British cist has evidential value through its remains which can inform on past funerary practices and traditions.

Other Scheduled Monuments of prehistoric date within the study area include field systems, cists, hut circles, settlements and entrance graves. All of these monuments will have evidential value related to physical remains. Those monuments that survive

above ground may also have aesthetic value through their contribution to the historic landscape of the Isles of Scilly. The setting of Scheduled Monuments on Bryher is defined by their typical remote locations on rough upland areas or within the intertidal areas along the coast. The rural character of these areas, lacking in modern landscape change or developments and long distant views across Bryher and other Islands contribute towards the significance of the setting. The setting of these assets on Bryher typically make a positive contribution to the significance of the asset. Where Scheduled Monuments survive primarily as below ground archaeological remains, the setting makes less of a contribution to their significance, although the relationship of the monuments to the surrounding historic landscape can still be understood in most cases.

King Charles' Castle (1013667) on Tresco is a Scheduled Monument and Grade II* Listed Building. It is an example of a 16th century artillery castle, only 21 of which survive and are therefore rare at a national scale. The monument has evidential value in its structural remains which can yield information about architectural style, materials, construction techniques and location. The castle survives comparatively well, and its design and layout can be clearly understood. Cromwell's Castle (1013275) on Tresco is also a Scheduled Monument and Grade II* Listed Building. It is an example of a mid-17th century blockhouse and 18th century raised gun platform. The monument contains evidential value related to its materials, architecture, construction techniques and location. Both monuments have historical value as evidence of the past strategic importance of the Isles of Scilly and connections with specific periods of defence. The monuments are prominent in the landscape, with Cromwell's Castle being particularly visible across the straight from Bryher and contributing strongly to the aesthetic value of the area. The setting of these assets is defined by their relationship to the coast and views of the straight between Bryher and Tresco which are characteristic of the defensive role of these monuments. The setting makes a positive contribution to the overall heritage significance of these assets.

Other post-medieval monuments include two Civil War batteries, a gig shed, watch house and coastguard lookout and a pilot lookout. These monuments will have evidential value in their structural remains which can yield information about building materials, architectural style and construction techniques.

All of the Listed Buildings have evidential value embedded within the structures which can inform on past construction techniques, materials and architectural style and have aesthetic value through their contribution to the historic character of Bryher. The Church of All Saints (1141234) has communal value as an active place of worship for the local populace. The four Grade II Listed Buildings in the study area are of medium importance.

The Isles of Scilly Conservation Area encompasses the entirety of the Isles of Scilly, and as such contains all other designated and non-designated assets on the Islands, from prehistory to modern. On Bryher the Conservation Area exhibits evidential value through Scheduled Monuments and non-designated archaeological sites which contain evidence of all periods but particularly prehistoric and post-medieval activity on the Isles of Scilly. Historic buildings have evidential value through their architecture and layout across the island which provide evidence of the development of post-medieval construction techniques and occupation on Bryher. The Conservation Area also encompasses non-designated assets and historic landscape features such as field systems that contain evidential value through their layout which informs on the past agricultural industry on the island and have aesthetic value through their contribution to the historic character of Bryher. The architecture of the buildings also contributes towards the aesthetic value of the Conservation Area. Overall, the Conservation Area is considered to be of medium importance.

Assessment of Significance – Non-designated and Archaeological Potential

The significance of non-designated heritage assets and archaeological potential on Bryher have been considered by site, with access routes considered separately.

Kitchen Porth

Prehistoric activity at Kitchen Porth is evidenced by prehistoric findspots comprising worked flints including cores and tools (MCO30217), and in the wider area by the cairn cemetery on Shipman Head Down (1017784). The site lies on the sandy foreshore, a landscape type from which numerous prehistoric find spots have been discovered, often lying on the surface or at very shallow depths. The potential for discovering previously unknown prehistoric archaeological remains is reduced due to the presence of existing rock armour on the site, the installation of which is likely to have disturbed any surviving in-situ remains. Any prehistoric remains within the site are likely to be individual findspots out of their original context, potentially redeposited by tidal action. The potential for remains of prehistoric date with evidential value to survive within the site is considered to be low.

There are no records within the vicinity of the Kitchen Porth site dated to the Romano-British period, and as such there is negligible potential for remains dating to this period to survive within the site.

Early medieval activity at Kitchen Porth is evidenced by the presence of a quay (MCO30728), and trackway (MCO41934). The quay is located on the opposite end of the bay from the site and has been heavily damaged by wave action. No other finds of early-medieval date associated with the quay have been discovered at Kitchen Porth. Considering the site has been disturbed by installation of rock armour, there is low potential for remains of early medieval date to survive within the site. Their significance would lie primarily in their evidential value.

There are only three records of medieval date within the study area on Bryher. The site of a medieval settlement (MCO30900) is located approximately 30m to the south of the site, indicated by the large concentration of pottery found in this area during trenching in 1985. Finds relating to this settlement may exist within the site, though as previously discussed remains are likely to have been disturbed by previous installation of rock armour on the site. There is low potential for previously unknown archaeological remains of medieval date and evidential value to exist within the site.

Post-medieval activity is evidenced by the presence of a post-medieval field system (MCO41931) associated with bulb strips. The embankment to the rear of the site may incorporate or be part of a post-medieval field system. Post-medieval activity in the area is also evidenced by fortifications on Tresco (Cromwell's Castle, King Charles' Castle). There is low potential for unknown archaeological remains of post-medieval date to survive within the site, and any remains that may exist will likely have been disturbed by the installation of rock armour on the site. Their significance would lie primarily in their evidential value.

There was on record of unknown date at Kitchen Porth, a limpet midden (MCO30935) located in the cliff face to the east of the site boundary.

Green Bay

At Green Bay numerous monuments and sites on the foreshore date to the prehistoric period, including a field system (1014989), enclosure (1015649), hut circle (1014990) and the findspot of a Mesolithic or Neolithic flint arrowhead and various scrapers (MCO31553). The findspot doesn't have any enduring heritage significance as the artefacts have been recovered. All records of prehistoric date in the vicinity of this site are located on the foreshore. A watching brief carried out during groundworks at Sampson Cottage (ECO3236) identified 43 sherds of pottery possibly dating to the Bronze Age. The site is likely to have been disturbed in the past as a result of installation of informal rock defences on the beach and the drystone wall that still partly survives within the site. There is low potential for archaeological remains dating

to the prehistoric period to survive within the site. Their significance would lie primarily in their evidential value.

The Scheduled Monument 1014989 contains a Romano-British cist in addition to the prehistoric field system, evidence of activity from this period close to Green Bay. There are no other assets within the vicinity of Green Bay dating to the Romano-British period, and there is low potential for Romano-British remains to survive within the site. Their significance would lie primarily in their evidential value.

There are no records within the vicinity of Green Bay dating to either the early medieval or medieval periods. There is negligible potential for archaeological remains dating to either of these periods to survive within the site.

Post-medieval activity in the study area is evidenced by a scheduled civil war battery (1010176) surviving as low-lying earthworks. A stone working site is located in the intertidal area approximately 125m to the north-east of the site (MCO31607). The drystone wall located partly within the site correlates with a field boundary shown on historic OS maps and it is likely that the feature dates to this period, although it may have been robbed out to construct the informal rock defences on the beach and is mostly destroyed. There is low potential for previously unknown post-medieval remains with evidential value to survive within the site.

Great Porth (Great Par)

At Great Porth (Great Par) there is a lack of prehistoric evidence in the intertidal area compared to other sites, with only one recorded findspot of four water worn flints (MCO30596). This may be the result of strong coastal erosion that could have damaged or removed any remains, although there may be remains related to the scheduled prehistoric field system to the south of the site (1014987). The site has modern rock armour defences, the installation of which likely disturbed any previous archaeological remains, reducing the archaeological potential of the site. There is considered a low potential for prehistoric remains with evidential value to survive within the site.

There are no records of Romano-British, early medieval or medieval date within the vicinity of the Great Porth (North) site. As such there is considered a negligible potential for remains from these periods to be present within the site.

Post-medieval activity within the vicinity of the site is evidenced by records for three boathouses built on the crest behind the beach, one of which is scheduled (1016173, MCO30593, MCO30595). A post-medieval quay was located approximately 77m to the west of the site, prior to its destruction by a coastal protection scheme (MCO30597). Post-medieval field boundaries exist behind the site; these were surveyed as part of a project to map and assess field boundaries on the Isles of Scilly (ECO3567). Any post-medieval remains that may have once existed within the site have likely been disturbed or removed by installation of modern rock armour, as such the potential for post-medieval remains to exist within the site is low. Their significance would lie primarily in their evidential value.

Stinking Porth

Prehistoric activity in the vicinity of Stinking Porth is demonstrated by the prehistoric field system (1015004) and cairns (1015648, 1015544) located on Gweal Hill. There is no evidence of prehistoric activity within the site itself or in the intertidal area at Stinking Porth. There is low potential for remains of prehistoric date with evidential value to survive within the site boundary.

There are no records in the vicinity of Stinking Porth dating to the Romano-British, early medieval or medieval periods. As such there is negligible potential to encounter remains dating to any of these periods.

The only record of remains of post-medieval date within the vicinity of the site is the post-medieval quay (MCO30597) destroyed during construction of a coastal protection scheme and hence of negligible heritage significance. There is low potential to for unknown archaeological remains of post-medieval date to survive within the Stinking Porth site. Their significance would lie primarily in their evidential value.

Great Popplestone

To the east of the Popplestone site prehistoric activity has been identified on Gweal Hill by the prehistoric field system (1015004), and cairns (1015648, 1015544). There are no known finds or monuments of prehistoric date in the intertidal area at Popplestone, although there is an undated find of an ox jawbone. Any unknown remains that may once have existed within the site have likely been disturbed by the construction of the modern sea wall and rock armour. There is negligible potential for archaeological remains of prehistoric date to survive within the site.

There are no records dating to the Romano-British, early medieval or medieval periods in the vicinity of the Popplestone site. There is negligible potential for remains of these periods to survive within the Popplestone site.

There is one record of post-medieval date within the vicinity of Popplestone, a midden consisting of a 10cm thick layer of winkle shells exposed in the cliff face at Popplestone (MCO30787). The modern sea defences constructed at the Popplestone site reduce the possibility of archaeological remains surviving within the site, as such the potential for further remains of post-medieval date is negligible.

Access

Access to the Island for construction activities and materials would be via Church Quay, a modern concrete structure, or via a landing site on the beach adjacent to Church Quay. During the site visit no assets were noted in this area, but there is evidence on the foreshore to the south for prehistoric activity. There is low potential for prehistoric remains to survive in this unloading area. The proposed working area inland of Church Quay is situated on an area of hardstanding currently used for storage of vehicles and miscellaneous materials. There is no potential for archaeological remains to survive in this area.

The majority of access routes on Bryher follow pre-existing tracks, and there is negligible potential for archaeological remains to survive along these tracks. Where the access route runs along the foreshore (between Church Quay and Green Bay) there is high potential for prehistoric remains to survive, especially within the scheduled area of the prehistoric field system and Romano-British cist (1014989). Archaeological remains within with the Scheduled Monument, or associated with it, would have evidential value relating to the prehistoric agricultural use of the island and later funerary rituals. The importance of any remains could be up to high importance.

Impact Assessment

The impacts of the proposed works at Bryher have been considered by site. The impact of access routes and compound areas on the historic environment are assessed separately.

Kitchen Porth

The proposed works comprise installation of recharge rock on top of existing rock armour and extension of the rock armour onto the beach. During construction of the scheme material will be brought onto site via the access track from Church Quay sand offloaded onto the beach. There will be no direct physical impacts on any known designated or non-designated assets as a result of the proposed works at the Kitchen Porth site.

During construction of the scheme there may be impacts on the setting of Cromwell's Castle (1013275), and St James Castle (1013667) as construction machinery and

movement are likely to be visible within the western seaward views from these assets. These views are characteristic of the defensive setting of these monuments and make a positive contribution to the significance of the assets. However, the works are limited in scale, and these impacts would be temporary and restricted to the construction phase of the works. The works are therefore considered to have a negligible impact on the setting of these monuments resulting in a neutral significance of effect **(Not Significant).**

The works also lie within the setting of the Scheduled Monument on Shipman Head Down (1017784), and construction activity will likely be visible from the monument. Considering the scale of the works in comparison to the overall landscape that the monument encompasses and wide reaching views in all directions, the impact on the setting is considered to be negligible. This would result in a neutral significance of effect **(Not Significant).**

During operation of the scheme the visibility of proposed rock armour would not be appreciable from these Scheduled Monuments due to the intervening distance, and would not impact on characteristic sea views. The scale of the works also mean that there will be no impacts on the character of the Conservation Area, and there will be no restriction of any key views. As a result, during operation of the scheme there would be no impact on the setting of heritage assets.

The assessment of archaeological potential has identified that there is low potential for previously unknown archaeological remains of prehistoric, early medieval, medieval or post medieval date, and negligible potential for remains of Romano-British date to be present within the site. Considering the limited amount of intrusive ground works to construct the scheme, the works would have a negligible impact on potential unknown archaeological remains, resulting in a neutral significance of effect **(Not Significant).**

Green Bay

During the construction phase there will be no direct physical impacts on any known designated or recorded non-designated assets as a result of the proposed works at the Green Bay site.

During construction of the scheme there may be impacts on the setting of two Scheduled Monuments within view of the site arising from plant activity: the prehistoric field system and Romano-British Cist in Green Bay (1014989); and the Prehistoric Enclosure South East of the Brow (1015649). The impacts on the setting of these assets is limited as they primarily survive below ground, as a result the impact on the setting of these assets during construction is considered to be negligible. This would result in a neutral significance of effect **(Not Significant).**

The installation of geobags will be covered with an embankment and revegetated leading to a slight increase in crest height in this area, but visually there would be little change from the present. During operation of the scheme there would be no change in the character of the area. As a result the change to the setting of the Scheduled Monuments is considered to be neutral **(Not Significant).**

The proposed works would result in the removal of a small part of the remains of the post-medieval dry-stone wall that survives within the site. As a poorly preserved non-designated asset the wall is considered to be of low importance with limited potential to add to local research objectives. As works would have a moderate impact on this asset, resulting in a **slight adverse** significance of effect.

Works will require excavation of the crest, and as such the potential to encounter previously unknown buried archaeological remains exists. The assessment of archaeological potential has identified a low potential to encounter remains of any period in this area and considering the limited impact of the proposed works the impact on the archaeological resource of the area is considered to be negligible **(Not Significant).**

Great Porth (Great Par) North of Great Carn

During construction the proposed works will impact on the post-medieval boathouse Scheduled Monument (1016173). The works will impact on surviving structural remains of the boathouse through construction of the proposed rock armour. Currently the boathouse survives in a very poor condition compared to its description in the Historic England listing, only the bottom courses of the walls survive, with much of the stone appearing to have been robbed out and placed on the beach. The boathouse is also likely to be suffering from erosion as a result of wave overtopping. During construction there will be major adverse direct physical impact on the surviving remains of the boathouse arising from construction activities, including installation of rock armour and excavation of the bank. This would result in a **large adverse** significance of effect.

During operation the proposed works will result in some potential minor positive impacts to the Scheduled Monument through reducing the risk of the boathouse being further damaged by wave overtopping, resulting in a slight beneficial significance of effect. There will no significant change to the character of the area, as the beach already features rock armour. The impacts on the setting of the scheduled monument during operation is considered to be negligible, resulting in a neutral significance of effect **(Not Significant)**.

The assessment of archaeological potential concluded that there was low potential for remains of prehistoric or post-medieval date to survive within the site and negligible potential for remains of Romano-British, early medieval or medieval date. The site already features rock armour, the installation of which has likely damaged or disturbed any archaeological remains. The extent of groundworks to install the rock armour will be minimal, therefore the impact of the works during construction on unknown archaeological remains is considered to be negligible **(Not Significant)**.

Stinking Porth

There will be no direct physical impacts on any known designated or recorded non-designated assets as a result of the proposed works at the Stinking Porth site.

The works lie within the setting of Prehistoric Field System on Gweal Hill (1015004) and Three Prehistoric Cairns on Gweal Hill (1015648) Scheduled Monuments. During construction of the scheme there may be limited impacts on the setting of these assets, from noise and visual impacts arising from plant activity. These impacts would be temporary and are reduced due to the low lying nature of the Scheduled Monuments and the distance from the works.

Installation of rock armour would introduce a man-made structure to the area and raise the height of the crest by approximately 1m. Rock armour would be constructed of either Scillonian or Cornish granite sympathetic to the local geology of the site. The revetment will be backed by site won material (soil and sand) topped with biomatting and re-vegetated. The proposed works are sympathetic to the current landscape, and will not result in a change to the character of the area. The impact on the setting of the Scheduled Monuments is considered to be negligible, resulting in a neutral significance of effect **(Not Significant)**.

The assessment of archaeological potential has identified low potential to encounter remains of prehistoric or post-medieval date, and negligible potential to encounter remains of Romano-British, early medieval or medieval date. There are no records for any heritage assets on the foreshore at Stinking Porth, and as such the impact on the archaeological resource is considered to be negligible **(Not Significant)**.

Great Popplestone

There will be no direct physical impacts on any known designated or recorded non-designated assets as a result of the proposed works at the Great Popplestone site, rock recovery area or sand recovery area.

The Scheduled Three Prehistoric Cairns on Gweal Hill (1015648) have views down towards the site. During construction at the Popplestone site there may negative impacts on the setting of this Scheduled Monument, due to noise and visual impacts

arising from plant activity. However, considering the distance of the Scheduled Monument from the site and the temporary nature of the impacts, the overall impact on the monument during the construction phase is considered to be negligible, resulting in a neutral significance of effect **(Not Significant)**.

The rock armour revetment will be constructed of either Scillonian or Cornish granite which is sympathetic to the geology of the local area. This will be sourced from the rock recovery area on the north side of Great Popplestone. The site currently features a modern concrete sea defence wall fronted by rock armour, and the addition of further rock to this existing structure will not change the character of the area. During operation of the scheme the impact on the setting of the Scheduled Monument is considered to be negligible, resulting in a neutral significance of effect **(Not Significant)**.

The assessment of archaeological potential has identified a negligible potential for remains of any period to survive within the site. As such there will be no impact on the archaeological resource at Great Popplestone **(Not Significant)**.

Access routes and compounds

Green Bay may be accessed from Church Quay via a low tide route along the foreshore if it is not feasible to deliver materials directly to the site by barge. This access track crosses through the Scheduled Monument Prehistoric field system and Romano-British cist in Green Bay (1014989). Vehicle movement through this Scheduled Monument has the potential to damage features related to the significance of the Scheduled Monument. This impact could range from moderate to minor negative, resulting in a **moderate adverse** significance of effect.

The Grade II listed Church of All Saints (1141234) lies adjacent to the access road and as such there will be a temporary minor negative impact on the setting of this Listed Building during the construction phase of the scheme from vehicle movements. This will result in a slight adverse significance of effect which will be temporary and cease at the end of construction. There will be no impacts on the church during operation of the scheme and therefore the significance of effect will be neutral **(Not Significant)**.

A compound/storage area is located inland of Church Quay. This area is currently utilised as a storage area for agricultural materials and is on hardstanding. As such there will be no impacts on archaeological remains as a result of construction activity in this area **(Not Significant)**.

Other access routes lie on hardstanding or follow pre-established tracks. As a result there will be no impact on any archaeological remains as a result of construction traffic across these routes.

7.5.2 St Agnes

Assessment of Significance – Designated Assets

Scheduled Monuments within the study area at St Agnes relate to two distinct periods in the islands history: the early occupation and exploitation of the islands, including the construction of funerary monuments; and the increasing maritime importance of the Islands during the post-medieval period. Some Scheduled Monuments contain features from both of these periods.

The prehistoric settlement and field system at Porth Killier (1014998) has evidential value through surviving Bronze Age structural remains and remains of the prehistoric field system. Previous investigations within the Scheduled Monument have shown it be a rich source of economic, environmental and artefactual information. Other prehistoric monuments on St Agnes include field systems, settlements, cairns and entrance graves. These monuments have evidential value embodied in their physical remains which can provide information on how past communities utilised the resources of the island, how they viewed and understood the landscape and their funerary rituals and practices. Many of the prehistoric remains within these

monuments only survive below ground, but those funerary monuments such as cairns and entrance graves that survive above ground can contribute to the historic character of the Island, and therefore have aesthetic value. Those Scheduled Monuments with visible remains that survive above ground or as earthworks will have a setting which contributes towards the significance of the monument. The setting of Scheduled Monuments on St Agnes is formed of the coastal and rural character of the Island. Long reaching coastal views and the lack of modern development contribute to the importance of the setting of these assets. The Scheduled Monuments of prehistoric date are of high importance.

The St Agnes Lighthouse is a Scheduled Monument (1014999) and Grade II* Listed Building (1328835). As one of the earliest surviving examples of a Trinity House lighthouse the monument occupies an important place in national maritime studies with historical value derived from its association with the Trinity House charity and archival resources. The monument has evidential value incorporating features relating to its earliest use as a coal-burning lighthouse tower, and unusually features gun ports in its design. The monument has aesthetic value as it occupies a very prominent position on St Agnes, making a very strong contribution to the historic character of the Island. Due to the prominence of the Lighthouse its setting encompasses almost the entirety of the Island, though its more local setting is that of Middle Town, of which it forms the focus and was likely the building the town was built around. The lighthouse is of high importance.

The other post-medieval Scheduled Monuments in the study area comprise two post-medieval quays (1016512) and a 19th century horse engine and threshing machine (1015000). These monuments have evidential value within their physical remains which can provide evidence about the past maritime and agricultural uses of the area. The Scheduled Monuments are all considered to be of high importance.

The Church of St Agnes (1141238) has evidential value through its architectural form and materials which can provide information on past construction techniques. The Church also has communal value as an active place of worship and aesthetic value arising from its architecture. The setting of the church in its coastal location and long reaching views out to sea contributes towards the significance of the Church. The Church is a Grade II Listed Building and of medium importance.

The remaining Listed Buildings in the study area have evidential value arising from their physical form and materials, and aesthetic value related to their contribution to the historic character of Middle Town and St Agnes in general. The Listed Buildings are all Grade II listed and are of medium importance.

On St Agnes the Conservation Area exhibits evidential value through Scheduled Monuments and non-designated archaeological sites which contain evidence of all periods, but particularly prehistoric and post-medieval activity on the Island. Historic buildings at Middle Town and elsewhere on the Island have evidential value within their architecture which may yield information about past construction techniques, and their layout across the island which provides evidence of the development of post-medieval occupation on St Agnes. The architecture of the buildings also contributes towards the aesthetic value of the Conservation Area. Overall, the Conservation Area is considered to be of medium importance.

Assessment of Significance – Non-designated Assets

The significance of non-designated assets and archaeological potential are assessed by site with access, storage areas and construction compounds assessed separately.

Porth Killier

The main evidence for prehistoric activity within the vicinity of the Porth Killier site is the scheduled Prehistoric Settlement and Field System (1014998). Prehistoric assets and remains within this area include: the settlement, which contains at least three hut circles; the field system which consists of boulder walls; an Iron Age "Cliff Castle" (Promontory fort), and findspots of Neolithic, Bronze Age and Iron Age pottery. The

finds of pottery primarily came from an eroding section of cliff face discovered in 1985 during archaeological works associated with the Isles of Scilly electrification project (ECO784). Immediately in front of the sea wall, remains of prehistoric date that may have once existed within the site have likely been disturbed or removed by the construction of the modern sea defence wall. There is low potential for remains of prehistoric date to be present in the vicinity of the sea wall. In the area where the 'fan-shaped' section of rock armour is proposed in front of the eroded section of beach, there is considered a high potential to encounter remains of prehistoric date as this area has not been subject to previous construction activities or groundworks.

There are no records of remains dating to the Romano-British, early medieval or post-medieval within the vicinity of the Porth Killier site. There is negligible potential for remains dated to these periods to exist within the site.

There are no remains of post-medieval date in the immediate vicinity of the Porth Killer site, although in the wider area post medieval activity on St Agnes is evidenced by many buildings, such as the St Agnes Lighthouse and more modest houses. There is a low potential for remains of post-medieval date to survive in the area of the site where the 'fan-shaped' rock armour will be constructed. The construction of the modern sea wall is likely to have removed any remains within the site, therefore there is negligble potential for remains of post-medieval date to survive within the site.

Porth Coose

At Porth Coose there are two records of prehistoric date within the vicinity of the site, a hut circle discovered in the intertidal area of Porth Coose in 2010 as part of the Lyonesse Project (MCO64520) and a possible prehistoric pond that is located in the area of an extant pond known as "Big Pool" (MCO64518). The construction of the modern sea defences (MCO64519) in 1996 has likely removed or disturbed any remains that may have once existed within the site; the potential for encountering remains of prehistoric date is considered to be negligible.

There are no records of assets of Romano-British, early medieval or medieval date within the vicinity of the Porth Coose site. There is negligible potential for remains from these periods to be present within the site.

As at Porth Killier, there are no remains of post-medieval date in the vicinity of the Porth Coose site, although there is evidence in the wider area on St Agnes. There is one record of modern date in the study area, the modern sea wall constructed in 1996 (MCO64519). Although this sea wall is recorded as a heritage asset within the HER, it is considered to have negligible heritage value. Considering the impact arising from construction of the modern sea wall on any below ground remains, the potential for remains of post-medieval date within the Porth Coose site is negligible.

Periglis

At Periglis prehistoric activity is evidenced by six records located on the south side of the bay, comprising of findspots (MCO31076, MCO31429, MCO31431), an old land surface (MCO31071, MCO52966), and a standing stone (MCO31173). As at Porth Coose, any remains that may have once existed within the site have likely been disturbed or destroyed by the construction of the modern sea wall in 1996. As such there is low potential for remains of prehistoric date to survive within the Periglis site.

There are no records of Romano-British date within the vicinity of the site and there is negligible potential to encounter remains dating to this period.

Early medieval activity in the vicinity of the Periglis site is evidenced by a limpet midden (MCO31072), which may also be of medieval date. There are no other finds of early medieval date within the vicinity and accounting for the impact of the 1996 sea wall there is negligible potential for remains of early medieval date to be present within the Periglis site.

There are two records of monuments in the vicinity of Periglis dated to the medieval period. There is the aforementioned midden (MCO31072) which may be of medieval

date, and the possible site of a medieval chapel and burial ground (MCO31073). There is low potential for remains of medieval date to survive within the site, partly due to the disturbance anticipated to have occurred during construction of the modern sea wall.

Post-medieval activity at Periglis is evident in recorded sites including two scheduled post-medieval quays (1016512), the Listed St Agnes Church (1141238), a coastguard station and lighthouse, and their associated slipways (MCO31074, MCO31075) and a chapel (MCO30819) located to the rear of the site. There is low potential for remains of post-medieval date to survive within the site as the construction of the existing sea wall will have resulted in truncation and disturbance.

Storage areas, compounds and access routes

The access to the island will be via the concrete quay to the east of Porth Killer, and utilising a pre-existing track that runs behind Porth Killier towards Porth Coose. The potential for unknown archaeological remains to exist along the access route is negligible.

The proposed compound/working area close to the quay was subject to an archaeological investigation in 2008 in the form of a watching brief during preparation of a contractor's compound (ECO2696). The watching brief identified: two Bronze Age urn bases placed in small pits; remains of a probable 19th century farm building; and, a concrete base for a late 1980s meteorological balloon. As the site has already been investigated and stripped for use as a compound previously, there is negligible potential for further archaeological remains to exist within this area.

A storage area is proposed adjacent to the access route between the Porth Killier and Porth Coose sites. The is identified in the HLC as 'anciently enclosed land' indicating use from as early as the prehistoric period. Although there are no monument records in this area, work undertaken by Oxford Archaeology in 2014 indicated the presence of Bronze Age settlement features (ECO5155). The remains comprised possible structures, earthworks and potential occupation layer deposits that were under threat from bracken rhizomes. An informal track runs through the centre of the storage area, which appears to be in use by off-road vehicles. Vehicle movement may have disturbed or destroyed archaeological remains within the site, although this may only be in localised areas. There is considered a high potential for archaeological remains to survive within this storage area, and the remains could be of any period, but are most likely to be Bronze Age in date and associated with the already identified remains.

Impact Assessment

The impacts of the proposed works on St Agnes have been considered by site.

Porth Killier

The red line boundary at Porth Killier lies within the scheduled area of the Prehistoric Settlement and Field System at Porth Killier (1014998), but construction activities will not take place within the scheduled area, other than movement of vehicles along pre-existing tracks. During construction at Porth Killier site features related to the Scheduled Monument may exist within the footprint of this 'fan shaped' section of rock. Groundbreaking in this area will be undertaken at the top of the existing embankment down to a maximum depth of approximately 0.5m.

The red line boundary at Porth Killier lies within the scheduled area of the Prehistoric Settlement and Field System at Porth Killier (1014998), and installation of rock armour takes place within the Scheduled Monument. During construction at Porth Killier site features related to the Scheduled Monument may exist within the construction footprint of the defences, which could be impacted by the proposed scheme. The Scheduled Monument is currently suffering from coastal erosion, which could impact on buried remains within the Scheduled Monument. The proposed defences would serve to reduce the threat the monument faces from coastal erosion, and provide protection to surviving buried remains to the rear of the defences.

Groundbreaking in this area will be undertaken at the top of the existing embankment down to a maximum depth of approximately 0.5m.

The overall impact during construction of the Porth Killier works on the significance of the Scheduled Monument is considered to be minor negative, resulting in a **slight adverse** significance of effect.

During construction of the scheme there will be temporary minor negative impacts on the setting of Scheduled Monument due to vehicle movement along the access route through the Monument and construction activities at the site introducing additional movement and machinery within the characteristic sea views and outlook. This would lead to a **slight adverse** significance of effect which would cease following the completion of construction activities.

During operation of the proposed works installation of rock armour will prevent further damage to the Scheduled Monument by coastal erosion. This would have a minor positive impact on the Scheduled Monument, resulting in a **slight beneficial** significance of effect.

During operation the impact of the proposed works on the setting of the Scheduled Monument is considered to be negligible. The majority of works comprise installation of rock armour forward of a modern sea wall, which does not currently contribute towards the setting of the monument. The installation of the fan-shaped armour would introduce a man-made structure into the landscape, but considering its proximity to the modern sea wall this would not result in a significant change to the character of the area. The impact is further reduced through use of either Cornish or Scillonian granite for the rock armour, which is sympathetic to the geology of the surrounding area. Considering the large scale of the Scheduled Monument and the relatively small scale of the works in comparison, the impact of the proposed works on the setting of the Scheduled Monument during operation is considered to be negligible, resulting in a neutral significance of effect **(Not Significant)**.

Porth Coose

There will be no direct physical impacts on any known designated assets as a result of the proposed works at the Porth Coose site. The works will impact on the non-designated asset '1996 sea wall' (MCO64519), although as this is of negligible heritage importance the significance of effect is neutral **(Not Significant)**. No other recorded non-designated assets will be impacted.

During operation the proposed works would result in raising the crest height by 1.2m, which would be backed on the leeward side of the crest by bank formed of site won material supported by geomatting. The crest is already at a height that there are no views over it from either the rear or the front, and an additional raising of the crest by 1.2m would not block any other views. The impact on the Isles of Scilly Conservation Area during operation will be negligible, resulting in a neutral significance of effect **(Not Significant)**.

The assessment of archaeological potential has identified negligible potential to encounter buried archaeological remains, and as the works at Porth Coose do not involve ground breaking the impact of the works on archaeological remains is considered to be negligible, resulting in a neutral significance of effect **(Not Significant)**.

Periglis

There will be no direct physical impacts on any known designated assets as a result of the proposed works at the Periglis site. As with Porth Coose the works at Periglis will impact the 1996 sea wall which is recorded on the HER as a non-designated asset (MCO64519), although this has negligible heritage significance and therefore the significance of effect will be neutral **(Not Significant)**. There will be no direct physical impacts on any other recorded non-designated assets.

The works at Periglis lie in the setting of the Scheduled Monument two post-medieval quays (1016512) and the. The Scheduled post-medieval quays were not visible at the time of the site visit, and appear to survive predominantly below the MHMW, meaning it is not visible for long periods of time, reducing the significance of its setting. During construction impacts arising from plant activity on the setting of this Scheduled Monument will be negligible and temporary, restricted to the construction phase. This will result in a neutral significance of effect **(Not Significant)**.

The proposed works also sit within the setting of the St Agnes Church (1141238), which has views across the beach at Periglis. During construction there will be **slight adverse** impacts on the setting of the Church arising from plant activity. The setting of the church contributes towards its aesthetic value, reducing the significance of this asset. These impacts will be temporary and cease once the construction phase is complete.

During operation the proposed works will not alter the character of the area, which will maintain a very similar appearance to present, though somewhat improved through the removal of currently exposed geobags and geomatting, which detract from the aesthetic value of the area. Overall the works are considered to be a minor positive impact on the setting of designated assets, resulting in a **slight beneficial** significance of effect.

Storage Areas, Compounds and Access Routes

Materials will either be delivered directly to the site where they will be used, where feasible, or to the Island via Porthconger quay located on the east side of the island. There will be no impacts on any designated or non-designated assets as a result of the use of this quay. An alternative landing location is located to the south of the quay, with materials being brought up from the beach via the slipway close to the Turks Head Public House. This slipway is a non-designated asset (MCO31736) of post-medieval date related to the historic coastguard station (MCO31734). Vehicle movement across this slipway has the potential to damage this asset, with impacts ranging from major to minor. This would result in a **slight to moderate adverse** significance of effect.

