



Mawgan Porth Coastal Change Study Report

Coastal Change Study Report

For C Jones Enterprise Ltd.

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1. INTRODUCTION

1.1 Terms of reference

Hydrock Consultants Ltd. (Hydrock) was commissioned by C Jones Enterprise Ltd. (the Client) to prepare a Coastal Change Study Report to inform the proposed mixed-use redevelopment at a site at Mawgan Porth.

Hydrock's instruction to proceed was provided in email correspondence between James Walker (Hydrock) and Charlie Jones (C Jones Enterprise Ltd), dated 08 February 2021.

1.2 Objectives

The site lies upon a stretch of coast which is known to be subject to coastal erosion; this erosion is anticipated to be ongoing for the design life of the development proposed. This Coastal Change Study Report is, therefore, required to consider the likely impact of future coastal change on the proposed development, the access (the B3276), and conversely, any impact the project may have on coastal change.

1.2 Scope of works

This study includes a review of baseline conditions, likely historical coastal regression rates and third-party estimates of future coastal regression. The report provides commentary upon the implications of this to the proposed development with conclusions and recommendations.

Baseline conditions at the site will be deduced from Ordnance Survey mapping, geological maps/memoirs, and a site reconnaissance survey.

A review of historical Ordnance Survey mapping will be undertaken to establish whether historical coastal regression rates can be reliably understood.

Estimates of future coastal regression will take account of the Shoreline Management Plan 2 (SMP2) and National Coastal Erosion Risk Mapping (NCERM). SMP2 provides an estimate of future coastal change based on United Kingdom (UK) climate data provided by United Kingdom Climate Projections (UKCP09) and historical rates of erosion at the site, estimated from the historical Ordnance Survey mapping. The NCERM will also be used, this uses methodologies developed during the Risk Assessment of Coastal Erosion (RACE) R&D Project FD2324.

This report will then provide a site-specific assessment of this data looking in more detail at the foreshore and coastal geomorphology local to the proposed development to provide a refined site-specific assessment for the design life of the development and access. The conclusions of which are then used to identify areas of the coastal frontage where mitigation measures may be necessary to ensure the proposed development and access are protected from coastal regression during their design life.

This assessment and commentary are given in the context of national and local planning policies. In addition to the potential impacts to the proposed redevelopment and its immediate environs as a result of coastal change, the impact the project may have on coastal change will also be considered.

1.3 Proposed development

It is proposed to redevelop the site for mixed-use residential and commercial purposes.

The proposed development layout comprises a number of two-storey structures, comprising four retail units on the ground floor, and fifteen residential 1-to-3-bedroom apartments on the first floor. A copy of the development proposals is presented in Appendix A for reference.

It has been assumed that the development itself requires a 60-year design life.

1.4 Planning Context

This report has been produced in support of a planning application for the proposed development and makes reference to the national and local planning guidance referenced in the following subsections.

1.4.1 National Planning Policy Framework

The National Planning Policy Framework (NPPF) dictates that the planning system should take account of coastal change. All plans should take a proactive approach to mitigating and adapting to climate change, taking account of both flood risk and coastal change (the subject of this report). New development should be planned in ways that avoid increased vulnerability to the range of impacts arising from climate change. In particular, paragraphs 167 and 168 of the NPPF suggest that:

167. Plans should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast. They should identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, and:

- a. be clear as to what development will be appropriate in such areas and in what circumstances; and*
- b. make provision for development and infrastructure that needs to be relocated away from Coastal Change Management Areas.*

168. 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.*

This report will specifically address paragraph 168a, but also discuss paragraphs 168b through 168d, where relevant.

Paragraphs 170 and 178 of the NPPF are also relevant to the proposed development stating that:

170. Planning policies and decisions should contribute to and enhance the natural and local environment by:

- a. 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.*

178. Planning policies and decisions should ensure that:

- a. *a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation).*

1.4.2 Cornwall Local Plan - Strategic Policies 2010-2030

Cornwall Local Plan Policy 26: Flood risk management and coastal change suggests that: *Development should take account of and be consistent with any adopted strategic and local flood and coastal management strategies including the Shoreline Management Plan and Catchment Flood Management Plans for Cornwall and the South West River Basin Plan.*

1.4.3 Cornwall Shoreline Management Plan

The site is located in the Trevelgue Head to Trevoze Head management area (Ref: MA33) of the SMP2 (Cornwall and Isles of Scilly), which was prepared in 2011.

A mid-term review of the was also undertaken by Cornwall Council in 2016 and included MA33.

1.4.4 Designations

The site or wider Mawgan Porth area does not fall within any statutory designations such as an Area of Outstanding Natural Beauty (AONB) or a Site of Special Scientific Interest (SSSI).

2. THE SITE

2.1 Site location

The site is located at an existing mixed-use development at an intersection along the B3276 in Mawgan Porth, Cornwall.

The existing site comprises one two-storey structure, providing takeaway food on the ground floor and residential accommodation on the first floor, and two single-storey commercial properties. Parking areas are also sited to the front of the existing structures. The site is centred on approximate National Grid Reference: 185015E, 067179N and the nearest postcode is TR8 4BA.

The site lies to the southeast of the South West Coast Path, Mawgan Porth beach and the English Channel. The northern site boundary comprises the B3276 roadway with an adjoining local road to the northeast. To the west of the site is further mixed-use development with a large car park to the east.

Access to the site is gained from the B3276 (from either the north or south) or from the local road to the east.

A Site Location Plan (Ref: 17682-HYD-XX-XX-DR-GE-1001, dated 24 February 2021) is presented in Appendix A for reference. The existing site layout is presented on the Existing Block Plan (Ref: MP-PL-2020-PL-02, dated 17 May 2020) in Appendix A.

2.2 Geomorphological setting

This site lies close to the base of the valley and mouth of the River Menalhyl. The valley extends from Mawgan Porth towards the southeast, and follows the line of a geological fault (break in the rock [see Section 3]).

There are a number of depositional environments within the site's immediate environs, ranging from: marshland to the east/southeast of Mawgan Porth and the flood plain/buried river valley, associated with the River Menalhyl, upon which Mawgan Porth sits, overlapping with the sand dunes, visible to the north and west of the site, before the beach front.

Mawgan Porth beach, which lies approximately 50m to the west of the site at its closest point, predominantly comprises sand. The B3276 roadway and a sand dune system are present between the site and the beach. The sand dunes are approximately 275m in length along the beach (orientated north to south) and approximately 80-100m in width at their widest visible points. They likely contribute to Mawgan Porth beach.

A sea cliff rises up from the northern extent of the sand dunes as well as to the south of Mawgan Porth beach.

The site location is indicated in Figure 2.1 and Figure 2.2.

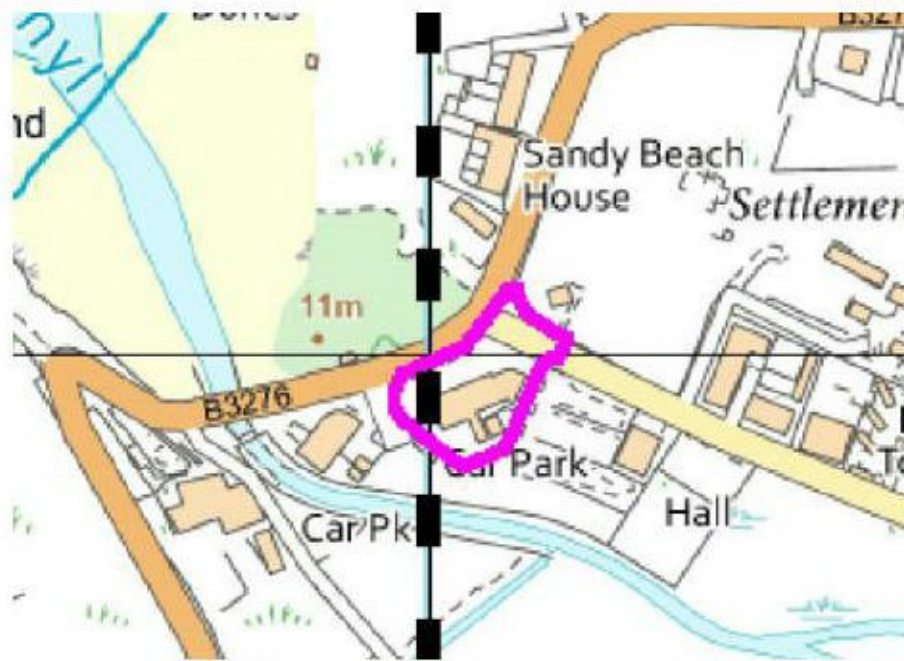


Figure 2.1: Site location (OS Map).

Reproduced with permission from Envirocheck.

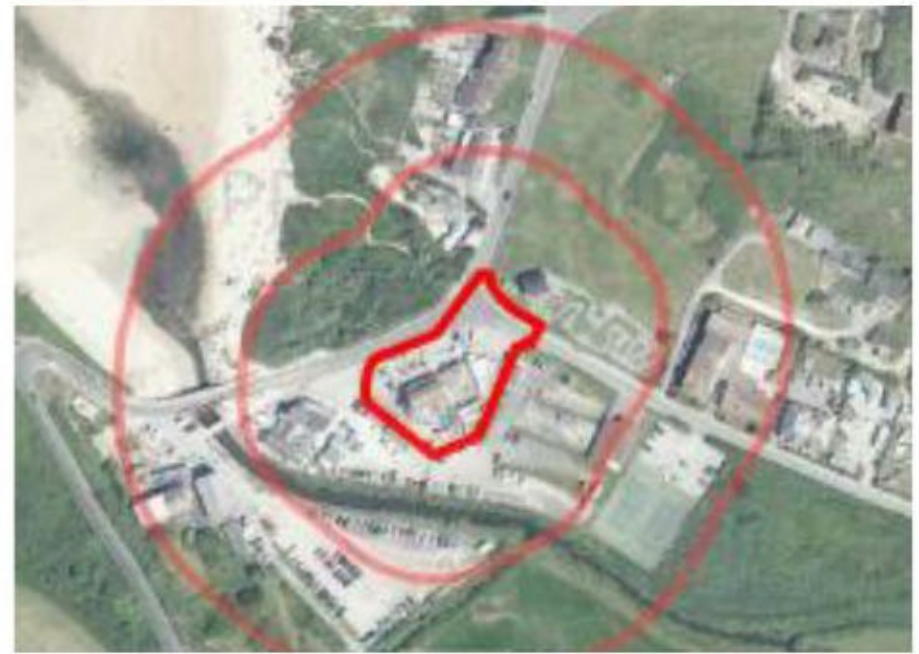


Figure 2.2: Site location (Aerial).

