3421
57 River Road, Littlehampton

Flood Risk Assessment

November 2020

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ARUN DISTRICT COUNCIL LU/247/20/PL

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1. Introduction

AKT II have been commissioned to undertake a Flood Risk Assessment (FRA) in support of the planning application for the proposed redevelopment of 57 River Road in Littlehampton.

The site is located on the eastern bank of the River Arun in Littlehampton.

The study is to be prepared in accordance with the National Planning Policy Statement (NPPF).

2. Requirements of National Planning Policy Framework (NPPF)

2.1 Summary

The National Planning Policy Framework (NPPF) has recently superseded Planning Policy Statement 25 "Development and Flood Risk" (PPS 25) although the requirements and goals remain essentially the same:

- The susceptibility of land to flooding is a material planning consideration;
- The Environment Agency has the lead role in providing advice on flood issues, at a strategic level and in relation to planning applications;
- Planning decisions should apply the precautionary principle to the issue of flood risk, using a risk-based search sequence to avoid inappropriate development on undeveloped and undefended flood plains etc;
- Developers should fund flood defences and warning measures required because of the development;
- Planning policies and decisions should recognise that the consideration of flood risk and its management needs to be applied on a whole-catchment basis and not only be restricted to flood plains.

With regard to the NPPF, those proposing particular developments are responsible for:

- Providing an assessment of whether any proposed development is likely to be affected by flooding and whether it will increase flood risk elsewhere and the measures proposed to deal with these effects and risks and;
- Satisfying the local planning authority that any flood risk to the development or additional risk arising from the proposal will be successfully managed with the minimum environmental effect thus ensuring the safe development and secure future occupancy of the site.

After this has been addressed, it is then the local planning authority's responsibility (advised as necessary by the Environment Agency) to determine an application for planning permission after taking into account all material considerations, including the issue of flood risk and how it might be managed or mitigated. Local planning authorities are required to adopt a risk-based approach to proposals for development in flood risk areas. The assessment of risk should take into account:

- The area liable to flooding;
- The probability of it occurring, both now and over time;
- The extent and standard of existing flood defences and their effectiveness over time;
- The likely depth of flooding;
- The rates of flow likely to be involved; and
- The nature of the development proposed and the extent to which it is designed to deal with flood risk.

Local planning authorities in conjunction with the Environment Agency are responsible for determining that the threat of flooding should be managed. This is to ensure that the development is and remains safe throughout its lifetime (i.e. it has an appropriate degree of protection) and does not increase flood risk elsewhere.

Following flooding in December 2000 the Environment Agency (EA) provided indicative flood plain maps to all authorities and published them on the EA website. In addition to these indicative maps (following a national programme adopted by the Agency in 1996), detailed data and maps for priority areas at risk are available, to provide precise information for building developments.

The Government looks to local planning authorities under the NPPF to apply the risk-based approach to their decisions on development control through a sequential test. Under the test, sites are to be categorised under the following zones.

1. Areas with little or no potential risk of flooding (annual probability less than 0.1% for rivers, tidal & coastal). These areas would have no constraints on development other than the need to ensure that the development does not increase run-off from the site to greater than that from the site in its undeveloped or presently developed state. For development proposals on sites located within Flood Zone 1 comprising one hectare or above the vulnerability to flooding from other sources as well as from river and the sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a FRA.
2. Areas with low potential risk of flooding (annual probability between 1.0% - 0.1% for rivers and between 0.5% - 0.1% for tidal & coastal). These areas would be suitable for most developments.

3a. Areas with high potential risk of flooding (annual probability greater than 1.0% for rivers and greater than 0.5% for tidal & coastal). These areas will generally be suitable for residential, commercial and industrial uses, provided there are adequate flood defences in place, that ensure buildings are designed to resist flooding, there are suitable warning and evacuation procedures in place and the new development does not add to flood risk downstream.

3b. Areas at highest risk from flooding (including those areas behind defences that offer a standard of defence less than 1% for rivers and less than 0.5% for tidal & coastal or where there is a significant risk that failure could lead to rapid inundation by fast flowing water). These areas may be suitable for recreation, sport and conservation use.

3. Site Description

The site location is shown in Figures 3.1 to 3.3. The site occupies an area of approximately 475 m^2 at Grid Ref. TQ 023021 and is sandwiched between River Road to the north east and the River Arun to the south west. The site is fairly flat with the maximum level difference approximately 0.1 m. The average ground surface level on site is approximately 3.40 m AOD. A site specific topographical survey for 55-57 River Road has been included in Appendix 1 for reference.

The adjacent recently developed site, 47 River Road, is the first property on the eastern bank of Littlehampton's Arun riverside just after entering the town from the A258 across a bridge. It was developed originally in the early 19th Century as home to a small blacksmith's shop and warehouses and in recent years was used as a car repair workshop. The current site, 57 River Road, is a further workshop building associated with the garage and the yard area that serves it.

- The site co-ordinates are at grid reference 502342/102139.
- The nearest postcode is BN17 5DB.
- Latitude North: 504835.
- Latitude West: 03256.

Access to the site is currently available to pedestrians from River Road.

Figure 3.2: Site Location

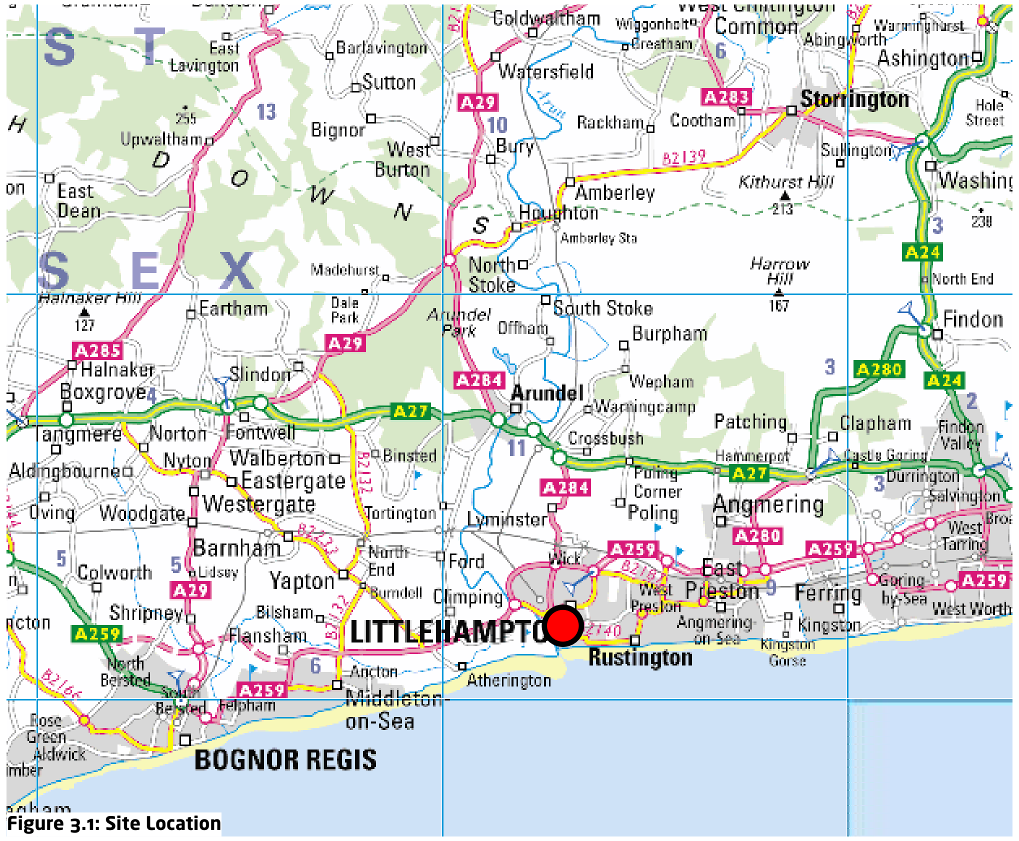

Figure 3.1: Site Location

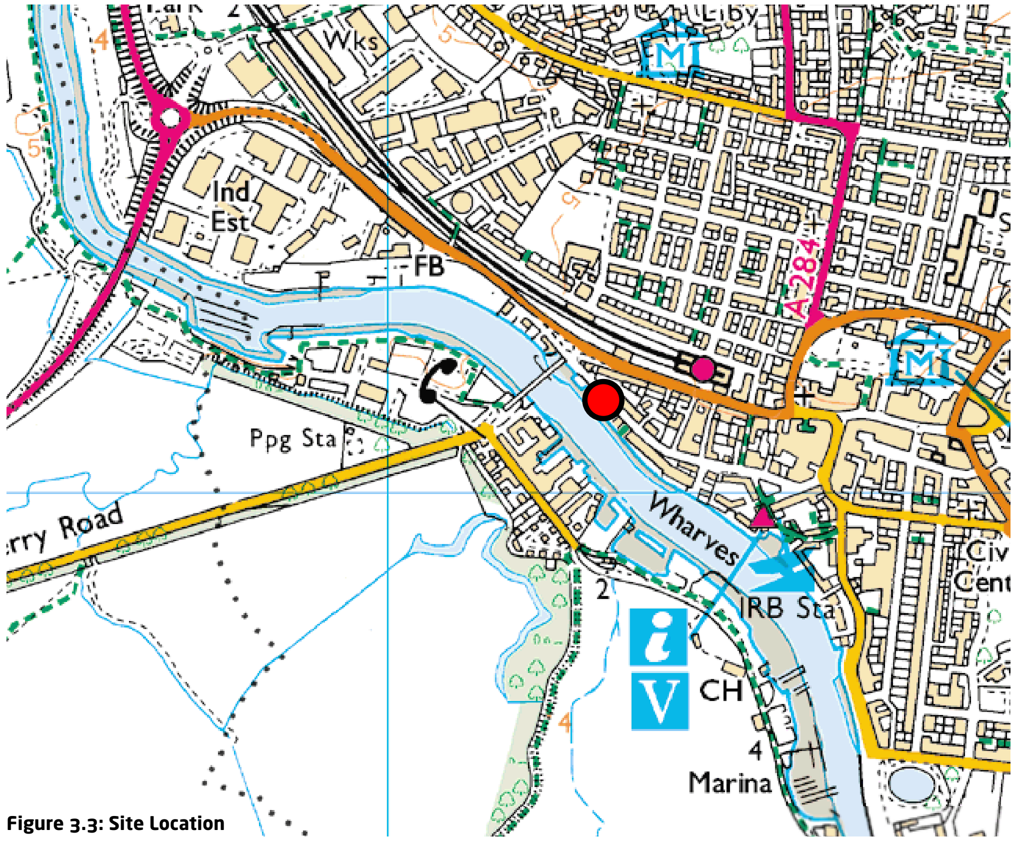

Figure 3.3: Site Location

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4. Proposed Development

It is proposed to redevelop the site for residential purposes in a similar manner to the adjacent site 47 River Road which is owned by the same developer and has already received planning permission.

The ground floor level will consist of communal car parking, bicycle parking, bin store areas and residential space and the three upper floors will provide the habitable residential space.

Six apartments are proposed with each apartment ranging from two to three bedrooms.

All habitable space has a finished floor level above 5.17m.

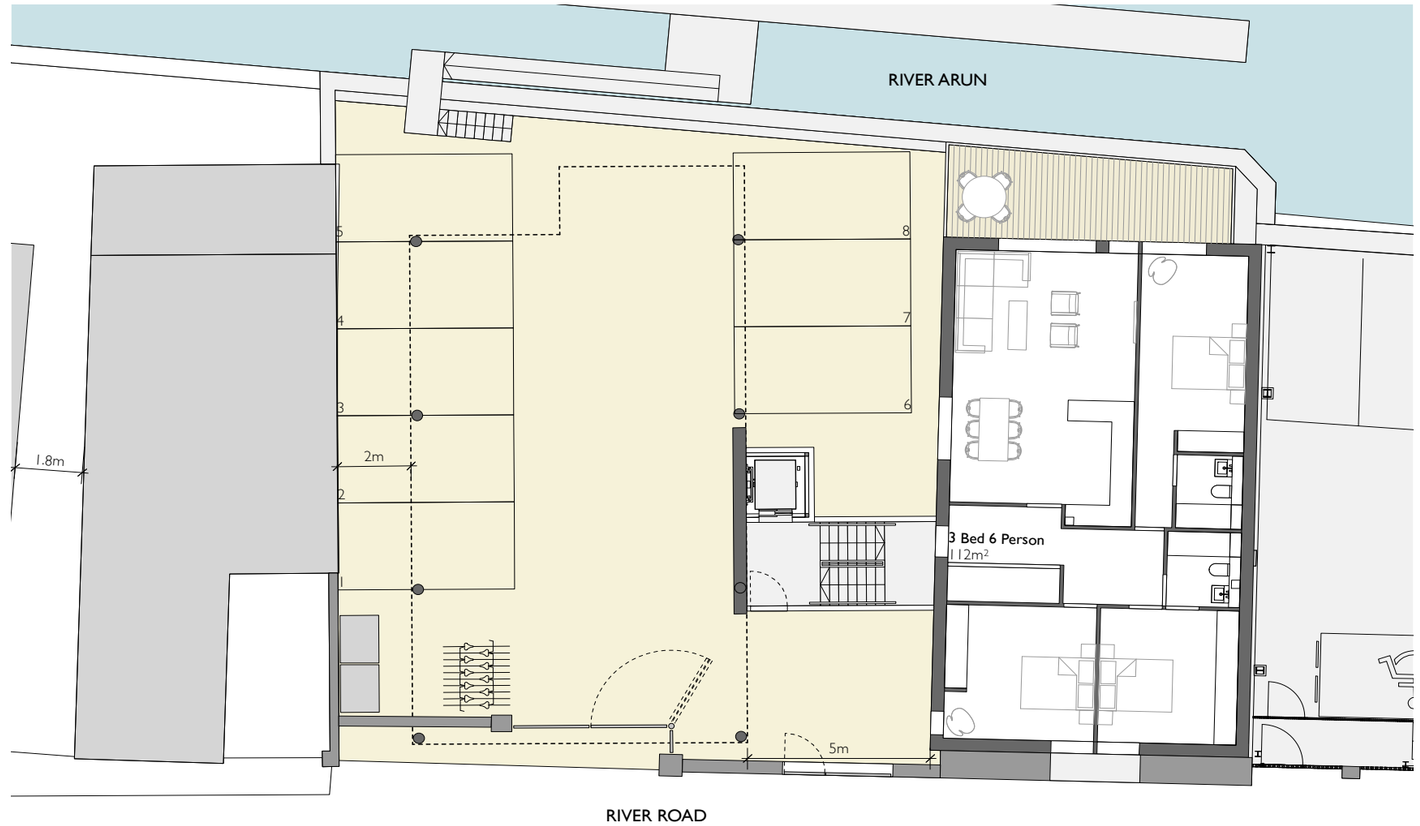


Figure 4.1 Proposed Ground Floor Layout

5. Flood Risk Assessment

5.1 Flood Risk from Watercourses

5.1.1 General Observations

There is a risk of flooding from rivers or the sea, as identified on the Environment Agency (EA) indicative flood outline map in Figure 5.1. The map shows that the site lies within the flood plain (Zone 3).

Since the adjacent development at 47 River Road, the EA have undertaken an updated modelling and mapping exercise in the area which has revised the flood outline map and reduced the extent of flooding adjacent to the site although the site itself is still located just within Zone 3.

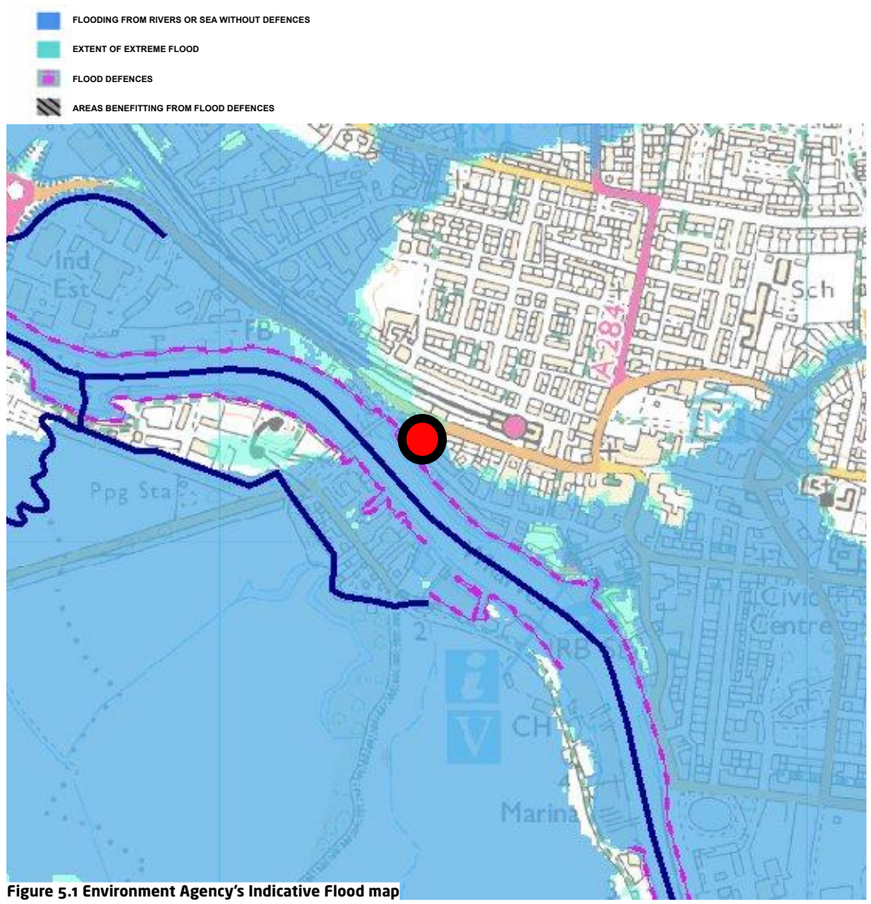


Figure 5.1 Environment Agency's Indicative Flood map

5.1.2 Environment Agency Comments

The EA confirmed that the site falls within the flood plain although they are unaware of any previous flooding having affected the site (refer to Appendix 3.0). The EA also provided the modelled flood levels for this location.

- 1:200yr AEP Undefended = 3.80mAOD
- 1:200yr AEP (2070) Undefended = 4.30mAOD
- 1:200yr AEP (2115) Undefended = 4.87mAOD
- 1:300yr AEP Defended = 4.8mAOD
- 1:1000yr AEP Undefended = 4.02mAOD

5.1.3 Flood Defences

Appendix 4.0 contains extracts from the Environment Agency document "Planning for the Future - Rivers Arun to Adur draft flood and erosion management strategy" and the "Littlehampton Arun East Bank Tide Wall Flood Defence Scheme Environmental Statement" which detail the proposed improvements to the flood defences along this stretch of the River Arun.

The site falls under the "River Arun East Bank" frontage and the sub-section "Reach 3 (private frontage). The site's south-west brick wall is part of the flood defences at this location and are assessed generally in the Environmental Statement as providing a 1 in 20 standard of protection with a 20 year residual life in this area. At present, based on the figures in Section 5.1.2 above, the top of the existing wall is approximately 3.8m AOD which indicates that the site is protected to approximately the current 1 in 200 year flood level.

However, it is understood that, as part of the improvement works, the flood defence wall was raised to 4.8m AOD, designed to 1 in 300 year which is 70mm below the 1 in 200 year AEP in the year 2115 flood level. Therefore the flood defences will protect the site for events up to 1 in 300 year up to the year 2110, and are comparable to those in "Reach 3 (walkway)", minor flooding would occur on site for a 1 in 200 year event in the year 2115.

Based on these findings we believe that there is a low risk of flooding due to overtopping of the flood defences both in the short-term (the 20 years until improvement has been undertaken) and the long-term (post-improvement up to 2110).

5.2 Flood Risk from Groundwater

A ground investigation report was not available at the time this report was undertaken. However, the EA confirmed that *"the site lies on a major aquifer and the ground water table is shallow beneath the site"* (refer to Section 7.2).

The site has not been affected by groundwater flooding in the past; a ground investigation study was commissioned and confirms the maximum groundwater levels is between 1.05m and 2.50m below ground level, (refer to Appendix 6 for extract of the ground investigation).

6 Sequential & Exception Tests

6.1 Sequential Test

The risk-based Sequential Test should be applied at all stages of planning process. Its aim is to steer developments to areas at lowest probability of flooding (i.e. to Flood Zone 1).

In accordance with NPPF Table 2 (reproduced below) the proposed development is classified as "More Vulnerable". The Environment Agency's floodplain map shows the site lies within Flood Zone 3 and NPPF Table 3 (reproduced below) indicates that the exception test is therefore required.

There are no suitable sites located within a reasonable radius of the site which could be used by this development. The available sites within Zone 1 are all disproportionately large to be viable for a small development of six apartments and those of an appropriate size are also located within Zones 2 and 3.

6.2 Exception Test

1. The location adjoining the town centre, railway station and bus routes means the development is highly sustainable, the mitigation measures taken in the design mean the development is not an unacceptable risk nor does it pose an unacceptable risk to existing developments in the area. It provides safe and attractive residential units in a very popular, sought after riverside location which cannot be provided elsewhere in a lower risk site.
2. Mitigation measures such as openings on the flood wall could be beneficial for the existing developments, as trapped flood water would be able to drain back into the river channel through the proposed openings via flap valves.
3. The proposed development is on previously developed land.
4. The proposed development has been designed specifically for this site to compliment and effectively act as an extension to the redevelopment of 47 River Road.
5. This report is prepared to satisfy the third condition of the exception test.

Flood Risk vulnerability classification (see Table 2)		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✘	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✘	✘	✘

National Planning Policy Framework: Table 3 - Flood Risk Vulnerability and Flood Zone "Compatibility"

Essential infrastructure
- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable
- Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use.
- Installations requiring hazardous substances consent (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure").

More vulnerable
- Hospitals.
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan.*

Less vulnerable
- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Water-compatible development
- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, *subject to a specific warning and evacuation plan.*

National Planning Policy Framework: Table 2 - Flood Risk Vulnerability Classification

7 Run-off Assessment

7.1 Existing Site Run-off

As with 47 River Road, it is believed that surface water from the site currently drains to the public sewers in River Road. The entire site is currently occupied by a mixture of roof and impermeable yard area.

The existing 1 in 100 year run-off from the impermeable area is:

$Q_{100} = 2.78 \times A \times i$

(where A is the catchment area in Ha and i is the rainfall intensity in mm/hour).