Access routes from the quay to Porth Killier lie within the Scheduled Monument prehistoric settlement and field system at Porth Killier (1014998). The access route through the monument follows a pre-existing gravel track that is currently utilised by vehicles, as such there will be no impacts on the Scheduled Monument as a result of vehicle movement across this access route. Access routes from the Quay to Porth Killier and the forward working area also lie within the setting of this Scheduled Monument. During construction there will be **slight adverse** impacts on the setting of this Scheduled Monument as a result of vehicle movement and plant activity along the access routes and within the forward working area. These setting impacts will be temporary and cease on completion of the construction phase of the works.

The forward working area has been subject to an archaeological investigation consisting of a strip and map in 2007 (Johns and Sawyer 2008, 16-17). As a result there is no potential to impact on archaeological remains in this area.

The proposed sand storage area is located on an area of undeveloped land within an enclosed field system. Plant activity and vehicle movement in this area may impact on previously unknown buried archaeological remains. Although there are no monument records in this area, work undertaken by Oxford Archaeology in 2014 indicated the presence of Bronze Age settlement features (ECO5155). There is evidence of recent vehicle movement through the area, which will likely have disturbed features. If archaeological remains are encountered, then the impact from storage activities would depend on the level of survival and the importance of those discovered remains. The use of this area as a storage or working area could have up to a moderate impact on archaeological remains in the area, resulting in a **slight adverse** significance of effect.

Access to Porth Coose and Periglis during construction will be via a pre-existing informal track to the rear of Porth Coose and the beach crest. The track is already in use by vehicles and as such the movement of vehicles along this access route during construction is considered to have no impact on any buried archaeological remains that may survive, as they will have already been disturbed. The proposed works require no groundbreaking, and considering the area has already been disturbed by the construction of the 1996 sea wall, there will be no impact on any unknown buried archaeological remains.

An alternative access route is proposed leading from the quay overland through Middle Town and down past the Grade II Listed Church of St Agnes (1141238) towards the Periglis site. There would be temporary impacts on the setting of the Church of St Agnes and Listed Buildings within Middle Town, which would cease at the end of the construction phase of the scheme. The magnitude of impact is considered to minor, result in a **slight adverse** significance of effect.

7.5.3 St Martin's

Assessment of Significance – Designated Assets

Scheduled Monuments within the study area relate to primarily to prehistoric funerary monuments, specifically cairns (1016178, 1016179, 1018109, 1018111). These monuments contain evidence of past funerary practices and rituals and can illustrate how past communities viewed and interpreted the landscape. The scheduled area of monument 1016179 also contains later features comprising: post-medieval settlements & field systems, an early Christian focus (cemetery and chapel), post-medieval kelp pits and a post-medieval quay. These features along with the post-medieval kelp pit on the western coast of Tinkler's Hill (1013810) provide evidence of early-medieval and post-medieval agricultural and industrial activity on St Martin's, giving the monuments evidential value. The Scheduled Monuments have a high importance.

Those monuments with visible surviving above ground features will have a setting that contributes towards the significance of Scheduled Monuments within the Study Area. The setting of Scheduled Monuments on St Agnes is formed of the coastal and rural character of the Island. Long reaching coastal views and the lack of modern development contribute to the importance of the setting of these assets.

The Grade II listed Ashvale Farmhouse (1141203) is an example of a mid-19th century farmhouse incorporating earlier features that may provide evidence of past construction techniques and architectural styles, giving it evidential value. The farmhouse is also the only Listed Building within Lower Town on St Martin's, increasing its significance within the town and its contribution to the historic character of the area. The Listed Building has medium importance.

On St Martin's the Conservation Area exhibits evidential value within Scheduled Monuments and non-designated assets which contain evidence from all periods, but particularly of prehistoric and post-medieval activity on the island. Historic buildings and small enclosed bulb-planting fields have evidential value within their form and layout which may yield evidence about post-medieval settlement and industry on St Martin's. Buildings and enclosed fields also contribute to the aesthetic value and character of the Conservation Area. Overall, the Conservation Area is considered to be of medium importance.

Assessment of Significance – Non-designated Assets and Archaeological Potential

A watching brief was undertaken on trenching operations by BT Telecom (ECO1855). This trench extended into the current site and therefore the site has already been disturbed and subject to archaeological investigation. The watching brief did not discover any archaeological remains within the site. There is negligible potential for archaeological remains of any period to exist within the site.

Access to the Island will be via a pre-existing concrete quay, which leads onto a hardstanding track. Access to the beach from the tracks will be via a modern slipway, the construction of which will have likely destroyed any earlier remains, as such there is a negligible potential for archaeological remains to survive in this area.

An alternative access point onto the island is proposed from the Lower Town Beach. A ruined post-medieval quay is recorded at this location (MCO31598) although during the site visit no remains were identified. The remains were last identified in 1990 following a storm event. If they survive the remains may have evidential value relating to their form and techniques used in their construction, although the fragmentary nature of the remains diminishes their significance. The remains would be considered to be of low importance.

A rock recovery area is located in Lower Town close to the Seven Stones Inn. Personal communications with the client indicate this area has been used as a storage area for block material for some time, and there is negligible potential for archaeological remains to survive in this area.

Impact Assessment

There will be no direct physical impacts on any known designated assets as a result of the proposed works on St Martin's.

The remains of a post-medieval quay (MCO31598) may survive below ground in the location of the proposed alternate access point onto the island. If these remains survive, they may be impacted by construction activities including vehicle movements and unloading of materials. The magnitude of impact could range from negligible to minor adverse. This would result in a **slight adverse** significance of effect.

The works lie within the setting of the Scheduled Monument "Prehistoric cairns, prehistoric to post-medieval settlements & field systems, an early Christian focus, post-medieval kelp pits & quay on Tean" (1016179), as there are clear views across the straight to St Martins. Considering the minor nature of the works at St Martin's, there will be no appreciable change to the view from the monument and therefore the way in which it is experienced. This will result in no impact on the setting of this asset during construction or operation and a neutral significance of effect **(Not Significant)**.

The site has already been subject to trenching as part of works to lay a BT line, which will have disturbed or removed any archaeological remains. The construction of the fence in front of the dunes will have minimal below ground impacts, and as such there is not considered to be any impact on unknown buried archaeological remains. Similarly, the works to the slipway will take place on ground that will have been disturbed by the construction of the original slipway, and there will be no impact on any unknown buried archaeological remains.

Materials will be brought to the island via the quay at Lower Town, and access to the site will be via existing tracks that are currently utilised by vehicles. The access route to the rock recovery area passes the Grade II listed Ashvale Farmhouse (1141203). During the construction phase of the works there will be a minor temporary impact on the setting of this Listed Building. This would result in a **slight adverse** significance of effect.

During operation there will be no impacts on the setting of this Listed Building.

There will be no impacts on buried archaeological remains due to recovery of rock or movement of vehicles along the access routes, as access uses existing tracks.

7.5.4 Impacts on Isles of Scilly Conservation Area

The entirety of the Isles of Scilly is designated as a Conservation Area, and therefore every site is contained within its boundaries. As such the impacts of the works on Bryher, St Agnes and St Martin's have been considered separately here. During the construction phase of the proposed works impacts may arise on the setting and

character of the Isles of Scilly Conservation Area as a result of plant activity, movement of vehicles and storage of materials. These impacts are temporary and will cease at the end of the construction phase of the proposed works. Compared to the overall extent of the Conservation Area the scale of construction activities are not considered large enough to result in an impact on the heritage significance of this asset. This would result in a neutral significance of effect **(Not Significant)**.

During operation at sites which already feature man-made sea defences, the proposed works will not result in a change to the character of the area. At sites which do not currently feature man-made coastal defences the proposed works would result in the addition of man-made structures onto coastal locations, which has the potential to change the character of the area. The impact on the Conservation Area is reduced through sympathetic design choices, such as the use of Scillonian or Cornish granite for rock armour; and the use of soft engineering in other locations. Compared to the overall extent of the Conservation Area, the scale of the works will result in a negligible impact on this asset. This would result in a neutral significance of effect **(Not Significant)**.

7.6 Mitigation Measures

Bryher

Kitchen Porth

The impact assessment has identified there will be no direct physical impacts on any known designated or recorded non-designated heritage assets and there is a low potential for archaeological remains to survive within the site. The works will not impact on the setting of designated assets during construction or operation of the scheme.

There are no impacts that require mitigation at Kitchen Porth.

Green Bay

The works at the Green Bay site will not impact on any known designated or non-designated assets. The assessment of archaeological potential identified a low/negligible potential for remains to survive within the site, and any remains have likely been disturbed by more recent activity. Considering the limited scale and nature of works, the impact assessment identified that the works would cause a negligible impact on unknown buried archaeological remains. There will be no impact on the setting of designated assets as a result of the works.

There are no impacts that require mitigation at Green Bay.

Great Porth (Great Par)

The proposed works at Great Par take place within the scheduled area of the post-medieval boathouse (1016173), and will impact on surviving remains. Any works that take place within the scheduled area of the boathouse will require Scheduled Monument Consent from Historic England. It is recommended that consultation is undertaken with Historic England in advance of the Scheduled Monument Consent application to identify potential mitigation measures. The boathouse currently survives in a poor condition quite different to how it is described in the list entry, and is recorded on the Historic England Heritage at Risk Register. Potential mitigation measures could include recording and evaluation or restoration and conservation of any remains that will survive. The details of any proposed mitigation measures should be agreed after consultation with Historic England.

Stinking Porth

The impact assessment has identified there will be no direct physical impacts on any known designated or recorded non-designated heritage assets, and that there is a low potential for archaeological remains to survive within the site. The impacts on the setting of designated assets will also be negligible.

There are no impacts that require mitigation at Stinking Porth.

Great Popplestone

The impact assessment has identified there will be no direct physical impacts on any known designated or non-designated heritage assets and that there is a low potential for archaeological remains to survive within the site. That impacts on the setting of designated assets will be negligible.

There are no impacts that require mitigation at Great Popplestone.

Access Routes

The access route between Church Quay and Green Bay crosses the scheduled area of the prehistoric field system and Romano-British monument (1014989). Any works that impact on the Scheduled Monument may require Scheduled Monument Consent. Potential mitigation may take the form of an alternate route or reinforcement of the access route via matting or similar method. Impacts could be avoided by delivering materials directly to site by barge rather than tracking across the beach.

St Agnes

Porth Killier

The proposed works at Porth Killier currently lie within the boundary of the Scheduled Monument prehistoric settlement and field system at Porth Killier (1014998). Construction activities that take place within the scheduled area will require Scheduled Monument Consent. Works forward of the modern sea wall will have a negligible potential to encounter previously unknown archaeological remains. The east section of the works at the 'fan-shaped' section of rock armour have the potential to encounter previously unknown archaeological remains likely associated with the Scheduled Monument. It is recommended that archaeological monitoring in the form of a watching brief and programme of excavation and recording if archaeological remains are identified takes place during groundbreaking in this location, in line with an approved WSI. Mitigation measures should be agreed with Historic England during consultation in advance of the Scheduled Monument Consent Application.

The impacts on the setting of the scheduled monument will be negligible during construction and operation, and no mitigation is required against this.

Porth Coose

The impact assessment has identified there will be no direct physical impacts on any known designated assets. The works will directly impact on the 1996 sea wall (MCO64519), but this asset is of negligible importance and mitigation measures are not considered necessary. There will be no direct physical impacts on any other recorded non-designated assets. There is a negligible potential for archaeological remains to survive within the site.

The impacts on the setting of designated assets during construction and operation will be negligible.

There are no impacts that require mitigation at Porth Coose.

Periglis

The impact assessment has identified there will be no direct physical impacts on any known designated. The works will directly impact on the 1996 sea wall (MCO64519), but this asset is of negligible importance and mitigation measures are not considered necessary. There will be no direct physical impacts on any other recorded non-designated assets. There is a negligible potential for archaeological remains to survive within the site.

Impacts on the setting of designated assets will be negligible.

There are no impacts that require mitigation at Periglis.

Storage Areas, Compounds and Access Routes

All access routes follow pre-established tracks currently in use by vehicles and it is assumed no alterations or improvements to these tracks to facilitate construction are

proposed; therefore no mitigation is proposed along these routes. However, the presence and boundaries of the Scheduled Monument should be brought to the attention of staff during construction to avoid inadvertent or accidental damage to the monument. This could be achieved through fencing of the monument along the access route and the location of the SM be identified in the CEMP.

The proposed forward working area has already been stripped for use as a compound and has been subject to archaeological investigation and no further investigation is proposed.

The proposed sand storage area is an area of undeveloped land located within an enclosed field system, and previous archaeological investigation has shown evidence of Bronze Age settlement features. It is recommended that the preparation of this area for storage, including any groundworks be subject to archaeological monitoring such as a watching brief.

The impact assessment has identified there will be no direct physical impacts on any known designated heritage assets.

Potential impacts of on the non-designated slipway at the Quay adjacent to Turk's Head could be avoided through use of Porthconger quay or the landing sites at each location for the delivery of materials.

St Martin's

The remains of a post medieval quay are recorded within the boundary of the proposed alternative landing area but no remains were identified above ground during the site visit. There is considered to be a low potential for any surviving remains to be impacted by works in this area but it is recommended that the area be subject to either an investigation to confirm presence or absence of the remains or that the landing area be reinforced through matting or other ground cover such that the potential archaeology is protected from construction vehicles and other activity to reduce the potential for construction vehicles to adversely impact on this asset.

There is negligible potential for previously unknown archaeological remains to survive within the of the site due to previous construction works. Due to the limited extent of groundworks proposed there are no impacts anticipated that require archaeological mitigation on St Martin's.

The impact on the setting of the Grade II Listed Ashvale Farmhouse (1141203) will be negligible during construction, and there will be no impacts during operation. There will be no impacts on the setting of any other heritage assets within the study area during operation or construction of the proposed works. As such no mitigation in relation to setting impacts have been proposed.

7.7 Residual Effects

There are no anticipated residual impacts on the setting of any heritage assets as a result of the proposed works on Bryher, St Agnes and St Martin's.

Any works that impact on Scheduled Monuments may require SMC. If site boundaries can be adjusted to avoid scheduled areas, or alternative access routes taken, this would no longer be a residual effect. Direct impacts on remains within Scheduled Monuments will result in a permanent change to those assets. These impacts can be mitigated against following consultation with Historic England as part of the Scheduled Monument Consent process, which may identify potential to preserve or record heritage assets.

Direct physical impacts on buried archaeological remains will have a permanent negative impact on those remains, if they are encountered. However, this impact can be mitigated against through archaeological monitoring and excavation and recording of any encountered remains.

8 Land Use, Tourism and Recreation

8.1 Introduction

This chapter assesses the potential for the proposed coastal defence developments to result in likely significant effects on the local tourism industry, recreation, and land use.

8.2 Assessment Methodology & Assessment Criteria

An assessment has been undertaken to assess the development proposals against the baseline presented. The assessment considers how the physical impacts of the proposed scheme may affect land use, geodiversity, tourism and recreation.

Impacts have been quantified referencing the impact assessment matrix described in Table 3-4.

The EIA Scoping Response from CIoS (received for proposed sea defence works on the islands of St Mary's) stated that potential adverse amenity impacts associated with the development could occur during the construction phase and should be addressed by the ES. For example, impacts related to the amenity afforded by the adjacent footpaths. This will be assessed in Section 8.4, with further assessment of amenity impacts included within Chapter 6: Landscape and Visual.

8.3 Baseline Conditions

8.3.1 Land Use

Where humans have influenced the land use on inhabited islands in the Isles of Scilly, it is predominantly for agricultural purposes. Across the three islands, the most populated is St Martin's where there are some small areas of urban/residential land. There are some small areas of semi-urban residential land across all three islands, the other settlements consisting of small hamlets and isolated settlements.

The Coastal Community Typology Report (2011) categorises the Isles of Scilly as a category A3 coastal community – Rural Chic. These areas are predominantly rural, with sparse populations in small settlements. Rural Chic areas are generally more prosperous, with low proportions of people receiving benefits relating to worklessness and poor health and a population with high levels of skilled workers. This offers some benchmarks against which to analyse the situation and trends relating to the Isles of Scilly, including local economic factors, issues for vulnerable groups and change factors.

Bryher

Great Popplestone

The Great Popplestone site comprises two discrete sites: Great Popplestone (South) where the proposed works include the raising of the height crest level of existing defences, and Great Popplestone (North) that is proposed to be used for the recovery of rock materials for re-use elsewhere on Bryher. Great Popplestone (South) and Great Popplestone (North) are approximately 160m apart.

Great Popplestone is surrounded by agricultural land, with Gweal Hill to the west and Shipman Head Down to the north. The water meadow is located to the east of Great Popplestone, with Great Pool located approximately 30m and 140m south of Great Popplestone (South) and Great Popplestone (North), respectively.

Stinking Porth

Approximately 60m northeast of Stinking Porth is the Great Pool. There is the Old School House and several individual dwellings to the east of the site. North of the site, there is a small area of agricultural and heathland.

Great Porth (Great Par) North of Great Carn

Immediately north of the Great Porth (Great Par) North of Great Carn site is the Old School House. There are several commercial (accommodation) properties located to the east of the site including Hell Bay Hotel and Bank Cottage self-catering accommodation. Further south along the bay, the Richard Pearce Artist Studio is located immediately east, along with a large area of agricultural land.

Green Bay

Within the immediate vicinity of Green Bay is the boat yard. To the northwest of the site are some commercial businesses offering self-catered accommodation, with Samson Hill Cottage self-catered accommodation located to the southwest. Land use to the west of the site is primarily agricultural land and to the south, the area is characterised as heathland.

Kitchen Porth

Within approximately 20m of the proposed scheme is the Harbour View and Fraggle Rock Bar and the Bryher Post Office. To the northwest of the site is a large area of healthland, and to the southwest is a campsite and agricultural land. To the south there is private accommodation and a seafood restaurant with some larger agricultural infrastructure.

St Agnes

Porth Killier

Immediately south of the Porth Killier site is a track which leads to Porthconger Quay, which is the main access point for the island of St Agnes, and a large area of agricultural land. To the southwest of the site there are some larger buildings adjacent to the agricultural land along Old Lane which are likely associated with agricultural land to the west.

Porth Coose

Porth Coose is located approximately 40m northwest of Big Pool. The areas surrounding Big Pool, behind Porth Coose, are used as a Cricket Ground with some visible access paths and an area of agricultural land towards the north-east.

Periglis

Approximately 70m east of Periglis Beach is Big Pool. To the south of the beach is a kayak and canoe rental facility, a boat ramp, and St Agnes Church. Along Old Lane, stretching to the east of the site, is a boat yard, the St Agnes community hall, electricity substation and agricultural land. The bay itself appears to be used for fishing purposes.

St Martin's

Lower Town Beach

Within the immediate vicinity of the site is an access track leading down to the beach. To the north of the site there are several commercial properties, including a restaurant and accommodation facilities, along with a quay to the northwest providing access. To the east of the site is a campsite along the coast and a stretch of agricultural land.

8.3.2 Access and Recreation

Access across the islands is varied. A network of surfaced roads, tracks and about 200km of paths provide access to most parts of the archipelago. Inter-island boats transport residents and visitors between the islands. Freight boats also operate regularly between the islands, including the Royal Mail delivery boat.

The islands of Bryher, St Agnes and St Martin's are all smaller than the island of St Mary's, where Hugh Town is the main civic hub, however the islands all offer a series of public amenities including convenience stores, cafes, and postal facilities.

To travel between the Isles of Scilly and the mainland, residents and visitors can either catch the Scillonian ferry between Hugh Town and Penzance or fly by plane into St Mary's Airport from either Land's End, Newquay or Exeter airports, or by helicopter into St Mary's or Tresco from Penzance. There are public ferry services connecting St Mary's to the off islands.

There are no rural public footpaths or bridleways on the Isles of Scilly, however, there is publicly owned land including various parks, public facilities and roads. All walking routes on the Isles of Scilly are 'permissive footpaths' – footpaths along which the Duchy of Cornwall and its tenants have permitted public use but holds the ability to withdraw that permission at any time. Nonetheless, walking is a popular pastime on the islands for both tourists and residents.

There are permissive footpaths providing access across several of the nine sites. Permissive footpaths and tracks in Bryher, illustrated on Figure 8-1, link Great Popplestone with Stinking Porth and Great Porth (Great Par) North of Great Carn. Permissive footpaths and tracks also connect to the sites on the eastern side of the island (Green Bay and Kitchen Porth).

On St Agnes, there are several permissive footpaths adjacent to Periglis beach and Porth Killier, illustrated on Figure 8-2, connecting the settlements of Lower Town, Middle Town and Higher Town.

Permissive footpaths provide access along the stretch of beach at the Lower Town Beach site at St Martin's, illustrated on Figure 8-3, connecting it to the settlement of Lower Town.

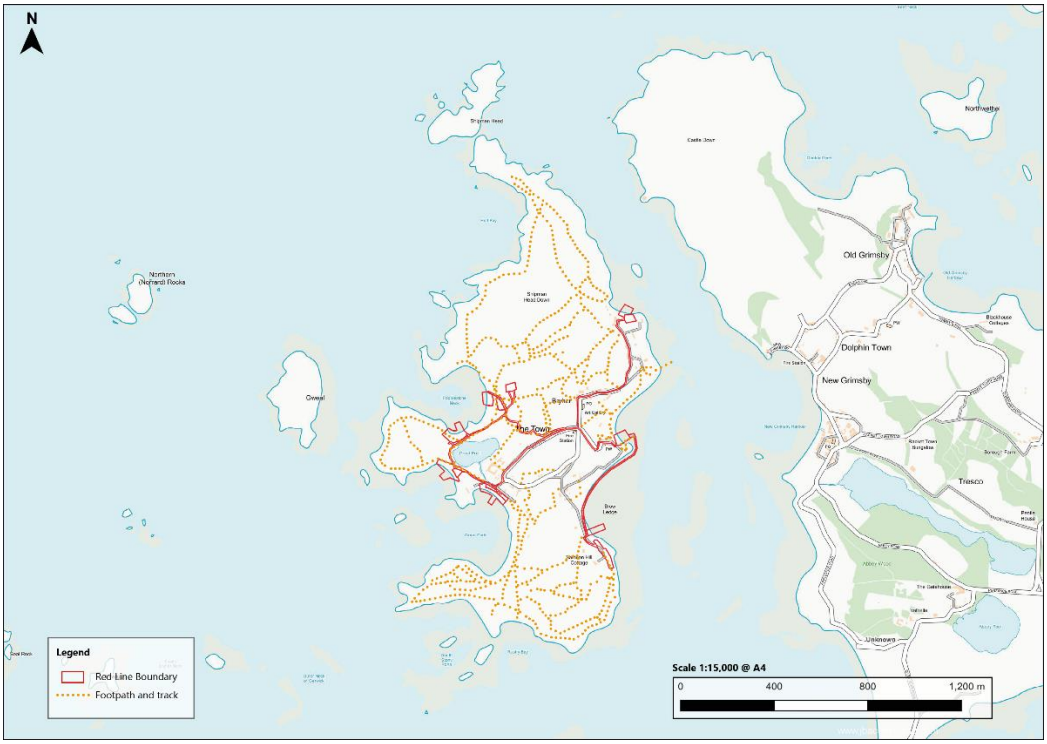

Figure 8-1: Permissive footpaths and tracks across the island of Bryher (MAGIC, 2022)

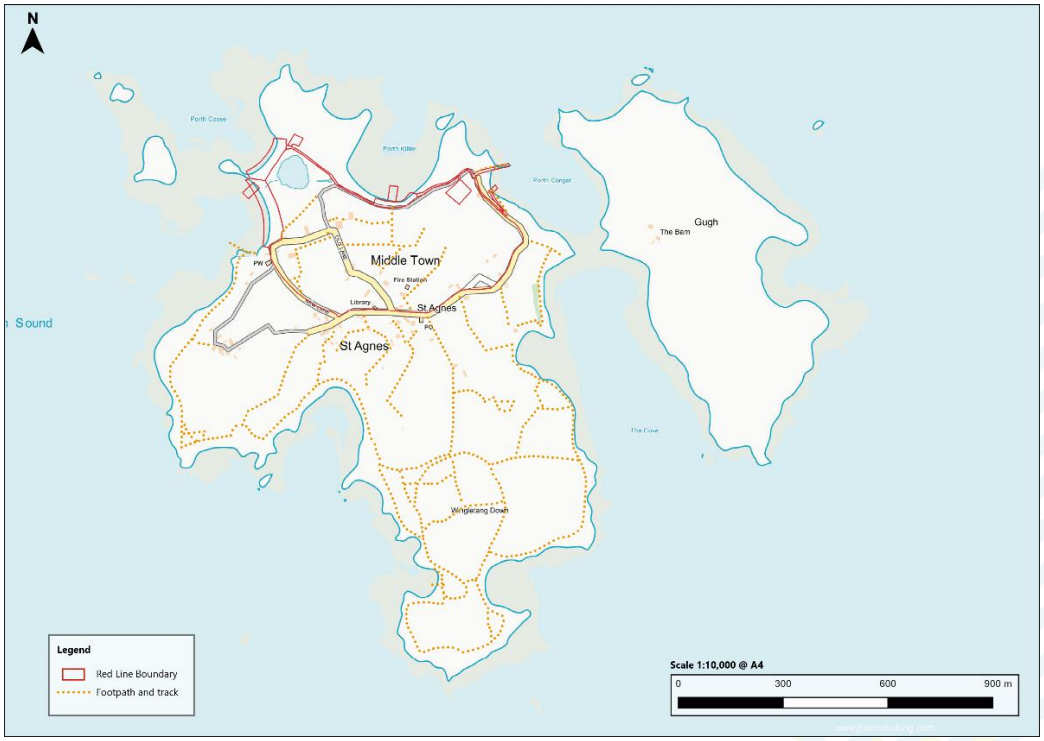

Figure 8-2: Permissive footpaths and tracks across the island of St Agnes (MAGIC, 2022)

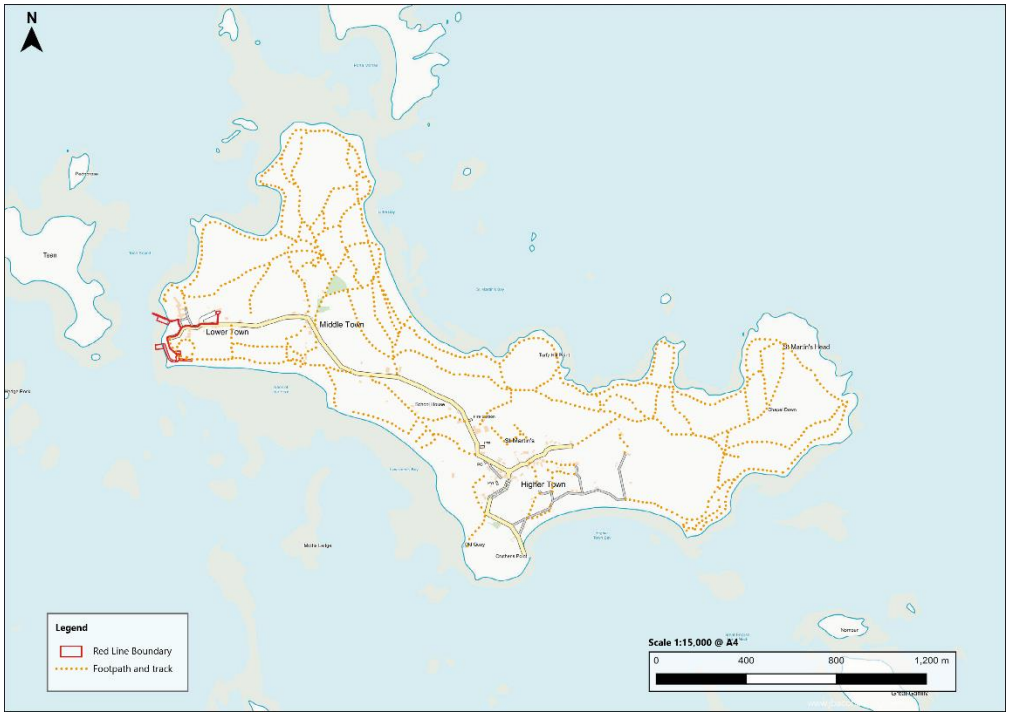

Figure 8-3: Permissive footpaths and tracks across the island of St Martin's (MAGIC, 2022)

Based on anecdotal evidence, recreational use of beaches varies across the three islands. Across the island of Bryher, Great Porth (Great Par) North of Great Carn, Green Bay and Kitchen Porth are used for recreational purposes including sitting, walking and observing. Great Popplestone and Stinking Porth are not popular beaches for recreational use due to issues associated with accessibility, including presence of rocks.

Across the island of St Agnes, Porth Killier is rocky with a steep access point and is typically not used for recreational purposes. Porth Coose is lightly used for recreational purposes, with people often preferring to use the adjacent Periglis beach, the most popular beach on the island due to its accessibility from New Lane/Old Lane and existing tracks.

Lower Town Beach on St Martin's is typically used for recreational purposes including sitting, walking, observing, and for boat access.

8.3.3 Tourism

The economy of the Isles of Scilly is relatively small, has very high levels of small businesses, and unemployment is very low (35 individuals in the Isles of Scilly claim Out-Of-Work Benefits, equating to 2.7% of the 16-64 population, compared to a UK average of 4.4%) (Nomisweb, 2022). As a result of these factors, the economy of the islands has little space to expand and is very susceptible to patterns in the UK and global economies (Council of the Isles of Scilly, 2021). It is also dominated by tourism (85% of the Islands' economy is tourism related), which as an industry, is susceptible to movements in the wider economy (Natural England, 2012; Porter et al. 2012).

Tourism on the islands has recently suffered from the Covid-19 pandemic which has severely impacted the global tourism industry. The Isles of Scilly seek to transform the tourism economy on the islands to recover from the pandemic and provide a year-round industry, rather than an industry that brings in the vast majority of its income during the summer months.

The Isles of Scilly Tourism Survey 2018 was published in April 2019 (Porter et al. 2012). It showed that 96% of visitors were UK residents (21% permanently residing

in either Devon or Cornwall). 52% of all visitors to the islands were aged 55 or over. The tourist industry on the Isles of Scilly experiences a great deal of repeat business, with 71% of respondents of the 2018 tourist survey saying they had visited before, and the average number of previous visits standing at 11. Once visitors are on the Isles of Scilly, they typically move around and visit other areas and islands. Other than the island where they had stayed, 62% of respondents had visited St Martin's, 61% St Agnes, 57% Bryher, 73% Tresco and 48% St Mary's (The Island Partnership, 2018).

When asked what inspired them to visit the islands, the most popular answers were Scenery (84%) and Peace & Quiet (76%). Beaches (64%) and Wildlife (52%) were also popular.

Tourist accommodation is available across the islands of Bryher, St Agnes and St Martin's. However in a visitor survey undertaken in 2017, 78% of respondents had stayed on the island of St Mary's, with 11% on Bryher, 9% on St Agnes and 13% on St Martin's. It is therefore considered that the majority of tourists to the off islands are there on day trips (The Island Partnership, 2018).

Of the resident workforce in the Isles of Scilly, 20% were employed in the accommodation and food services industry, closely linked to tourism. There are also relatively high proportions of people working in Public Administration and Defence (8%) and Transportation and Storage (8%) (Nomisweb, 2017).

8.3.4 Geodiversity

The Bedrock Geology of the Isles of Scilly comprises the Isles of Scilly Intrusion, a magmatic pluton forming part of the Cornubian Batholith. Formed from silica-rich magma intruded into the Earth's crust approximately 252 to 359 million years ago in the Permian and Carboniferous Periods, these rocks cooled slowly to create a coarsely crystalline biotite granite (British Geological Survey, 2021).

The exposed location of the archipelago has led to the formation of wave cut platforms around each island that relates to wave direction, refraction between the major islands and waves flowing over the island platforms themselves (JNCC, 2003). These conditions, together with the supply of sediment from the granite cliffs, provides the perfect environment for the formation of coastal tombolos between several islands.

The geodiversity of the Isles of Scilly has given rise to a landscape character comprising sandy, boulder-strewn beaches on the main islands and hundreds of smaller islands. This geodiversity has given rise to unique landscapes upon which tourism in the Isles of Scilly is dependent (Wheeler, 2005). 84% of respondents to the 2018 Isles of Scilly Tourism Survey stated that scenery was a reason for visiting the islands, which is created in part by its underlying granite geology.

There are five SSSIs on the Isles of Scilly that are designated for their geological interests (Figure 8-4). Two of these SSSIs are located on St Martin's, namely Porth Seal and White Island. Porth Seal SSSI provides deposits from the Pleistocene which are important for research on Quaternary environments. White Island is located off the coast of St Martin's and is important for its visual sequence of the periglacial and glacial deposits from the Pleistocene period (Natural England, 2012).

The Isles of Scilly Special Area of Conservation also contains some geological elements, the site contains Annex I habitats which includes sublittoral sandy sediments, reefs and rocky islets (JNCC, 2022).