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2.3 Site reconnaissance

A walkover survey of the site was undertaken on 19 February 2021. The walkover survey was undertaken to confirm the baseline conditions and truth elements of the desk study (see Section 3).

For clarity, the site reconnaissance has been split into four areas:

1. Mawgan Porth beach, the River Menalhyl and the B3276 roadway.
2. The sand dune system bordering the east of the beach.
3. The northern headland.
4. The southern headland.

A summary of the observations from the site walkover survey are presented in the following subsections. Photographs of the site (Photograph 1) and its immediate environs are presented in Appendix B of this report.

The site and surrounding area, including the River Menalhyl, the B3276 roadway, the sand dune system, and notable coastal and fluvial defences, are presented on the Mawgan Porth Beach Layout drawing (Ref: 17682-HYD-XX-XX-DR-GE-1002, dated 1 March 2021) in Appendix A.

2.3.1 Mawgan Porth beach, the River Menalhyl and the B3276 roadway

- The B3276 bridge forms the southern boundary of the Mawgan Porth beach with the River Menalhyl flowing under the bridge and directly on to the beach (Photographs 2 & 3).
- Granite boulders (rip-rap) and geo-grid secure the dune sand on the northern side of the river, where it exits under the bridge and on to the beach (Photographs 3 & 4).
- A single row of gabion baskets approximately 10m in length (with each basket approximately 1m³) has been placed to defend the dunes from wave action on the northern side of the river (adjacent to a raised picnic area) (Photograph 5).
- A stockpile of assumed dredged river gravels was present on the southern side of the beach, where the river exits from under the bridge (Photograph 6).
- Granite boulders (rip-rap) front the sand dunes for the majority of its length at beach level (approximately 180m of rip-rap) (Photographs 7-9).
- The beach deposits (sand) stretch all the way out to the sea (observed at low tide) (Photograph 10).

- No signs of rock outcrops were observed on the beach.
- The channel of the River Menalhyl broadly hugged the southern side of the beach (away from the sand dunes). The base of the channel was only approximately 100mm lower than the adjacent beach levels (Photograph 10).
- The river channel on the beach was strewn with boulders of local provenance (Photograph 11).
- East of the bridge, the river channel is lined with stone (channelised) broadly in line with the existing building frontage (Photograph 12).
- A small pedestrian bridge is also present a short distance to the east from the main road bridge. The pedestrian bridge has 4 rectangular openings for flow conveyance.
- The river is still channelised further upriver, however, the stone appears to have been replaced with woven geotextile covered by topsoil on (low) banks. No hard engineering was observed to be fronting the river from this point, however, approximately 1m high concrete walls bound both sides of the channel for at least 100m (up-river) (Photograph 13).

2.3.2 Sand dune system

- The sand dunes flank the beach to the east (orientated north to south) for approximately 275m (Photographs 7, 8, 14 & 15).
- At their southern end, the sand dunes are approximately 5m high relative to beach level.
- The dunes are frequently cut by footpaths along their entire length.
- There is evidence of planar failures and slumping on the seaward face of the dunes (Photographs 16 & 17).
- The dunes are densely vegetated by marram grass but not typically on their seaward face.
- Approximately 1m or so higher than existing beach level, a layer of rounded pebbles was observed within the seaward face of the sand dunes. This may be evidence of a former beach level (i.e., a raised beach) (Photograph 18).
- A lifeguard shelter sits immediately west of the sand dunes approximately halfway along the beach. Signage indicates that it is unsafe.
- To the north of the lifeguard shelter, coarse mesh fencing has been placed to maintain the sand dunes, however, at the time of the walkover this was in a poor state of repair (Photograph 18).
- The height of the sand dunes extends to approximately 20m above beach level at their northern end prior to meeting the (rock) coastal cliff, which broadly runs northwest to southeast, cross-cutting the dunes, and appearing to continue towards the southeast (Photograph 19).
- The level of the sand dunes at the northern end of the beach is broadly level with the adjacent residential properties to the east, which may suggest that the dunes continue beyond the residential housing to the east.
- The golf course to the northeast of the site appears to be located on historical sand dunes (now landscaped), which similarly may also extend further to the east (Photograph 20).

2.3.3 The northern headland

- The rock on the beach's northern cliff face comprises broadly sub-horizontally bedded (thinly laminated) light greenish grey mudstone and siltstone. The rock has (subvertical) discontinuities running vertically up the cliff face cross-cutting the sedimentary bedding. The discontinuities include quartz veins and some degree of contact metamorphism was observed at their margins.
- The dip direction and angle of the sedimentary bedding was observed to be variable, however, where access allowed, the bedding was recorded as dipping down at angles of approximately 15° to the south.

- The cliff-top appeared to be topped with dune sand, which may also comprise beach deposits (Photograph 23).
- Further northwest along the cliff line, it is evident that the dune sand/beach deposits has been sliding off the bedrock geology and on to the beach. Due to the height of the deposits, which sit atop approximately 10-15m of rock, this is not likely to have been caused by wave action.
- Large boulders of rock were observed on the beach at the base of the cliff. These are likely to be remnant from rock-falls related to structurally-controlled release of material from the cliffs (Photograph 24).

2.3.4 *The southern headland*

- The clifftop to the south of the beach dips steeply down towards the north (resembling a dip slope) with a relatively short cliff face at the base (in contrast to the northern cliff face) (Photograph 25).
- The rock of the cliff face comprised a sequence of dark grey sedimentary rocks, including mudstone and siltstone. No particular evidence of mineralization was observed.
- The bedding and main discontinuities appeared to be dipping into the slope (in contrast to the dip slope nature of the headland).
- No sign of landslip or significant rock-falls were observed.

3. SITE GEOLOGY AND HISTORY

3.1 Site soils and geology

The British Geological Survey (BGS) maps of the area (1:50,000 series, Sheet 346: Newquay; and Sheet 335: Trevoze Head) indicate that the site is underlain by Superficial Deposits of Alluvium (clay, silt, sand and gravel) associated with the River Manalhyl. The nearby sand dunes and Mawgan Porth beach are similarly recorded as Superficial Deposits of Blown Sand, and Beach & Tidal Flat Deposits, respectively.

The underlying Solid Geology beneath the site comprises the Bovisand Formation, which comprises a slaty mudstone with thin sandstone beds and sporadic thin limestone beds. The Bovisand Formation extends across the wider area and forms the headland to the south of the Mawgan Porth beach.

To the north of the Mawgan Porth beach, the Solid Geology changes to Staddon Formation, which comprises a fine- to medium-grained sandstone, thickening and coarsening upwards with thin interbedded grey mudstone and siltstone. The Staddon Formation forms the headland to the north of the beach. Whilst not specifically mapped, Raised Beach Deposits are also known to be present along this stretch of coast (see site walkover observations in Section 2.3).

The River Manalhyl broadly follows the line of a northwest to southeast trending geological normal fault (break in the rock), which downthrows strata to the northeast. Several north-south trending normal faults are also mapped within the surrounding area.

The BGS geological map of the site and the wider Mawgan Porth area is shown on Figure 3.1.



Figure 3.1: BGS Geological Map of Mawgan Porth

The BGS mapping has not recorded any landslips within 500m of the site. The closest landslip is recorded approximately 1.5km to the south of site.

3.2 Site hydrology

The River Menalhyl flows past the site, approximately 20m to the south (at its closest point). The river flows east to west and discharges on to the Mawgan Porth beach and out to sea.

A Flood Risk Assessment, undertaken by Nijhuis Industries (Ref: J-14070, dated 22 December 2020) (see Section 5.5), suggests that the catchment area of the River Menalhyl is approximately 44km² and extends a significant distance out to the east from Mawgan Porth. The catchment takes in the villages of St Mawgan and St Columb Major.

3.3 Site history

Historical Ordnance Survey maps are provided within Appendix C of this report. A summary is provided below.

At the time of the first edition Ordnance Survey maps, the majority of the site is designated as 'marsh', which also surrounds the site. Two tracks cross the site in the north at the approximate location of the present-day local road. The River Menalhyl flows past the site approximately 20m to the south and exits on to the Mawgan Porth beach to the west and hugs the sand dunes that are marked to the east of Mawgan Porth beach. A river crossing is marked at the approximate location of the present-day pedestrian bridge. It is of note that the track, that crosses the north of the site, continues through the dunes on to the beach, before meeting a 'ford' crossing the River Menalhyl; the track continues south to meet the southern headland.

By the time of the 1907 Ordnance Survey map, the site remains largely unchanged. However, the River Menalhyl now discharges and hugs the western side of the Mawgan Porth beach (i.e., the opposite site of the beach to the sand dunes). Consequently, the ford and track (leading south) are no longer present. The main road bridge over the River Menalhyl is now marked.

On the 1970 Ordnance Survey map, several structures are now present on site. The western part of the site is marked as a garage with a traffic island marked on the northern boundary. The eastern part of the site is marked as 'Surfside'. Both the main road bridge and the pedestrian bridge are now marked as crossing the River Menalhyl. The river has also been channelised and the channel extends out beneath the road bridge and onto the Mawgan Porth beach. The river continues to hug the west of the beach (away from the sand dunes) as it flows out from under the bridge.

No significant changes are marked on the 1995 Ordnance Survey map. By 2020, the western portion of the site is no longer marked as a garage. No other significant changes in the surrounding area are marked.

3.4 Mean sea level rise

At Newlyn, Bradshaw *et al* have reported that the rate of sea level rise between 1920 and 2014 was 1.8mm/yr, increasing to around 3.8mm/yr between 1993 and 2014.

The Mean High Water Line (as recorded on the 2020 Ordnance Survey map) is marked on the Mawgan Porth Beach Layout drawing (Ref: 17682-HYD-XX-XX-DR-GE-1002, dated 1 March 2021) in Appendix A

4. HISTORICAL COASTAL CHANGE

4.1 Historical Ordnance Survey map comparison

The historical Ordnance Survey maps have been analysed to look for indications of historical coastal change.

Due to their distance from site and their composition of Solid Geology, the change of the cliff lines on the northern and southern promontories over time are unlikely to impact the site. Therefore, for clarity, only the following two main areas have been analysed:

1. The River Menalhyl.
2. The sand dune system bordering the east of the beach.

The trends from the historical coastal change review are summarised in Sections 4.1.1 and 4.1.2 and are also plotted on the Historical River Menalhyl and Sand Dune Frontage drawing (Ref: 17682-HYD-XX-XX-DR-GE-1003, dated 1 March 2021) in Appendix A. The likely reasons for the changes (or lack thereof) are discussed in Section 4.2.

4.1.1 *The River Menalhyl*

The alignment of the River Menalhyl as it discharges onto the Mawgan Porth beach and flows out to the sea has changed over the course of the available historical Ordnance Survey mapping (1880 to 2020). On the earliest mapping (dated 1880) the river flows under a narrow crossing (at the approximate location of the present-day pedestrian bridge) and then hugs the eastern flank of the beach that borders the sand dunes.