Therefore, $Q_{100} = 2.78 \times 0.045 \times 43.5 = 5.45$ litres/sec

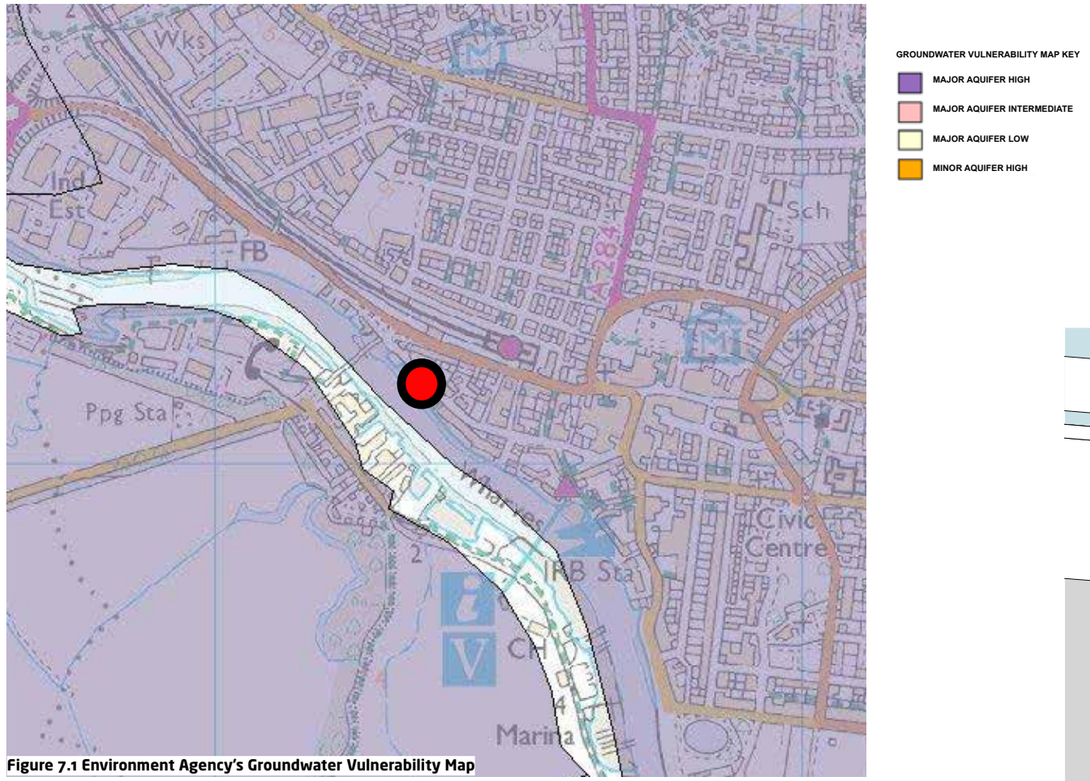


Figure 7.1 Environment Agency's Groundwater Vulnerability Map

Range	Total potential change anticipated for 2010-2039	Total potential change anticipated for 2040-2059	Total potential change anticipated for 2060-2115
Upper end	10%	20%	40%
Central	5%	10%	20%

Peak Rainfall Intensity allowance in small catchment

7.2 Proposed Site Run-off

In accordance with Environment Agency guidelines, the Building Regulations and Water Authorities advice, the preferred means of surface water drainage for any new development is into a suitable soakaway or infiltration drainage system. Sustainable urban drainage systems can reduce the impact of urbanization on watercourse flows, ensure the protection and enhancement of water quality and encourage recharge of groundwater in a manner which mimics nature.

The Environment Agency confirmed that "the site lies on a major aquifer and the ground water table is shallow beneath the site". This supports the finding from the ground investigation as the ground water table is approximately 1.05m to 2.50m below the existing ground level. Therefore, the use of infiltration techniques such as soakaways are not recommended for this site.

Correspondence received from the EA regarding the development at 47 River Road (enclosed in Appendix 3.0 for reference) specifically requested that surface water is discharged directly to the River Arun via a single outlet and therefore the same approach is proposed for the development at 57 River Road. The discharge point should be kept at as a high a level as possible to minimise the time that the outlet is tide-locked due to the water level in the river and any surface water drainage from the car park area should pass through oil-trapped gullies prior to discharge.

A storage tank will be required within the car park area in order to store the backup of water caused when the outfall cannot discharge due to a high water level in the river. The tank should be sized to allow for the worst case scenario of the critical storm event coinciding with the peak high-tide event whilst making an allowance for climate change of 40% (per local authority's recommendation).

A detailed surface water drainage design scheme will be prepared at a later stage and will be submitted to the Local Authority for approval.

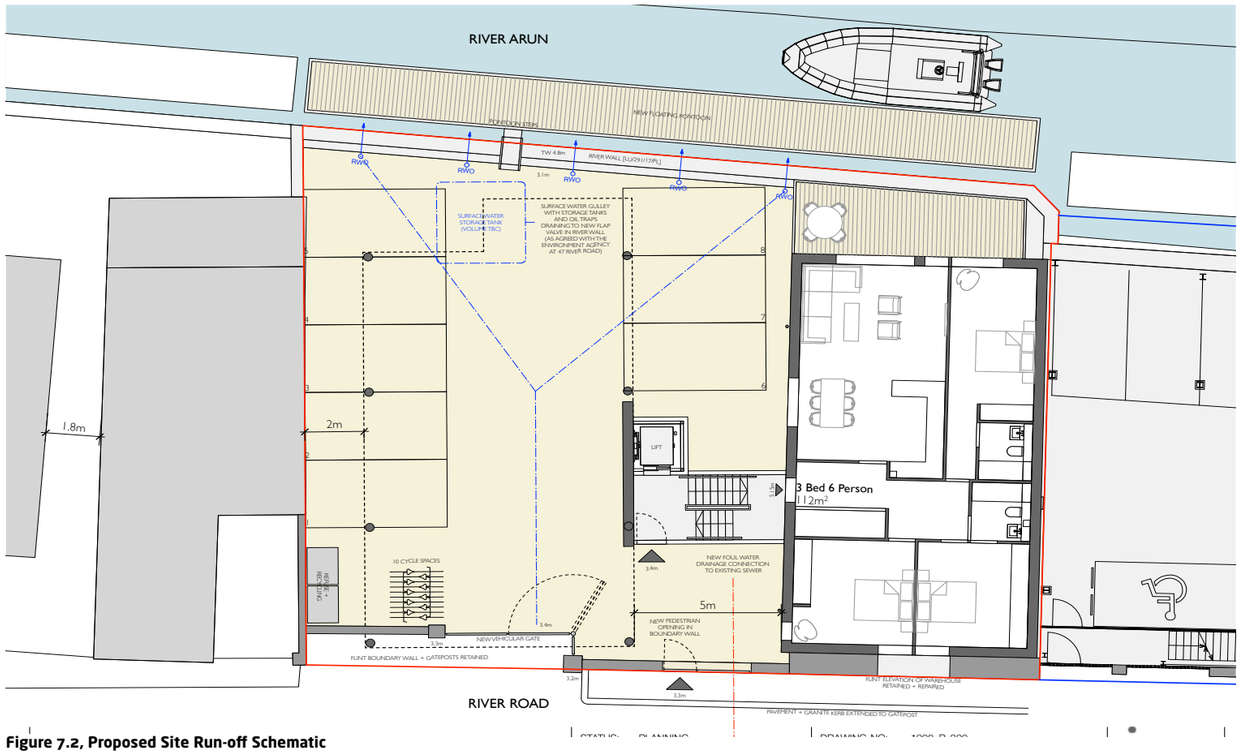


Figure 7.2, Proposed Site Run-off Schematic

8 Mitigation Measures

8.1 Site Layout

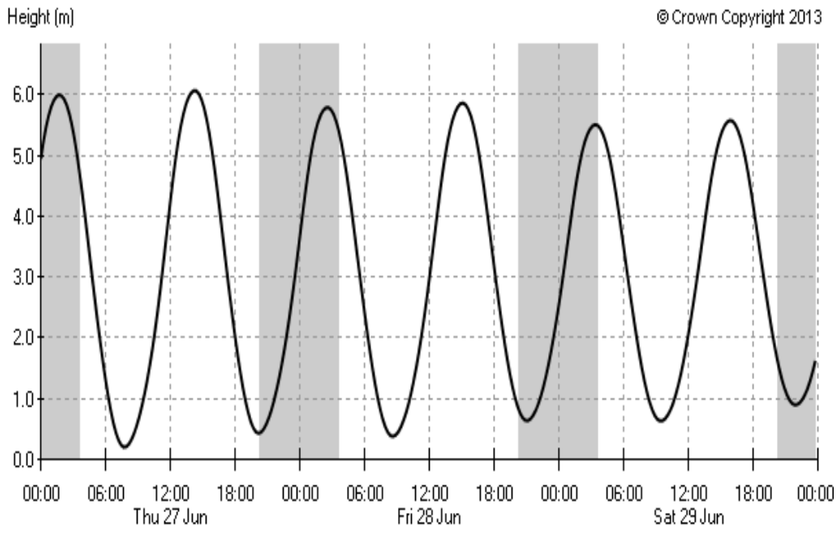
Guidance suggests that finished floor levels must be constructed above the 1 in 200yr AEP in year 2115 flood level including a 300mm freeboard. Therefore, as a minimum, the finished floor levels of this development must be constructed at 5.17m AOD.

Prior to the NPPF, PPS 25 Practice Guide, paragraph 6.16 published by the EA in June 2008 states that "Provided there is adequate flood warning available it may be reasonable to design development with parking or other flood-compatible uses at the ground level and residential or other people-intensive use above the flood level". This advice is considered to still be applicable.

On this basis, the ground floor level (car parking area) will be constructed at 3.4m AOD to match 47 River Road but all residential accommodation will be located at a level of 5.17m AOD and above.

The flood wall currently protects the site for storm events up to approximately 1 in 300 years, (flood wall built to 4.8m AOD) and will protect the site in higher storm events (refer to paragraph 5.1.3).

Tidal prediction chart



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Height (m) © Crown Copyright 2013

Figure 8.1 Littlehampton Tidal Prediction

8.2 Safe Access

The proposed development will be at flood risk if the defences are not improved and this scenario is considered in this section. A dry route connecting the site to an area outside the floodplain will not be available, if flood water remains trapped behind the flood defences in an extreme storm event. The flood risk to people must be fully assessed in this case, as the residents may have to walk in the flood water to access an area outside the floodplain.

Using the tidal prediction chart in Figure 8.1 and the EA's flood water data (1 in 200yr AEP in 2115 flood level = 4.87m AOD) the water level will be increasing at a rate of 0.95m per hour in the 1 in 200 year + climate change tidal event. Therefore, flood water would overtop the existing defences (currently set at 4.8m AOD) in the last 5 minutes of the tidal event and the maximum flood water level would be 0.07m. The flood water level in the river would return below the flood wall level in 5 minutes. The trapped water level on site behind the flood wall would be 1.4m - the difference between the top of wall (4.8m AOD) and the site's FFL. Therefore, in the worst case scenario the site would be affected by the tidal event for no more than 10 minutes and would be ponded by flood water to a depth of 1.4m. The water level under the 1 in 300 year event (without climate change) will be below the 4.80m top of wall level and so will not pose an overtopping risk to the site.

The EA and Defra published FD2321/TR2 "Flood Risks to People" in March 2006. Guidance Note 2, Figure 2.1 provides details on combinations of flood depth and velocities that cause danger to people. This table shows that people become endangered when the water level exceeds 1.25m if the velocity is 0 m/sec (Figure 8.2). Flood water will be trapped at this location only if there is not an opening downstream allowing water to drain to the River, sea or drainage. Therefore, the flood water velocity would be 0 m/sec in this instance. The flood water level between the site and an area outside the floodplain (Bridge Road which is approximately 40m west of the site) would be less than 500mm. Therefore, based on Figure 8.2 the depths and velocities of flood water will not cause risk to people.

People will be safe in their properties during the peak time of the flood event, as the proposed development will be constructed in accordance with the EA's recommendations and will be able to leave the properties after the peak of the storm event (if needed) walking in an acceptable still flood water depth.

Velocity (m/s) \ Depth (m)	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
0.00	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25
0.50	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
1.00	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75
1.50	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
2.00	0.63	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
2.50	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
3.00	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75
3.50	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
4.00	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25
4.50	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50
5.00	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75

Flood Hazard Rating (HR)	Colour Code	Hazard to People Classification
< 0.75		Very low hazard - Caution
0.75 to 1.25		Danger for some – includes children, the elderly and the infirm
1.25 to 2.00		Danger for most – includes the general public
> 2.00		Danger for all – includes the emergency services

Figure 8.2 FD2321/TR2 "Flood Risk to People" Extract

8.3 Warning and Evacuation Plans

The developer must ensure that all warning and evacuation plans are in place and must submit car parking construction details showing prevention measures for floating vehicles out of the site. Appendix 5.0 contains the Emergency Flood Risk Management and Rescue Plan which is based on the approved plan for the adjacent site.

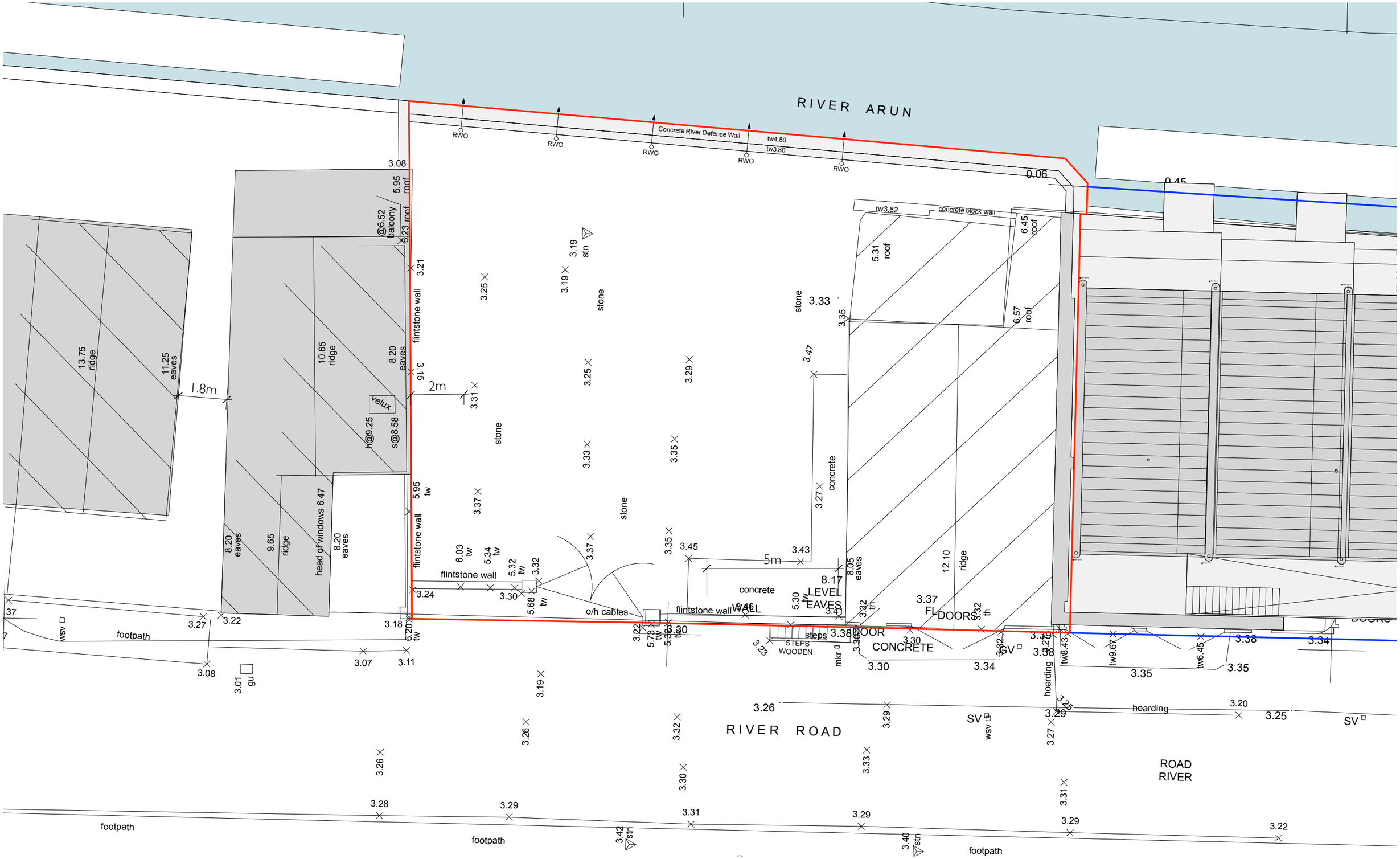
9 Conclusions

- In accordance with the National Planning Policy Framework, we would categorise the site as lying in Flood Zone 3 - an area with high potential risk of flooding (annual probability greater than 1.0% for rivers and greater than 0.5% for tidal & coastal). - The site will be suitable for residential development, provided the proposed mitigation measures are in place.
- Flood defences currently protect the site from flooding in storm events up to approximately 1 in 300 years.
- The EA in partnership with Worthing Borough Council, Adur and Arun District Councils have undertaken to improve the defences at this location in the near future.
- The residents will be safe in their properties which will be constructed at 5.17m AOD which is 0.37m above the 1 in 300 year flood level of 4.8m AOD. They will be able to leave their properties (if needed) after the peak of the storm event (no more than 10 minutes) walking in static flood water at a maximum depth of 500mm. The EA's FD2321/TR2 document confirms that this is acceptable.
- The developer must ensure that all warning and evacuation plans are in place.
- Surface water from the proposed development can drain to the River Arun through a single outlet
- Any surface water from car park areas should be passed through oil-trapped gullies prior to discharge to the river.
- An appropriately sized tank will be required to store any backup of surface water caused by the outfall being tide-locked due to high water levels in the river.
- Therefore, the proposed redevelopment has an acceptable flood risk within the terms and requirements of the National Planning Policy Framework.
- The comments stated above are based on information received from other consultees. The flood risk classification of this site has been based on the above observations, and the recommendations stated. This report is intended for the use of the developer of the site in support of their planning application for the site only.

3421
57 River Road, Littlehampton

Appendix 1

Existing Site Topographical Survey



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STATUS:	PLANNING	DRAWING NO:	1908_P_150
SCALE:	1:125 @ A3	TITLE:	TOPOGRAPHIC SURVEY
DATE:	SEPTEMBER 2020	PROJECT:	**57 RIVER ROAD, LITTLEHAMPTON**

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3421
57 River Road, Littlehampton

Appendix 2

WinDes Calculations

AKTII LTD		Page 1
White Collar Factory 1 Old Street Yard London, EC1Y 8AF	57 River Road Littlehampton	
Date 13/11/2020 18:24 File Preliminary Tank Size_A...	Designed by AY Checked by MD	
Micro Drainage	Source Control 2017.1.2	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	2.449	0.549	3.7	8.8	O K
30 min Summer	2.542	0.642	4.0	10.3	O K
60 min Summer	2.577	0.677	4.1	10.8	O K
120 min Summer	2.533	0.633	4.0	10.1	O K
180 min Summer	2.463	0.563	3.8	9.0	O K
240 min Summer	2.393	0.493	3.5	7.9	O K
360 min Summer	2.269	0.369	3.2	5.9	O K
480 min Summer	2.163	0.263	3.1	4.2	O K
600 min Summer	2.087	0.187	3.1	3.0	O K
720 min Summer	2.046	0.146	3.0	2.3	O K
960 min Summer	2.008	0.108	2.6	1.7	O K
1440 min Summer	1.979	0.079	2.0	1.3	O K
2160 min Summer	1.961	0.061	1.4	1.0	O K
2880 min Summer	1.951	0.051	1.2	0.8	O K
4320 min Summer	1.941	0.041	0.8	0.6	O K
5760 min Summer	1.935	0.035	0.7	0.6	O K
7200 min Summer	1.931	0.031	0.6	0.5	O K
8640 min Summer	1.928	0.028	0.5	0.4	O K
10080 min Summer	1.926	0.026	0.4	0.4	O K
15 min Winter	2.524	0.624	3.9	10.0	O K
30 min Winter	2.634	0.734	4.3	11.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	124.633	0.0	11.2	16
30 min Summer	83.789	0.0	15.1	26
60 min Summer	53.779	0.0	19.4	42
120 min Summer	33.337	0.0	24.0	78
180 min Summer	24.832	0.0	26.8	112
240 min Summer	20.006	0.0	28.8	144
360 min Summer	14.706	0.0	31.8	208
480 min Summer	11.818	0.0	34.0	266
600 min Summer	9.966	0.0	35.9	320
720 min Summer	8.665	0.0	37.4	376
960 min Summer	6.943	0.0	40.0	492
1440 min Summer	5.071	0.0	43.8	734
2160 min Summer	3.696	0.0	47.9	1100
2880 min Summer	2.949	0.0	51.0	1464
4320 min Summer	2.142	0.0	55.5	2188
5760 min Summer	1.705	0.0	58.9	2912
7200 min Summer	1.427	0.0	61.6	3648
8640 min Summer	1.235	0.0	64.0	4392
10080 min Summer	1.093	0.0	66.1	5072
15 min Winter	124.633	0.0	12.6	16
30 min Winter	83.789	0.0	16.9	27

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AKTII LTD		Page 2
White Collar Factory 1 Old Street Yard London, EC1Y 8AF	57 River Road Littlehampton	
Date 13/11/2020 18:24 File Preliminary Tank Size_A...	Designed by AY Checked by MD	
Micro Drainage	Source Control 2017.1.2	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	2.666	0.766	4.4	12.2	O K
120 min Winter	2.583	0.683	4.1	10.9	O K
180 min Winter	2.476	0.576	3.8	9.2	O K
240 min Winter	2.373	0.473	3.5	7.6	O K
360 min Winter	2.187	0.287	3.1	4.6	O K
480 min Winter	2.060	0.160	3.1	2.6	O K
600 min Winter	2.017	0.117	2.7	1.9	O K
720 min Winter	1.998	0.098	2.4	1.6	O K
960 min Winter	1.978	0.078	2.0	1.3	O K
1440 min Winter	1.960	0.060	1.4	1.0	O K
2160 min Winter	1.948	0.048	1.1	0.8	O K
2880 min Winter	1.941	0.041	0.8	0.6	O K
4320 min Winter	1.933	0.033	0.6	0.5	O K
5760 min Winter	1.928	0.028	0.5	0.4	O K
7200 min Winter	1.925	0.025	0.4	0.4	O K
8640 min Winter	1.923	0.023	0.4	0.4	O K
10080 min Winter	1.921	0.021	0.3	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	53.779	0.0	21.7	46
120 min Winter	33.337	0.0	26.9	84
180 min Winter	24.832	0.0	30.0	118
240 min Winter	20.006	0.0	32.3	152
360 min Winter	14.706	0.0	35.6	216
480 min Winter	11.818	0.0	38.1	264
600 min Winter	9.966	0.0	40.2	314
720 min Winter	8.665	0.0	41.9	372
960 min Winter	6.943	0.0	44.8	492
1440 min Winter	5.071	0.0	49.1	734
2160 min Winter	3.696	0.0	53.6	1080
2880 min Winter	2.949	0.0	57.1	1444
4320 min Winter	2.142	0.0	62.2	2144
5760 min Winter	1.705	0.0	66.0	2928
7200 min Winter	1.427	0.0	69.0	3512
8640 min Winter	1.235	0.0	71.7	4312
10080 min Winter	1.093	0.0	74.1	5072

