Appendix A – Exmouth Coastal Defence Condition Assessment Report

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Version: 1

1 Introduction

The inspection and assessment of the coastal defence structures along the Exmouth frontage has been undertaken as part of the development of the Exmouth Beach Management Plan (BMP). The purpose of this inspection is to inform, guide and assist in the sustainable management of coastal flooding and erosion risk to properties and other assets. This report covers the seawalls and groynes along the 2.7km Exmouth open coast frontage between Orcombe Point to the east and Exmouth Pier to the west (see Figure 1).

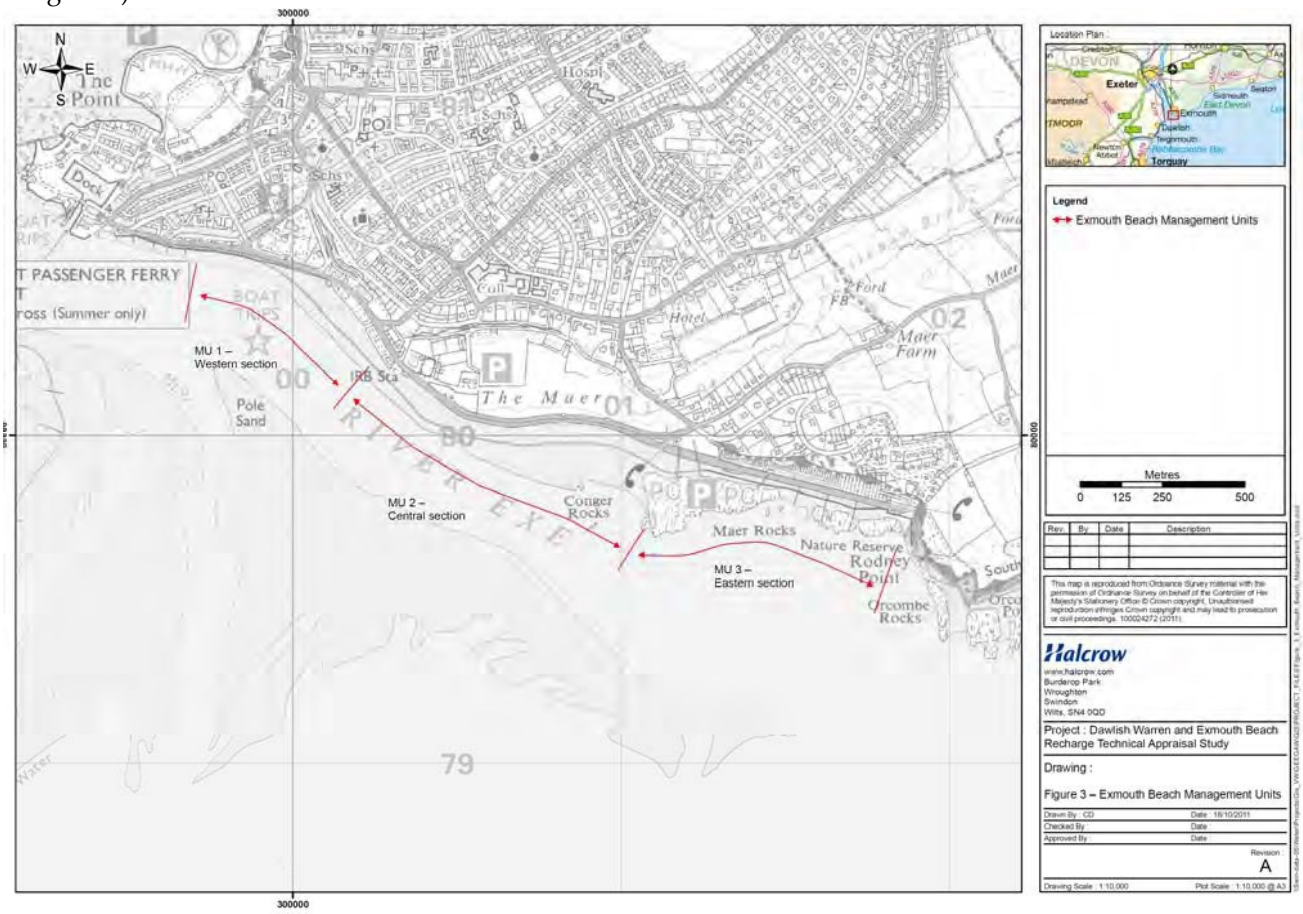


Figure 1: Exmouth BMP extent and management units

The assessment is divided into two parts:

- A desk study was undertaken to identify the location and extent of coastal defence assets and to review baseline information for these structures (**Section 2**).
- Following this desk study, a visual inspection was undertaken to assess the condition and performance of the defences. Based on the findings of the desk study and visual inspection an

estimate of residual life was made for each asset along with recommendations for ongoing repair and maintenance for the continued function of the defences (**Section 3**).

2 Desk Study

A review of existing information for the Exmouth coastal defence was undertaken to identify the type and extent of coastal defences, the condition at the previous inspection, construction date and age of asset as well as maintenance regime and previous repair works undertaken. Where condition assessments were available this allowed comparative assessment of recent changes. Details of the documents review and a summary of the findings is presented below. A plan showing the location and extent of the assets inspected is provided in **Annex A**.

- National Flood and Coastal Defence Database (NFCDD). A copy of NFCDD data for the flood and erosion assets along the Exmouth frontage was available from previous projects in the area. This database typically provides details of each asset (locations, length, cross-section etc.) along with records of previous visual inspections and photographs. A summary of key NFCDD data from the most recent inspection on 2nd March 2006 are provided in Table 2. However, it should be noted that since the most recent inspection was undertaken around 9 years ago the condition of these structures is likely to have changed.

NFCDD No. (113FAS335..)	AIMS No.	Description	Length	Grade (EA, 2012)	Residual Life
..1002C01	168679	Masonry seawall	1,692m	2	11 – 20yrs
..1002C02	-	Masonry seawall	61m	2	>20yrs
..1002C03	58351	Masonry seawall	138m	2	>20yrs
..1002C04	170455	Masonry seawall	171m	2	>20yrs
..1002C05	3808	Masonry seawall	697m	2	>20yrs
..1003C01	n/a	Masonry seawall	-	-	-

Table 2: Summary of key asset information from NFCDD.

The NFCDD has recently been superseded by AIMS (discussed further in the next section). However, in some cases the NFCDD contains more comprehensive data than AIMS and therefore still provides useful in the assessment of the defences.

- Asset Information Management System (AIMS). The AIMS database is an Environment Agency tool and is a direct replacement for NFCDD database. A copy of the latest AIMS records was obtained from the Environment Agency on 9th December 2014, key data from this database are summarised in Table 3. Maps showing location of AIMS assets (by AIMS no.) are provided in Figures 2a and 2b. Where information in this database is incomplete or out of date, data from the previous NFCDD database has been used.

AIMS No.	Description	Grade (EA, 2012)	Crest Level (mODN)	Toe Level (mODN)
168679	Masonry seawall	2	+4.53m	+2.93m
71549	Masonry seawall	3	+5.17 to +5.59m	+4.12m
58351	Masonry seawall	2	+5.24m	+2.62m
170455	Masonry seawall with recurve	2	+4.87m	+3.63m
3808	Masonry seawall with recurve	3	+4.87m	-0.32m

Table 3: Summary of key asset information from AIMS

Comparison of toe levels provided in AIMS with those recorded by the trial pit survey (see next bullet point below) show a notable discrepancy for all structures with the exception of 3808. On further inspection it is believed that the toe level given in AIMS relates to the level of the beach crest at the toe of the structures. This information is not therefore applicable to determining action levels for undermining of the seawall structure.

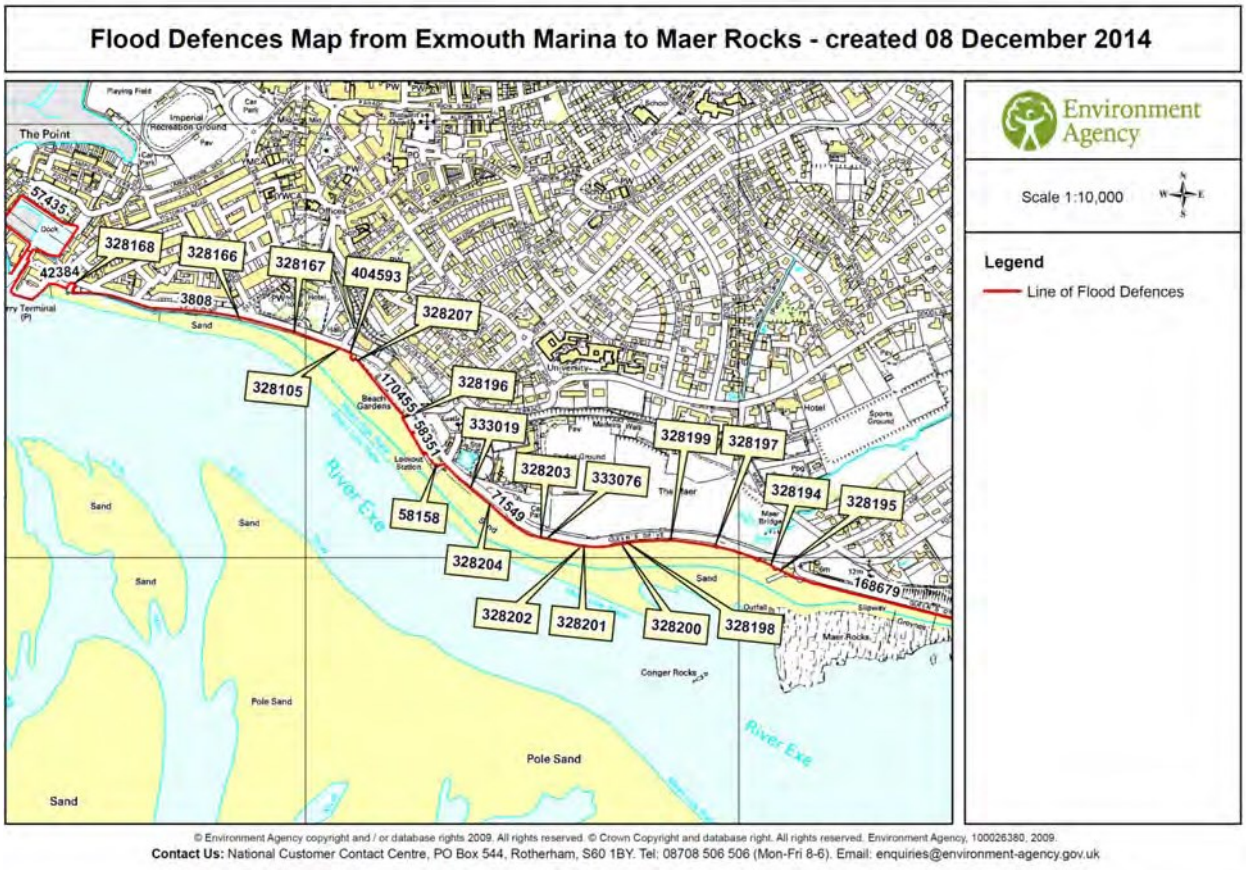


Table 2a: Location of AIMS assets between Exmouth Marina and Maer Rocks (Environment Agency, 2014).