On the 1907 map, the narrow crossing has been replaced with a more substantial crossing at the approximately location of the present-day B3276 bridge. The River Menalhyl then discharges on to the beach and largely occupies the western side of the beach away from the sand dunes. This suggests that some channelisation works may have been undertaken as part of the construction works for the new bridge and have (to some extent) directed the river away from the sand dunes.

The subsequent Ordnance Survey maps (dated 1963, 1972, 1995, 2001 and 2020) show that the River Menalhyl is dynamic and that the course of the river as it discharges on to the Mawgan Porth beach and out to sea has changed over time (and is, therefore, largely only representative of the date of the mapping). However, the mapping period does suggest that the river consistently flows away from the sand dunes down the western flank/central portion of the beach. The 1972 Ordnance Survey map shows further channelisation of the river that extends out on to the Mawgan Porth beach.

A review of historical aerial imagery on 'Google Earth', dated 2001, 2005, 2006, 2009 and 2017 and 2019, corroborates these observations.

The historical route of the river is plotted on the Historical River Menalhyl and Sand Dune Frontage drawing (Ref: 17682-HYD-XX-XX-DR-GE-1003, dated 1 March 2021) in Appendix A.

4.1.2 *Sand dunes*

The seaward limit of the sand dunes has also been compared over the period of the available historical Ordnance Survey mapping (1880 to 2020). There is no clear regression trend for the sand dune system and it may have actually transgressed (migrated seaward) in some parts along the beach following the

change of course of the River Menalhyl over to the western side of the beach (i.e., away from the sand dunes).

It should be understood that this analysis is limited due to the accuracy and relatively poor resolution of available historical Ordnance Survey mapping, and that the extent of the dunes is based on the symbology on the maps.

The historical sand dune frontage is plotted on the River Menalhyl and Sand Dune Frontage drawing (Ref: 17682-HYD-XX-XX-DR-GE-1003, dated 1 March 2021) in Appendix A.

4.2 Controls of coastal change

Analysis of the historical Ordnance Survey mapping indicates that both the River Menalhyl and the sand dunes are dynamic environments. In addition to wave attack by the tides, the seaward limit of the sand dunes environment may also have been historically controlled by the River Menalhyl, which appears to have migrated west through time due to the channelisation and construction of the fluvial defences; it is of particular note that the existing defences (to the east of the river upon exiting the road bridge on to the beach), observed at the time of Hydrock's walkover survey, are likely to be responsible for the river's present-day alignment.

The sand dunes appeared to have been furthest from the sea during the period 1880 to 1963 when the River Menalhyl meandered further east across the beach. Following the works to further channelise the river as shown on the 1972 Ordnance Survey map, the dunes may have transgressed (migrated seaward) before remaining relatively consistent over the period 2001 to 2020.

However, due to the lack of any clear and significant trends of regression, and the relatively poor resolution of the historical Ordnance Survey maps, this methodology cannot sensibly be used in isolation to project a future regression rate for the sand dunes.

5. FUTURE COASTAL CHANGE

5.1 Proposed redevelopment

It is proposed to redevelop the site for mixed-use residential and commercial purposes. It has been assumed that the development itself requires a 60-year design life.

It is understood that as part of the redevelopment of the site, the existing local road to the north, which joins with the B3276, will also undergo some minor realignment works.

The proposed development layout is presented in Appendix A.

5.2 Mean sea level rise

The UKCP18 have estimated sea level rises of 0.27m-0.69m and 0.51m-1.13m for Cardiff (nearest UK city) for low and high emissions scenarios over the next 81 years (up until 2100), akin to rates of between 3.33mm/yr-8.51mm/yr and 6.29m/yr-13.95mm/yr, respectively, i.e., up to 3-4 times the existing annual rate of mean sea level rise (3.8mm/yr).

5.3 Shoreline Management Plan 2 (SMP2)

The SMP2, which was prepared in 2011, has been consulted to provide an estimate of the condition at the site.

The SMP2 provides an estimate of future coastal change based on United Kingdom (UK) climate data provided by United Kingdom Climate Projections (UKCP09) and historical rates of erosion at the site, estimated from the historical Ordnance Survey mapping.

The coastal change (assuming a No Active Intervention scenario) has been considered for three periods: Epoch 1: 0-20 years (to 2025), Epoch 2: 20-50 years (to 2055), and Epoch 3: 50-100 years (to 2105), corresponding to (assumed) sea level rises of: 0.06m (2025), 0.34m (2055) and 1.0m (2105). This has been assessed by considering the number of existing sea defences, geology, geomorphology, tide, wave climate, sediment sources and sediment supply.

The site falls within management area MA33: Trevelgue Head to Trevoze Head of the SMP2, specifically Policy Unit (PU) 33.3 (Mawgan Porth – road section), and PU 33.4 (Mawgan Porth – dunes).

The relevant chapter of the SMP2 (Ref: Chapter 4 PDZ13, dated February 2011) is presented in Appendix D for reference, as well as the preferred plan for MA33 (Ref: Chapter 5, dated February 2011) and an extract from the mid-term review, which was undertaken in 2016 (Ref: WATPB4338R001D01, dated 21 September 2016).

The SMP2 states that the risk of both erosion and flooding places significant future pressures on the frontage at Mawgan Porth. The extent of erosion could be as much as 35-40m under a 'No Active Intervention' scenario and flooding extents will also increase up to the normal tidal limit of the River Menalhyl, which discharges on to the beach and out to sea. The extent of the projected regression is presented on Figure 5.1, which is an inset map taken from SMP2.

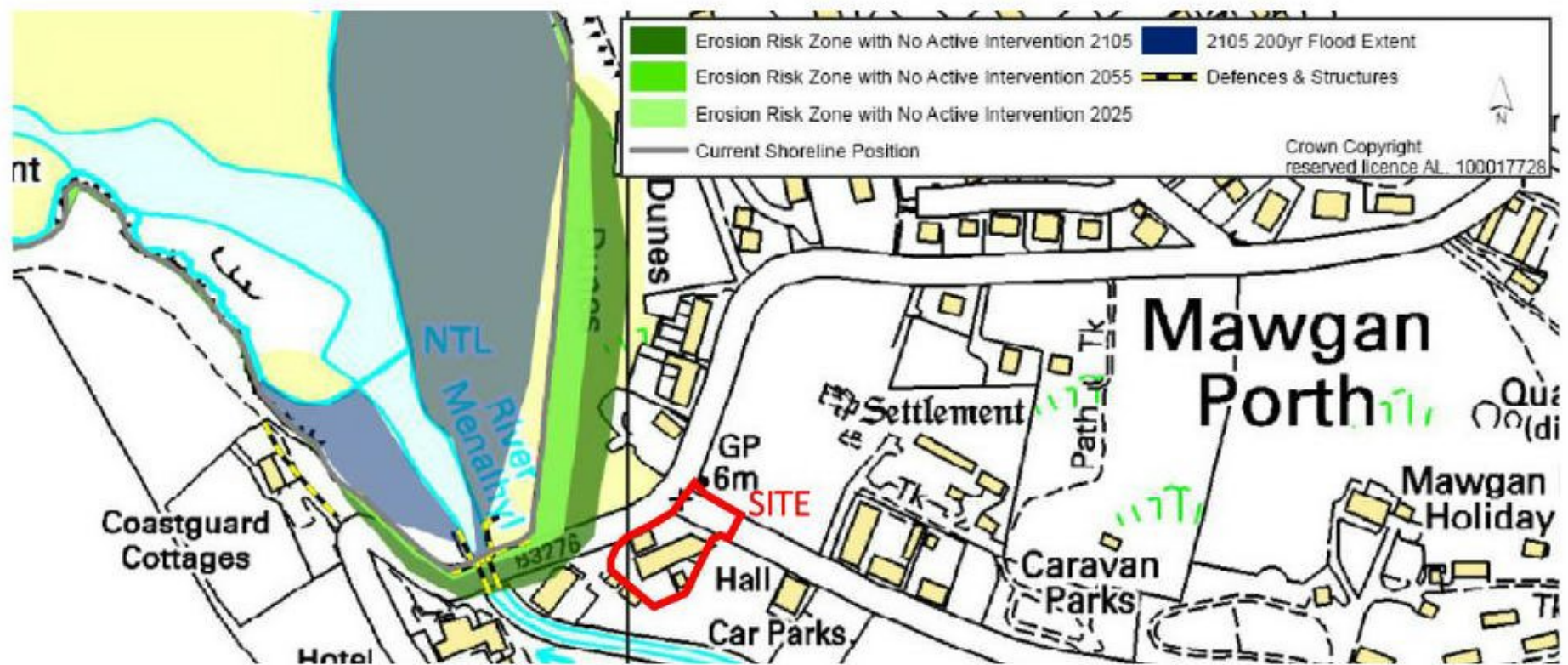


Figure 5.1: Extent of projected regression at Mawgan Porth (inset map taken from SMP2).

Properties to the rear of the beach are reportedly already subject to high flood risk due to wave overtopping action and the B3276 is also noted to be vulnerable. Given the above risks, the preferred plan (for PU 33.3 road section) is to initiate a Managed Realignment approach in the short- to medium-term, which in the long-term (>50 years) is expected to give way to No Active Intervention as a sustainable shoreline position is established.

The SMP2 goes on to state that the coastal changes will potentially, therefore, be significant to this community, possibly requiring re-routing of the B3276, and possible relocation of the commercial hub.

Conversely, the preferred plan for the sand dunes (PU 33.4) is to allow them to respond naturally to sea level rise and adjust their form and profile accordingly, through a 'No Active Intervention' approach from the onset. However, it should be noted that coastal defences are already in place along the full extent of the sand dunes (see site walkover observations in Section 2.3).

The SMP2 notes that the extent of erosion will depend on the position of the Solid Geology and the relict cliff line beneath the sand dunes. Understanding the actual sea level rise experienced, the volume of new sediments (from offsite sources), and the position of hard rock will be key to determine the approach at Mawgan Porth. Depending on the findings, a 'Managed Realignment' approach could be introduced to assist with enhancing the sand dunes.

The SMP2 preferred plan for all of Mawgan Porth is summarised in Table 5.3.

Table 5.1: SMP2 Preferred plan for Mawgan Porth.

Policy Unit	SMP2 Policy Plan			Comment
	2025	2055	2105	
33.3 Mawgan Porth – road section	MR	MR	NAI	Pressure on this frontage dictates that a Manged Realignment approach is required to address the risks to the road and rear-of-beach development. The longer-term aim would be to return the frontage to one which is entirely non-interventional (linked directly to PU33.4).
33.4 Mawgan Porth – dunes	NAI	NAI	NAI	Dunes should be allowed to respond naturally to sea level rise and continue to provide natural defence.

