Riverview Road, Bromborough

Flood Risk Assessment & Drainage Strategy

August 2021

Waterco

Assessment | Modelling | Design

Project Information	
Project:	Riverview Road, Bromborough
Report Title:	Flood Risk Assessment & Drainage Strategy
Client:	Slackwood 8 Ltd
Instruction:	The instruction to undertake this Flood Risk Assessment & Drainage Strategy was received from Louise Burrow of Condy Lofthouse Architects acting on behalf of the Client.
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Approval Record	
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	Document History	
Revision	**Date**	**Comment**
01	19/01/2018	First issue
02	24/09/2019	Second issue – Updated to reflect a retrospective Development Plan
03	03/10/2019	Third Issue – Updated following United Utilities Comments
04	16/08/2021	Fourth Issue – Updated to reflect new development plans

This report will remain valid for a period of twelve months (from the date of last issue) after which the source data should be reviewed in order to reassess the findings and conclusions on the basis of latest available information.

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Introduction

Waterco has been commissioned to undertake a Flood Risk Assessment and Drainage Strategy in relation to an industrial development at land off Riverview Road, Bromborough, Wirral, CH62 3RH.

The purpose of this report is to outline the potential flood risk to the site, the impact of the proposed development on flood risk elsewhere, and the proposed measures which could be incorporated to mitigate the identified risk. This report has been prepared in accordance with the guidance contained in the National Planning Policy Framework (NPPF) revised in 2021, and the National Planning Practice Guidance (NPPG): Flood Risk and Coastal Change.

From April 2015, Wirral Council as Lead Local Flood Authority (LLFA) is a statutory consultee for major planning applications in relation to surface water drainage, requiring that all planning applications are accompanied by a Sustainable Drainage Strategy. The aim of the Sustainable Drainage Strategy is to identify water management measures, including Sustainable Drainage Systems (SuDS), to provide surface water runoff reduction and treatment.

This Flood Risk Assessment and Drainage Strategy has been supported by and should be read in conjunction with the Phase I Geo Environmental Desk Study (document reference: 12416-Phase I Geo Environmental Desk Study-02) undertaken by Waterco in August 2021.

Existing Conditions

The site covers approximately 6,603m^2 and is located at National Grid Reference (NGR): 336018, 382727. A location plan and an aerial image are included in Appendix A.

Online mapping (including Google Maps / Google Streetview imagery, accessed August 2021) shows that the site comprises a levelled hardstanding / gravelled area occupied with industrial containers. The site is bordered by an industrial premises and woodland to the north, undeveloped land and the River Mersey to the east, industrial land use to the south and Riverview Road with industrial buildings beyond to the west. Access to the site is provided from Riverview Road.

Local Topography

Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR data shows that the site slopes a high of approximately 20m AOD in the north-west to a low of approximately 9m AOD in the south-east. A LiDAR extract is included in Appendix B. Land east of the site slopes to 5m AOD adjacent to the River Mersey.

Site levels have been modified recently and LiDAR data now superseded. The proposed development plan (DWG No. 21-022-110) shows that existing site levels range from 20.11m AOD in the north-western extent to 16.4m AOD in the south-east. The 'Proposed Site Plan' is included as Appendix C.

Ground Conditions

Reference to the British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by the Chester Sandstone Formation. No superficial deposits are recorded.

The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

A Phase I Geo-environmental Desk Study has been undertaken by Waterco in August 2021 (reference: 12416-Phase I Geo Environmental Desk Study-02). Full details are provided within the report, a summary is as follows:

- Based on a review of historical maps, that site has remained largely undeveloped until recently.
- The risk of encountering ground contamination from on-site activities is considered low as no significant on-site contaminative land uses have been identified.
- It is considered that the surrounding land uses are unlikely to have had a significant contaminative impact on the shallow soils and groundwater underlying the site.
- The potential risks to human health and controlled waters, that have been identified have been assessed by the preliminary risk assessment as being very low to moderate risk, with the majority being **moderate /low risk**.
- The principal risks are associated with the uncertainty of the suitability of the imported material. Given that the works on site were undertaken recently, it has been assumed that the importation of material was undertaken in accordance with current regulations and guidance and was deemed suitable for use. Waterco cannot confirm that this is the case.
- Where confirmation of the suitability of the imported material cannot be ascertained, a ground investigation to confirm the presence or absence of potential contamination in shallow soils is recommended.
- In the event that suspected contamination or unusual ground conditions are encountered during future maintenance works specialist professional advice from an environmental scientist should be sought.

According to the EA's online Aquifer Designation data, obtained from MAGIC's online mapping [accessed August 2021], the underlying bedrock is described as a Principal Aquifer. These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

The EA's online 'Source Protection Zones' data obtained from MAGIC's online mapping [accessed August 2021], indicates that the site is not located within a Groundwater Source Protection Zone.

The Cranfield University 'Soilscapes' map [accessed August 2021] indicates that the site is underlain by 'freely

draining loamy soils.'

Local Drainage

Public sewer records have been obtained from United Utilities (UU) and are included in Appendix D. The UU sewer records show that there is a 225mm public foul sewer located to the west of the site within Riverview Road. The 225mm public foul sewer flows north-west. Public foul manhole 9601, immediately west of the site, has an identified cover level of 18.11m AOD. No invert levels are provided for the public foul manholes adjacent to the site.

There is also an 825mm public surface water sewer located to the west of the site within Riverview Road which upsizes to 900mm. Manhole 9602, immediately west of the site, has an identified cover level of 18.07m AOD and an invert level of 15.46m AOD. The 900mm surface water sewer flows south from manhole 9602 to manhole 0601 where it joins a 1350mm surface water sewer and flows east to its outfall to the River Mersey.

Development Proposals

The proposed development is part of a wider engineering operation and use of land as a civil engineering depot development. The site owner will be accepting only their own waste from their mini and midi skips with a maximum of twelve skips per day. The skips will be tipped in an enclosed three-sided shed with bays and sorted by hand and recyclables recovered and placed into the bays to await baling. The residual waste will be loaded on to a roll on roll off bin for despatch to landfill.

The development comprises 6No. discrete storage areas, an office, welfare facilities, industrial unit, parking and access. A development plan is included in Appendix C.

The development site will be wholly covered by hardstanding.

Flood Zone Classification and Policy Context

The EA 'Flood Map for Planning', included in Appendix E, shows that the site is located within an area outside of the extreme flood extent (Flood Zone 1), meaning it has a less than 0.1% annual probability of flooding.

In accordance with Table 2 of the NPPG: Flood Risk and Coastal Change, industrial developments are considered to be 'less vulnerable'. Table 3 of the NPPG: Flood Risk and Coastal Change, states that 'less vulnerable' development is considered appropriate within Flood Zone 1 and as such the NPPF Sequential Test is passed and the Exception Test does not need to be applied.

Local Policy

The Wirral Unitary Development Plan was adopted in February 2000 and is the existing development plan for Wirral Council. The Wirral Council Unitary Development Plan (February 2000) contains the following relevant policy relating to flood risk and drainage:

WAT1 Fluvial and Tidal Flooding

Planning permission will only be granted for new development which would not be at risk from fluvial or tidal flooding, or which would not increase these risks to other developments.

WA1 Development and Flood Risk

(ii) Where land is (a) in an area protected from tidal flooding by embankments or (b) within a floodplain but at lower risk of fluvial flooding and the land is protected by flood embankments, which are properly maintained and provide an acceptable standard of safety, development may be permitted, subject to consultation with the Environment Agency and where necessary the imposition of appropriate conditions, for example, with respect to minimum floor level.

(iii) Development which would itself increase the risk of flooding to other properties or which would reduce the effectiveness or impede the maintenance of flood control structures or works will not be permitted.

(iv) Development which would adversely affect the integrity and continuity of tidal and fluvial defences or which would compromise the access requirements for maintenance or emergency purposes will not be permitted.

WA2 Development and Land Drainage Policy

(i) Where proposed developments are on land of such size or nature relative to receiving watercourses that there could be significant increase in surface water run-off from the area, or are situated in an area where the Environment Agency has indicated that there may be drainage problems, consultation with the Environment Agency or the local Land Drainage Authority will be required and conditions may be imposed requiring storage within the surface water system.

(ii) In assessing development proposals, the Local Planning Authority will seek to maintain and enhance the natural character of wetlands, groundwaters, ponds, rivers and their margins. In particular, the culverting of watercourses will be discouraged, in order to preserve the natural storage provided and to avoid future maintenance difficulties.

WA5 Protecting Surface Waters

The Local Planning Authority will only permit development which:

(i) includes satisfactory arrangements for the disposal of foul sewage, trade effluent or contaminated surface water;

(ii) does not exacerbate existing problems such as premature or increased frequency of discharges through storm sewer overflows due to inadequate infrastructure or lack of sewer capacity; and

(iii) will not lead to spillage or leakage of stored oils or chemicals or other potentially polluting substances.

The Wirral Council 'Sustainable Drainage & Surface Water Management Guidance' contains the following requirements for a Sustainable Drainage Strategy:

'Greenfield Sites

Where records of the previously developed system are not available and system characteristics cannot otherwise be determined, or if the drainage system is broken or blocked (or no longer operational), then the run-off characteristics, or if the site is previously undeveloped then the site should be defined as greenfield.

Peak Flow Control: If the site is classed as greenfield, the flow rates from the development are to be limited to the equivalent pre-development greenfield runoff rates for all rainfall events up to and including the 1 in 100 year event (plus appropriate climate change allowance in line with Standard 2 of DEFRA's Technical Standards for Sustainable Drainage Systems).

Volume Control: For greenfield developments the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event in line with Standard 4 of DEFRA's Technical Standards for Sustainable Drainage Systems.

It should be noted that the applicant should also consult United Utilities or Dwr Cymru Welsh Water (dependent upon site location) to determine if they have any discharge restrictions which may be more restrictive. Notwithstanding the above, the existing site drainage constraints will also be taken into account when agreeing discharge limits and the proposed flow should not exceed existing flows.'

Local guidance documents including the Wirral Council Strategic Flood Risk Assessment (SFRA) (June 2019) and the Wirral Council Preliminary Flood Risk Assessment (PFRA) (2011 and its 2017 addendum) have been reviewed and inform this report.

Consultation

A pre-planning opinion request was submitted to the EA in December 2017. A response is included in Appendix E. The EA have stated that;

'*Development must be safe and should not increase the risk of flooding. … In terms of your specific parcel of land the Flood Risk Assessment should clearly demonstrate the proposed development is on that part of the site that is within Flood Zone 1.'*

A pre-planning opinion request was submitted to the LLFA in December 2017. A response is included in Appendix F. The LLFA have stated that;

'… we hold no records of flooding in the vicinity of this location, however it is worth bearing in mind that as the area is not residential reporting rates may not be reflective.

The adopted highway outside the development is shown as high risk of surface water flooding on flood maps.

The discharge rate should be restricted to greenfield runoff rates… with the 1 in 100 (plus appropriate climate change allowance) event retained within the curtilage of the site. …

Since it is easier to know these things from the outset and plan accordingly, please also note that the applicant must enter into a Section 106 agreement before the grant of planning permission, requiring that any communal elements of the sustainable drainage system, not adopted by the Water and Sewerage Company, are maintained in perpetuity in accordance with a specified maintenance and inspection schedule which must cover all components and be submitted for approval by the LLFA.

A developer enquiry was submitted to UU in December 2017. UU have been consulted to confirm that their response, received in January 2018, is still valid. Their response (and the original response from 2018) is included in Appendix D. UU have stated:

'Unfortunately the pre development advice is only valid for 12 month, we have looked into this again and we have found that the ground around your development has excellent infiltration possibilities having checked the BGS website and seen nearby borehole data.

Foul

Foul will be allowed to drain to the public sewer network. Our preferred point of discharge would be to the 225mm foul sewer on Riverview road at an unrestricted rate.

Surface Water

Surface water from this site must drain to soakaway or some other form of infiltration system if you can prove this is not feasible we will relook into this area again. We would expect to carry out percolation test in accordance of BRE365'

Sources of Flooding and Probability

Fluvial / Tidal

The nearest watercourse is the River Mersey which is located approximately 70m east of the site. The River Mersey flows north and is tidally influenced in this location. There are no other watercourses in the vicinity of the site.

EA correspondence dated 4th January 2018 (Appendix E) states '*We have no records of flooding affecting the site.'* The EA 'Historical Flood Map', included in Appendix E, shows that there are no records of fluvial or tidal flooding at or near to the site. The PFRA and SFRA contain no records of flooding at or near the site.

EA Estimated Flood Levels

Estimated flood levels for the River Mersey have been obtained from the EA in January 2018 and are included in Appendix E. The flood levels are taken from the EA 'Mersey Estuary 2016 Draft Study'. A summary of the flood levels for the node points closest to the site is provided in Table 1. The node locations are shown on

the EA 'Draft Flood Outline Map' in Appendix E.

Table 1 - EA Estimated Flood Levels

		Maximum Water Level (m AOD)				
Node reference	Grid reference	1% AEP*	0.5% AEP	0.1% AEP	0.5% AEP (Year 2065)	0.5% AEP (Year 2115)
1	338167, 382889	6.84	6.94	7.16	7.26	7.65
2	337926, 383197	6.82	6.92	7.14	7.24	7.63
3	337617, 383545	6.80	6.91	7.13	7.22	7.62

*Annual Exceedance Probability

As shown in Table 1, the maximum water level during the 0.5% AEP event with climate change up to the year 2115 is 7.65m AOD. The site is situated above 16.4m AOD and will be flood free during all events up to and including the 0.5% AEP event with climate change up to the year 2115.

It can therefore be concluded that the risk of fluvial and tidal flooding is very low.

Surface Water

Surface water flooding occurs when rainwater does not drain away through the normal drainage system or soak into the ground. It is usually associated with high intensity rainfall events, but can also occur with lower intensity rainfall or melting snow where the ground is saturated, frozen or developed, resulting in overland flow and ponding in depressions in topography. Surface water flooding can occur anywhere without warning. However, flow paths can be determined by consideration of contours and relative levels.

The EA 'Flood Risk from Surface Water' map (Appendix E) indicates that the majority of the site is at very low risk of surface water flooding, meaning it has a less than 0.1% annual probability of flooding. An isolated area on the eastern boundary of the site is shown to be at low risk of surface water flooding, meaning it has between a 1% and 0.1% annual probability of flooding. A small extent of Riverview Road to the west of the site is shown to be at high risk of surface water flooding, meaning it has a greater than 3.3% annual probability of flooding.

The area of low surface water risk identified on EA mapping on the eastern site boundary corresponds to an isolated topographical low point which will be removed as part of the development. The high risk of flooding identified in Riverview Road is associated with an isolated topographical low point in the road. There are no distinct flow routes in the area which would direct any potential surface water flooding arising in Riverview Road towards the site. Surface water flooding in Riverview Road is considered unlikely when accounting for the capacity of the local surface water drainage systems.

The SFRA and PFRA contain no records of surface water flooding at or near the site. It can therefore be

concluded that the risk of surface water flooding is very low.

Sewer

Flooding from sewers can occur when a sewer is overwhelmed by heavy rainfall, becomes blocked, is damaged, or is of inadequate capacity. Flooding is mostly applicable to combined and surface water sewers.

As previously discussed, there is a 225mm public foul sewer and a 900mm public surface water sewer in Riverview Road, west of the site. There is also a 1350mm public surface water sewer to the south of the site.

There are no distinct flow routes in this area which would direct any potential flooding arising from the 900mm public surface water sewer and the 225mm public foul sewer in Riverview Road towards the site. Any potential flooding arising from the 1350mm public surface water sewer to the south of the site would be directed east, into the River Mersey, following the local topography.

The PFRA states, *'Discussions with representatives of both United Utilities and Welsh Water has not identified any past sewage flooding incidents that were locally significant.'*

It can therefore be concluded that the risk of sewer flooding is very low.

Groundwater

Groundwater flooding occurs when water levels underneath the ground rise above normal levels. Prolonged heavy rainfall soaks into the ground and can cause the ground to become saturated. This results in rising groundwater levels which leads to flooding above ground.

The PFRA states that, '*No records were identified of known groundwater flooding within the Wirral…*'. There are no records of groundwater flooding at or near to the site. It can therefore be concluded that the risk of groundwater flooding is low.

Artificial Sources

There are no canals in the immediate vicinity of the site. The EA 'Flood Risk from Reservoirs' map (Appendix E) shows that the site is not at risk of flooding from reservoirs.

It can therefore be concluded that the risk of flooding from artificial sources is very low.

Summary of Potential Flooding

It can be concluded that the risk of flooding from all sources is very low. The site is located in Flood Zone 1 and at least 8.75m above the 0.5% AEP flood level with climate change up to the year 2115.