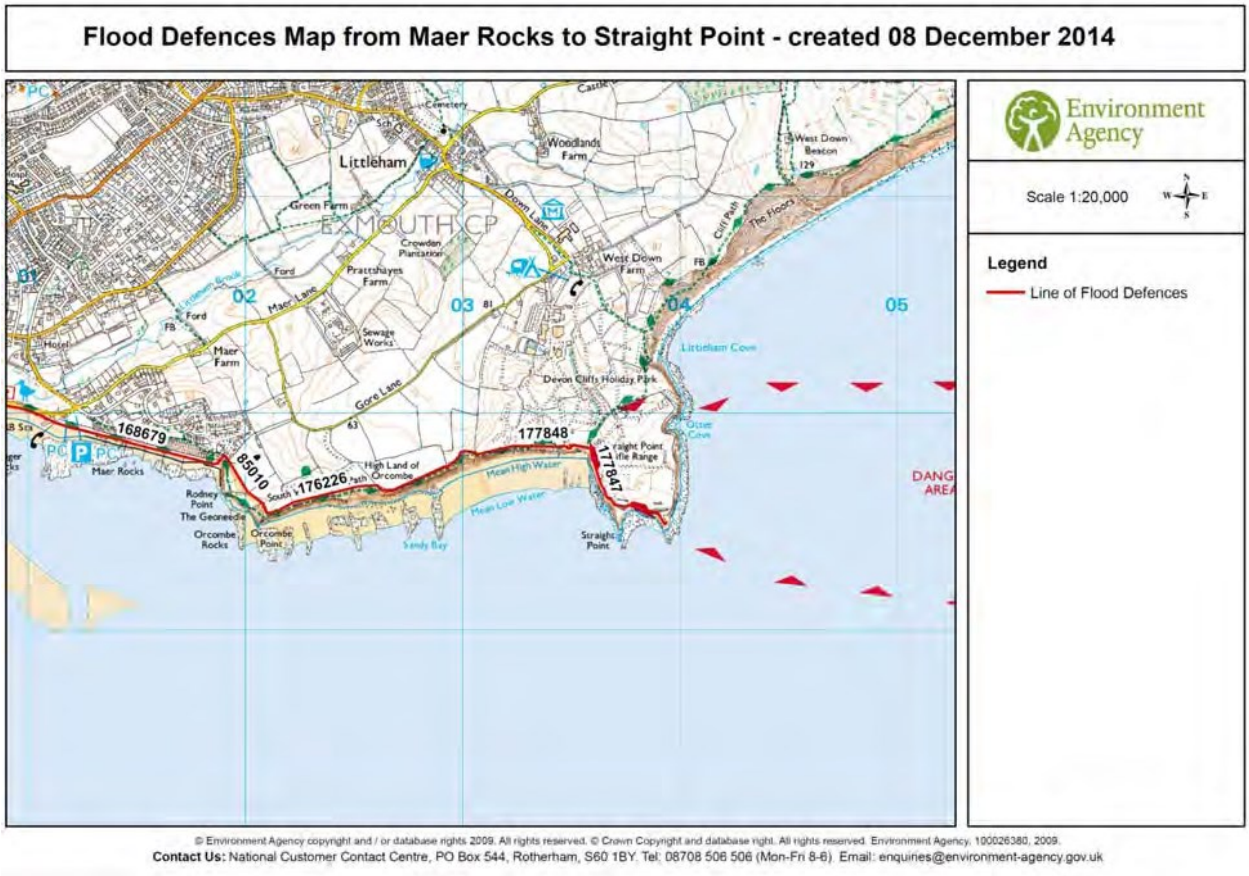


Table 2b: Location of AIMS assets between Maer Rocks and Straight Point (Environment Agency, 2014).

- Exmouth Beach Wall Trial Pit Information (JVB Jan-14). Excavation of 6no. trial pits at discrete locations along the seawall toe were undertaken in winter 2013/14 (the exact date of site work is not clear). The purpose of these investigations was to determine the as-constructed level of the seawall toe to allow assessment of likelihood of undermining. A copy of the trial pit investigation drawing is provided in **Annex B**. Based on the crest level information in AIMS and scaling of dimensions from the trail pit survey the typical toe level for each of the sea wall assets has been determined. Estimated seawall toe levels are presented in Table 4.

AIMS No.	Trail Pit No.	Estimated Toe Level (mODN)
168679	TP1, TP2	+0.0 to 0.8m
71549	TP3, TP4	+2.0 to +2.4m
58351	-	-
170455	TP5	+0.7m
3808	TP6	-0.1m

Table 4: Estimate of seawall toe level.

However, it should be noted that due to the poor quality of data from this trial pit inspection reported on the drawing provided to this project (i.e. drawing does not include reduced levels, has incomplete dimensions, provides no information on structural arrangement of toe or founding material etc.) the quality of the trial pit data is considered poor and should not be relied upon.

- Exe Estuary Flood and Coastal Erosion Risk Management Strategy (Atkins/Halcrow Jun-13). The recent Exe Estuary Strategy undertook a review of the condition of flood and erosion defences

along the Exmouth frontage in June 2013. A summary of key data from this report is provided in Table 5. The findings of strategy report provide a more detailed estimate of residual life but also suggest that since the NFCDD inspection in 2006 condition of most of the assets has deteriorated from 2: Good to 3: Fair.

NFCDD No. (113FAS335..)	Grade (EA, 2012)	Residual Life
..1002C01	3	45yrs
..1002C02	3	45yrs
..1002C03	3	45yrs
..1002C04	3	45yrs
..1002C05	3	45yrs

Table 5: Summary of key asset information provided in the Exe Estuary Strategy.

The Exe Estuary Strategy also provides details of construction dates for some of the coastal defences along the Exmouth frontage. A summary of relevant dates are presented in Table 6 and has been used to determine an estimate of residual life of the structures.

Seawall Element	Construction Date
Seawall, Exmouth west	1841
Beach gardens seawall	1841/42
Parapet added to seawall, Exmouth west	1869
Promenade and seawall behind Maer	1914-15
Groynes	1970's

Table 6: Construction dates for Exmouth coastal defences.

3 Visual Inspection

The walk-over inspection of coastal defences was undertaken by a Chartered Coastal Engineer and Coastal Scientist on the 8th December 2014 between 10:30am and 13:30pm. Inspections started at the east end of Queens Drive and was undertaken in a westerly direction along the seawall, returning in an easterly direction for inspection of the groynes. Although the focus of the visit was to inspect the hard defences some comments are included as to the condition of the dunes and the level of the beach crest at the toe of the structures.

The weather at the time of the inspection was clear, sunny and cold. The inspection was scheduled to be undertaken around the spring low tide resulting in exposure of the intertidal area and permitted assessment of the toe of the seawalls. Tide levels on the day of the inspection are shown in Table 7.

Tide	Time	Level
High Tide (HT)	07.29am	+4.3mCD
Low Tide (LT)	13:07pm	+0.7mCD

Table 7: Tide times during inspection on 8th December 2014

The coastal defence assets identified along the Exmouth frontage comprise hard defences of masonry/ concrete seawalls and concrete/timber groynes. These structures are fronted by a wide sandy beach and intermittent dunes. However, for the purpose of this inspection only the hard defences have been included. Assessment of these soft beach defences has been undertaken separately and is documented in the BMP. It should be noted that since groynes are not identified as distinct assets in AIMS or NFCDD,

for the purpose of this inspection they have been inspected separately and numbered from east to west starting with groyne no.1 nearest to Orcombe Point (refer to **Annex A**).

Detailed findings of the visual inspection of each asset along with overview photos and photos of key defects are presented by asset in **Annex D**. A comparative summary table for all assets is also presented in Table 10 and Table 11 at the end of this section.

3.1 Condition Grade

Visual inspections of the seawalls and groynes was undertaken based on the Asset Inspection Guidance (Environment Agency, 2014) and Condition Assessment Manual (Environment Agency, 2012). This allowed the observed condition of the assets to be defined against pre-described grades and descriptions. A summary of the general condition grade description for all assets is presented in Table 8, full structure specific condition descriptions for seawall and groyne structures are provided in **Annex C.**

Grade	Rating	Description
1	Very Good	Cosmetic defects that will have no effect on performance.
2	Good	Minor defects that will not reduce the overall performance of the asset.
3	Fair	Defects that could reduce performance of the asset.
4	Poor	Defects that would significantly reduce the performance of the asset. Further investigation needed.
5	Very Poor	Severe defects resulting in complete performance failure.