Notes:

MR = Managed Realignment.

NAI = No Active Intervention.

The SMP2 calculated regression for up to 2025, 2055 and 2105 for the Mawgan Porth sand dunes is presented in Table 5.3. As previously stated above, the projections are based on a 'No Active Intervention' approach (i.e., a worst-case scenario) and do not take into account the 'Managed Realignment' approach of the road section until at least 2055(see Table 5.1). Therefore, in reality the extent of erosion experienced in the short- to medium-term is likely to be significantly less.

Table 5.2: Estimated regression from SMP2 (No Active Intervention).

Time Period	Mawgan Porth			Approach
	Confidence Limit			
	5%	50%	95%	
Short-term (up to 2025)	0m	0m	0m	No Active Intervention*
Medium-term (up to 2055)	20m	15m	10m	No Active Intervention*
Long-term (up to 2105)	40m	30m	20m	No Active Intervention

Notes:

* the SMP2 preferred plan for these epochs is actually Managed Realignment for PU 33.3 road section, therefore, the extent of erosion experienced in the short- to medium-term is likely to be significantly less

5.4 National Coastal Erosion Risk Mapping (NCERM)

The aim of the NCERM is to map the risk of coastal erosion around the coast of England and Wales.

NCERM uses methodologies developed during the previously referenced RACE R&D Project FD2324. The reader is referred to this publication for further information.

Whilst SMP2 predicts regression using a band of regression rates measured from a baseline comprising the cliff-top, cliff-toe or mean high high-water mark, NCERM applies a predicted band of regression rates, derived from potential geological regression, from the point of where regression is likely to commence, e.g., the back of a (sand) dune field. Nevertheless, the published NCERM SMP2 Comparison Note states that, in general, the regression rates compare well with the SMP2 data.

The NCERM calculated regression for up to 2025, 2055 and 2105 for the Mawgan Porth sand dunes is presented in Table 5.3. The table shows that the NCERM projected extents of erosion are actually significantly lower than the SMP2 extents discussed above (which reportedly could be as much as 35-40m). This difference is likely because the SMP2 projection is based on a worst-case 'No Active Intervention' approach, whereas, the NCERM projections are based on the SMP2 preferred plan approach that classifies the B3276 road section (PU 33.3) as 'Managed Realignment' up until 2055 (see Table 5.1). In fact, the NCERM actually classifies all of Mawgan Porth as Managed Realignment – see Mawgan Porth Beach Layout drawing (Ref: 17682-HYD-XX-XX-DR-GE-1002, dated 1 March 2021) in Appendix A.

Therefore, as detailed in Table 5.3, the projected regression in the short- and medium-term is negligible (up to 0.01m), which is likely due to the Managed Realignment until 2055. However, in the long-term the projected regression significantly increases to between 16m and 28m based on the 95% and 5% confidence limits, respectively, which is likely due to the change in approach to No Active Intervention.

Table 5.3: Estimated regression from NCERM.

Time Period	Mawgan Porth			Approach
	Confidence Limit			
	5%	50%	95%	
Short-term (up to 2025)	0m	0m	0m	Managed Realignment
Medium-term (up to 2055)	0.01m	0.01m	0.01m	Managed Realignment
Long-term (up to 2105)	28m	22m	16m	No Active Intervention

5.5 Flood Risk Assessment

A Flood Risk Assessment has previously been undertaken by Nijhuis Industries (Ref: J-14070, dated 22 December 2020). The reader is referred to this report for further information; however, the salient details are summarised as follows:

- The site lies within the catchment of the River Menalhyl, which has an area of approximately 44km².
- The catchment area extends a significant distance out to the east from Mawgan Porth and takes in the villages of St Mawgan and St Columb Major.
- The site is unlikely to be at risk of groundwater flooding due to its relative elevation to the River Menalhyl (i.e., the river channel would act as a sump to drain water in the ground and away from the site).
- The site was initially considered to be at risk from surface water, fluvial and tidal flooding.
- The critical mechanism was determined to be fluvial flooding (1 in 100-year). When considering climate change, the top (flood) water level calculated was 5.92m above Ordnance Datum (AOD), which equates to be a maximum 0.72m above the existing property entrance.
- Towards the northern boundary of the site the flood depths decrease significantly, dropping to 0.05m as the ground profile raises away from the River Menalhyl.
- The site would not be affected by tidal flooding at present as the entire site is above the 1 in 200-year tidal level.
- The Finished Floor Levels (FFL) of new properties should be set 0.76m above the existing ground level (or at 5.92m AOD), which will minimise the risk of any flooding into properties. Reportedly, the FFL for the proposed retail unit is to be located at 6.50m AOD and the FFL for the residential first floor apartments will be located at 10.40m AOD.
- The main access and egress to and from the site (the existing B3276) was anticipated to be at risk of flooding between 0.05-0.25m in the current scenario.
- Mitigation measures for the development's egress, included raising the road table at the intersection of the B3276 and local road to the north of the site to provide additional safety for traffic and pedestrians. This potentially reduced the flood depths at the egress point to 0.00m.
- As the site is within Flood Zone 3, and in accordance with the Planning Practice Guidance (PPG), the development is classified as 'More Vulnerable'. Therefore, the site was also subject to the Sequential and Exception Test.
- The sequential test found no available alternative sites for the proposed development with a lower risk of flooding.
- Since the site is located on developable land, and the recommendations of the Flood Risk Assessment have been incorporated into the development proposals (i.e., raising FFL and road realignment), the report concluded that the Parts B and C of the exception test were met. The Planning Statement that accompanies the planning application for the proposed development is understood to outline how Part A of the exception test is being met (however, this has not been seen by Hydrock).

6. DISCUSSION

6.1 General

Based on the information provided within the Flood Risk Assessment (see Section 5.5), together with the channelised and actively managed nature of the River Menalhyl to the south of the site, Hydrock consider that the risk of the river changing course over the design life of the development is low.

The seaward limit of the sand dunes, the position of the B3276, and fluvial and coastal defences have been traced from 2020 Google imagery to extrapolate coastal change on Mawgan Porth beach to the west of the site.

Both the SMP2 and the NCERM 5% and 95% confidence limits, which provide maximum and minimum limits of projected regression, respectively, have been mapped to ascertain if the proposed development site is likely to be at risk by 2105. The SMP2 projected regression has been taken from the inset map contained within the SMP2 report (see Figure 5.1), and the NCERM projected regression is based on the calculated values in Table 5.3 and apply these from the current position of the shoreline.

The following discussion should be read with reference to the Projected Regression drawing (Ref: 17682-HYD-XX-XX-DR-GE-1004, dated 1 March 2021) in Appendix A.

6.2 Mawgan Porth redevelopment site

Both the SMP2 and NCERM projections suggest that the sand dune environment may change significantly in the coming years. The SMP2 data (based on No Active Intervention) suggest between 20m and 40m of regression by 2105, and the NCERM data suggest between 16m and 28m regression by 2105 (both sets of data are based on 95% and 5% confidence limits, respectively).

Whilst the two sets of projections are different, both the SMP2 and NCERM suggest that the site is not at risk by 2105. Hydrock also consider this a conservative estimate as the projected regression is for some 25 years after the design life of the development (60 years), i.e., the actual regression that takes place within the design life may be significantly less and, therefore, further away from the site.

The SMP2 projected regression suggests that the B3276 through road is under threat. However, as previously stated, this projection is based on a worst-case 'No Active Intervention' approach and does not take into account the 'Managed Realignment' classification of the road until at least 2055. Therefore, measures will likely continue to be implemented by the local authority to protect the road from erosion (i.e., through maintenance/replacement of the existing hard engineering, or installation of additional/new measures) until at least such time. Consequently, the SMP2 projected regression behind the bridge and across the B3276 is overly conservative and is likely to be inaccurate.

In addition, it is considered unlikely that the local authority will no longer maintain the defences/protect the road from 2055 onwards considering the local importance of both the road and the commercial assets behind. The limited expenditure to maintain the existing defences, or extend/install additional measures, when compared against the benefits of protecting the existing through road and community hub, likely outweighs their costly relocation.

Considering the above, Hydrock have calculated a likely alternative projected regression for up to 2105 that is based on the anticipated scenario of ensuring the serviceability of the B3276 through road and bridge. This is presented on the map inset 'Alternative Projection' on the Projected Regression drawing

(Ref: 17682-HYD-XX-XX-DR-GE-1004, dated 1 March 2021) in Appendix A and shows the impacted area is further from the site.

However, even if the projected regression on the SMP2 were a reality, the site itself is not at risk from erosion and viable access and egress for the site is still available, which comprises the B3276 to the north and the local road to the east.

It has been assumed that both the SMP2 and NCERM projected regression datasets apply to the Superficial Deposits across the area (i.e., the Beach & Tidal Flat Deposits, Blown Sand, and Alluvium) recorded on the BGS mapping, which are anticipated to have a thickness in excess of 5m. As observed during the site walkover (Section 2.3), the northern headland meets the sand dunes at their northern extent and appears to continue towards the southeast and beneath the dunes. The anticipated position of the buried cliff as it moves in land is shown on the Projected Regression drawing (Ref: 17682-HYD-XX-XX-DR-GE-1004, dated 1 March 2021) in Appendix A. The SMP2 notes that the extent of the sand dune regression that is experienced will depend on the position of the Solid Geology (i.e., the relict cliff), however, given the anticipated position of the buried cliff, and the anticipated thickness of the Superficial Deposits (>5m), the Solid Geology is unlikely to have an impact.

Whilst it is recognised that there has historically been regression of the sand dune environment, the dunes have also transgressed (moved seaward) in recent times. It would appear that the migration of the sand dunes is also controlled by the position of the River Menalhyl on the beach and not just from coastal erosion. Negligible erosion appears to have occurred between the 2001 and 2020 Ordnance Survey mapping. Nevertheless, it is recognised that rising sea levels would inevitably (in time) lead to a nett regression of the beach and sand dunes. However, there is still uncertainty over what time period this may happen.