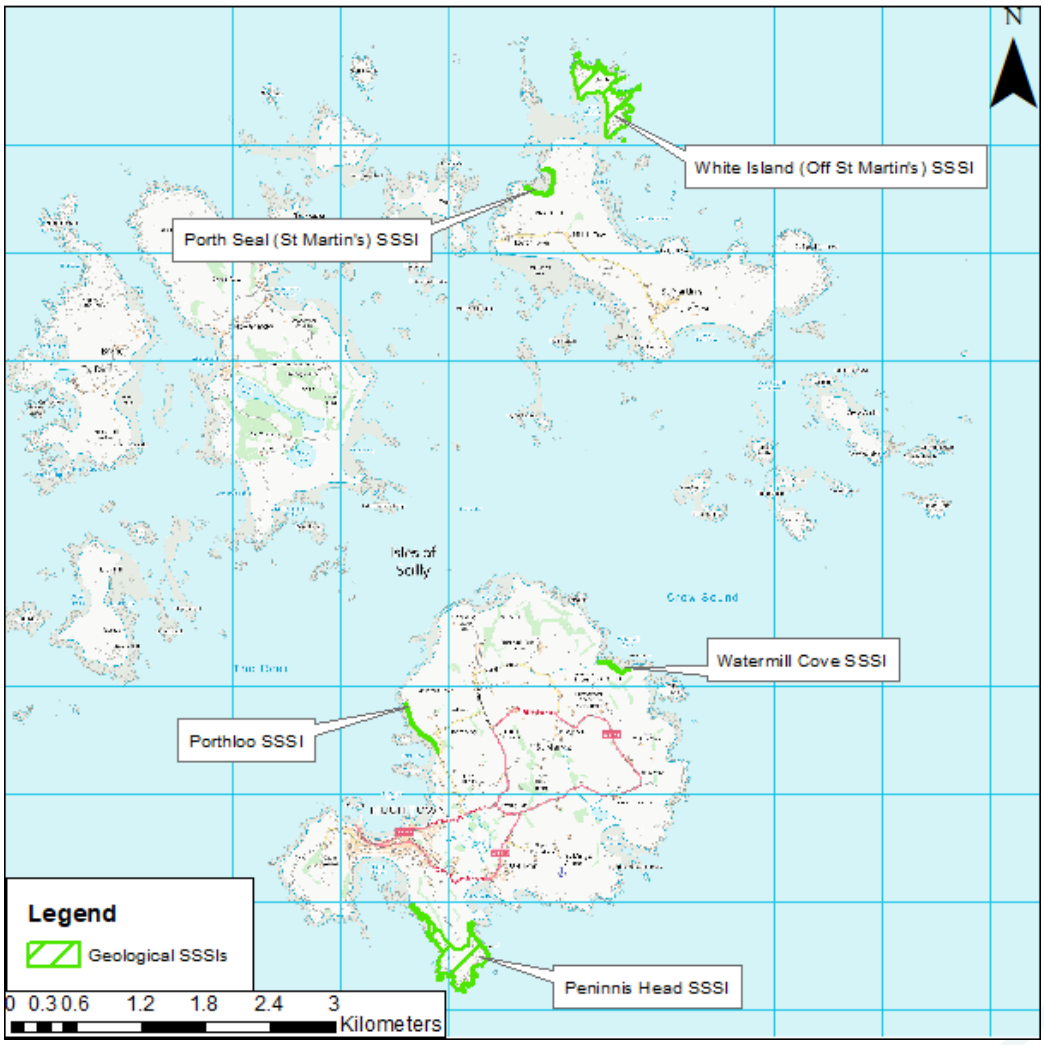

Figure 8-4: SSSIs on the Isles of Scilly designated in full, or in part, for their geological interest

8.4 Potential Impacts & Significant Effects

The construction of the proposed scheme will predominantly be in areas where there are existing coastal defences. Existing roads, permissive footpaths and tracks will be used to facilitate access during the construction phase.

Most of the works will be undertaken sequentially, with works completed at one site before moving onto the next. However, there will be some overlap between the construction works at Great Popplestone and Kitchen Porth on the island of Bryher.

It should be noted that for each island there will be disruption during the whole of the works, as the contractor moves from one site to the next. This will likely extend the disruption for some receptors, such as permissive footpaths, affected by works across several sites.

The proposed timescales for the construction works take into consideration the operational constraints noted for the nine sites including tourist use of beaches and adjacent access routes.

Following the construction phase, due to the nature of the proposed schemes, it is not anticipated that there will be any long-term significant impacts on the site or the surrounding areas as a result of their operation.

Further discussion of the potential impacts and significant effects on land use, tourism, access and recreation, and geodiversity are presented below. Impacts have been assessed using the impact assessment matrix in Table 3-4.

8.4.1 Land Use

The proposed works at most sites entail the replacement and augmentation of existing defences and therefore the construction and operation of the proposed schemes would not affect existing land uses. The potential for loss of sand habitat is assessed in further detail in Chapter 5: Biodiversity and Nature Conservation.

The impact on land use assessed to result from that the nine proposed schemes is **neutral (not significant)**.

8.4.2 Access and Recreation

Bryher

Material delivery to the island

Materials will be delivered to the island via barge. A landing site is located at each of the five sites to allow materials to be brought directly into the beaches where they will be used, where feasible. Landing craft will moor at the landing sites with materials offloaded onto the foreshore and moved to temporary storage areas. Any construction materials that cannot be landed at the site where they will be used will instead be landed at the nearest accessible site and then transported to the site via road using the designated access tracks.

Plant and machinery would travel between landing sites and each site as required, causing temporary disruption to access and recreation during construction.

As a result, a **temporary slight adverse** impact is assessed to result from the delivery of material to the island, via landing sites at the beaches, and movement of materials across the island using access tracks.

Great Popplestone

Construction

The proposed scheme at Great Popplestone is concentrated in the southern corner of the beach. There are also two small areas where rock and sand will be recovered from in the north of the beach. It is likely that during construction, anticipated to be undertaken over approximately 15 working days in May 2023, there will be temporary closure of the beach.

As a result, it is considered that the proposed construction works would have a **temporary slight adverse** impact on access and recreation.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on the Great Popplestone beach, and moved directly to the materials storage area behind the beach. This option may cause temporary disturbance to both users of the beach and a small section of the permissive footpath that runs between the beach and the laydown area due to moving vehicles and disturbance to trackways. If it is not feasible to use the landing site at Great Popplestone, the nearest accessible site will be used and the materials transported via the access route. This may lead to temporary disturbance of users of the permissive footpath due to moving vehicles and disturbance to trackways. It is also likely that the permissive footpath may suffer churn due to softness of ground conditions. As a result, the impact of either option for the delivery of materials is assessed as being **temporary slight adverse.**

Stinking Porth

Construction

The proposed scheme at Stinking Porth involves the construction of a revetment within the centre of the bay. The footprint of the intervention is quite large; therefore, the construction phase of the revetment is likely to reduce the access to 60% of the beach. It is anticipated that the construction of the proposed scheme at Stinking Porth will be undertaken over approximately 10 working days in May 2023, and closure of the beach will be required for this duration. As a result, the impact of construction of the proposed scheme on access and recreation is assessed as being **temporary slight adverse**.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on Stinking Porth beach, and moved directly to the materials storage area behind the beach. This option may cause temporary disturbance to users of the beach during the delivery but would not impact the adjacent permissive footpath. Based on anecdotal evidence, Stinking Porth is not a popular beach for recreational use, and therefore the impact of this option on access and recreation is assessed as **neutral (not significant).**

However, if it is not feasible to use the landing site at Stinking Porth, the nearest accessible site will be used and materials transported via the access route. The permissive footpath running adjacent to the Stinking Porth site will be used for the delivery of the materials to the site. There may be temporary disturbance to users of the permissive footpath caused by moving vehicles and disturbance to trackways. It is also likely that the permissive footpath may suffer churn due to softness of ground conditions. As a result, the impact on access and recreation in the surrounding area is assessed as being **temporary slight adverse** if materials cannot be delivered using the landing site on Stinking Porth beach.

Great Porth (Great Par) North of Great Carn

Construction

The proposed scheme at this site is in the more typical sand dune area of the beach. This is likely to reduce some access to approximately 20% of the beach. It is anticipated that the construction of the proposed scheme at Great Porth (Great Par) North of Great Carn will be undertaken over approximately 15 working days across April and May 2023, and the closure of a small area of the beach will be required for this duration. As a result, the impact of construction of the proposed scheme on access and recreation is assessed as being **temporary slight adverse**.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on the beach at Great Porth (Great Par) North of Great Carn, and moved directly to the materials storage area behind the beach. This option may cause temporary disturbance to users of the beach during the delivery but would not impact the adjacent permissive footpath. Based on anecdotal evidence, Great Porth (Great Par) North of Great Carn is a popular beach for recreational purposes including sitting, walking and observing. As a result, the impact on access and recreation is assessed as being **temporary slight adverse.**

However, if it is not feasible to use the landing site at Great Porth (Great Par) North of Great Carn, the nearest accessible site will be used and materials transported via the access route. New Road and the permissive footpath running adjacent to the site would be used for the delivery of materials for the scheme. There may be temporary disturbance to users of the permissive footpath caused by moving vehicles and disturbance to trackways. It is also likely that the permissive footpath may suffer

churn due to softness of ground conditions. It should be noted that, whilst works are not anticipated to be undertaken simultaneously, this access track may also be used by construction vehicles accessing the Great Popplestone site and Stinking Porth site which may extend the duration of impacts. As a result, the impact on access and recreation in the surrounding area is assessed as being **temporary slight adverse**.

Green Bay

Construction

The proposed scheme at Green Bay is located within the southern end of the bay where the beach is comprised of sand and cobbles from granite. The construction phase of the proposed works is likely to reduce access to a very small section of the beach. It is anticipated that the construction works will be undertaken over approximately 5 working days in June 2023, and a small area of beach around the proposed scheme will require closure for this duration. As a result, the impact of construction of the proposed scheme on access and recreation is assessed as being **temporary slight adverse**.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on the beach at Green Bay. This option may cause temporary disruption to recreational use of Green Bay (including for boating) since the landing site would be located adjacent to the beach access point for the boat park. As a result, the impact on access and recreation is assessed as being **temporary slight adverse.**

However, if it is not feasible to use the landing site on the beach at Green Bay, the nearest accessible site will be used and materials transported via the access route. This would involve the use of the beach as a low tide access route to the site. At low tide, vehicles would travel from Church Quay, along the beach to Green Bay, causing temporary disruption to recreational use of Green Bay. Recreational use of the bay for boating (and the boat park immediately adjacent) may also be negatively impacted by these vehicles through disruption to access. As a result, the impact on access and recreation is assessed as being **temporary slight adverse**.

Kitchen Porth

Construction

The proposed scheme at Kitchen Porth is located within the southern corner of the small beach. Therefore, this is likely to reduce access to approximately 25% of the beach. It is anticipated that the construction works will be undertaken over approximately 3 working days in May 2023, and a small area of beach around the proposed scheme will require closure for this duration. As a result, the impact of construction of the proposed scheme on access and recreation is assessed as being **temporary slight adverse**.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on the beach at Kitchen Porth. This option may cause temporary disruption to recreational use of Kitchen Porth beach since the landing site would be on the beach. Anecdotal evidence outlines that Kitchen Porth is a popular beach for recreational purposes including sitting, walking and observing. As a result, the impact on access and recreation is assessed as being **temporary slight adverse.**

However, if it is not feasible to use the landing site on the beach at Kitchen Porth, the nearest accessible site will be used and materials transported via the access route. This would involve use of the existing road and a small section of permissive footpath for the delivery of materials. There may be temporary disturbance to users of the road and permissive footpath, and restriction to access, caused by moving vehicles

and disturbance to trackways. It is also likely that the permissive footpath may suffer churn due to softness of ground conditions. As a result, the impact on access and recreation in the surrounding area is assessed as being **temporary slight adverse**.

St Agnes

Material delivery to the island

Materials will be delivered to the island via barge, either to Porthconger Quay and then transported via road, or directly to each of the sites using their respective landing sites.

Landing craft will moor at the landing sites with materials offloaded onto the foreshore and moved to temporary storage areas. Any construction materials that cannot be landed at the site where they will be used will instead be landed at the nearest accessible site and then transported to the site via road using the designated access tracks.

Plant and machinery would travel between landing sites and each site as required, causing temporary disruption to access and recreation during construction.

As a result, a **temporary slight adverse** impact is assessed to result from the delivery of material to the island, via landing sites at the beaches, and movement of materials across the island using access tracks.

Porth Killier

Construction

The proposed scheme at Porth Killer at the seawall is likely to require the closure of much of the beach during the construction period (approximately 10 working days in March 2023). In the Eastern End, the construction of a rock armour revetment is likely to result in restricted access to this area of the coastline. As a result, the impact on access and recreation in the surrounding area is assessed as being **neutral (not significant)**.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on the beach at Porth Killier, and then moved to the temporary storage area located behind the beach. This may cause temporary disruption to recreational use of Porth Killier beach since the landing site would be on the beach. However, anecdotal evidence outlines that Porth Killier is not typically used for recreational purposes due to being rocky and with a steep access point. As a result, the impact on access and recreation is assessed as being **neutral (not significant).**

However, if it is not feasible to use the landing site on the beach at Porth Killier, the nearest accessible site will be used and materials transported via the access route. This would likely involve delivery to Porthconger Quay and use of the track running adjacent to Porth Killier. This track is fairly narrow and therefore there may be a requirement to temporarily close it for the duration of the works. As a result, the impact on access and recreation in the surrounding area is assessed as being **temporary slight adverse**.

Porth Coose

Construction

The proposed scheme at Porth Coose is located along the majority of the length of the beach area, therefore the construction phase is likely to restrict access to the beach (for approximately 15 working days across February and March 2023). As a result, the impact on access and recreation in the surrounding area is assessed as

being **temporary slight adverse**. The permissive footpath along the embankment will be reinstated upon completion.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on the adjacent Periglis beach, and then moved to the temporary storage area located between Porth Coose and Periglis. This option may cause temporary disruption to Periglis beach since the landing site would be on the beach. However, it would not impact access and recreation on Porth Coose beach or the adjacent permissive footpath. As a result, the impact on access and recreation is assessed as being **neutral (not significant).**

However, if it is not feasible to use the landing site on the beach at Periglis, the nearest accessible site will be used and materials transported via the access route. This would require the use of the parallel adjacent permissive footpaths alongside the site. The permissive footpath would be used for the movement of plant and materials as required and there may be temporary disturbance to users and restriction of access due to moving vehicles. It should be noted that, whilst works are not anticipated to be undertaken simultaneously, the access track used may also be used by construction vehicles accessing the Porth Killier and Periglis sites which may extend the duration of impacts. As a result, a **temporary slight adverse** impact is assessed.

Periglis

Construction

The proposed scheme at Periglis beach is along much of the length of the beach, and therefore the construction phase is likely to restrict access the beach (for approximately 28 working days across January and February 2023). Whilst access to the beach will be restricted, it is not anticipated that the proposed works will impact access for fishing or watersports. As a result, the impact on access and recreation in the surrounding area is assessed as being **temporary slight adverse**.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on the adjacent Periglis beach, and then moved to the temporary storage area located between Porth Coose and Periglis. This option may cause temporary disruption to Periglis beach since the landing site would be on the beach. Based on anecdotal evidence, Periglis beach is the most popular beach on the island due to its accessibility from New Lane/Old Lane. Therefore, whilst the delivery of materials by barge would not impact the adjacent permissive footpath, the impact on access and recreation across the beach is assessed as being **temporary slight adverse.**

However, if it is not feasible to use the landing site on the beach at Periglis, the nearest accessible site will be used and materials transported via the access route. This would require the use of the parallel adjacent permissive footpaths alongside the site. The permissive footpath would be used for the movement of plant and materials as required and there may be temporary disturbance to users and restriction of access due to moving vehicles. It should be noted that, whilst works are not anticipated to be undertaken simultaneously, the access track used may also be used by construction vehicles accessing the Porth Killier and Porth Coose sites which may extend the duration of impacts. As a result, a **temporary slight adverse** impact is assessed.

St Martin's

Construction materials will be transported to St Martin's by an appropriate vessel which will arrive either at St Martin's quay and transported via Lower Town ramp or the landing site on Lower Town Beach approximately 120m south. Construction

materials will be offloaded and transported to the temporary storage area behind the beach.

The movement of material from either St Martin's quay or the alternative landing site would cause temporary disruption to access and recreation during construction. As a result, a **temporary slight adverse** impact is assessed to result from use of either St Martin's quay or the beach landing site.

Lower Town Beach

Construction

The proposed scheme at Lower Town Beach is along a small section of the dune where there is an existing footpath and beach access point. The area surrounding this section of dune, including the footpath, will require closure during the construction phase (approximately 4 working days in June 2023). Whilst use of the footpath and beach access point will be restricted, it is not anticipated that the proposed works will impact use of the beach. As a result, the impact on access and recreation in the surrounding area is assessed as being **temporary slight adverse**.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on Lower Town Beach, and then moved to the temporary storage area located behind the beach. This option may cause temporary disruption to Lower Town beach since the landing site would be on the beach. Therefore, whilst the delivery of materials by barge would not impact users of the adjacent track, the impact on access and recreation across the beach is assessed as being **temporary slight adverse.**

However, if it is not feasible to use the landing site on Lower Town beach, materials would b delivered to St Martin's quay and moved to the temporary storage area via road. This would require the use of a track running southwards from St Martin's quay. This track would be used for the movement of plant and materials the temporary storage area as required, and there may be temporary disturbance to users and restriction of access due to moving vehicles. As a result, a **temporary slight adverse** impact is assessed.

The proposed scheme at Lower Town Beach involves fencing off some of the most sensitive area of the dunes. This is likely to result in the long-term diversion of access paths to the beach, with general pedestrian footpath management in the long-term. There are multiple alternative footpaths available and therefore the operational phase of the development is not likely to significantly impact access or recreational use of the local area.

8.4.3 Tourism

According to the 2018 Scilly Visitors Survey, 84% of visitors to the islands cite scenery as a reason for visiting, 76% cite peace and quiet and 64% cite beaches.

There is potential for the construction of the nine proposed schemes to impact tourism through restriction of some access to beaches to facilitate the construction works, visibility of the construction works, and potential disturbance of this peace and quiet due to the movement of construction vehicles and the associated noise emissions. However, it is proposed that interpretive panels will be erected adjacent to the construction sites to outline why the work is being undertaken, which may generate interest amongst tourists.

Most of the works will be undertaken sequentially, with works completed at one site before moving onto the next. However, there will be some overlap between the construction works at Great Popplestone and Kitchen Porth on the island of Bryher. The duration of impacts at some receptors (including residential and commercial properties) may be extended if they are located adjacent to Church Quay where

materials may be delivered, or adjacent to beach landing sites or access routes to multiple sites.

Tourist accommodation is available across the islands of Bryher, St Agnes and St Martin's, however the majority of visitors stay on St Mary's and it is therefore considered that the majority of tourists to the off islands are there on day trips (The Island Partnership, 2018).

Based on anecdotal evidence, the total number of visitors on any one beach at a time is typically low on the off-islands because visitors are required to be staying on that island, or day tripping from another island. As a result, it is assumed that where access to one beach is restricted, alternative beaches with different orientations and exposure to wind are available.

Further discussion of the potential impacts of the construction works on tourism at each of the nine sites is discussed below.

Bryher

Construction materials and machinery will be delivered to the landing sites at each of the five sites where they will be used and moved to suitable laydown area near each site. Any construction materials that cannot be landed at the site where they will be used will instead be landed at the nearest accessible site and moved across the island as needed.

The delivery of machinery and materials will potentially cause disruption to the beaches where individual landing sites are proposed, however, rock and hearting material will be shipped to Bryher outside of the peak tourist season.

As a result, due to the use beaches by visitors for recreational purposes, a **temporary slight adverse** impact is assessed to result from the delivery of materials.

Great Popplestone

Construction

Access to part of the beach during construction may be restricted; as a result, the Great Popplestone area may experience a reduction of visitors during the construction period. However, it is anticipated that the construction period will be a total duration of 15 working days and given the availability of the rest of the beach and other beaches in close proximity to Great Popplestone, it is likely that tourists would visit these rather than avoid the wider area altogether. As a result, based on the duration of the proposed works and proximity of other beaches, the impact is assessed as being **neutral (not significant)**.

Material delivery

It is intended that materials will be delivered directly to Great Popplestone via barge, using the landing site on the Great Popplestone beach, and moved directly to the materials storage area behind the beach. The movement of construction machinery and materials along the beach may contribute to a reduction of visitors to Great Popplestone beach as a result of potential noise, dust and visual impacts. However, this material will be transported the minimum distance possible from a suitable beach landing to a laydown area.

If it is not feasible for materials to be delivered to Great Popplestone directly, they will instead be landed at the nearest accessible site and transported across by road. This may lead to a restriction of usage of the permissive footpath running parallel to the Great Popplestone site, particularly since vehicles will be using the footpath to track back and forth from the north of the beach to the south. The movement of construction vehicles may contribute to a reduction of visitors to that specific area due to potential noise, dust and visual impacts. As a result, the impact of delivery directly by barge, or by road, is assessed as being **neutral (not significant)**.

There are no known businesses within 100m of the proposed scheme. However, there are some private accommodation facilities within approximately 200m including the Hell Bay Hotel and Bank Cottage. It is possible that the temporary restricted access to nearby beaches and associated noise emissions and construction traffic could lead to tourist dissatisfaction. As a result, the impact is assessed as being **temporary slight adverse.**

Stinking Porth

Construction

Access to the central area of the beach during construction may be restricted; as a result, the Stinking Porth area may experience a reduction of visitors during the anticipated 10 working day construction period. However, based on anecdotal evidence, Stinking Porth is considered one of the least used beaches by tourists due to its rocky coastline and a number of sandy beaches in close proximity. As a result, based on the duration of the proposed works and proximity of other beaches, construction of the proposed scheme is unlikely to impact tourism in the area and the impact is assessed as being **neutral (not significant)**.

Material delivery

The movement of construction machinery and materials along the beach may contribute to a reduction of visitors to Stinking Porth beach as a result of potential noise, dust and visual impacts. However, this material will be transported the minimum distance possible from the beach landing to a laydown.

If it is not feasible for materials to be delivered to Stinking Porth directly, they will instead be landed at the nearest accessible site and transported across by road. This may lead to a restriction of usage of the permissive footpath running parallel to the Stinking Porth site. The movement of construction vehicles may contribute to a reduction of visitors to that specific area due to potential noise, dust and visual impacts. However, it is assumed that material deliveries will be staggered throughout the day, and appropriate signage and diversion routes will be put in place. As a result, the impact of delivery directly by barge, or by road, is assessed as being **neutral (not significant)**.

There are no known businesses within 100m of the proposed scheme. However, there are some private accommodation facilities within approximately 200m such as Hell Bay hotel and Bank Cottage. It is possible that the temporary restricted access to nearby beaches and associated noise emissions (and construction traffic if materials and machinery are delivered by road) could lead to tourist dissatisfaction. As a result, the impact is assessed as being **temporary slight adverse**.

Great Porth (Great Par) North of Great Carn

Construction

During construction, access to the beach may be restricted. Therefore, the Great Porth area may experience a reduction of visitors during the anticipated 15 working day construction period. Due to its close proximity to Great Porth (Great Par) South of Great Carn to the south and Great Popplestone to the north, it is likely that tourists would visit these areas rather than avoid the wider area altogether. As a result, based on the duration of the proposed works and proximity of other beaches, the impact is assessed as being **neutral (not significant)**.

Material delivery

It is intended that materials will be delivered directly to Great Porth (Great Par) North of Great Carn via barge, using the landing site on the beach at Great Porth (Great Par) North of Great Carn and moved directly to the materials storage area behind the beach. The movement of construction machinery and materials along the beach may

contribute to a reduction of visitors to the beach as a result of potential noise, dust and visual impacts. However, this material will be transported the minimum distance possible from the beach landing to a laydown area.

If it is not feasible for materials to be delivered to Great Porth (Great Par) North of Great Carn directly, they will instead be landed at the nearest accessible site and transported across by road, using the existing New Road and a small section of permissive footpath adjacent to the Great Porth (Great Par) North of Great Carn site. The movement of construction vehicles may contribute to a reduction of visitors to that specific area due to potential noise, dust and visual impacts. However, it is assumed that material deliveries will be staggered throughout the day, and appropriate signage and diversion routes will be put in place. As a result, the impact of delivery directly by barge, or by road, is assessed as being **neutral (not significant)**.

There are some businesses local to the proposed scheme which could see a reduction in footfall and/or interest because of the scheme. For example, the Richard Pearce Artist Studio is within 100m of the proposed scheme. However, given the scale and duration of the proposed works, it is not anticipated the construction would lead to significant impacts on these businesses. Therefore, the impact is assessed as being **neutral (not significant)**.

Green Bay

Construction

During construction, access to a very small part of the southern end of Green Bay around the cobble embankment will be restricted. Based on anecdotal evidence, it is one of the least used beaches by tourists. However, tourists walk around Samson Hill at the southern end of Bryher.

It is likely that tourists would visit alternative areas, including the northern end of Green Bay rather than avoid the wider area altogether. However, there may be slight adverse impacts on tourists walking around Samson Hill adjacent to Green Bay. As a result, based on the limited usage of the southern end of Green Bay and the nature of the proposed works, the impact is assessed as **temporary slight adverse**.

Material delivery

It is intended that materials will be delivered directly to Green Bay via barge, using the landing site on the beach at moved directly to the nearest temporary storage area. The movement of construction machinery and materials from a barge and along the beach may negatively impact tourists to Green Bay, along with those undertaking activities including sailing and kayaking. Access from the boat yard to the shore may require temporary diversion.

If it is not feasible for materials to be delivered directly to Green Bay, they will instead be landed at the nearest accessible site and transported across by road. This will be via the beach; vehicles will traverse the sand to reach the working site. The access route to the site intersects with access point from the adjacent boat yard. As a result, delivery of materials may negatively impact tourists to Green Bay, along with those undertaking activities including sailing and kayaking. As a result, the impact of delivery directly by barge, or by road, is assessed as being **temporary slight adverse.**

Overall, the construction phase of the proposed development at Green Bay could negatively impact footfall for the boat yard rental site and individuals utilising the bay for sailing activities. Therefore, the impact is assessed as being **temporary slight adverse**.

Kitchen Porth

Construction

Access to the eastern area of the beach during construction (anticipated to be approximately 3 days) may be restricted. As a result, Kitchen Porth area may experience a reduction of visitors during the construction period. As this bay area is located within proximity to larger beaches, it is unlikely to significantly impact tourism. As a result, based on the duration of the proposed works and the proximity to other beaches, the impact is assessed as being **neutral (not significant)**.

Material delivery

It is intended that materials will be delivered directly to Kitchen Porth via barge, using the landing site on the beach at moved directly to the nearest temporary storage area. The movement of construction machinery and materials along the beach may contribute to a reduction of visitors to the beach as a result of potential noise, dust and visual impacts, however, this is not considered to be significant.

If it is not feasible for materials to be delivered directly to Kitchen Porth, they will instead be landed at the nearest accessible site and transported across by road. This will be via existing roads, with a small section of permissive footpath. The movement of construction vehicles may contribute to a reduction of visitors to that specific area due to potential noise, dust and visual impacts. However, it is assumed that material deliveries will be staggered throughout the day, and appropriate signage and diversion routes will be put in place. There are not any other works proposed in the northeastern side of the island and therefore impacts are likely to only last for a short duration. Overall, the impact of either delivery option on tourism is assessed as being **neutral (not significant).**

There are several businesses local to the proposed scheme including accommodation and hospitality businesses, such as the Harbour View and Fraggle Rock Bar, which may see a reduction of interest because of the proposed works. However, given the nature and duration of the proposed works, it is not considered likely that construction would deter visitors. As a result, the impact is assessed as being **temporary slight adverse**.

St Agnes

Materials will be delivered to the island via barge, either to Porthconger Quay and then transported via road, or directly to each of the sites using their respective landing sites. Access to Porthconger Quay, the adjoining access route, and the landing sites at each location may be restricted during the delivery of machinery and materials. This will potentially cause disruption to the use of Porthconger Quay and the beaches, particularly if works take place during the tourist season. Since Porthconger Quay is used as a landing site for visitors to the island a **temporary slight adverse** impact is assessed to result.

Porth Killier

Construction

Due to the nature of the proposed works, access to Porth Killier is likely to be restricted during the construction period (anticipated to be 10 days). Given its rocky nature and proximity to large, sandy beaches, it is unlikely that restricted access would significantly impact tourists who are seeking sandy beaches to use. As a result, the impact is assessed as being **neutral (not significant)**.

Material delivery

It is intended that materials will be delivered directly to Porth Killier via barge, using the landing site on the beach at moved directly to the adjacent temporary storage area. The movement of construction machinery and materials along the beach may

contribute to a reduction of visitors, however Porth Killier is rocky and inaccessible and not typically used.

If it is not feasible for materials to be delivered directly to Porth Killier, they will instead be landed at the nearest accessible site and transported by road using the track that runs adjacent to Porth Killer, which is a main access route to the island, however, alternative access routes across the island are available. Overall, the impact of either delivery option on tourism is assessed as being **neutral (not significant).**

There are no businesses located within 100m of the proposed scheme. It is unlikely that the construction of the proposed scheme at Porth Killier would have an impact on tourism across the island. As a result, the impact is assessed as being **neutral (not significant)**.

Porth Coose

Construction

Access to most of the beach during the anticipated 15 day construction period may be restricted; as a result, the area surrounding Porth Coose may experience a reduction of visitors during the construction period. However, the adjacent Periglis beach provides an alternative sandy beach for visitors. As a result, based on the duration of the works and the proximity of other beaches, the impact is assessed as being **neutral (not significant)**.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using the landing site on the beach at Periglis and moved directly to the adjacent materials storage area located between Periglis and Porth Coose. This would not lead to any significant impacts on tourism at Porth Coose.

If it is not feasible for materials to be delivered directly to Porth Coose, they will instead be landed at the nearest accessible site and transported by road, via a track or road running west of Porthconger Quay, connecting to a permissive footpath running around the outside of Great Pool. Other access routes are available and it is not considered likely that the proposed construction works would deter tourists from visiting this area of the island. Overall, the impact of either delivery option on tourism is assessed as being **neutral (not significant).**

There are no businesses located within 100m of the proposed scheme. It is unlikely that the construction of the proposed scheme at Porth Coose would have an impact on tourism across the island. As a result, the impact is assessed as being **neutral (not significant)**.

Periglis

Construction

Based on anecdotal evidence, the southern end of Periglis beach experiences greater tourist interest than other areas in the vicinity. Access to the majority of the beach during the anticipated 28 day construction period may be restricted and there may be potential for audible noise emissions associated with the use of machinery. As a result, the area surrounding Periglis beach may experience a reduction of visitors during the construction period. Based on the duration of the proposed works and the usual tourist interest at Periglis, the impact is assessed as being **temporary slight adverse**.

Material delivery

It is intended that materials will be delivered directly to the site via barge using a landing site on Periglis beach and moved directly to the adjacent materials storage area located between Periglis and Porth Coose. The movement of construction

machinery and materials from Periglis to the storage area may lead to adverse visual impacts, however, it is not considered likely that this would deter tourists from visiting the area. It would also reduce construction traffic in the vicinity of the popular southern end of the beach.

If it is not feasible for material delivery to use the landing site on Periglis, materials will instead be landed at the nearest accessible site and transported by road, via a track or road running west of Porthconger Quay, connecting to a permissive footpath running around the outside of Great Pool and south towards Periglis, or via an existing concrete road across the island ridge. Periglis beach will still be able to be accessed via Old Lane and New Lane to the south. It is not considered likely that the construction works would deter tourists from visiting this area of the island. As a result, the impact of either delivery option on tourism is assessed as being **neutral (not significant)**.

Within 100m of the proposed scheme at Periglis is St Agnes Watersports in the Isles of Scilly, a water sports facility on a separate beach to the south. The bay area is also used for sailing and swimming. It is possible that the temporary restricted access to Periglis beach and associated noise emissions may deter visitors to the area which would impact footfall and negatively affect user experience of the services the beach offers. As a result, the impact is assessed as being **temporary slight adverse.**

St Martin's

Lower Town Beach

Construction

Access to a small area of the beach during construction may be restricted; as a result, the Lower Town Beach area may experience a reduction of visitors during the construction period. Due to the small scale of the proposed works, it is unlikely to significantly impact tourism to the beach as a whole.

However, it is acknowledged that the access ramp at Lower Town Beach is used twice a year to lift boats from the water and return them. This time varies each year but is typically around Easter and October for a period of approximately 2 weeks each time. The ramp is also one of the main access points to Lower Town Beach for tourists on foot. Alternative access is available 150m north and 60m west. These alternative access points will be mapped and signposted for visitors using temporary signs. As a result, the potential impact is assessed as being **temporary slight adverse**, however this could be avoided if the construction period did not coincide with use of the ramp. It should be noted that the construction works will entail the construction of a temporary ramp.

Material delivery

It is intended that materials will be delivered directly to the site via barge, using a landing site on Lower Town Beach, and moved directly to a temporary storage area located behind the beach. This option may cause temporary impacts on tourism due to materials being moved across the beach, however, the impact isn't considered to be significant.

If it is not feasible for the material delivery to use the landing site on Lower Town Beach, materials will be delivered to the site using St Martin's quay and the existing track running from the quay to the Lower Town Beach site. Alternative access routes are available between St Martin's Quay, and it is not considered likely that the delivery of materials would have an impact on tourism. As a result, the impact of either delivery option is assessed as being **neutral (not significant)**.

There is a shepherd's hut accommodation site under construction approximately 80m northeast of the proposed scheme and several other accommodation businesses approximately 150m away. However, due to the nature of the proposed works at Lower Town Beach, it is not considered likely that these businesses would be impacted

by the proposed works. As a result, the impact is assessed as being **neutral (not significant)**.

8.4.4 Geodiversity

The proposed works at the majority of sites involve utilising existing rock and on-site material which is therefore in keeping with the local geology from a landscape perspective. In some instances, imported rock will be required which will be Cornish granite, which weathers to a similar appearance to Scillonian granite. Further assessment of potential landscape impacts is presented within Chapter 6: Landscape. None of the nine sites across the islands of Bryher, St Agnes and St Martin's are within the vicinity of any SSSIs designated for geological interest.

The impact of the proposed works on geodiversity is therefore assessed as **neutral (not significant)**.