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White Collar Factory 1 Old Street Yard London, EC1Y 8AF	57 River Road Littlehampton	
Date 13/11/2020 18:24 File Preliminary Tank Size_A...	Designed by AY Checked by MD	
Micro Drainage	Source Control 2017.1.2	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.048

Time (mins) From:	To:	Area (ha)
0	4	0.048

AKTII LTD		Page 4
White Collar Factory 1 Old Street Yard London, EC1Y 8AF	57 River Road Littlehampton	
Date 13/11/2020 18:24 File Preliminary Tank Size_A...	Designed by AY Checked by MD	
Micro Drainage	Source Control 2017.1.2	

Model Details

Storage is Online Cover Level (m) 3.400

Tank or Pond Structure

Invert Level (m) 1.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	16.0	0.700	16.0	1.400	16.0	2.100	16.0
0.100	16.0	0.800	16.0	1.500	16.0	2.200	16.0
0.200	16.0	0.900	16.0	1.600	16.0	2.300	16.0
0.300	16.0	1.000	16.0	1.700	16.0	2.400	16.0
0.400	16.0	1.100	16.0	1.800	16.0	2.500	16.0
0.500	16.0	1.200	16.0	1.900	16.0		
0.600	16.0	1.300	16.0	2.000	16.0		

Hydro-Brake® Outflow Control

Design Head (m) 0.550 Hydro-Brake® Type Md5 SW Only Invert Level (m) 1.900
Design Flow (l/s) 3.8 Diameter (mm) 91

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.5	1.200	5.5	3.000	8.6	7.000	13.2
0.200	3.1	1.400	5.9	3.500	9.3	7.500	13.6
0.300	3.1	1.600	6.3	4.000	10.0	8.000	14.1
0.400	3.3	1.800	6.7	4.500	10.6	8.500	14.5
0.500	3.6	2.000	7.0	5.000	11.1	9.000	15.0
0.600	3.9	2.200	7.4	5.500	11.7	9.500	15.4
0.800	4.5	2.400	7.7	6.000	12.2		
1.000	5.0	2.600	8.0	6.500	12.7		

ARUN DISTRICT COUNCIL LU/247/20/PL

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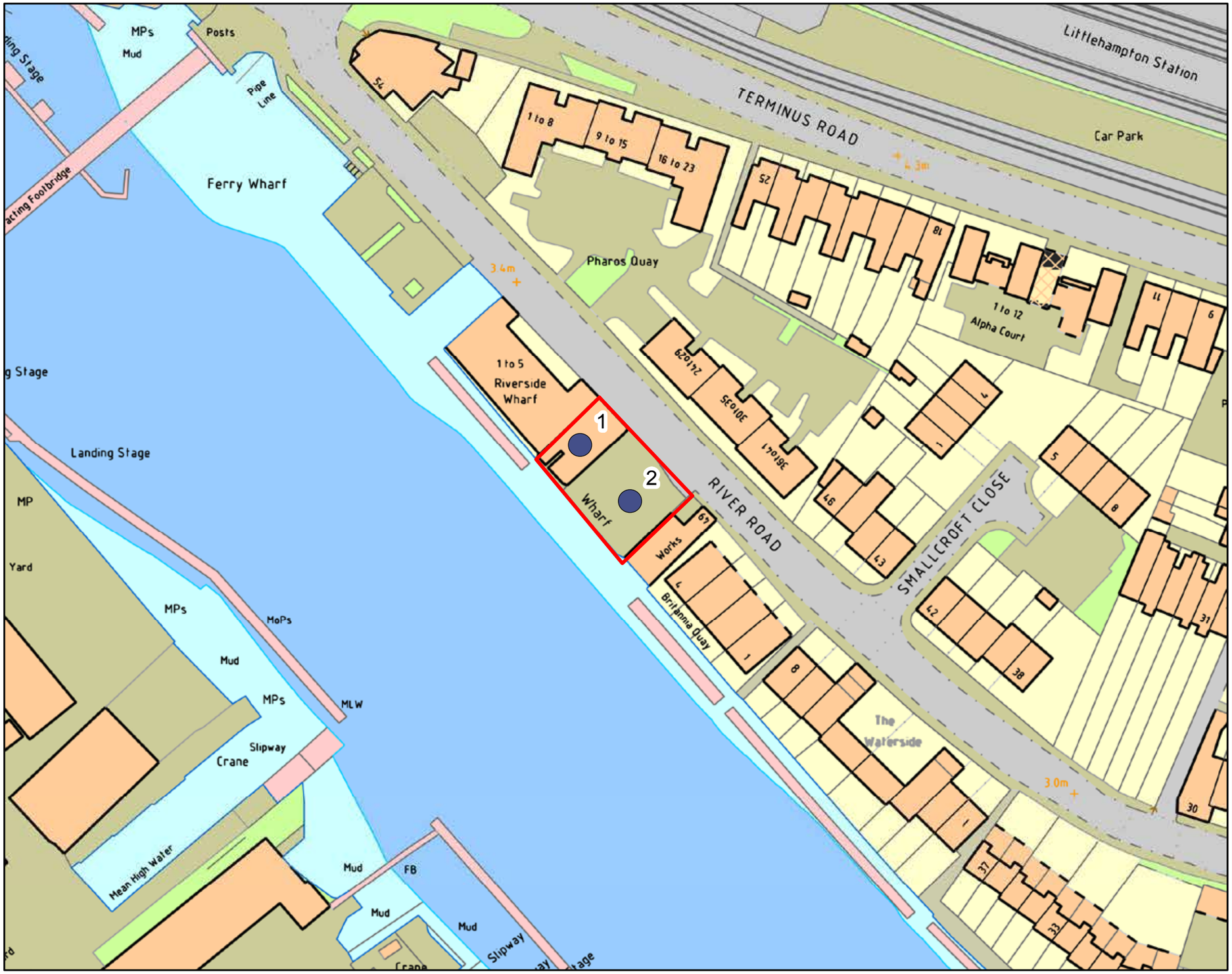
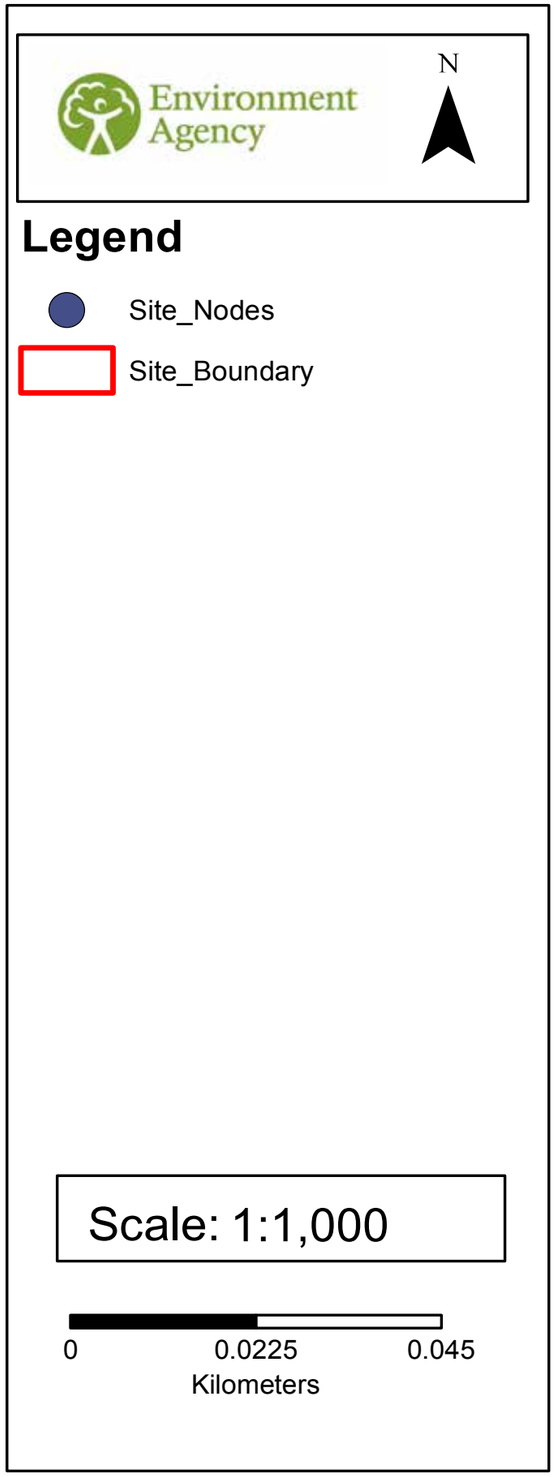
Appendix 3

Environment Agency Correspondence and Product 4

FRA Site Boundary & Node Points. Centred BN17 5DB. Created 05/11/2020.





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Contact us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506. Email:enquiries@environment-agency.gov.uk

Environment Agency

Product 4 Flood Risk Data Requested by: AKT

Site: 57 River Road, Littlehampton, BN17 5DB

Table 1: Water Levels: Tidal Undefended

	NGR		Modelled Flood Levels in Metres AOD			
			Undefended Annual Exceedance Probability			
Node Ref	Eastings	Northings	0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	502347	102139	3.80	4.30	4.87	4.02
2	502356	102128	3.80	4.30	4.87	4.02

Table 2: Water Levels: Tidal Defended

	NGR		Modelled Flood Levels in Metres AOD			
			Defended Annual Exceedance Probability			
Node Ref	Eastings	Northings	0.5%	0.5% (2065)	0.5% (2115)	0.1%
1	502347	102139	-	-	4.52	-
2	502356	102128	-	-	4.67	-

Table 3: Water Depths: Tidal Undefended

	NGR		Modelled Flood Depths in Metres			
			Undefended Annual Exceedance Probability			
Node Ref	Eastings	Northings	0.5%	0.5% (2070)	0.5% (2115)	0.1%
1	502347	102139	0.55	1.04	1.62	0.77
2	502356	102128	0.59	1.08	1.67	0.81

Table 4: Water Depths: Tidal Defended

	NGR		Modelled Flood Depths in Metres			
			Defended Annual Exceedance Probability			
Node Ref	Eastings	Northings	0.5%	0.5% (2065)	0.5% (2115)	0.1%
1	502347	102139	-	-	1.14	-
2	502356	102128	-	-	1.16	-

All levels taken from: Arun to Adur Coastal Modelling (2012) with updated defended modelling (2017)

Produced on: 13/01/2020

Office Address: Guildbourne House, Chatsworth Road, Worthing BN11 1LD.
Customer services line: 03708 506 506. Email: enquiries@environment-agency.gov.uk
www.gov.uk/government/organisations/environment-agency

Michael Duff

From: SSD Enquiries [SSDEnquiries@environment-agency.gov.uk]
Sent: 28 June 2013 16:18
To: Michael Duff
Subject: FW: SSD/1313/CC Ref 130611/AH23 RE: 3421 - 55 to 57 RIVER ROAD, LITTLEHAMPTON

Dear Mr Duff

Further to your enquiry please find below information on the specified site.

Flood levels: All in Metres AOD.
Modelled levels taken from 2012 JBA TUFLOW Model

1% AEP Defended	0.5% AEP Defended	0.5%AEP Climate Change Defended	0.1% AEP Defended
3.75	3.83	4.83	4.02

We are aware of some previous flooding having occurred on River Road. Much of this is believed to be associated with drainage issues and also due to tidal influence of the River Arun. We recommend contacting Arun District Council who may have more detailed records.

The Environment Agency, together with Arun District Council are currently in the process of implementing a new flood defence scheme for Littlehampton East Bank. The details for this can be found on our website at http://www.environment-agency.gov.uk/homeandleisure/floods/114650.aspx

If you have further queries regarding Flood Risk please do not hesitate to contact Jamie Fielding at this office.

For further information on Groundwater Protection and Surface Water Discharges please visit the following links
http://www.environment-agency.gov.uk/business/topics/water/111878.aspx

http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx

This information is provided subject to the notice attached.

Yours sincerely

We would be really grateful if you could spare five minutes to help us improve our service. Please click on the link below and fill in our survey – we use every piece of feedback we receive: **http://www.surveyshack.com/link/453a2**

Cherry Weeks
Customer Services Officer
Solent and South Downs
The Environment Agency - South East

External: 01903 703831
Internal: 723 3831
email: ssdenquiries@environment-agency.gov.uk

1

Michael Duff

From: Fielding, Jamie [jamie.fielding@environment-agency.gov.uk]
Sent: 04 July 2013 15:50
To: Alex Herman
Cc: Littlehampton, East Bank Scheme
Subject: undefended flood levels
Attachments: Littlehampton East Bank Flood Map.pdf

Hi Alex

The undefended levels for the site are:

1:1000yr = 4.02mAOD
1:200yr = 3.80mAOD

The flood map I attach shows purely the new flood zone for the East bank, hence the lack of flooding on the West Bank.

I have spoken to the Littlehampton project team and copied them into this email. I would recommend you forward your defence related question to this address and make for the attention of Andrew Walker. He should be able to then advise on this aspect of your enquiry.

Kind Regards
Jamie

Jamie Fielding
FCRM Advisor
West Sussex Partnership & Strategic Overview
Solent & South Downs

Tel: 01903 703833
07500994255
Email: jamie.fielding@environment-agency.gov.uk

Environment Agency
Guildbourne House, Chatsworth Road, Worthing, West Sussex BN11 1LD

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1

Environment Agency

Mr J Parsons
Arun District Council
Development Control
1, Arun Civic Centre Maltravers Road
Littlehampton, West Sussex
BN17 5LF

Our ref: SX/2009/104109/01-L01
Your ref: LU/407/07
LU/223/09/DOC

Date: 09 November 2009

Dear Mr Parsons,

DISCHARGE OF CONDITIONS OF APPEAL DECISION AT 47 RIVER ROAD LITTLEHAMPTON

Thank you for your consultation request regarding the application above.

With regards to the conditions for contamination, the desk study (A045787 July 2008) submitted is satisfactory. We would agree that a Phase 1 & 2 site investigation with soil and groundwater testing for heavy metals and organics is necessary.

Conditions 13 and 14 of LU/407/07 should not be discharged at this stage. Only part 13 (a) has been complied with at this stage. We understand that the applicants intend to do the further work at a later stage, which may necessitate a Variation of Condition application, or an agreement on behalf of the LPA that the development can continue before this condition is discharged fully.

With regards to Condition 5, we are surprised to note that the clean rainwater and undercover car park runoff is proposed to discharge via a hydrobrake into a combined sewer.
There appears to be no explanation for this method of disposal and we would question where the excess water would be stored during intense rainfall. We consider that a more appropriate solution would be to discharge the clean roof water via one outlet into the River Arun. The car park water could also go into this system providing the appropriate oil trapped gullies were provided.
We therefore consider this should be re-evaluated and do not recommend the discharge of condition 5 at this stage.

The emergency flood risk management and rescue plan relating to Condition 8 in our view falls short in several areas. If this is to be given to the occupants of the flats then it needs to be more targeted to their needs.
We feel it should cover;

i) movement of vehicles during a flood
ii) access routes to be followed
iii) potential period and depth of flooding
iv) areas of safe refuge

We do not consider the plan needs to contain Appendix D as this is not relevant to individuals and relates to fluvial flooding not coastal flooding. Additionally, there is information within the report that needs to be corrected and we would recommend that contact is made with both ourselves and your council prior to re-submitting the plan. The relevant contact here with regard to that information is Phil Hailey who can be contacted on 01903 703816.

We therefore consider this should be re-evaluated and do not recommend the discharge of condition 8. You are also advised to contact your Emergency Planning Officer, Guy Edwards with regards the discharge of this condition.

I trust that the above comments are satisfactory but if you require any further information please contact me.

Yours sincerely,

Miss Kate Attrill
Senior Area Planning Liaison Officer

Direct dial 01903 703918
Direct e-mail kate.attrill@environment-agency.gov.uk
www.environment-agency.gov.uk

cc. G Lawrence, John Pardey Architects

3421
57 River Road, Littlehampton

Appendix 4

Environment Agency Flood Defence Improvements

what we plan to do – river frontages

Implementation Plan

Frontage	Approved strategy option	Planned work (subject to funding)	Date
River Arun East Bank	Hold the line – Improve	Raise defences where required	2010 – 2014*
		Replace steel sheet piling at end of residual life	2060
River Adur West Bank	Hold the line – Improve	Raise defences of west bank tidal walls where required	2014*
		Habitat creation works	2016
		Raise sections of wall not requiring raising in year two	2031 and 2036
		Tidal barrier (or further defence raising)	2060+
River Adur East Bank	Hold the line – Improve (north)	Raise Defences	2030
		Tidal barrier (or further defence raising)	2060+
	Hold the line – Sustain (central)	Raise defences	2020
		Raise defences	2060
	No active intervention (east)	n/a	n/a

*These schemes are in the Environment Agency's Medium Term Plan (five *year programme of Flood and Coastal Erosion Schemes 2010/2011 -2014/2015)*, published in April 2010.

For these schemes we will produce a Project Appraisal Report which will look in detail at the costs and benefits and how to protect as many properties as we can economically justify. It will determine what materials to build any new defences from, what they will look like, the exact alignment and how high they need to be. This strategy does not guarantee funding for these planned works.

Please see page 14 to read about how funding is allocated.

what we plan to do – coastal frontages

Frontage	Approved strategy option	Planned work (subject to funding)	Date
Littlehampton to Rustington	Hold the line – Improve	Beach nourishment, groynes and some sea wall improvements where required. (Littlehampton)	2045
		Beach nourishment and sea wall construction	2025
		Replace groynes at end of residual life	2060
Rustington to Goring	Hold the line – Sustain	Replace groynes at end of residual life; Further groyne replacement and beach nourishment, construction of sea wall	2016 2060
Ferring Rife	Hold the line – Sustain	Replace all groynes at end of residual life;	2035
		Beach nourishment	2060
Marine Crescent, Goring	Hold the line – Sustain	Replace groynes at end of residual life	2021 – 2025
		Beach nourishment	2060
Worthing	Hold the line – Sustain	Replace groynes at end of residual life (phased with five yearly intervals)	2016 – 2045
		Beach nourishment	2085
Brooklands to Shoreham	Hold the line – Sustain	Beach nourishment and rebuild timber breastwork	2060

ARUN DISTRICT COUNCIL LU/247/20/PL

River Arun East Bank

Littlehampton is a coastal town at the mouth of the River Arun with most of the town built on the East Bank. It is a busy seaside resort and a local commercial centre.

There are a number of flood defences along the east bank of the river including earth embankments, sheet piled walls and a concrete apron with brick wall. The Environment Agency maintains some of the defences but the majority are privately owned, with Littlehampton Harbour Board also responsible for a significant frontage.
As the majority of the defences currently provide a low standard of protection, they can expect to be overtopped with increasing frequency which may eventually lead to failure and flooding as sea level rises. River Arun West Bank is considered in the *River Arun to Pagham Flood and Erosion Risk Management Strategy* which can be viewed on the Environment Agency website.

Approved Strategy Option
Hold the line - Improve

Improve the current standard of protection by raising the level of the walls and embankments immediately.

Replace the steel sheet piling at the end of its residual life, in approximately 50 years.

Littlehampton to Rustington

Between Littlehampton and Rustington is East Beach, a sand and shingle beach frontage. There are significant residential and commercial properties immediately behind the beach and promenade. The coastline is protected by a range of defences including a low concrete seawall and a shingle bank with timber groynes. The groynes immediately adjacent to the river have reached the end of their life. However, they will not be replaced immediately as the beach and sea wall currently provide an acceptable defence.

Approved Strategy Option – Hold the Line - Improve
Improve the current defences through beach nourishment, replacement of groynes at the end of their residual life (see table on previous page for timings) and reconstruction of the concrete wall, to increase protection to Littlehampton.

As no environmental impact assessment is required for the public realm improvements, the ES will not be submitted as part of the planning application made by Arun District Council for these works.

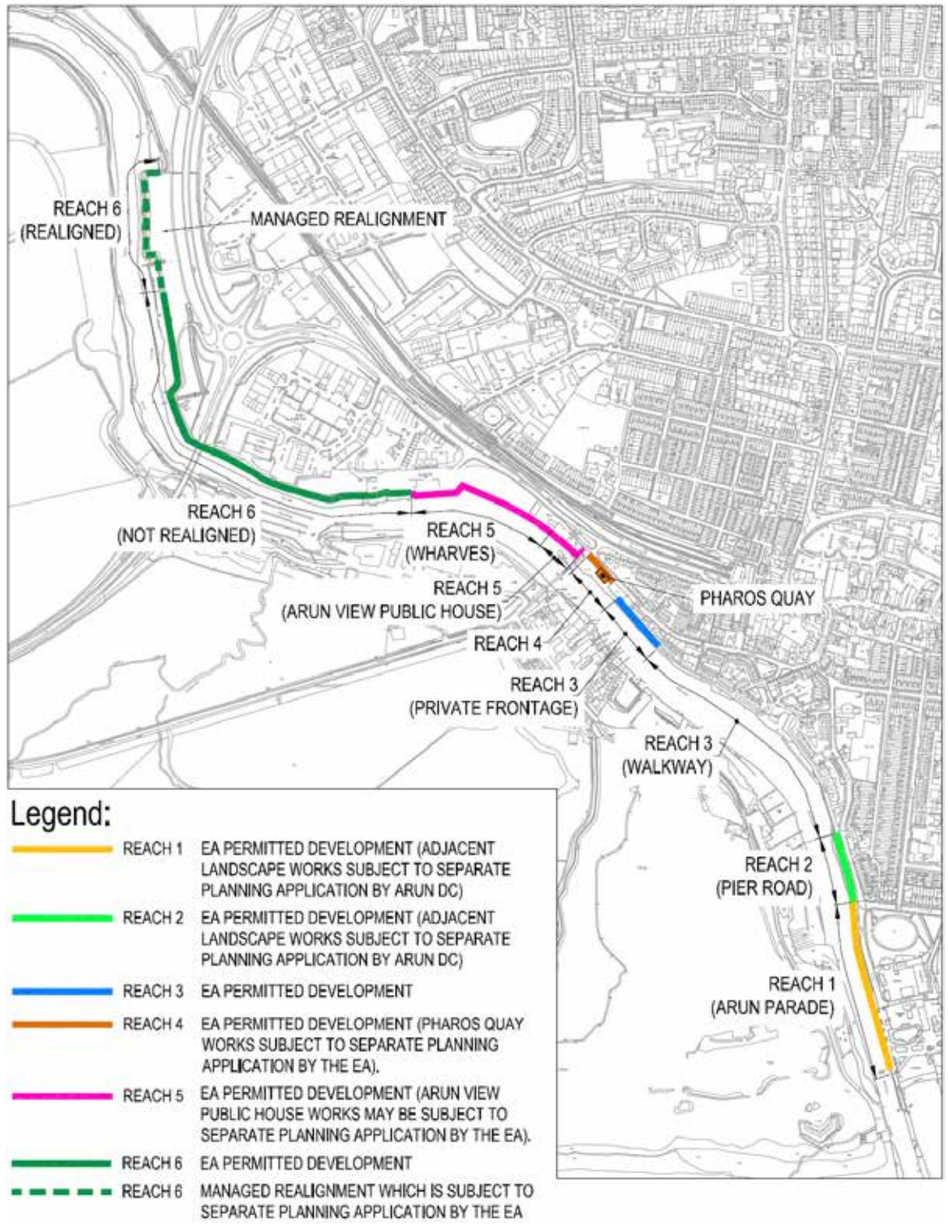

Figure 1.3 Plan of scheme reaches and planning requirements

ARUN DISTRICT COUNCIL LU/247/20/PL

3 Scheme description

This chapter describes the proposed scheme (where the works will be located and how they will look on completion, including details of hard and soft landscape features) and how it will be constructed, focusing on the nature of construction activities, temporary access and provisions for vehicles and pedestrians to be used, and the timing of the works.