7. CONCLUSIONS

It is considered that potential coastal change does not threaten the integrity of the proposed development within its design life (60 years). Notably:

1. The SMP2 and NCERM projected regression extents (based on 95% and 5% confidence limits) do not show the site to be at risk from erosion.
2. The SMP2 projected regression shows the B3276 through road to be at risk of erosion behind the existing fluvial and coastal defences (located to the southwest of the site). The SMP2 projected regression is based on a worst-case 'No Active Intervention' approach and does not take into account the 'Managed Realignment' approach for the road until at least 2055 (i.e., it is overly conservative and is likely to be inaccurate).
3. It is considered unlikely that the local authority will no longer maintain the defences/protect the B3276 from 2055 onwards considering the local importance of both the road and the commercial assets behind. The limited expenditure to maintain the existing defences, or extend/install additional measures, when compared against the benefits of protecting the existing through road and community hub, likely outweighs their costly relocation.
4. Hydrock have calculated a likely alternative projected regression for up to 2105 that is based on the anticipated scenario of ensuring the serviceability of the B3276 through road and bridge. This shows that the impacted area is likely to be further from the site.
5. Notwithstanding the above, if the SMP2 projected regression were accurate, the site itself is still not at risk from erosion (bullet 1) and viable access and egress for the site is still available, which comprises the B3276 to the north and the local road to the east.

Hydrock consider that the current development proposals are not at risk of coastal retreat and meet the requirements of NPPF paragraphs 168, 170 and 171. Therefore, Hydrock consider that no further action is deemed necessary.

8. UNCERTAINTIES AND LIMITATIONS

Hydrock Consultants Limited (Hydrock) has prepared this report in accordance with the instructions of C Jones Enterprise Ltd. (the Client), under the terms of appointment for Hydrock. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared and provided.

This report details the findings of work carried out in February and March 2021. The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, all potential environmental constraints or liabilities associated with the site may not have been revealed.

Information provided by third parties has been used in good faith and is taken at face value; however, Hydrock cannot guarantee its accuracy or completeness.

Where the existing report(s) prepared by others have been provided by the Client, it is assumed that these have been either commissioned by the Client, or can be assigned to the Client, and can be relied upon by Hydrock. Should this not be the case Hydrock should be informed immediately as additional work may be required. Hydrock is not responsible for any factual errors or omissions in the supplied data, or for the opinions and recommendations of others. It is possible that the conditions described may have since changed through natural processes or recent activities.

Any site boundary line depicted on plans does not imply legal ownership of land.

9. REFERENCES

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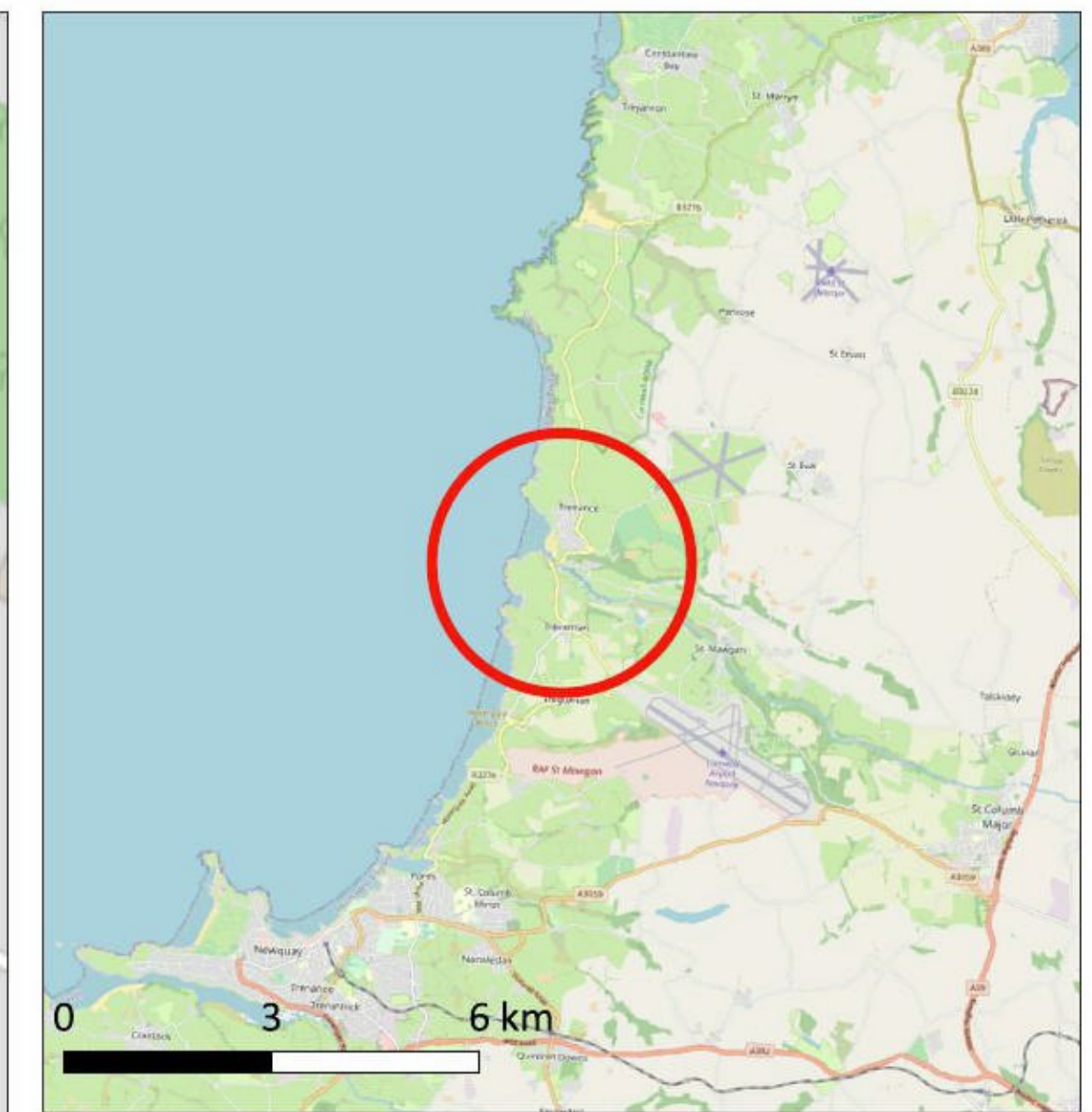
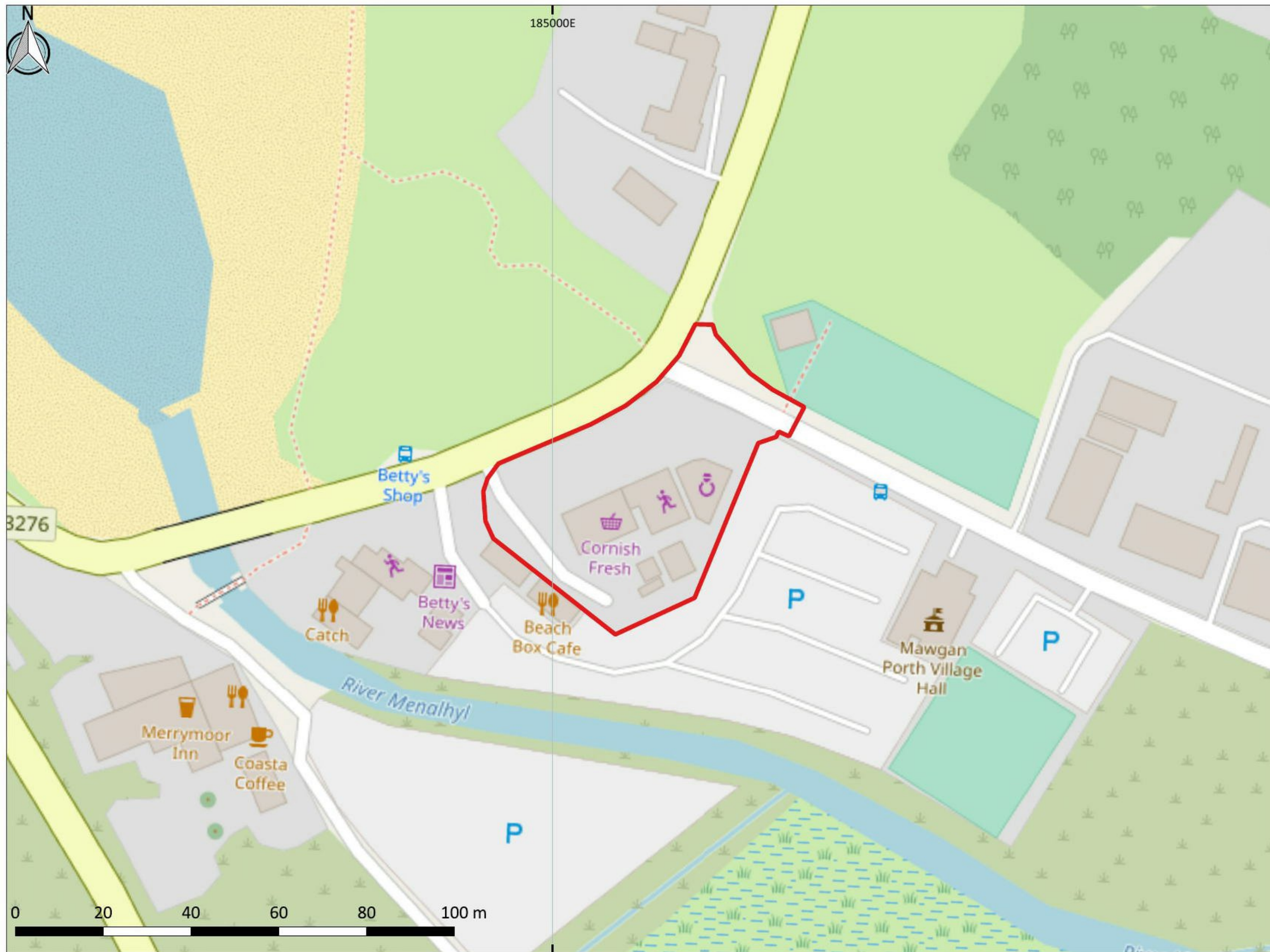
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Appendix A Drawings




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KEY PLAN	
	Site Boundary

NOTES
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REVISIONS				
P01	FIRST ISSUE			
	MK	RH	RH	24/02/2021
REV.	REVISION NOTES/COMMENTS			