8.4.5 Cumulative effects

Regarding land use, access and recreation, tourism and geodiversity, no adverse impacts are envisaged from any of the ten schemes in isolation. As indicated by the outline construction programmes for each of the proposed schemes, the proposed schemes will not be constructed simultaneously, rather, each will be constructed in turn.

An exception to this is the construction works at Great Popplestone and Kitchen Porth. Whilst works are ongoing at Great Popplestone to raise the existing sea wall, the rock revetment at Kitchen Porth will be built. Following this, the contractor will drop back to complete the rock revetment construction at Great Popplestone. Therefore, there is the potential for residents and visitors to the island to experience minor adverse impacts on access and recreation as a result of the simultaneous closure of two beaches. However, the Great Popplestone and Kitchen Porth sites are over 750m apart, and therefore potential cumulative impacts are not considered to be significant.

8.5 Mitigation Measures

As there are no formally designated rural public footpaths or bridleways on the Isles of Scilly, only permissive footpaths, there is therefore no statutory requirement to divert footpaths during construction. However, in order to maintain the safety of the public, temporary fences will be placed across impacted tracks and areas of publicly-used features likely to be affected by the works with notices directing walkers/ other recreational users to alternative routes.

At almost all of the sites, there are alternative paths that can be used to avoid the works. An exception to this is Porth Killier, however, this is rarely used for recreational purposes due to its rocky nature.

A public safety plan will be created for each site to identify the measures required to minimise impacts on public use of the area. This may require staff to be present at some sites where work interactions with the public are potentially higher risk. This member of staff would advise members of the public when it is safe to pass, or temporarily halting construction.

The appointed contractor will set out a stakeholder management plan outlining what communications are needed and when. For local residents, this will include a letter drop to advise of the up-coming works and ahead of any work which may be considered disruptive to them. Newsletters may also be used which would be beneficial to tourists particularly, being put up in local accommodation and shops as well as on noticeboards at the site.

Community consultation is ongoing and will continue to be undertaken with local businesses, particularly around Green Bay, Kitchen Porth and Periglis, to discuss the proposed works and identify any further mitigation measures necessary to mitigate any adverse impacts on tourism to in that area.

It is intended that materials and machinery will be delivered directly to the site at which they will be used, rather than using the main arrival points to the islands, and therefore it is not anticipated that material and machinery delivery will impact on tourism.

Community consultation has been undertaken with users of the ramp at Lower Town Beach to ensure that works are scheduled to avoid the time with the ramp will be used to lift boats from/ return boats to the water.

8.6 Residual Effects

No significant impacts on land use are assessed from any of the nine schemes, or cumulatively.

There are no plans to permanently divert permissive footpaths, as the scale and duration of the proposed works are relatively short. Notices of diversions will be displayed and/or a member of staff is present on all nine sites during construction, to either advise members of the public when it is safe to cross, or temporarily halt construction so the permissive paths can be used, **no significant impacts** are assessed on the permissive footpaths close to or within the proposed construction sites.

There is the potential for **temporary slight adverse** impacts on local businesses around Great Popplestone, Stinking Porth, Green Bay, Kitchen Porth and Periglis as adjacent construction works and passing construction vehicles may deter visitors.

It is intended that materials and machinery will be delivered directly to the site at which they will be used, rather than to the main arrival points on the islands. Therefore **no significant impacts** are assessed on tourism.

The proposed construction works will not be undertaken at times when the ramp at Lower Town Beach is used and as a result, there will be **no significant impacts.**

No significant impacts upon geodiversity are assessed, either as a result of any of the nine schemes individually, or cumulatively.

9 Climate Change

9.1 Introduction

This chapter covers the impacts of the proposed development relating to climate change. The chapter is split into two main parts, considering the impact climate change is likely to have on the scheme ('Vulnerability to Climate Change Assessment' and the Greenhouse Gas (GHG) emissions resulting from the scheme, which may contribute to climate change ('Greenhouse Gas Emissions Assessment').

The vulnerability to climate change sections identify the potential climate risks during both construction and operation (including maintenance) and consider how the scheme will impact the resilience of local receptors to climate change. The GHG sections consider emissions over the construction phase of the scheme and opportunities to reduce these emissions.

The proposed schemes have been designed to protect against a 1 in 200-year event. This reflects the 25-year anticipated design life of the schemes. The construction of the proposed schemes across the islands of Bryher, St Agnes and St Martin's is anticipated to commence in the winter of 2022/23 and will be completed by March 2024. It is anticipated that maintenance of the sea defences will be minimal throughout their design life. This will be limited to periodic visual inspection of the defences to identify any defects and/or damage caused by tidal or storm conditions.

9.2 Legislative and Planning Policy Context

Table 9-1 below sets out the relevant legislative and policy context for this EIA.

Table 9-1. Relevant legislation and policies

Legislation	Summary of Requirements
The EIA Directive 2014/52/EU	Article 3 of the 2014 amendments states: *"The environmental impact assessment shall identify, describe and assess in an appropriate manner, in light of each individual case, the direct and indirect significant effects of a project on the following factors:* • *Population and human health* • *Biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC* • *Land, soil, air, water and climate* • *Material assets, cultural heritage and the landscape* • *The interaction between factors referred to in points (a) to (d).* Annex III states where selection criteria to determine whether the project listed in Annex II should be subject to an EIA are to include "*1(f) the risk of major accidents and/or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge*". Annex IV states information to be included within the EIA: *"(4) A description of the factors specified in Article 3(1) likely to be significantly affected by the project, including climate (for example, greenhouse gas emissions, impacts relevant to adaptation).* *(5) A description of the likely significant effects from the project resulting from, inter alia (f) the impact of the project on climate (for example, the nature and magnitude of greenhouse gas emissions) and*

Legislation	Summary of Requirements
	the vulnerability of the project to climate change."
Town and County Planning (Environmental Impact Assessment) Regulations 2017	The requirements listed in the EU EIA Directive were transposed into UK law by the Town and Country Planning (Environment Impact Assessment) Regulations 2017. These regulations require both an assessment of the impact the project will have on climate change, along with an assessment of the vulnerability of the project to climate change. The regulations state the Environmental Statement must include: *"A description of the likely significant effects of the development on the environment resulting from, inter alia:* *(f) The impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change."*
The Climate Change Act 2008	*Establishes a legally binding target to reduce the UK's greenhouse gas emissions to net zero by 2050 (from 1990 levels).*

In addition to the legislation presented in Table 9-1 above, this chapter has also been carried out in accordance with the appropriate UK policy and guidance. The planning policies and guidance relevant to this chapter are presented in Table 9-2 below.

Table 9-2. Summary of relevant planning policy and guidance related to this chapter

Policy Name	Summary of Requirements
National Planning Policy Framework (2012), revised 2021	
Paragraph 11	*a) all plans should promote a sustainable pattern of development that seeks to: meet the development needs of their area; align growth and infrastructure; improve the environment; mitigate climate change (including by making effective use of land in urban areas) and adapt to its effects;*
Paragraph 154	*New development should be planned for in ways that:* *a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and* *b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.*
South West Marine Plan (2021)	
Climate Change SW-CC-1:	*Proposals that conserve, restore or enhance habitats that provide flood defense or carbon sequestration will be supported. Proposals that may have significant adverse*

Policy Name	Summary of Requirements
	impacts on habitats that provide a flood defense or carbon sequestration ecosystem service must demonstrate that they will, in order of preference: • *avoid* • *minimise* • *mitigate - adverse impacts so they are no longer significant* • *compensate for significant adverse impacts that cannot be mitigated.*
Climate Change SW-CC-2:	*Proposals in the south west marine plan areas should demonstrate for the lifetime of the project that they are resilient to the impacts of climate change and coastal change.*
Climate Change SW-CC-3:	*Proposals in the south west marine plan areas, and adjacent marine plan areas, that are likely to have significant adverse impacts on coastal change, or on climate change adaptation measures inside and outside of the proposed project areas, should only be supported if they can demonstrate that they will, in order of preference:* • *avoid* • *minimise* • *mitigate - adverse impacts so they are no longer significant.*
IEMA Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their significance (2017)	
A guide to assessing greenhouse gas emissions as part of an EIA assessment.	This chapter follows the guidance set out in the document by completing the following method: • Define the goals and scope of the assessment • Set study boundaries • Decide upon assessment methodology • Collect necessary data • Calculate/determine GHG emission inventory
IEMA Environmental Impact Assessment Guide to: Climate Change Resilience and Adaptation (2020)	
Guidance providing a framework for the effective consideration of climate change resilience and adaptation in EIAs.	This chapter follows the methods set out in this guidance document when assessing climate change resilience and adaptation: Step 1: Scoping climate change requirements for EIA Step 2: Defining the future (climate) baseline (using UKCP18 projections) Step 3: Identify and determine the sensitivity of receptors Step 4: Review and determine magnitude of effect Step 5: Determination of significance Step 6: Developing additional adaptation/EIA mitigation measures

On the basis of these requirements this EIA chapter primarily concerns the following aspects of climate change assessment:

- Potential impacts (vulnerability) to environmental receptors under likely scenarios of future climate change, which provides a wider baseline context for the assessment

of environmental impacts of the development associated with climate change presented in the other topic chapters in the ES;

- Contribution of the project to 'greenhouse gas emissions' during construction in the context of avoidance of dangerous climate change; and
- Resilience of the project to likely climate change scenarios over the construction and operational (maintenance) life of the project. Given that the proposed development project is a coastal defence scheme, aspects relating to resilience will mainly concern the standard of protection afforded to adjacent receptors over the design life of the project.

9.3 Scope of Assessment

9.3.1 Vulnerability to climate change

For this chapter, no prior scoping opinion comments have been received. Due to this, the tables below (Table 9-3 and Table 9-4) provide an overview of the climate hazards potential impacts that may result from various climate hazards for construction and operations (maintenance) separately.

Table 9-3. Elements of the vulnerability to climate change assessment scoped into and out of the EIA (Construction) with justification

Scoping: Construction vulnerability		Justification
Sea	Sea level rise	*Potential flood risk areas across the proposed site. If a flood event were to occur during construction, this could put site personnel and construction operations at risk. Flooding of access routes could also pose a risk to works. Sea level rise will be minimal within the proposed construction timeframe, therefore during this stage of development it has been* ***scoped out****.*
	Storm Surge and Storm Tide	
	Current and Waves	
	Sea surface temperature	*Although there are interdependencies with this element to wider sea conditions, no significant effects are likely to be experienced from this factor alone during the stages of development on the sites. Therefore, this is* ***scoped out.***
Precipitation	Change in annual average	*Heavy rainfall poses a risk to both site personnel and infrastructure on the site. Therefore, construction materials could become damaged, which would potentially delay the programme and have financial implications for obtaining additional materials. Drought and changes in annual averages are unlikely to occur during this stage of development and are therefore* ***scoped out.***
	Drought	
	Extreme precipitation events	

Scoping: Construction vulnerability		Justification
Temperature	Extreme temperature events	Temperature extremes could pose a health and safety risk to site personnel working on the site, causing potential overheating and associated health risks.
	Changes in annual average temperature	*No significant effects are likely to be experienced. Therefore, this is **scoped out.***
	Solar radiation	*No significant effects are likely to be experienced. Therefore, this is **scoped out.***
Wind	Gales and extreme wind events	Adverse weather and storm conditions, including heavy rain and high winds poses significant health and safety risk to those on site.
	Storms (snow, lightning and hail)	
Relative Humidity	Evaporation	*Will have little direct impact on the scheme receptors, no significant effects are therefore likely to be experienced. Therefore, this is **scoped out.***
	Change in annual average	

Table 9-4: Elements of the vulnerability to climate change assessment scoped into and out of the EIA (Operation, including maintenance) with justification

Scoped In: Operational (including maintenance) vulnerability		Justification
Sea	Sea level rise	Adverse coastal conditions risk the ability of workers to carry out scheduled maintenance and operational activities. This could compromise quality and frequency of maintenance and operational activities.
	Storm Surge and Storm Tide	
	Current and Waves	
	Sea surface temperature	*Although there are interdependencies with this element to wider sea conditions, no significant effects are likely to be experienced from this factor alone during the stages of development on the sites. Therefore, this is **scoped out.***
Precipitation	Change in annual average	*Risk of impact on ability of workers when carrying out maintenance and operational activities. This compromises quality and frequency of maintenance and operational activities. Drought and changes in*
	Drought	
	Extreme precipitation events	

Scoped In: Operational (including maintenance) vulnerability		Justification
		annual averages are unlikely to compromise the ability to undertake maintenance are therefore ***scoped out.***
Temperature	Extreme temperature events	Risk of impacts on ability of workers to carry out maintenance and operational activities. Potential health risks associated with exposure to heat. Risk to activities being carried out at all or effectively.
	Changes in annual average temperature	*No significant effects are likely to be experienced. Therefore, this is* ***scoped out.***
	Solar radiation	*No significant effects are likely to be experienced. Therefore, this is* ***scoped out.***
Wind	Gales and extreme wind events	Risk of impacts on ability of workers to carry out maintenance and operational activities. Including associated risks that prevent travel to the island (via boat, airbus) and on the island to carry out maintenance.
	Storms (snow, lightning and hail)	
Relative Humidity	Evaporation	*Will have little direct impact on the scheme receptors, no significant effects are therefore likely to be experienced. Therefore, this is* ***scoped out.***
	Change in annual average	

Following the review of the impacts of various climate hazards, the following tables indicate which climate hazards have been considered for each of the proposed development sites, based on the information provided in the tables above. Table 9-5 presents the climate hazards that are applicable to consider for each of the islands where development is proposed, whilst Table 9-6 presents the climate hazards scoped in for the assessment of the construction and operational (maintenance) phase of development.

Table 9-5. Climate hazards considered for each proposed development site

Element Scoping: Proposed Scheme Vulnerability to Climate Change		St. Martin's	St. Agnes	Bryher
Sea	Sea level rise	✓	✓	✓
	Storm Surge and Storm Tide	✓	✓	✓
	Sea Surface Temperature	X	X	X
	Current and Waves	✓	✓	✓
Precipitation	Change in annual average	✓	✓	✓
	Drought	✓	✓	✓
	Extreme precipitation events	✓	✓	✓

Element Scoping: Proposed Scheme Vulnerability to Climate Change		St. Martin's	St. Agnes	Bryher
Temperature	Change in annual average	X	X	X
	Extreme temperature events	✓	✓	✓
	Solar radiation	X	X	X
Wind	Gales and extreme wind events	✓	✓	✓
	Storms (snow, lightning and hail)	✓	✓	✓
Relative Humidity	Change in annual average	X	X	X
	Evaporation	X	X	X

Table 9-6. Elements of the vulnerability to climate change assessment scoped into the EIA

Scoping: Construction and Operational (including maintenance) Vulnerability		Construction	Operation
Sea	Sea level rise	X	X
	Storm Surge and Storm Tide	✓	✓
	Sea Surface Temperature	X	X
	Current and Waves	✓	✓
Precipitation	Change in annual average	X	X
	Drought	X	X
	Extreme precipitation events	✓	✓
Temperature	Change in annual average	X	X
	Extreme temperature events	✓	✓
	Solar radiation	X	X
Wind	Gales and extreme wind events	✓	✓
	Storms (snow, lightning, and hail)	✓	✓
Relative Humidity	Change in annual average	X	X
	Evaporation	X	X

To assess the impact of the climate hazards listed above, it is important to determine the sensitive receptors. The assessment will then look to understand the impact of the potential climate hazards on those receptors. Table 9-7 below outlines the sensitive receptors identified for the construction phase of the proposed development, whilst Table 9-8 outlines the sensitive receptors for the operational (including maintenance) phase.

Table 9-7. Sensitive receptors for the construction phase

Receptor	Sensitivity	Justification
Construction compounds	Moderate	This receptor has some ability to withstand climatic events; although its temporary nature means it is sensitive to extreme wind, storm and flooding events.
Machinery and plant	Moderate	This receptor has some ability to withstand climatic events but is likely sensitive to extremes.
Materials	Moderate	This receptor has some ability to withstand climatic factors but has sensitivity to wind and rainfall related events.
Construction workers	High	This receptor is likely to be significantly affected by various climate hazards, and health, safety and access issues are likely to occur as a result of climate hazards.
Tipping barge (for delivery of materials)	High	The proposed scheme will seek to import high density rock by tipping barge. This receptor is likely to be significantly affected by various climate hazards as it could be exposed to strong wave action, wind and storm events.
Interdependencies (infrastructure, local residents & natural environment e.g., Big Pool SSSI, Electricity distribution, Sewage etc.)	Moderate	Whilst these receptors are dependent on existing climatic conditions, their ability to tolerate certain conditions should uphold during the construction phase

Table 9-8. Sensitive receptors for the operational (including maintenance) phase

Receptor	Sensitivity	Justification
Flood defence assets (rock armour, dune stabilisation, revetment & retaining sea walls)	Moderate	The receptor has some ability to withstand climate factors, however as climate factors worsen, damage could occur.
Maintenance and repair staff	Moderate	This receptor has some ability to withstand climatic factors but is limited when access, infrastructure and safety issues become apparent, especially as the lifetime of the proposed schemes increases and climatic factors worsen.
Machinery and plant	Moderate	This receptor has some ability to

Receptor	Sensitivity	Justification
		withstand climatic factors, however as climate factors worsen, disruption could present.
Interdependencies (infrastructure, local residents & natural environment e.g., Big Pool SSSI, Electricity distribution, Sewage etc.)	High	These receptors are directly dependant on existing climatic conditions, their ability to tolerate limited conditions could disrupt future maintenance.

Interdependencies and Infrastructure

In the list of sensitive receptors above, interdependencies have also been included. The proposed schemes are located close to the sole existing infrastructure networks on the islands, consisting of roads, sewerage, water and electricity and telecommunication distribution. There are also environmental and cultural receptors, habitats, species, and heritage assets. These are assessed in more detail in other chapters of the EIA.

More specifically on St. Agnes, the Big Pool (SSSI) aquifer represents a key interdependency as it provides the island's main freshwater supply via borehole extraction from the neighbouring granite. These receptors are directly dependant on existing climatic conditions, their ability to tolerate limited conditions could disrupt construction and future maintenance.

Physical extent of the study area and temporal extent of the development

The vulnerability to climate change assessment has been completed based on the boundary of the areas defined for each of the proposed developments (see Chapter 2: The Proposed Development). The specific receptors within those boundaries assessed are defined in the tables above. Where interdependencies are concerned, an assessment has been made of impacts across the whole islands.

The temporal extent of the study has considered the design life of the proposed development of 25-years. Due to the long-term impacts associated with climate change, it was deemed appropriate to also consider climate change impacts further into the future. To assess this, UKCP18 projections were considered for the 2040s (in-line with the design life) and 2080s (beyond the design life). This approach of looking beyond the design life applies the precautionary principle and enables us to understand the potential impacts in a 'worst-case' scenario.

9.3.2 Greenhouse Gas Assessment

As with the vulnerability to climate change, no prior scoping responses on this chapter have been received. Due to this, the table below (Table 9-9) provides an overview of elements of the GHG assessment that have been scoped into this assessment.

Table 9-9. Elements of GHG emissions assessment scoped into the EIA

Greenhouse Gas Assessment: Element scoped in	Justification
Construction phase impacts, including: - Manufacture and transportation of raw materials - Delivery and laying of materials - Disposal of site arisings	It is important to consider the embodied GHG emissions relating to the materials used as part of the scheme to understand the potential impact construction of the proposed scheme may have on climate change. It is also necessary to assess GHG emissions as part of the assessment of impacts to unlock funding.

The following table (Table 9-10) provides an overview of those elements that have been scoped out of the greenhouse gas assessment and the reasoning for this. If any changes to the proposed development are made, the scoping exercise will be re-considered, and it may be necessary to scope in some of those elements listed below.

Table 9-10. Elements of the greenhouse gas assessment scoped out of the assessment

Greenhouse Gas Assessment: Element scoped Out	Justification
Land use change	Land use change has been scoped out of the GHG assessment as the nature of the works means there will be limited change to land use or habitat type.
Operation and maintenance phase	Maintenance activities will include 'topping up' of softer works (e.g., renourishment of dunes) after storm events. There are plans for maintenance storage areas, that will hold a range of materials suitable for repairing the sand dunes and other materials in the works. Storing these materials on the islands reduces the time required to repair damaged works following storms. Whilst also effectively reducing the need for transport of materials nationally. Therefore, due to the nature of the expected maintenance works, emissions related to operational procedures such as repair, are likely to be negligible in comparison to the construction GHG emissions and have not been explored within this chapter.
Decommissioning	There are unlikely to be any significant works associated with the decommissioning of the proposed scheme at the end of its design life, due to the nature of the works and the likelihood that most of the works will remain in situ.

Extent of the study area

The spatial extent of the Greenhouse Gas assessment is primarily focused on the site boundaries of the proposed developments (see Chapter 2: The Proposed Development). The assessment is concerned with all materials used for the development; however, it also considers the emissions associated with delivery of the materials. These emissions are likely to affect areas wider than just those associated with the development.

The temporal extent of the study is in-line with the design life of the proposed development. The assessment will consider emissions over the 25-year design life of the scheme.

9.4 Baseline Conditions

9.4.1 Vulnerability to climate change

Historic and Existing conditions

The following sections provides information on the historic climate conditions for both a national context (England), followed by more detailed context specifically for the Isles of Scilly.

The UK Committee for Climate Change recently released their third Climate Change Risk Assessment (CCRA) (June 2021). The summary for England Report identifies key trends and patterns observed in England:

- An increase in average annual temperature of 0.9°C from mid-1970s to mid-2010s.
- An increase in average mean rainfall of 4.5% from mid-1970s to mid-2010s.
- An increase in sunshine of 9.2% from mid-1970s to mid-2010s.
- There has been a UK wide increase in extreme heat events, however little evidence of changes to extreme rainfall.
- UK-wide sea levels have increased ~1.4mm per year since 1901 (16cm to date).

Future projections for England as listed in the UK CCRA include:

- Annual temperatures are expected to rise by approximately 1.2°C the 2050's and between 1.3°C and 2.4°C by the 2080s (from a 1981-2000 baseline).
- Winter rainfall is expected to increase by approximately 6% by the 2050s and between 8-13% by the 2080s (from a 1981-2000 baseline)
- Summer rainfall is expected to decrease by approximately 15% by the 2050's and between 15-22% by the 2080s. a
- The frequency and intensity of extreme temperature and rainfall events may increase in future. In summer, whilst rainfall amounts are projected to decrease, rainfall is expected be more intense.
- Considering scenarios for the South of England, sea level is expected to rise between approximately 23-29 cm by the 2050s, and by approximately 45-78 cm by the 2080s (from a 1980-2000 baseline).

In 2020, climate trends in the UK show (Royal Meteorological Society, 2021):

- Temperatures: 2020 was the third warmest year for the UK in a series from 1884. The most recent decade (2011–2020) has been on average 0.5°C warmer than the 1981–2010 average and 1.1°C warmer than 1961–1990.

- Snow: 2020 was one of the least snowy years on record. Although, widespread and substantial snow events have occurred in 2018, 2013, 2010 and 2009, their number and severity have generally declined since the 1960.
- Precipitation: 2020 was the UK's fifth wettest year in a series from 1862. Also, 2020 included the fifth wettest winter, the fifth driest spring and, for England, the driest May on record in a series from 1862.
- Sunshine: Spring 2020 was the UK's sunniest spring on record, and also sunnier than most UK summers. The most recent decade (2011– 2020) has had for the UK on average 4% more hours of bright sunshine than the 1981–2010 average and 8% more than the 1961–1990 average.
- Storms: Ten named storms affected the UK in 2020. This was a fairly typical year for storminess compared to recent decades.
- Sea-level rise: Mean sea level around the UK has risen by approximately 1.5 mm $year^{-1}$ on average from the start of the 20th century.

More specifically to the Isles of Scilly, the following presents a summary of observed climate events and recently observed climate trends for each climate hazard. This section has considered climate impacts on all of the islands across the Isles of Scilly, to give a comprehensive assessment of the potential impacts that could occur on any island.

Sea Level Rise

- A study from 2020 (Barnett et al.) draws comparisons between the current observed rate of mean global sea-level rise (around 3.6mm per year) and historical rates at the Isles of Scilly (1 to 2mm per year) that caused significant widespread coastal reorganisation between 5,000 and 4,000 years ago. This study highlights the potential social upheaval that could happen on the Isles, as a result of accelerated (climate change induced) sea level rise.

Storm Surge

- During 2014, a storm surge caused varying damage to the Isles of Scilly coastal assets. This included damage to St. Mary's harbour wall, St. Agnes (Periglis) sea defence and overtopping at Porth Hellick, causing erosion and possible future intrusion into St. Mary's freshwater catchment at Big Pool (SSSI) (Council of the Isles of Scilly, 2017).
- In 2017, storm surge events also affected marine life. An Isles of Scilly Wildlife Trust representative described the estimated loss of 100% of seal pups through such events (Whitehead, 2021).

Heavy rain-related events

- During 2021, Storm Evert caused significant disruption through heavy rain and wind prompting several maritime rescues from St. Mary's RNLI crews around the Isles of Scilly (BBC News, 2021).

Drought and Heat-related Events:

- A prolonged dry period during the summer of 1976 caused a significant drought on the Isles of Scilly – this event is used as the highest severity baseline for the Isles of Scilly drought plan (South West Water, 2021).
- During the summer of 2018 warnings were issued regarding a water shortage on St. Mary's, whereby dry weather and high demand saw the island unable to provide water without seriously damaging boreholes (Council of the Isles of Scilly, 2018).
- As only 36% of the water on the isles is provided by desalination, boreholes are necessary; consequently, drought poses a significant risk. (Rossiter, 2018)
- June 2018 was the third driest month since 1910, with only 11.9mm of rain falling across the region, at 23% of normal levels.

- The Isles of Scilly Drought Plan (2021) considers the Isles of Scilly to have high vulnerability to drought.
- The Devon and Cornwall Community Risk Register (CRR) (2008) considers heatwaves to be a low-risk proposition for Cornwall and the Scilly Isles (Local Resilience Forum, 2018)
- The annual rainfall totals in the Isles of Scilly are approximately 850-900mm (Met Office, 2013)

Cold weather-related events

- The strong maritime influence normally prevents very low temperatures, and the Isles of Scilly only experience air frost very occasionally (Met Office, 2013). Annual mean temperatures are also close to 11 to 12°C in coastal areas of Cornwall and the Isles of Scilly (Met Office, 2013).

However, low minimums have been recorded in the past on the Isles of Scilly, for example:

- 13th January 1987: The coldest day of the 20th Century in the South West, temperatures of -7.0 °C were recorded on the Isles of Scilly, accompanied by high wind speeds and deep snow in parts. Therefore, causing disruption to transport/local communities (Rowley, 2021).

Wind-related events:

- There have been several strong wind events on the Isles of Scilly. On the 15th of December 1979, severe gales at St. Mary's produced wind speeds of 118 mph.
- During January of 1990, the Burns Day Storm caused considerable damage to buildings and overturned vehicles due to high, widespread winds of 100 mph (Met Office, 2020 & BBC News, 1990).
- More recently there have been several strong storm events; for example, during November 2014, winds of up to 92mph (148km/h) were recorded across the isles, causing coastal asset damage (BBC News, 2014).
- In 2018, Storm Brendan grounded all Skybus flights to the Isles of Scilly (BBC News, 2018)
- In 2021, Storm Evert caused wind speeds up to 75 mph causing 20 incidents off the islands for Falmouth Coastguard and the RNLI. (BBC News, 2021).

9.4.2 Greenhouse Gas Assessment

Current Baseline

The current baseline for the proposed development is defined as the current GHG emissions arising from flood and coal erosion management (FCERM) activities and infrastructure within the project site boundary. This is in line with the IEMA guidance on GHG Assessment (2017). It is generally difficult to determine the baseline GHG emissions of existing FCERM activities as there are almost no operational emissions associated with the few existing assets (generally just flood walls).

The current GHG emissions across the Isles of Scilly are particularly low, and the islands produced the lowest number of emissions of all UK local authorities, in part because it has the lowest land-area and lowest population of any local authority. In 2019, total emissions for the Isles of Scilly were recorded as 8.6kt CO_2, and just 0.4kt CO_2 per km (Department for Business, Energy and Industrial Strategy, 2021). With this in mind, and due to the nature of the current development within the project site boundary, the current GHG baseline emissions cannot be reported, but it can be considered to be low.

Alternative emissions

In the context of FCERM proposed developments, it is important to consider the alternative future baseline emissions as a result of the proposed development not

being constructed. The GHG emissions associated with the impacts of flooding if the proposed development were not to be constructed can be significant. These emissions could result from:

- Repairs to buildings damaged by flooding
- Replacing the contents of buildings damaged by flooding
- Constructing replacement infrastructure and buildings following flooding

An Environment Agency report from 2010 estimated that the annual carbon emissions arising from FCERM activities (delivering of traditional flood defences) were 0.53 Mt CO_2e per year, whereas flood and coastal erosion damages were estimated to be 1.90 Mt CO_2e per. These figures were calculated using a proxy approach, linking estimates of economic damage costs to carbon emissions, using a multiplier similar to that calculated for the Thames Estuary Plan 2100 (Halcrow, 2008). The report concluded that net emissions would be greater without FCERM activities due to the impacts of greater flood damage. However, it is important to balance this apparently positive situation with the fact that emissions from construction will occur in the near future and have an immediate impact. Possible future reductions are not certain and may be of much lower magnitude because the global economy is decarbonising.

9.5 Future Baseline

9.5.1 Vulnerability to climate change

To understand future changes to the climate on the Isles of Scilly, UKCP18 projections were used. The regional (South West England) projections were downloaded for the 2040s and 2080s epochs, both for temperature change and percentage change in precipitation. In addition, projected sea level rise data was obtained for the 2020s, 2050s and 2080s. All of this data was obtained for RCP 4.5 and RCP 8.5, using a baseline period of 1981-2000.

Representative Concentration Pathways ("RCP"s) are used within UKCP18 to capture assumptions used in a set of scenarios about future social, economic and physical changes to our environment. The conditions of each scenario are used in the process of modelling possible future climate evolution within UKCP18. RCP 4.5 and RCP 8.5 were used within this chapter and are the basis for the climate vulnerability assessment. RCP 4.5 was chosen as the most representative emissions scenario, as it is widely believed we have already exceeded the RCP2.6 scenario commonly used. RCP 4.5 most closely relates to +2.4°C (1.7°C-3.2°C) warming. RCP 8.5 represents unmitigated climate change and is considered the most appropriate RCP to allow for the 'worse case' assessment of climate impacts on receptors. RCP 8.5 most closely relates to +4.3°C (3.2°C -5.4°C) warming. The RCP's chosen for this assessment are in line with the IEMA guidance.

Sea Level Rise

UK coastal flood risk is expected to increase under all emission scenarios, due to the impacts of Sea Level Rise (Met Office, 2019). Sea Level Rise is a particular concern on the Isles of Scilly, due to low-lying islands. The UKCP18 projections provide data for coastal locations across the UK. Table 9-11 below provides the projections for Sea Level Rise on the Isles of Scilly.

Table 9-11. UKCP18 projections mean Sea Level Rise for the Isles of Scilly under RCP 4.5 and RCP 8.5

Epoch	RCP 4.5	RCP 8.5
2020s	0.10	0.11
2050s	0.27	0.31
2080s	0.46	0.59

Precipitation

The overall projections for the UK suggest there is likely to be an increase in winter rainfall and a decrease in summer rainfall. Projections also show a trend towards increases in the precipitation intensity on wet days in winter across the whole UK and decreasing intensity in summer across central and southern UK. Table 9-12 below provides an overview of the projections for the Isles of Scilly. These projections clearly show an increase in winter precipitation, along with a significant decrease in summer rainfall.

Table 9-12. UKCP18 projections (50th Percentile) for winter and summer precipitation under RCP4.5 and RCP8.5 for the South West of England (% change)

Epoch	Percentage change in precipitation from baseline 1981-2000 (%)			
	RCP 4.5		RCP 8.5	
	Summer (%)	Winter (%)	Summer (%)	Winter (%)
2040s	-19.14	+8.61	-22.91	+12.32
2080s	-28.67	+16.37	-43.95	+27.60

Mean Temperature

By the end of the 21st Century, temperatures across the whole of the UK are expected to be warmer, with larger increases in summer temperatures. Table 9-13 below provides the UKCP18 climate projections for the South West of England. In this table it is clear temperatures are set to rise, more significantly in the summer, whereby the 2080's, under RCP8.5, there could be as much as 5.57˚C warming.

Table 9-13. UKCP18 projections (50th Percentile) for winter and summer temperature under RCP4.5 and RCP8.5 for the South West of England (˚C change)

Epoch	Change in temperature from baseline 1981-2000 (˚C)			
	RCP 4.5		RCP 8.5	
	Summer	Winter	Summer	Winter
2040s	+1.71	+1.20	+2.23	+1.59
2080s	+3.49	+2.04	+5.57	+3.43

9.5.2 Greenhouse Gas

The proposed defence schemes on the Isles of Scilly are a response to coastal erosion and flooding, forecast to increase with future sea level rise and the changing climate. It is now well recognised that emissions of carbon dioxide (CO_2) and other greenhouse gases (GHGs) such as methane (CH_4) and nitrogen dioxide (NO_2) from human activities, have caused global warming and climate change.

As well as a response to climate change it is recognised that CO_2 emissions would also result from construction of the coastal defence schemes, as a result of transport of materials via heavy vehicle movements, embodied carbon within the materials used and use of plant for construction. The defences would be low maintenance, but some emissions would arise as a result of the operation of the proposals.