Table 8: General condition grade descriptions (EA, 2012)

3.2 Residual Life

Based on the findings of the visual inspection, the residual life of the seawall structures was determined based on Guidance for Determining Asset Deterioration and the use of Condition Grade (Environment Agency, 2009). This guidance allows the condition grade and rating determined during the inspections to be related to deterioration time to complete performance failure. The residual life of the groynes has been estimated based on their construction date and guidance in the Beach Management Manual second edition (CIRIA 2010) which states the typical life of a groyne is 20-30 years.

Estimates for residual life have been provided for best estimate as well as slowest/fastest estimates for the seawall structures. These estimate assume ongoing routine maintenance of the structures with no capital repair works being undertaken and structures being allowed to deteriorate to condition grade 5: Very Poor (severe defects resulting in complete performance failure).

3.3 Recommendations

Based on the findings of the desk study and visual inspections, specific recommendations are made for ongoing maintenance and repair of the seawall and groyne structures to ensure their performance function continues. The recommended timing of any maintenance and repair work has been categorised in accordance with the following NFCDD descriptors:

- No Repairs: No defects identified. Re-inspection of the assets should be undertaken within the next 2 years and following significant storm events.

- Routine: Minor defects that could reduce the performance of the structure. Routine maintenance or minor repair works should be undertaken as part of the next planned maintenance activities and within the next 2 years.
- Urgent: Defects that would significantly reduce the performance of the structure. Repair works should be undertaken as soon as possible.

Although the inspections do not include assessment of the beaches, their function forms an implicit part of the overall performance of the defences. Draw down in the level of the beach in front of the seawalls can result in undermining leading to slumping, collapse and failure of the defence. It is recommended that action levels are defined to allow the effective management of these beaches through recycling, recharging and reprofiling activities. However, to set these action levels details of the toe of the structures is needed. Despite recent trial pit inspections undertaken in January 2014 (refer to Section 2), the quality of this data provided (see **Annex B**) is poor and does not provide suitable information to assess the likelihood of undermining and allow trigger levels to be defined. It is therefore recommended that these trail pit inspection are revisited to provide better quality data on the arrangement of the toe, including toe level and founding material. This information should be used to assess action levels for beach draw down and associated undermining risk.

3.4 Sensitivity Testing

A sensitivity test was undertaken for the residual life of the seawall structures. Since most of the coastal defence structures protect valuable assets such as the main coastal road and residential and commercial properties it may not be acceptable to allow this asset to deteriorate to condition grade 5: Very Poor resulting in complete performance failure. Should these structures only allowed to deteriorate to condition grade 4: Poor resulting significantly reduce the performance, revised estimates of residual life are presented in Table 9:

Asset No.	Assets Protected	Residual Life Estimate	
		Best	Slowest/ Fastest
168679	Parking, coastal slopes	30 years	20 – 60 years
71549	Main road, sand dunes	60 years	40 – 100 years
113FAS3351002C02	Property within 10m, coastal road	60 years	40– 100 years
58351	Coastal road, properties within 40m	55 years	25 – 100 years
170455	Coastal road, properties within 50m	60 years	40 – 100 years
3808	Coastal road, properties within 10m	60 years	40 – 100 years

Table 9: Estimates of residual life to condition grade 4: Poor.

Asset No.	Asset Description	Asset Length	Inspection Comments	Condition Grade	Residual Life	Recommendations	Urgency
168679	Vertical masonry and concrete block seawall and promenade, fronting seafront road and coastal slope.	824m	Evidence of various historic repairs to failed sections of wall along entire length, repairs remain sound. Repairs to wall undertaken with concrete blocks, brickwork and concrete rendering. More recent patch repairs to cracks and areas of spalling appear in good condition. Joint sealant at ramp in good condition. Continued areas of minor cracking, spalling of rendering, missing mortar between blocks and gaps beneath coping. Minor abrasion along lower section of wall and at base of steps. Minor onset of undermining of steps at mid-length but no evidence of structural movement. Toe of wall buried by high beach levels. Promenade surfacing in good condition, no movement cracks or signs of overtopping damage. Temporary access steps adjacent to the lifeboat station. Approximate beach level below crest: 1.3m east end, 2.4m centre, 1.6m west end. Strandline at toe of wall along central section.	3 [Fair]	45yrs (30–90yrs)	Fill cracks, repoint gaps beneath coping, repair damage to concrete rendering, monitor undermining of access steps, provide permanent replacement for temporary access steps.	Routine
71549	Sloping masonry blockwork seawall with crest wall and promenade, fronting seafront road and low lying hinterland.	868m	Masonry wall and joint generally sound, no movement or crest settlement evident. Minor cracking and gaps between some blocks, localised cracking and minor movement at discrete locations along concrete wall cap. New wall construction in 2009 for lifeboat station. Minor abrasion and spalling to concrete steps and access ramps. Toe of wall buried by high beach levels. Near complete loss of vegetation and erosion of dune at central section resulting in significant deposits of wind-blown beach sand on promenade and main road. Loss of vegetation and erosion of dune at west end, protected with some ad-hoc rocks and rubble. Construction of new timber building adjoining seaward side of wall at west end, beach crest appears to have been re-profiled in front of this building. Dilapidated brickwork structure on beach at west end continues to collapse. Approximate beach level below crest: 0.8m east end, 1.4m central, 2m west end. Strand line typically 15-20m from toe.	2 [Good]	75yrs (50–120yrs)	Repair cracks in wall cap, implement dune management, clear sand from promenade and road, monitor erosion in front of new timber building, monitor dilapidated brick wall structure and remove if safety becomes an issue.	Routine
113FAS 3351002 C02	Vertical masonry blockwork seawall and rock armour revetment, fronting café and seafront road.	61m	Masonry and joints generally sound with no gaps evident, no movement or crest settlement apparent. Joint sealant in good condition. No cracks evident in concrete crest beam. Rock revetment constructed of hard angular rocks, generally well packed but with some loos slender rocks at east end, some large voids evident, gap in armour at mid-length were temporary steps constructed. Toe of rock armour and wall buried by high beach levels. No evidence of overtopping damage to crest. Hand railing in good condition. Temporary access steps at mid-length. Some abrasion to access ramp at east end, toe buried. Approximate beach levels below crest: 1.8m at east end, 2.1m at west end. Strand line at toe of wall.	2 [Good]	75yrs (50–120yrs)	Monitor potential movement of rock armour, provide permanent replacement for temporary access steps.	Routine
58351	Vertical concrete seawall with seating under overhang, fronting public gardens and seafront road.	138m	No evidence of settlement of structural movement. Some minor cracks evident along concrete toe beam and coping. Previous grout repairs to masonry beneath seating remains sound. Wooden seating is fair condition. Hand railing and promenade surfacing in good condition. Approximate beach level 1m below toe beam at east end. Strand line at toe of wall.	2 [Good]	70yrs (30–130yrs)	Monitor beach levels at east end.	No repairs
170455	Vertical masonry seawall and concrete recurve at crest, fronting public gardens and seafront road.	171m	No sign of structural movement or crest settlement, masonry and joints sound. No cracks apparent in concrete capping beam. Hand railing and promenade surfacing in good condition. Toe beam visible along short section at east end of wall. Beach levels ~2.2m below crest. Access steps and hand railing at mid-length in good condition. Wall extends around promontory of the Octagon Café at west end, ramps, steps and hand railing in good condition.	2 [Good]	75yrs (50–120yrs)	Monitor beach levels at east end.	No repairs
3808	Sloping masonry seawall and vertical crest wall with rock armour, fronting promenade and seafront road.	697m	No signs of movement or settlement of crest. All masonry and joints are sound, some minor loss of mortar at base of crest wall. Abrasion of sloping masonry but no damage apparent. Toe of structure well buried at east end, low beach levels exposing top edge of toe beam at west end. Corrosion to sheet piles along toe at west end resulting in noticeable loss of section. Rock armour fronting piles angular and well packed with no movement apparent. Heavy abrasion to toe beam behind rock armour. Access steps and hand railing at east end and along wall in good condition. No damage to promenade surfacing but, some wind-blown sand on promenade. Approximate beach level below base of crest wall: 8 joints down at east end, 12 joints down at centre, top edge of toe beam at west end.	2 [Good]	75yrs (50 – 120yrs)	Repair gaps in masonry at base of crest wall. Monitor beach levels at west end.	Routine

Table 10: Summary of Seawall Visual Inspection

Asset No.	Asset Description	Asset Length	Inspection Comments	Condition Grade	Residual Life	Recommendations	Urgency
Groyne 1	Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	~90m	Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks but little or no gaps between planks evident. Planks missing along seaward concrete section of groyne. All fixing sound, some corrosion evident. Some abrasion to concrete base. Steel bracing to navigation marker damaged and detached from base. Beach material level with top plank in upper beach. Strand line ~5-10m from seawall.	2 [Good]	10 - 15yrs	Consider raising groyne height in upper beach. Repair bracing to navigation marker.	Routine
Groyne 2	Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	~90m	Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks, minor gaps between planks in upper beach. Planks appear to be missing along mid to lower beach concrete section of groyne. All fixing sound, some corrosion evident. Some abrasion to concrete base. Low beach levels along mid and lower beach. Strand line 5m from seawall.	2 [Good]	10 - 15yrs	Monitor beach levels.	No repairs
Groyne 3	Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	~60m	Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks, minor gaps between planks in upper beach. All fixing sound, some corrosion evident. Some abrasion to concrete base. Low beach levels along upper, mid and lower beach. Groyne much shorter than groynes to east (1-3) and west (5-6). Strand line at toe of seawall.	2 [Good]	10 - 15yrs	Monitor low beach levels, consider placing additional beach material.	No repairs
Groyne 4	Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	~60m	Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks, some gaps between planks at mid-length. Two planks missing at seaward end of groyne. All fixing sound, some corrosion evident. Some abrasion to concrete base. Low beach levels along upper and lower beach. Groyne much shorter than groynes to east (1-2) and west (5-6). Beach material close to top of top plank in upper beach. Strand line at toe of seawall.	2 [Good]	10 - 15yrs	Consider raising height of groyne in upper beach to improve performance.	No repairs
Groyne 5	Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	~90m	Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks, no gaps between planks evident. All fixing sound, some corrosion evident. Some abrasion to concrete base. Low beach levels along upper, mid and lower beach. Groyne much shorter than others to the east. Beach material close to top of top plank in upper and mid beach. Strandline 5m from seawall.	2 [Good]	10 - 15yrs	Consider raising height of groyne in upper and mid beach to improve performance.	No repairs
Groyne 6	Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	~90m	Structure buried in upper and mid beach so inspection not possible. Concrete Structure appears sound. Seaward end of groyne appeared straight and vertical with no evidence of rotation. Minor onset of undermining below concrete base at groyne head. Significant abrasions and gaps between planks at seaward end. Fixing appear sound, some corrosion evident. Strandline 20m from seawall.	2 [Good]	10 - 15yrs	Consider raising height of groyne in upper and mid beach. Replace planks in lower beach.	Routine
Groyne 7	Timber piles. Remaining construction unknown		Remove exposed pile to improve safety for beach users, monitor exposed piles as beach levels change.	5 [Very Poor]	<1 year	Remove exposed pile to improve safety for beach users, monitor exposed piles as beach levels change.	Routine