Hydrock 

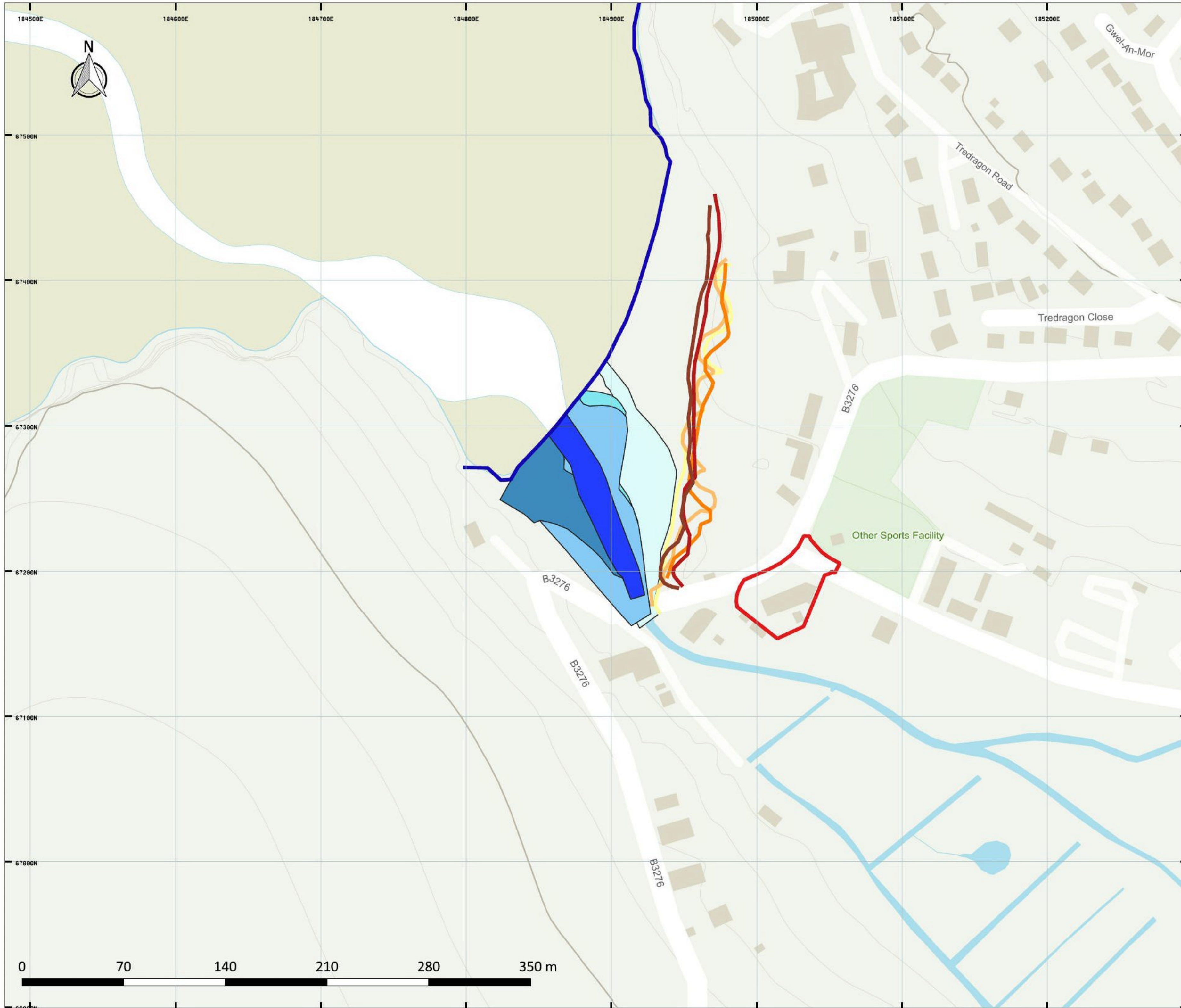
CLIENT
C JONES ENTERPRISE LTD.

PROJECT
MAWGAN PORTH

TITLE SITE LOCATION PLAN	
HYDROCK PROJECT NO. 17682	SCALE @ A3 1:1000
PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
DRAWING NO. 17682-HYD-XX-XX-DR-GE-1001	REVISION P01



KEY PLAN	
	Site Boundary
	Sand Dunes (2020)
	Mean High Water Line (2020)
	Coastal & Fluvial Defences & Structures
NCERM (2018)	
	No active intervention
	Managed realignment
NOTES	
1. Contains OS data © Crown copyright and database right (2021)	
REVISIONS	
P01 MK JW RH 01 MARCH 2021	
CLIENT C JONES ENTERPRISE LTD.	
PROJECT MAWGAN PORTH	
TITLE MAWGAN PORTH BEACH LAYOUT	
HYDROCK PROJECT NO. 17682-GSWP	SCALE @ A3 1:5000
PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
DRAWING NO. 17682-HYD-XX-XX-DR-GE-1002	REVISION P01



KEY PLAN

Site Boundary	Dune Frontage (2020)
Mean High Water (2020)	Route of River Menalhyl
Sand Dunes	1880 Route
Dune Frontage (1880)	1907 Route
Dune Frontage (1907)	1963 Route
Dune Frontage (1963)	2001 Route
Dune Frontage (2001)	2020 Route

NOTES

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REVISIONS

P01 | MK | JW | RH | 01 MARCH 2021



CLIENT
C JONES ENTERPRISE LTD.

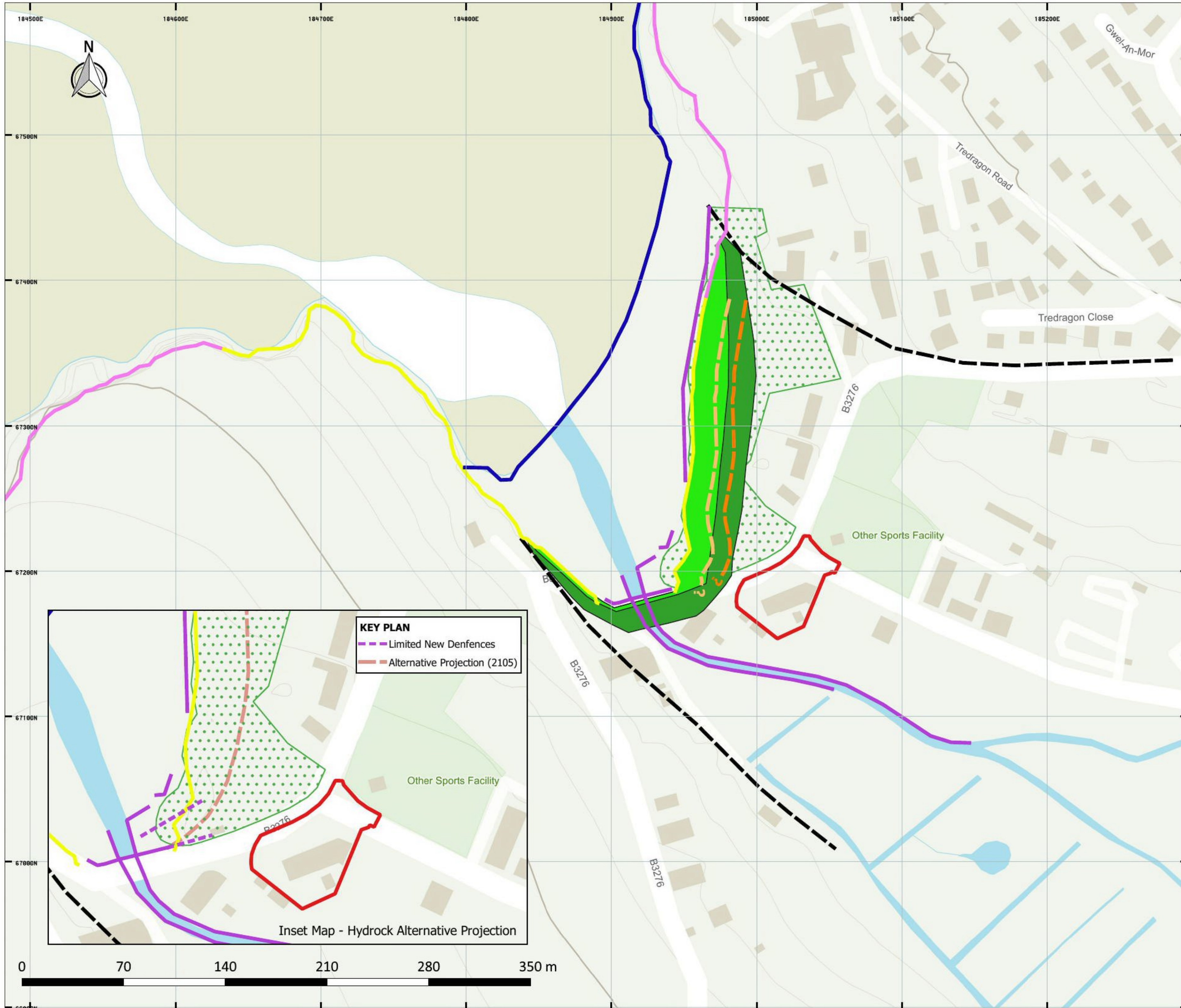
PROJECT
MAWGAN PORTH

TITLE
HISTORICAL RIVER MENALHYL AND SAND DUNE FRONTAGE

HYDROCK PROJECT NO. 17682-GSWP	SCALE @ A3 1:2500
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PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
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DRAWING NO. 17682-HYD-XX-XX-DR-GE-1003	REVISION P01
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KEY PLAN

- Site Boundary
- Sand Dunes (2020)
- Mean High Water (2020)
- Coastal & Fluvial Defences & Structures
- Anticipated Position of Buried Cliff

NCERM (2018)

- No active intervention
- Managed realignment

Projected Regression

- NCERM 95% 16m (2105)
- NCERM 5% 28m (2105)
- SMP2 No Active Intervention 95% 20m (2105)
- SMP2 No Active Intervention 5% 40m (2105)

NOTES

1. Contains OS data © Crown copyright and database right (2021).
2. The SMP2 regression rates are based on a No Active Intervention approach (i.e., worst case scenario).
3. The NCERM regression rates are based on the preferred plan detailed in the SMP2 document.
4. The Hydrock alternative regression (see inset map) is based on the likely scenario of ensuring the serviceability of the B3276 through road and bridge up to 2105.

REVISIONS

P01 | MK | JW | RH | 01 MARCH 2021



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C JONES ENTERPRISE LTD.