9.6 Assessment Methodology

9.6.1 Vulnerability to climate change

The methodology presented below for assessing the proposed developments vulnerability to climate change has been developed in line with the IEMA EIA guidance on climate change resilience and adaptation (2020).

Baseline Assessment

The information for the baseline assessment was collected through desk-based research. To assess the Proposed Scheme's vulnerability to climate hazards and future climate change, the initial baseline was determined. This included:

- Understanding the current climate conditions
- Determining the future climate changes projected to occur (and obtaining the relevant data)
- Identifying the climate hazards most likely to impact the development
- Determining the receptors sensitive to the climate.

The baseline methodology for the vulnerability to climate change assessment is split into four stages and is presented in Table 9-14 below.

Table 9-14. Methodology for establishing the baseline

Baseline methodology	
Existing conditions (historic climate and current site use)	A review of historic weather trends, significant weather events and site conditions to understand the current climatic conditions and hazards impacting the site.
Future Baseline - UKCP18 projections	Future climate projections have been analysed as part of the methodology for this EIA assessment. Climate trends and projections are published by the Met Office on the UK Climate Projections website. The UK Climate Projections 2018 ("UKCP18") became available in November 2018 and provide the most up to date assessment of how the climate of the UK may change over this century.
Climate drivers and hazards	Based on the historic climate events, and climate projections, the pertinent climate drivers (e.g., increased precipitation) for the site and the associated hazards (e.g., flooding) are identified for current and future epochs.
Sensitive receptors	In order to assess the impacts of future climate hazards, a list of specific receptors will be determined to assess. These could be specific elements of the proposed development or more detailed receptors such as construction staff and machinery.

Impact assessment methodology

The impact of the identified climate hazards on the sensitive receptors at the site was determined through assessing:

- The vulnerability and sensitivity of the receptors
- Understanding the magnitude of effect (the probability of the effect occurring and consequences if this were to occur)

- Determining the significance of the impacts
- Identifying potential mitigation and management measures.

Table 9-15 below provides a summary of how the impact assessment has been completed.

Table 9-15. Methodology for impact assessment

Potential Effects	
Vulnerability and sensitivity assessment	The sensitivity of the agreed receptors to climate hazards will be assessed by determining the susceptibility and vulnerability of them (see Table 9-16 and Table 9-17 for the scoring categories). The value/ importance of the receptor will also be considered to reach a conclusion on the vulnerability and sensitivity. This step allows us to scope in the relevant climate hazards and receptors to the assessment.
Determining the magnitude of effect	The magnitude of effect (i.e., the degree of change from the relevant baseline which derives from the construction and operation of a project) will be assessed by considering the probability of the effect occurring (see Table 9-18) and the consequence if the effect were to occur (Table 9-19) for categories).
Significance assessment	The sensitivity and magnitude of effects determined in the previous stages will be used to make an overall judgement of the significance climate hazards on the development.
Climate Change mitigation and adaptive management	Once the impact of climate change on the development is understood, it is important to identify any interventions that may be necessary with future climate change. IEMA recommends the use of adaptive management, which enables uncertainties to be included in future decision making.

Table 9-16. Scale of susceptibility to use when assessing receptors (IEMA, 2020)

Susceptibility	Description
High	The receptor has no ability to withstand/not be substantially altered by the projected changes to the existing/prevailing climatic factors (e.g., lose much of its original function and form)
Moderate	The receptor has some limited ability to withstand/not be altered by the projected changes to the existing/prevailing climatic conditions (e.g., retain elements of its original function and form)
Low	The receptor has the ability to withstand/not be altered much by the projected changes to the existing/prevailing climatic factors (e.g. retain much of its original function and form).

Table 9-17. Vulnerability assessment of receptors (IEMA, 2020)

Vulnerability	Description
High	The receptor is directly dependent on existing/prevailing climatic factors and reliant on these specific existing climate conditions continuing in future (e.g., river flows and groundwater level) or only able to tolerate a very limited variation in climate conditions.
Moderate	The receptor is dependent on some climatic factors but able to tolerate a range of conditions (e.g., a species which has a wide geographic range across the entire UK but is not found in southern Spain).
Low	The climatic factors have little influence on the receptors (consider whether it is justifiable to assess such receptors further within the context of EIA – i.e., it is likely that such issues should have been excluded through the EIA scoping process).

Table 9-18. Likelihood categories (IEMA, 2020)

Likelihood category	Description (probability and frequency of occurrence)
Very high	The event is likely to occur multiple times during the construction phase of the project. The event occurs multiple times during the operational lifetime of the project (25 years), e.g., approximately annually, typically 25 events
High	The event may occur more than once during the construction phase of the project. The event occurs several times during the lifetime of the project (25 years), e.g., approximately once every five years, typically 5 events.
Medium	The event may occur only once during the construction phase of the project. The event occurs limited times during the lifetime of the project (25 years), e.g., approximately once every 15 years, typically 2 events.
Low	It is unlikely the event will occur during the construction phase of the project. The event occurs during the lifetime of the project (25 years), e.g., once in 25 years.
Very Low	The event is very unlikely to occur during the construction phase of the project. The event is unlikely to occur during the lifetime of the project (25 years).

Table 9-19. Measure of consequence (IEMA, 2020)

Consequence of Impact	Description
Very large adverse	Property destroyed or not safe to use / fatality or multiple injuries. Financial loss > £100,000 Failure of key objectives and/or key services (e.g., failure to protect to the 1:200 year standard of protection) National media coverage National-level (or greater) disruption lasting more than 1 week
Large adverse	Significant damage requiring repair / multiple people significantly injured and requiring medical treatment. Financial loss from £50,000 to £100,000 Significant impact on achievement of objectives; Significant localised press coverage. National level disruption lasting more than 1 day but less than 1 week or Regional level disruption lasting more than 1 week.
Moderate adverse	Moderate damage requiring repair / Injury requiring medical treatment. Financial loss from £10,000 to £50,000 Medium impact on achievement of objectives; Some localised press coverage. Regional level disruption lasting more than 1 day but less than 1 week.
Minor adverse	Minor damage or injury. Financial loss < £10,000 Minor impact on achievements of objectives Minimal damage to reputation. Regional level disruption lasting less than 1 day.
Negligible	No damage, injury or financial loss. No minor impact on achievements of objectives No damage to reputation. Potential positive impact. Disruption to the sites lasting less than 1 day.

The significance level attributed to each climate hazard has been assessed based on the sensitivity of the affected receptor and the magnitude of change arising from the Proposed Scheme. Table 9-20 below sets out how significance of effect has been determined, based on the likelihood and measure of consequence categories, as shown above.

Table 9-20. Evaluation of significance (Source: IEMA, 2020)

		Likelihood				
Consequence		Very low	Low	Medium	High	Very high
	Negligible	Not significant	Not significant	Not significant	Not significant	Not significant
	Minor	Not significant	Not significant	Not significant	Significant	Significant
	Moderate	Not significant	Not significant	Significant	Significant	Significant
	Large	Not significant	Significant	Significant	Significant	Significant
	Very large	Not significant	Significant	Significant	Significant	Significant

Assumptions and limitations

The following list provide the assumptions and limitations associated with the assessment of the proposed schemes vulnerability to climate change:

- The assessment is based on qualitative assessment and professional judgement. The best available guidance (IEMA guidance) and the matrix of likelihood, consequence and significance presented above was developed by professional judgement and provided structure to the approach.
- The UKCP18 25km projections were not available for the Isles of Scilly, therefore regional projections for the South West England have been used. These projections should still be representative and were the best available data at the time of writing (December 2021).

9.6.2 Greenhouse Gas Assessment

Baseline assessment

The baseline for the GHG assessment has been determined based on current GHG emissions at the site. Due to the nature of the sites, there was no means of calculating current GHG emissions (due to the absence of any significant GHG emissions), therefore a qualitative assessment has been presented, emphasising the low levels of GHG emissions.

Emissions calculations

GHG emissions have been calculated using the Environment Agency's e:Mission Carbon Planning Tool. This tool calculates the GHG impacts of construction activities in terms of CO_2e. It does this by calculating the embodied CO_2e of materials plus the CO_2e associated with their transportation. It also considers personnel travel, site energy use and waste management. The tool was developed by the Environment Agency for fluvial and coastal schemes. The IEMA guidance on assessing GHG emissions and evaluating their significance has also been used.

Impact assessment

There are currently no agreed thresholds for determining what levels of GHG emissions is significant. Therefore, the assessment for GHG emissions has been completed based on:

- The magnitude of GHG emissions calculated to be generated through construction and operation

- Considering the magnitude in the local context of current emissions
- The IEMA guide to assessing Greenhouse Gas Emissions (IEMA, 2017).

Assumptions and limitations

Where information was not available, a series of assumptions have been made. The list below details the assumptions and limitations associated with the GHG assessment:

- The Environment Agency's e:Mission Carbon Planning Tool assumes that transporting material by road emits GHGs at a rate of 0.10672kmCO_2e $km^{-1}kg^{-1}$;
- At the time of writing this chapter, limited information was available on plant movement during construction of the scheme. Therefore, this information has not been captured in the carbon calculations;

Where a range of potential sources, or no source, for the material required was stated, it was assumed that the materials would be acquired locally, either through importing materials from the mainland (Cornwall) or reusing site won materials at the proposed developments.

- Granite: Information given about the developments (reaffirmed by the Council of the Isles of Scilly, 2021) suggests that granite will be used within the developments and would be sourced from Cornwall. With similar qualities to that of the rock found on the Isles of Scilly - to match the Isles geomorphological character. To represent this scenario, a distance of 50 km was chosen via Van (EA alternative to HGV) and a distance of 50 km via barge (EA substitute for boat).
- Polyethylene / Concrete / Plastic Timber / Timber: It was not specified in the works information for the scheme where these materials would be sourced. For this assessment, it was assumed the materials would be sourced from elsewhere in Cornwall, UK rather than further afield, a distance of 50 km was chosen via Van (EA alternative to HGV) and a distance of 50 km via barge (EA substitute for boat).
- Waste: When specified, site won backfill and refill of material was calculated as a proportion of total excavation at any given proposed site. This was true for sub-assets such as soil, rammed clay, sand and cobbles. Which, when accounted for, finalised the values for waste (%). Just as local material acquirement was assumed, it was assumed that the scenario for removal would be local with an implied 50 km disposal radius.
- Furthermore, waste for polyethylene geotextiles was assumed to have an integral 5% waste value - following the engineering and design advice of similar coastal defence schemes.

9.7 Assessment of effects

9.7.1 Construction: Effect Significance, Mitigation and Residual Effects

Based on the information presented above in the baseline and future baseline, the impacts of each climate hazard on each of the sensitive construction receptors has been assessed. As the methodology explains, the vulnerability of the receptors and the magnitude of effect have both been considered to determine the overall significance of effect.

Table 9-21 - Significance assessment of the impacts of climate hazards on construction sensitive receptors

Variable		Projected Change	Receptor	Impact	Likelihood	Consequence	Significance
Sea and Precipitation	Storm Surge and Storm Tide	Increase in the height of storm surges.	Construction compounds	Adverse flooding could pose risk to site personnel and construction process, including blocking access, disrupting delivery and damaging materials and machinery	Very Low	Large adverse	Not Significant
			Materials				
			Tipping barge delivery				
			Staff				
			Machinery and Plant				
			Interdependencies				
	Current and Waves	Increase in the height of onshore waves	Materials	Damage to heavy construction - materials, site and access issues for staff. Delivery disruption	Low	Moderate adverse	Not Significant
			Machinery and Plant				
			Staff				
			Tipping barge delivery				
			Construction compounds				
			Materials	Enhanced reactions when cement stabilising and drying of concrete	Low	Minor adverse	Not Significant
	Extreme rainfall	Increase in magnitude and frequency of extreme rainfall events	Construction compound & Interdependencies	Flooding of construction works and compound	Very Low	Moderate adverse	Significant
				Waterlogging of excavations	Low	Moderate adverse	Not Significant
				Overwhelming of drains	Medium	Minor adverse	Not Significant
				Soil erosion and sedimentation	Low	Minor adverse	Not Significant
			Materials	Destabilisation of material, including topsoil and spoil heaps	Low	Minor adverse	Not Significant
			Staff	Unsafe working conditions – during construction and delivery	Very Low	Large adverse	Not Significant
			Tipping barge delivery				
			Machinery and Plant				
	Extreme temperature events	Increase in magnitude of extreme temperature	Construction compounds	Fire	Very Low	Moderate adverse	Not Significant
			Machinery and Plant	Overheating of machinery	Very Low	Minor adverse	Not Significant

Variable		Projected Change	Receptor	Impact	Likelihood	Consequence	Significance
			Materials	Deformation of materials	Low	Minor adverse	Not Significant
			Staff	Unsafe working conditions	Very Low	Moderate adverse	Not Significant
Wind & Storms	Gales and extreme wind events	Increase in mean wind speed and more frequent gusts; increased wind loading	Construction compounds	Increase in dust leading to delay of works	Low	Minor adverse	Not Significant
			Interdependencies				
			Machinery and Plant				
			Materials	Loss of materials	Very Low	Minor adverse	Not Significant
			Staff	Unsafe working conditions (working at height, wave exposure, increased dust, reduced visibility)	Low	Moderate adverse	Not Significant
			Tipping barge delivery	Exposure & Unsafe working conditions for personnel during the delivery process			
	Storms (snow, lightning and hail)	Increase in frequency of storms	Construction compounds	Flooding of construction works and compounds	Very Low	Moderate adverse	Not Significant
			Materials	Destabilisation of material, including topsoil and spoil heaps	Low	Minor adverse	Not Significant
			Staff	Unsafe working conditions, particularly for working at height; lost productivity through disruption of operations (Stormy conditions and wave height) and loss of access	Very Low	Moderate adverse	Not Significant

Variable	Projected Change	Receptor	Impact	Likelihood	Consequence	Significance
		Tipping barge delivery	Unsafe working conditions, Exposure or materials and personnel during the delivery process	Low	Large Adverse	Significant
		Machinery and Plant	Water and flood damage; collision with storm debris and downed trees; risk of lightning strike	Low	Large adverse	Significant
		Interdependenciess				

9.7.2 Greenhouse Gas Assessment: Construction

The following section provides the results of the Greenhouse Gas assessment. This has been broken down by island, and the results will be presented for St Martin's, St Agnes and Bryher. For each of the assessments, the EA carbon planning tool was used to calculate the likely potential CO_2e resulting from both construction and operation. The carbon calculator breaks the emissions down into:

- Capital carbon
- Operational (maintenance & repairs) carbon
- Replacement carbon
- Refurbishment carbon
- Demolition carbon
- Residual carbon
- Carbon sequestration

Alongside this breakdown in the calculator, the information below has been provided to illustrate where the carbon emissions are concentrated, whether that be embodied carbon within materials, or associated with delivery of the construction materials.

St Martin's Greenhouse Gas Assessment

The estimated embodied GHG emissions associated with the use of materials and excavation of materials for the proposed developments on St Martin's is summarised and provided in Table 9-22.

Table 9-22: Estimated embodied carbon emissions associated with the construction material for the proposed developments at St. Martin's

Material	Volume (m3)	Embodied (tCO_2e)
Grid Surfacing	18.8	85.9
Sub-grade	5	0.06
Dune fencing	2.3	0.67

Material	Volume (m3)	Embodied (tCO_2e)
Total carbon (tCO_2e)		87.4

In addition to the embodied carbon, there will be emissions arising from construction material delivery though vehicle and sea transport. The emissions calculated for the proposed developments on St Martin's are presented in Table 9-23 below.

Table 9-23 - Estimated CO_2 emissions associated with the delivery of construction materials to the sites on St. Martin's

Material for delivery	Volume (m3)	Mode of Transport	Estimated distance between source of supply and site (km)	Tonnes CO_2e resulting from transport
Geogrid (Plastics)	18.8	'Van' and 'Barge'	100	0.16
Sub-base (Aggregate)	5	'Van' and 'Barge'	100	0.2
Dune fencing (Timber)	2.3	'Van' and 'Barge'	100	0.09
Total embodied carbon equivalent (tCO_2e)				0.22

When embodied carbon values and values resulting from the freight of these materials are combined, the total CO_2e emissions resulting from the materials used from the St. Martin's developments are 87.6 tCO_2e. Construction waste may be generated as part of the development, therefore, requiring an assumed 0.12 tCO_2e in removal via transport (over 100 km).

In addition, emissions that would result from personnel travelling to the site to work has been assumed to be negligible when compared to other emissions arising from the scheme.

It is estimated that in total **87.7 tCO_2e** would be emitted as a result of the construction of the proposed developments on St. Martin's.

St. Agnes Greenhouse Gas Assessment

The estimated embodied GHG emissions associated with the use of materials and excavation of materials for the proposed developments on St. Agnes is summarised and provided in Table 9-24.

Table 9-24: Estimated embodied carbon emissions associated with key construction material for the proposed developments at St. Agnes

Material	Volume (m3)	Embodied tCO_2e
Granite	2,061	4,154
Polyethylene geotextile	33	76
Excavation (sand/soil/clay)	1,892	22
Total carbon (tCO_2e) (with remaining material)		4,377

In addition to the embodied carbon, there will be emissions arising from construction material delivery through vehicle and sea transport. The emissions calculated for the proposed developments on St. Agnes are presented in Table 9-25.

Table 9-25 - Estimated CO_2 emissions associated with the delivery of construction materials to the sites on St. Agnes

Material for delivery	Volume (m3)	Mode of Transport	Estimated distance between source of supply and site (km)	Tonnes CO_2e resulting from transport
Granite	2,061	'Van' and 'Barge'	100	30.8
Polyethylene	33	'Van' and 'Barge'	100	2.3
Total embodied carbon equivalent (tCO_2e)				33.2

When embodied carbon values and values resulting from the freight of these materials are combined, the total CO_2e emission resulting from the materials used from the St. Agnes developments are 4,409.66 tCO_2e. Construction waste may be generated as part of the development if clay, soil or sand is excavated that cannot be reused as backfill, cover material or topsoil. Therefore, requiring an assumed 3.63 tCO_2e removal via transport (over 350 km).

In addition, emissions that would result from personnel travelling to the site to work has been assumed to be negligible when compared to other emissions arising from the scheme.

It is estimated that in total **4,413 tCO_2e** would be emitted as a result of the construction of the proposed developments on St. Agnes – with the bulk of the CO_2e emission resulting from granite usage.

Bryher Greenhouse Gas Assessment

The estimated embodied GHG emissions associated with the use of materials and excavation of materials for the proposed developments on Bryher is summarised and

provided in Table 9-26 below.

Table 9-26 - Estimated embodied carbon emissions associated with key construction material for the proposed developments at Bryher

Material	Volume (m3)	Embodied (tCO_2e)
Granite	2,532	5213
Polyethylene geotextile	6.37	14.4
Excavated material	1,363	15.6
Total carbon (tCO_2e) (with remaining material)		5,253

In addition to the embodied carbon, there will be emissions arising from construction material delivery though vehicle and sea transport. The emissions calculated for the proposed developments on Bryher are presented in Table 9-27 below.

Table 9-27 - Estimated CO_2 emissions associated with the delivery of construction materials to the sites on Bryher

Material for delivery	Volume (m3)	Mode of Transport	Estimated distance between source of supply and site (km)
Imported Granite	1,885	'Van' and 'Barge'	100
Polyethylene + Brick	6.37	'Van' and 'Barge'	100
Total embodied carbon equivalent (tCO_2e)			2.30

When embodied carbon values and values resulting from the freight of these materials are combined, the total CO2e emission resulting from the materials used from the Bryher developments are 5,254.86 tCO_2e. Construction waste may be generated as part of the development if clay, soil or sand is excavated that cannot be reused as backfill, cover material or topsoil. Therefore, requiring an assumed 10.56 tCO_2e removal via transport (over 300 km).

In addition, emissions that would result from personnel travelling to the site to work has been assumed to be negligible when compared to other emissions arising from the scheme.

It is estimated that in total **5,265 tCO_2e** would be emitted as a result of the construction of the proposed developments on Bryher.

Alternative Option: Great Popplestone

The initial proposal for this proposed scheme is to remove existing rock from the beach/dunes at Popplestone North for re-use in the works at Popplestone South, with

the removed rock replaced with sand. However, after early consultation, this proposal has been reconsidered. Therefore, there are two alternate options to consider:

1) Leave the rock in situ and import rock instead. (750m^3 volume of 1-3 tonne rock).

2) Remove the rock for re-use, regrade the dune and allow the dune to adjust to the new situation naturally.

Below the embodied carbon of option 1 (tCO_2e) has been calculated accounting for embodied emissions and import emissions.

Table 9-28: Estimated embodied carbon emissions for the Great Popplestone works (option 1)

Material	Volume (m^3)	Embodied (tCO_2e)
Granite	750	1,512
Material	**Delivery Mode**	**Embodied (tCO_2e)**
Granite	'Van' and 'Barge'	13
Total embodied carbon equivalent (tCO_2e)		1,525

Option 1 would produce an estimated additional **1,525 tCO_2e** bringing the total Bryher carbon to **6,791 tCO_2e** and the overall proposed development total to **11,386 tCO_2e –** which represents a **15%** increase.

Plant Usage estimates

Plant usage (tCO_2e) estimates were estimated using the EA's carbon planning tool and assumed working hours. These hours are assumed through early tender estimates for duration of works.

However, as details relating to construction methodology have not yet been finalised, assumptions have been made as to the type of plant present on-site across the scheme so that carbon estimates can be generated from machinery, plant type and utilisation.

To build upon these assumptions, previous scheme information was reviewed from the Environmental Statement prepared for proposed sea defence works across the island of St Mary's in 2019 which highlighted indicated plant use within the indicative method statement – which included machinery description, fuel and size of the plant. The overall plant usage total embodied carbon equivalent estimate (tCO_2e) is **95.9 tCO_2e.**

Table 9-29: Plant Usage estimates

Sites	Type of works	Plant type	Hours	tCO_2e
Great Popplestone	Raising sea wall	360° Excavators Dumper(s), Miscellaneous site vehicles, Miscellaneous small plant and tools (generator etc.)	312	26.8
Green Bay	Adding GEObag(s)to be covered with reclaimed embankment	360° Excavators, Dumper(s), Roller, Miscellaneous site vehicles, Miscellaneous small plant and tools	240	9.4
Stinking Porth	Construction of revetment and rock	360° Excavators Dumper(s), Miscellaneous site vehicles,	280	24.0

Sites	Type of works	Plant type	Hours	tCO_2e
	armour	Miscellaneous small plant and tools		
Kitchen Porth	Embankment protection using armourstone	360° Excavators Dumper(s), Miscellaneous site vehicles, Miscellaneous small plant and tools	256	22.0
Porth Killier (E)	Rock revetment addition	360° Excavators Dumper(s), Miscellaneous site vehicles, Miscellaneous small plant and tools	64	5.5
Periglis Beach	Implement geocontainers	360° Excavators (small), Dumper(s), Roller, Miscellaneous site vehicles, Miscellaneous small plant and tools	120	3.7
Porth Coose	Geomatting and rock mattress added	360° Excavators (small), Dumper(s), Roller, Miscellaneous site vehicles, Miscellaneous small plant and tools	120	3.7
Lower Town Beach	Fence off area of dunes and implement ramp.	Small Vehicle (Truck), low utilisation	80	1.0
Total embodied carbon equivalent (tCO_2e)				96

9.8 Vulnerability to climate change

9.8.1 Operation (including maintenance): Effect Significance, Mitigation and Residual Effects

Based on the information presented above in the baseline and future baseline, the impacts of each climate hazard on each of the operational sensitive receptors has been assessed. As the methodology explains, the vulnerability of the receptors and the magnitude of effect have both been considered to determine the overall significance of effect.

Table 9-30: Significant assessment of the impacts of climate hazards on operational sensitive receptors

Variable & Climate Hazard		Projected Change	Receptor	Impact	Likelihood	Consequence	Significance
Sea and Precipitation	Storm Surge and Storm Tide	Increase in the height of storm surges.	Repairs and maintenance staff	Flooding could pose risk to repair personnel and maintenance process, including blocking access	Medium	Moderate adverse	Significant
			Machinery and Plant				
			Interdependencies				
			Flood defence assets				
	Current and Waves	Increase in the height of onshore waves	Repairs and maintenance staff	Risk to personnel during high tide	Medium	Moderate adverse	Significant

Variable & Climate Hazard		Projected Change	Receptor	Impact	Likelihood	Consequence	Significance
			Machinery and Plant	Damage to repair materials	Medium	Minor adverse	Not Significant
	Extreme rainfall	Increase in magnitude and frequency of extreme rainfall events	Repairs and maintenance staff	Unsafe working conditions	Medium	Moderate adverse	Significant
			Machinery and Plant	Flooding of repair works and compounds	Medium	Moderate adverse	Significant
			Flood defence assets				
			Interdependencies				
	Extreme temperature events	Increase in magnitude of extreme temperature	Repairs and maintenance staff	Unsafe working conditions	Low	Moderate adverse	Not significant
			Machinery and Plant	Overheating	Medium	Minor adverse	Not Significant
Wind	Gales and extreme wind events	Increase in mean wind speed and more frequent gusts; increased wind loading	Repairs and maintenance staff	Unsafe working conditions (working at height, increased dust, reduced visibility)	Medium	Moderate adverse	Significant
			Machinery and Plant	Increase in dust and particulates	Low	Minor adverse	Not Significant
	Storms (snow, lightning and hail)	Increase in frequency of storms	Repairs and maintenance staff	Unsafe working conditions, particularly for working at height; lost productivity through disruption of operations and loss of access for repair	Medium	Moderate adverse	Significant
			Machinery and Plant	Water and flood damage; collision with storm	Medium	Moderate adverse	Significant

Variable & Climate Hazard	Projected Change	Receptor	Impact	Likelihood	Consequence	Significance
			debris and downed trees; risk			
		Interdependencies	Damage or loss of critical infrastructure	Medium	Moderate adverse	Significant
		Flood defence assets	Damage during maintenance of assets requiring increased repairs	Low	Moderate adverse	Not Significant

9.9 Mitigation and monitoring

Vulnerability to climate change

Following the assessment of significance for the impacts during construction and operation, it is important to determine the potential mitigation measures for the receptors, to limit the impacts from climate hazards. The following section provides an overview of the potential mitigation measures that may be implemented during the construction and operation phase, which may reduce the risk posed by climate hazards. It should be noted that at the time of writing, a contractor has not yet been appointed for the works; therefore, specific mitigation measures are currently unknown. The measures below are proposed based on general best practice.

During the construction phase, the following mitigation measures are proposed to address all of the significant risks identified:

- An emergency plan should be developed. This would include, but not be limited to, the following:
  - Emergency procedures for flooding and storm events, including threshold for cessation of work caused by a climate event.
  - Site layout plan indicating areas of safe access, egress and muster points in the event of a major flood or storm event during site operation.
  - Details of alternative road access to the site should the principal routes be blocked.
  - Use of the Environment Agency Flood Risk Warning Service to provide early warning of flood risk to the construction site and allow preparedness, reducing exposure of site personnel to risks.
  - Contingency plans and accident plans.
  - Staff training in safe working during climate events (flood and storm events)
- Comprehensive method statements and risk assessments for all site activities should be completed.
- The Construction (Design and Management) Regulations (CDM Regulations) 2015 require that as the design of a development progresses, risks are identified and eliminated, and residual risks are reduced and managed.

- Risk assessments and method statements (RAMS) are an effective means of assessing, managing and controlling the health and safety risks associated with storms and adverse weather. The method statement should consider how controls put in place will work in adverse conditions.
- Site configuration to account for potential storm or flooding events

During the operational phase, the proposed mitigation measures are broadly similar to those presented for construction. When any maintenance works are to be completed, the measures proposed for during construction should be followed. Some additional mitigation measures, specific to the proposed developments operation include:

- A full inspection of assets should be completed following any storm/extreme weather event, to check for damage to any of the assets.
- Any damaged assets should be repaired reactively and as quickly as possible to minimise any adverse effects cause from additional extreme/adverse weather.
- Consider materials and repair techniques that maintain the longevity of the assets accounting for climate change impacts
- Follow the guidance set out by South West Water and the Council of the Isles of Scilly in their preliminary communications during a drought event.
- Design infrastructure for resilience to the impact of intense heavy rain. Materials and construction techniques to be designed for longevity of assets for site design life.
- Access and storage design strategy to allow safe access to materials and goods during periods of heavy rain.

Greenhouse Gas assessment

These coastal defence proposals and enhancements are a response to the adverse consequences of a changing climate. Due to this, the mitigation measures for this scheme are limited. As carbon related mitigation has the potential to reduce the standards of protection that the schemes offer – especially where hard engineering is necessary. However, some significant mitigation measures for the scheme should be considered at all stages of the scheme:

- Granite has been chosen as it is the underlying geology for the Isles of Scilly and therefore would be in-keeping with the local aesthetic and geodiversity. However, granite used for the scheme should be as locally sourced as possible - reducing the embodied carbon of the scheme involved in the transport of heavy materials.
- Furthermore, to integrate this mitigation further, the scheme should remain flexible as to the choice of rock within coastal defences – opting for less energy and carbon intensive rock where possible, whilst retaining structural standards.
- Recycled materials should be used where possible e.g., recycled aggregate, aluminium and steel.
- The scheme could trial the usage of low (or non) OPC (Ordinary Portland Cement) concrete in low-risk areas, leading to significant carbon reduction where used.
- Ecological enhancement of coastal engineering structures could be explored, as some passive enhancement techniques may sequester carbon.

9.10 Residual effects

Vulnerability to climate change

Following the inclusion of potential mitigation measures in the assessment, the level of consequence for each of the significant impacts is likely to change, therefore changing the significance score. With the proposed mitigation measures in place, the

following residual effects as a result of climate change resilience are expected. These are outlined below:

Table 9-31: Residual effects during construction

Climate Hazard (Significant)	Receptor	Residual Effect	Residual Significance
Construction			
Storms (snow, lightning and hail)	Tipping barge delivery, Machinery and Plant ,	Minor Adverse: Through the implementation of mitigation, the residual risk to material delivery, machinery and plant should be reduced.	Not Significant
Gales and extreme wind events	Tipping barge delivery	Minor Adverse: Unsafe conditions can be amended through the implementation of mitigation for extreme wind events, alongside taking precautionary measures to pause works if storms present construction and supply risks. This should reduce residual risk to a manageable level for site personnel, including those involved in material delivery process.	Not Significant

Table 9-32: Residual effects during operation

Climate Hazard (Significant)	Receptor	Residual Effect	Residual Significance
Operation			
Storm surge and storm tide	All assets; machinery and plant, repairs and maintenance,	Minor Adverse: The risk significance of storm surges remains high due to coastal location and exposure	Not Significant

Climate Hazard (Significant)	Receptor	Residual Effect	Residual Significance
	flood defence assets and interdependencies	of the sites - with the likelihood of storm surge and tide events remaining high during the lifetime of the project's operations. However, following the recommended measures, including reactive repairs and visual assessment, the overall level of residual risk should be reduced.	
Extreme rainfall	All assets; machinery and plant, repairs and maintenance, flood defence assets and interdependencies	Minor Adverse: Damage resulting from heavy rain events over the lifetime of operations (repair, maintenance) can be mitigated through thorough risk assessment, asset and infrastructure design for durability, accounting for future climate conditions. Therefore, reducing residual risk to a manageable level.	Not Significant
Storms (snow, lightning and hail)	Machinery and Plant, interdependencies and repair and maintenance staff	Minor Adverse: Unsafe working conditions, damage to interdependencies, machinery and plant can be accounted for, with reduced residual risk by employing warning systems and active contingency planning during the operational procedures at the affected sites.	Not Significant
Currents and waves	Repairs and maintenance staff	Minor Adverse: Following adoption of sufficient risk assessment and tidal warnings before operational procedures the risk to	Not Significant

Climate Hazard (Significant)	Receptor	Residual Effect	Residual Significance
		personnel should be manageable, some inherent residual risk remains due to the coastal location of the site.	
Gales and extreme wind events	Repairs and maintenance staff, interdependencies	Minor Adverse: Unsafe conditions for can be mitigated through early warning of extreme wind events alongside other storm warning measures. This should reduce residual risk to a manageable level for site personnel.	Not Significant
Extreme temperature events	Repairs and maintenance staff	Minor Adverse: Residual risk of extreme temperature events can be successfully mitigated through design of systems and contingency planning that accounts for future climate conditions.	Not Significant

Greenhouse Gas Assessment

The projected GHG emissions for the scheme would constitute an increase in emissions from the Isles of Scilly of 152% over the course of the year of 2022 (when construction is expected to occur). IEMA EIA guidance recommends that as contextualising GHG emissions on a global or even national scale is not an effective way of assessing them, but all emissions should be viewed as significant and should be mitigated. It is therefore recommended that the proposals are amended to ensure that:

- Materials required for the proposed defences should be sourced from as close as possible to the developments, in order to minimise transport emissions.
- Utilising alternative, less carbon-intensive, recycled materials where possible.

The negative effects of this development are however arguably outweighed by the need to protect residents, infrastructure and economy of the Isles of Scilly, maintaining the viability of the archipelago as an area to live. The proposed development would have a large, direct, permanent positive impact upon many residents on the Isles. Safeguarding the Isle's continual sustainable development.

9.11 Cumulative contribution to climate change

The cumulative carbon dioxide equivalent emissions resulting from all schemes combined is estimated to be **9,861 tCO_2e.** On a global scale, the effects that these emissions have are negligible, so it is not a useful comparison. Across the 25-year

anticipated design life of the schemes this would represent an increase of **394 tCO_2e to the Isles of Scilly yearly**.

IEMA Guidance (2021) for assessing greenhouse gas emissions and evaluating their significance states that: *'GHG emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant'*. Therefore, to put the impacts of the proposed scheme's GHG emissions into context it is more useful to make regional or local inferences.