Table 11: Summary of Groynes Visual Inspection

References

- Atkins/ Halcrow (2013). Exe Estuary Flood and Coastal Erosion Risk Management Strategy, Baseline Flood and Coastal Risk Assessment, Appendix C: FCRM Asset Characterisation. Atkins/ Halcrow June 2013.
- CIRIA (2010). Beach Management Manual second edition. CIRIA C685, 2010.
- Environment Agency (2009). Guidance on Determining Asset Deterioration and the Use of Condition Grade Deterioration Curves. Environment Agent, May 2009.
- Environment Agency (2012). Condition Assessment Manual, Environment Agency. March 2012.
- Environment Agency (2013). Exe Estuary Flood and Coastal Erosion Rick Management Strategy. Atkins/ Halcrow for the Environment Agency, June 2013.
- Environment Agency (2014). Asset Performance Tool – Asset Inspection Guidance, Report SC110008/R2. Environment Agency, July 2014.

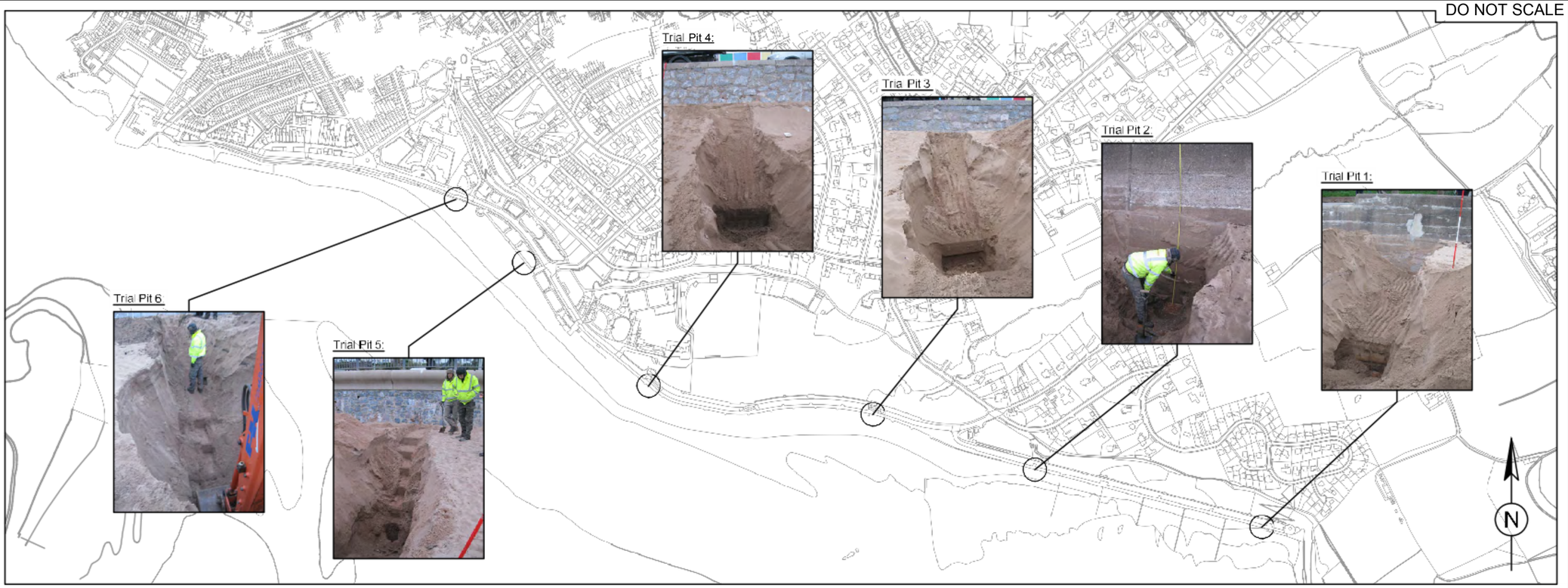
ANNEX A – Plan of Coastal Defence Assets

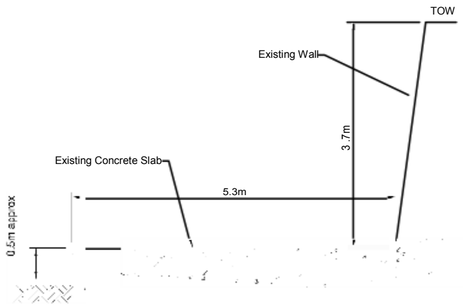

3808
170455
58351
58158
71549
168679
Groyne 7
Groyne 6
Groyne 5
Groyne 4
Groyne 3
Groyne 2
Groyne 1
Image © 2015 TerraMetrics
Image © 2015 Getmapping plc
Image © 2015 DigitalGlobe
Google earth

ANNEX B – Trial Pit Drawing

DO NOT SCALE

Millimetres 0 10 100





Trial Pit 1

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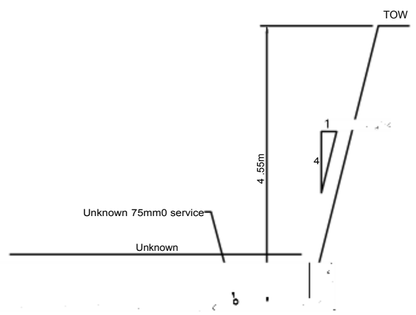

Trial Pit 2

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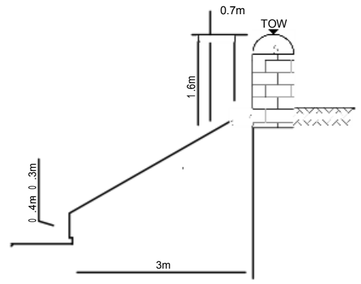

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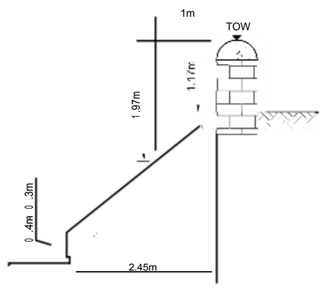

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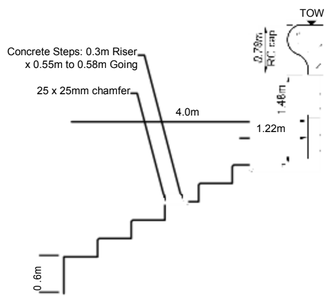

Trial Pit 5

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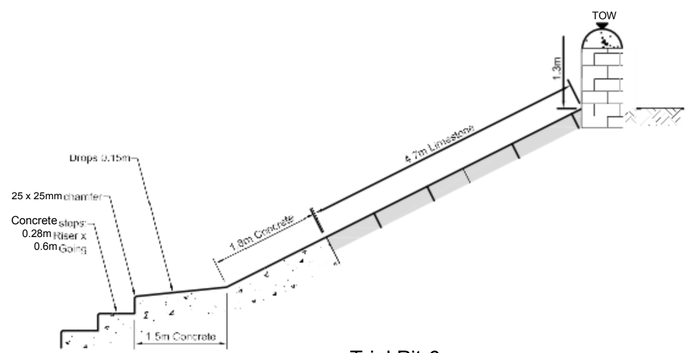


Trial Pit 6

Scale 1:50

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

N/A

MAINTENANCE/CLEANING

N/A

DECOMMISSIONING/DEMOLITION

N/A

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

Rev.	Date	Description	By	Chk'd	App'd

Drawing Status — Suitability

The Hub
500 Park Avenue
Aztec West
Bristol
BS32 4RZ
Tel: +44 (0)1454 662000
Fax: +44 (0)1454 663333

Client: Environment Agency

Project Title: DAWLISH WARREN & EXMOUTH BEACH MANAGEMENT SCHEME

Drawing Title: EXMOUTH BEACH WALL TRIAL PIT INFORMATION

Scale	Designed	Drawn	Checked	Authorised
As Shown	AJY	JM	AJY	PC
Original Size	**Date**	**Date**	**Date**	**Date**
A1	03/01/2014	03/01/2014	20/01/2014	20/01/2014

Drawing Number: 5125458-VBA-EX-XX-DR-C-1500

Revision: P 1

ANNEX C – Condition Grade Descriptions (EA, 2012)

Seawalls

Condition		Description	Key Features
1	Very Good	No significant visible defects. Hair-line cracks and small surface cavities are visible. Precast units fully seated with no joint deformation. Joints fully sealed.	No evidence of structure movement. No spalling or staining. Minor hair-line cracks or honeycombing may be present. No loss of backfill material, settlement or undermining. Joints are in good condition with no sealant loss.
2	Good	Minor cracking, no sealant loss from joints, localised honeycombing or flaking. Although not in pristine condition the structure has no significant defects, is structurally sound and in good serviceable condition. Mastic joints may have been replaced.	No evidence of structure movement. No slumping or heave of ground surrounding structure. Minor staining with localised spalling or appearance of small cracks. No settlement or undermining. Minor loss of backfill. Joints in good condition with minimal sealant loss.
3	Fair	Rust staining or exposed anti cracking steel, localised spalling, lack of cover, lengthy cracking and some movement or extensive honeycombing. Minor loss of joint sealant.	Minor slumping or heave of ground surrounding structure. Significant staining. Minor cracking or spalling with exposure of surface reinforcement. Minor loss of backfill. Localised undermining or settlement. Minor cracks or holes in joints due to sealant loss.
4	Poor	Extensive spalling, exposed rebar, leakage, staining, sealant loss (leakage), extensive movement or damage likely to affect structural integrity.	Minor movement of structure. Severe slumping or heave of ground surrounding structure. Minor settlement, undermining or loss of backfill material. Severe cracking or holes in joints. Severe cracking or spalling with localised areas of exposed main reinforcement.
5	Very Poor	Completely derelict, structural failure beyond repair. Concrete has failed and moved or completely collapsed. Considerable loss of wall thickness and reinforcement cover.	Evidence of severe structure movement. Severe settlement, undermining or loss of backfill material. Severe cracking or loss of concrete exposing extensive areas of main reinforcement.