Surface Water Management

The site has been raised and levelled and currently comprises hardcore. It is assumed that the site is not formally drained.

The introduction of hardstanding area (formally surfaced yards) will result in an increase in surface water runoff rates and volumes. In order to ensure the development will not increase flood risk elsewhere, surface water discharge from the site will be controlled.

Existing greenfield runoff rates have been estimated using the Revitalised Flood Hydrograph Model (ReFH2) method, provided as Appendix G. The existing 1 in 1 year greenfield rate for the 6,603m^2 site is 3.3 l/s. A discharge rate of 3.3 l/s is proposed for this site.

Attenuation Storage

In order to achieve a discharge rate of 3.3 l/s, attenuation storage will be required. Attenuation storage estimates have been provided using MicroDrainage and are included in Appendix H. In accordance with the Wirral Council 'Sustainable Drainage & Surface Water Management Technical Guidance for Developers' both 20% and 40% climate change allowances should be assessed. The 1 in 100 year plus 20% climate change event is considered the design event, however the 40% climate change allowance event should be safely managed on site (either above or below ground), with no increase in flood risk to third parties.

An estimated storage volume of 479m^3 will be required to accommodate the 1 in 100 year plus 40% CC event. An estimated storage volume of 398m^3 will be required to accommodate the 1 in 100 year plus 20% CC event. The storage estimates are based on a discharge rate of 3.3 l/s, storage within a tank or pond structure, an impermeable drainage area of 6,603m^2, a design head of 1m and hydro-brake flow control.

The attenuation volumes are provided for indicative purposes only and should be verified at the detailed design stage.

For the purposes of this report, attenuation storage will be provided to accommodate the 1 in 100 year plus 40% CC event. The potential for attenuating the 1 in 100 year plus 20% CC events below ground and allowing controlled flooding above ground up to the 1 in 100 year plus 40% CC event will be investigated at the detailed design stage.

Discharge Method

Paragraph 080 of the NPPG: Flood Risk and Coastal Change sets out the following hierarchy of drainage options: into the ground (infiltration); to a surface water body; to a surface water sewer, highway drain or another drainage system; to a combined sewer.

Infiltration

The first consideration for the disposal of surface water is infiltration (soakaways and permeable surfaces). As described above, the site is underlain by sandstone with the underlying bedrock described as a Principal Aquifer. No superficial deposits are identified. However, the developed site has been subject to ground raising and levelling using Made Ground of unknown composition. A Phase I Geo-environmental Desk Study

Report undertaken by Waterco in August 2021 has concluded that *'where confirmation of the suitability of the imported material cannot be ascertained, a ground investigation to confirm the presence or absence of potential contamination in shallow soils is recommended.'*

Given that the underlying bedrock of the site is a Principal Aquifer and the composition of Made Ground at the site has not been fully established, infiltration is not considered to be a suitable option for the site, without further assessment.

Watercourse

A connection to watercourse is the next consideration. The nearest watercourse is the River Mersey which is located immediately east of the wider site. Discharge to the River Mersey, at a limited greenfield discharge rate of 3.3 l/s, appears to be a feasible option. A gravity connection can be achieved. Forming a new outfall to the River Mersey would require an environmental permit from the EA. To avoid forming a new outfall to the Mersey, a connection could be made via the existing public surface water sewer, as discussed below.

Sewer

Discharge to the River Mersey could be made via the public surface water sewer system. UU have stated, '*The Surface water flows generated from this site must drain to soak away or some other form of infiltration system, but if ground conditions confirm that this is not a viable solution then surface water flows may drain to the 825mm public surface water sewer located within Riverside Road at a maximum pass forward flow of 10 l/s.'*

Manhole 9602 on the surface water sewer in Riverview Road has a cover level of 18.07m AOD and an invert level of 15.46m AOD. A review of site levels indicates that gravity drainage can be achieved.

It can be concluded that a connection to the public surface water sewer (if preferred) is considered acceptable to UU. Discharge will be made at the greenfield runoff rate of 3.3 l/s.

Sustainable Drainage Systems

Attenuation storage should be provided in the form of Sustainable Drainage Systems (SuDS) where practical. The following SuDS options have been considered:

Soakaways

As described above, the use of soakaways is not considered to be a likely suitable option for the site.

Swales, detention basins and ponds

The site will be occupied by 100% hardstanding area and there is limited space to accommodate above ground storage features such as ponds and basins.

Porous / Permeable Paving

The majority of the site will be utilised by HGV vehicles and storage areas and will therefore be unsuitable for permeable surfacing.

Underground Attenuation Tanks

Storage could be provided within an underground attenuation tank. Sufficient space for an underground tank is provided beneath the south-eastern extent of the site. A tank measuring 1m x 20.5m wide x 25m long with a void ratio of 95% (applicable to a geo-cellular storage system) will provide sufficient attenuation for the 1 in 100 year plus 40% CC event.

Concept Surface Water Drainage Scheme

Surface water runoff will be discharged to the River Mersey via the public surface water sewer system. Discharge will be made at a controlled greenfield rate of 3.3 l/s. Surface water runoff up to the 1 in 100 year plus 40% climate change allowance event will be attenuated on site. A total attenuation volume of 479m³ will be required to achieve the discharge rate and will be provided in the form of an underground tank located beneath the southern extent of the site.

The proposed surface water drainage scheme will ensure no increase in runoff over the lifetime of the development.

Exceedance Event

Storage will be provided for the 1 in 100 year plus 40% CC event. Storm events in access of the 1 in 100 year plus 40% CC event should be permitted to produce temporary shallow depth flooding within parking and storage areas. Finished floor levels of the industrial unit will be set above surrounding ground levels ensuring exceedance flooding will not affect the building.

Surface Water Treatment

In accordance with the CIRIA C753 publication 'The SuDS Manual' (2015), non-residential car parking with infrequent change and low traffic roads are classified as having a 'low' pollution hazard level. Commercial yards and delivery areas are classified as having a 'medium' pollution hazard level. Table 2 shows the pollution hazard indices for each land use.

Table 2 – Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Non-Residential Car Parking and Low Traffic Roads	Low	0.5	0.4	0.4
Commercial Yard and Delivery Areas	Medium	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2

* Indices values range from 0-1.

As attenuation will be provided in a below ground system (tank storage), treatment should be provided by a suitably sized separator.

Maintenance

Maintenance of the drainage system will be the responsibility of the site owner. A maintenance schedule for an attenuation tank is included in Appendix I. Maintenance of a separator will be as per the manufacturer's guidance.

Foul Drainage

Correspondence from UU (Appendix D) states that: *Foul will be allowed to drain to the public sewer network. Our preferred point of discharge would be to the 225mm foul sewer on Riverview road at an unrestricted rate.'*

Foul flows should be discharged to the 225mm public foul sewer in Riverview Road. Manhole 9601, immediately west of the site, has a cover level of 18.11m AOD. No invert levels are available. A gravity connection appears to be achievable based site levels, however, is subject to sewer invert levels. A survey should be undertaken to establish sewer invert levels.

Conclusions

The proposed development comprises 6No. discrete storage areas, an office, welfare facilities, industrial unit, parking and access. The site owner will be accepting waste from their own mini and midi skips.

The Environment Agency 'Flood Map for Planning' map shows that the site is located within an area outside of the extreme flood extent (Flood Zone 1), meaning it has a less than 0.1% annual probability of flooding.

The site is situated at least 8.75m above the 0.5% AEP tidal flood level with climate change up to the year 2115. The flood risk to the site is therefore considered to be low and no mitigation measures are considered necessary.

All methods of surface water discharge have been assessed. Discharge of surface water to the River Mersey via the public surface water sewer in Riverview Road at a rate of 3.3 l/s appears to be the most practical option. This has been agreed in principle with UU. A gravity connection can be achieved to public surface water sewer.

Attenuation storage will be required on site in order to restrict surface water discharge to 3.3 l/s. Attenuation can be provided within an underground tank located beneath the southern extent of the site.

UU have confirmed that foul flows can discharge to the 225mm public foul sewer in Riverview Road.

A Concept Designer's Risk Assessment (cDRA) has been prepared to inform future designers of any identified hazards associated with the scheme. The cDRA has been included in Appendix J.

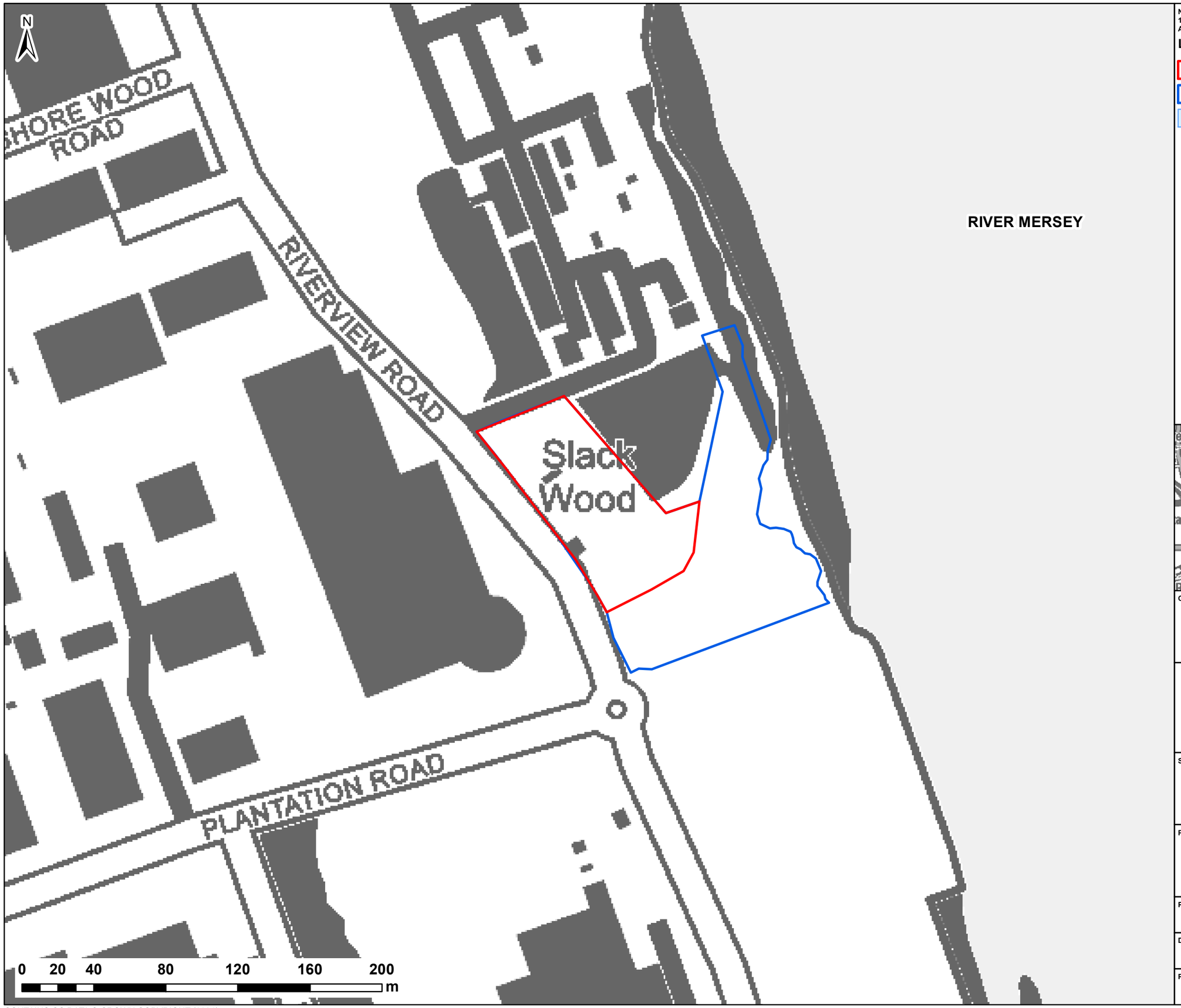
Recommendations

1. Submit this Flood Risk Assessment and Drainage Strategy to the Planning Authority in support of the Planning Application.

2. Verify the attenuation volumes included in this report when undertaking detailed drainage design.

3. Where direct surface water discharge to the River Mersey is proposed, obtain an Environmental permit from the EA.

Appendix A Location Plan and Aerial Image



CONTAINS OS DATA © CROWN COPYRIGHT (2021)

NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Wider Site
- Watercourses / Water Bodies

CLIENT:

SLACKWOOD 8 LTD

waterco

www.waterco.co.uk

SCHEME:

RIVERVIEW ROAD, BROMBOROUGH

PLOT TITLE:

LOCATION PLAN

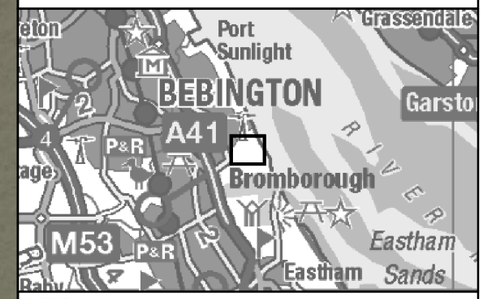
PLOT STATUS:			DATE:
FINAL			11/08/2021
DRAWN: CM	CHECKED: AW	APPROVED: VG	PLOT SCALE @ A3: 1:2,000 (UNLESS STATED OTHERWISE)
PLOT NAME: 12416-Location_Plan			REV: -

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Wider Site



CLIENT:

SLACKWOOD 8 LTD

waterco

www.waterco.co.uk

SCHEME:

RIVERVIEW ROAD, BROMBOROUGH

PLOT TITLE:

AERIAL PLAN

PLOT STATUS:	DATE:
FINAL	11/08/2021

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
CM	AW	VG	1:2,000 (UNLESS STATED OTHERWISE)

PLOT NAME:	REV:
12416-Aerial_Plan	-

Appendix B LiDAR Extract

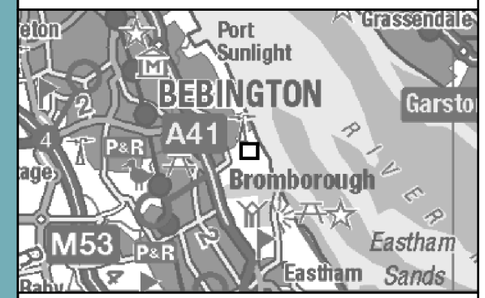
NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Wider Site
- Site Levels

Ground Elevations (m AOD)

- < 5
- 5 - 10
- 10 - 15
- 15 - 20
- > 20



CLIENT:

SLACKWOOD 8 LTD

waterco

www.waterco.co.uk

SCHEME:

RIVERVIEW ROAD, BROMBOROUGH

PLOT TITLE:

LIDAR ELEVATIONS

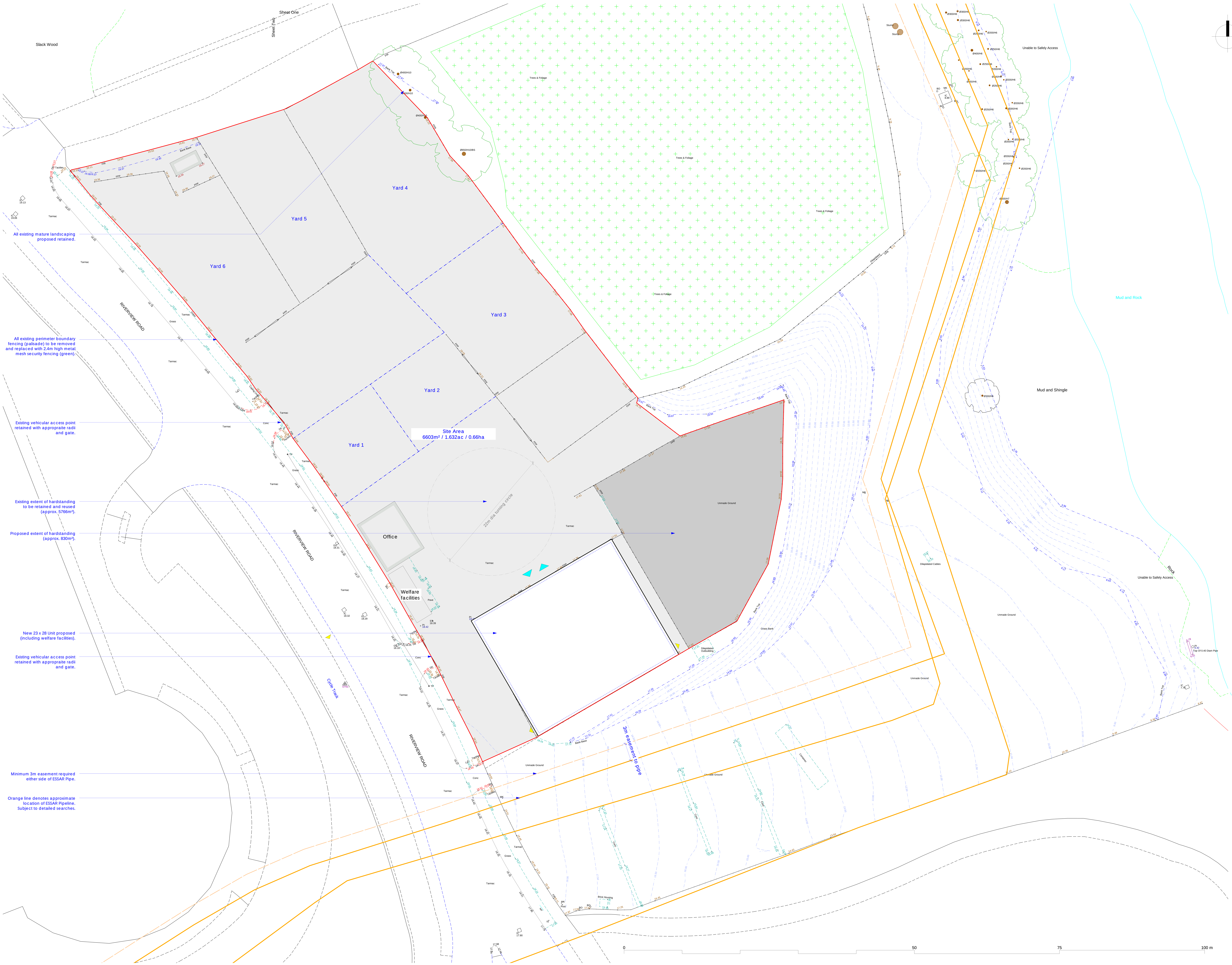
1m RESOLUTION

PLOT STATUS:	DATE:
FINAL	11/08/2021

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
CM	AW	VG	1:1,000 (UNLESS STATED OTHERWISE)

PLOT NAME:	REV:
12416-LiDAR	-

Appendix C Proposed Development Plan



Notes

©This drawing is copyright of Condy and Lofthouse Ltd. and may not be reproduced in any way without their specific permission.