According to Office for National Statistics' records on carbon dioxide emissions for UK regions and local authorities, the total CO_2 emissions within the scope of emissions for the Isles of Scilly local authority for 2019 (the most recent year for which records are available) equalled **6.5kt CO_2e**. As a result, the total carbon of the scheme would result in a contribution to the Isles of Scilly district's CO_2 emissions of **152%** of annual emissions. Which would represent an estimated per capita increase of **2.9t CO_2** to **8.79 t CO_2** compared to the 2020 baseline if assigned to a one-year period. (DBEIS, 2022).

Whilst it is acknowledged that any increase is undesirable, this project should not undermine the trajectory towards a carbon-neutral Isles of Scilly. Moreover, upon scheme completion the infrastructure will protect the local community from the effects of climate change.

9.12 Summary of findings

The overall impacts of climate change in respect to the proposed development are likely to include risk from sea-level rise, currents and waves, storm surge, increases in winter rainfall, extreme rainfall, storms, droughts, extreme temperature events, gales and extreme wind events.

During construction, effects are likely to be **not significant**, there are climate hazards that pose some risks, for example, in the delivery of materials (via tipping barge), health and safety of site personnel, risk to construction compounds, damage to materials and risk to machinery and plant. However, due to the short duration of the construction period resulting climate hazard risk is likely to be low. Moreover, through the recommendations and further design iterations, these hazards can be effectively mitigated against to a minor residual level of risk.

During operation, there are significant risks that pose operational issues for repair and maintenance staff, flood defence assets, machinery and plant. Moreover, climate change poses risks to interdependencies, inaccessibility of the site due to cascading risks or damage to receptors such as critical infrastructure, which could obstruct future maintenance, repair and inspection of the proposed schemes (e.g. full inspection of assets should be completed following any storm/extreme weather event, to check for damage to any of the assets – see 9.9.1 - Mitigation and monitoring) . The proposed developments are located close to existing infrastructure networks, consisting of roads, sewerage, water and electricity and telecommunication distribution. If the flood defences fail due to climate hazards this would result in large adverse impacts that cannot be mitigated completely and will result in significant residual impacts.

It is also important to consider that the proposed scheme is itself a response to the consequences of climate change. Therefore, the likely emissions are justified as the scheme is designed to provide resilience to future climate change. Especially wherein the livelihoods, environment and sustainable development of the Isles are at risk.

Climate change is resulting in more extreme weather phenomena and will continue to cause flood events to be more frequent, more severe and less predictable. The potential impact climate change will have on extreme storm events could further exacerbate these issues. Climate change allowances have been integrated into the design of the scheme to adapt to future climate change risks. Additionally, the

mitigation in place should provide resilience for high-impact, low-probability events.

10 Other Construction Related Effects

10.1 Introduction

This Other Construction Related Effects chapter includes discussion and assessment of impacts on receptors arising specifically during the construction phase, which are not considered in each of the other specialist ES topic chapters. Consideration is particularly given to impacts from construction activities including construction traffic, noise, vibration, air quality and light spill. With reference to Schedule 4 of the EIA Regulations this chapter provides where relevant '*an estimate, by type and quantity, of expected residues and emissions (such as water, air, oil and subsoil pollution, noise, vibration, light, heat, radiation*[1]*) and quantities and types of waste produced during the construction phase'.*

Where possible, an iterative approach to avoiding and mitigating construction related effects has been employed, to minimise the potential for significant environmental effects to arise during construction. This assessment has been used to inform an outline CEMP, provided in Appendix 2.2.

10.2 Assessment Methodology & Assessment Criteria

10.2.1 Construction Traffic

Assessment of construction traffic has been undertaken using the Institute of Environmental Assessment's Guidelines for the Environmental Assessment of Road Traffic (IEA, 1993) (now the Institute of Environmental Management and Assessment). The guidelines provide a basis for a comprehensive and consistent approach to the appraisal of traffic and transport impacts.

The volume and type of traffic differ depending on the different stages of a project. Due to the nature of the proposed development, there will be no traffic movements associated with the operational phase. Therefore, consideration has only been given to traffic associated with the construction phase.

In accordance with the guidance, issues including severance, driver delay, pedestrian amenity and delay, and accidents and safety associated with the proposed development have been considered and are outlined within this chapter.

The guidance states that regarding environmental impacts, it is recommended as a starting point that a 30% change in traffic flow represents a reasonable threshold for including a highway link within the assessment. Where there are major changes in the composition of traffic flow, for example a much greater flow of HGVs, a lower threshold may be appropriate. In sensitive areas, a lower threshold of 10% is recommended.

In the absence of baseline traffic data for the islands of Bryher, St Agnes and St Martin's, the percentage increase for traffic flows (including number of HGVs) cannot accurately be determined. As a result, all of the roads/tracks covered by the proposed access routes have been included in the assessment of construction traffic.

The assessment of environmental impacts of traffic requires determination of existing and forecast traffic levels and characteristics and consideration of the sensitivity of a road or the immediate area through which it passes. This sensitivity can be defined by the type of user groups who may use them, with vulnerable groups including

1 As this EIA is assessing impacts of a coastal defence scheme, heat and radiation will not be created during either construction or operation, and have therefore not been assessed in the chapter.

elderly residents and children. It is also necessary to consider footpath and cycle route networks that use or cross roads within the study area.

The assessment of the impact of construction traffic involves the prediction of the magnitude of impact.

The magnitude of traffic impacts is considered to be based on the percentage increase in traffic volumes as a result of the proposed development, including changes in type of traffic.

The IEA guidelines identify thresholds for impact magnitude on severance and mitigation based on percentage changes in traffic levels. The magnitude of impacts arising from the percentage increase in traffic volumes (both traffic flow and heavy goods vehicle traffic flow) is categorised as follows:

- Major: Above 90% increase in the existing traffic/HGV levels
- Moderate: Between 60% and 90% increase in existing traffic/HGV levels
- Minor: Between 30% and 60% increase in existing traffic/HGV levels; and
- Negligible: Fewer than 30% increase in existing traffic/HGV levels.

The significance of effect of construction traffic will then be assessed on the basis of the magnitude, intensity or irreversibility of impacts versus the value, sensitivity or importance of the impacted environmental resource or receptor. This will be based on Table 3-4 presented in Chapter 3: EIA Method of Assessment.

10.2.2 Air Quality

A construction dust assessment has been undertaken using the Institute of Air Quality Management Guidance on the Assessment of Dust from Demolition and Construction (2014), to determine whether air quality impacts are likely to arise from the construction of the proposed development. Under the IAQM guidance, where there are existing human receptors within 350m or ecological receptors within 50m of the boundary of the site, an assessment is required to determine potential dust impacts.

The assessment then determines the magnitude of dust impact from the works associated with earthworks, and other construction activities. Vehicle tracking out of site is also assessed, this considers the impact of the transport of dust and dirt from the construction site onto the public road network, where it may be deposited and then re-suspended by vehicles using the network. The approach taken to the assessment of dust impacts is a risk assessment, where risk of impacts from dust is identified using Table 10-1 and Table 10-2, which compared with the sensitivity of receptors is used to determine the best practicable means that should be recommended to reduce the risk of dust impacts.

The matrix of significance of effects scoring terms provided in Table 10-1, has been used to define the resulting significance of effect of potential dust on sensitive receptors. Where the significance of effect scoring term is split (i.e. slight or moderate), then the location of sensitive receptors in relation to the prevailing wind direction (with reference to Figure 10-1) has been used to determine which significance score is most appropriate.

Table 10-1 Sensitivity of the area around the site to dust soiling impacts on people and property (IAQM, 2014)

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)[c]			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 10-2 Sensitivity of the area around the site to dust soiling impacts on ecological receptors (IAQM, 2014)

Receptor Sensitivity	Distance from the Source (m)[c]	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

10.2.3 Noise & Vibration

An indicative assessment of the likely noise impacts associated with construction activities to surrounding sensitive receptors was undertaken using the methodology contained within BS 5228 Code of practice for noise and vibration control on construction and open sites Part 1: Noise. Annex E of BS 5228 recommends that:

'Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut. Noise levels, between 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the boundary site should not exceed 70 decibels in rural, suburban and urban areas away from main road traffic and industrial noise. This limit is for daytime working outside living rooms and offices. In noise-sensitive locations, when working outside normal hours – the allowable noise levels from building sites will be less: such as the reduced values given in the contract specification or as advised by an Environmental Health Officer (a reduction of 10 decibels may often be appropriate).'

Specific details relating to the plant requirements for the construction of the proposed development are not currently available and have therefore been assumed. Typical noise levels for the proposed construction activities based on this plant, as provided in BS 5228 (summarised in Table 10-3), have been used as a baseline for noise impacts on receptors within close proximity to the works. Where individual sensitive receptors are located approximately 10m from the construction site boundary, there is the potential for the 70dB recommended limit to be exceeded on the basis of the typical noise levels. BS 5228 also provides typical noise reductions that can be achieved through best practicable means, and so where an impact is identified on a specific receptor, consideration can be given to effectively reducing the impact through best practicable means.

Table 10-3: Typical A-weighted sound pressure levels from construction activities at 10m

Construction Activity	A-weighted sound pressure level at 10m
20 tonne excavator general site activities	71dB
6 tonne dumper general site activities	73dB
14 tonne wheeled excavator general site activities	71dB

Construction vibration is difficult to predict, however, BS 5228 Code of construction practice for noise and vibration control on construction and open sites Part 2: Vibration also provides guidance on determining whether construction vibration impacts are likely to affect nearby receptors, by providing distances from typical construction activities at which vibration would be noticeable. This identifies that for most people, the threshold of vibration perceptibility is between 0.14 and 0.3 mms^{-1} PPV, which for excavation works is typically noticeable to sensitive receptors at a distance of 15 to 20m. This guidance has been used as a basis for predicting the impact of vibration from the movement of rock armour.

Consideration will also be given to impacts on noise and vibration levels associated with the movement of construction traffic along access routes. Existing and forecast traffic noise levels are greatly influenced by the volume of traffic, percentage of heavy goods and distance from the source. BS 5228 outlines that the A-weighted sound pressure level at 10m for a 23-tonne articulated dumper truck with tipping fill is 74dB. As a result, recommended noise levels for receptors within 10m of access routes would be exceeded by construction vehicles.

Traffic induced vibration is a low frequency disturbance which can be transmitted through the air or ground. Air-borne vibration is largely caused by the engine and exhaust of the vehicle, whereas ground-borne vibration is from the movement of wheels on the road surface. The threshold of vibration perceptibility contained within BS 5228 Part 2 has been used as a basis for predicting the impact of vibration from heavy goods vehicles. It is considered that a vibration level 0.3mms^{-1} PPV may be perceptible in residential environments, and a vibration level of 1.0mms^{-1} PPV would likely cause complaint in residential environments but could be tolerated if prior warning and explanation has been given to residents. The movement of construction vehicles will generate intermittent and transient vibrations and it is not anticipated that the movement of HGVs would generate levels of vibration at receptors that would exceed tolerable levels. However, given the proximity of some receptors to the access route, there is potential that vibration impacts could cause complaints within the closest receptors (within 20m).

As a result, noise and vibration effects from construction traffic has been considered for receptors within 20m of access routes.

10.2.4 Light Spill

Based on the location and nature of the proposed works, it is assumed that all construction works will be undertaken during daylight hours. As a result, it is assumed

that artificial lighting will not be required and therefore assessment of light spill has not been undertaken and it is not considered further within this assessment.

10.3 Baseline Conditions

10.3.1 Traffic

Baseline traffic counts by the Department for Traffic are not available for Bryher, St Agnes, and St Martin's. Most roads are not public highways but are maintained by the Duchy of Cornwall. However, most of the roads on are dirt tracks and sandy/grassy coastal paths, with some concreted main roads through the settlements. It is anecdotally known that vehicle usage is very low across the off-islands, with roads and tracks used by farm vehicles and a small number of cars.

The proposed construction access routes utilise a combination of existing paved roads and tracks. These roads and tracks are all single lane, with no street lighting. They are typically shared with pedestrians and cyclists.

Road safety is generally considered to be good across the islands of Bryher, St Agnes and St Martin's; road safety collision statistics have been obtained from the Crashmap website (www.crashmap.co.uk) which show that there have not been any collisions that resulted in a personal accident and which were reported to the police in the last 20 years.

10.3.2 Air quality

Air quality is not routinely monitored on the Isles of Scilly, but is generally considered to be exceptionally good, given its aspect within the Atlantic Ocean 40 km off the UK mainland. The Department for Environment Food and Rural Affairs (Defra's) most recent release on air quality, Air Pollution in the UK 2020, sets out the airborne concentrations of pollutants on the Isles of Scilly are well below national air quality objectives (Table 10-4). As a result, there are no Local Air Quality Management areas on the Isles of Scilly.

Table 10-4 Airborne Concentrations of pollutants on the Isles of Scilly

Pollutant	Airborne concentrations (µg m^{-3}) and National Air Quality Objective Threshold (in brackets)
Sulphur dioxide (SO_2)	≤10 (20)
Nitrogen dioxide (NO_2)	≤10 (40)
Particulate Matter 10 (PM10)	≤13 (40)
Particulate Matter 2.5 (PM2.5)	≤5 (40)
Carbon Monoxide (CO)	Not Stated – assumed to be well within national air quality objective (10)

Construction activities can generate significant quantities of airborne particulate matter (dust) because of plant movements on bare ground, movement and tipping of material, as well as the exhaust of diesel-powered machinery. These activities have the potential to cause soiling to local properties and vehicles. It is also recognised that in coastal areas, salt spray gives rise to elevated levels of fine particulate matter. Given this, there is the potential for construction works to exacerbate dust impacts.

The predominant wind direction on the Isles of Scilly is south westerly, as shown on Figure 10-1.

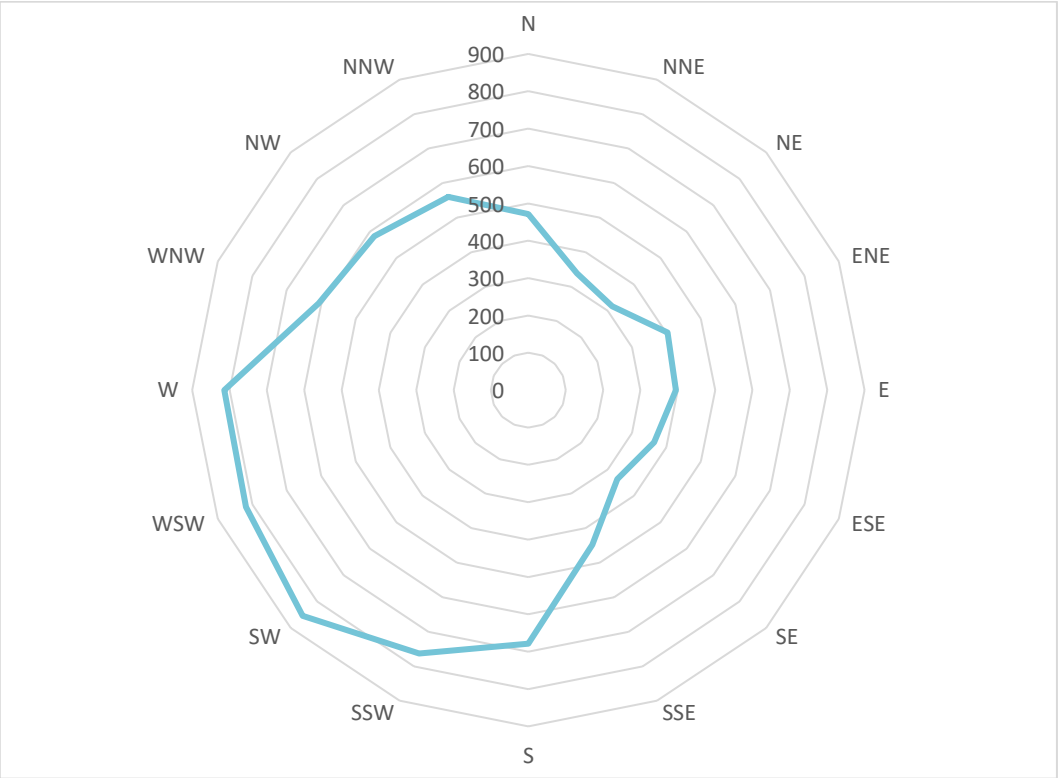

Figure 10-1 Wind rose for the Isles of Scilly (y axis refers to average number of hours per year) (adapted from Meteoblue, 2022).

10.3.3 Noise and Vibration

The Council of the Isles of Scilly does not regularly measure noise levels on the Isles of Scilly, but they are generally considered tranquil areas, which attract many visitors.

Anthropogenic background noise across the islands, mostly around the quays and main roads, is generally from boat and road traffic and occasional use of jet boats/skis.

10.4 Construction Logistics

This section presents an overview of the construction logistics proposed at each site to inform the assessment of potential impacts and significant effects.

10.4.1 Construction vehicle journeys

As part of the construction logistics, consideration has been given to likely construction traffic.

It is intended that materials and machinery will be delivered to site where they will be used via barge, using the landing sites on the beaches at these sites. Where it is not feasible for materials to be delivered to the site where they will be used, they will instead be landed at the nearest accessible site and transported by road. This will reduce the transportation of large volumes of material around the islands.

It cannot currently be determined whether construction materials can be landed at each of the sites, therefore, the construction vehicle journeys have been calculated based on the assumption that all must be delivered by road to present a worst case scenario.

It has been assumed that construction materials will be delivered to site using a standard 20-tonne truck. Based on the quantities of materials required for each of the proposed schemes, consideration has been given to the likely number of standard 20-tonne truck vehicle movements associated with the construction phase of each of the proposed schemes.

Table 10-5 outlines the total number of 20-tonne truck journeys required for each of the proposed schemes, based on the total construction material required to be transported, along with a daily average number of 20-tonne truck journeys based on the anticipated construction duration of each of the proposed schemes. Further discussion of these vehicle journeys is included in the respective construction logistics section for each site below.

Table 10-5: Likely worst-case number of construction vehicle journeys per site (if road transport required)

Proposed scheme	Construction duration (days)	Total construction material (tonnes)	20 tonne truck journeys	Daily average journeys
Bryher				
Great Popplestone	15	11 (if on site rock used) 2100 (if rock imported)	1 105	<1 7
Stinking Porth	10	3969	199	20
Great Porth (Great Par) North of Great Carn	15	897	45	3
Green Bay	5	0.2	1	<1
Kitchen Porth	3	507	25	8
St Agnes				
Porth Killier	10	2382	119	12
Porth Coose	15	1239	62	4
Periglis	28	2152	108	4
St Martin's				
Lower Town Beach	4	11	1	<1

10.4.2 Construction logistics

An outline construction methodology has been prepared for the proposed works and is summarised in Section 2.7 of Chapter 2: The Proposed Development of this Environmental Statement.

The following descriptions provide an outline of the likely construction requirements across each of the islands, presented for the purpose of the construction effects assessment.

Bryher

Construction of the proposed schemes across the island of Bryher will be facilitated through the access routes, landing site, temporary storage areas and forward working area illustrated on Figure 2-26 of Chapter 2 of this Environmental Statement.

A landing site is located at each of the five sites to allow materials to be brought directly into the beaches where they will be used, where feasible. Landing craft will moor at the landing sites at mid to high tide with materials offloaded onto the foreshore and moved to temporary storage areas. Any construction materials that cannot be landed at the site where they will be used will instead be landed at the nearest accessible site. Materials will be stored in forward working area or in the adjacent temporary storage areas at the respective sites prior to their use.

It is anticipated that it will take a total of 48 working days to complete the construction of the five schemes across the island of Bryher.

A programme of construction works for the island of Bryher is outlined in Table 10-4 below, this is subject to obtaining the necessary permissions and licences. Most of the works will be undertaken separately, with works completed at one site before moving on to the next. However, there will be some overlap between the construction works at Great Popplestone and Kitchen Porth. Whilst works are ongoing at Great Popplestone to raise the existing sea wall, the rock revetment at Kitchen Porth will be built. Following this, the contractor will drop back to complete the rock revetment construction at Great Popplestone once the masons have completed.

Table 10-4: Programme of construction works on Bryher

Site	Duration	Start	End
Great Porth (Great Par) North of Great Carn	15 days	12/04/23	02/05/23
Stinking Porth	10 days	04/05/23	17/05/23
Great Popplestone	15 days	22/05/23	09/06/23
Kitchen Porth	3 days	24/05/23	26/05/23
Green Bay	5 days	12/06/23	16/06/23

Great Popplestone

Great Popplestone is in the west of Bryher which is a relatively remote area of the island. It is primarily surrounded by agricultural land and some small pockets of commercial properties to the southeast. There is the Great Pool approximately 25m south of the site which is a primary source of freshwater. The permissive footpath between Great Popplestone and Stinking Porth will be utilised as an access track.

A construction working area would be established on Great Popplestone beach for the duration of the construction works. Due to the movement of materials from the north of the beach to the south, it is considered likely that the beach would need to be closed to the public, potentially for the 15-day duration of the works.

It is intended that all materials will be transported to the Great Popplestone site using the landing site on Great Popplestone beach. If it is not feasible to do this, materials will be delivered to the nearest accessible site and transported via road using New Road and an existing access track, or an alternative access track which run across the island to the north of Great Pool.

There are currently two options under consideration for Great Popplestone: movement of existing rock material in Great Popplestone North for use at Great

Popplestone South, or import of required material. If transport via road is required, if existing rock were to be used from Great Popplestone North, a total of 1 x 20-tonne truck journeys would be required to deliver the construction materials. However, if rock were to be imported for use at Great Popplestone, a total of 7 x 20-tonne truck journeys would be required to deliver the materials. Where material needs to be stored on site prior to use, it will be stored in the adjacent forward working area.

Assumptions have been made regarding the types of plant that are likely to be used during the construction work. It is assumed that a 20-tonne 360° excavator and a 6-tonne dumper truck will be used to move material around the site. This would be kept on site for the duration of the construction and secured in Heras fencing when not in use.

It is anticipated that all arisings will be reused on site where possible. However, any excess material could require offsite disposal.

Stinking Porth construction logistics

Stinking Porth is located on the west coast of Bryher, approximately 60m southwest of Great Pool and from the water abstraction boreholes across the water meadow surrounding the pool. It is primarily surrounded by agricultural land with the Old School House and several individual swellings located to the east of the site, along with the Hell Bay Hotel. The track running between Great Popplestone and Great Porth (Great Par) will be utilised as an access track.

A construction working area would be established on Stinking Porth beach for the duration of the construction works. Due to the movement of materials including rock armour, it is considered likely that the beach would need to be closed to the public, potentially for the 10-day duration of the works.

It is intended that all materials, including rock armour, will be transported to the Stinking Porth site via barge using the landing site on Stinking Porth beach. If it is not feasible to do this, materials will be delivered to the nearest accessible site and transported via road using New Road and an existing access track. An alternative access track is also being considered which would run across the island to the north of Great Pool.

If transport via road is required, based on the material required for the construction of the proposed scheme, a total of 199 x 20-tonne truck journeys will be required to deliver the construction materials. This would be an average of 20 x 20-tonne truck journeys per day for the duration of the construction works. It has been assumed that these deliveries of materials will be staggered. Where material needs to be stored on site prior to use, it will be stored in the adjacent temporary storage area.

Assumptions have been made regarding the types of plant that are likely to be used during the construction work. It is assumed that a 20-tonne 360° excavator and 6-tonne dumper truck will be used to move material around the site. This would be kept on site for the duration of the construction and secured in Heras fencing when not in use.

It is anticipated that all arisings will be reused on site where possible. However, any excess material could require offsite disposal.

Great Porth (Great Par) North of Great Carn construction logistics

Great Porth (Great Par) North of Great Carn is located on the western side of Bryher. Immediately north of Great Porth (Great Par) North of Great Carn is the Old School House. There are several commercial (accommodation) properties located to the east of the site including Hell Bay Hotel and Bank Cottage self-catering accommodation. Further south along the bay, the Richard Pearce Artist Studio is located immediately east. The track running behind Great Porth (Great Par) will be utilised as an access track.

A construction working area would be established on Great Porth (Great Par) North of Great Carn beach for the duration of the construction works. Due to the movement of materials including rock armour, it is considered likely that the beach would need to be closed to the public, potentially for the 15-day duration of the works.

It is intended that all materials, including rock armour, will be transported to the Great Porth (Great Par) North of Great Carn site via barge using the landing site on the beach at Great Porth (Great Par) North of Great Carn. If it is not feasible to do this, materials will be delivered to the nearest accessible site and transported via road using New Road.

If transport via road is required, based on the material required for the construction of the proposed scheme, a total of 45 x 20-tonne truck journeys will be required to deliver the construction materials. This would be an average of 3 x 20-tonne truck journey per day for the duration of the construction works. It has been assumed that these deliveries of materials will be staggered. Where material needs to be stored on site prior to use, it will be stored within the adjacent temporary storage area.

Assumptions have been made regarding the types of plant that are likely to be used during the construction work. It is assumed that a 20-tonne 360° excavator and 6-tonne dumper truck will be used to move material around the site. This would be kept on site for the duration of the construction and secured in Heras fencing when not in use.

It is anticipated that all arisings will be reused on site where possible. However, any excess material could require offsite disposal.

Green Bay construction logistics

Green Bay is located on the eastern side of Bryher, south of Church Quay. Within the immediate vicinity of Green Bay is a boat yard. To the northwest of the site are some commercial businesses offering self-catered accommodation. Land use to the west of the site is primarily agricultural land and to the south, the area is characterised as heathland.

A construction working area would be established on Green Bay beach for the duration of the construction works. Due to the movement of materials it is considered likely that a small area of the beach would need to be closed to the public, potentially for the 5-day duration of the works.

It is intended that all materials will be transported to the Green Bay site via barge using the landing site on the beach at Green Bay. If it is not feasible to do this, materials will be delivered to the nearest accessible site and transported via road and across the beach from the south of Church Quay to the boat yard where an existing on land track will be used. As the access track is reliant on tidal patterns, all intertidal works including vehicle movements on the beach, will cease three hours prior to the anticipated high tide time.

If transport via road is required, based on the materials required for the construction of the proposed scheme, only 1 x 20-tonne truck journey will be required to deliver the construction materials over the 30-day construction period. Where material needs to be stored on site prior to use, it will be stored within a nearby temporary storage area.

Assumptions have been made regarding the types of plant that are likely to be used during the construction work. It is assumed that a 20-tonne 360° excavator and 6-tonne dumper truck will be used to move material around the site. This would be kept on site for the duration of the construction and secured in Heras fencing when not in use.

It is anticipated that all arisings will be reused on site where possible. However, any excess material could require offsite disposal.

Kitchen Porth construction logistics

Kitchen Porth is located on the northeast side of the island. Within approximately 50m of the proposed scheme is the Harbour View and Fraggle Rock Bar, with Bryher Post Office located approximately 12m east. To the north-west of the site is largely unused heathland, and to the south-west is a campsite and agricultural land. To the south there is private accommodation and a seafood restaurant with some larger agricultural infrastructure.

A construction working area would be established at Kitchen Porth for the duration of the construction works. Due to the movement of materials around the beach, it is considered likely that the southern end of Kitchen Porth beach where works are proposed would be closed for the 3-day duration of the works.

It is intended that all materials will be transported to the Kitchen Porth site via barge using the landing site on the beach at Kitchen Porth. If it is not feasible to do this, materials will be delivered to the nearest accessible site and transported via road using the existing road running through The Town and northwards towards Kitchen Porth.

If transport via road is required, based on the material required for the construction of the proposed scheme, a total of 25 x 20-tonne truck journeys will be required to deliver the construction materials. This would be an average 8 x 20-tonne truck journey per day for the duration of the construction works. It has been assumed that these deliveries of materials will be staggered. Where material needs to be stored on site prior to use, it will be stored within a nearby temporary storage area.

Assumptions have been made regarding the types of plant that are likely to be used during the construction work. It is assumed that a 20-tonne 360° excavator and 6-tonne dumper truck will be used to move material around the site, including moving the 1 to 3 tonne armourstone into position. This would be kept on site for the duration of the construction and secured in Heras fencing when not in use.

It is anticipated that all arisings will be reused on site where possible. However, any excess material could require offsite disposal.

St Agnes

Construction of the proposed schemes across the island of St Agnes will be facilitated through the access routes, landing sites, temporary storage areas, and forward working area illustrated on Figure 2-27 of Chapter 2 of this Environmental Statement.

Landing of materials at Porthconger Quay is constrained by moorings on the quay being rated to 55 tonne loads maximum. Since the landing craft will likely have a larger mooring load than this, the only way for Porthconger Quay to be used for the landing craft is to have 'spud' (dropdown) legs that it can drop on the seaward side and rest against the quay to stabilise the vessel while uploading. An alternative landing location under consideration is located at the quay adjacent to Turks Head.

A landing site is located at each of the sites to allow materials to be brought directly into the beaches where they will be used, where feasible. Landing craft will moor at the landing sites at mid to high tide with materials offloaded onto the foreshore and moved to temporary storage areas. Any construction materials that cannot be landed at the site where they will be used will instead be landed at the nearest accessible site. Materials will be stored in the forward working area or in the temporary storage areas the respective sites prior to their use.

It is anticipated that it will take a total of 53 working days to complete the construction of the three schemes across the island of St Agnes. A programme of construction works on St Agnes is outlined in the table below. This is subject to obtaining the necessary permissions and licences. Works will not be undertaken simultaneously; works will instead be completed at one site before moving on to the next.

Table 10-5: Programme of construction works on St Agnes

Site	Duration	Start	End
Periglis	28 days	04/01/23	10/02/23
Porth Coose	15 days	13/02/23	03/03/23
Porth Killier	10 days	06/03/23	17/03/23

Porth Killier construction logistics

Porth Killier is located on the northern coast of the island of St Agnes. Immediately south of the Porth Killier site is an area of agricultural land and a track which leads to Porthconger Quay. There are some larger buildings adjacent to the agricultural land along Old Lane which are likely associated with agricultural land to the west.

A construction working area would be established adjacent to the site for the duration of the construction works. Due to the movement of materials, including rock armour, it is considered likely that the area around the sea wall would be closed to the public, potentially for the 10-day duration of the works.

It is intended that all materials, including rock armour, will be transported to the site via barge using the landing site on the beach at Porth Killier. If it is not feasible to do this, materials will be delivered to the nearest accessible site and transported via road using the existing access track, or the alternative access track during wet periods.

If transport via road is required, it is assumed that materials, including rock armour, will be transported using a 20-tonne truck, or alternative small vehicle if required due to the width of the track in that location. Based on the material required for the construction of the proposed scheme, a total of 119 x 20-tonne truck journeys will be required to deliver the construction materials. This would be an average of 12 x 20-tonne truck journeys per day for the duration of the construction works. It has been assumed that these deliveries of materials will be staggered. Where material needs to be stored on site prior to use, it will be stored within the adjacent temporary storage area.

Assumptions have been made regarding the types of plant that are likely to be used during the construction work. It is assumed that a 20-tonne 360° excavator and 6-tonne dumper truck will be used to move material around the site. This would be kept on site for the duration of the construction works and secured in Heras fencing when not in use.

It is anticipated that all arisings will be reused on site where possible. However, any excess material could require offsite disposal.

Porth Coose construction logistics

Porth Coose is located on the northwest coast of St Agnes, approximately 40m northwest of Big Pool. The areas surrounding Big Pool, behind Porth Coose, are used as a cricket ground with some visible access paths and an area of agricultural land towards the northeast.

A construction working area would be established at the site for the duration of the construction works. Due to the movement of materials around the site, it is considered likely that the area of beach around the proposed works would be closed to the public, potentially for the 15-day duration of the works.

It is intended that all construction materials would be delivered to site via barge using the landing site on the adjacent Periglis beach. If it is not feasible to do this, materials will be delivered to the nearest accessible site and transported via road using the access track which follows an existing road and track, or via the alternative access route during wet periods.

If transport via road is required, it is assumed that materials will be transported using a 20-tonne truck, or alternative smaller vehicle if required due to the width of the access track.

Based on the material required for the construction of the proposed scheme, a total of 62 x 20-tonne truck journeys will be required to deliver the construction materials. This would be an average of 4 x 20-tonne truck journeys per day for the duration of the construction works. It has been assumed that these deliveries of materials will be staggered. Where material needs to be stored on site prior to use, it will be stored within the temporary storage area located between Porth Coose and Periglis.

Assumptions have been made regarding the types of plant that are likely to be used during the construction work. It is assumed that a 20-tonne 360° excavator and 6-tonne dumper truck will be used to move material around the site. This would be kept on site for the duration of the construction works and secured in Heras fencing when not in use.

Site won material from the excavation will be used to tie into existing ground. It is assumed that any excess material will be moved to the spare sand storage area to the northeast. However, any additional excess material could require offsite disposal.

Periglis construction logistics

Periglis is located on the northwest coast of St Agnes, approximately 70m west of Big Pool. To the south of the beach is Lower Town including a kayak and canoe rental facility, a boat ramp and St Agnes Church. Along Old Lane, stretching to the east of the site is a boat yard, the St Agnes community hall, electricity substation and agricultural land.

A construction working area would be established at the site for the duration of the construction works. Due to the movement of materials around the site, it is considered likely that the area of beach around the proposed works would be closed to the public, potentially for the 28-day duration of the works.

It is intended that all materials will be transported to site by barge using the landing site located on the beach at Periglis. If it is not feasible to do this, materials will be delivered to the nearest accessible site and transported via road using the access track which follows an existing road and track, or via the alternative access route during wet periods.

If transport via road is required, it is assumed that materials will be transported using a 20-tonne truck, or alternative smaller vehicle if required due to the width of the access track.