Groynes

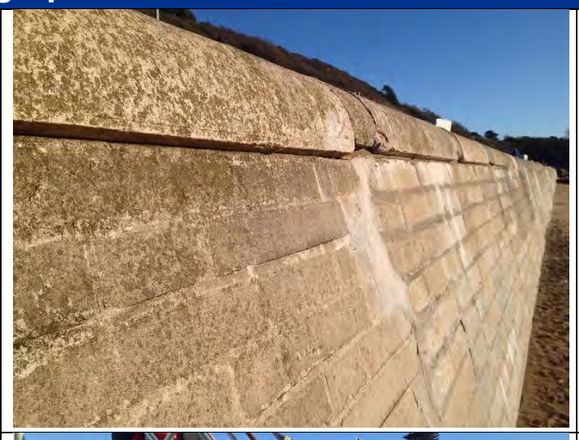
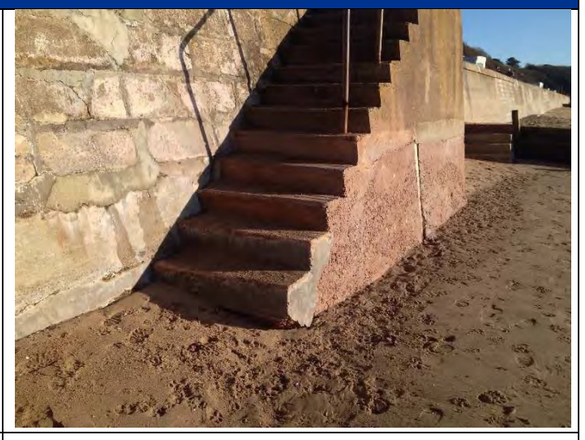
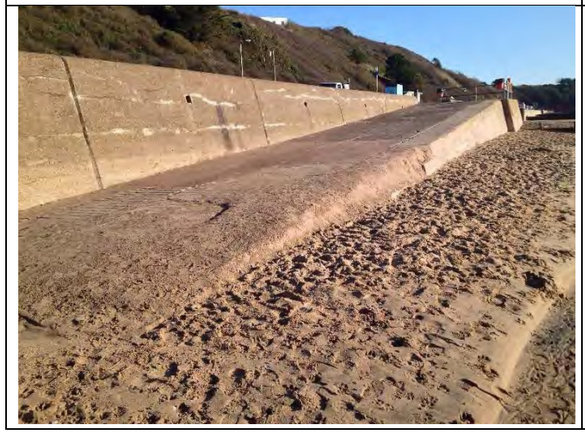
Condition		Description	Key Features
1	Very Good	Timber planks, walings, piles and fixings sound. Minimal gap between planks to arrest drift of beach material.	No significant defects. No significant gaps in planks or missing planks. No structural damage to walings, ties or fixings. No undermining.
2	Good	Timber planks, walings, piles and fixings sound, though small gaps between planks may be evident. Occasional plank requires replacement.	Minor defects. Minimal damage to, or loss of planks. Minimal structural damage to ties, walings, or fixings. No undermining.
3	Fair	Some missing or broken planks. Gaps between planks allowing shingle through. Fixings reasonably sound. Some rotation (main image) or bulging (insert) may be evident.	Some damage to, or absence of planks. Some movement, rotation or bulging possible but groyne still ensures arrest of majority of beach material drift. Minor damage to ties, walings and fixings. No undermining.
4	Poor	Large number of planks and fixings missing or damaged. Timber walings are distressed and fixings severely corroded. Large gaps between planks allowing beach material through. Piles abraded and split.	Structurally unsound now or in the near future. Substantial loss of or damage to planks significantly reducing arrest of beach material drift. Partial undermining. Significant movement or rotation of groyne, damage or loss of ties, walings or fixings.
5	Very poor	Significant number of timber planks missing, some piles damaged. Fixings missing, walings and ties disconnected or missing. Timber at end of useful life.	Completely failed or derelict. Loss of a significant number of planks and groyne no longer arresting drift of beach material. Severe movement, rotation or undermining. Ties, walings and fixings damaged or missing.

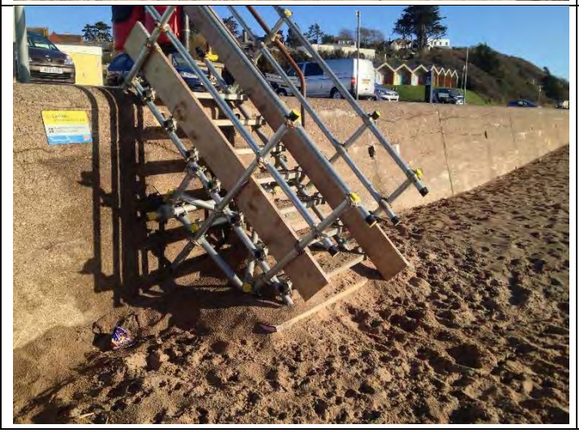
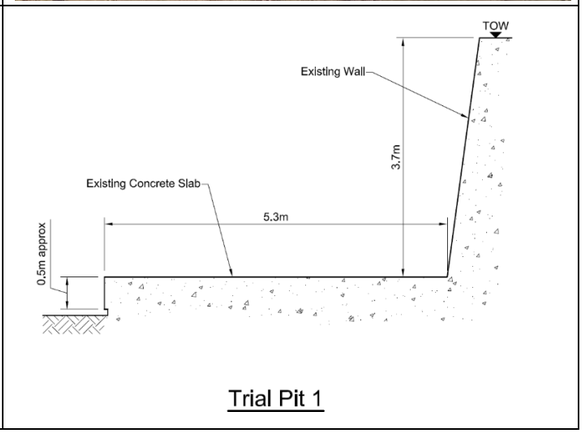
ANNEX D – Visual Inspection Records

AIMS Asset Name	**168679** [NFCDD ref. 113FAS3351002C01]		
Location description	Queens Drive East to Maer Rocks		
Asset Description	Vertical masonry and concrete block seawall and promenade, fronting seafront road and coastal slope.	Construction Date	1914/15
Asset Length	824m (eastern part of 1,692m asset)		
Inspection Date	8th December 2014		
Inspection Comments	Evidence of various historic repairs to failed sections of wall along entire length, repairs remain sound. Repairs to wall undertaken with concrete blocks, brickwork and concrete rendering. More recent patch repairs to cracks and areas of spalling appear in good condition. Joint sealant at ramp in good condition. Continued areas of minor cracking, spalling of rendering, missing mortar between blocks and gaps beneath coping. Minor abrasion along lower section of wall and at base of steps. Minor onset of undermining of steps at mid-length but no evidence of structural movement. Toe of wall buried by high beach levels. Promenade surfacing in good condition, no movement cracks or signs of overtopping damage. Temporary access steps adjacent to the lifeboat station. Approximate beach level below crest: 1.3m east end, 2.4m centre, 1.6m west end. Strandline at toe of wall along central section.		
Crest level:	+4.53m ODN, lowest point [from NFCDD]		
Toe level:	+0.0m to +0.8m ODN [POOR QUALITY DATA - scaled from trial pit survey]		
Overall Condition:	3 | FAIR		
Residual Life:	Best estimate 45 years (slowest/ fastest estimate 30 – 90 years)		
Recommendations:	Fill cracks, repoint gaps beneath coping, repair damage to concrete rendering, monitor undermining of access steps, provide permanent replacement for temporary access steps.		
Urgency:	Routine.		

Photographs



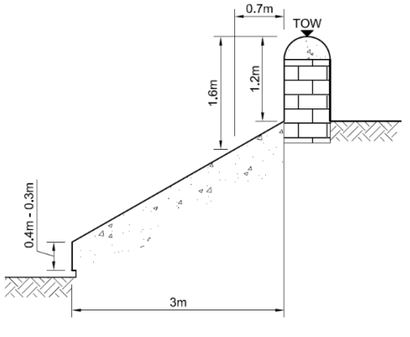




Trial Pit 1

AIMS Asset Name	71549		
Location description	Maer Rocks to Queens Drive West		
Asset Description	Sloping masonry blockwork seawall with crest wall and promenade, fronting seafront road and low lying hinterland.	Construction Date	1914/15
Asset Length	868m (western part of 1,692m asset)		
Inspection Date	8th December 2014		
Inspection Comments	Masonry wall and joint generally sound, no movement or crest settlement evident. Minor cracking and gaps between some blocks, localised cracking and minor movement at discrete locations along concrete wall cap. New wall construction in 2009 for lifeboat station. Minor abrasion and spalling to concrete steps and access ramps. Toe of wall buried by high beach levels. Near complete loss of vegetation and erosion of dune at central section resulting in significant deposits of wind-blown beach sand on promenade and main road. Loss of vegetation and erosion of dune at west end, protected with some ad-hoc rocks and rubble. Construction of new timber building adjoining seaward side of wall at west end, beach crest appears to have been re-profiled in front of this building. Dilapidated brickwork structure on beach at west end continues to collapse. Approximate beach level below crest: 0.8m east end, 1.4m central, 2m west end. Strand line typically 15-20m from toe.		
Crest level:	+5.17m to +5.59m ODN [from NFCDD]		
Toe level:	+2.0m to +2.4m ODN [POOR QUALITY DATA - scaled from trial pit survey]		
Overall Condition:	2 | GOOD		
Residual Life:	Best estimate 75 years (slowest/ fastest estimate 50 – 120 years)		
Recommendations:	Repair cracks in wall cap, implement dune management, clear sand from promenade and road, monitor erosion in front of new timber building, monitor dilapidated brick wall structure and remove if safety becomes an issue.		
Urgency:	Routine.		