3.1 The proposed scheme (preferred option)

The majority of the works will be located either along or immediately riverward of the existing alignment of the flood defences. The exceptions are in Reach 4 Pharos Quay, where the new defence wall will be realigned in part landward and in part riverward of the existing defences and in Reach 6 Realignment, where the embankment will be realigned landward in order to provide saltmarsh and mudflat habitat.

Key features of the design are:

- The design life of the new flood defences is in excess of 75years, with defences typically varying from 4.8mAOD to 5.3mAOD. The exception is in Pharos Quay (Reach 4) and the Wharf (Reach 5) where a phased raising of defences is proposed and the proposed defences are to 4.4mAOD.
- Extensive landscape and public realm works will be undertaken to provide enhancements to the public realm in Reaches 1 and 2 and general improvements throughout the scheme
- For Reaches 1 and 2, the materials, furniture and planting will be inspired by Littlehampton's surrounding natural context. They have been selected to provide a unified, robust, simple and understated public realm which complement the surrounding natural context and will not compete visually with the more brightly coloured buildings along the waterfront
- In Reach 2 the narrow footpath will be widened and a promenade created which forms a continuous link from East Beach to the south and the existing Riverside Walk to the north
- The design of the public realm and landscape reflects the coastal character through the use of materials and colour
- Un-necessary clutter caused by street furniture will be removed from the public realm
- Handrails will be provided in Reach 1 and 2 for health and safety reasons which are visually light weight in design to maintain views to the river. The addition of feature-lighting in the handrails will be considered.
- A planting plan will be implemented in Reaches 1, 2, 4 and 6 to mitigate for those lost trees and vegetation to the scheme. The character of the planting in Reaches 1 and 2 will aim to mimic the natural shoreline coastal planting (naturalistic, not formal). Attractive coastal species, preferably indigenous to the West Sussex coastline or suitability for environment and of low maintenance will be chosen. In Reach 4 the plants will be a combination of herbaceous and shrubs with plants chosen for year round interest to compliment the more residential character. Native trees, shrubs and grassland have been chosen for Reach 6

- Replacement lighting in Reaches 1 and 2 will use high quality light fittings to enhance the public realm.
- Glass panels have been proposed in Reach 5 to mitigate for loss of views
- Access to the river in Reaches 1, 2 and 3 will be maintained and improved where practicable by new ramps, steps or pontoons
- Ecological mitigation and enhancement will be provided through managed realignment in Reach 6

Plans showing the alignment and design details of the proposed works are provided in Landscape Masterplans and on the engineering drawings, which are located at the end of this document.

The Landscape Masterplans comprise:

- Landscape Masterplan Reach 1, Sheet 1 of 3: 3483 PL 101
- Landscape Masterplan Reach 1, Sheet 2 of 3: 3483 PL 102
- Landscape Masterplan Reach 1, Sheet 3 of 3: 3483 PL 103
- Landscape Masterplan Reach 2: 3483 PL 104
- Visualisations Reaches 1 and 2: 3483 PL 105
- Section Elevations Reaches 1 and 2: 3483 PL106
- Landscape Masterplan Reach 3: 3483 PL 107
- Landscape Masterplan Reach 4: 3483 PL 108
- Details Reach 4: 3483 PL 109
- Landscape Masterplan Reach 5, Sheet 1 of 2: 3483 PL 110
- Landscape Masterplan Reach 5, Sheet 2 of 2: 3483 PL 111
- Landscape Masterplan Reach 6, Sheet 1 of 2: 3483 PL 112
- Landscape Masterplan Reach 6, Sheet 2 of 2: 3483 PL 113

The engineering drawings comprise:

- Reaches 1 and 2 General Arrangement Plan (Sheet 1 of 2): 463457-CIVIL-100-P1
- Reaches 1 and 2 General Arrangement Plan (Sheet 2 of 2): 463457-CIVIL-101-P1
- Reaches 1 and 2 General Arrangement Sections: 463457-CIVIL-103-P2
- Reach 3B (private frontage) General Arrangement Plan: 463457-CIVIL-300-P1
- Reach 3B (private frontage) General Arrangement Sections: 463457-CIVIL-301-P1
- Reach3B (private frontage) General Arrangement Elevations: 463457-CIVIL-302-P1
- Reach 4 General Arrangement Plan: 463457-CIVIL-400-P2
- Reach 4 General Arrangement Sections: 463457-CIVIL-401-P2

ARUN DISTRICT COUNCIL LU/247/20/PL

- Reach 5A (Arun View public house) General Arrangement Plan: 463457-CIVIL-500-P2
- Reach 5A (Arun View public house) General Arrangement Sections: 463457-CIVIL-500-P2
- Reach 5B (Arun View public house) General Arrangement Plan: 463457-CIVIL-550-P2
- Reach 5B Details: 463457-CIVIL-560-P1
- Reach 6 General Arrangement Plan (Sheet 1 of 2): 463457-CIVIL-600-P3
- Reach 6 General Arrangement Plan (Sheet 2 of 2): 46357-CIVIL-600-P3
- Reach 6 General Arrangement Sections (Sheet 1 of 3): 463457-CIVIL-602-P2
- Reach 6 General Arrangement Sections (Sheet 2 of 3): 46345 -CIVIL-603-P2
- Reach 6 General Arrangement Sections (Sheet 3 of 3): 463457-CIVIL-604-P2

The proposed works for each Reach of the scheme are as follows:

Reach 1 (Arun Parade) A new sheet piled vertical flood defence wall installed directly riverward of the existing sheet piled wall and capped with a decorative precast concrete coping. The wall will be approximately 300m long and 1.3m higher than the existing defence. The wall will generally be 0.5m higher than the new river promenade level and will comprise a new transparent railing for health and safety. The level difference between existing and proposed will be transitioned using a combination of pedestrian and seating steps, planting terraces and ramps. These elements will be arranged in a simple repetition along the whole length of Reach 1 and 2. A new footpath adjacent to Arun Parade will be provided at the lower level.

Extensive public realm works landward side will comprise high quality in-situ decorative concrete paving, planting complementing the coastal landscape character, bespoke timber seating, low terraced corten steel (a ready rusted steel used in architectural applications) walls to the planting and a high quality co-ordinated range of replacement street furniture such as litter bins, finger post signs and lighting. Accessibility features including steps and ramps will be located on desire lines and access points to adjacent land uses. Replacement access to the river will be provided.

Reach 2 (Pier Road) A new sheet piled vertical flood defence wall installed directly riverward of the existing sloping concrete revetment and capped with a decorative precast concrete coping. The wall will be approximately 150m long and1.0m higher than the existing defence and landside works will comprise extensive public realm works to match the proposal for Reach 1. The wall will generally be 0.2m higher than the river promenade level and will comprise a new transparent railing for health and safety. The position of the piles will create a wider area between the river and Pier Road, widening the walkway which is a current pinch point and creating space for seating and steps up to the raise promenade. Replacement access to the pontoons will be provided. The fish kiosk will be moved and the promenade widened in this locality to provide more waiting and circulation space.

Reach 3 (walkway) No works are needed for at least 20 years, when the existing flood defence will need to be raised to maintain the 1 in 300 Standard of Protection.

Reach 3 (private frontage) A raised new vertical sheet piled flood defence wall installed riverward of the existing wall and capped with concrete. The wall will be approximately 100m long and 1.0m higher than the existing wall. Replacement access to the pontoons will be provided and private gardens will be reinstated.

Reach 4 (Pharos Quay) In the southern end of this frontage (approximately 40m), in the area subject to planning permission, a retaining wall will be installed to a height of approximately 1.0m above footpath level. This retaining wall will take a landward alignment and will be installed alongside the footpath. Vehicular and pedestrian access to the private quay (Pharos Quay) will be provided.

Works to the northern end of this frontage (adjoining to the footbridge), which are permitted development, comprise a new vertical sheet piled wall with concrete cap to a level approximately 0.9m higher than the existing wall.

This reach will be designed to reflect the Conservation Area status and will included a raised area to allow people to gain a view of the river with an area of low level ground cover planting between the footpath and raised area.

Reach 5 (Arun View public house) The river-facing walls of the Arun View public house will be flood-proofed using concrete and flood glass units. The walls alongside the patios will be raised using flood glass units and access to the pontoons will be reinstated.

Reach 5 (wharves) A 300m length (approximately) of the existing flood defences will be raised by construction of a 0.4m high reinforced concrete wall. To the southern/eastern end of this reach the existing concrete cap will be raised, but for the majority of this reach works will comprise a retaining wall constructed in-situ on an alignment immediately landward of the existing wall.

Reach 6 (non-realigned) The existing flood defence level will be raised by 0.8m through installation of approximately 600m length of steel sheet piled wall driven through the existing embankment, aligned along the riverward side of the existing embankment crest. In the northern 200m length of this reach, the existing embankments will be raised by 1.0m with imported fill (approximately 2,500m^3). The scour protection at the top of the existing embankment will be repaired using open stone asphalt (which will be of a similar construction detail to the existing protection). The embankments will be reseeded as required with a species rich seed mix.

Reach 6 Realignment The objective in this area is to establish a bio-engineered set-back embankment to promote a salt marsh and mudflat with scour protection at the toe of the A259 highway embankment. The salt marsh and mudflat will be created by removing part of the existing flood embankment and re-using approximately 50% of the material to raise existing ground levels behind. The scour protection will be provided by grassing the highway embankment slopes to the 120 yr design life elevation of 5.45m Above Ordnance Datum.

A working platform will be created along the toe of the highway embankment to allow future maintenance of the scour protection and highway embankment. The elevation of this working platform will be approximately 3.85m Above Ordnance Datum (which will be above current ground levels) so that it is accessible during the design life of the scheme (100 years). The platform will be constructed from the remaining 50% of the flood bund material (approximately 2,500m^3). A 50m section of new earth flood embankment will be constructed using 3,000m^3 of imported fill to join the realigned flood defence with the existing defence.

The A259 highways embankment will be protected by the addition of earthworks to form the working platform and the scour protection. Native trees and shrubs will be planted on the road embankment to replace the planting lost. A coastal grass seed mix would be planted on the riverward side of the embankment and a species rich mix on the landward side.

ARUN DISTRICT COUNCIL LU/247/20/PL

Table 2.1 Summary of proposed new defences (source: Environment Agency, 2012).

Reach	Type defences	Delivered	SoP	Design Life
1 - Arun Parade	New steel sheet piled wall (308m) to be constructed directly in front of the existing defence. Reinstatement of the promenade, steps and ramps. Arun DC public realm improvement works.	2014	1 in 300 to year 75	100yrs
2 - Pier Road	New steel combi wall (128m) to be constructed directly in front of the existing defence. Reinstatement of the promenade, steps, ramps and new pontoon access. Arun DC public realm improvement works.	2014	1 in 300 to year 75	100yrs
3 A- County Wharf South	Raise existing concrete cap and promenade (535m) when needed (approx. 2030). [This solution would be replaced in approx. 2050 with new steel sheet piled wall which would be constructed directly in front of the existing defence].	2030 & 2050	1 in 300 to year 100	16 yrs & 100 yrs
3B - County Wharf North	New steel sheet piled wall (81m) constructed directly in front of the existing defence. Reinstatement of pontoons and access.	2014	1 in 300 to year 75	100yrs
4A - River Road South	New steel sheet piled wall (74m) to be constructed directly in front of the existing defence.	2014	1 in 300 to year 75	100yrs
4B - River Road North	New steel sheet piled wall (99m) to be constructed directly in front of the existing defence, plus reinstatement of public footpath next to River Road.	2014	1 in 300 to year 75	100yrs
5A - Arun View public house	Raised existing defences (26m) and new steel sheet piled wall (20m) to be constructed directly in front of the existing defence.	2014	1 in 300 to year 75	100yrs
5B - Railway Wharf	The existing defences will be raised by increasing the height of the existing concrete cap (357m). This solution would be replaced in approx. 2030 with new steel sheet piled wall which would be constructed directly in front of the existing defence].	2014 & 2030	1 in 300 to year 100	16 yrs and 100 yrs
6A - South of A259 road bridge	Raise the height of the existing embankment (429m) with a cantilevered plastic pile wall and repair of scour protection	2014	1 in 300 to year 75	100yrs
6B - North of A259 road bridge	Raised earth embankment and new realigned earth embankment (639m) and replace scour protection.	2014	1 in 300 to year 100	100 yrs

Flood Risk Statement

2.2.4 Detailed Design Stage (Present)

Following approval of the Littlehampton Arun East Bank Tidal Walls PAR, detailed design of the proposed works, for which this FRS forms part, is now underway. Some changes to the proposed works set-out in the PAR (and described in Section 2.2.3) have changed during the detailed design phase. Refer to Table 2.2 and Figure 2.4, which provides details of the current scheme proposals.

The scheme is delivered in partnership with Arun District Council (Arun DC), Littlehampton Harbour Board (LBH) and West Sussex County Council (WSCC). The Environment Agency is the Lead Organisation (Environment Agency, 2012).

Table 2.2 Summary of Littlehampton Arun East Bank Tidal Walls Flood Defence Scheme current proposals.

Reach	Type defences	Delivered	SoP	Design Life
1 (Arun Parade)	A new sheet piled vertical flood defence wall installed directly riverward of the existing sheet piled wall and capped with concrete. The wall will be approximately 300m long and 1.3m higher than the existing defence. Tidal flaps will be replaced/ refurbished as necessary. Extensive public realm works landward side will comprise high quality landscape materials, planting, seating areas and accessibility features. Replacement access to the river will be provided. Replacement lighting will be provided.	2014	1 in 300 to year 75	100yrs
2 (Pier Road)	A new sheet piled vertical flood defence wall installed directly riverward of the existing sloping concrete revetment and capped with concrete. The wall will be approximately 150m long and 1.0m higher than the existing defence and landside works will comprise extensive public realm works. Tidal flaps will be replaced/ refurbished as necessary. Replacement access to the pontoons will be provided. Replacement lighting will be provided.	2014	1 in 300 to year 75	100yrs
3 (walkway)	No works are needed for at least 20 years, when the existing flood defence will be raised using concrete.	2030 & 2050	1 in 300 to year 100	16 yrs & 100 yrs
3 (private frontage)	A raised new vertical sheet piled flood defence wall installed riverward of the existing wall and capped with concrete. The wall will be approximately 100m long and 1.0m higher than the existing wall. Tidal flaps will be replaced/ refurbished as necessary. Replacement access to the pontoons will be provided and private gardens will be reinstated.	2014	1 in 300 to year 75	100yrs

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Table 3.1 Existing SoP of defences along the east bank of the River Arun (source: Environment Agency, 2012). Please note that the 'reach' refers to the revised names given during the detailed design phase.*

Reach*	Existing defences	Current SoP	Residual Life
1 (Arun Parade)	Concrete post and plank wall, part of section with secondary wall	1 in 50	1 – 10yrs
2 (Pier Road)	Concrete revetment with toe piles and upstand flood wall	1 in 50	5 – 15yrs
3 (walkway)	Steel sheet piles/tubular combi wall	>1 in 300	20 – 35yrs
3 (private frontage)	Concrete and steel sheet piled walls.	1 in 20	20yrs
4 (Pharos Quay)	Masonry and concrete walls	1 in 5 (a 17m section of defences has failed, with local SoP 1 in 1)	0 – 20yrs (Reach 4A) 10 – 20yrs (Reach 4B)
5 (Arun View Pub)	Concrete and steel sheet piled walls	1 in 20	5 – 20yrs
5 (wharfes)	Steel sheet piled walls	1in 20	20 – 30yrs
6 (non realigned)	Embankment and various concrete walls	1 in 10 (46m has no formal defences; localised flooding in a 1 in 1)	1 – 15yrs
6 Realignment	Earth embankment	1 in 10	10 – 20yrs

3.3 Implications of Flooding

3.3.1 Do-Nothing Scenario

The PAR (Environment Agency, 2012) reports that if no works are undertaken to the defences along the east bank of the River Arun, then rapid deterioration and further failures are expected in the short term (within the next 10 years). This could result in a breach causing wide-spread flooding, flood damages, health and safety implications and an increasingly unsustainable town, both as a local community and as a regional tourist centre. These findings draw from the flood inundation and erosion modelling completed for the Rivers Arun to Adur Flood and Erosion Management Strategy (Environment Agency, 2009). The results of the flood modelling for the River Arun under a No Active Intervention (i.e. Do Nothing) scenario are presented in Figure 3.1.

The residential and commercial properties that could be lost under this scenario are identified in Table 3.2. Other assets at risk of tidal flooding include Littlehampton

3.3.3 During Construction of the New Scheme

During construction, materials and equipment will be stored behind existing defences and temporary defences provided by the Contractor during the works to limit the potential for damage and water pollution.

Whilst working on the project, the Contractor will register with the local Environment Agency Flood Incident Management team for automatic notification of flood warnings to ensure that equipment, materials and personnel can be removed from the area if the risk is severe enough.

For many reaches the existing defences will remain in place, but where existing defences are compromised during the construction work, temporary works will ensure risk to property is managed. Any temporary works will also require Environment Agency flood defence consent, which will be used to control the risk.

Along the River Arun, there are a number of tidal flaps at the end of some outfalls which help to manage flood risk for lower magnitude events. As described in Table 2.2, any tidal flaps affected by the works will be replaced / refurbished as necessary.

Any drainage system disturbed during construction along Reaches 1-6 will be re-instated or replaced to the same standard as before the works. In addition, provision has been made in the Contractor's contract for them to provide temporary defences to a high standard of protection.

3.3.4 With New Scheme in Place

With the new scheme on the east bank of the River Arun, the town of Littlehampton will be protected from a 1 in 300 tidal flood event. The scheme is not anticipated to have an effect on water levels outside of those that would occur naturally under sea level rise. The rationale behind this is described below.

3.3.4.1 East Bank River Arun

With the 2.1km of new and raised tidal defences in place, the 790 residential and 340 commercial properties in Littlehampton currently at risk from flooding would be protected into the future from a 1 in 300 year tidal flood event. As sea levels rise the number of properties that the improved defence will protect will increase (subject to future works phases being implemented).

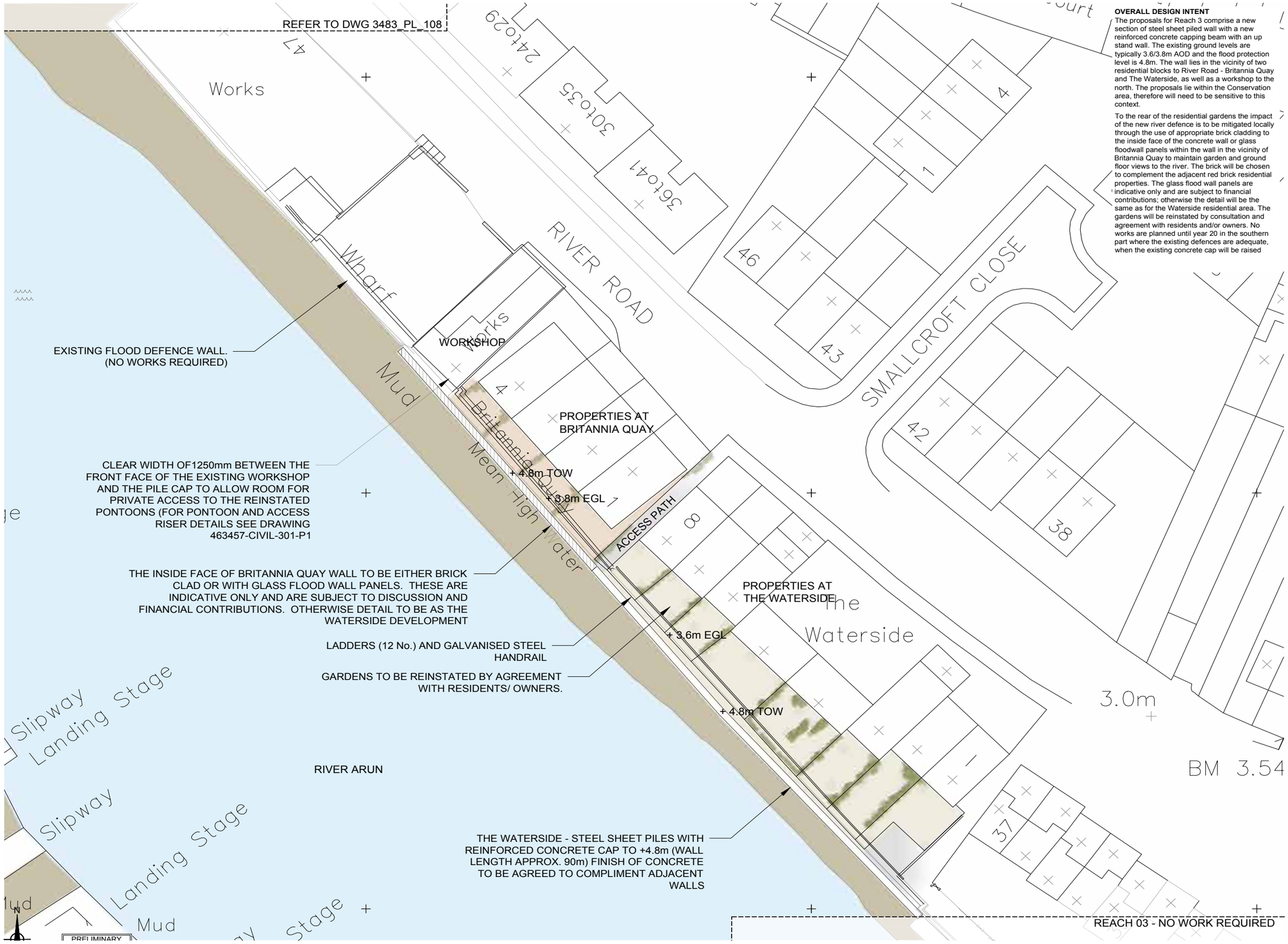
Further up river, the scheme includes for the riverwall on the east bank to be reconstructed; this is to be achieved by driving a new steel piled wall slightly into the river. The effect of this will be to slightly narrow the river and thus marginally throttle the flows able to come in from the sea, however, any affect on the west bank will be negligible.