All dimensions are to be checked on site. Do not scale from this drawing, work to figured dimensions only. Any queries please contact condy lofthouse architects.

Materials Prohibited

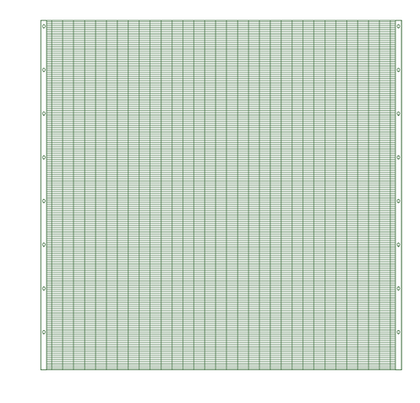
Materials prohibited from use, except where used in accordance with 'Good Practice in the Selection of Construction Materials (March 2011)' or unless required by the Contract:

a) high alumina cement in the structural elements;
b) wood wool slabs in permanent formwork to concrete;
c) calcium chloride admixtures for use in reinforced concrete;
d) asbestos or asbestos-containing products, as defined in the 'Control of Asbestos at Work Regulations, as amended 2012' or any other statutory modification or re-enactment thereof;
e) any naturally occurring or man made mineral fibres (for example, rock-wool or slag wool) with a thickness of 3 microns or less and a length of 200 microns or less, unless they are appropriately sealed to prevent migration of fibres;
f) aggregates for use in reinforced concrete which do not comply with:
'BS EN 12620:2002: properties of aggregates used in concrete.
'BS EN 13139:2002: Properties of aggregates used in mortar.
'BS EN 13055 (Parts 1 & 2): properties of lightweight aggregates.
'Guidance on avoiding alkali-silica reaction and limitations on alkali content in BRE Digest 330 (2004)' & 'Concrete Society Technical Report 30 (1999)';
g) lead, lead paint or any other materials containing lead which may be ingested, inhaled or absorbed, except where copper alloy fittings also containing lead are specifically required in drinking water pipework by any relevant statutory requirement or where lead flashings or other lead roof coverings are specifically provided for in the Contract;
h) urea formaldehyde foam or materials which may release formaldehyde in quantities which may be hazardous with reference to the limits set by the Health and Safety Executive;
i) calcium silicate bricks or tiles;
j) vermiculite unless it is established as being fibre-free; calcium silicate bricks or tiles;
k) any products containing cadmium referred to in Statutory Instrument 'SI 2006/3311 Controls on dangerous substances and preparations Regulations 2006'. Reference should also be made to 'HSE IDGE391 Cadmium and you';
l) any new timber treated with pentachlorophenol;
m) non galvanised mild steel structural fixings for building elements particularly susceptible to erosion;
n) concrete used in circumstances where it is susceptible to alkali/silica reaction;
o) materials containing chlorofluorocarbons (CFC's);
p) solvent based paints except where water based paints are unsuitable for unavailable;
q) any new materials not in accordance with statutory requirements, British Standards, Codes of Practice and good building practice current at the date of incorporation of the relevant materials into the Works or the specifications thereof;

Additional Notes

Based on West Coast Geomatics Topographical Survey WCG 21-1561-T-1:1/2, dated April 2021

PROPOSED PERIMETER BOUNDARY



2400mm HIGH METAL MESH SECURITY FENCING (GREEN COLOUR)

DRAFT

B	Updated following Client meeting	TB 21-07-2021
A	Amended following Client comment	LB 09-06-2021
*	First issue	LB 19-05-2021

condylofthouse architects

Client
tbc.

Project
Slackwood, Riverview Road, Bromborough, Wirral CH62 3RL

Title
Proposed Site Plan

Scale	Date	Drawn By
1:200@A0	05 2021	LB

Drawing No	Revision
21-022-110	B

Unit 17 Connect Business Village
24 Derby Road
Liverpool L5 9PR
0151 207 4371
info@condylofthouse.co.uk
www.condylofthouse.co.uk

Appendix D UU Sewer Plan and Correspondence

United Utilites Water Limited

Property Searches
Ground Floor Grasmere House
Lingley Mere Business Park
Great Sankey
Warrington
WA5 3LP

Telephone 0370 751 0101

Property.searches@uuplc.co.uk

Your Ref: W10324
Our Ref: 1349054
Date: 14/12/2017

Waterco Ltd

Eden Court
Lon Parcwr Business Park
Ruthin
LL15 1NJ

FAO: **Sally Pettit**

Dear Sirs

Location: **Riverview Road Bromborough CH62 3RR**

I acknowledge with thanks your request dated 14/12/17 for information on the location of our services.

Please find enclosed plans showing the approximate position of our apparatus known to be in the vicinity of this site.

The enclosed plans are being provided to you subject to the United Utilities terms and conditions for both the wastewater and water distribution plans which are shown attached.

If you are planning works anywhere in the North West, please read our access statement before you start work to check how it will affect our network.
http://www.unitedutilities.com/work-near-asset.aspx.

I trust the above meets with you requirements and look forward to hearing from you should you need anything further.

If you have any queries regarding this matter please telephone us on 0370 7510101.

Yours Faithfully,

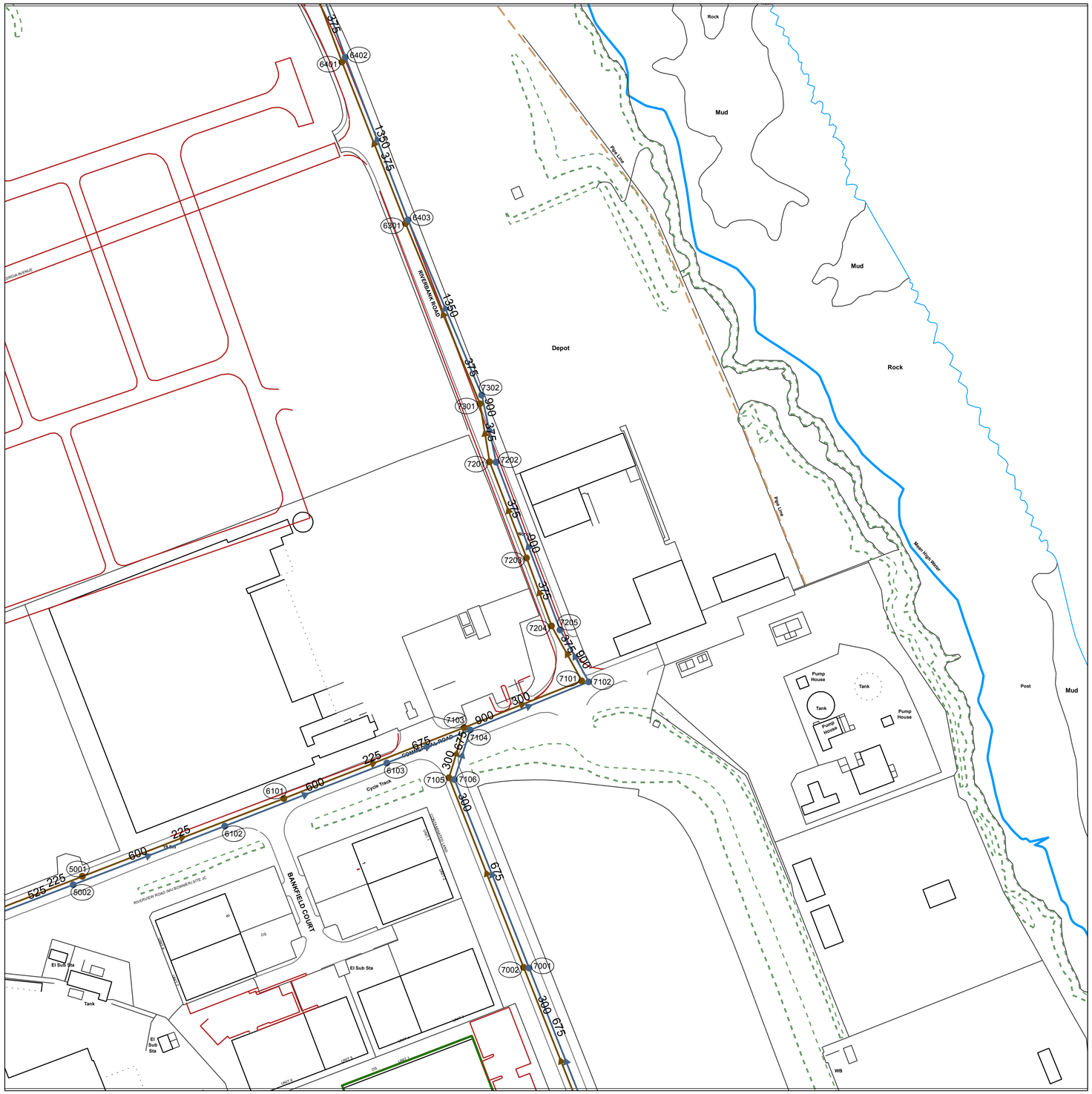
Karen McCormack
Property Searches Manager

TERMS AND CONDITIONS - WASTERWATER & WATER DISTRIBUTION PLANS

These provisions apply to the public sewerage, water distribution and telemetry systems (including sewers which are the subject of an agreement under Section 104 of the Water Industry Act 1991 and mains installed in accordance with the agreement for the self-construction of water mains) (UUWL apparatus) of United Utilities Water Limited "(UUWL)".

TERMS AND CONDITIONS:

1. This Map and any information supplied with it is issued subject to the provisions contained below, to the exclusion of all others and no party relies upon any representation, warranty, collateral contract or other assurance of any person (whether party to this agreement or not) that is not set out in this agreement or the documents referred to in it.
2. This Map and any information supplied with it is provided for general guidance only and no representation, undertaking or warranty as to its accuracy, completeness or being up to date is given or implied.
3. In particular, the position and depth of any UUWL apparatus shown on the Map are approximate only and given in accordance with the best information available. The nature of the relevant system and/or its actual position may be different from that shown on the plan and UUWL is not liable for any damage caused by incorrect information provided save as stated in section 199 of the Water Industry Act 1991. UUWL strongly recommends that a comprehensive survey is undertaken in addition to reviewing this Map to determine and ensure the precise location of any UUWL apparatus. The exact location, positions and depths should be obtained by excavation trial holes.
4. The location and position of private drains, private sewers and service pipes to properties are not normally shown on this Map but their presence must be anticipated and accounted for and you are strongly advised to carry out your own further enquiries and investigations in order to locate the same.
5. The position and depth of UUWL apparatus is subject to change and therefore this Map is issued subject to any removal or change in location of the same. The onus is entirely upon you to confirm whether any changes to the Map have been made subsequent to issue and prior to any works being carried out.
6. This Map and any information shown on it or provided with it must not be relied upon in the event of any development, construction or other works (including but not limited to any excavations) in the vicinity of UUWL apparatus or for the purpose of determining the suitability of a point of connection to the sewerage or other distribution systems.
7. No person or legal entity, including any company shall be relieved from any liability howsoever and whensoever arising for any damage caused to UUWL apparatus by reason of the actual position and/or depths of UUWL apparatus being different from those shown on the Map and any information supplied with it.
8. If any provision contained herein is or becomes legally invalid or unenforceable, it will be taken to be severed from the remaining provisions which shall be unaffected and continue in full force and affect.
9. This agreement shall be governed by English law and all parties submit to the exclusive jurisdiction of the English courts, save that nothing will prevent UUWL from bringing proceedings in any other competent jurisdiction, whether concurrently or otherwise.



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
5001	20.23	FO							
5002	20.22	SW							
6101	18.23	FO	15.51	225		CI	VC	89.45	34
6102	19.08	SW							
6103	16.76	SW	14.56	675		CI	CO	41.34	46
6301	11.45	FO							
6401	12.53	FO							
6402	12.68	SW							
6403	11.46	SW							
7001	18.28	SW	14.09	675		CI	CO	93.71	55
7002	18.21	FO	11.13	300		CI	CO	94.15	277
7101	13.93	FO							
7102	13.94	SW							
7103	15.53	FO							
7104	15.54	SW							
7105	15.91	FO	10.79	300		CI	CO	24.22	484
7106	15.88	SW							
7201	14.47	FO							
7202	14.47	SW							
7203	14.46	FO	9.96	375		CI	CO	47.48	74
7204	14.51	FO	10.4	375		CI	CO	33.46	76
7205	14.54	SW	10	900		CI	CO	82.97	66
7301	12.08	FO							
7302	11.76	SW							

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad

Printed By: Property Searches

OS Sheet No: SJ3583SE

Scale: 1:1250 Date: 14/12/2017

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Control Kiosk
Unspecified

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ3583SE
Scale: 1:1250 Date: 14/12/2017
24 Nodes
Sheet 1 of 1

United Utilities
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SEWER RECORDS

Refno Cover Func Invert Size.x Size.y Shape Mati Length Grad Refno Cover Func Invert Size.x Size.y Shape Mati Length Grad

OS Sheet No: SJ3683SW

Scale: 1:1250 Date: 14/12/2017

Printed By: Property Searches

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall

Control Kiosk
Unspecified

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ3683SW
Scale: 1:1250 Date: 14/12/2017
0 Nodes
Sheet 1 of 1

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SEWER RECORDS

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
5501	24.63	SW							
5601		FO							
5602		FO							
5603		FO							
5604		FO							
5605		FO							
6501	23.31	FO							
6502		FO							
6503		FO							
6504		FO							
6506		FO							
6508		SW							
6601		FO							
6602		FO							
6901		FO							
6902		FO							
6903		FO							
7501	22.63	SW	19.73	600		CI	CO	34.6	37
7502	22.72	FO	19.51	225		CI	VC	59.41	42
7503	22.76	FO							
7504	22.7	SW							
7505	22.74	FO							
7901	19.24	SW	15.09	675		CI	CO	91.96	92
7902	19.08	FO	11.52	300		CI	CO	92.1	236
8501	22.51	FO							
8502	20.38	FO	17.62	225		CI	VC	31.79	65
8503	22.4	SW							
8504	20.36	SW							
8505	22.81	SW							
8506	22.74	SW	18.42	825		CI	CO	12.05	402
8801	20.28	SW	16.05	675		CI	CO	94.04	98
8802	20	FO	11.87	300		CI	CO	96.55	276
8803	19.4	SW	17.24	825		CI	CO	85.75	111
8804	19.55	FO							
9501	19.57	FO							
9502	19.52	SW							
9601	18.11	FO							
9602	18.07	SW	15.46	900		CI	CO	85.17	114
9701	18.78	FO							
9702	18.86	SW	16.47	825		CI	CO	90.68	90