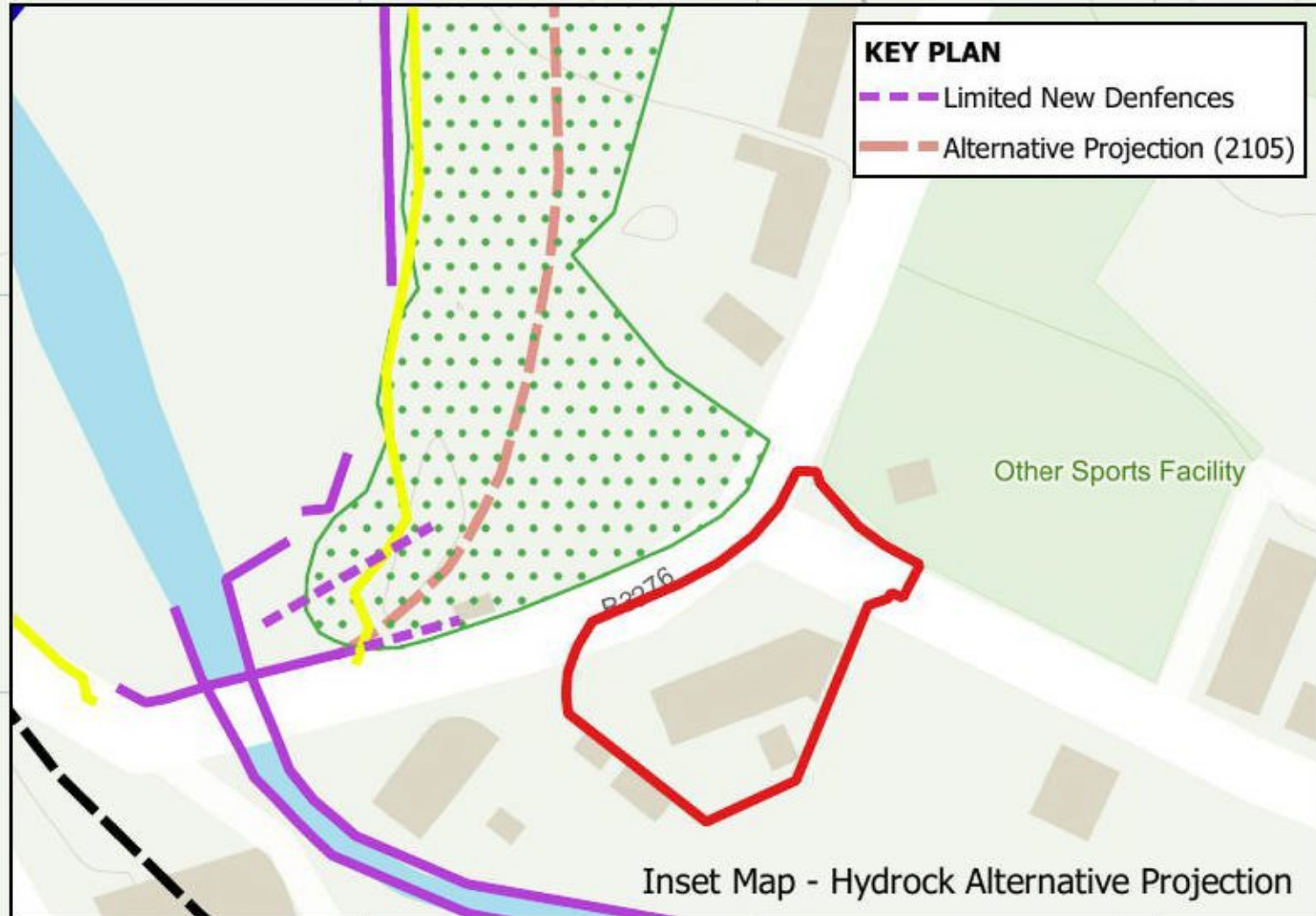
PROJECT
MAWGAN PORTH

TITLE
PROJECTED REGRESSION

HYDROCK PROJECT NO. 17682-GSWP	SCALE @ A3 1:2500
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PURPOSE OF ISSUE SUITABLE FOR INFORMATION	STATUS S2
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DRAWING NO. 17682-HYD-XX-XX-DR-GE-1004	REVISION P01
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 Plans shall not be taken in conformity with relevant British or European Standards. Codes of practice or materials names in the drawings to health & safety including construction materials must not be used or specified on the project.



PROJECT		Mawgan Porth	
CORNWALL		Cornwall	
TITLE			
EXISTING BLOCK PLAN			
DRAWING STATUS			
PLANNING			
DRAWN	DPB	CHECKED	
SCALE	1:500	DATE	17.05.2020
SUPERSTRUKT			
JOB NO.	DRAWING NO.	REV	REV
MP-PL-2020	PL-02		

FLOOR PLANS

SCAN ME



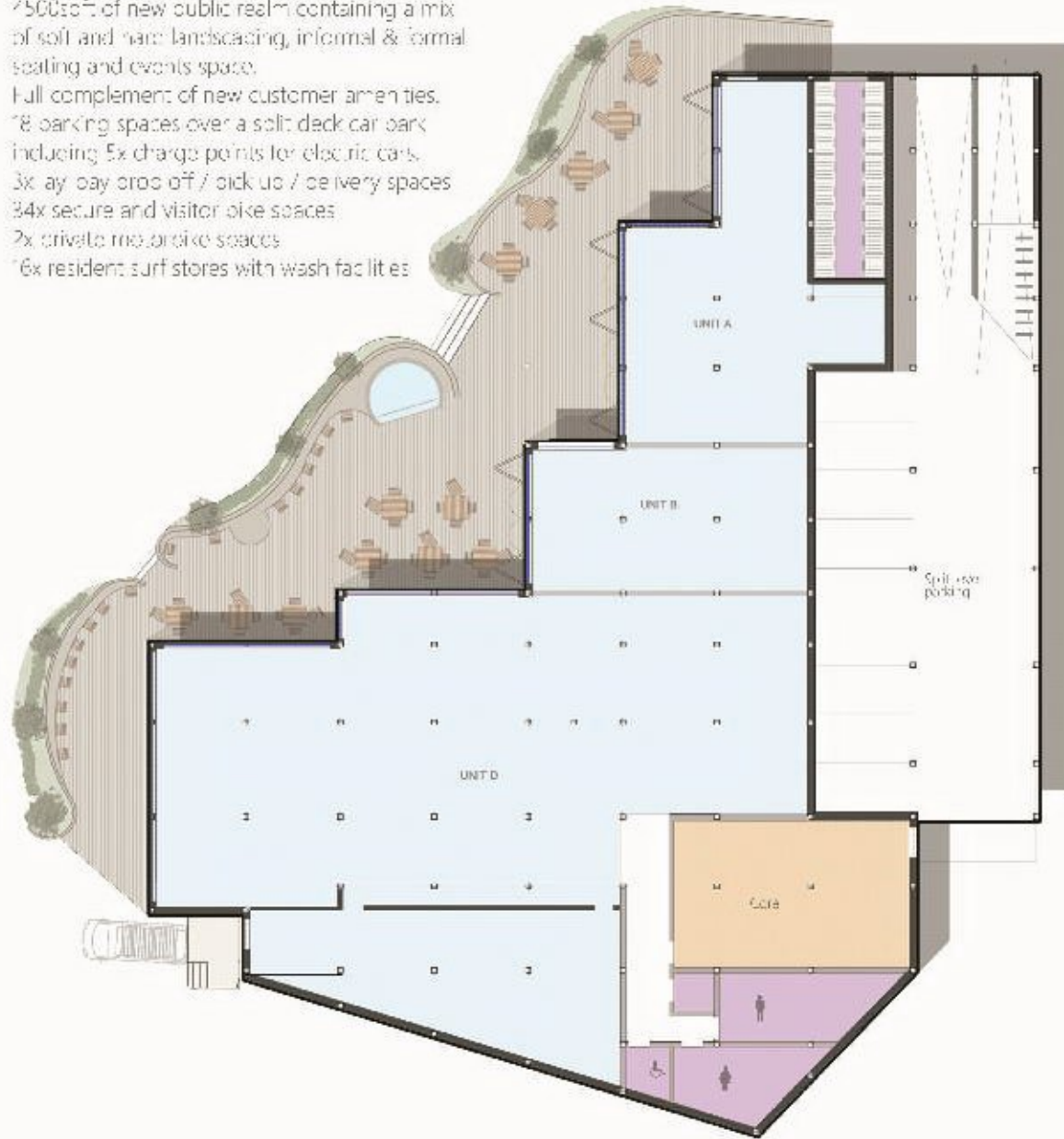
Ground Floor

USE-

Retail, food & beverage, public realm, toilets, resident's access core, stores and parking.

Quantum

4x retail units sharing around 7500sqft GIA,
 7500sqft of new public realm containing a mix
 of soft and hard landscaping, informal & formal
 seating and events space.
 Full complement of new customer amenities.
 18 parking spaces over a solid deck car park
 including 5x charge points for electric cars.
 3x ay bay drop off / pick up / delivery spaces
 34x secure and visitor bike spaces
 2x private motorbike spaces
 16x resident surf stores with wash facilities



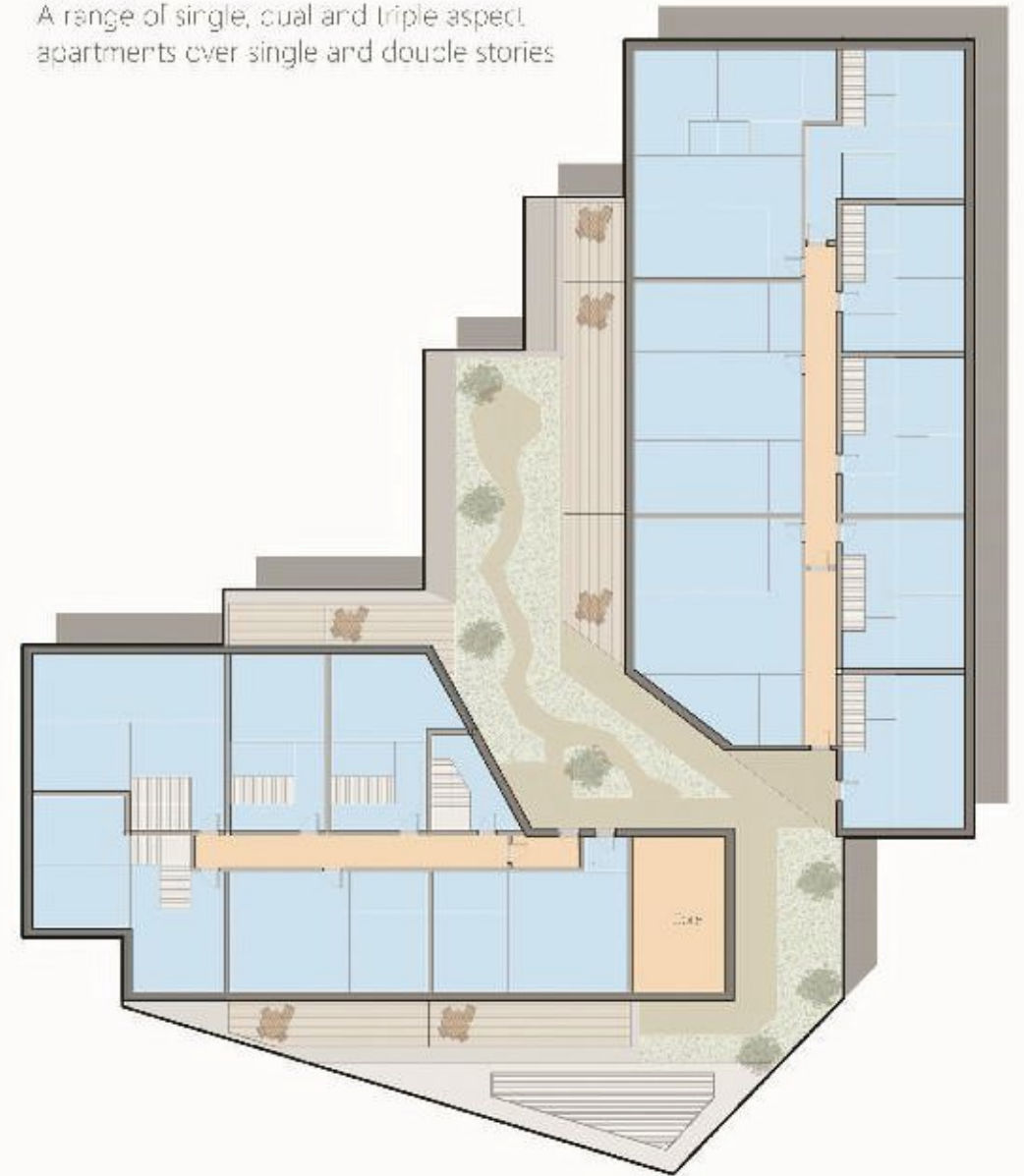
1st Floor

USE-

Residents gardens, apartments, access core, private amenity & commercial plant space