The scheme does not provide any increased protection to surface water/groundwater flooding behind the defences.

3.3.4.2 West Bank River Arun

The scheme and SSSI are located within the River Arun estuary, very close to the mouth of the river. Within this system, water levels are always dominated by sea levels, therefore, by changing the level of defences or width of channel there would not be any direct impact on the habitats covered by the Climping Beach SSSI (flora

ARUN DISTRICT COUNCIL LU/247/20/PL



OVERALL DESIGN INTENT

The proposals for Reach 3 comprise a new section of steel sheet piled wall with a new reinforced concrete capping beam with an up stand wall. The existing ground levels are typically 3.6/3.8m AOD and the flood protection level is 4.8m. The wall lies in the vicinity of two residential blocks to River Road - Britannia Quay and The Waterside, as well as a workshop to the north. The proposals lie within the Conservation area, therefore will need to be sensitive to this context.

To the rear of the residential gardens the impact of the new river defence is to be mitigated locally through the use of appropriate brick cladding to the inside face of the concrete wall or glass floodwall panels within the wall in the vicinity of Britannia Quay to maintain garden and ground floor views to the river. The brick will be chosen to complement the adjacent red brick residential properties. The glass flood wall panels are indicative only and are subject to financial contributions; otherwise the detail will be the same as for the Waterside residential area. The gardens will be reinstated by consultation and agreement with residents and/or owners. No works are planned until year 20 in the southern part where the existing defences are adequate, when the existing concrete cap will be raised

NOTES:

1. Do not scale from this drawing.
2. All dimensions are in metres unless noted otherwise.
3. All levels are in metres above Ordnance Datum Newlyn.

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LOCATION PLAN:

NEW FLOOD WALL - STEEL SHEET PILES WITH REINFORCED CONCRETE CAP

NEW FLOOD WALL - BRICK CLAD OR GLASS WALL PANELS

GARDENS TO BE REINSTATED BY AGREEMENT WITH OWNERS/ RESIDENTS.

FOR MORE INFORMATION AND ENGINEERING DETAILS REFER TO 463457-CIVIL-300, 301 AND 302

GLASS FLOODWALL PANELS FOR BRITANNIA QUAY ARE INDICATIVE ONLY AND ARE SUBJECT TO FINANCIAL CONTRIBUTIONS. OTHERWISE DETAIL TO BE AS THE WATERSIDE DEVELOPMENT.

Revision	By	Checked	Approved	Date	Description

Client

ENVIRONMENT AGENCY

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A CH2M HILL COMPANY

Halcrow

Project

LITTLEHAMPTON ARUN, EAST BANK LANDSCAPE AND PUBLIC REALM

Drawing

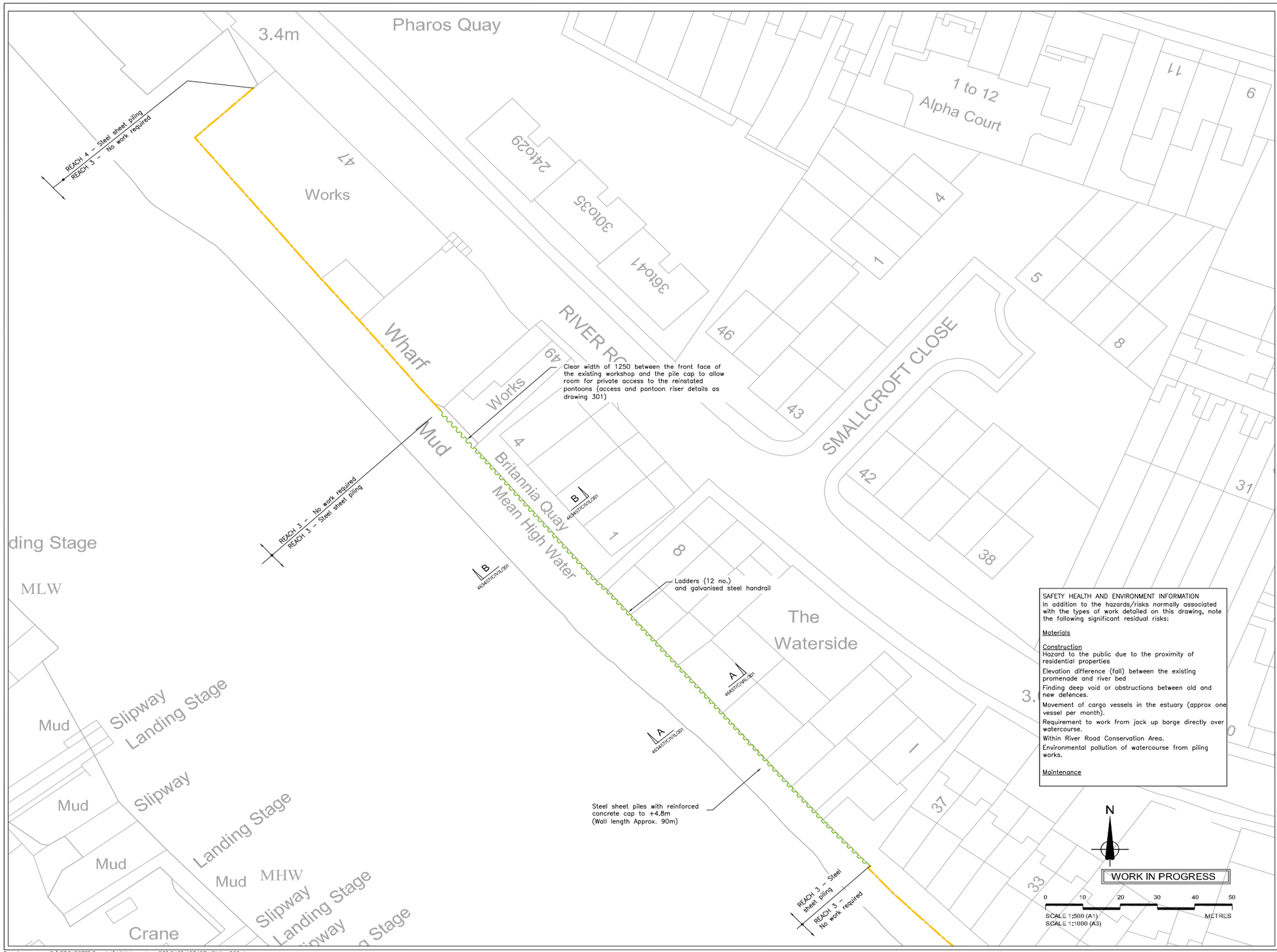
LANDSCAPE MASTERPLAN REACH 03

Drawn by	KB (LDA)	Date:	May 2013
Checked by	SJT (LDA)	Date:	May 2013
Authorised by	SJT (LDA)	Date:	May 2013

Drawing No. 3483_PL_107 Revision

Drawing Scale: 1:200 @ A1

CAD Filename: 3483 Reach 3 and 5 Plan Plot Scale:



NOTES:

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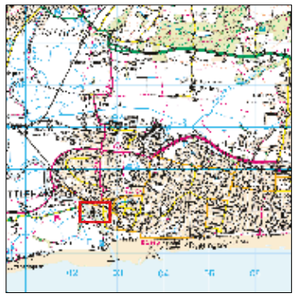
3. All levels are in metres above Ordnance Datum Newlyn.



REACH LOCATION PLAN

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KEY

Proposed sheet pile flood defence

Existing flood defence wall – no works required (raise cap in 2030)

+5.3m Level above Ordnance Datum Newlyn

SAFETY HEALTH AND ENVIRONMENT INFORMATION

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

Materials

Construction

Hazard to the public due to the proximity of residential properties

Elevation difference (fall) between the existing promenade and river bed

Finding deep void or obstructions between old and new defences.

Movement of cargo vessels in the estuary (approx one vessel per month).

Requirement to work from jack up barge directly over watercourse.

Within River Road Conservation Area.

Environmental pollution of watercourse from piling works.

Maintenance

Revision	By	Checked	Approved	Date	Description
P1	MCC	RSH		18/04/13	PRELIMINARY ISSUE

Client

ENVIRONMENT AGENCY

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Project

LITTLEHAMPTON ARUN
EAST BANK TIDAL WALLS

Drawing

REACH 3B
GENERAL ARRANGEMENT
PLAN

Drawn by	JAB	Date:	02.04.13
Checked by	RSH	Date:	-
Authorised by	FL	Date:	-

Drawing No. 463457/CIVIL/300 Revision P1

Drawing Scale: 1:500

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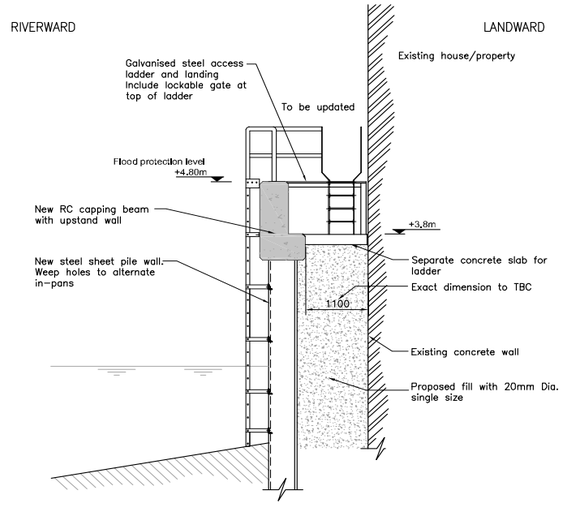
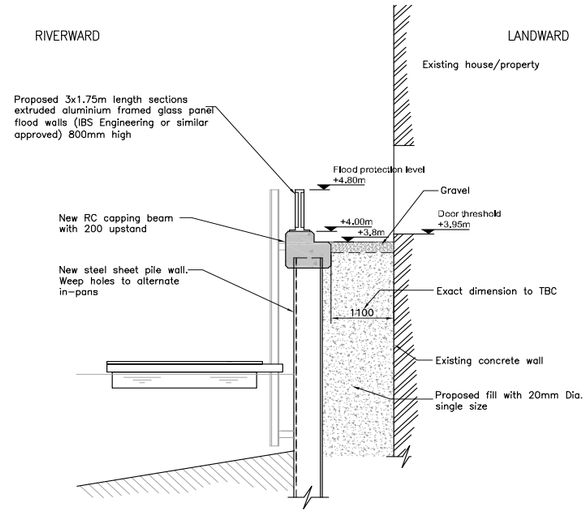
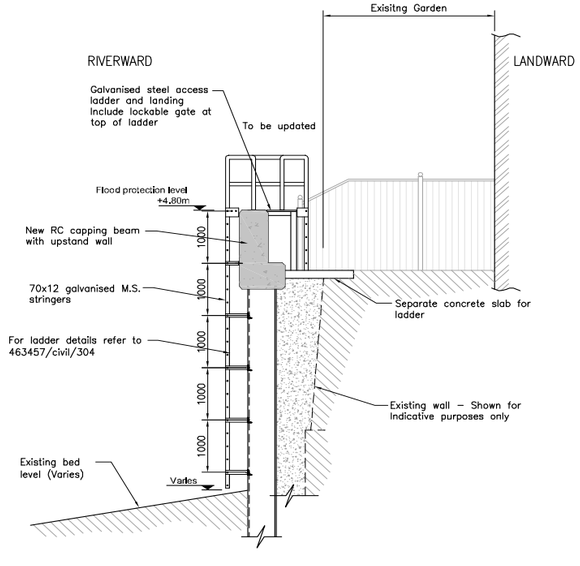


SECTION A-A



SECTION B-B



SECTION C-C

NOTES:

1. Do not scale from this drawing.
2. All dimensions are in millimetres unless noted otherwise.
3. All levels are in metres above Ordnance Datum Newlyn.

KEY

+3.70m Level above Ordnance Datum Newlyn

NOTE: DETAILS OF EXISTING STRUCTURES TAKEN FROM ARCHIVED DRAWINGS INDICATIVE ONLY (T.B.C. BY THE CONTRACTOR ON SITE)

WORK IN PROGRESS

0 1000 2000 3000 4000 5000

SCALE 1:50 (A1)
SCALE 1:100 (A3)
MILLIMETRES

Revision	By	Checked	Approved	Date	Description
P1	MCC	RSH		18/04/13	PRELIMINARY ISSUE

Client

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www.halcrow.com
A CH2M HILL COMPANY
Halcrow

Project

LITTLEHAMPTON ARUN
EAST BANK TIDAL WALLS

Drawing

REACH 3B
GENERAL ARRANGEMENT
SECTIONS

Drawn by	MCC	Date:	02.04.13
Checked by	RSH	Date:	-
Authorised by	FL	Date:	-

Drawing No. 463457/CIVIL/301 Revision P1

Drawing Scale: 1:50 at A1

CAD Filename: 463457-CIVIL-301 Plot Scale: 1:1

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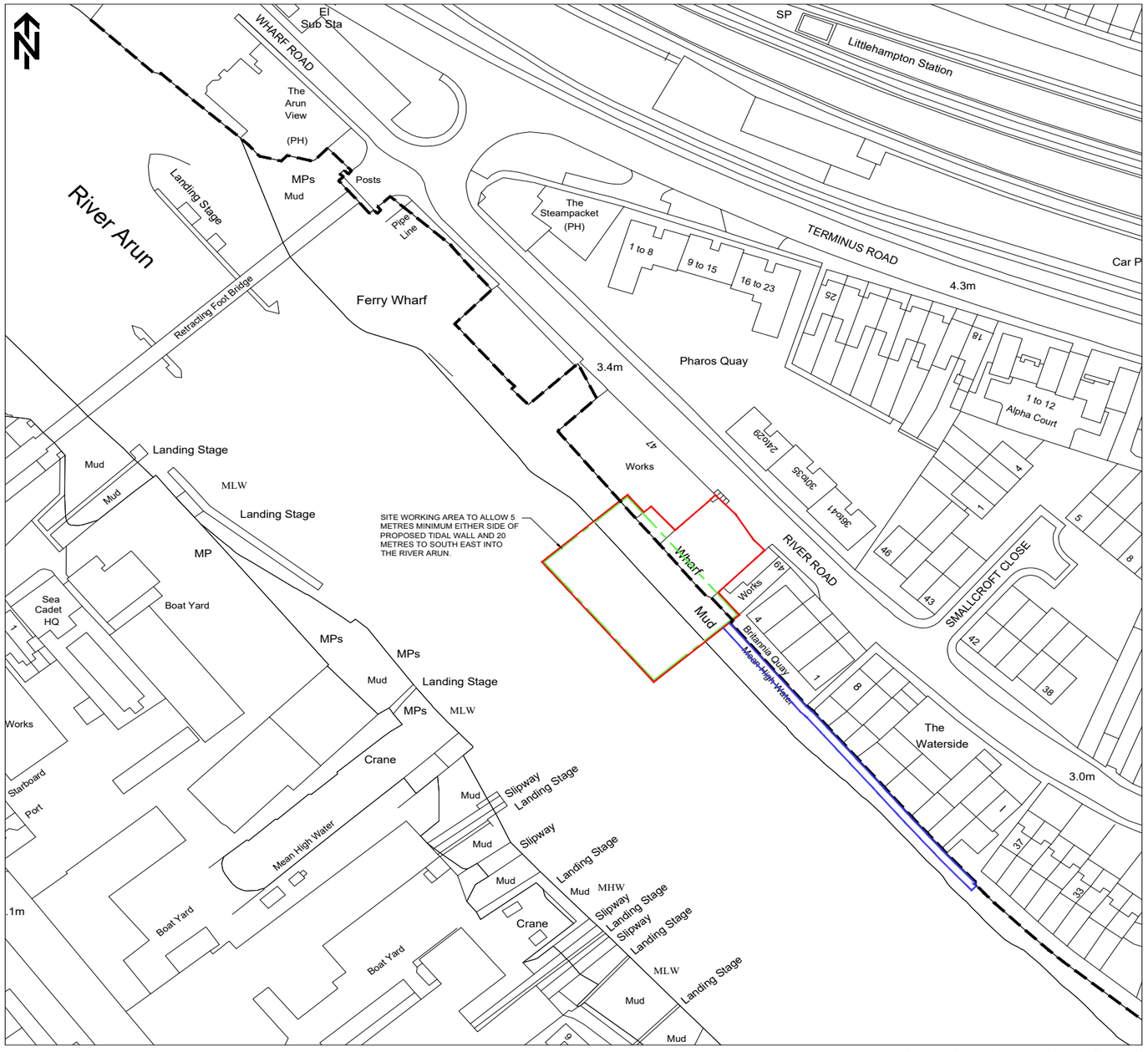

BLOCK PLAN
SCALE 1:500

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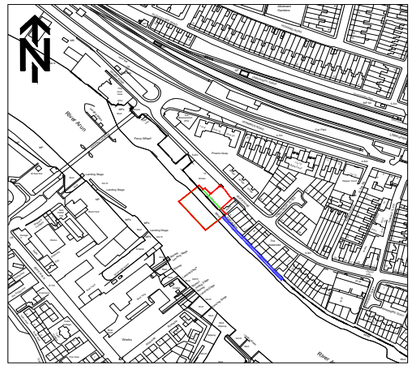
SCALE 1:500 (A1)
SCALE 1:1000 (A3)
METRES



0 50 100 150 200
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SCALE 1:5000 (A3)
METRES

LOCATION PLAN
SCALE 1:2500

MHWS	+2.860
MHWN	+1.760
MLWN	-1.240
MLWS	-2.040

TIDAL PLANE
(m AOD)

NOTES

GENERAL:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm) & ALL LEVELS ARE IN METRES (m) AOD, UNLESS STATED OTHERWISE.
3. ALL DIMENSIONS & LEVELS TO BE CHECKED ON SITE AND ANY DISCREPANCIES SHOULD BE REPORTED TO GHD.
4. THIS DOCUMENT IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT PROJECT STANDARDS AND SPECIFICATIONS.

LEGEND:

- SITE BOUNDARY
- ANY LAND OWNED BY THE APPLICANT OUTSIDE OF THE APPLICATION
- SITE WORKING AREA
- MHWS

SAFETY, HEALTH & ENVIRONMENTAL (SHE) INFORMATION
IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH TCONSTRUCTION WORK OR RELATED WORKS.
1. WORKING ON OR NEAR WATER - ALL OPERATIVES TO WEAR LIFEJACKETS AT ALL TIMES WHEN AFLOAT OR IN THE VICINITY OF THE RIVER. 2. FLOODING AND EXCESSIVE FLOWS - SITE SUPERVISORS TO MONITOR WETAHER AND RIVER FLOWS AND ENSURE THAT NO OPERATIVES ARE PUT AT RISK BY BEING ASKED TO WORK ADJACENT TO FAST FLOWING WATER UNLESS MEASURES ARE PUT IN PLACE TO ENSURE THEIR SAFETY. 3. ENVIRONMENTAL RISK - SPILL KIT TO BE AVAILABLE ON DECK THROUGHOUT THE WORKS. ALL FUELS AND OILS TO BE IN BUNDED CONTAINERS, RE-FUELING TO ONLY TAKE PLACE FROM PUMPED SUPPLIES WITH 'DEAD MANS' TRIGGERS ON THE SUPPLY NOZZLES.
IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR AND TO AN APPROPRIATE AND SITE SPECIFIC METHOD STATEMENT.

No.	Revision	Drawn	Job Manager	Project Director	Date
P1	ISSUED FOR REVIEW	CC	ME	GB	09.10.17
C	ADDITIONAL LAND BOUNDARY	CC	ME	GB	07.09.17
B	SITE BOUNDARY AMENDED	CC	ME	GB	18.08.17
A	ISSUED FOR COMMENTS	CC	ME	GB	01.08.17

Drawing Revisions

Note: * indicates signatures on original issue of drawing or last revision of drawing

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ENVIRONMENT AGENCY

The Studio, 51 Brookfield Road,
Cheadle, SK8 1ES, United Kingdom
T 44 (0)161 491 4600
E UKmail@ghd.com **W** www.ghd.com

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Client **JT MACKLEY & CO LTD**

Project **LITTLEHAMPTON FLOOD DEFENCE**

Title **EAST BANK REACH 4 LOCATION / BLOCK PLANS**

Scale	NTS		**DO NOT SCALE**
Drawn	CC	Designer	DS
Drafting Check	AS	Design Check	ME
Approved (Project Director)	GB		
Date	09.10.17		

This Drawing must not be used for Construction unless signed as Approved

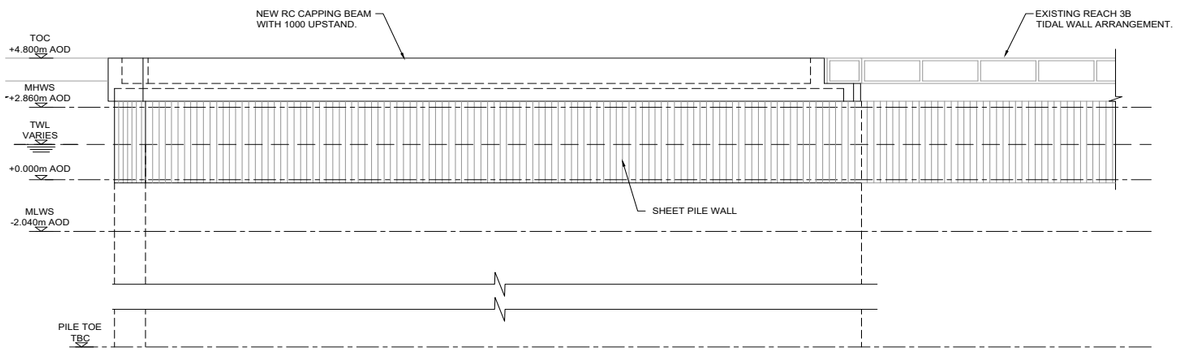
Drawing No. **66-000009-K-003**

Original Size **A1**

Rev. **P1**

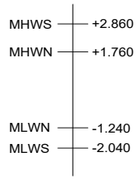
FOR REVIEW

ARUN DISTRICT COUNCIL LU/291/17/PL

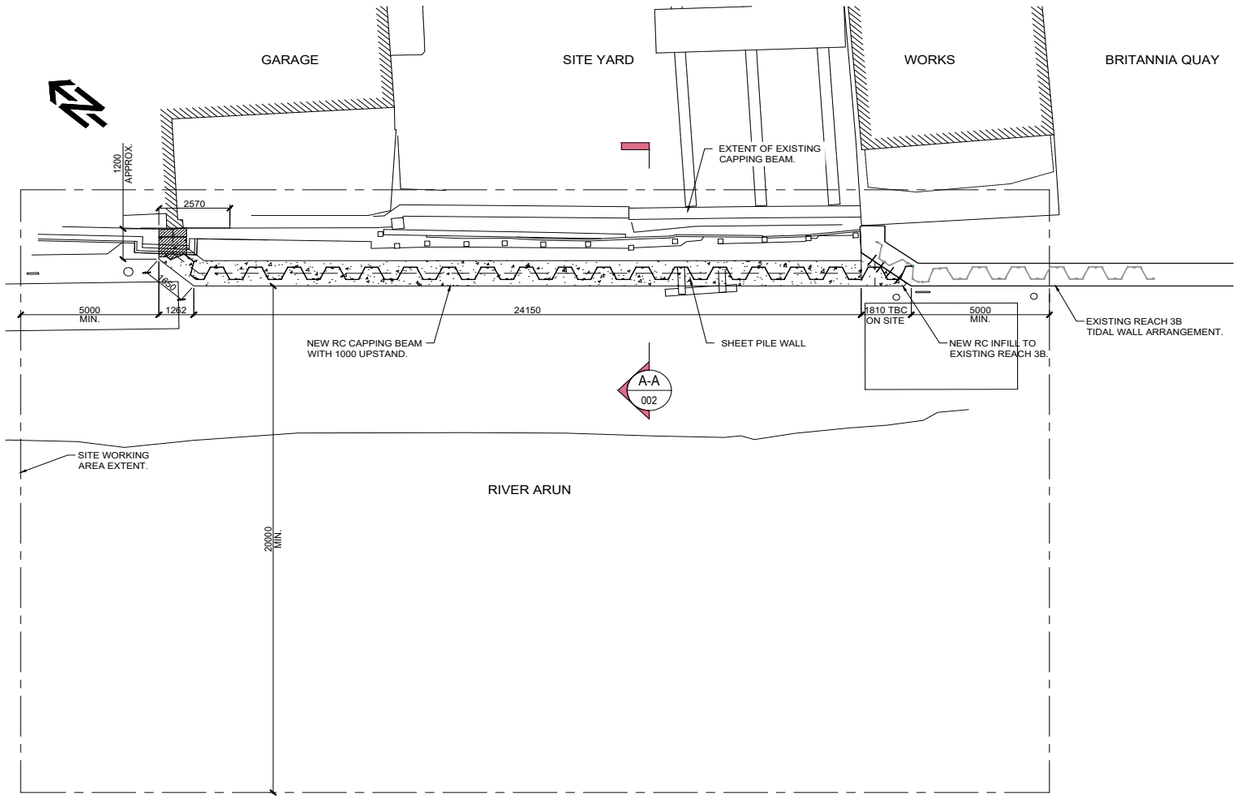


SOUTH WEST ELEVATION
SCALE 1:100

NOTE:
FOR PILE AND CAPPING BEAM DETAILS REFER TO DRAWINGS 66-000009-K-006, 66-000009-K-007.