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad

WASTE WATER SYMBOLOGY

Foul Surface Combined Overflow

Manhole
Manhole, Side Entry
MainSewer, Public
MainSewer, Private
MainSewer, S104
Rising Main, Public
Rising Main, Private
Rising Main, S104
Highway Drain, Private

Foul Surface Combined

WW Site Termination
Air Valve
Cascade
Non Return Valve
Extent of Survey
Flow Meter
Gulley
Hatch Box
Head of System
Hydrobrake / Vortex
Inlet
Inspection Chamber
Bifurcation
Catchpit
Contaminated Surface Water
WW Pumping Station
Sludge Pumping Station
Sewer Overflow
TJunction/Saddle
LampHole
OilInterceptor
PenStock
Pump
RoddingEye
Soakaway
Summit
Valve
Valve Chamber
Washout Chamber
DropShaft
WW Treatment Works
Septic Tank
Vent Column
Network Storage Tank
Orifice Plate
Vortex Chamber
Penstock Chamber
Blind Manhole

Foul Surface Combined Overflow

Screen Chamber
Discharge Point
Outfall
Control Kiosk
Unspecified

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ3582NE
Scale: 1:1250 Date: 14/12/2017
40 Nodes
Sheet 1 of 1

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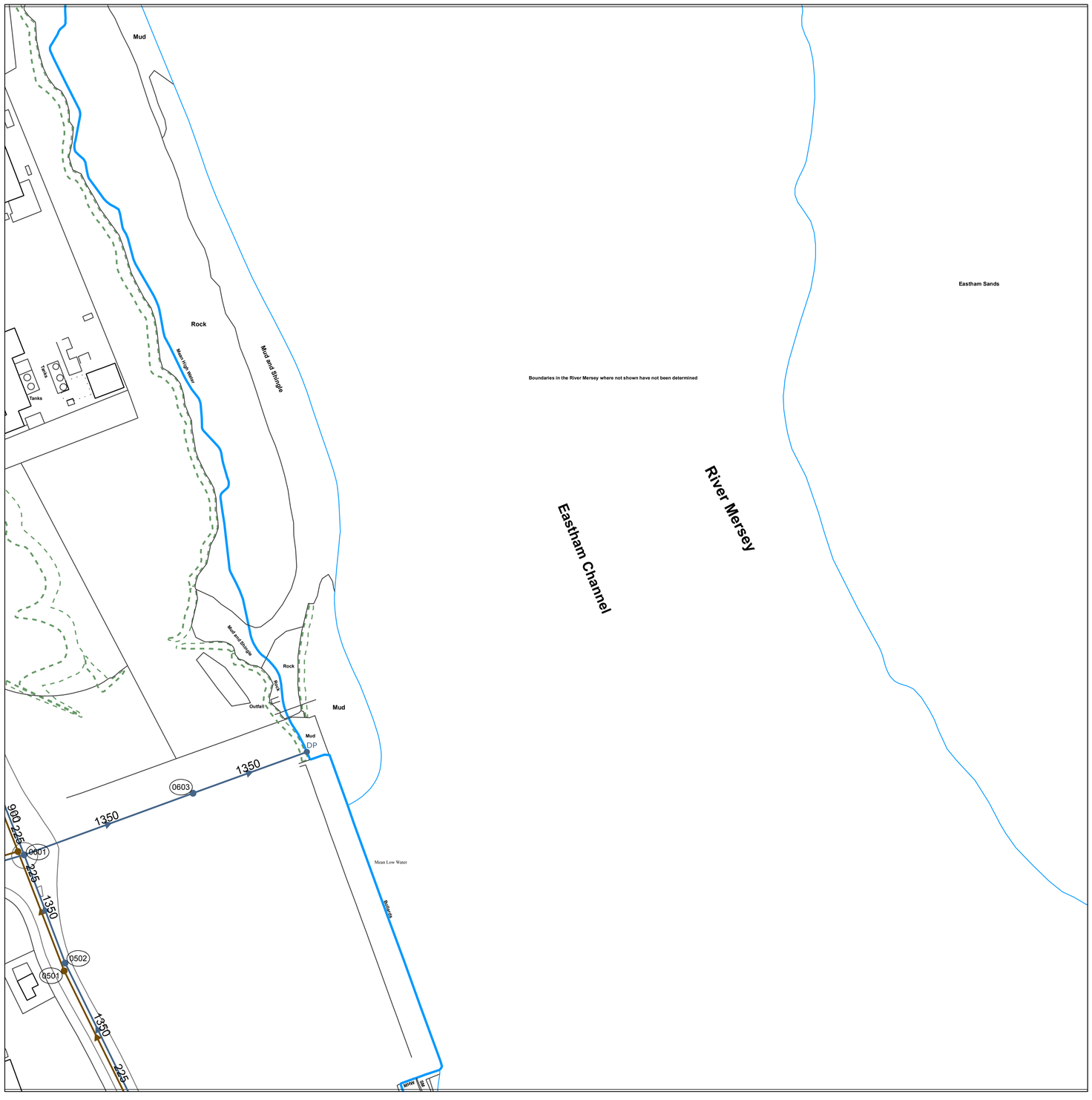
SEWER RECORDS

Printed By: Property Searches

OS Sheet No: SJ3582NE

Scale: 1:1250 Date: 14/12/2017



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad
0501	17.03	FO							
0502	17.15	SW							
0601	18.22	SW							
0602	17.8	FO							
0603	15.69	SW							

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Mati	Length	Grad

OS Sheet No: SJ3682NW

Scale: 1:1250 Date: 14/12/2017

Printed By: Property Searches

WASTE WATER SYMBOLOGY

Foul	Surface	Combined	Overflow	
				Manhole
				Manhole, Side Entry
				MainSewer, Public
				MainSewer, Private
				MainSewer, S104
				Rising Main, Public
				Rising Main, Private
				Rising Main, S104
				Highway Drain, Private

Foul	Surface	Combined	
			WW Site Termination
AV	AV	AV	Air Valve
CA	CA	CA	Cascade
NRV	NRV	NRV	Non Return Valve
ES	ES	ES	Extent of Survey
FM	FM	FM	Flow Meter
GU	GU	GU	Gulley
HA	HA	HA	Hatch Box
HS	HS	HS	Head of System
HY	HY	HY	Hydrobrake / Vortex
IN	IN	IN	Inlet
IC	IC	IC	Inspection Chamber
			Bifurcation
CA	CA	CA	Catchpit
		CW	Contaminated Surface Water
			WW Pumping Station
			Sludge Pumping Station
			Sewer Overflow
			TJunction/Saddle
LH	LH	LH	LampHole
OI	OI	OI	OilInterceptor
PE	PE	PE	PenStock
			Pump
RE	RE	RE	RoddingEye
SO	SO	SO	Soakaway
SM	SM	SM	Summit
VA	VA	VA	Valve
VC	VC	VC	Valve Chamber
WO	WO	WO	Washout Chamber
DS	DS	DS	DropShaft
WTW		WTW	WW Treatment Works
ST		ST	Septic Tank
			Vent Column
			Network Storage Tank
OP	OP	OP	Orifice Plate
			Vortex Chamber
			Penstock Chamber
			Blind Manhole
Foul	Surface	Combined	Overflow
			Screen Chamber
			Discharge Point
			Outfall

Sludge Main, Public
Sludge Main, Private
Sludge Main, S104

ABANDONED PIPE

MainSewer
Rising Main
Highway Drain
Sludge Main

Control Kiosk
Unspecified

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

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PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

OS Sheet No: SJ3682NW

Scale: 1:1250 Date: 14/12/2017

5 Nodes

Sheet 1 of 1

United Utilities
helping life flow smoothly

SEWER RECORDS

Sally Pettit

From: Lunt, John <John.Lunt@uuplc.co.uk>
Sent: 03 January 2018 15:32
To: Sally Pettit
Cc: Wastewater Developer Services
Subject: Repeat: (UU Ref: PDE 4200019336) Riverside Road, Wirral

Hi Sally,

In reply and in principle yes, however please note, this section of sewer may reside within a third party boundary of which we would preferably not wish to go down the requisition route…..!

Kind regards,

John

From: Sally Pettit [mailto:Sally.Pettit@waterco.co.uk]
Sent: 03 January 2018 15:09
To: Lunt, John <John.Lunt@uuplc.co.uk>
Subject: RE: (UU Ref: PDE 4200019336) Riverside Road, Wirral

Dear John,

Thank you for your recent response to our developer enquiry dated 18th of December 2017 (Ref: PDE 4200019336). I have attached the sewer plans for the site for reference.

With regards to surface water discharge you state that, 'surface water flows may drain to the 825mm public surface water sewer located within Riverside Road at a maximum pass forward flow of 10 l/s.'

We note that the 825mm public surface water sewer discharges to a 1350mm sewer to the south-west of the site, which then flows east to manhole 0603 before its eventual outfall to the River Mersey. Please could you advise if a connection to the 1350mm public surface water sewer located to the south of the site at manhole 0603 would be acceptable. This will enable a gravity drainage solution from the site.

Kind Regards,

Sally Pettit
Environmental Consultant

01824 702220

Waterco consultants
Assessment, Modelling, Design
Ruthin - Chester - Manchester - Hyderabad

20 Years 1998 . 2018

From: Lunt, John [mailto:John.Lunt@uuplc.co.uk]
Sent: 03 January 2018 14:06
To: Sally Pettit <Sally.Pettit@waterco.co.uk>

Cc: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: (UU Ref: PDE 4200019336) Riverside Road, Wirral

Hi Sally,

In reply, we have carried out an assessment of your application which is based on the information provided; this wastewater pre development advice will be valid for 12 months.

Foul

The foul water flows emanating from this site will be allowed to drain freely in to the public foul water sewerage system located within Riverside Road.

Surface Water

The Surface water flows generated from this site must drain to soak away or some other form of infiltration system, but if ground conditions confirm that this is not a viable solution then surface water flows may drain to the 825mm public surface water sewer located within Riverside Road at a maximum pass forward flow of 10 l/s.

Connection Application

Although we may discuss and agree discharge points & rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below

http://www.unitedutilities.com/connecting-public-sewer.aspx

Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

Please note, if you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements of Sewers for adoption and United Utilities Asset Standards. The proposed design should give consideration to long term operability and give United Utilities a cost effective proposal for the life of the assets. Therefore, further to this enquiry should you wish to progress a Section 104 agreement, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 agreement, has been assessed and accepted in writing by United Utilities. Any works carried out prior to the technical assessment being approved is done entirely at the developers own risk and could be subject to change.

Regards,

John

John Lunt
Developer Query Engineer
Developer Services and Planning
Operational Services
T: 01925 679411 (Int; 79411)
E-mail: wastewaterdeveloperservices@uuplc.co.uk
United Utilities.com

From: Sally Pettit [mailto:Sally.Pettit@waterco.co.uk]
Sent: 18 December 2017 09:41

To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: w10324-Developer enquiry

Dear Sir / Madam,

Please find attached a completed developer enquiry form, site location plan and development plan.

Please do not hesitate to contact me should you have any queries.

Kind regards,

Sally Pettit
Environmental Consultant

01824 702220

Waterco consultants
Assessment, Modelling, Design
Ruthin - Chester - Manchester - Hyderabad

Sally Pettit

From: Jack, Andy <Andy.Jack@uuplc.co.uk>
Sent: 25 September 2019 08:57
To: Sally Pettit; Wastewater Developer Services
Subject: RE: 12388-Riverview Road, Bromborough - UU developer enquiry query

Categories: Information received

Hi Sally

Unfortunately the pre development advice is only valid for 12 month, we have looked into this again and we have found that the ground around your development has excellent infiltration possibilities having checked the BGS website and seen nearby borehole data.

Foul

Foul will be allowed to drain to the public sewer network. Our preferred point of discharge would be to the 225mm foul sewer on Riverview road road at an unrestricted rate.

Surface Water

Surface water from this site must drain to soakaway or some other form of infiltration system if you can prove this is not feasible we will relook into this area again. We would expect to carry out percolation test in accordance of BRE365

Connection Application

Although we may discuss and agree discharge points & rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimately inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below

http://www.unitedutilities.com/connecting-public-sewer.aspx

Sewer Adoption Agreement

You may wish to offer the proposed new sewers for adoption. United Utilities assess adoption application based on Sewers adoption 6th Edition and for any pumping stations our company addenda document. Please refer to link below to obtain further guidance and application pack:

http://www.unitedutilities.com/sewer-adoption.aspx

Trade Effluent

If you intend to discharge trade effluent to the public sewer you will require a trade effluent permit. Please see United Utilities' website for details.

http://www.unitedutilities.com/trade-effluent-faqs.aspx

Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, and local flood authority guidelines, we would recommend that you speak and make suitable agreements with the relevant statutory bodies.

Please note, if you intend to put forward your wastewater assets for adoption by United Utilities, the proposed detail design will be subject to a technical appraisal by an Adoption Engineer as we need to be sure that the proposals meets the requirements of Sewers for adoption and United Utilities Asset Standards. The proposed design should give consideration to long term operability and give United Utilities a cost effective proposal for the life of the assets. Therefore, further to this enquiry should you wish to progress a Section 104 agreement, we strongly recommend that no construction commences until the detailed drainage design, submitted as part of the Section 104 agreement, has been assessed and accepted in writing by United Utilities. Any works carried out prior to the technical assessment being approved is done entirely at the developers own risk and could be subject to change.

Regards

Andy Jack
Developer Engineer (Liverpool & Wirral)
Technical Assurance Wastewater
Developer Services
Customer
United Utilities
T: 01925 679412 (internal 79412)
E: seweradoptions@uuplc.co.uk
unitedutilities.com

If you have received a great service today why not tell us?
Visit: unitedutilities.com/wow

From: Sally Pettit [mailto:Sally.Pettit@waterco.co.uk]
Sent: 18 September 2019 11:35
To: Wastewater Developer Services <WastewaterDeveloperServices@uuplc.co.uk>
Subject: 12388-Riverview Road, Bromborough - UU developer enquiry query

Proposed industrial development on Land off Riverview Road, Bromborough, The Wirral, CH62 3RR. National Grid reference: 336018E 382727N

Dear Sir / Madam,

Please find attached a developer enquiry email chain from January 2018 which was submitted for a proposed development at Riverview Road, Bromborough. The development is now for engineering operations and use of land as a civil engineering depot. We do not anticipate any changes being made to the original drainage proposals for the site, and hardstanding areas have reduced slightly to the original plans.

The response given in January 2018 was valid for 12 months. Please can you advise if the response is still valid. I have attached a site location plan and a new development plan for reference.

Please do not hesitate to contact me should you have any queries.