Based on the material required for the construction of the proposed scheme, a total of 108 x 20-tonne truck journeys will be required to deliver the construction materials. This would be an average of 4 x 20-tonne truck journeys per day for the duration of the construction works. It has been assumed that these deliveries of materials will be staggered. Where material needs to be stored on site prior to use, it will be stored within the adjacent temporary storage area located between Periglis and Porth Coose.

Assumptions have been made regarding the types of plant that are likely to be used during the construction work. It is assumed that a 20-tonne 360° excavator and 6-tonne dumper truck will be used to move material around the site. This would be kept

on site for the duration of the construction works and secured in Heras fencing when not in use.

Site won material from the excavation will be used to tie into existing ground. It is assumed that any excess material will be moved to the spare sand storage area to the northeast. However, any additional excess material could require offsite disposal.

St Martin's

Construction of the proposed scheme on the island of St Martin's will be facilitated through the access route illustrated on Figure 2-28 of Chapter 2 of this Environmental Statement.

Lower Town Beach logistics

The construction of the proposed scheme on the island of St Martin's will be undertaken over approximately 4 days, as outlined below. This is subject to obtaining the necessary permissions and licences.

Table 10-6: Programme of construction works on St Martin's

Site	Duration	Start	End
Lower Town Beach	4 days	05/06/23	08/06/23

Lower Town Beach is located on the southwest coast of St Martin's. To the north of the site there are several commercial properties, including a restaurant and accommodation facilities. To the east of the site is a campsite along the coast and a stretch of agricultural land.

Construction materials will be transported to St Martin's by an appropriate vessel which will arrive at the landing site on Lower Town Beach. If it is not feasible to do this, materials will be delivered to the nearest accessible site and transported via road using the access track. Construction materials will be offloaded and transported to the temporary storage area behind the beach. It is anticipated that deliveries will be staggered. Any intertidal works will cease three hours prior to the anticipated high tide time.

Due to the movement of materials around the site, it is considered likely that the area of the beach around the proposed works would be closed to the public for the duration of the works.

If transport via road is required, it is assumed that materials will be transported using a 20-tonne truck, or alternative small vehicle if required due to the width of the access track. Based on the material required for the construction of the proposed scheme, only 1 x 20-tonne truck journey would be required to deliver the materials.

Assumptions have been made regarding the types of plant that are likely to be used during the construction work. It is assumed that a 20-tonne 360° excavator and 6-tonne dumper truck will be used to move material around the site. This would be kept on site for the duration of the construction works and secured in Heras fencing when not in use.

It is anticipated that all arisings will be reused on site where possible. However, any excess material could require offsite disposal.

10.5 Potential Impacts & Significant Effects

Based on the current baseline conditions and the construction logistics for each of the sites, this section presents an overview of the potential impacts and significant effects of construction of the nine proposed schemes using the matrix of significance of effects scoring terms provided in Table 3-4.

It must be noted that this section presents a worst-case scenario since it is intended that all materials will be delivered directly to the beaches where they will be used using the respective landing sites. The potential impacts and significant effects presented here outline a worst-case scenario whereby transport by road is required.

10.5.1 Construction traffic

In the absence of baseline traffic data for the islands of Bryher, St Agnes and St Martin's, all of the roads/tracks covered by the proposed access routes have been included in the assessment of construction traffic. Based on anecdotal evidence of in infrequent use of roads across the islands of Bryher, St Agnes and St Martin's, all of the proposed access routes have been assessed as being of high sensitivity to change.

As indicated by the construction programme outlined in Tables 10-4 to 10-6, the proposed schemes will not be constructed simultaneously, rather each will be constructed in turn. An exception to this is the construction works at Great Popplestone and Kitchen Porth. Whilst works are ongoing at Great Popplestone to raise the existing sea wall, the rock revetment at Kitchen Porth will be built. Following this, the contractor will drop back to complete the rock revetment construction at Great Popplestone once the masons have completed. As a result, impacts associated with the construction of each site are considered both separately and cumulatively.

The average number of daily vehicle journeys required for the construction of each of the proposed schemes is outlined below. This is an outline of the worst case scenario whereby materials and machinery cannot be delivered to the sites where they will be used directly using the beach landing sites, and transport via road is required.

It is assumed that all vehicle journeys will be staggered throughout the day and there will not be any road closures required to facilitate the proposed works. It is therefore assumed that the presence of additional construction vehicles using the road network will cause **negligible** effects on severance and delays for drivers and pedestrians during the construction period.

Pedestrian activity surrounding all of the sites is largely recreational and given the nature of the roads and access tracks across the islands of Bryher, St Agnes and St Martin's, they are largely already shared use tracks for pedestrians, cyclists and vehicles. The anticipated volume of daily traffic is low, and therefore the impact of construction traffic on pedestrian amenity, fear and intimidation across all of the proposed sites is considered to be **temporary slight adverse.**

Bryher

The proposed access track across the island of Bryher utilises New Road as a key access route across the island of Bryher. An alternative access route to the western side of the island is being considered passing along a track south of the tennis courts. Access to the sites on the eastern side of Bryher is proposed via existing roads to the north, and the beach to the south.

New Road is used as a key access route for people travelling between the eastern and western sides of the island. It is used by vehicles, cyclists and vulnerable pedestrians including elderly residents and children. It is largely surrounded by fields with several residential and commercial properties, including the Hell Bay Hotel, located at the western extent. New Road is therefore considered to be of high sensitivity.

Great Popplestone

As outlined in Table 10-5 above, it is assumed that the construction of the proposed works at the Great Popplestone site will only require 1 x 20-tonne truck journeys for

the 15-day duration of the works if existing rock were to be used from Great Popplestone North, and a total of 105 x 20-tonne truck journeys if rock were to be imported.

The proposed access route to the site will either be via New Road connecting to a track running west of Great Pool, or via an alternative access route running northwest of New Road between fields, south of the tennis courts. Given the use of both of these access routes by cyclists and vulnerable pedestrians, their sensitivity is considered to be high.

In the absence of baseline traffic flows along the access route, the percentage increase cannot accurately be determined. However, based on anecdotal evidence of the use of the roads across Bryher, and based on the IEA guidance, it is assumed that the one truck journey associated with the construction of the proposed scheme at Great Popplestone would be negligible. However, if materials were to be imported and 107 truck journeys were required, it is assumed that the truck journeys would equate to a major increase.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Great Popplestone site is assessed as **neutral (not significant)** if rocks from Great Popplestone North are used.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Great Popplestone site is assessed as **temporary large adverse** if rock is imported from elsewhere.

Stinking Porth

As outlined in Table 10-5 above, it is assumed that the construction of the proposed works at the Stinking Porth site will require 199 x 20-tonne truck journeys for the 10-day duration of the works, equating to an average of 20 journeys per day.

The proposed access route to the site will either be via New Road connecting to a track running west of Great Pool, or via an alternative access route running northwest of New Road between fields, south of the tennis courts and west around Great pool. Given the use of both of these access routes by cyclists and vulnerable pedestrians, their sensitivity is considered to be high.

In the absence of baseline traffic flows along the access route, the percentage increase cannot accurately be determined. However, based on anecdotal evidence of the use of the roads across Bryher, and based on the IEA guidance, it is assumed that the truck journeys associated with the construction of the proposed scheme at Stinking Porth would equate to a major increase.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Stinking Porth site is assessed **temporary large adverse.**

Great Porth (Great Par) North of Great Carn

As outlined in Table 10-5 above, it is assumed that the construction of the proposed works at the Great Porth (Great Par) North of Great Carn site will require 45 x 20-tonne truck journeys for the 15-day duration of the works, equating to an average of three journeys per day.

The proposed access route to the site will be via New Road, which is considered to be of high sensitivity.

In the absence of baseline traffic flows along the access route, the percentage increase cannot accurately be determined. However, based on anecdotal evidence of the use of the roads across Bryher, and based on the IEA guidance, it is assumed that the truck journeys associated with the construction of the proposed scheme at Great Porth (Great Par) North of Great Carn would equate to a moderate increase.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Great Porth (Great Par) North of Great Carn site is assessed as **temporary large adverse.**

Green Bay

As outlined in Table 10-5 above, it is assumed that the construction of the proposed works at the Green Bay site will require one truck journey for the 5-day duration of the works.

The proposed access route to the site will be from Church Quay across the beach of Green Bay. Given the use of the beach by pedestrians, it is considered to be of high sensitivity.

It is assumed that baseline traffic flows are very low along this access route since it is a publicly accessible beach. However, it is assumed that the one truck journey associated with the construction of the proposed scheme at Green Bay would be negligible.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Green Bay site is assessed as **neutral (not significant).**

Kitchen Porth

As outlined in Table 10-5 above, it is assumed that the construction of the proposed works at the Kitchen Porth site will require 25 x 20-tonne truck journeys for the 3-day duration of the works, equating to eight journeys per day.

The proposed access route to the site will be via an existing road running northwards to Kitchen Porth. Given this road passes through The Town and it is likely used by cyclists and vulnerable pedestrians, it is considered to be of high sensitivity.

In the absence of baseline traffic flows along the access route, the percentage increase cannot accurately be determined. However, based on anecdotal evidence of the use of the roads across Bryher, and based on the IEA guidance, it is assumed that the truck journeys associated with the construction of the proposed scheme at Kitchen Porth would equate to a moderate increase.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Kitchen Porth site is assessed as **temporary large adverse.**

St Agnes

The proposed access track across the island of St Agnes utilises an existing track from Porthconger Quay, running west across the northern coast of the island to the proposed sites. This track is likely used by vehicles, cyclists and vulnerable pedestrians including elderly residents and children travelling between Porthconger Quay/the alternative landing site and Lower Town. It is therefore considered to be of high sensitivity.

An alternative access route to the western side of the island is being considered for use during wet periods passing along the existing concrete road over the ridge of the island, along Old Lane/New Lane. This road is likely used by vehicles, cyclists and vulnerable pedestrians including elderly residents and children travelling between Porthconger Quay/the alternative landing site and Lower Town. It is therefore considered to be of high sensitivity.

Porth Killier

As outlined in Table 10-5 above, it is assumed that the construction of the proposed works at the Porth Killier site will require 119 x 20-tonne truck journeys for the 10-day duration of the works, equating to an average of 12 x 20-tonne truck journeys per day.

The proposed access route to the site will be via the track running west from Porthconger Quay, or via the existing road running west along the ridge of the island, both which is considered to be of high sensitivity.

In the absence of baseline traffic flows along the access route, the percentage increase cannot accurately be determined. However, based on anecdotal evidence of the use of the roads across St Agnes, and based on the IEA guidance, it is assumed that the truck journeys associated with the construction of the proposed scheme at would equate to a major increase.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Porth Killier site is assessed as **temporary large adverse.**

Porth Coose

As outlined in Table 10-5 above, it is assumed that the construction of the proposed works at the Porth Coose site will require 62 x 20-tonne truck journeys for the 15-day duration of the works, equating to an average of 4 x 20-tonne truck journeys per day.

The proposed access route to the site will be via the track running west from Porthconger Quay connecting to a track running in a northwest direction around Big Pool to the Porth Coose site, or via the existing road running west along the ridge of the island connecting to a track running north. Both of access routes are considered to be of high sensitivity.

In the absence of baseline traffic flows along the access route, the percentage increase cannot accurately be determined. However, based on anecdotal evidence of the use of the roads across St Agnes, and based on the IEA guidance, it is assumed that the truck journeys associated with the construction of the proposed scheme at would equate to a major increase.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Porth Coose site is assessed as **temporary large adverse.**

Periglis

As outlined in Table 10-5 above, it is assumed that the construction of the proposed works at the Periglis site will require 108 x 20-tonne truck journeys for the 28-day duration of the works, equating to an average of 4 x 20-tonne truck journeys per day.

The proposed access route to the site will be via the track running west from Porthconger Quay connecting to a track running around the outside of Big Pool and southwards to the Periglis site, or via the existing road running west along the ridge of the island. Both of the tracks are considered to be of high sensitivity.

In the absence of baseline traffic flows along the access route, the percentage increase cannot accurately be determined. However, based on anecdotal evidence of the use of the roads across St Agnes, and based on the IEA guidance, it is assumed that the truck journeys associated with the construction of the proposed scheme at would equate to a major increase.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Periglis site is assessed as **temporary large adverse.**

St Martin's

The proposed access track across the island of St Martin's utilises existing tracks from St Martin's Quay to the Lower Town Beach site. This track is likely used by vehicles, cyclists and vulnerable pedestrians including elderly residents travelling between St Martin's Quay and Lower Town Beach. It is therefore considered to be of high sensitivity.

Lower Town Beach

As outlined in Table 10-5 above, it is assumed that the construction of the proposed works at the Lower Town Beach site will require one 20 truck journey for the entire 4-day duration of the works.

In the absence of baseline traffic flows along the access route, the percentage increase cannot accurately be determined. However, it is assumed that the one truck journey associated with the construction of the proposed scheme at Lower Town beach would be negligible.

The significance of effect of increase of vehicles (namely HGVs) associated with the construction of the Lower Town Beach site is assessed as neutral (not significant).

Given that there will only be one truck journey over a duration of 4 days, effects on severance, driver delay, pedestrian amenity and delay, accidents and safety, air pollution and noise are considered to be neutral **(not significant).**

10.5.2 Air Quality

Following the IAQM guidance, consideration has been given to the potential impacts of dust associated with the construction of the proposed scheme on sensitive receptors. Chapter 5: Biodiversity and Nature Conservation includes assessment of the impacts of dust on ecological features (including nature conservation sites, habitats and species). As a result, impacts on ecological features are not considered within this chapter.

According to the guidance, the highest level of sensitivity should be recorded. Given the construction of the proposed schemes primarily involves excavating material, the excavation phase of construction has been considered as presenting a worst-case scenario.

Consideration has also been given to the potential dust impacts associated with trackout: where the vehicles leaving the each of the nine sites may transfer dust or dirt onto the road having travelled over unpaved access tracks with muddy ground. This presents a worst-case scenario assuming that vehicles are required for the transport of materials and machinery around the islands. According to the IAQM guidance, trackout may occur 50m from small sites, as measured from the site exit. Receptor distances have therefore been measured from the roadside, up to 50m from the site exit.

Bryher

Great Popplestone

Earthworks

According to the IAQM guidance, given that the earthworks area would be <2,500m^2, with <5 heavy earth moving vehicles at any time, and the construction volume would be <25,000m^3, the magnitude of dust impact potentially arising from the Great Popplestone scheme would be small (minor).

The closest property is located approximately 65m east of the sand recovery area at Great Popplestone. The risk of dust impacts at this receptor is considered to be of low

sensitivity. There are numerous other commercial and residential properties located within 350m of the Great Popplestone site, including the Hell Bay Hotel. The risk of dust impacts at these receptors is also considered to be of low sensitivity.

The significance of effect of potential dust at these surrounding properties is assessed as slight. Given the prevailing south-westerly wind direction and the location of the residential receptor 65m east of the sand recovery area, the sensitivity of effect has been assessed as **temporary slight adverse.**

Trackout

In order to access the Great Popplestone site, vehicles will be required to travel down an unpaved road (track) for a length of over 100m before joining New Road. According to the IAQM guidance, the magnitude of dust impact potentially arising from trackout at the Great Popplestone site would be large (major).

There are not any receptors within 50m of the site exit. The access track running from the Great Popplestone site is an unpaved sandy/grassy track, and therefore the effect of potential dust from trackout is assessed as **neutral (not significant).**

Stinking Porth

Earthworks

According to the IAQM guidance, given that the earthworks area would be <2,500m^2, with <5 heavy earth moving vehicles at any time, and the construction volume would be <25,000m^3, the magnitude of dust impact potentially arising from the Stinking Porth scheme would be small (minor).

The closest property is the Old School House located approximately 48m southeast of the Stinking Porth site. The risk of dust impacts at this receptor is considered to be of low sensitivity. There are numerous other commercial and residential properties located within 350m of the Stinking Porth site, including Hell Bay Hotel approximately 120m northeast. The risk of dust impacts at these receptors is also considered to be of low sensitivity.

The significance of effect of potential dust at the Old School House, the Hell Bay Hotel, and other surrounding properties, is assessed as slight. Given the prevailing south-westerly wind direction, and the respective locations of the Old School House and Hell Bay Hotel, along with other properties to the northeast of the site, the sensitivity of effect for surrounding receptors is assessed as **temporary slight adverse**.

Trackout

In order to access the Stinking Porth site, vehicles will travel down an unpaved road (track) for a length of over 100m. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Stinking Porth site would be large (major).

There are not any receptors within 50m of the site. The access track running from the Stinking Porth site is an unpaved sandy/grassy track, and therefore the significance of effect of trackout is assessed as **neutral (not significant).**

Great Porth (Great Par) North of Great Carn

Earthworks

According to the IAQM guidance, given that the earthworks area would be <2,500m^2, with <5 heavy earth moving vehicles at any time, and the construction volume would be <25,000m^3, the magnitude of dust impact potentially arising from the Great Porth (Great Par) North of Great Carn scheme would be small (minor).

There are two properties located within 20m of the Great Porth (Great Par) North of Great Carn site. These are located to the northeast of the Great Porth (Great Par)

North of Great Carn site, along the track that runs adjacent to it. The risk of dust impacts at these receptors is considered to be of medium sensitivity.

The significance of effect of potential dust at these receptors is assessed as slight or moderate. Given the prevailing south-westerly wind direction, and the location of the receptors, the sensitivity of effect for these receptors is assessed as **temporary moderate adverse.**

Trackout

In order to access the Great Porth (Great Par) North of Great Carn site, vehicles will travel down New Road before travelling down an unpaved track for approximately 10m. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Great Porth (Great Par) North of Great Carn site would be small (minor).

New Road is located approximately 10m from the site exit and is considered to be of medium sensitivity. The significance of effect of potential dust arising from trackout at the Great Porth (Great Par) North of Great Carn site is assessed as slight or moderate. Given many of the roads across the island of Bryher are unpaved dirt tracks, the sensitivity of effect for New Road is assessed as **temporary slight adverse**.

Green Bay

Earthworks

According to the IAQM guidance, given the earthworks area would be <2,500m^2, with <5 heavy earth moving vehicles at any time, and the construction volume would be <25,000m^3, the magnitude of dust impact potentially arising from the Green Bay scheme would be small (minor).

A boat yard is located approximately 18m southwest of the Green Bay site. The risk of dust impacts at this receptor is considered to be of medium sensitivity. Other commercial and residential receptors, including Samson Hill Cottage are located within 100m of the Green Bay site, these are considered to be of low sensitivity.

The significance of effect of potential dust at the boat yard is assessed as slight or moderate, with a slight effect for other surrounding receptors. Given the location of the boat yard, the sensitivity of effect is assessed as **temporary moderate adverse.**

Trackout

In order to access the Green Bay site, vehicles will travel down the beach for a length of over 100m before intersecting with an existing road adjacent to the boat yard to access the dune. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Green Bay site would be large (major).

Vehicles will intersect with a corner of this existing road again, passing by the boat yard when leaving the site. The risk of dust impact from trackout at this location considered to be of medium sensitivity.

The significance of effect of potential dust from trackout is assessed as **temporary moderate adverse**.

Kitchen Porth

Earthworks

According to the IAQM guidance, given the earthworks area would be <2,500m^2, with <5 heavy earth moving vehicles at any time, and the construction volume would be

<25,000m^3, the magnitude of dust impact potentially arising from the Kitchen Porth scheme would be small (minor).

Bryher Post Office is located approximately 10m east of the Kitchen Porth site, with other receptors including the Harbour View and Fraggle Rock Bar and commercial/residential properties located within 100m of the proposed scheme. The risk of dust impacts at Bryher Post Office is assessed as medium, with the risk of dust impacts at other surrounding receptors assessed as low.

The significance of effect of potential dust at Bryher Post Office is assessed as slight or moderate, with a slight effect for other surrounding receptors. Given the prevailing south-westerly wind direction, and the location of the Post Office, the sensitivity of effect for this receptor is assessed as **temporary moderate adverse.**

Trackout

In order to access the Kitchen Porth site, vehicles will travel along the existing road running east from the construction compound and then northwards through the Town, before travelling down an unpaved track for approximately 40m to access the site. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Kitchen Porth site would be small (minor).

Vehicles will travel back along the track, onto the existing road adjacent to the Harbour View and Fraggle Rock Bar. The risk of dust impact from trackout at this location considered to be of medium sensitivity.

The significance of effect of potential dust from trackout is assessed as slight or moderate. Given the nature of the roads across the island of Bryher, many of which are sandy/grassy tracks, the significance of effect of potential dust from trackout is assessed as **temporary slight adverse**.

St Agnes

Porth Killier

Earthworks

According to the IAQM guidance, given the earthworks area would be <2,500m^2, with <5 heavy earth moving vehicles at any time, and the construction volume would be <25,000m^3, the magnitude of dust impact potentially arising from the Porth Killier scheme would be small (minor).

There are numerous commercial and residential properties located within 350m of the proposed Porth Killier scheme, the closest of which is an agricultural building associated with Lower Town Farm approximately 70m west. These risk of dust impacts at all of these surrounding receptors is considered to be low.

The significance of effect of potential dust at surrounding receptors is assessed as slight. The significance of effect for these receptors is assessed as a **temporary slight adverse effect.**

Trackout

In order to access the Porth Killier site, vehicles will travel along an existing paved track running west from Porthconger Quay for approximately 100m. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Kitchen Porth site would be small (minor).

There are not any receptors within 50m of the site exit. The access track running to the Porth Killier site is a paved, and therefore the significance of effect of trackout is assessed as **neutral (not significant).**

An alternative access track may be used during wet periods, running west from Porthconger Quay along an existing concrete road over the ridge of the island before

running along an unpaved sandy/grassy track. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Kitchen Porth site along the alternative access route would be large (major) due to the existing use of the sandy/grassy track.

There are not any receptors within 50m of the site exit. The alternative access track running to the Porth Killier site is a paved road connecting to a sandy/grassy track and therefore the significance of effect of trackout is assessed as **neutral (not significant).**

Porth Coose

Earthworks

According to the IAQM guidance, given the earthworks area would be <2,500m^2, with <5 heavy earth moving vehicles at any time, and the construction volume would be <25,000m^3, the magnitude of dust impact potentially arising from the Porth Coose scheme would be small (minor).

There are several commercial and residential properties located within 350m of the proposed Porth Coose Scheme within Lower Town, the closest of which is approximately 230m southeast of Porth Coose. The risk of dust impacts at these receptors is considered to be low.

The significance of effect of potential dust at these receptors is assessed as slight. The significance of effect for these receptors is assessed as a **temporary slight adverse effect.**

Trackout

In order to access the Porth Coose site, vehicles will travel along an existing paved track running west from Porthconger Quay before connecting to an existing unpaved track running for approximately 180m around the outside of Great Pool to the site. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Kitchen Porth site would be large (major).

There are not any receptors within 50m of the site exit. The access track running from the Porth Coose site is an unpaved sandy/grassy track, and therefore the effect of potential dust from trackout is assessed as **neutral (not significant).**

An alternative access track may be used during wet periods, running west from Porthconger Quay along an existing concrete road over the ridge of the island before running along an unpaved sandy/grassy track. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Porth Coose site along the alternative access route would be large (major) due to the existing use of the sandy/grassy track.

There are not any receptors within 50m of the site exit. The alternative access track running to the Porth Coose site is a paved road connecting to a sandy/grassy track and therefore the significance of effect of trackout is assessed as **neutral (not significant).**

Periglis

Earthworks

According to the IAQM guidance, given the earthworks area would be <2,500m^2, with <5 heavy earth moving vehicles at any time, and the construction volume would be <25,000m^3, the magnitude of dust impact potentially arising from the Periglis scheme would be small (minor).

There are approximately four residential/commercial properties located on Old Lane that are within 20m of the Periglis site. The risk of dust impacts at these receptors is considered to be medium.

The significance of effect of potential dust at these receptors is assessed as slight. The significance of effect for these receptors is assessed as a **temporary slight or moderate adverse effect.**

Trackout

In order to access the Periglis site, vehicles will travel along an existing paved track running west from Porthconger Quay before connecting to an existing unpaved track running for approximately 300m around the outside of Great Pool to the site. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Periglis site would be large (major).

There are not any receptors within 50m of the site exit. The access track running from the Periglis site is an unpaved sandy/grassy track, and therefore the effect of potential dust from trackout is assessed as **neutral (not significant).**

An alternative access track may be used during wet periods, running west from Porthconger Quay along an existing concrete road over the ridge of the island. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Periglis site along the alternative access route would be small (minor).

There are not any receptors within 50m of the site exit. The alternative access track running to the Periglis site is a paved, and therefore the significance of effect of trackout is assessed as **neutral (not significant).**

St Martin's

Lower Town Beach

Earthworks

According to the IAQM guidance, given the earthworks area would be <2,500m^2, with <5 heavy earth moving vehicles at any time, and the construction volume would be <25,000m^3, the magnitude of dust impact potentially arising from the Lower Town Beach scheme would be small (minor).

There is a cluster of residential/commercial properties located north of the Lower Town Beach site, the closest of which are buildings associated with Ashvale Farm approximately 90m north. According to the IAQM guidance, based on the threshold criteria and professional judgement, activities may be assigned a 'negligible' risk if the scale is very small and there are no receptors near to the activity. Given the small scale of the proposed works at the Lower Town Beach site and the proximity of surrounding receptors, the effect of potential dust from construction is assessed as **neutral (not significant).**

Trackout

In order to access the Lower Town Beach site, vehicles will travel along an existing paved track running south from St Martin's quay to the Lower Town beach site. According to the IAQM guidance the magnitude of dust impact potentially arising from trackout at the Lower Town beach site would be small (minor).

There are not any receptors within 50m of the site exit. The access track running from the Periglis site is an unpaved sandy/grassy track, and therefore the effect of potential dust from trackout is assessed as **neutral (not significant).**

10.5.3 Noise & Vibration

Following guidance contained within BS 5228, this section considers the sound levels associated with the assumed machinery to be used at each site, and the proximity of surrounding sensitive receptors. Chapter 5: Biodiversity and Nature Conservation includes assessment of the impacts of construction noise on ecological features (including nature conservation sites, habitats and species). As a result, impacts on ecological features are not considered within this chapter.

Consideration is given to the likely noise and vibration effects associated with construction traffic for each of the sites. This presents a worst case scenario whereby materials and machinery cannot be delivered to the site via boat and require delivery via road.

Bryher

Great Popplestone

According to BS 5228, the operation of a 20-tonne excavator and 6-tonne dumper truck likely to be required to undertake the proposed works at the Great Popplestone site could result in impacts on sensitive receptors from noise, where located approximately 10m from the works, and vibration where located 15m from the works. No sensitive receptors are located within 10m of the Great Popplestone site. The closest receptor is an agricultural building located approximately 65m east of the sand recovery area. Therefore noise and vibration impacts associated with the construction works at Great Popplestone are considered to be **neutral (not significant).**

In order to access the Great Popplestone site, construction vehicles will be required to travel west from the materials storage area along the access route along New Road and along an existing track around the west of Great Pool. It is considered that there is the **potential for significant temporary noise and vibration effects at sensitive receptors** within 20m of the access route including All Saints Church, the ambulance station, Hell Bay Hotel, and numerous residential properties at the western extent of New Road.

There is an alternative access route to Great Popplestone that runs northwest of New Road, south of the tennis courts. If this route was taken instead of New Road, noise and vibration impacts would be **neutral (not significant)** since there are not any sensitive receptors within 20m.

Stinking Porth

According to BS 5228, the operation of a 20-tonne excavator and a 6-tonne dumper truck likely to be required to undertake the proposed works at the Stinking Porth site could result in impacts on sensitive receptors where located approximately 10m from the works. No sensitive receptors are located within 10m from the works. The closest receptor is the Old School House located approximately 48m southeast. Therefore noise and vibration impacts associated with the construction works at Stinking Porth are considered to be **neutral (not significant).**

In order to access the Stinking Porth site, construction vehicles will be required to travel west from the materials storage area along the access route along New Road and along an existing track around the west of Great Pool. It is considered that there is the **potential for significant temporary noise and vibration effects at sensitive receptors** within 20m of the access route including All Saints Church, the ambulance station, Hell Bay Hotel, and numerous residential properties at the western extent of New Road.

There is an alternative access route to Stinking Porth site that runs northwest of New Road, south of the tennis courts and around the outside of Great Pool. If this route was taken instead of New Road, noise and vibration impacts from construction traffic would be **neutral (not significant)** since there are not any sensitive receptors within 20m.

Great Porth (Great Par) North of Great Carn

According to BS 5228, the operation of a 20-tonne excavator and a 6-tonne dumper truck likely to be required to undertake the proposed works at the Great Porth (Great Par) North of Great Carn site could result in impacts on sensitive receptors where these are located approximately 10m from the works. No sensitive receptors are located within 10m of the proposed works. Therefore noise impacts associated with the construction works at Great Porth (Great Par) North of Great Carn are considered to be **neutral (not significant).**

Two residential properties have been identified within 15m of the proposed works. Given the nature of the proposed works, there is **potential for significant temporary vibration effects on residential receptors** as a result of the works. BS 5228 refers to vibration reductions that can be achieved through best practicable means, and so it is recommended that this is considered further in the mitigation assessment below to reduce the risk of significant vibration impacts occurring.

In order to access the Great Porth (Great Par) North of Great Carn site, construction vehicles will be required to travel west from the materials storage area along the access route along New Road. It is considered that there is the **potential for significant temporary noise and vibration effects at sensitive receptors** within 20m of the access route including All Saints Church, the ambulance station, Hell Bay Hotel, and numerous residential properties at the western extent of New Road.

Green Bay

According to BS 5228, the operation of a 20-tonne excavator and 6-tonne dumper truck likely to be required to undertake the proposed works at the Green Bay site could result in impacts on sensitive receptors, where located approximately 10m from the works. No sensitive receptors are located within close proximity to the Green Bay site, with the closest residential receptor, Samson Hill Cottage holiday accommodation, located over 60m southwest of the proposed works.

Therefore noise and vibration impacts associated with the construction works at Green Bay are considered to be **neutral (not significant).**

In order to access the North Green By site, construction vehicles will be required to track across the beach southwards from Church Quay. Due to the absence of sensitive receptors within 20m of this access route, it is considered that noise and vibration effects associated with the movement of construction vehicles along access routes would be **neutral (not significant).**

Kitchen Porth

According to BS 5228, the operation of a 20-tonne excavator and 6-tonne dumper truck likely to be required to undertake the proposed works at Kitchen Porth could result in impacts on sensitive receptors, where located approximately 10m from the works. No residential receptors are located within 10m of the works. However, Bryher Post Office is located approximately 12m east of the proposed works and may be sensitive to **potential for significant temporary vibration effects.**

BS 5228 refers to vibration reductions that can be achieved through best practicable means, and so it is recommended that this is considered further in the mitigation assessment below to reduce the risk of significant noise impacts occurring.

In order to access the Kitchen Porth site, construction vehicles will be required to travel west from the materials storage area and then north along an existing road through The Town. It is considered that there is the **potential for significant temporary noise and vibration effects at sensitive receptors** within 20m of the

access route including All Saints Church, the ambulance station, numerous residential properties within The Town.

St Agnes

Porth Killier

According to BS 5228, the operation of a 20-tonne excavator and 6-tonne dumper truck likely to be required to undertake the proposed works at the Porth Killier site could result in impacts on sensitive receptors, where located approximately 10m from the works. No sensitive receptors are located within 10m of the Porth Killier site, the closest receptor is approximately 70m west.

Therefore noise and vibration impacts associated with the construction works at Porth Killier are considered to be **neutral (not significant).**

In order to access the Porth Killier site, construction vehicles will be required to travel west from the materials storage area along the access route along an existing track. Due to the absence of sensitive receptors within 20m of this access route, it is considered that noise and vibration effects associated with the movement of construction vehicles along the access routes would be **neutral (not significant).**

There is an alternative access route to the Porth Killier site that runs west from Porthconger Quay west along an existing road over the ridge of the island that may be used during wet periods. There are numerous sensitive receptors, including residential properties, located within 20m of this alternative access route. If this alternative access route was taken, it is considered that there is the **potential for significant temporary noise and vibration effects at these sensitive receptors**.

Porth Coose

According to BS 5228, the operation of a 20-tonne excavator and 6-tonne dumper truck likely to be required to undertake the proposed works at the Porth Coose site could result in impacts on sensitive receptors, where located approximately 10m from the works. No residential receptors are located within 10m of the Porth Coose site, the closest receptor is 230m southeast.

Therefore noise and vibration impacts associated with the construction works at Porth Coose are considered to be **neutral (not significant).**

In order to access the Porth Coose site, construction vehicles will be required to travel west from the materials storage area along the access route along an existing track. Due to the absence of sensitive receptors within 20m of this access route, it is considered that noise and vibration effects associated with the movement of construction vehicles along the access routes would be **neutral (not significant).**

There is an alternative access route to the Porth Coose site that runs west from Porthconger Quay west along an existing road over the ridge of the island that may be used during wet periods. There are numerous sensitive receptors, including residential properties, located within 20m of this alternative access route. If this alternative access route was taken, it is considered that there is the **potential for significant temporary noise and vibration effects at these sensitive receptors**.

Periglis

According to BS 5228, the operation of a 20-tonne excavator and 6-tonne dumper truck likely to be required to undertake the proposed works at the Periglis site could result in impacts on sensitive receptors, where located approximately 10m from the works. There are approximately two residential properties within 10m of the site, with

an additional two receptors within 20m. Given the low noise environment of the site, there is **potential for significant temporary noise effects on these residential receptors.** Given the proposed works involve excavation works, there is **potential for significant temporary vibration effects on these residential receptors.** BS 5228 refers to noise and vibration reductions that can be achieved through best practicable means, and so it is recommended that this is considered further in the mitigation assessment below to reduce the risk of significant noise impacts occurring.