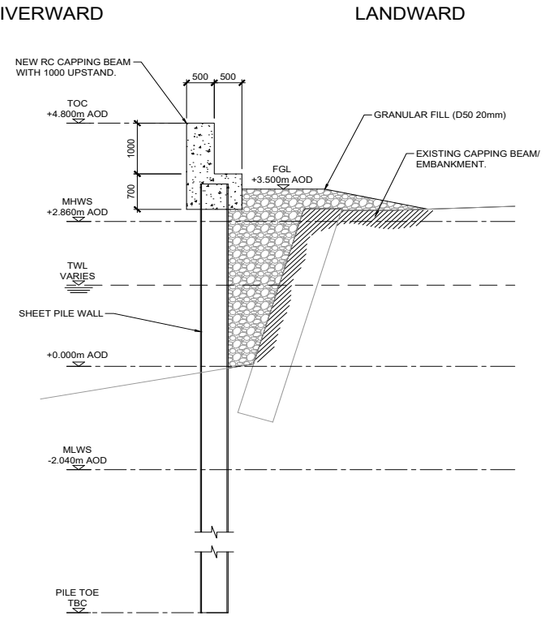


TIDAL PLANE
(m AOD)



PLAN
SCALE 1:100

0 5 10
SCALE 1:100 (A1)
SCALE 1:200 (A3)
METRES



SECTION A-A
SCALE 1:50

FOR REVIEW

NOTES

GENERAL:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm) & ALL LEVELS ARE IN METRES (m) AOD, UNLESS STATED OTHERWISE.
3. ALL DIMENSIONS & LEVELS TO BE CHECKED ON SITE AND ANY DISCREPANCIES SHOULD BE REPORTED TO GHD.
4. THIS DOCUMENT IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT PROJECT STANDARDS AND SPECIFICATIONS.

SAFETY, HEALTH & ENVIRONMENTAL (SHE) INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH CONSTRUCTION WORK OR RELATED WORKS.

1. WORKING ON OR NEAR WATER - ALL OPERATIVES TO WEAR LIFEJACKETS AT ALL TIMES WHEN AFLOAT OR IN THE VICINITY OF THE RIVER.
2. FLOODING AND EXCESSIVE FLOWS - SITE SUPERVISORS TO MONITOR WEATHER AND RIVER FLOWS AND ENSURE THAT NO OPERATIVES ARE PUT AT RISK BY BEING ASKED TO WORK ADJACENT TO FAST FLOWING WATER UNLESS MEASURES ARE PUT IN PLACE TO ENSURE THEIR SAFETY.
3. ENVIRONMENTAL RISK - SPILL KIT TO BE AVAILABLE ON DECK THROUGHOUT THE WORKS. ALL FUELS AND OILS TO BE IN BUNDED CONTAINERS. RE-FUELING TO ONLY TAKE PLACE FROM PUMPED SUPPLIES WITH 'DEAD MANS' TRIGGERS ON THE SUPPLY NOZZLES.

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR AND TO AN APPROPRIATE AND SITE SPECIFIC METHOD STATEMENT.

No.	Revision	Drawn	Job Manager	Project Director	Date
P1	ISSUED FOR REVIEW	CC	ME	GB	09.10.17
A	ISSUED FOR COMMENTS	CC	ME	GB	01.08.17

Drawing Revisions
Note: * indicates signatures on original issue of drawing or last revision of drawing

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Client **JT MACKLEY & CO LTD**

Project **LITTLEHAMPTON FLOOD DEFENCE**

Title **EAST BANK REACH 4 PLANS AND ELEVATIONS AS PROPOSED**

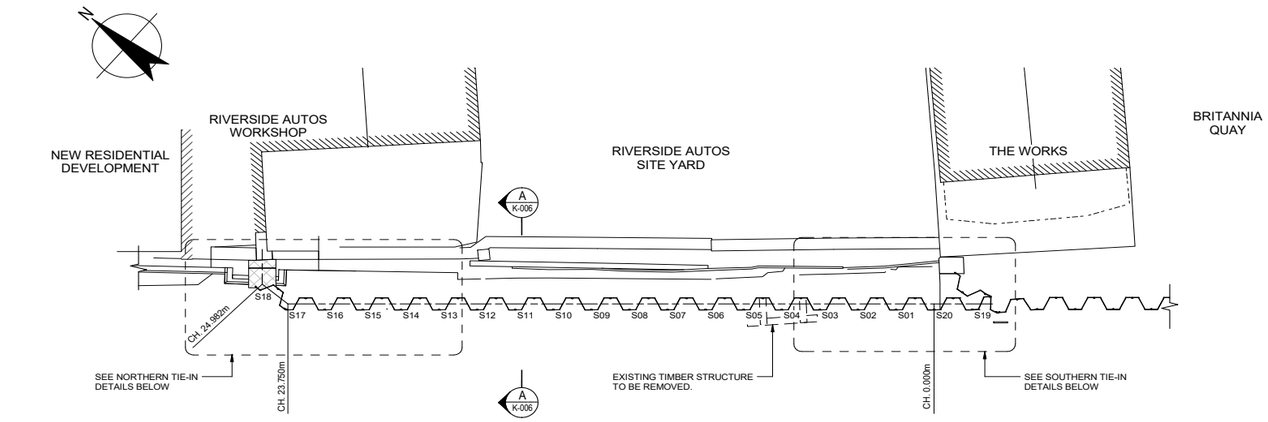
Scale	NTS	**DO NOT SCALE**	
Drawn	CC	Designer	DS
Drafting Check	AS	Design Check	ME
Approved (Project Director)	GB		
Date	09.10.17		

This Drawing must not be used for Construction unless signed as Approved

Drawing No. **66-000009-K-005**
Original Size **A1**
Rev. **P1**

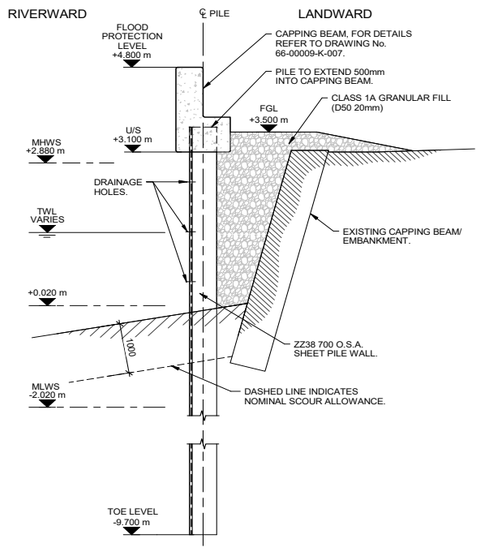
AMENDMENT CHECK LEGITIMA

SETTING OUT SCHEDULE		
SOP REF	EASTING (m)	NORTHING (m)
SOP-1	502353.619	102116.657
SOP-2	502338.220	102134.738
SOP-3	502338.211	102135.970



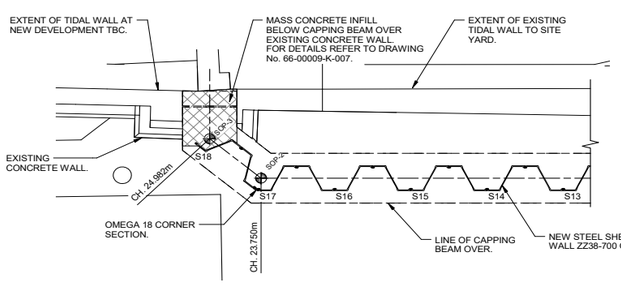
PLAN ON REACH 4 PILING

SCALE 1 : 100



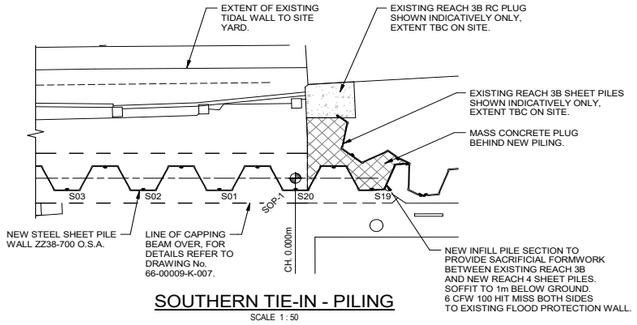
SECTION A-A

SCALE 1 : 50



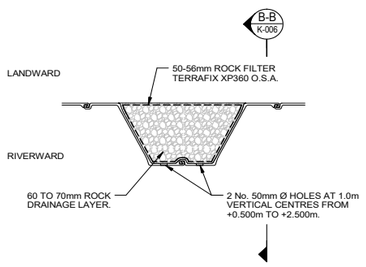
NORTHERN TIE-IN - PILING

SCALE 1 : 50



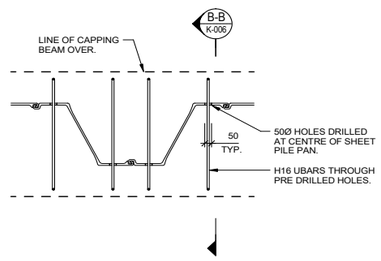
SOUTHERN TIE-IN - PILING

SCALE 1 : 50



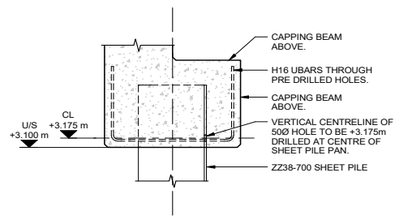
TYP. SHEET PILE DRAINAGE DETAIL

SCALE 1 : 20



TYP. SHEET PILE DRILLING ARRANGEMENT

SCALE 1 : 20



SECTION B-B THRU' TYP. DRILLING ARRANGEMENT

SCALE 1 : 20

GENERAL:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE IN MILLIMETRES (mm) & ALL LEVELS ARE IN METRES (m) AOD, UNLESS STATED OTHERWISE.
3. ALL DIMENSIONS & LEVELS TO BE CHECKED ON SITE AND ANY DISCREPANCIES SHOULD BE REPORTED TO GHD.
4. THIS DOCUMENT IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT PROJECT STANDARDS AND SPECIFICATIONS.
5. NOMINAL PILE LENGTH TO BE PROVIDED IS 13.3m (INCLUDES 500mm ALLOWANCE FOR OVER DRIVE DUE TO VARIABLE GROUND CONDITIONS).

SAFETY, HEALTH & ENVIRONMENTAL (SHE) INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:

CONSTRUCTION

1. EXISTING TIDAL WALL UNSTABLE.
2. EXISTING CONCRETE CAPPING BEAM HAS HISTORY OF INSTABILITY.
3. HIGH TIDAL FLOW IN RIVER.
4. WORKING OVER WATER FROM MARINE PLANT/BARGE.
5. CUTTING OFF PILE TOPS.
6. EXISTING SERVICES.
7. REMOVAL OF EXISTING PONTOONS DUE TO EXISTING CONDITION.
8. MOVEMENT OF CARGO VESSELS IN RIVER.
9. HAZARD TO THE RESIDENTS DUE TO THE PROXIMITY OF THE WORKS TO RESIDENTIAL PROPERTIES.
10. WORKS ARE WITHIN THE RIVER ROAD CONSERVATION AREA.
11. POLLUTION OF WATER COURSE FROM WORKS.

MAINTENANCE/CLEANING

1. NO SIGNIFICANT RISK.

DECOMMISONING/DEMOLITION

1. NO SIGNIFICANT RISK.

No	Revision	Drawn	Job Manager	Project Director	Date
P3	ISSUED FOR REVIEW				09.10.17
P2	ISSUED FOR INFORMATION				27.09.17
P1	ISSUED FOR INFORMATION	CC	ME	GB	18.08.17

Note: * indicates signatures on original issue of drawing or last revision of drawing

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W www.ghd.com

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Client **JT MACKLEY & CO LTD**

Project **LITTLEHAMPTON FLOOD DEFENCE**

Title **EAST BANK REACH 4 PILING GENERAL ARRANGEMENT**

Scale	As indicated	**DO NOT SCALE**	
Drawn	CC	Designer	DS
Drafting Check	AS	Design Check	ME
Approved (Project Director)	GB		

This Drawing must not be used for Construction unless signed as Approved

Drawing No: **66-00009-K-006**

Original Size **A1**

Rev: **P3**

FOR REVIEW

Plot Date: 13/10/2017 12:57:58

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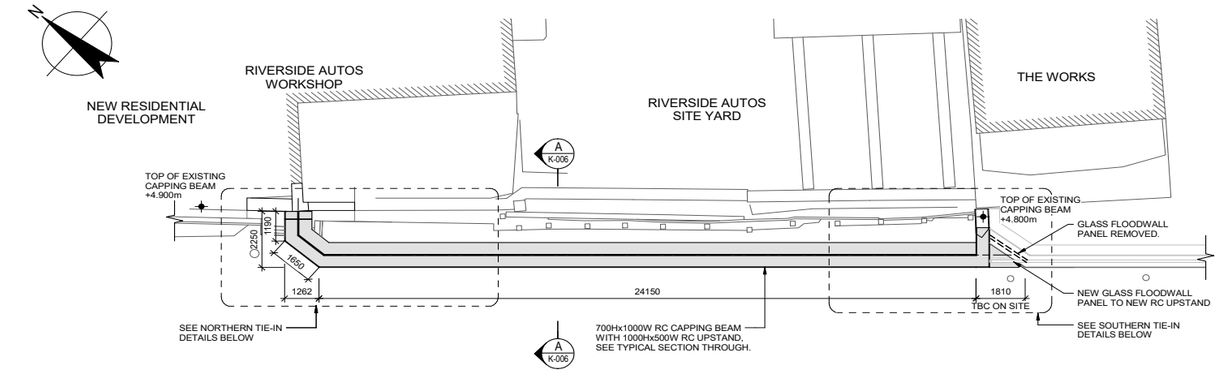
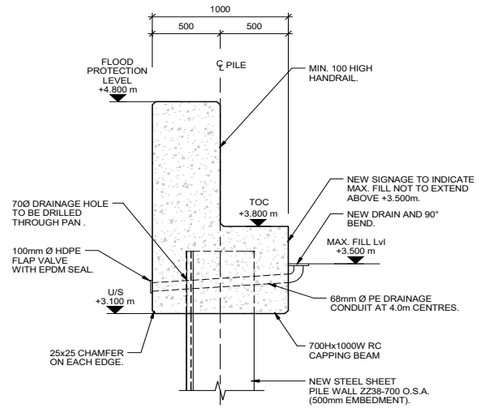


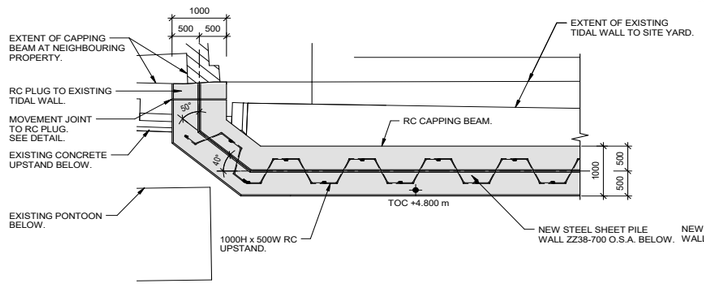
PLAN ON REACH 4 CAPPING BEAM

SCALE 1 : 100



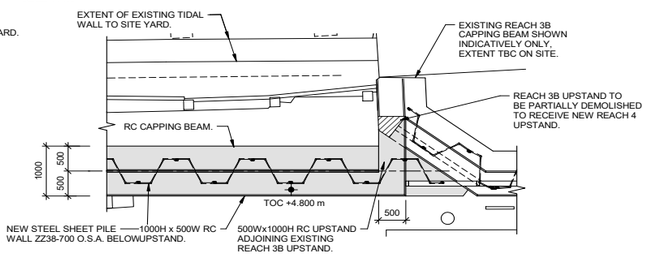
SECTION A-A THRU' CAPPING BEAM (TYP.)

SCALE 1 : 20



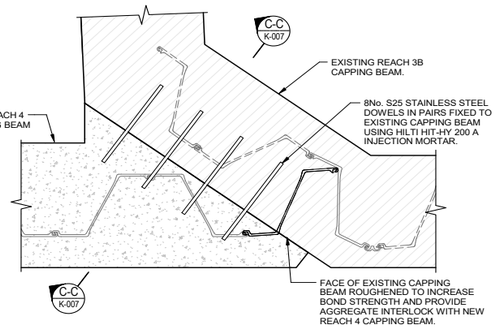
NORTHERN TIE-IN - CAPPING BEAM

SCALE 1 : 50



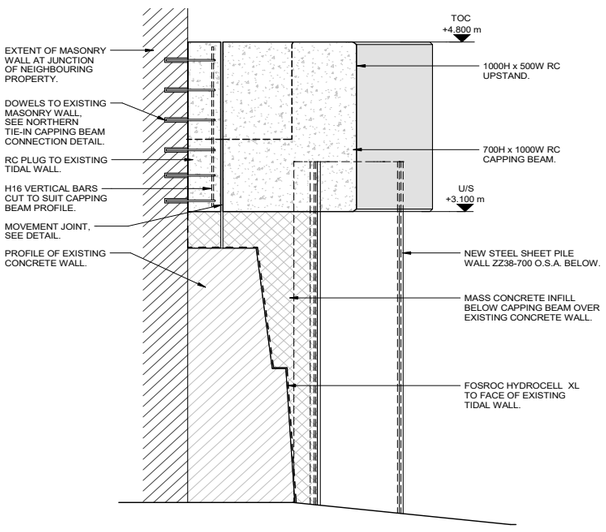
SOUTHERN TIE-IN - CAPPING BEAM

SCALE 1 : 50



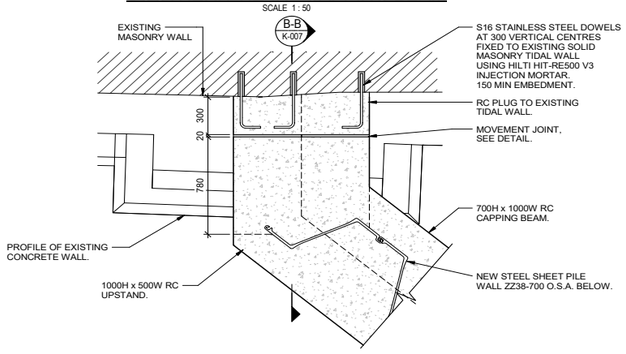
SOUTHERN TIE-IN - CAPPING BEAM DOWELLED CONNECTION

SCALE 1 : 20



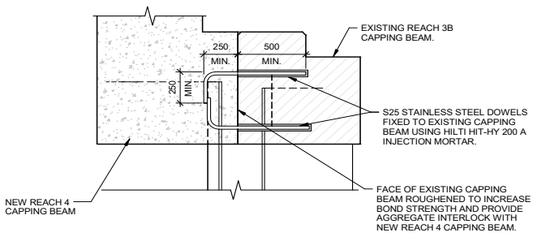
CAPPING BEAM - SECTION B-B

SCALE 1 : 25



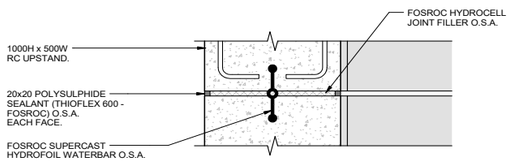
NORTHERN TIE-IN - CAPPING BEAM CONNECTION DETAIL

SCALE 1 : 20



CAPPING BEAM - SECTION C-C

SCALE 1 : 20



MOVEMENT JOINT DETAIL

SCALE 1 : 10

FOR REVIEW

GENERAL:

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5. NOMINAL PILE LENGTH TO BE PROVIDED IS 13.3m (INCLUDES 500mm ALLOWANCE FOR OVER DRIVE DUE TO VARIABLE GROUND CONDITIONS).
6. FOR CONCRETE SPECIFICATION REFER TO DRAWING No. 66-000009-K-008.

SAFETY, HEALTH & ENVIRONMENTAL (SHE) INFORMATION

IN ADDITION TO THE HAZARDS/RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, NOTE THE FOLLOWING:

CONSTRUCTION

1. EXISTING TIDAL WALL UNSTABLE.
2. EXISTING CONCRETE CAPPING BEAM HAS HISTORY OF INSTABILITY.
3. HIGH TIDAL FLOW IN RIVER.
4. WORKING OVER WATER FROM MARINE PLANT/BARGE.
5. CUTTING OFF PILE TOPS.
6. EXISTING SERVICES.
7. REMOVAL OF EXISTING PONTOONS DUE TO EXISTING CONDITION.
8. MOVEMENT OF CARGO VESSELS IN RIVER.
9. HAZARD TO THE RESIDENTS DUE TO THE PROXIMITY OF THE WORKS TO RESIDEDENTIAL PROPERTIES.
10. WORKS ARE WITHIN THE RIVER ROAD CONSERVATION AREA.
11. POLLUTION OF WATER COURSE FROM WORKS.