Kind regards,

Sally Pettit BSc (Hons)
Environmental Consultant

Office: 01824 702220
Teams: Sally.Pettit@waterco.co.uk

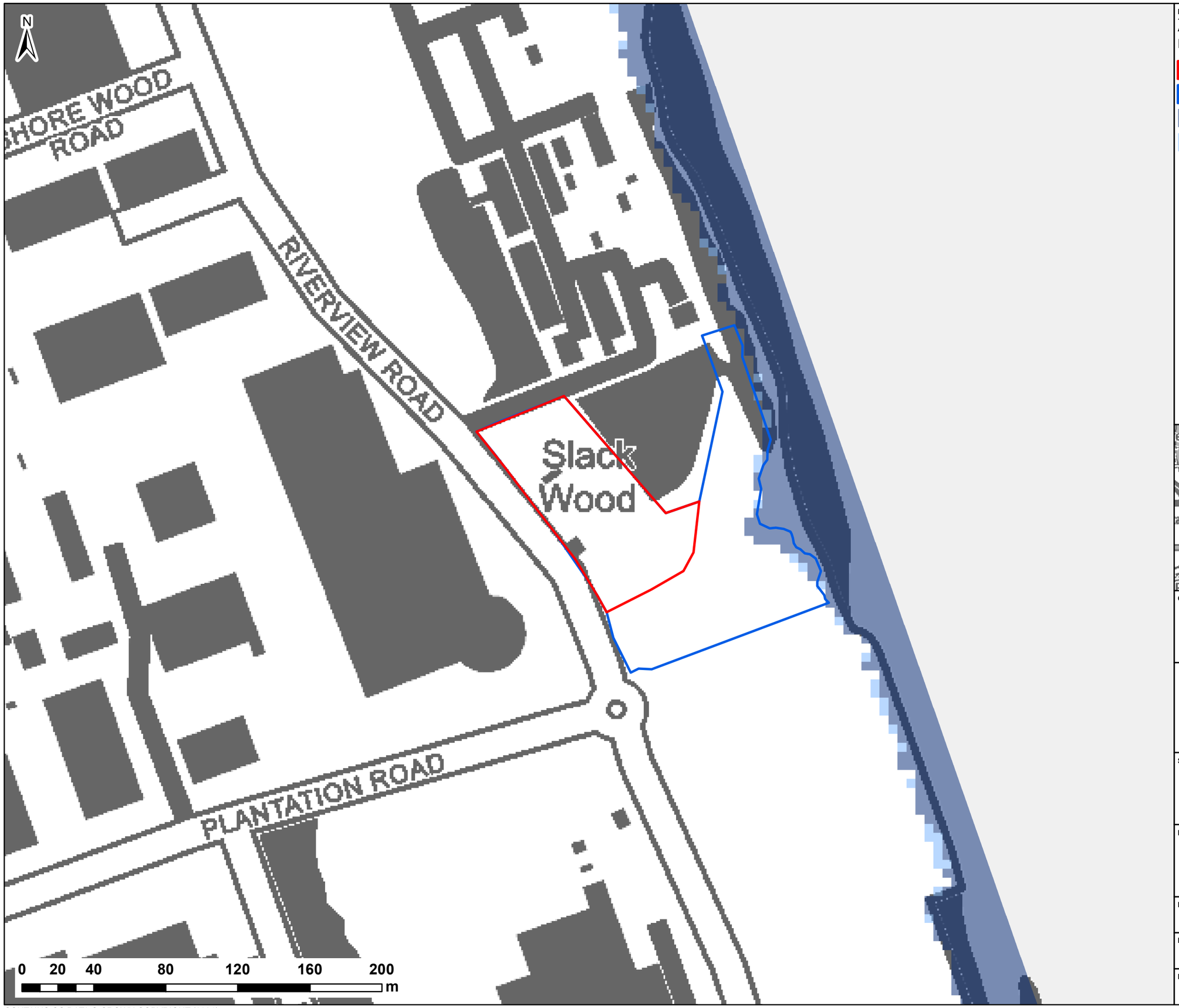
My working days are Monday, Tuesday, Thursday and Friday

Waterco
Assessment, Modelling, Design
Ruthin - Chester - Manchester - London

Shortlisted for awards in the following categories;
'*Innovation in Project Management*' & '*Impact in Water*'

New Civil Engineer 100 COMPANIES OF THE YEAR 2019

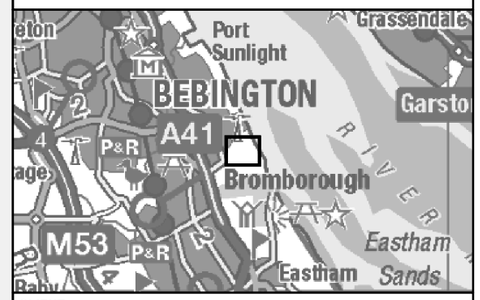
Appendix E EA Flood Maps, Correspondence and Data



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Wider Site
- EA Flood Zone 3
- EA Flood Zone 2



CLIENT:

SLACKWOOD 8 LTD

waterco

www.waterco.co.uk

SCHEME:

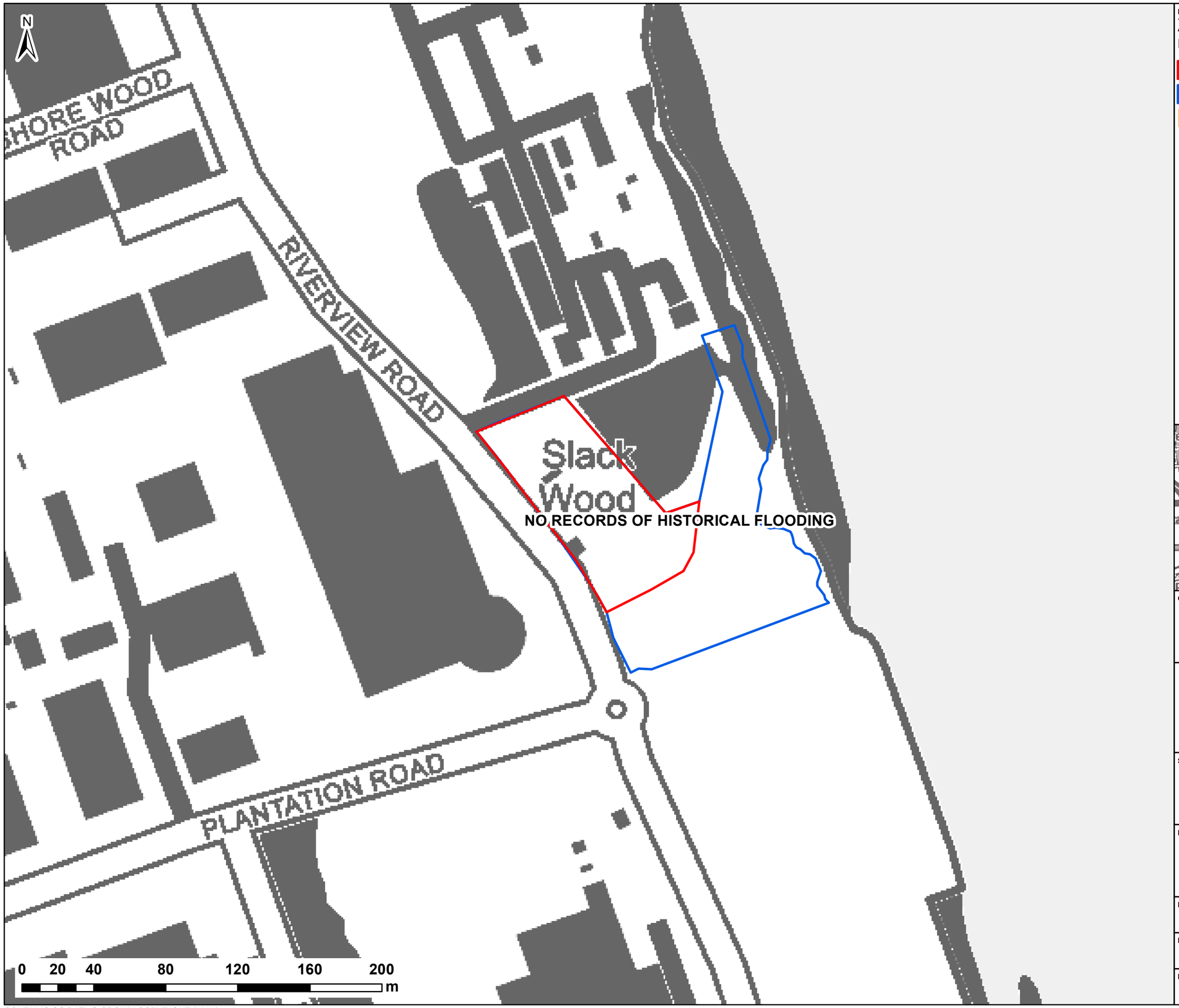
RIVERVIEW ROAD, BROMBOROUGH

PLOT TITLE:

EA FLOOD MAP FOR PLANNING

DATA ACCESSED AUGUST 2021

PLOT STATUS:			DATE:
FINAL			11/08/2021
DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
CM	AW	VG	1:2,000 (UNLESS STATED OTHERWISE)
PLOT NAME:			REV:
12416-EA_FZ			-



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Wider Site
- Historical Flood Map

CLIENT:

SLACKWOOD 8 LTD

waterco

www.waterco.co.uk

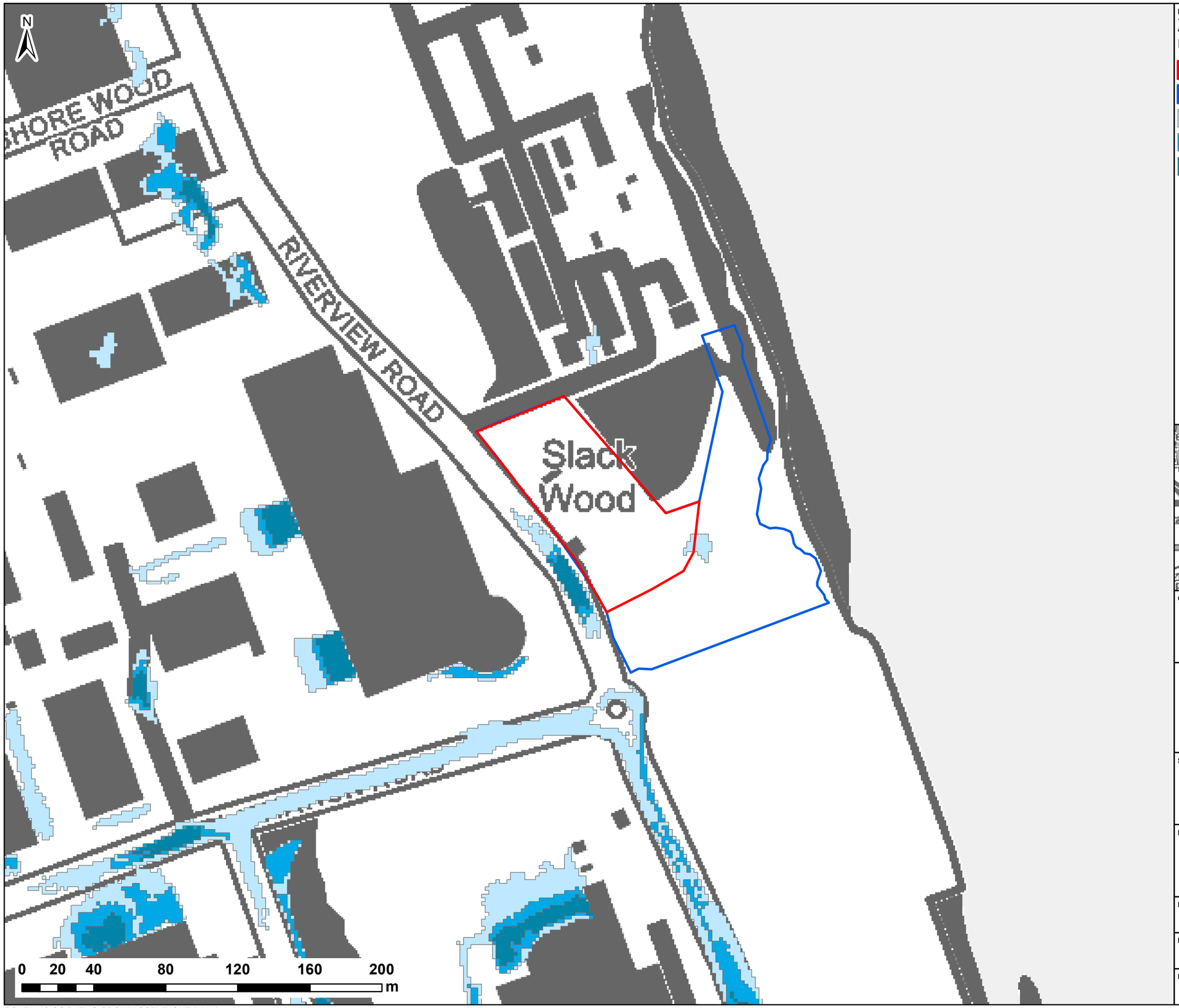
SCHEME:

RIVERVIEW ROAD, BROMBOROUGH

PLOT TITLE:

EA HISTORICAL FLOOD MAP

PLOT STATUS:			DATE:
FINAL			11/08/2021
DRAWN: CM	CHECKED: AW	APPROVED: VG	PLOT SCALE @ A3: 1:2,000 (UNLESS STATED OTHERWISE)
PLOT NAME: 12416-EA_HIST			REV: -



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Wider Site
- Low (between 0.1% and 1.0%)
- Medium (between 1.0% and 3.3%)
- High (3.3% or greater)

CLIENT:

SLACKWOOD 8 LTD

waterco

www.waterco.co.uk

SCHEME:

RIVERVIEW ROAD, BROMBOROUGH

PLOT TITLE:

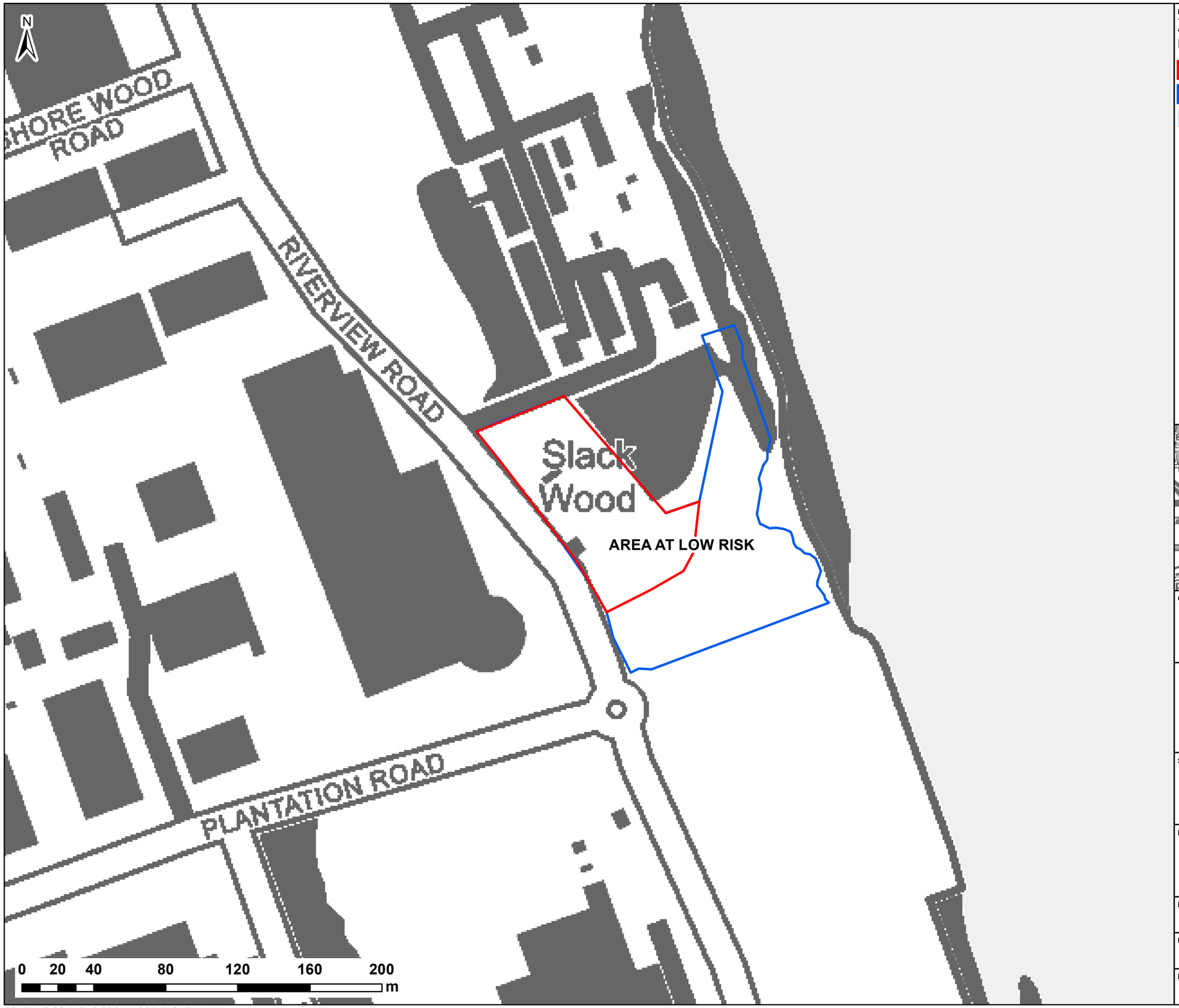
EA FLOOD RISK FROM SURFACE WATER

DATA ACCESSED AUGUST 2021

PLOT STATUS:	DATE:
FINAL	11/08/2021

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
CM	AW	VG	1:2,000 (UNLESS STATED OTHERWISE)

PLOT NAME:	REV:
12416-EA_SW	-



NOTES:
1) ALL DIMENSIONS ARE IN METRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS STATED OTHERWISE

LEGEND

- Site Boundary
- Wider Site
- EA Reservoir Flood Map

CLIENT:

SLACKWOOD 8 LTD

waterco

www.waterco.co.uk

SCHEME:

RIVERVIEW ROAD, BROMBOROUGH

PLOT TITLE:

EA FLOOD RISK FROM RESERVOIRS

DATA ACCESSED AUGUST 2021

PLOT STATUS:	DATE:
FINAL	11/08/2021

DRAWN:	CHECKED:	APPROVED:	PLOT SCALE @ A3:
CM	AW	VG	1:2,000 (UNLESS STATED OTHERWISE)

PLOT NAME:	REV:
12416-EA_RES	-

Waterco Consultants
Eden Court Business Centre Lon Parcwr
Industrial Estate
Ruthin
Clwyd
LL15 1NJ

Our ref: SO/2017/117837/01-L01
Your ref: w10324-EA

Date: 09 January 2018

FAO Sally Pettit

Dear Sally

PROPOSED INDUSTRIAL DEVELOPMENT PRELIMINARY OPINION
LAND OFF RIVERVIEW ROAD, BROMBOROUGH, THE WIRRAL, CH62 3RR

Thank you for your preliminary opinion request which was received in this office 20th December 2017. We make the following comments;

Flood Risk

Development must be safe and should not increase the risk of flooding.