Quantum

15x residential apartments ranging from
 1-3 beds
 A range of single, dual and triple aspect
 apartments over single and double stories



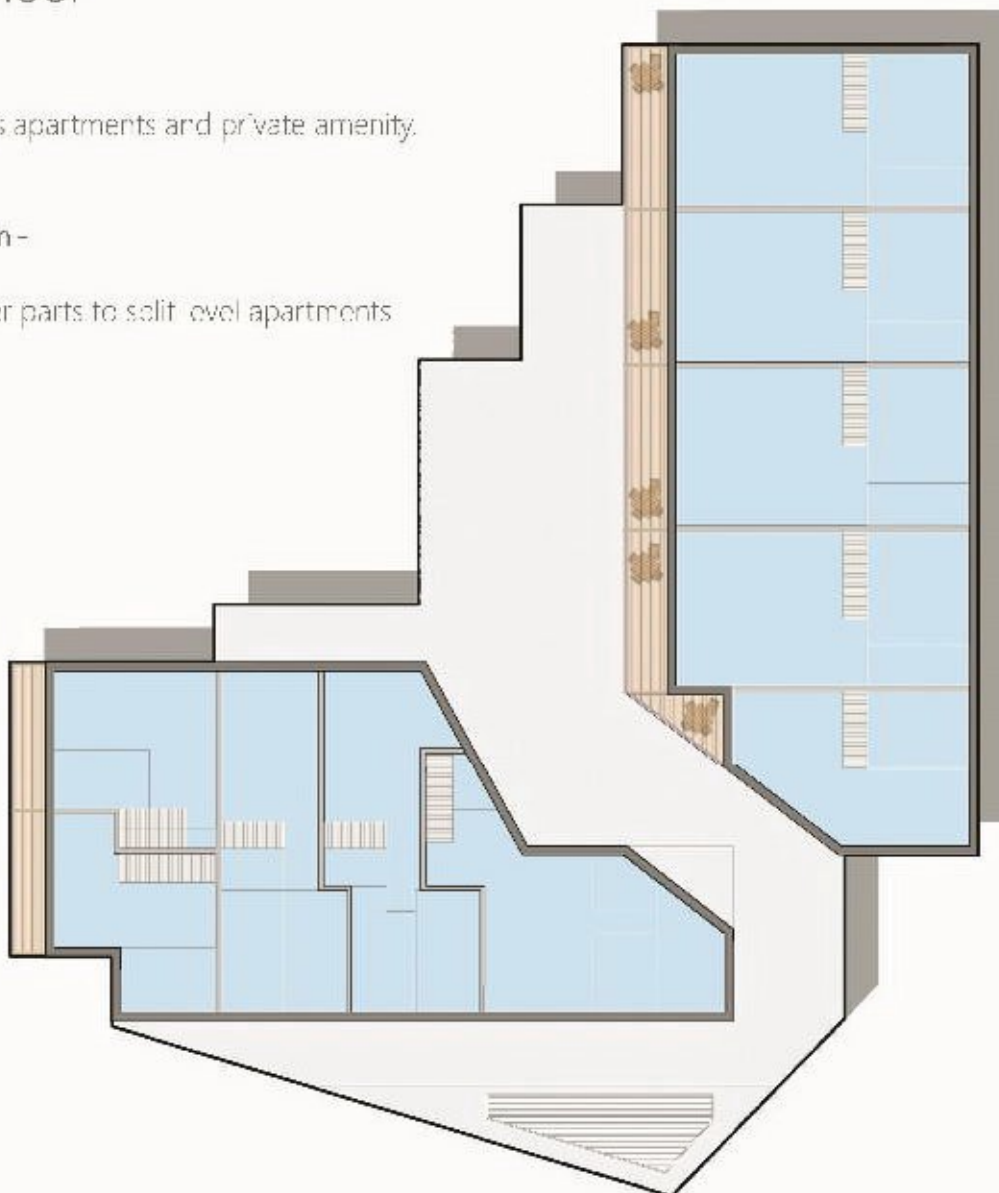
2nd Floor

USE-

Residents apartments and private amenity.

Quantum -

10x Upper parts to split level apartments



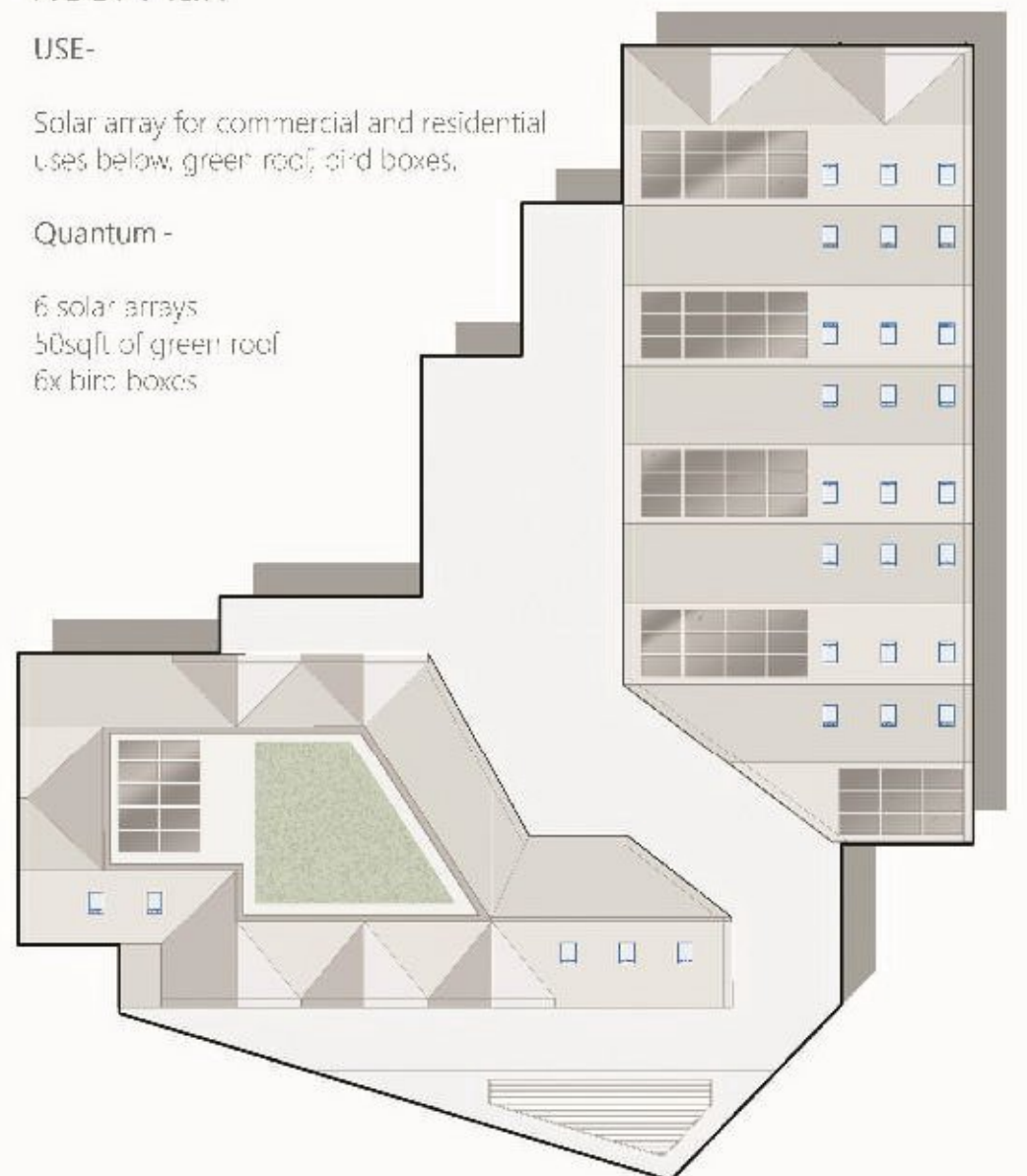
Roof Plan

USE-

Solar array for commercial and residential uses below, green roof, bird boxes.

Quantum -

6 solar arrays
 50sqft of green roof
 6x bird boxes



Appendix B Site Reconnaissance Photographs

<p>Walkover Photograph 1</p>	
<p>Date: 19 Feb 2021</p>	
<p>Direction Photograph Taken: South.</p>	
<p>Description: The site.</p>	

<p>Walkover Photograph 2</p>	
<p>Date: 19 Feb 2021</p>	
<p>Direction Photograph Taken: North.</p>	
<p>Description: The sand dune frontage and River Menalhyl flowing on to the beach.</p>	

<p>Walkover Photograph 3</p>	
<p>Date: 19 Feb 2021</p>	
<p>Direction Photograph Taken:</p> <p>South.</p>	
<p>Description:</p> <p>River Menalhyl flowing on to site with rip-rap and geogrid securing sand dunes on eastern side of river.</p>	

<p>Walkover Photograph 4</p>	
<p>Date: 19 Feb 2021</p>	
<p>Direction Photograph Taken:</p> <p>South.</p>	
<p>Description:</p> <p>Rip-rap on eastern side of river.</p>	

<p>Walkover Photograph 5</p>	
<p>Date: 19 Feb 2021</p>	
<p>Direction Photograph Taken: East.</p>	
<p>Description: Gabions protecting the toe of the sand dunes close to the River Menalhyl.</p>	

<p>Walkover Photograph 6</p>	
<p>Date: 19 Feb 2021</p>	
<p>Direction Photograph Taken: South.</p>	
<p>Description: Stockpile of assumed dredged material to the west of the river channel.</p>	