MAINTENANCE/CLEANING

1. NO SIGNIFICANT RISK.

DECOMMISONING/DEMOLITION

1. NO SIGNIFICANT RISK.

No	Revision	Drawn	Job Manager	Project Director	Date
P3	ISSUED FOR REVIEW	CC	ME	GB	09.10.17
P2	ISSUED FOR INFORMATION	CC	ME	GB	27.09.17
P1	ISSUED FOR INFORMATION	CC	ME	GB	18.08.17

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Client **JT MACKLEY & CO LTD**

Project **LITTLEHAMPTON FLOOD DEFENCE**

Title **EAST BANK REACH 4 CAPPING BEAM GENERAL ARRANGEMENT**

Scale	As indicated	**DO NOT SCALE**	
Drawn	CC	Designer	DS
Drafting Check	AS	Design Check	ME
Approved (Project Director)	GB		

This Drawing must not be used for Construction unless signed as Approved

Drawing No: **66-00009-K-007**

Original Size **A1**

Rev: **P3**

Plot Date: 13/10/2017 12:58:18

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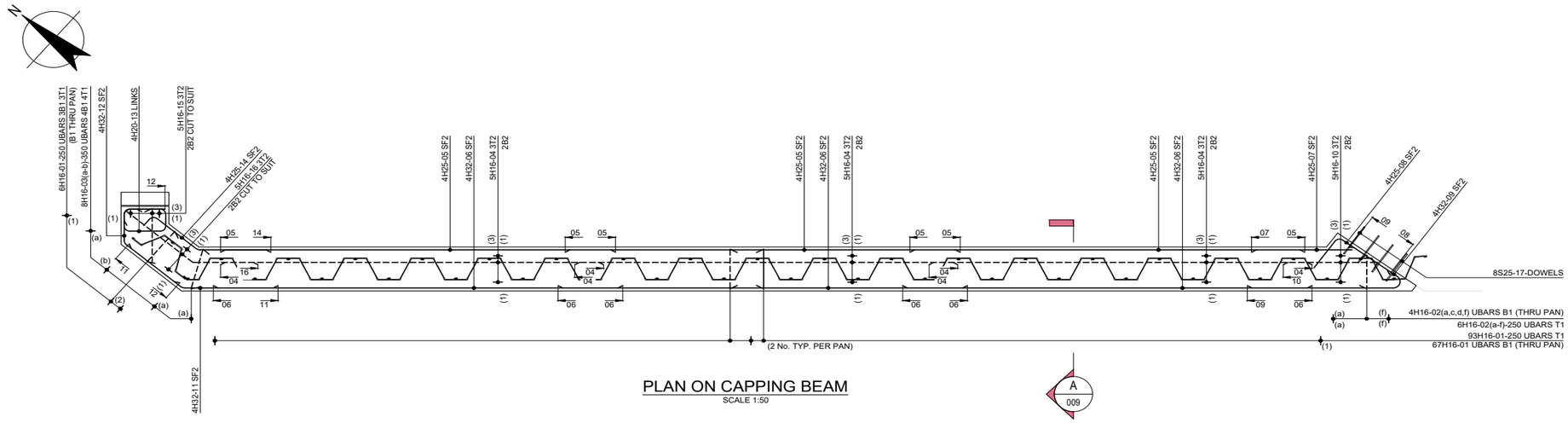
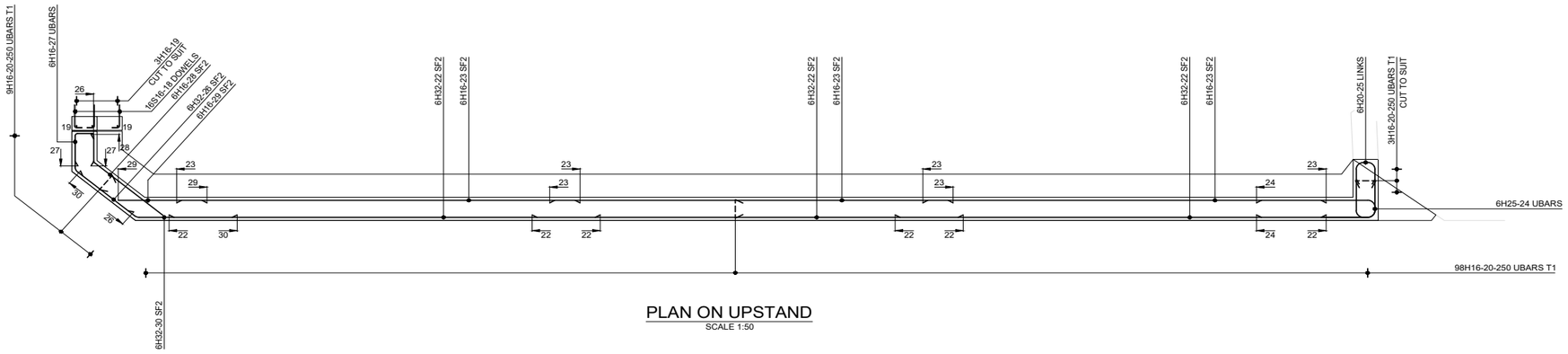
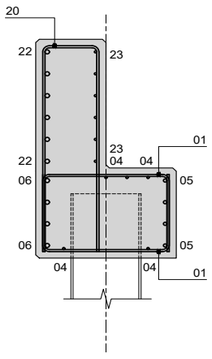


PLAN ON CAPPING BEAM
SCALE 1:50

A
009



PLAN ON UPSTAND
SCALE 1:50



SECTION A
SCALE 1:20

FOR DETAILS OF DOWEL ARRANGEMENTS AT NORTHERN AND SOUTHERN TIE-IN LOCATIONS REFER TO DRAWING No. 66-000009-K007.

SAFETY, HEALTH & ENVIRONMENTAL (SHE) INFORMATION

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

CONSTRUCTION

1. CARE TO BE TAKEN WHEN HADLING LONG REINFORCEMENT BARS.
2. ANY PROTRUDING BARS TO HAVE SAFETY CAPS FITTED TO ENDS PRIOR TO NEXT LIFT/POUR/CONNECTION.
3. FORMWORK TO BE STABILIZED PRIOR TO POURING OF CONCRETE.
4. CONTRACTOR TO BE AWARE OF REQUIREMENT FOR LARGE BARS WHICH EXCEED THE GUIDANCE LIMITS FOR A SINGLE PERSON LIFT.

MAINTENANCE / CLEANING

N/A

DECOMMISSIONING / DEMOLITION

N/A

PRELIMINARY

NOTES

GENERAL :

1. DO NOT SCALE FROM THIS DRAWING.

2. ALL DIMENSIONS ARE IN MILLIMETRES (mm) & ALL LEVELS ARE IN METRES (m) AOD, UNLESS STATED OTHERWISE.

3. ALL DIMENSIONS & LEVELS CHECKED ON SITE.

REINFORCEMENT NOTES :

FOR GENERAL ARRANGEMENT REFER TO GHD DRAWING 66-00000-S-007.

1. BAR REINFORCEMENT GRADE B500 TYPE H BARS TO BS4449:2005 CUT & BENT TO BS8666:2005.

2. UNLESS SHOWN OTHERWISE , NOMINAL COVER TO BE : 50mm (ALL FACES)

3. ALL REINFORCEMENT HAS A MINIMUM LAP OF:

H16 - TOP, SF, BTM LAYERS	- 600mm
H25 - TOP, SF, BTM LAYERS	- 1050mm
H32 - TOP, SF, BTM LAYERS	- 1350mm

4. ALL REINFORCEMENT SHOWN ON THIS DRAWING IS LISTED ON BENDING SCHEDULE No. 66-00000-S-009.

5. CONTRACTOR TO PROVIDE ADEQUATE SPACERS TO SUPPORT REINFORCEMENT DURING CONSTRUCTION AND TO CONTROL COVER.

6. ABBREVIATIONS

NF1 - NEAR FACE OUTER LAYER
FF1 - FAR FACE OUTER LAYER
EF1 - EACH FACE OUTER LAYER
EF2 - EACH FACE SECOND LAYER
B1 - BOTTOM OUTER LAYER
T1 - TOP OUTER LAYER
B2 - BOTTOM SECOND LAYER
T2 - TOP SECOND LAYER
SF - SIDE FACE
SF2 - SIDE FACE SECOND LAYER
AB - ALTERNATE BARS
ABS - ALTERNATE BARS STAGGERED

No.	Revision	Drawn	Job Manager	Project Director	Date
A	ISSUED FOR REVIEW	CC	ME	GB	12.10.17

Drawing Revisions

Note: * indicates signatures on original issue of drawing or last revision of drawing

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Client **JT MACKLEY & CO LTD**

Project **LITTLEHAMPTON FLOOD DEFENCE**

Title **EAST BANK REACH 4 RC DETAILS**

Scale	NTS	**DO NOT SCALE**	
Drawn	CC	Designer	DS
Drafting Check	AS	Design Check	ME
Approved (Project Director)	GB		
Date	11.10.17		

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Drawing No. **66-000009-K-009**

Original Size **A1**

Rev. **P1**

ARUN DISTRICT COUNCIL LU/247/20/PL

3421
57 River Road, Littlehampton

Appendix 5

Emergency Flood Risk Management and Rescue Plan

EMERGENCY FLOOD RISK MANAGEMENT AND RESCUE PLAN FOR 57 RIVER ROAD, LITTLEHAMPTON

57 River Road, Littlehampton
Project No.: 3421

Date: 06th Novemberr 2020

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10 VULNERABLE PEOPLE AND GROUPS .....
11 KEY INFRASTRUCTURE .....
12 EVACUATION AND SHELTERING OF PEOPLE .....
13 RECOVERY.....
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APPENDIX B - CONTACT DETAILS OF KEY PERSONNEL
APPENDIX C - ACCESS TO BUILDING
APPENDIX D - ENVIRONMENT AGENCY'S COMMUNITY FLOOD WARNING CODES
APPENDIX E - WARNING THOSE AT RISK

Reference: 3421			
Issue	**Written by**	**Reviewed by**	**Circulation**
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57 River Road, Littlehampton
Project No.: 3421

Date: 06th Novemberr 2020

1 Introduction

Planning Permission has been applied for in respect of the proposed redevelopment of 57 River Road, Littlehampton. This project involves the construction of a terrace of six apartments with a ground floor car park and three storeys of habitable space above.

This Emergency Flood Risk Management and Rescue Plan (EFRMRP) has been prepared in anticipation of its requirement as part of the Planning Approval and has been prepared in line with the approved EFRMRP for 47 River Road which is adjacent to the proposed development, is being developed by the same Developer and will be of almost identical construction.

The following form must be completed if this report is revised.

Amendment Sheet

Amendment number	Details	Amended by	Date

2 Aim and Objectives of the Plan

The aim of this report is to outline an appropriate emergency response to flooding on site. The objectives are:

- Explain flood warning arrangements.
- Clarify the roles and responsibilities of other bodies.

The report draws upon the findings of a Flood Risk Assessment (FRA) that was prepared in support of the Planning Application for the redevelopment of 57 River Road in Littlehampton, to demonstrate that the site can be redeveloped safely, without exposing the new development to an unacceptable degree of flood risk or increasing the flood risk to third parties. Refer to figures 1 and 2 for the site location.

57 River Road, Littlehampton
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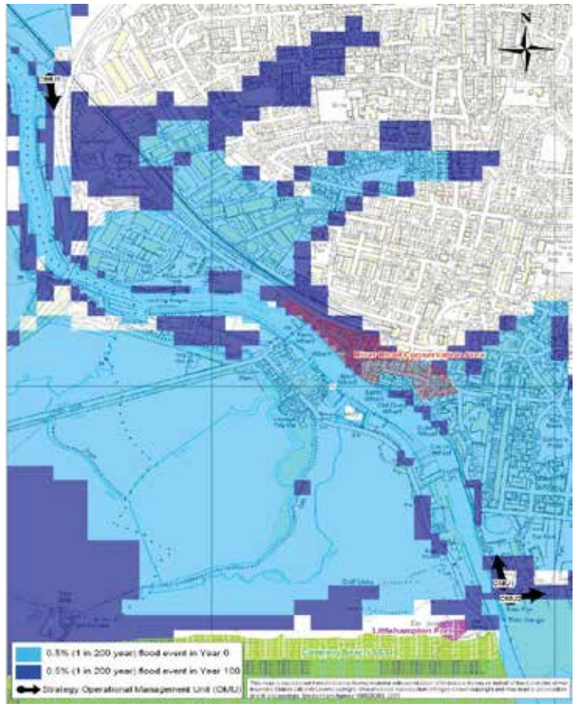

Figure 1: Site Location - Tidal Floodplain Map

Figure 2: Site Location

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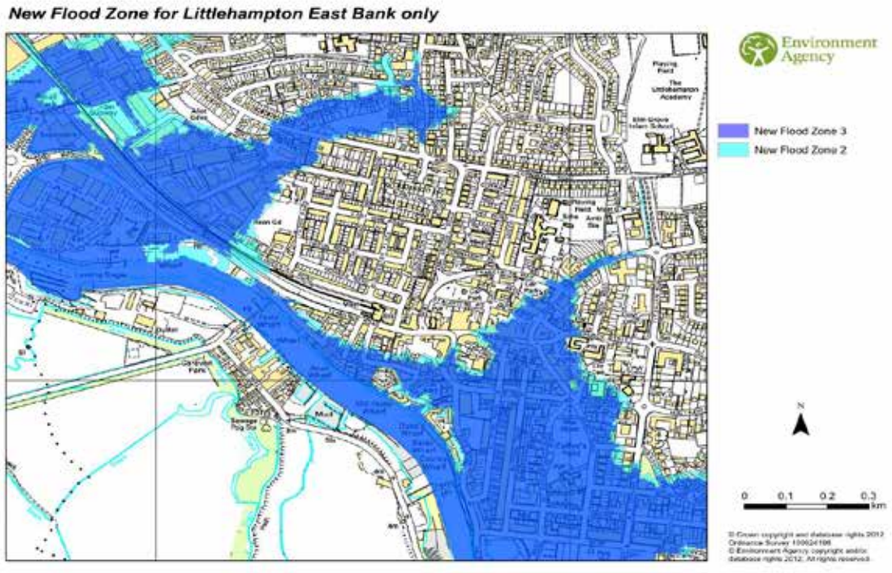

Figure 3: Site Location - Fluvial Floodplain Map

The Risk of Flooding

The varied geography of Sussex on a flood plain between the South Downs and the sea means the threat of coastal, river and flash flooding will remain into the future.

The West Sussex population has a large number of buildings within river and coastal flood plains so the impact of flooding to the community in social, economic and environmental terms can be devastating. The Autumn floods of 2000 caused 900 homes to be flooded at many different locations across Sussex. The impact of flooding can have serious consequences to transport, key infrastructure, housing, utilities, health and pollution.

There are eight flood risks identified on the Sussex Resilience Forum (SRF) Community Risk Register:

	Risk Category	Risk Rating
HL19a	Groundwater Flooding Risk	Very High
H19	Major coastal and tidal flooding affecting more than 2 UK Regions	Very High
HL16	Local coastal/tidal flooding (affecting more than one Region)	Very High
HL17	Local coastal/tidal flooding (in one Region)	Very High
H21	Major fluvial flooding affecting parts of more than 2 UK regions.	Very High
HL18	Local/Urban flooding (fluvial or surface run-off)	Very High
HL19	Local fluvial flooding	Very High
HL20	Localised, extremely hazardous flash flooding	High

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Flooding as a high-risk includes sites in West Sussex at: Selsey, Pagham, Littlehampton, Arundel. In accordance with the Environment Agency (EA)'s floodplain maps the site currently becomes at risk from tidal sources under the 1 in 200yr AEP flood event in 2115 (a flood level of 4.87m AOD compared with the top of the existing flood wall level of 4.80m AOD). The EA confirmed that the groundwater levels are shallow at this location. Therefore, there is no flood risk from groundwater.

3 Ownership and Audience

Arun District Council's Emergency Planning Officer (EPO) G Edwards is responsible for updating and maintaining the plan. Contact Details:
Arun District Council, Maltravers Road, Littlehampton, West Sussex, BN17 5LF.
Tel: 01903 737500
E-mail: emergency.response@arun.gov.uk

The Audience is Jane Wood East Beach Café, Sea Rd, Littlehampton, BN17 5GB, Tel: 07958 935096

Updates and amendments shall be issued by Arun's EPO to the plan audience at the review date and when amended to reflect lessons learnt from exercises and training.

The following table will need to be refreshed annually.

Amendment Sheet

Amendment number	Details	Amended by	Date

ARUN DISTRICT COUNCIL LU/247/20/PL

57 River Road, Littlehampton
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4 The Risk Of Flooding

Figure 4: Flood Risk Summary Sheet for a development provided with an environment Agency 's flood warning service

Description: 57 River Road, Littlehampton		
57 River Road is at risk of tidal flooding from the River Arun. Flood defences that bound the site provide a 100-year standard of protection but many residential and commercial properties are at risk in a major flood incident. Refer to the Environment Agency's flood warnings.		
No. of people / properties at risk	**No. of vulnerable people at risk**	**Critical vulnerable infrastructure**
6 Apartments	N/A	N/A
No. of properties registered to Flood Warning service	**Return Period**	**Lead Time**
All residents will be encouraged to sign to the EA's	From 100 years	2 hours
Flooding History (if known)		
The EA confirmed that they are unaware of previous flooding having affected the site.		
Flood Defences / Alleviation Measures (if any)		
o The existing flood wall alongside the site's boundary provides approximately a 200-year standard of protection.		

Flood Warning Status	**Area(s) at risk (refer to map)**		
Flood Watch	Expect no flood.		
Flood Warning	Expect River Road and ground floor car park to flood.		
Severe Flood Warning	Expect River Road and ground floor car park to flood.		
Risk Assessment:	Refer to Emergency Preparedness, Annex 4D		
Likelihood	3		**Final Risk Rating**
Impact - Health	3	Mean Impact Score	**High**
- Social	3	3	
- Economic	1		
- Environmental	3		

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New Flood Zone for Littlehampton East Bank only

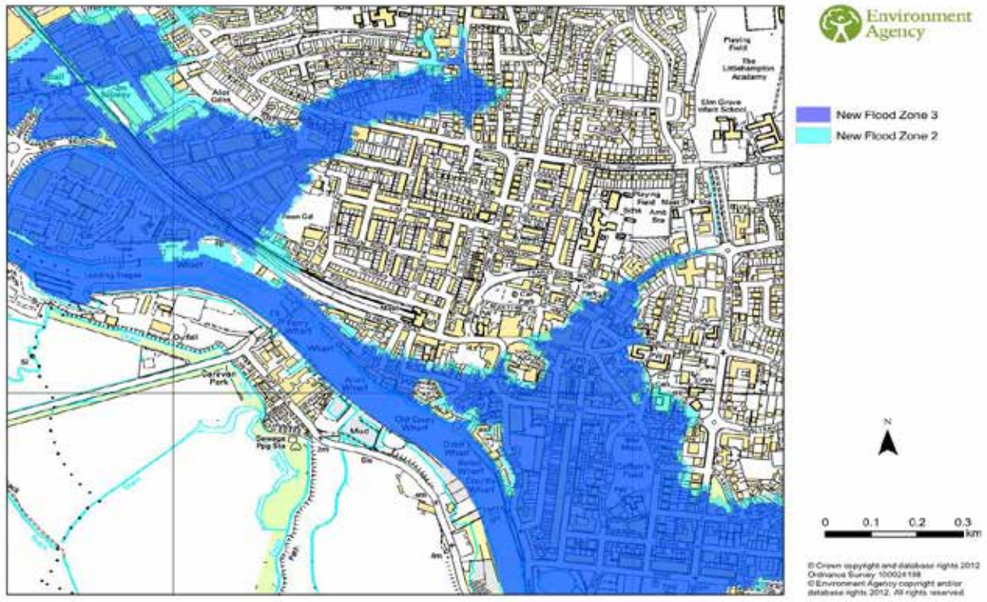

Figure 5: Site Location - Extreme Tidal Event (including climate change)

5 Flood Depths and Safe Access

The proposed development will be at flood risk if the defences are not improved. A dry route connecting the site to an area outside the floodplain will not be available, if flood water remains trapped behind the flood defences in an extreme storm event. The flood risk to people must be fully assessed in this case, as the residents may have to walk in the flood water to access an area outside the floodplain.

Using the tidal prediction map and the EA's flood water data (1 in 200yr AEP in 2115 flood level = 4.87m AOD) the water level will be increased by 0.95m per hour in the 1 in 200 year + climate change tidal event. Therefore, flood water will overtop the defences in the last 5 minutes of the tidal event and the maximum flood water level will be 0.07m. The flood water level in the river will be below the flood wall level in 5 minutes, as the tide prediction map, Figure 6a, shows (the trapped water level on site, behind the flood wall will be 1.4m - the level difference between the wall and the site's FFL). Therefore, in the worst-case scenario the site will be affected by the tidal event for no more than 10 minutes and will be ponded by flood water at a depth of 1.0m. The water level under the 1 in 300 year event (without climate change) will be below the 4.80m top of wall level and so will not pose an overtopping risk to the site.

The EA and DEFRA published FD2321/TR2 "Flood Risks to People" in March 2006. Guidance Note 2 (page 16), figure 2.1 provides details on "combinations of flood depth and velocity that cause danger to people. This table shows that most people are in danger when the water level exceeds 1.25m if the velocity is 0 m/sec (figure

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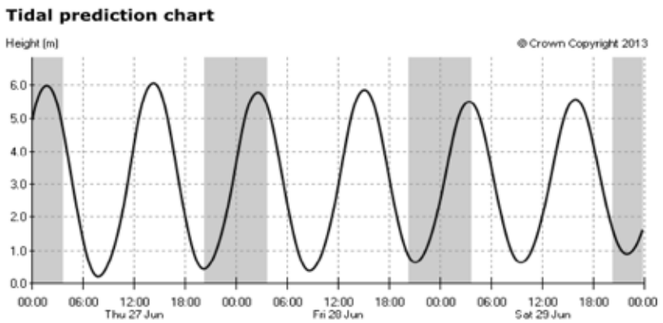
6b). Flood water will be trapped at this location only if there is not an opening downstream allowing water to drain to the River, sea or drainage. Therefore, the flood water velocity would be 0 m/sec in this instance. The flood water level between the site and an area outside the floodplain (Bridge road that is approximately 40m west to the site) will be between 0mm – 500mm. Therefore, based on figure 6b. The depths and velocities of flood water will not cause risk to people.