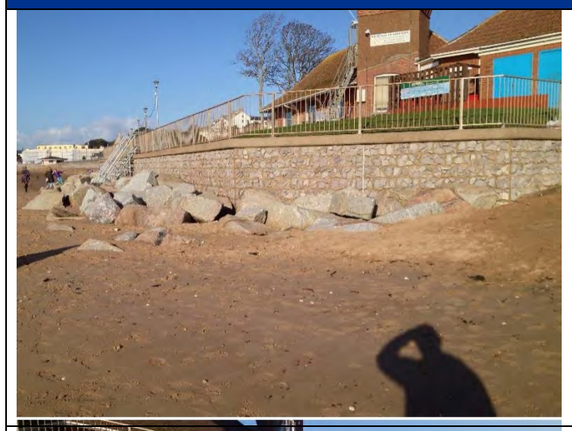
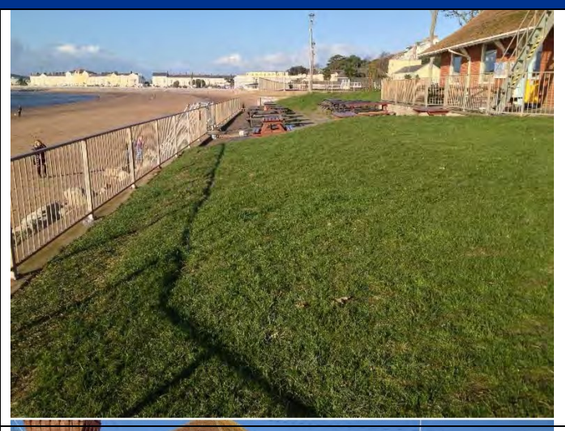
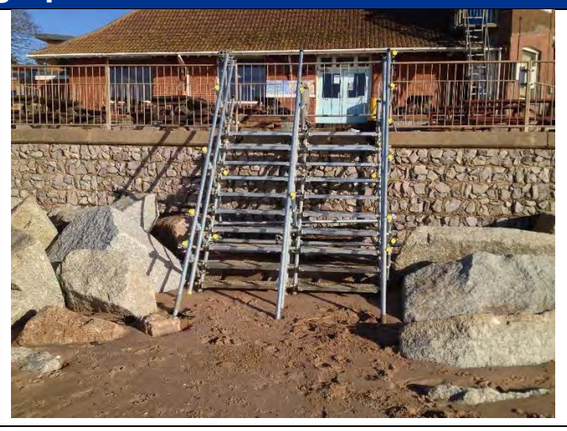
Photographs



Trial Pit 3

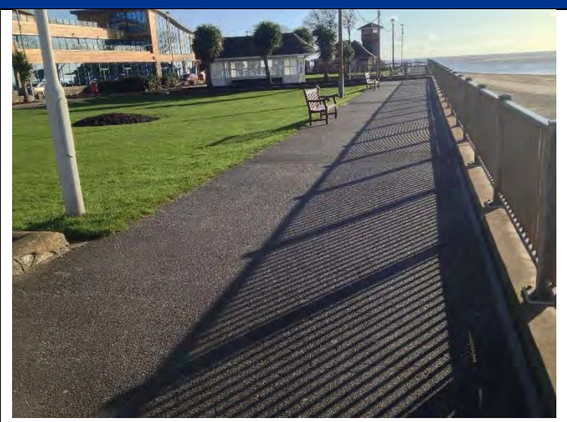
AIMS Asset Name	N/A [NFCDD ref. 113FAS3351002C02]		
Location description	Around Harbour View Café/ Lookout Station		
Asset Description	Vertical masonry blockwork seawall and rock armour revetment, fronting café and seafront road.	Construction Date	
Asset Length	61m		
Inspection Date	8th December 2014		
Inspection Comments	Masonry and joints generally sound with no gaps evident, no movement or crest settlement apparent. Joint sealant in good condition. No cracks evident in concrete crest beam. Rock revetment constructed of hard angular rocks, generally well packed but with some loos slender rocks at east end, some large voids evident, gap in armour at mid-length were temporary steps constructed. Toe of rock armour and wall buried by high beach levels. No evidence of overtopping damage to crest. Hand railing in good condition. Temporary access steps at mid-length. Some abrasion to access ramp at east end, toe buried. Approximate beach levels below crest: 1.8m at east end, 2.1m at west end. Strand line at toe of wall.		
Crest level:	No crest level data available in NFCDD		
Toe level:	No trial pit data available		
Overall Condition:	2 | Good		
Residual Life:	Best estimate 75 years (slowest/ fastest estimate 50 – 120 years)		
Recommendations:	Monitor potential movement of rock armour, provide permanent replacement for temporary access steps.		
Urgency:	Routine.		

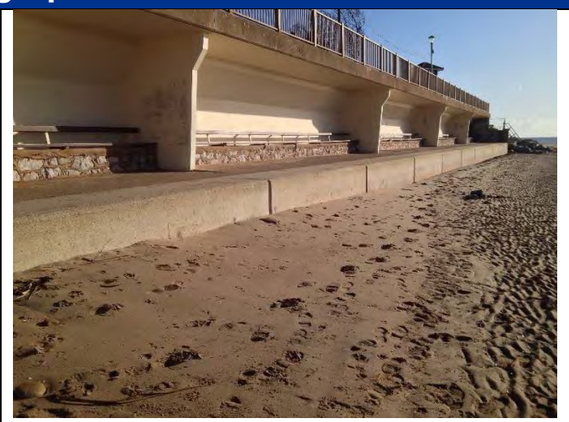
Photographs

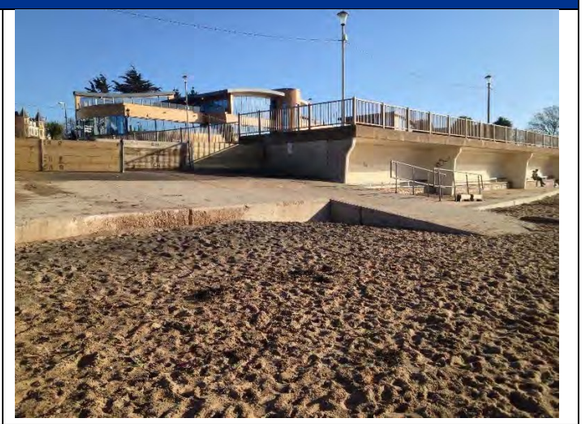





AIMS Asset Name	58351 [NFCDD ref. 113FAS3351002C03]		
Location description	From Harbour View café/ Lookout Station west to access ramp		
Asset Description	Vertical concrete seawall with seating under overhang, fronting public gardens and seafront road.	Construction Date	
Asset Length	138m		
Inspection Date	8th December 2014		
Inspection Comments	No evidence of settlement of structural movement. Some minor cracks evident along concrete toe beam and coping. Previous grout repairs to masonry beneath seating remains sound. Wooden seating is fair condition. Hand railing and promenade surfacing in good condition. Approximate beach level 1m below toe beam at east end. Strand line at toe of wall.		
Crest level:	+5.24m ODN [from NFCDD]		
Toe level:	No trial pit data available		
Overall Condition:	2 | GOOD		
Residual Life:	Best estimate 70 years (slowest/ fastest estimate 30 - 130 years)		
Recommendations:	Monitor beach levels at east end.		
Urgency:	No repairs.		