You can view a site's flood zone on the Flood Map for Planning on our website:

http://apps.environment-agency.gov.uk/wiyby/37837.aspx

If your proposed development is located within flood zone 2 or 3 you should consult the Flood Risk and Coastal Change pages of the National Planning Policy Guidance (NPPG)

http://planningguidance.communities.gov.uk/blog/guidance/flood-risk-and-coastal-change/

Here you can determine whether the flood risk vulnerability of your proposed development and the flood zone are compatible. You can also establish if there are flood risk sequential test and exception test requirements for your proposed development.

If your proposed development is located within flood zone 2 or 3 and its vulnerability and flood zone are considered acceptable under the NPPG then a site specific Flood Risk Assessment (FRA) is required to support any subsequent planning application. This is required by paragraph 103 of the National Planning Policy Framework (NPPF)

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

Guidance on the content of a site specific FRA can be found on the NPPG and the .gov website:

https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

In terms of your specific parcel of land the Flood Risk Assessment should clearly demonstrate the proposed development is on that part of the site that is within Flood Zone 1.

Contaminated land

The NPPF takes a precautionary approach to land contamination. Before the principle of development can be determined, land contamination should be investigated to see whether it could preclude certain development due to environmental risk or cost of remediation.

Where contamination is known or suspected, a desk study, site investigation, remediation and other works may be required to enable safe development (paragraph 121 of the NPPF). Minimum requirements for submission with a planning application are a preliminary risk assessment, such as a site walkover or desk top study.

Site investigation and remediation strategy reports may be required for submission with a planning application for sensitive land use types or where significant contamination, or uncertainty, is found. When dealing with land affected by contamination, developers should follow the risk management framework provided in the CLR11, Model Procedures for the Management of Land Contamination:

https://www.gov.uk/government/publications/managing-land-contamination

Pollution

If the proposed development use has the potential to pollute ground or surface water receptors then an assessment to establish whether the risk of pollution is acceptable or can be satisfactorily mitigated for will be required within any planning application.

Further Advice

We are able to provide detailed and bespoke advice and answer technical questions for a charged fee which equates to £84 per hour.

If you are interested in finding out more about this service, please email:

SPPlanning.RFH@environment-agency.gov.uk

We can explain this service and provide you with a bespoke quote for further pre-application advice that you may require.

Cont/d..

This document is a response to a pre-application enquiry only and does not represent our final view in relation to any future planning application made in relation to any site. You should seek your own expert advice in relation to technical matters relevant to any planning application before submission.

If you have any questions please feel free to contact me.

Yours sincerely

Mr Stephen Sayce
Sustainable Places Planning Advisor

Direct e-mail stephen.sayce@environment-agency.gov.uk

End

Sally Pettit

From: Cooke, Claire <Claire.Cooke@environment-agency.gov.uk> on behalf of GMMC Info Requests <Inforequests.gmmc@environment-agency.gov.uk>
Sent: 04 January 2018 13:36
To: Sally Pettit
Subject: GMMC70414CC - Response from the Environment Agency
Attachments: GMMC70414CC DFM.pdf; GMMC70414CC Table.pdf

Categories: Information received

Dear Sally Pettit,

Thank you for your enquiry which was received on 15 Decemeber 2017.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Please find attached the data requested and see our officers supporting comments below:

History: We have no records of flooding affecting the site. However, this does not mean flooding has not occurred in the past or that it will not flood in future. We recommend that you also contact United Utilities and Wirral Council who may hold additional information (the former especially in relation to sewer flooding).

Defences: There are no flood defences in the vicinity of the site.

The outlines for the Mersey Estuary 2016 model are still in draft. There are plans for this to be dealt with in the next quarter but we cannot state in which quarter the reviewed model will be fully available.

Please refer to the Open Government Licence which explains the permitted use of this information.

Please get in touch if you have any further queries or contact us within two months if you'd like us to review the information we have sent.

Kind regards,

Claire Cooke
Customer and Engagement Officer
Greater Manchester, Merseyside and Cheshire
External: 0208 474 9502
Email: Inforequests.gmmc@environment-agency.gov.uk

From: Sally Pettit [mailto:Sally.Pettit@waterco.co.uk]
Sent: 15 December 2017 09:13
To: Enquiries, Unit <enquiries@environment-agency.gov.uk>
Subject: 171218/KS10 - w10324-EA 'Product 4' request

Proposed industrial development on Land off Riverview Road, Bromborough, The Wirral, CH62 3RR. National Grid reference: 336018E 382727N.

Dear Sir / Madam,

Please could you provide me with ‘Product 4’ flood level data for the site at the above address. I attach a site location plan for reference.

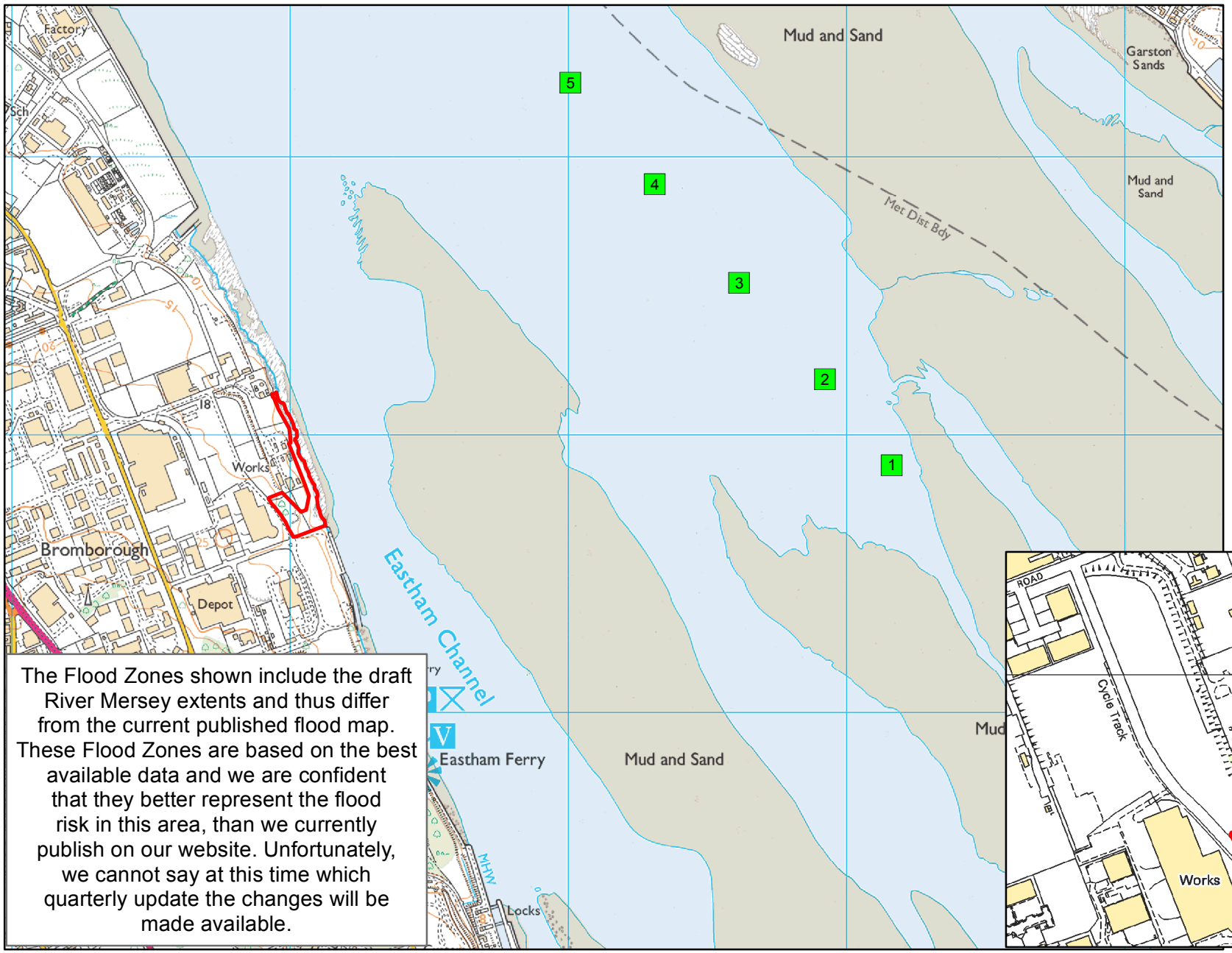
If you have any questions or require any further information to process my request please don’t hesitate to contact me.

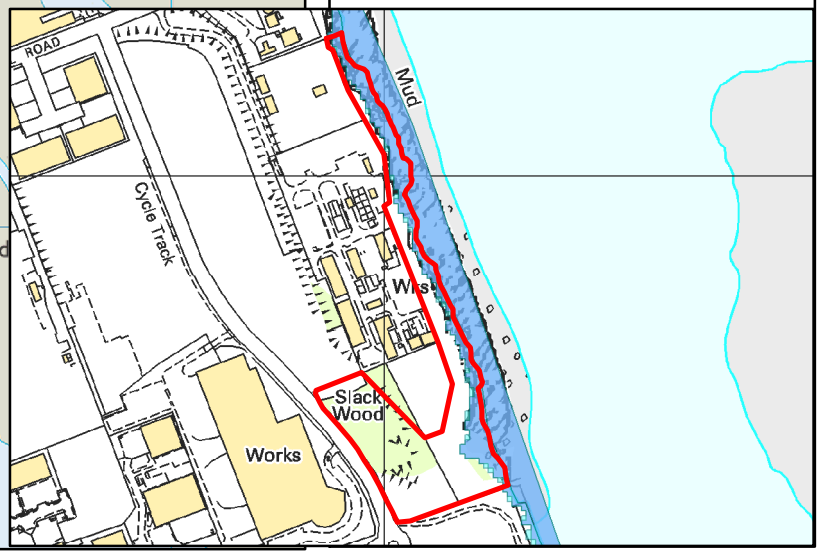
Kind Regards,

Sally Pettit
Environmental Consultant

01824 702220

Draft Flood Outline Map centred on Riverview Road, Bromborough, The Wirral, CH62 3RR. Created 28/12/2017 [GMMC70414CC]





Environment Agency

1:20,001

N

Legend

- Site Location
- Model Measurements
- Main River
- Flood Zone 3
- Flood Zone 2

The Flood Zones shown include the draft River Mersey extents and thus differ from the current published flood map. These Flood Zones are based on the best available data and we are confident that they better represent the flood risk in this area, than we currently publish on our website. Unfortunately, we cannot say at this time which quarterly update the changes will be made available.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

					Mersey Estuary 2016 - Undefended				
Map Reference	Model Node Reference	Easting	Northing	Data	1 % AEP (1 in 100 year)	0.5 % AEP (1 in 200 year)	0.5% AEP (1 in 200 year) 2065 Climate Change Scenario (Tidal)	0.5% AEP (1 in 200 year) 2115 Climate Change Scenario (Tidal)	0.1 % AEP (1 in 1000 year)
1	MEST_14250	338167	382889	Modelled Water Level (m aodN)	6.84	6.94	7.26	7.65	7.16
2	MEST_13750	337926	383197	Modelled Water Level (m aodN)	6.82	6.92	7.24	7.63	7.14
3	MEST_13250	337617	383545	Modelled Water Level (m aodN)	6.80	6.91	7.22	7.62	7.13
4	MEST_12750	337314	383900	Modelled Water Level (m aodN)	6.78	6.89	7.20	7.60	7.11
5	MEST_12250	337012	384264	Modelled Water Level (m aodN)	6.75	6.87	7.18	7.59	7.09

Model data taken from Mersey Estuary 2016 DRAFT Study

AEP - Annual Exceedence Probability

m aodN - metres above ordnance datum Newlyn

Notes:

*The impact of climate change was assessed by simulating a 200-year event including an increase in predicted sea-level rise up to the year 2065 and 2115. The new climate change guidance is available at https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances. The location of the site and the type (vulnerability) of development determine the climate change allowances to consider in any flood risk assessment.

Appendix F LLFA Correspondence

Sally Pettit

From: Chapman, Allison <allisonchapman@wirral.gov.uk> on behalf of Regen-LLFA <LLFA@wirral.gov.uk>
Sent: 04 January 2018 16:51
To: Sally Pettit
Subject: RE: w10324-LLFA pre-planning request-boundary query
Attachments: Wirral - Sustainable Drainage & Surface Water Management - Guidance for ....pdf; Wirral Council - Sustainable Drainage Operation and Maintenance Plan [No....docx

Categories: Information received

Hi Sally,

I can confirm that we hold no records of flooding in the vicinity of this location, however it is worth bearing in mind that as the area is not residential reporting rates may not be reflective. The adopted highway outside the development is shown as high risk of surface water flooding on flood maps. The discharge rate should be restricted to greenfield runoff rates, unless the greenfield runoff rate is less than 5 l/s, in which case it should be limited to 5 l/s with the 1 in 100 (plus appropriate climate change allowance) event retained within the curtilage of the site. I have attached a copy of our guidance for developers to assist you with your drainage strategy – there is a checklist at the back listing the requirements for outline and full applications. Applications that omit the required information and require repeated re-submissions inevitably result in delays. The guidance addresses climate change allowances, which are dependent on the expected lifetime of the development, however if in doubt apply the higher allowance for that epoch.

Since it is easier to know these things from the outset and plan accordingly, please also note that the applicant must enter into a Section 106 agreement *before* the grant of planning permission, requiring that any communal elements of the sustainable drainage system, not adopted by the Water and Sewerage Company, are maintained in perpetuity in accordance with a specified maintenance and inspection schedule which must cover all components and be submitted for approval by the LLFA. I have also attached a copy of a blank Operation and Maintenance Plan for info. Consideration should be given to the fact that maintenance and operation requirements should be economically proportionate.

Also, my maps show the perimeter of the site encroaching into flood zone 2/3. I am unsure if this is as a result of the scale of the mapping layers, but I would encourage you to consult the Environment Agency if you have not already done so.

I hope this response is of assistance.

Kind regards,

Allison Chapman
Lead Local Flood Authority
Environmental Services, Wirral Council
Cheshire Lines Building, Canning Street,
Birkenhead, WIRRAL
CH41 1ND
email: LLFA@wirral.gov.uk

From: Sally Pettit [mailto:Sally.Pettit@waterco.co.uk]
Sent: 04 January 2018 15:17
To: Regen-LLFA
Subject: RE: w10324-LLFA pre-planning request-boundary query

Proposed industrial development on Land off Riverview Road, Bromborough, The Wirral, CH62 3RR. National Grid reference: 336018E 382727N

Dear Alison,

Thank you for your recent email regarding the above site. The area for proposed development is the red area on the red/blue plan (the red outline is very faint) and this area corresponds to the development plan attached. The blue area is within the same ownership, but is not included as part of the developable area. I have attached both plans again for your convenience.

Kind regards

Sally Pettit
Environmental Consultant

01824 702220

Waterco consultants
Assessment, Modelling, Design
Ruthin - Chester - Manchester - Hyderabad

20 Years 1998 . 2018

From: Chapman, Allison [mailto:allisonchapman@wirral.gov.uk] **On Behalf Of** Regen-LLFA
Sent: 04 January 2018 14:40
To: Sally Pettit <Sally.Pettit@waterco.co.uk>
Subject: RE: w10324-LLFA pre-planning request

Hi Sally,

Can you clarify the site boundary please? I'm not certain how the site plan fits in with the red/blue plan.

Kind regards,

Allison Chapman
Lead Local Flood Authority
Environmental Services, Wirral Council
Cheshire Lines Building, Canning Street,
Birkenhead, WIRRAL
CH41 1ND
email: LLFA@wirral.gov.uk

From: Sally Pettit [mailto:Sally.Pettit@waterco.co.uk]
Sent: 15 December 2017 10:05
To: Regen-LLFA
Subject: w10324-LLFA pre-planning request

Proposed industrial development on Land off Riverview Road, Bromborough, The Wirral, CH62 3RR. National Grid reference: 336018E 382727N

Dear Sir / Madam,

Please can you provide us with a pre-planning opinion in relation to flood risk and drainage for the proposed development at the above site.