Note: the date shown underneath 12:00 on any given day is applicable to the previous and next periods of 12 hours

Thu 27 Jun				Fri 28 Jun				Sat 29 Jun			
HW	LW	HW	LW	HW	LW	HW	LW	HW	LW	HW	LW
01:43	07:44	14:15	20:09	02:33	08:35	15:04	21:01	03:22	09:25	15:53	21:54
6.0 m	0.2 m	6.1 m	0.4 m	5.8 m	0.4 m	5.9 m	0.6 m	5.5 m	0.6 m	5.6 m	0.9 m

Figure 6a: Tide Prediction Map

Velocity (m/s)	Depth (m)									
	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
0.00	0.13	0.25	0.38	0.50	0.63	0.75	0.88	1.00	1.13	1.25
0.50	0.25	0.50	0.75	1.00	1.25	1.50	1.75	2.00	2.25	2.50
1.00	0.38	0.75	1.13	1.50	1.88	2.25	2.63	3.00	3.38	3.75
1.50	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00
2.00	0.63	1.25	1.88	2.50	3.13	3.75	4.38	5.00	5.63	6.25
2.50	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
3.00	0.88	1.75	2.63	3.50	4.38	5.25	6.13	7.00	7.88	8.75
3.50	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00
4.00	1.13	2.25	3.38	4.50	5.63	6.75	7.88	9.00	10.13	11.25
4.50	1.25	2.50	3.75	5.00	6.25	7.50	8.75	10.00	11.25	12.50
5.00	1.38	2.75	4.13	5.50	6.88	8.25	9.63	11.00	12.38	13.75

Flood Hazard Rating (HR)	Colour Code	Hazard to People Classification
< 0.75		Very low hazard - Caution
0.75 to 1.25		Danger for some – includes children, the elderly and the infirm
1.25 to 2.00		Danger for most – includes the general public
> 2.00		Danger for all – includes the emergency services

Figure 6b: Extract from FD2321/TR2

People will be safe in their properties during the peak time of the flood event, as the proposed development will be constructed in accordance with the EA's recommendations and will be able to leave the properties after the peak of the storm event (if needed) walking in an acceptable, still, flood water depth.

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6 Related and Interdependent Plans

Arun's Strategic Flood Risk Assessment (SFRA) states that "In addition to the Flood Warning Service operated by the EA, West Sussex County Council and Boroughs and District Councils have a defined role in emergency planning. The role and responsibilities for emergency planning is set out by legislation following the implementation of the Civil Contingencies Act 2004 on April 1st 2005".

Arun is covered by the Sussex LRF partnership formed of the emergency services, health agencies, LPAs, the EA and other organisations such as the Maritime and Coastguard Agency. Together these groups prepare for incidents, including flooding, in the form of contingency plans. They respond to incidents and then assist in the recovery following the incident.

The Arun District Emergency Plan was issued in November 2005 and aims to enable the authority to respond effectively to any major emergency, irrespective of its cause, whilst maintaining it normal services. This complies with the Civil Contingencies Act 2004 and Cabinet Office guidance. The plan is prepared by the District Emergency Planning Officer.

The SFRA confirms that Littlehampton is covered by the river and sea flood warning areas (Codes: F3C4 River, C12C Sea).

7 Communication Plan

Warning and informing those at risk is a key requirement.

Communication during an incident

It is proposed a flood alarm system to be installed in the building. The flood alarm will be activated from communal areas and will provide hearing and visual warning to the residents.

Residents will be advised to contact the EA or other emergency services during an incident for advice (Refer to Appendix B for important flood telephone numbers. This document must be completed/amended by the residents). Residents will also be encouraged to contact the EA's flood warning service for registering to receive flood alerts direct to their phone. This service is also on the EA's website at www.environment-agency.gov.uk/homeandleisure/floods. The EA will also provide a Quickdial number for this area.

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8 Plan Activation – Thresholds and Triggers

What do flood warnings mean and what do responders do?

The Environment Agency operates a flood warning service in areas at risk of flooding from rivers and the sea. Warnings are issued using a set of four easily recognisable codes. A description of the codes, their definition and lead times is below:

Flood Warnings are defined as:

8.1 Flood Alert

Flooding is possible. Be prepared.
- Be prepared for flooding.
- Prepare a flood kit of essential items.
- Monitor local water levels and the flood forecast on the Environment Agency's website.

8.2 Flood Warning

Flooding is expected. Immediate action required
- Move family, pets and valuables to a safe place.
- Turn off gas, electricity and water supplies if safe to do so.
- Put flood protection equipment in place.

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8.3 Severe Flood Warning

Severe flooding. Danger to life
- Stay in a safe place with a means of escape.
- Be ready should you need to evacuate from your home.
- Co-operate with the emergency services.
- Call 999 if you are in immediate danger.

8.4 Warning No Longer In Force

No further flooding is currently expected for your area
- Flood water may still be around and could be contaminated.
- If you've been flooded, ring your buildings and contents insurance company as soon as possible.

Planning Assumptions

Flood Alert: Issued two hours to two days in advance of flooding.

Flood Warning: Issued half an hour to one day in advance of flooding.

Severe Flood Warning: Issued when flooding poses a significant threat to life and different actions are required.

Water Rescue: Assumes the use of only emergency services' high-clearance vehicles (not self-presenting voluntary operators whose standard of training and equipment will be unknown).

Infrastructure: It is assumed that trapped flood water on River Road will drain to the River and highway drainage in 8-10 hours after the peak of the flood event.

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9 Actions, Roles and Responsibilities

The Arun District Emergency Plan was issued in November 2005 and aims to enable the authority to respond effectively to any major emergency, irrespective of its cause, whilst maintaining it normal services. This complies with the Civil Contingencies Act 2004 and Cabinet Office guidance. The plan is prepared by the District Emergency Planning Officer.

Different organisations have responsibilities for different consequences of flooding:

Arun District Council:

- The welfare/shelter of people made homeless as a result of flooding
- Care of communities isolated or severely affected by flooding
- Assistance with salvage and drying out of property
- Advice regarding contamination of food stocks

The County Council:

- The drainage of surface water on the highway
- Social Services provision and support

West Sussex Fire and Rescue Service may respond to:

- Pumping operations at flooded properties only to facilitate emergency rescue
- Flooding incidents affecting electrical supplies in premises

The Environment Agency:

- Issues flood warnings
- Advises and assists in river and coastal flood defences and environmental protection

Water Companies:

- Sewerage, where they have a service provider / customer relationship.

Police

- The evacuation of the public if they are endangered

Health and Safety considerations

All organisations need to ensure that they have appropriate and adequate resources, both equipment and personnel that can be sustained over a protracted period if required.

All responding organisations, including voluntary agencies should be aware of the risks associated with working in or nearby to floodwater, such as:

- health issues when contact is made with floodwater;
- risk of electrocution;
- hidden objects / trip hazards beneath the water;
- the power of water and how easy it is to become unbalanced.

In all cases, people/staff that are expected to play a role in flood response and recovery should receive appropriate training in relevant health and safety policies and procedures of their organisation.

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10 Vulnerable People and Groups

This section must be completed when the category of the building's residents will be known.

Figure 8 Examples of Vulnerable People/Sites Log sheet

Location	Details	Contact Details	Support needed in Emergency	Communication Issues	Comments
Individuals:	Via Social Services	Social Services	-	-	Do not include Individuals details in the plan

11 Key Facilities

The car parking area is at risk of flooding if flood water overtops the defences, as the proposed ground levels will be constructed approximately 500mm below the flood wall level. Residents are advised to remove their cars to an area outside the floodplain (refer to figure 9).

The Key infrastructure at risk of flooding will be identified at a later a stage of the project and the flood plan will be revised accordingly. However, sewer, electrical and telephone undertaker must consider the flood risk in their design.

12 Evacuation and Sheltering of People

Evacuation is normally organised by emergency services. Figure 9 shows the safest route that the emergency services can use to access the site. Residents can be moved to Terminus Road that is outside the floodplain and from there to family/friend's houses, hotels, hospitals or other safe places, depends on the current need of each resident.

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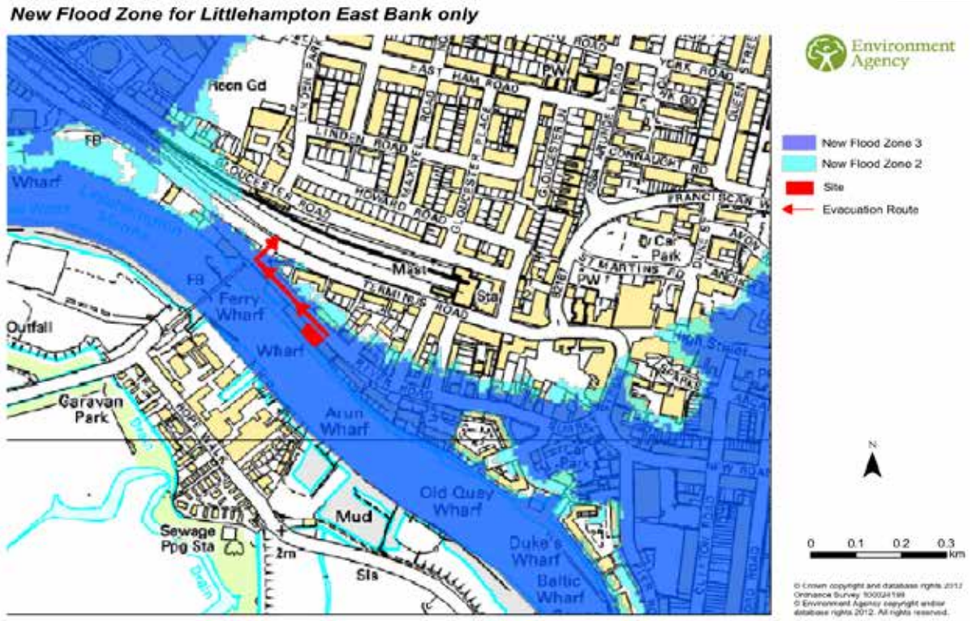

Figure 9: Evacuation Route

13 Recovery

As the floodwater recedes, the emergency response may still be ongoing as the recovery phase begins. The local authority will lead the recovery of the community and help to restore the economy, infrastructure and the environment in partnership with other agencies and organisations and the private sector.

Recovery from a minor flood will usually form part of normal operations without special arrangements. However, a severe flood affecting many people and properties will require a co-ordinated response.

The Recovery will need to prioritise the various needs and allocate resources appropriately so that the community returns to normality as soon as possible.

Common issues following flooding include:

- clean up and waste disposal;
- repairs to assets;
- restoration of power, communications and water;
- domestic and business insurance issues;
- humanitarian assistance needs including
    - homeless / displaced residents;
    - psychological impacts;

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14 References

National Planning Policy Framework – Department for Communities and Local Government, March 2012

FD2321/TR2 "Flood Risks to People" – Environment Agency, Defra, March 2006

Arun District Council Emergency Planning Services "Guide for Developers for Making a Flood Plan for Specific Development" – Draft at 13 February 2009-04-09

Arun District Council Level 1 and Level 2 SFRA – JBA Consulting, November 2016

Arun District Council website **www.arun.gov.uk**

Environment Agency's website "www.environment-agency.gov.uk"

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Appendix A – General Advice to those at risk

Before a flood / evacuation preparation

Prepare a Flood Plan and include the following:

A flood kit
Pack a small bag with essential belongings and include warm clothes, torch (check batteries), radio (wind up or battery powered), food, water, other drink, mobile phone (pre input useful numbers), any medicines that you might need to take, any important documents that you have and a first aid kit. Keep this bag easily accessible.

- Move people, pets, valuables and sentimental items upstairs or in a high place downstairs.
- Keep a separate list of useful telephone numbers to hand (this should include your local Council, your insurance company and **Floodline – 0845 988 188**).
- Find out where and how to turn off your Gas and Electricity. Ensure that you switch it off if flooding is imminent before evacuating.
- If possible, move electrical equipment and furniture upstairs.
- Any furniture that you cannot move upstairs, try to raise well off the floor.
- Alert neighbours and assist the elderly, infirm and those with small children.
- Block doorways and air bricks
- Avoid walking and driving through floodwater, there could be hidden hazards.
- Keep up to date with local radio for further information and announcements and via **Floodline 0845 988 1188.**

During a flood

- Continue to listen to situation updates on your local radio and via **Floodline 0845 988 1188.**
- Keep dry and out of floodwater if possible
- Stay in your property, if safe to do so, until advised otherwise by the emergency services or the floodwater has receded.
- Do not walk or drive through flowing floodwater.
- If it is necessary to walk through shallow floodwater, take care for hidden holes, obstacles or other hazards
- Do not walk on river banks, sea defences or cross bridges over torrential rivers.
- Avoid contact with floodwater and wash any exposed parts before handling food or attending to wounds.
- If possible, move electrical equipment and furniture upstairs.

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If evacuation becomes necessary

- Stay calm and do not panic.
- Police officers and / or other officials will try to visit all properties at risk to advise on the requirement to evacuate.
- If road conditions permit, move vehicles to unaffected areas and ask friends / family if you can share their parking facilities.
- You will hear about your evacuation point for transport and the location of the reception centre either verbally or by a leaflet.
- Try to check that any elderly / vulnerable family members or neighbours know about the evacuation.
- Try to inform family members / friends as to where you are evacuating.
- Please follow the instructions given when the time comes.

After a flood / returning home

- Contact your insurers and follow their advice. Do not throw away damaged goods until your insurer has checked them.
- Check the safety of electricity and gas before use. A qualified electrician needs to check any electrical equipment and circuits that have been exposed to floodwater.
- Avoid contact with any remaining floodwater or items having had contact with floodwater unless wearing protective gloves / clothing.
- Boil all tap water until it is declared safe by the water supply company
- Wash yours and your children's hands frequently with bottled water if your supply has not been declared fit for use. Disinfect any children's toys.
- Dispose of any contaminated food, including tinned food, defrosted food, and packaged food that have been exposed to floodwater.
- Seek medical assistance if any health issues appear, especially flu like symptoms.
- Ventilate your property whilst taking care for security.
- Do not throw rubbish and furniture outdoors; wait for an organised collection.
- During these hard times, bogus / cowboy builders / traders are frequently offering their services. Make sure that you get a written quotation that is on letter headed paper with a landline contact number and address.

The National Recovery Guidance contains the following advice provided by the Association of British Insurers. You may wish to incorporate any additional points into the above lists.

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Key messages for people affected by a flood:

- For those people living in a flood risk area, personal safety is the top priority. They should:
  - listen to local radio and Environment Agency Floodline bulletins (0845 988 1188) for up-to-date information on the flooding situation in their area, or alternatively register with the Environment Agency's 'Flood Warnings Direct' early warnings system;
  - collect personal belongings, including insurance and bank details, and essential telephone numbers together, and keep them in a waterproof bag;
  - if safe to do so, move belongings from lower floors to higher levels.
  - be prepared to turn off essential supplies – gas, electricity and water – at the mains.
  - listen to the advice of the authorities and follow any instructions to leave a property.
- If people are affected by a flood, they should contact their insurers as soon as possible after their properties have been damaged. Most insurers have a 24-hour helpline. Claims staff will be able to give advice on the actions that need to be taken. In certain circumstances, claims staff may also be able to give the go-ahead for repair work to be commenced.
- If people have to leave their houses during the flood and subsequent repair, alternative accommodation must be reasonable and in keeping with their normal lifestyles. They should always obtain their insurers' approval before incurring any costs.
- Once the flood waters have receded, the property should have mud removed, be cleaned and disinfected, and dried out. Where possible, people should seek professional advice as to how walls, furniture and carpets should be cleaned and dried out, before any work is undertaken.
- It is a good idea for people to take photographs of the damage. Any carpets, furniture or other goods that have been removed from their homes should be retained until their insurers have agreed that they can be disposed of. If it is not possible to store or retain goods, every effort should be made to contact the insurers or their representatives (loss adjusters) to obtain their agreement to the disposal of goods.

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Appendix B – Contact Details of Key Personnel

Figure A1 Contact Details of Key Personnel

Department / Organisation	Post title	Contact number	Secondary contact (name / number)
Environment Agency floodline		**0845 988 1188**	
Quickdial number			
Local authority emergency helpline			
Insurance company 24-hour number			
Local radio station frequency for news alerts and weather updates			
Family and neighbours			
Bank phone number and details			
Work phone number			
Doctor's surgery			
Local police station			
Vet/kennel/cattery			
Local hotel or B&B			
Gas supplier and meter number			
Electricity supplier and meter number			
Water supplier and meter number			
Electrician			
Plumber			
Builder			

Visionary design engineers

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Appendix C – Access to Building

The building can be accessed from River Road. Ground floor car parking area is provided. The main entrance is at:

55-57 River Road
Littlehampton
West Sussex
BN17 5DB

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Appendix D – Environment Agency's Community Flood Warning Codes

Community Flood Warning Area Name	Community Flood Warning Area Description	Code
Westbourne	Westbourne including New Brighton, Commonside and the B2147 at Racton House	074FW0101
Emsworth	Emsworth including A27, A259 and Lumley Road	074FW0102
East Lavant	East Lavant including Chilgrove	074FW0201
Chichester	Chichester including Church farm pit, A27 and retail park	074FW0202
Chichester City Centre	Chichester City Centre including A286 and college grounds	074FW0203
Broadbridge and West Ashling	Broadbridge and West Ashling including the A27, B2146 and Merryfields Plantation	074FW0301
Bosham	Bosham including the Old Bosham Ditch, Shore Road and Churchfield Stream	074FW0302
Broad and Earnley Rifes	Broad and Earnley Rifes including Sidlesham, Earnley and Norton	074FW0401
West Selsey	West Selsey including Wadeway caravan park and Warners Lane	074FW0402
Barnham	Barnham including Highground Lane Nanny Copse	074FW0501
Shripney and Eastergate	Shripney including Shripney Road, Shripney Lane and the Lidsey Rife at Eastergate	074FW0502
Bersted	Bersted including South Bersted caravan park, industrial estate at Durban Road, Sunningdale Gardens and the Elbridge Rife at Elbridge	074FW0503
Felpham	The Aldingbourne Rife at Felpham including the A259 and Links Avenue	074FW0504
Horsham South	Horsham South from the A24 to Amiesmill End	074FW0601
Kings Hanger to Broadbridge Heath	Kings Hanger to Broadbridge Heath including Slinfold and Rudgwick	074FW0602
Newbridge to Pallingham Lock	Newbridge to Pallingham Lock including the Wey and Arun Canal	074FW0603

Community Flood Warning Area Name	Community Flood Warning Area Description	Code
Pulborough	Pulborough including Greatham Bridge, Pulborough Brooks and railway at Coldwatham	074FW0604
Amberley Wild Brooks	Amberley Wild Brooks including Haughton, Bury and South Stoke	074FW0605
Arundel	Arundel including Warningcamp and Burpham	074FW0606
Ford and Climping	Ford and Climping including Ford Prison	074FW0607
Lyminster	Lyminster including the Black Ditch at Hollyacre farm nurseries	074FW0608
Wick	Wick including the Enterprise Centre on Courtwick Lane	074FW0609
Angmering	Angmering including Hammerpot and the A259 at Brook Lane	074FW0610
Liss	Liss including sewage works and B3006	074FW0701
River Rother from Princes Marsh to Sheet	River Rother from Princes Marsh to Sheet including Adhurst Wood and the A3	074FW0702
Durford Mill to Midhurst	Durford Mill to Midhurst including Iping, Dumpford, Trotton, Steadham, Chithurst, the A272 at Midhurst and Easbourne	074FW0703
West Lavington to Halfway Bridge	West Lavington to Halfway Bridge including Selham and South Ambersham	074FW0704
Coultershaws Bridge to Shopham Bridge	Coultershaws Bridge to Shopham Bridge including Shopham Loop	074FW0705
North Ferring	North Ferring including the A259 at Northbrook College	074FW0801
South Ferring	South Ferring from Blue Bird Cafe to Clover Lane	074FW0802
Shipley	Shipley, including Whitehall and Coolham	074FW0901
Upper Beeding and Bramber	Upper Beeding and Bramber including Botolphs	074FW0902
Lancing North	Lancing North including Old Shoreham, Shoreham Airport, Adur outdoor activity centre and Old shoreham Road Industrial estate	074FW0903

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Appendix E - Warning those at risk

Sirens/Alarms

SIRENS/ALARMS	
Location	Communal areas
Operation	Similar to fire alarm
Activation	From residents if a flood warning is issued

Visionary design engineers

3421
57 River Road, Littlehampton

Appendix 6

Extract from Ground Investigation

EXECUTIVE SUMMARY

The following presents a summary of the main findings of the report. It is emphasised that no reliance should be placed on any individual point until the whole of the report has been read as other sections of the report may put into context the information contained herein.

It is proposed to redevelop the site at 57 River Road, Littlehampton, West Sussex. The development proposals are understood to comprise demolition of the existing building and the construction of a 2 storey residential building including car and cycle parking spaces but no areas of soft landscaping.

The site currently comprises a two-storey building occupied by Riverside Autos, situated at the north western end of the site, with the remainder of the site used for parking and storage of equipment. The River Arun lies to the south west of the site.

The existing building was present at the time of the earliest inspected historical map, dated 1876, and no physical development appears to have occurred on the site since this time. The site and the surrounding areas have had a number of commercial uses as various types of works and has been used as a wharf.

Reference to geological datasets indicates that the site is expected to be underlain by the Raised Beach Deposits overlying the White Chalk Subgroup. The ground investigation confirmed the underlying soils to comprise a significant thickness of made ground, overlying Raised Beach Deposits. A previous ground investigation on the site also encountered a significant thickness of made ground underlain by the Raised Beach Deposits overlying the White Chalk Subgroup.

The Raised Beach Deposits is classed as a Secondary A Aquifer and the White Chalk Subgroup is a Principal Aquifer. The site does not lie within an Environment Agency Source Protection Zone with regard to the protection of the quality of groundwater that is abstracted for potable supply. Groundwater was encountered only within the standpipe installed in borehole WS01, at depths of between 1.05m and 2.50m below ground level. The other stand-pipe, installed in borehole WS05 further back from the river edge remained dry.

The preliminary contamination risk assessment identified potential pollutant linkages relating to both proposed end users of the site and controlled waters.

Testing of shallow made ground soils did not record any concentrations of heavy metals, PAH compounds or petroleum hydrocarbons that would be considered to pose an unacceptable risk to either end users or controlled waters where the soils remain beneath building cover or permanent hard standing.

Liaison with the local water supply company is recommended in relation to whether protective water supply pipe is required as part of the development.

There remains the potential for localised petroleum hydrocarbon contamination to be present beneath the footprint of the building on site and it is recommended that further inspections are undertaken following demolition and clearance of the floor slab to confirm whether any visual or olfactory evidence of petroleum hydrocarbon contamination is present.

It is recommended that this report is submitted to the Local Planning Authority in support of a planning application for the site and the conclusions drawn should be considered as provisional until such time is it approved by the LPA.