In order to access the Periglis site, construction vehicles will be required to travel west from the materials storage area along the access route along an existing track around Big Pool. It is considered that there is the **potential for significant temporary noise and vibration effects at sensitive receptors** within 20m of the access route including residential properties in Lower Town adjacent to the southern extent of Periglis beach.

There is an alternative access route to the Periglis site that runs west from Porthconger Quay west along an existing road over the ridge of the island that may be used during wet periods. There are numerous sensitive receptors, including residential properties, located within 20m of this alternative access route. If this alternative access route was taken, it is considered that there is the **potential for significant temporary noise and vibration effects at these sensitive receptors**.

St Martin's

Lower Town Beach

According to BS 5228, the operation of a 20-tonne excavator and 6-tonne dumper truck likely to be required to undertake the proposed works at the Lower Town Beach site could result in impacts on sensitive receptors, where located approximately 10m from the works. There are not any sensitive receptors within 20m of the proposed works and therefore, any potential noise and vibration impacts arising from the proposed works are considered to be **neutral (not significant).**

In order to access the Lower Town Beach site, construction vehicles will be required to travel east and then south from St Martin's quay along the access route along an existing track. It is considered that there is the **potential for significant temporary noise and vibration effects at sensitive receptors** within 20m of the access route including the Karma St Martin's hotel.

10.6 Cumulative Effects

As indicated by the construction programme outlined in Tables 10-4 to 10-6, the proposed schemes will not be constructed simultaneously, rather each will be constructed in turn. An exception to this is the construction works at Great Popplestone and Kitchen Porth. Whilst works are ongoing at Great Popplestone to raise the existing sea wall, the rock revetment at Kitchen Porth will be built. Following this, the contractor will drop back to complete the rock revetment construction at Great Popplestone once the masons have completed.

There is potential for residential receptors in the north of the island of Bryher to experience minor adverse cumulative construction impacts as a result of noise and dust emissions. However, the Great Popplestone and Kitchen Porth sites are over 750m apart and would be unlikely to use the same access track, therefore potential cumulative impacts are not considered to be significant.

10.7 Mitigation Measures

This assessment has been used to inform development of the CEMP, provided in Appendix 2.2. The CEMP has been written to carry forward the requirements for environmental management made in this ES, to the construction phase of the development project. It outlines the likely roles and responsibilities of those involved

in the delivery of the project and sets out environmental actions required to achieve a series of environmental management objectives identified for the scheme.

Environmental management objectives are set out in the CEMP, within which an appropriate project team member is identified for ensuring that the action is fully implemented. Monitoring of the CEMP would be undertaken by the construction contractor as part of their Environmental Management System (EMS).

Construction Traffic

Temporary large and temporary moderate adverse effects from construction traffic have been identified at many of the sites across the islands of Bryher and St Agnes. However, it must be noted that these present a worst-case scenario whereby materials and machinery cannot be delivered to the sites where they will be used using the respective beach landing sites.

A range of temporary traffic management measures are likely to be required to facilitate the construction works and mitigate the potential impacts. A Construction Traffic Management Plan will be developed and implemented by the contractor and agreed with the Council of the Isles of Scilly prior to works commencing to detail approach and timings for deliveries and other matters related to safety on the access routes. This will include:

- HGV routeing plan communicated to all drivers during their induction; and
- Limiting construction delivery hours and avoidance of 'peak' times.

Air Quality

Temporary slight or moderate adverse effects on sensitive receptors as a result of dust emissions from earthworks have been assessed at all of sites across the islands of Bryher and St Agnes. Temporary slight or moderate adverse effects of trackout have been assessed at Great Porth (Great Par) North of Great Carn, Green Bay and Kitchen Porth. It must be noted that the effects of trackout present a worst case scenario whereby materials and machinery cannot be delivered to the sites where they will be used using the respective beach landing sites.

Therefore, in accordance with IAQM guidelines, appropriate mitigation measures for medium and high-risk sites will be implemented through a Construction Environmental Management Plan (CEMP). These will include:

- Develop and implement a stakeholder communications plan that includes community engagement before work commences on site;
- Display the name and contact details of the person(s) accountable for air quality and dust issues on the site boundary;
- Display the head or regional office contact information;
- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority;
- Record all dust complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken;
- Record any exceptional incidents that cause dust and/or air emissions either on or off site and the action taken to resolve the situation in a log book. Make the complaints log available to the local authority when asked;
- Carry out regular site inspections to monitor compliance with the DMP, record inspection results and make inspection log available to the local authority when asked;

- Increase the frequency of site inspections for air quality and dust when activities with a high potential to produce dust are being carried out or during prolonged dry or windy conditions;
- Erect screens or barriers around dusty activities;
- Ensure all vehicles switch off engines when stationary – no idling vehicles;
- Impose and signpost a maximum-speed-limit of 15 mph on surfaced and 10 mph on un-surfaced haul roads and work areas (these speeds may be increased on long haul roads with suitable additional control measures subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate);
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials; and
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment.

Noise and Vibration

Potential for significant temporary noise and vibration effects from construction works on sensitive receptors has been identified at Great Porth (Great Par) North of Great Carn, Kitchen Porth and Periglis.

Potential for significant temporary noise and vibration effects from construction vehicles moving along the access routes has been identified for sites where there are sensitive receptors within close proximity to the proposed access routes (Great Popplestone, Stinking Porth, Great Porth (Great Par) North of Great Carn, Kitchen Porth, Porth Killier, Porth Coose, Periglis and Lower Town Beach). It must be noted that the effects of construction traffic noise present a worst case scenario whereby materials and machinery cannot be delivered to the sites where they will be used using the respective beach landing sites.

In accordance with BS 5228 the following measures will be undertaken to reduce noise impacts from construction plant by between 5dB and 15dB:

- Fit more efficient exhaust sound reduction equipment on excavators and dumpers;
- Manufacturers enclosure panels on plant need to be kept closed;
- Do not drop materials from excessive heights, rather place materials where required;
- Line chutes and dump trucks with noise resilient material;
- Screen dropping zones with acoustic panelling attached to Heras fencing;
- Restriction of the movement of vehicles at particular times of day; and
- Provision of information to the public on expected noise, especially to those likely to be exposed to significant effects.

In accordance with BS 5228 the following measures will be undertaken to reduce vibration impacts including:

- Activities that are undertaken close to vibration-sensitive properties will be programmed over a short period of time appropriate to local conditions;
- The movement of plant on and off site will be restricted to within the agreed working hours; and
- Sufficient information will be provided to vehicle drivers to ensure that they follow the designated access routes.

Ground Conditions, Waste Management & Pollution Prevention

A construction contractor is yet to be appointed. However, it is assumed that Ground Investigations will be undertaken prior to the start of construction to identify any requirements for remedial works to be undertaken associated with ground conditions.

Measures undertaken to minimise risks of pollution to the marine environment will follow the CIRIA guidance Control of water pollution from construction sites. Guidance for consultants and contractors (2001). Examples of good practice include:

- Site storage of fuel and any chemicals on site should be above Mean High-Water Springs (MHWS) and away from high-risk locations.
- Plant, equipment and vehicle refuelling will only be permitted at designated refuelling areas. No refuelling will take place below MHWS;
- Refuelling and bulk deliveries to be supervised at all times;
- Emergency spill kits to be available where plant is operating, and operatives should be trained in their use. Any spillages to be contained and reported; and
- Drip trays to be used to prevent oil leading from machinery when parked or stored during refuelling.

In the absence of an appointed contractor, proposals for waste management are not available. It is anticipated that all arisings will be reused on site as backfill, however, any excess material disposal could require offsite disposal. All waste materials will either be placed into the relevant storage disposal container or removed from site by the individual site contractor and disposed of in an appropriate manner.

10.8 Residual Effects

Given the sensitivity of the road network across the Isles of Scilly and the absence of baseline data, as a worst case scenario, **temporary large adverse effects** from construction traffic have been identified at Great Popplestone (if rock is imported), Stinking Porth, Great Porth (Great Par) North of Great Carn, Kitchen Porth, Porth Killier and Porth Coose and Periglis. With the development and implementation of a CTMP, the residual effect of construction traffic impacts would be reduced to **temporary moderate adverse** or **temporary slight adverse effects**.

Temporary moderate adverse effects on sensitive receptors as a result of dust emissions from earthworks has been assessed at all sites across the islands of Bryher and St Agnes, and at Great Porth (Great Par) North of Great Carn, Green Bay and Kitchen Porth as a result of trackout as a worst case scenario. However, were the IAQM recommended mitigation measures for outlined above applied, then the residual effect of dust effects at all of the sites would be **negligible (not significant).**

Potential for **significant temporary noise and vibration effects** on sensitive receptors has also been identified at Great Popplestone, Stinking Porth, Great Porth (Great Par) North of Great Carn, Kitchen Porth, Periglis and Lower Town Beach. With implementation of the measures identified in BS 5228, noise impacts on sensitive receptors arising from the use of the construction plant will be reduced by between 5dB and 15dB. This will bring construction noise levels at these receptors within the 70dB threshold required for a residual **negligible (not significant)** likely significant effect.

Should noisy construction operations be required outside of normal construction working hours, this would need to be agreed with the Council of the Isles of Scilly in advance of the works and may require noise monitoring.

With measures undertaken to minimise risks of pollution to the marine environment following the standard CIRIA guidelines, the residual effect of waste and pollution management issues is assessed as **negligible (not significant).**

11 Cumulative and In-Combination Effects

11.1 Introduction

This chapter of the ES outlines potential cumulative and combined effects that may arise as a result of the construction of the proposed development.
In order to determine potential for cumulative effects, consideration is given to the impacts of any other committed developments where these would coincide with the temporal and spatial scope of the development proposals. The environmental impacts of the respective developments are assessed collectively on individual receptors to determine where this could give rise to likely significant effects, which would otherwise be not significant.

11.2 Legislative and Planning Policy Context

Regulation 18(3) of the EIA Regulations requires with reference to paragraph 5 of Schedule 4, a consideration of cumulative effects is included in the Environmental Statement:

'A description of the likely significant effects of the development on the environment resulting from…(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources…

The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(1) and Directive 2009/147/EC(2).'

11.3 Assessment Methodology & Assessment Criteria

Cumulative effects are assessed with regard to (i) the environmental impacts of the development proposals when considered cumulatively with the environmental impact of other existing adjacent and approved development projects at the time of submission of the ES; and (ii) the cumulative effect of inter-relationships between multiple environmental impacts on individual receptors.

Regarding (i), the spatial and temporal scope of the EIA considers the following:

- The physical extent of the proposed works, as defined by the limits of land to be used (temporarily or permanently) as denoted in the respective planning or marine licence consents by their site boundary;
- The nature of the existing baseline environment, including the location of sensitive receptors;
- The geographical extent of impacts beyond the sites, e.g. effects from traffic, visual effects and disturbance of ecological receptors;
- The geographical boundaries of the political and administrative institutions and authorities, which provide the planning and policy context for the project; and
- The timing of the works for the respective development project.

Cumulative effects would therefore consider the impacts of any other committed developments where these would coincide with both the temporal and spatial scope of the development proposals assessed within this ES. The environmental impacts of

the respective development projects are assessed collectively on individual receptors to determine where this could give rise to synergistic likely significant effects.

Regarding (ii) the cumulative effects of inter-relationships between multiple environmental impacts would consider any impacts assessed individually within this ES, the synergistic effects of which would either be made greater as a result of the cumulative effects on the individual receptors, or which otherwise would not be considered significant on its own.

11.4 Baseline Conditions

11.4.1 Cumulative effects with other committed developments

A search of the CIoS planning portal for submitted applications identified developments with the potential to cause cumulative effects. This search, undertaken on 21st September 2022, considered applications submitted in the past three years since, in accordance with planning law, planning permission expired after three years unless work has not begun. Development projects that meet the above criteria are outlined below. Discussions were undertaken with the CIoS Chief Planning Officer to confirm the status of the applications. Those already constructed were removed from the table below.

Table 11-1: Long list of planning applications with potential to generate cumulative impacts with the proposed schemes

Reference	Description	Status	Location
P/21/086/FUL	The development of a live/work unit for Island Fish Ltd, Bryher. The work unit will be a single storey room with a floor area of 17m^2 connected to the existing Island Fish development and used for the purpose of picking and processing crab meat.	Permission granted 16/12/21. Material delivery complete with construction expected to commence in Autumn 2022.	Island Fish, Norrad, Bryher, TR23 0PR
P/21/075/COU	Proposal for two 'off grid' shepherd hut holiday lets in the lower field of the Apple Tree Cottage Land Holding in Lower Town, St Martin's.	Permission granted 16/11/2021. Pending construction, possible that materials have been delivered.	Land to the South of Lower Town Barns, Lower Town, St Martin's
P/19/085	Proposed alterations and extension to Bank Cottage, Bryher, adjacent to Great Porth.	Permission granted 19/10/2020. Currently under construction.	Bank Cottage, South'ard, Bryher, TR23 0PR
P/19/084	Proposed new timber building adjacent to Seven Stones Inn public house to serve as a WC, shower room, and laundry facility for visiting yachts and customers. Proposal includes rebuilding the retaining wall of the terrace after is dismantled for access.	Permission granted 28/01/2020. Currently under construction, almost complete.	Seven Stones Inn, Lower Town, St Martin's, TR25 0QW

The Marine Management Organisation (MMO) is responsible for granting marine licences in England. A marine licence is required for many different activities that

occur within inshore and offshore areas in England including construction works. As is the case for planning applications, marine licence applications are available to view on a public register. This public register (available at https://marinelicensing.marinemanagement.org.uk/mmofox5/fox/live/) was searched on 21st September 2022. It was deemed that there were no permitted schemes that could create cumulative impacts with any of the proposed schemes on the public register.

11.5 Potential Impacts & Significant Effects

11.5.1 Cumulative effects with other committed developments

The environmental impacts of the nine development proposals when considered cumulatively with the environmental impact of other existing adjacent and approved development projects at the time of submission of the ES is assessed for significance in Table 11-2.

Table 11-2: Assessment of potential cumulative impacts arising from the applications described in Table 11-1

Reference	Description	Location	Potential for cumulative effects	Significance
P/21/086/FUL	The development of a live/work unit for Island Fish Ltd, Bryher. The work unit will be a single storey room with a floor area of 17m^2 connected to the existing Island Fish development and used for the purpose of picking and processing crab meat.	Island Fish, Norrad, Bryher, TR23 0PR	Potential for cumulative traffic related impacts due to material delivery. However, materials have already been delivered to site for this scheme, with construction due to commence in autumn 2022.	Timescales unlikely to overlap and therefore no significant cumulative impacts anticipated.
P/21/075/COU	Proposal for two 'off grid' shepherd hut holiday lets in the lower field of the Apple Tree Cottage Land Holding in Lower Town, St Martin's.	Land to the South of Lower Town Barns, Lower Town, St Martin's	Proposed site for two shepherd huts adjacent to Lower Town Beach. Potential for temporary increase in noise pollution in that location. However, construction is pending and it is possible that materials have already been delivered.	Timescales unlikely to overlap and therefore no significant cumulative impacts anticipated.
P/19/085	Proposed alterations and extension to Bank Cottage, Bryher, adjacent to Great Porth.	Bank Cottage, South'ard, Bryher, TR23 0PR	Could temporarily increase noise pollution in a similar location to the works at Great Porth (Great Par) North of Great Carn. However, currently under construction.	This application was approved in 2020 and is currently under construction. Therefore it is unlikely that there will be overlap in construction programmes and no significant cumulative impacts

Reference	Description	Location	Potential for cumulative effects	Significance
				are anticipated.
P/19/084	Proposed new timber building adjacent to Seven Stones Inn public house to serve as a WC, shower room, and laundry facility for visiting yachts and customers. Proposal includes rebuilding the retaining wall of the terrace after is dismantled for access.	Seven Stones Inn, Lower Town, St Martin's, TR25 0QW	Could temporarily increase noise and dust pollution and increase in construction related traffic in a similar location to Lower Town Beach. However, currently under construction and almost complete.	Timescales unlikely to overlap and therefore no significant cumulative impacts anticipated.

11.5.2 Interrelationship effects between topics

The technical assessments within each of the ES chapters have identified a number of effects which would occur as a result of the construction and operation of the nine proposed schemes. Several effects on one or more receptors could theoretically interact or combine to result in a combined effect which is more or less significant. When considering combined effects, the mitigation measures set out in the ES chapters (including the construction programme) must be taken into account (i.e. only residual effects (after mitigation) should be considered).

Typically, receptors which are likely to experience a combined effect are those which are more sensitive to change, for example people, whilst those receptors which are more tolerant to change, for example aspects of the physical environment such as geodiversity, are less likely to experience a combined effect. Where only one effect is identified for a particular receptor or only one topic identifies effects on that receptor, there are no common receptors and therefore no potential for a combined effect to occur.

Residential properties and local businesses close to the proposed schemes may be subject to synergistic interrelationship effects during construction, principally arising from the following:

- Visual impacts from construction activities;
- Disturbances from construction noise and dust impacts;
- Impacts from increases in construction related traffic across the islands.

Table 11-3 below summarises the interrelationship effect on residential receptors and local businesses surrounding each of the proposed schemes as an accumulation of environmental effects assessed individually for these receptors elsewhere in the ES.

Table 11-3: Interrelationship impact during construction on specific receptors where environmental effects have been assessed individually elsewhere in the ES

Receptor	Impacts						Overall Significance Assessed
	Access	Tourism	Construction traffic	Dust emissions	Noise	Visual impact	
Residential receptors, visitors & local businesses – Great Popplestone	Neutral (not significant)	Neutral (not significant)	Slight or moderate adverse (if delivery via road)	Neutral (not significant)	Neutral (not significant)	Slight adverse	**Temporary slight adverse**
Residential receptors, visitors & local businesses – Stinking Porth	Neutral (not significant)	Neutral (not significant)	Slight or moderate adverse (if delivery via road)	Neutral (not significant)	Neutral (not significant)	Slight adverse	**Temporary slight or moderate adverse**
Residential receptors, visitors & local businesses – Great Porth (Great Par) North of Great Carn	Neutral (not significant)	Neutral (not significant)	Slight or moderate adverse (if delivery via road)	Neutral (not significant)	Neutral (not significant)	Slight or moderate adverse	**Temporary slight or moderate adverse**
Residential receptors, visitors & local businesses – Green Bay	Neutral (not significant)	Neutral (not significant)	Neutral (not significant)	Neutral (not significant)	Neutral (not significant)	Slight adverse	**Temporary slight adverse**

Receptor	Impacts						Overall Significance Assessed
	Access	Tourism	Construction traffic	Dust emissions	Noise	Visual impact	
Residential receptors, visitors & local businesses – Kitchen Porth	Neutral (not significant)	Neutral (not significant)	Slight or moderate adverse (if delivery via road)	Neutral (not significant)	Neutral (not significant)	Slight adverse	**Temporary slight or moderate adverse**
Residential receptors, visitors & local businesses – Porth Killier	Neutral (not significant)	Neutral (not significant)	Slight or moderate adverse (if delivery via road)	Neutral (not significant)	Neutral (not significant)	Slight adverse	**Temporary slight or moderate adverse**
Residential receptors, visitors & local businesses – Porth Coose	Neutral (not significant)	Neutral (not significant)	Slight or moderate adverse (if delivery via road)	Neutral (not significant)	Neutral (not significant)	Slight adverse	**Slight or moderate adverse**
Residential receptors, visitors & local businesses – Periglis	Neutral (not significant)	Neutral (not significant)	Slight or moderate adverse (if delivery via road)	Neutral (not significant)	Neutral (not significant)	Moderate adverse	**Temporary moderate adverse**
Residential receptors, visitors & local businesses – Lower Town Beach	Neutral (not significant)	Neutral (not significant)	Neutral (not significant)	Neutral (not significant)	Neutral (not significant)	Slight adverse	**Temporary slight adverse**

Interrelationship effects are also possible on some environmental receptors where mitigation is proposed on other environmental topics. For example, mitigation proposed in Chapter 10: Other Construction Related Effects could also have a positive impact upon receptors assessed in other ES chapters, including Chapter 5: Biodiversity and Nature Conservation.

11.6 Mitigation measures

11.6.1 Cumulative effects with other committed developments

No significant cumulative impacts are anticipated to be caused by other committed developments. No mitigation is therefore proposed.

11.6.2 Interrelationship effects between topics

Mitigation of combined effects is best achieved through management and control measures to prevent the individual impacts in the first instance, or reduce the impacts themselves, and therefore reduce the likelihood of such interactions occurring. The mitigation measures set out in the preceding chapters are recommended to reduce any cumulative effects.

It is proposed that interpretive panels will be erected adjacent to the construction sites to provided residents and local businesses with information and outline why the work is being undertaken. A letter drop will be undertaken to advise local residents of the up-coming works and any works which may be considered disruptive to them, and newsletters may be put up on local accommodation and shops to inform tourists. If the demand should arise, it is possible that a Community Liaison Officer could be appointed by CIoS. The role would require keeping residents of these areas well informed on the progress of the construction stage and answering any queries that may arise as the construction stage progresses.

11.7 Residual effects

11.7.1 Cumulative effects with other committed developments

No residual impacts regarding cumulative impacts with other developments are identified. However, it should be considered that these receptors will benefit from the installation of coastal defences in these areas.

11.7.2 Interrelationship effects between topics

Overall, it is not anticipated that any interrelationships between topics will make the impacts already described within Chapters 4-10 any more severe. Therefore the residual effects identified in these preceding chapters remain.

12 Conclusions

12.1 EIA Outcomes

Table 12-1 provides a summary of the significant effects, mitigation measures and residual effects identified in each of the chapters in this ES. For the purpose of this summary table, some significance scores have been adapted to reflect the standardised approach to significance scoring as detailed in Table 3-4. Refer to the individual topic specific ES chapters for the topic specific guidelines significance terminology.

Table 12-1: Summary of likely significant effects, mitigation measures and residual effects

Stage	Locations	Potential Likely Significant Effect	Significance Score	Proposed Mitigation	Residual Effect Significance Score
Chapter 4: Coastal Processes, Geomorphology and Flood Risk					
Construction	No significant effects identified				
Operation	Great Popplestone, Great Porth (Great Par) North of Great Carn, Stinking Porth, Green Bay, Porth Killier, Porth Coose, Lower Town Beach	Impact on flood risk during extreme events	Moderate beneficial	N/A	Moderate beneficial
Chapter 5: Biodiversity and Nature Conservation					
Construction	Isles of Scilly SPA and Ramsar	Habitat degradation and reduction in suitable habitat for foraging.	Temporary adverse	Implementation of strict pollution prevention measures on site.	Not significant
Construction	Isles of Scilly Complex SAC	Delivery of materials by barge landing in intertidal zone within SAC leading to potential compaction of intertidal sediments and potential for indirect damage to pollution.	Temporary adverse	Ecological Clerk of Works (ECoW) to be present when the landing site is established to ensure any sensitive marine habitats are avoided. Implementation of strict pollution prevention measures to prevent pollution. Landing of barge will not	Small scale temporary adverse effect. No significant adverse effect on the conservation status of the site.

Stage	Locations	Potential Likely Significant Effect	Significance Score	Proposed Mitigation	Residual Effect Significance Score
				cause significant adverse impact on conservation status of site.	
Construction	All sites	Indirect damage to subtidal and intertidal habitats via pollution runoff.	Temporary adverse	Implementation of strict pollution prevention measures.	Not significant
Construction	All sites (Bryher and St Agnes)	Potential destruction of active breeding bird nests.	Temporary adverse	Any clearance of vegetation required to permit works and access that is due to be undertaken during the main breeding season (March to September inclusive) will require a pre-works check no sooner than 2 weeks in advance of work commencing at each site to identify whether nesting birds are present or not. Exclusion zone to be implemented if nests found.	Not significant
Construction	Big Pool and Browarth Point SSSI (St Agnes)	Potential for damage and loss of habitats supporting rare plant species	Adverse effect	Use of barge or existing roads and tracks to bring materials into area. Further survey to be carried out immediately prior to works commencing. Laydown area to be marked out.	Temporary adverse effect on conservation status of site.
Construction	St Agnes	Potential disturbance of marine fauna and	Temporary significant	Implement appropriate	Not significant

Stage	Locations	Potential Likely Significant Effect	Significance Score	Proposed Mitigation	Residual Effect Significance Score
		pollution of water.	adverse	pollution prevention measures and ensure all rock armour placement work undertaken in dry conditions. No working if seals approach site.	
Construction	St Agnes	Potential disturbance to bats (if construction undertaken overnight).	Temporary adverse	No night time working or minimal directional lighting.	Not significant
Construction	St Agnes	Habitat loss - amphibians, terrestrial invertebrates and protected flora.	Adverse	Placement of all site compounds to be agreed following surveys undertaken by ECoW.	Small temporary adverse effect
Construction	All sites	Invasive non-native species (INNS) – risk of killing, injuring, uprooting. Brown rats have previously been eradicated from St Agnes.	Significant adverse	An invasive species management plan will need to be written in order to ensure the works don't cause the spread of INNS. Biosecurity measures to be put in place. All local biosecurity measures to ensure that the works do not facilitate the spread of Brown Rats will be adhered to and documented in a biosecurity risk assessment.	Not significant
Construction	Pool of Bryher and	Direct damage to SSSI if alternative access	Temporary adverse	A full vegetation	Temporary adverse

Stage	Locations	Potential Likely Significant Effect	Significance Score	Proposed Mitigation	Residual Effect Significance Score
	Popplestone Bank SSSI	track used	impact	survey of the dunes to be impacted should be carried out at an appropriate time of year. Any rare plants found will need to be suitably translocated prior to the works taking place.	impact. No significant adverse effect on conservation status of site.
Construction	Rushy Bay & Heathy Hill (Bryher) SSSI	Direct damage to brackish lagoon via pollution and run off.	Temporary adverse effect	Implementation of pollution prevention measures.	Not significant.
		Potential for damage and loss to habitats supporting rare plant species.	Small scale adverse	Use of existing roads and tracks to bring materials into the area. A further survey will be carried out at a suitable time of year immediately prior to works taking place. Laydown area to be strictly marked out with no material or plant storage in this areas.	Temporary adverse effect on conservation status of the site.
Construction	Isles of Scilly Marine Conservation Zone complex	Indirect damage via pollution run off.	Temporary adverse effect	Implementation of strict pollution prevention measures	Not significant
Construction	Sand dune habitat, St Martin's	Direct damage during construction due to sand excavation to install fence posts.	Temporary adverse effects	All sand will be replaced following completion of scheme.	Temporary adverse effect.
Operation	Sand dune habitat, St Martin's	Recovery of dune following completion of the works. Fence will restrict access to the sand dunes and	Permanent positive effect	N/A	Permanent positive effect

Stage	Locations	Potential Likely Significant Effect	Significance Score	Proposed Mitigation	Residual Effect Significance Score
		reduce erosion protection from visitors.			
Chapter 6: Landscape and Visual					
Construction	No significant effects identified				
Operation	Periglis	Removal of degraded erosion control fabrics currently visible at dune surface.	Moderate beneficial	N/A	Moderate beneficial
Chapter 7: Historic Environment					
Construction	Great Porth (Great Par) North of Great Carn	Impact on surviving structural remains of post-medieval boathouse Scheduled Monument.	Large adverse	Any works that take place within scheduled area will require Scheduled Monument Consent. It is recommended that consultation is undertaken with Historic England in advance of the Scheduled Monument Consent application to identify potential mitigation measures. Mitigation measures could include recording and evaluation or restoration and conservation of any remains that will survive. Details of measures should be agreed after consultation with Historic England.	Not significant (subject to agreement of mitigation measures with Historic England).
	Porth Killier	Impact on the Scheduled Monument prehistoric settlement and field system at	Slight adverse	Construction activities within the scheduled area will	Not significant (subject to agreement of

Stage	Locations	Potential Likely Significant Effect	Significance Score	Proposed Mitigation	Residual Effect Significance Score
		Porth Killier.		required Scheduled Monument Consent. Mitigation measures should be agreed with Historic England during consultation in advance of the application. It is recommended that archaeological monitoring in the form of a watching brief and programme of excavation and recording of archaeological remains identified is undertaken.	mitigation measures with Historic England).
	Green Bay	Impact of vehicle access route on Scheduled Monument.	Moderate adverse	May require Scheduled Monument Consent. Impacts could be avoided through use of alternative route (such as direct delivery by barge) or reinforcing the access route via matting or similar.	Not significant (if avoidance measures taken)
	Alternative quay adjacent to Turk's Head, St Agnes	Slipway is a non-designated asset and vehicle movement across it has potential to damage asset.	Moderate adverse	Avoid use of slipway and deliver materials via Porthconger Quay or landing site at site.	Not significant (if avoidance measures taken)
Operation	No significant effects identified				
Chapter 8: Land Use, Tourism and Recreation					
Construction	No significant effects identified				

Stage	Locations	Potential Likely Significant Effect	Significance Score	Proposed Mitigation	Residual Effect Significance Score
Operation	No significant effects identified				
Chapter 9: Climate Change					
Construction	All sites	Storms leading to tipping barge delivery or water and flood damage for machinery and infrastructure.	Moderate adverse	Implementation of relevant emergency plans and procedures.	Not significant
Operation	All sites	Increase in height of storm surges leading to flooding and risk to maintenance process.	Moderate adverse	Implementation of relevant emergency plans and procedures.	Not significant
	All sites	Increase in height of onshore waves risking maintenance personnel during high tide.	Moderate adverse	Implementation of relevant emergency plans and procedures.	Not significant
	All sites	Increase in magnitude and frequency of extreme rainfall events leading to unsafe working conditions for maintenance staff and flooding repair works.	Moderate adverse	Implementation of relevant emergency plans and procedures.	Not significant
	All sites	Gales and extreme wind events leading to unsafe working conditions during maintenance.	Moderate adverse	Implementation of relevant emergency plans and procedures.	Not significant
	All sites	Storms leading to unsafe working conditions during maintenance and damage to machinery, plant and critical infrastructure.	Moderate adverse	Implementation of relevant emergency plans and procedures.	Not significant
Chapter 10: Other Construction Related Effects					
Construction	Great Popplestone	Increase in construction vehicles (if rock imported and delivered by road)	Temporary large adverse	Implementation of Construction Traffic Management Plan or avoidance through accessing by beach landing site.	Temporary moderate adverse (if rock imported and delivered by road)
	Stinking Porth, Great Porth (Great Par) North of Great Carn,	Increase in construction vehicles (if materials delivered by road)	Temporary large adverse	Implementation of Construction Traffic Management Plan or	Temporary moderate adverse (if materials delivered by

Stage	Locations	Potential Likely Significant Effect	Significance Score	Proposed Mitigation	Residual Effect Significance Score
	Kitchen Porth, Porth Killier, Porth Coose, Periglis.			avoidance through accessing by beach landing site.	road)
	Great Porth (Great Par) North of Great Carn, Green Bay, Kitchen Porth, Periglis	Impact on potential dust from earthworks on sensitive receptors	Temporary moderate adverse	Implementation of dust management measures in accordance with IAQM guidelines.	Not significant
	Green Bay	Impact of potential dust from trackout (if accessing site by tracking across beach)	Temporary moderate adverse	Implementation of dust management measures in accordance with IAQM guidelines.	Not significant
	Great Porth , Kitchen Porth, Periglis	Noise and vibration effects at sensitive receptors from construction works	Temporary adverse	Implementation of noise management measures in accordance with BS 5228.	Not significant
	Great Popplestone, Stinking Porth, Great Porth (Great Par) North of Great Carn, Kitchen Porth, Porth Killier, Porth Coose, Periglis, Lower Town Beach	Noise and vibration effects at sensitive receptors form construction traffic (if accessed by road)	Temporary adverse	Implementation of noise management and measures in accordance with BS 5228 along with a traffic management plan.	Not significant
Operation	No significant effects identified				
Chapter 11: Cumulative and Combined Effects					
Construction	No significant effects identified				
Operation	No significant effects identified				

12.2 Concluding remarks

The nine proposed sea defences across the islands of Bryher, St Agnes and St Martin's on the Isles of Scilly will protect homes, businesses and infrastructure on the Isles of Scilly, from tidal flooding and coastal erosion, for the lifetimes of the respective schemes.

It was determined by a Screening Opinion from CIoS in August 2021 that the works would constitute EIA development, and an ES must be written to accompany the planning applications for the nine schemes.

This ES has assessed anticipated impacts for the nine schemes under the following specialist chapters – Coastal Processes, Geomorphology and Flood Risk, Biodiversity and Nature Conservation, Landscape and Visual, Historic Environment, Land Use, Tourism & Recreation, Sustainability & Climate Change, Other Construction Related Effects and Cumulative and Combined Effects. Where potential impacts have been identified (summarised in Table 12-1), mitigation has been suggested (where possible) in order to lessen these impacts.

12.3 Mitigation and monitoring

An Outline CEMP (Appendix 2.2) has been produced to assist with the implementation of construction mitigation recommended within this ES. It is recommended that an ECoW would also be present on site, to aid the construction contractor for the duration of the construction period. The role of the ECoW on a construction project is to monitor compliance with the ecological policies described in the CEMP together with any planning conditions and legal environmental requirements.

If the need for one should arise, a Community Liaison Officer would be provided during the construction phases of the nine schemes. The role of the Community Liaison Officer would be to communicate and coordinate between the construction contractor and local residents and businesses. This would ensure that any disruptive construction activities are well communicated to residents in advance of the works, and that the views or concerns of residents are accounted for by the construction contractor when planning the works.

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