Photographs

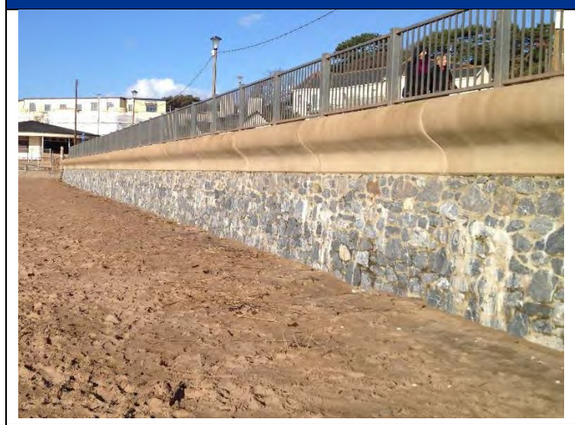


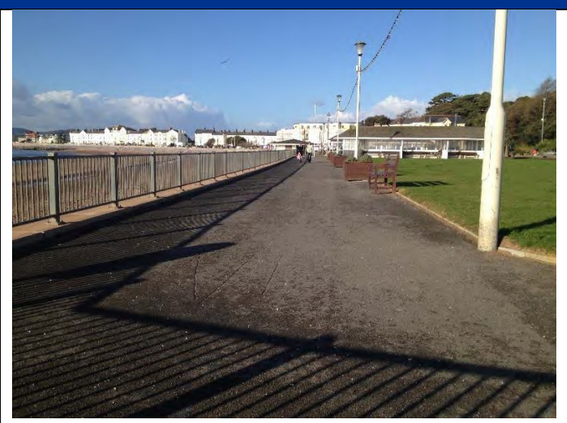


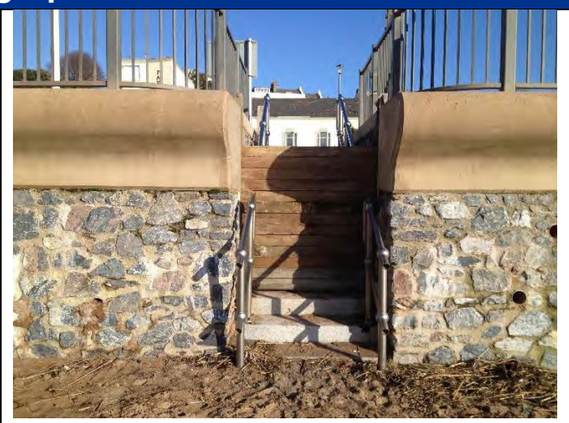


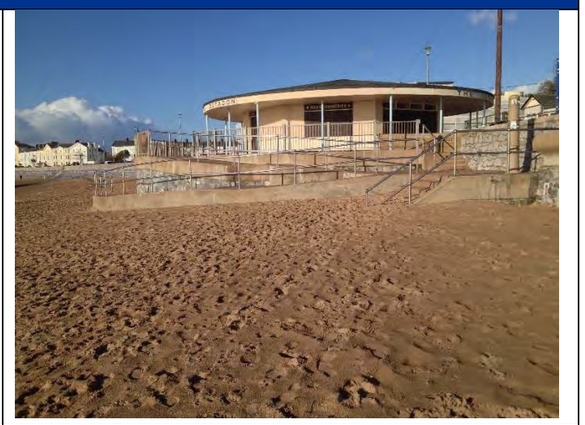
AIMS Asset Name	**170455 [NFCDD ref. 113FAS3351002C04]**		
Location description	From Octagon Café east to access ramp		
Asset Description	Vertical masonry seawall and concrete recurve at crest, fronting public gardens and seafront road.	Construction Date	Reconstructed 2006?
Asset Length	171m		
Inspection Date	8th December 2014		
Inspection Comments	No sign of structural movement or crest settlement, masonry and joints sound. No cracks apparent in concrete capping beam. Hand railing and promenade surfacing in good condition. Toe beam visible along short section at east end of wall. Beach levels ~2.2m below crest. Access steps and hand railing at mid-length in good condition. Wall extends around promontory of the Octagon Café at west end, ramps, steps and hand railing in good condition.		
Crest level:	+4.87m ODN [from NFCDD]		
Toe level:	+0.7m ODN [POOR QUALITY DATA - scaled from trial pit survey]		
Overall Condition:	2 | GOOD		
Residual Life:	Best estimate 75 years (slowest/ fastest estimate 50 – 120 years)		
Recommendations:	Monitor beach levels at east end.		
Urgency:	No repairs		

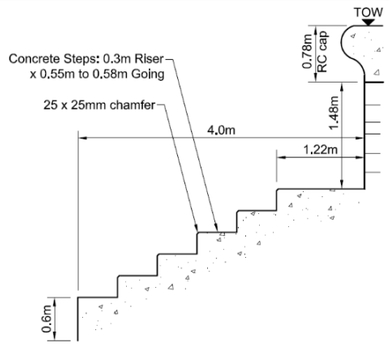
Photographs









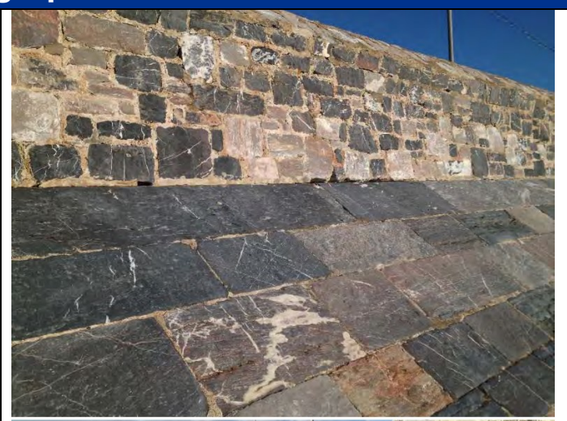
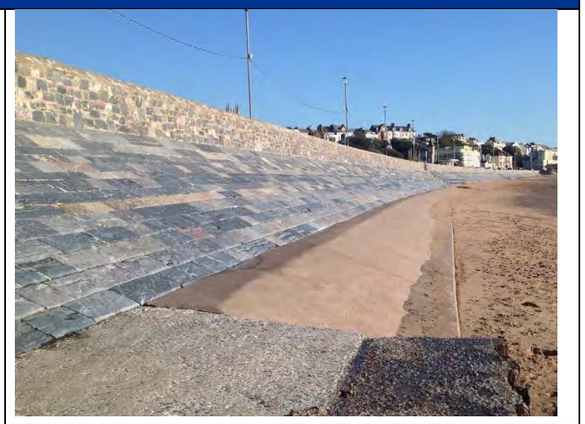
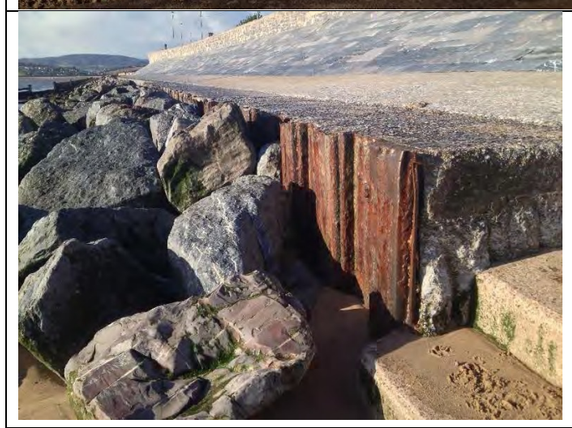


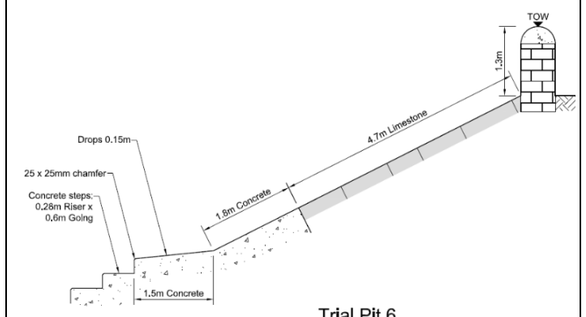
Trial Pit 5

AIMS Asset Name	**3808 [NFCDD ref. 113FAS3351002C05]**		
Location description	Octagon Café to Slipway at west end of Esplanade.		
Asset Description	Sloping masonry seawall and vertical crest wall with rock armour, fronting promenade and seafront road.	**Construction Date**	1841/42, parapet added 1869, rock armour added 2004.
Asset Length	697m		
Inspection Date	8th December 2014		
Inspection Comments	No signs of movement or settlement of crest. All masonry and joints are sound, some minor loss of mortar at base of crest wall. Abrasion of sloping masonry but no damage apparent. Toe of structure well buried at east end, low beach levels exposing top edge of toe beam at west end. Corrosion to sheet piles along toe at west end resulting in noticeable loss of section. Rock armour fronting piles angular and well packed with no movement apparent. Heavy abrasion to toe beam behind rock armour. Access steps and hand railing at east end and along wall in good condition. No damage to promenade surfacing but, some wind-blown sand on promenade. Approximate beach level below base of crest wall: 8 joints down at east end, 12 joints down at centre, top edge of toe beam at west end.		
Crest level:	+4.87m ODN [from NFCDD]		
Toe level:	-0.1m ODN [scaled from trial pit survey – agrees well with AIMS]		
Overall Condition:	2 | GOOD		
Residual Life:	Best estimate 75 years (slowest/ fastest estimate 50 – 120 years)		
Recommendations:	Repair gaps in masonry at base of crest wall. Monitor beach levels at west end.		
Urgency:	Routine		

Photographs



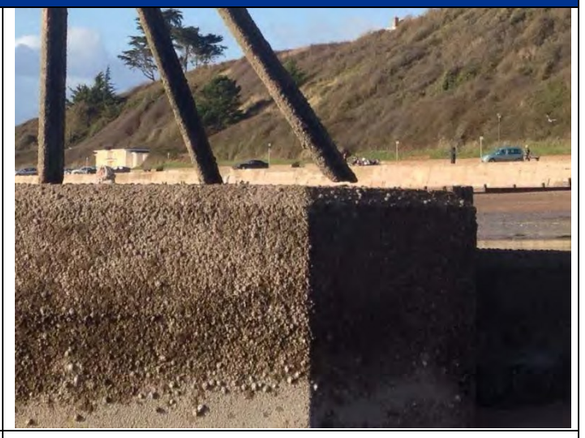



Trial Pit 6

Asset Name		**Groyne no. 1**		
Location description		First groyne along Queens Drive at Orcombe Point		
Asset Description		Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	**Construction Date**	1970's
Asset Length		90m		
Inspection Date		8th December 2014		
Inspection Comments		Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks but little or no gaps between planks evident. Planks missing along seaward concrete section of groyne. All fixing sound, some corrosion evident. Some abrasion to concrete base. Steel bracing to navigation marker damaged and detached from base. Beach material level with top plank in upper beach. Strand line ~5-10m from seawall.		
Beach level differential	**Upper**	+0.6m (east side)		
	Mid	+0.3m (east side)		
	Lower	-		
Overall Condition:		2 | GOOD		
Residual Life:		10 - 15 years		
Recommendations:		Consider raising groyne height in upper beach. Repair bracing to navigation marker.		
Urgency:		Routine.		