The proposed development is for 6no. industrial units with associated access and parking. I attach a proposed development plan and site location plan for reference.

Please could you advise if there will be any specific requirements for a Surface Water Drainage Strategy at this site i.e. specify any flow rate requirements and attenuation storage requirements (i.e. confirm the %age climate change to be applied for commercial units).

Please could you also advise if you have any records of historical flooding in this area?

If you have any questions or require any further information to process my request please don't hesitate to contact me.

Kind regards,

Sally Pettit
Environmental Consultant

01824 702220

Appendix G ReFH2 Greenfield Runoff Rates

DOCUMENT VERIFICATION RECORD	
Project:	Riverview Road, Bromborough
Client:	Slackwood 8 Ltd
Report Title:	Flood Risk Assessment & Drainage Strategy
Date:	11th August 2021

DOCUMENT REVIEW & APPROVAL	
Author:	Ceire McGough BSc (Hons) AMIEnvSc
Checker:	Aled Williams BSc (Hons) MCIWEM
Approver:	Victoria Griffin BSc (Hon) MSc MIEnvSc CEnv

Return Period (Years)	As-rural Peak Flow (l/s)
1	3.3
2	3.7
5	5.1
10	6.1
30	8.2
50	9.5
75	10.6
100	11.5
200	14.0
1000	20.9

*Runoff Rates printed from the ReFH Flood Modelling software package

Appendix H MicroDrainage Storage Volumes

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	9.382	0.382	3.3	153.0	O K
30 min Summer	9.500	0.500	3.3	200.1	O K
60 min Summer	9.624	0.624	3.3	249.6	O K
120 min Summer	9.728	0.728	3.3	291.3	Flood Risk
180 min Summer	9.786	0.786	3.3	314.3	Flood Risk
240 min Summer	9.821	0.821	3.3	328.6	Flood Risk
360 min Summer	9.859	0.859	3.3	343.5	Flood Risk
480 min Summer	9.871	0.871	3.3	348.3	Flood Risk
600 min Summer	9.869	0.869	3.3	347.6	Flood Risk
720 min Summer	9.859	0.859	3.3	343.6	Flood Risk
960 min Summer	9.828	0.828	3.3	331.1	Flood Risk
1440 min Summer	9.766	0.766	3.3	306.4	Flood Risk
2160 min Summer	9.682	0.682	3.3	272.8	O K
2880 min Summer	9.603	0.603	3.3	241.3	O K
4320 min Summer	9.473	0.473	3.3	189.3	O K
5760 min Summer	9.381	0.381	3.3	152.4	O K
7200 min Summer	9.317	0.317	3.3	126.8	O K
8640 min Summer	9.271	0.271	3.3	108.4	O K
10080 min Summer	9.238	0.238	3.3	95.4	O K
15 min Winter	9.429	0.429	3.3	171.5	O K
30 min Winter	9.561	0.561	3.3	224.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	125.328	0.0	151.1	16
30 min Summer	82.584	0.0	197.8	31
60 min Summer	52.140	0.0	257.1	62
120 min Summer	31.151	0.0	306.7	122
180 min Summer	22.931	0.0	338.3	182
240 min Summer	18.391	0.0	361.4	242
360 min Summer	13.392	0.0	393.9	360
480 min Summer	10.632	0.0	416.0	480
600 min Summer	8.860	0.0	432.3	600
720 min Summer	7.619	0.0	444.8	720
960 min Summer	5.980	0.0	461.8	874
1440 min Summer	4.222	0.0	469.8	1108
2160 min Summer	2.965	0.0	528.2	1496
2880 min Summer	2.312	0.0	549.1	1904
4320 min Summer	1.642	0.0	584.2	2640
5760 min Summer	1.303	0.0	619.0	3400
7200 min Summer	1.106	0.0	656.9	4112
8640 min Summer	0.979	0.0	697.6	4840
10080 min Summer	0.891	0.0	740.5	5544
15 min Winter	125.328	0.0	168.9	16
30 min Winter	82.584	0.0	220.0	31

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	9.701	0.701	3.3	280.4	Flood Risk
120 min Winter	9.819	0.819	3.3	327.7	Flood Risk
180 min Winter	9.886	0.886	3.3	354.3	Flood Risk
240 min Winter	9.928	0.928	3.3	371.2	Flood Risk
360 min Winter	9.974	0.974	3.3	389.7	Flood Risk
480 min Winter	9.992	0.992	3.3	396.8	Flood Risk
600 min Winter	9.994	0.994	3.3	397.8	Flood Risk
720 min Winter	9.988	0.988	3.3	395.1	Flood Risk
960 min Winter	9.959	0.959	3.3	383.5	Flood Risk
1440 min Winter	9.881	0.881	3.3	352.4	Flood Risk
2160 min Winter	9.776	0.776	3.3	310.2	Flood Risk
2880 min Winter	9.676	0.676	3.3	270.4	O K
4320 min Winter	9.476	0.476	3.3	190.5	O K
5760 min Winter	9.339	0.339	3.3	135.4	O K
7200 min Winter	9.250	0.250	3.3	99.9	O K
8640 min Winter	9.193	0.193	3.2	77.1	O K
10080 min Winter	9.156	0.156	3.1	62.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	52.140	0.0	287.7	62
120 min Winter	31.151	0.0	343.1	120
180 min Winter	22.931	0.0	378.2	180
240 min Winter	18.391	0.0	403.8	238
360 min Winter	13.392	0.0	439.4	354
480 min Winter	10.632	0.0	463.2	470
600 min Winter	8.860	0.0	479.7	582
720 min Winter	7.619	0.0	491.1	694
960 min Winter	5.980	0.0	500.2	912
1440 min Winter	4.222	0.0	483.5	1154
2160 min Winter	2.965	0.0	591.6	1620
2880 min Winter	2.312	0.0	614.7	2076
4320 min Winter	1.642	0.0	654.2	2852
5760 min Winter	1.303	0.0	693.5	3576
7200 min Winter	1.106	0.0	735.8	4256
8640 min Winter	0.979	0.0	781.1	4928
10080 min Winter	0.891	0.0	829.6	5552

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 324082 385404 SJ 24082 85404
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.660

Time (mins) From:	To:	Area (ha)
0	1	0.660

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	400.0	1.000	400.0

Hydro-Brake® Optimum Outflow Control

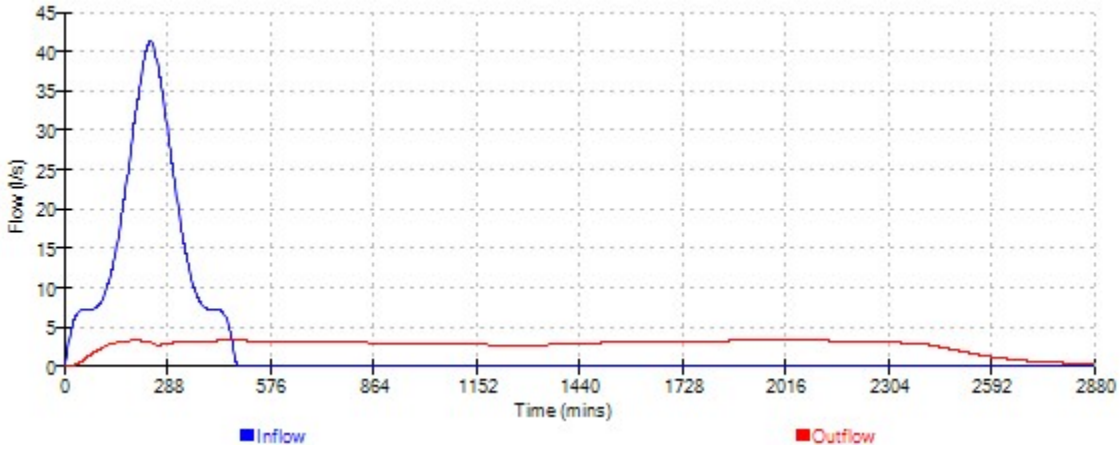
Unit Reference	MD-SHE-0086-3300-1000-3300
Design Head (m)	1.000
Design Flow (l/s)	3.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	86
Invert Level (m)	8.995
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

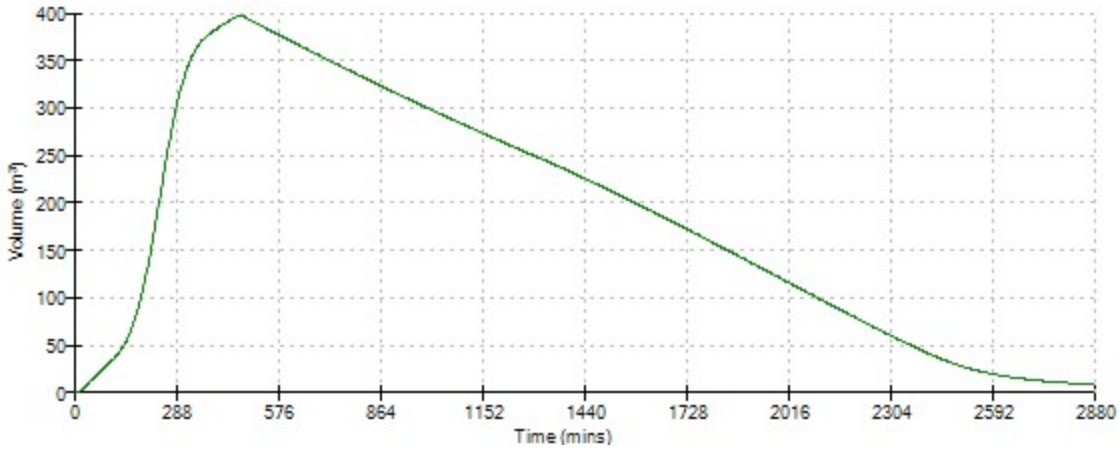
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.3
Flush-Flo™	0.296	3.3
Kick-Flo®	0.624	2.7
Mean Flow over Head Range	-	2.9

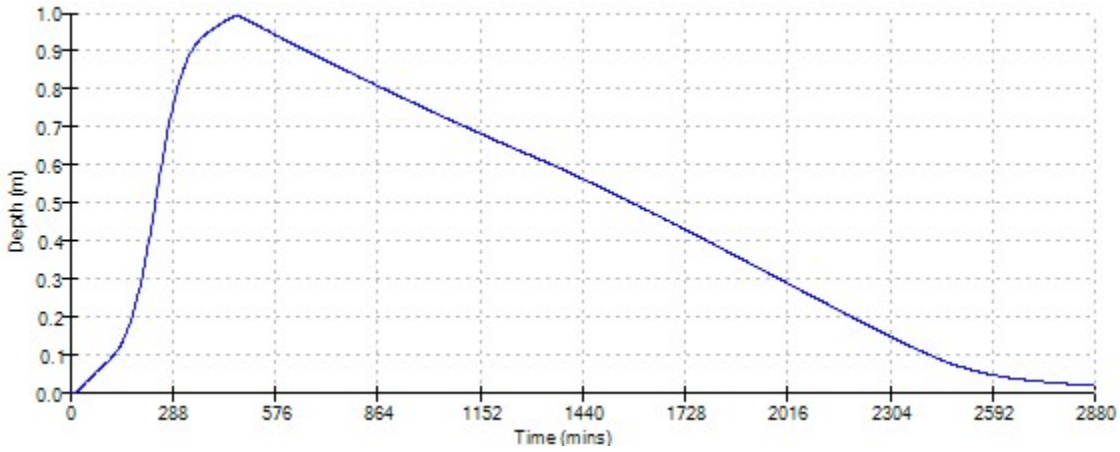
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.6	1.200	3.6	3.000	5.5	7.000	8.2
0.200	3.2	1.400	3.9	3.500	5.9	7.500	8.5
0.300	3.3	1.600	4.1	4.000	6.3	8.000	8.7
0.400	3.2	1.800	4.3	4.500	6.6	8.500	9.0
0.500	3.1	2.000	4.5	5.000	7.0	9.000	9.2
0.600	2.8	2.200	4.8	5.500	7.3	9.500	9.5
0.800	3.0	2.400	4.9	6.000	7.6		
1.000	3.3	2.600	5.1	6.500	7.9		