Photographs



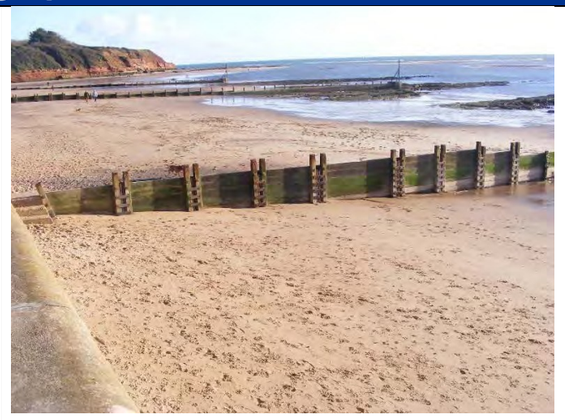



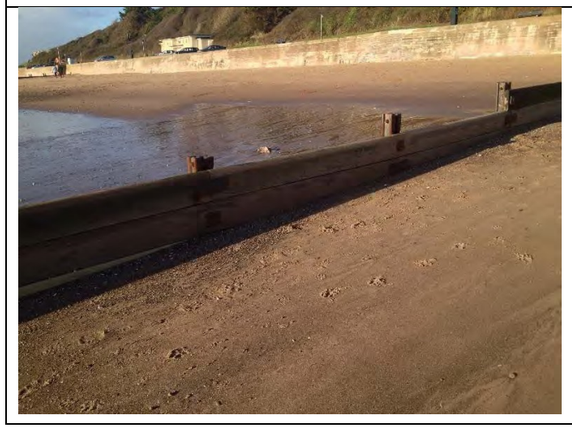
Asset Name		Groyne no. 2		
Location description		Second groyne along Queens Drive from Orcombe Point and The Maer		
Asset Description		Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	Construction Date	1970's
Asset Length		~90m		
Inspection Date		8th December 2014		
Inspection Comments		Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks, minor gaps between planks in upper beach. Planks appear to be missing along mid to lower beach concrete section of groyne. All fixing sound, some corrosion evident. Some abrasion to concrete base. Low beach levels along mid and lower beach. Strand line 5m from seawall.		
Beach level differential	Upper	+0.3m (east side)		
	Mid	+0.4m (east side)		
	Lower	-		
Overall Condition:		2 | GOOD		
Residual Life:		10 - 15 years		
Recommendations:		Monitor beach levels.		
Urgency:		No repairs.		

Photographs

Asset Name		Groyne no. 3		
Location description		Third groyne along Queens Drive from Orcombe Point and The Maer		
Asset Description		Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	Construction Date	1970's
Asset Length		~60m		
Inspection Date		8th December 2014		
Inspection Comments		Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks, minor gaps between planks in upper beach. All fixing sound, some corrosion evident. Some abrasion to concrete base. Low beach levels along upper, mid and lower beach. Groyne much shorter than groynes to east (1-3) and west (5-6). Strand line at toe of seawall.		
Beach level differential	Upper	+1.0m (east side)		
	Mid	+0.7m (east side)		
	Lower	+0.4m (east side)		
Overall Condition:		2 | GOOD		
Residual Life:		10 - 15 years		
Recommendations:		Monitor low beach levels, consider placing additional beach material.		
Urgency:		No repairs.		

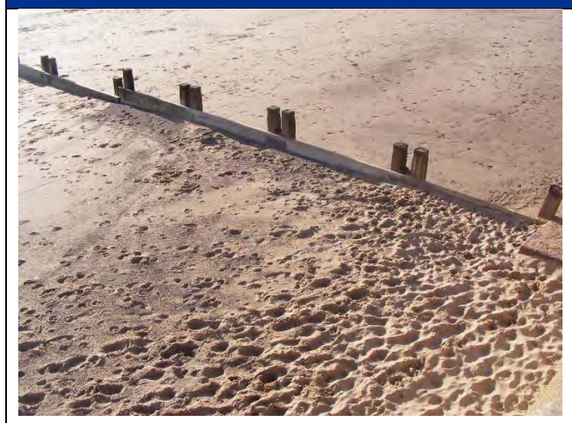
Photographs

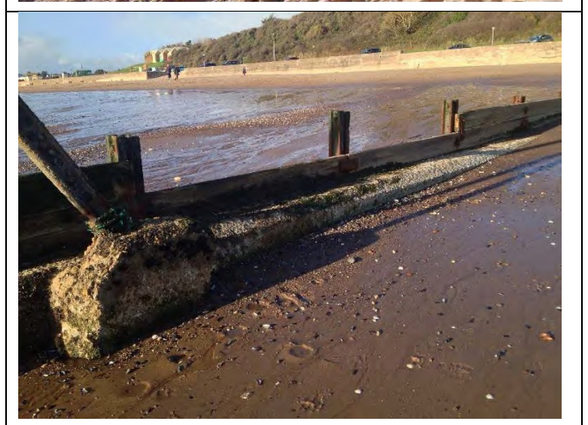




Asset Name		Groyne no. 4		
Location description		Fourth groyne along Queens Drive from Orcombe Point and The Maer		
Asset Description		Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	Construction Date	1970's
Asset Length		~60m		
Inspection Date		8th December 2014		
Inspection Comments		Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks, some gaps between planks at mid-length. Two planks missing at seaward end of groyne. All fixing sound, some corrosion evident. Some abrasion to concrete base. Low beach levels along upper and lower beach. Groyne much shorter than groynes to east (1-2) and west (5-6). Beach material close to top of top plank in upper beach. Strand line at toe of seawall.		
Beach level differential	Upper	+0.7m (east side)		
	Mid	+0.7m (east side)		
	Lower	-		
Overall Condition:		2 | GOOD		
Residual Life:		10 - 15 years		
Recommendations:		Consider raising height of groyne in upper beach to improve performance.		
Urgency:		No repairs.		

Photographs



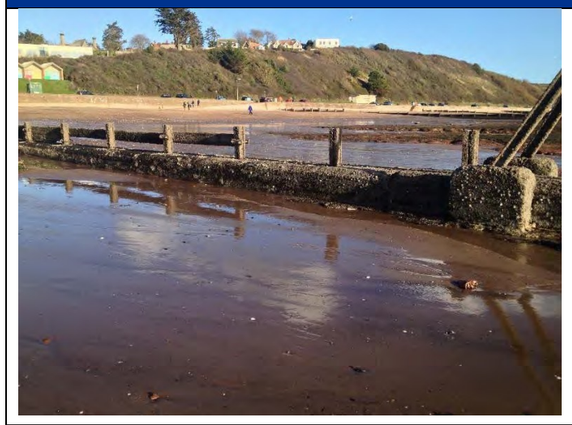


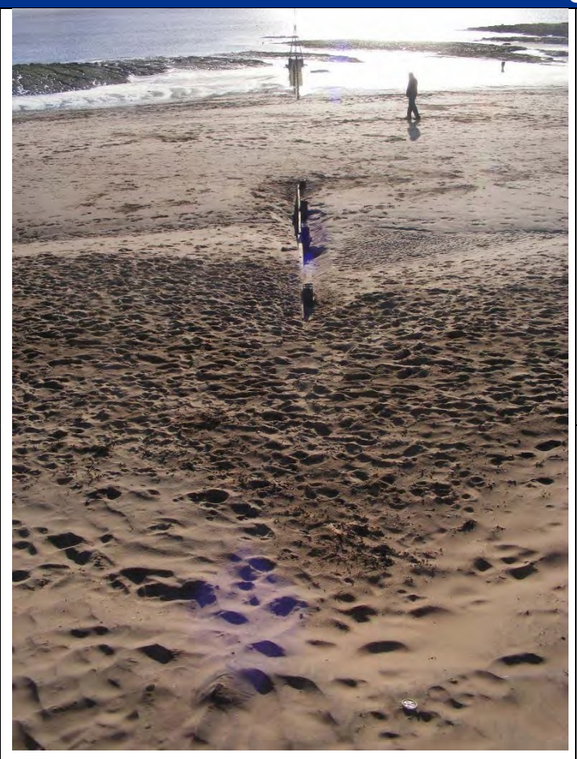
Asset Name		Groyne no. 5		
Location description		Fifth groyne along Queens Drive from Orcombe Point and The Maer		
Asset Description		Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	Construction Date	1970's
Asset Length		~90m		
Inspection Date		8th December 2014		
Inspection Comments		Structure appears sound, groyne straight and all piles vertical with no evidence of rotation or undermining. Some abrasion to timber planks, no gaps between planks evident. All fixing sound, some corrosion evident. Some abrasion to concrete base. Low beach levels along upper, mid and lower beach. Groyne much shorter than others to the east. Beach material close to top of top plank in upper and mid beach. Strandline 5m from seawall.		
Beach level differential	Upper	+0.3m (east side)		
	Mid	+0.7m (east side)		
	Lower	-		
Overall Condition:		2 | GOOD		
Residual Life:		10 - 15 years		
Recommendations:		Consider raising height of groyne in upper and mid beach to improve performance.		
Urgency:		No repairs.		

Photographs

Asset Name		Groyne No.6		
Location description		Sixth groyne on Queens Drive from Orcombe Point and The Maer		
Asset Description		Timber post and plank groyne with concrete and base and steel posts at seaward end. Steel navigation marker.	Construction Date	1970's
Asset Length		~90m		
Inspection Date		8th December 2014		
Inspection Comments		Structure buried in upper and mid beach so inspection not possible. Concrete Structure appears sound. Seaward end of groyne appeared straight and vertical with no evidence of rotation. Minor onset of undermining below concrete base at groyne head. Significant abrasions and gaps between planks at seaward end. Fixing appear sound, some corrosion evident. Strandline 20m from seawall.		
Beach level differential	Upper	Buried		
	Mid	Buried		
	Lower	-		
Overall Condition:		2 | GOOD		
Residual Life:		10 - 15 years		
Recommendations:		Consider raising height of groyne in upper and mid beach. Replace planks in lower beach.		
Urgency:		Routine.		

Photographs





Asset Name		Groyne No.7		
Location description		Seventh groyne on Queens Drive at The Maer		
Asset Description		Timber piles. Remaining construction unknown	Construction Date	1970's
Asset Length		n/a		
Inspection Date		8th December 2014		
Inspection Comments		Relic groyne in lee of The Maer. Groyne not visible, likely removed.		
Beach level differential	Upper	-		
	Mid	-		
	Lower	-		
Overall Condition:		5 (VERY POOR)		
Residual Life:		n/a		
Recommendations:		Remove exposed pile to improve safety for beach users, monitor exposed piles as beach levels change.		
Urgency:		Routine.		

Photographs