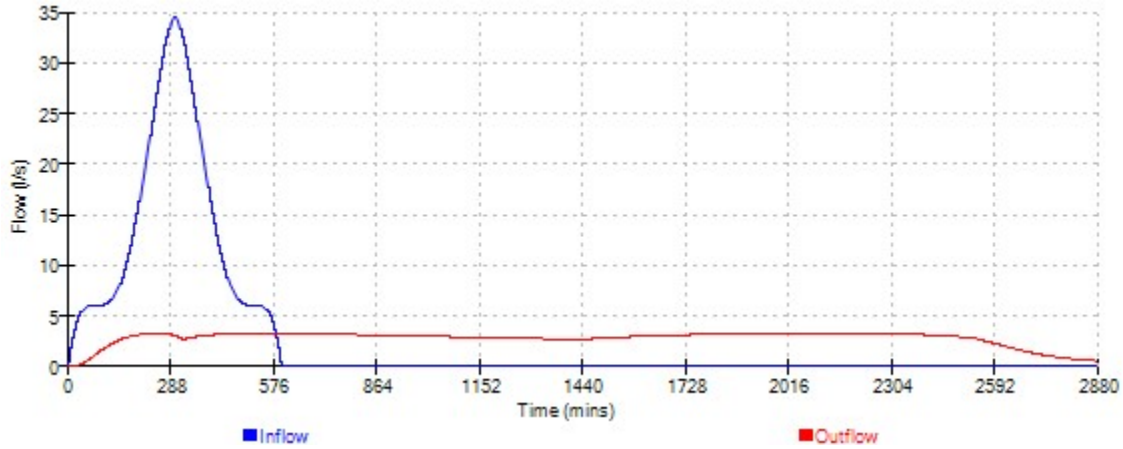
Event: 480 min Winter

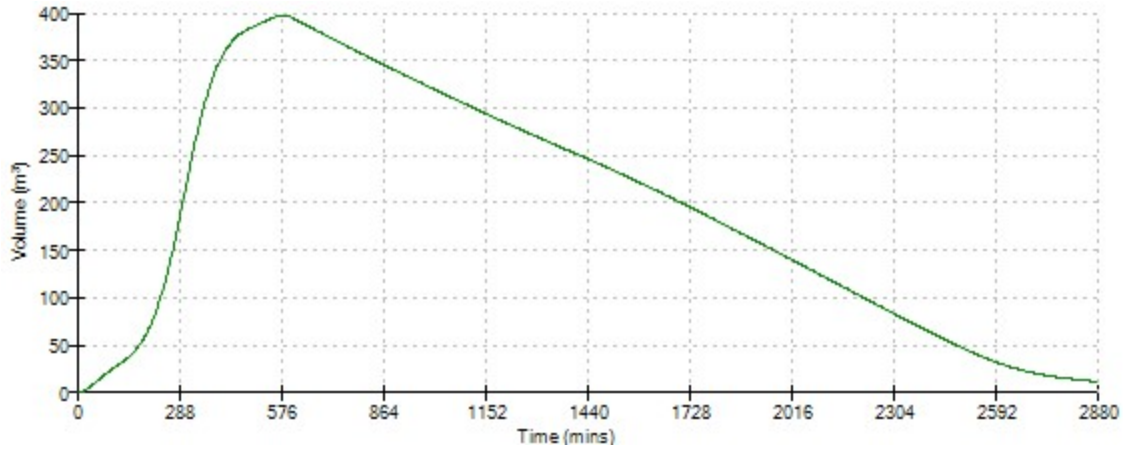


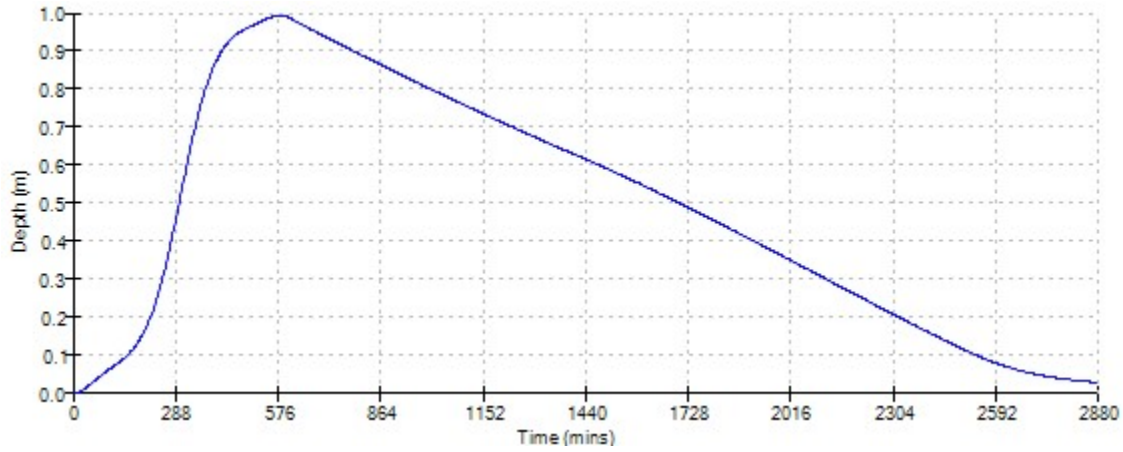




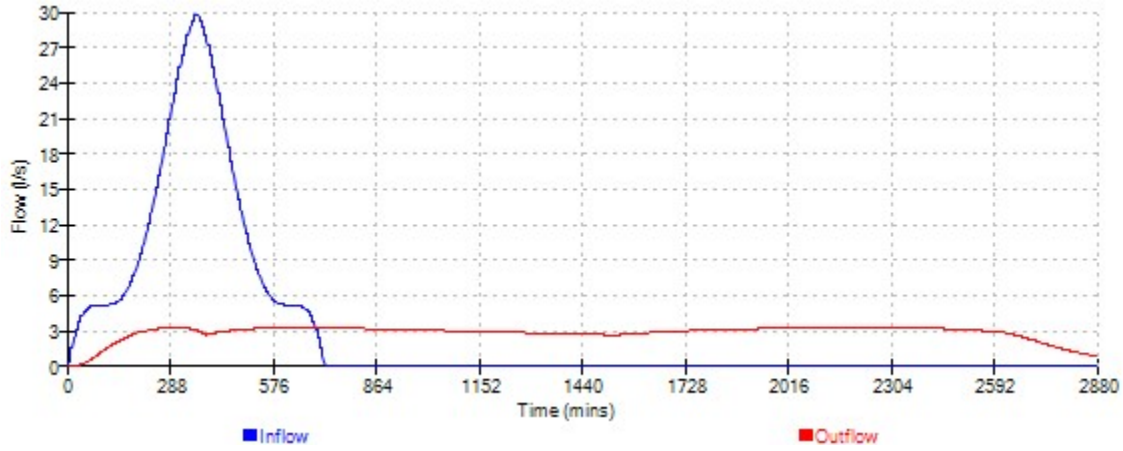
Event: 600 min Winter

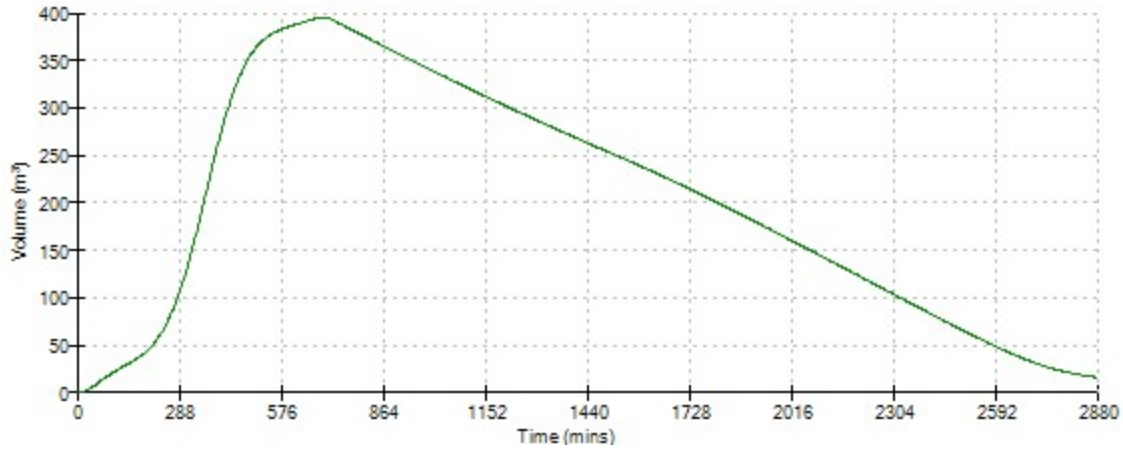


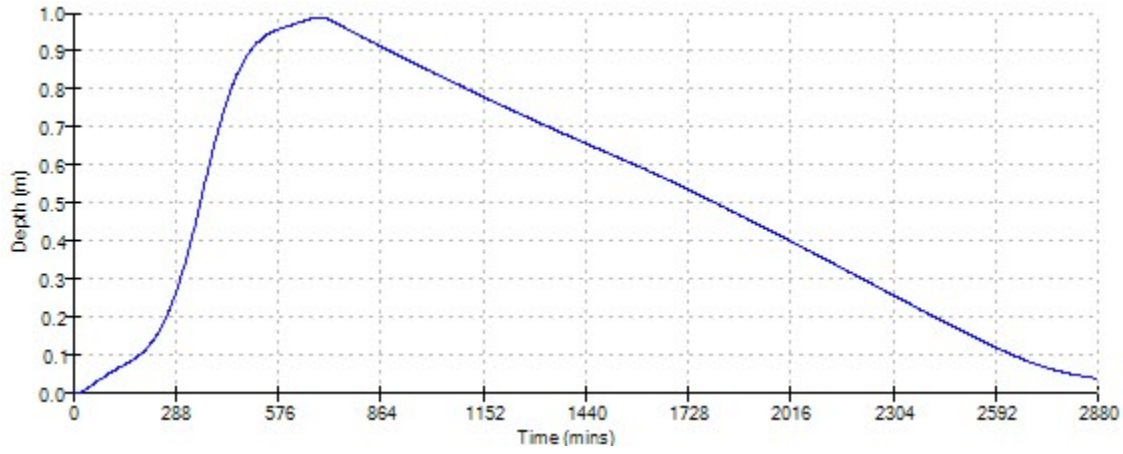




Event: 720 min Winter







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	9.373	0.373	3.3	178.8	O K
30 min Summer	9.488	0.488	3.3	234.2	O K
60 min Summer	9.609	0.609	3.3	292.5	O K
120 min Summer	9.714	0.714	3.3	342.7	Flood Risk
180 min Summer	9.773	0.773	3.3	371.2	Flood Risk
240 min Summer	9.811	0.811	3.3	389.5	Flood Risk
360 min Summer	9.854	0.854	3.3	410.0	Flood Risk
480 min Summer	9.872	0.872	3.3	418.5	Flood Risk
600 min Summer	9.876	0.876	3.3	420.6	Flood Risk
720 min Summer	9.872	0.872	3.3	418.6	Flood Risk
960 min Summer	9.849	0.849	3.3	407.7	Flood Risk
1440 min Summer	9.793	0.793	3.3	380.8	Flood Risk
2160 min Summer	9.718	0.718	3.3	344.6	Flood Risk
2880 min Summer	9.653	0.653	3.3	313.5	O K
4320 min Summer	9.534	0.534	3.3	256.3	O K
5760 min Summer	9.447	0.447	3.3	214.5	O K
7200 min Summer	9.386	0.386	3.3	185.1	O K
8640 min Summer	9.340	0.340	3.3	163.0	O K
10080 min Summer	9.306	0.306	3.3	146.9	O K
15 min Winter	9.418	0.418	3.3	200.5	O K
30 min Winter	9.547	0.547	3.3	262.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	146.216	0.0	173.7	16
30 min Summer	96.348	0.0	225.6	31
60 min Summer	60.831	0.0	298.7	62
120 min Summer	36.343	0.0	355.9	122
180 min Summer	26.753	0.0	391.9	182
240 min Summer	21.456	0.0	417.9	242
360 min Summer	15.624	0.0	453.5	362
480 min Summer	12.404	0.0	476.0	480
600 min Summer	10.337	0.0	490.1	600
720 min Summer	8.888	0.0	497.2	720
960 min Summer	6.977	0.0	495.5	960
1440 min Summer	4.926	0.0	473.5	1180
2160 min Summer	3.459	0.0	615.5	1556
2880 min Summer	2.697	0.0	639.2	1964
4320 min Summer	1.916	0.0	679.6	2724
5760 min Summer	1.520	0.0	722.2	3464
7200 min Summer	1.291	0.0	766.4	4248
8640 min Summer	1.142	0.0	813.7	4936
10080 min Summer	1.040	0.0	863.3	5656
15 min Winter	146.216	0.0	193.9	16
30 min Winter	96.348	0.0	248.1	31

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	9.685	0.685	3.3	328.6	O K
120 min Winter	9.803	0.803	3.3	385.3	Flood Risk
180 min Winter	9.871	0.871	3.3	418.0	Flood Risk
240 min Winter	9.915	0.915	3.3	439.3	Flood Risk
360 min Winter	9.967	0.967	3.3	464.1	Flood Risk
480 min Winter	9.990	0.990	3.3	475.4	Flood Risk
600 min Winter	9.999	0.999	3.3	479.4	Flood Risk
720 min Winter	9.998	0.998	3.3	479.1	Flood Risk
960 min Winter	9.980	0.980	3.3	470.5	Flood Risk
1440 min Winter	9.916	0.916	3.3	439.4	Flood Risk
2160 min Winter	9.822	0.822	3.3	394.7	Flood Risk
2880 min Winter	9.738	0.738	3.3	354.4	Flood Risk
4320 min Winter	9.571	0.571	3.3	274.2	O K
5760 min Winter	9.434	0.434	3.3	208.2	O K
7200 min Winter	9.340	0.340	3.3	163.1	O K
8640 min Winter	9.273	0.273	3.3	130.9	O K
10080 min Winter	9.226	0.226	3.3	108.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	60.831	0.0	334.0	62
120 min Winter	36.343	0.0	397.5	120
180 min Winter	26.753	0.0	436.8	180
240 min Winter	21.456	0.0	464.5	238
360 min Winter	15.624	0.0	499.0	356
480 min Winter	12.404	0.0	513.5	472
600 min Winter	10.337	0.0	514.7	584
720 min Winter	8.888	0.0	511.9	700
960 min Winter	6.977	0.0	503.1	922
1440 min Winter	4.926	0.0	481.2	1326
2160 min Winter	3.459	0.0	688.9	1648
2880 min Winter	2.697	0.0	715.3	2128
4320 min Winter	1.916	0.0	759.8	2984
5760 min Winter	1.520	0.0	808.9	3744
7200 min Winter	1.291	0.0	858.7	4464
8640 min Winter	1.142	0.0	911.6	5184
10080 min Winter	1.040	0.0	967.3	5848

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 324082 385404 SJ 24082 85404
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.660

Time (mins) From:	To:	Area (ha)
0	1	0.660

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 9.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	480.0	1.000	480.0

Hydro-Brake® Optimum Outflow Control

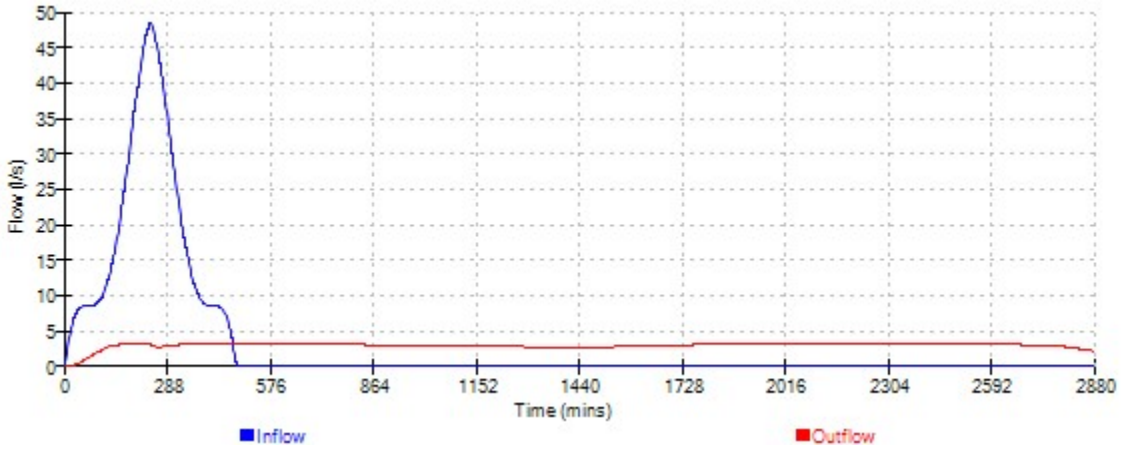
Unit Reference	MD-SHE-0086-3300-1000-3300
Design Head (m)	1.000
Design Flow (l/s)	3.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	86
Invert Level (m)	8.995
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

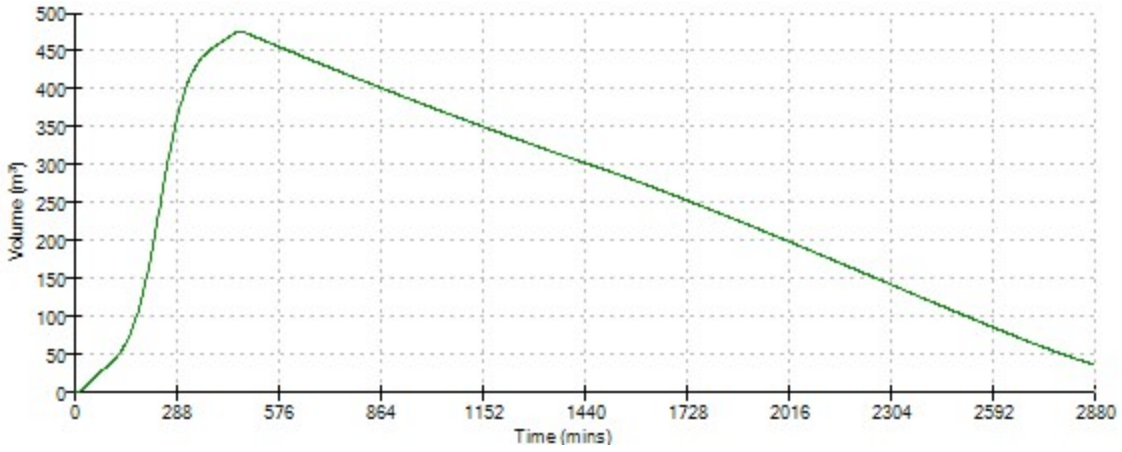
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.3
Flush-Flo™	0.296	3.3
Kick-Flo®	0.624	2.7
Mean Flow over Head Range	-	2.9

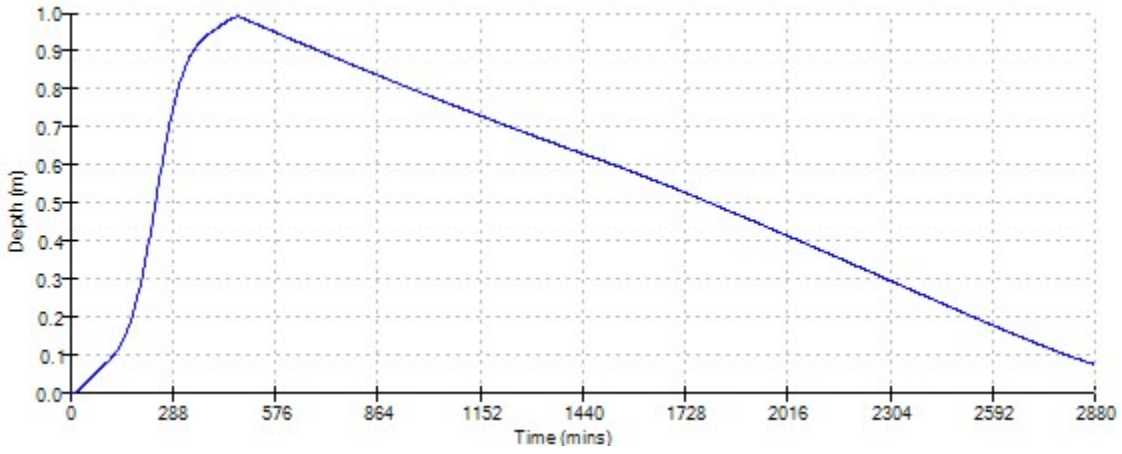
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.6	1.200	3.6	3.000	5.5	7.000	8.2
0.200	3.2	1.400	3.9	3.500	5.9	7.500	8.5
0.300	3.3	1.600	4.1	4.000	6.3	8.000	8.7
0.400	3.2	1.800	4.3	4.500	6.6	8.500	9.0
0.500	3.1	2.000	4.5	5.000	7.0	9.000	9.2
0.600	2.8	2.200	4.8	5.500	7.3	9.500	9.5
0.800	3.0	2.400	4.9	6.000	7.6		
1.000	3.3	2.600	5.1	6.500	7.9		

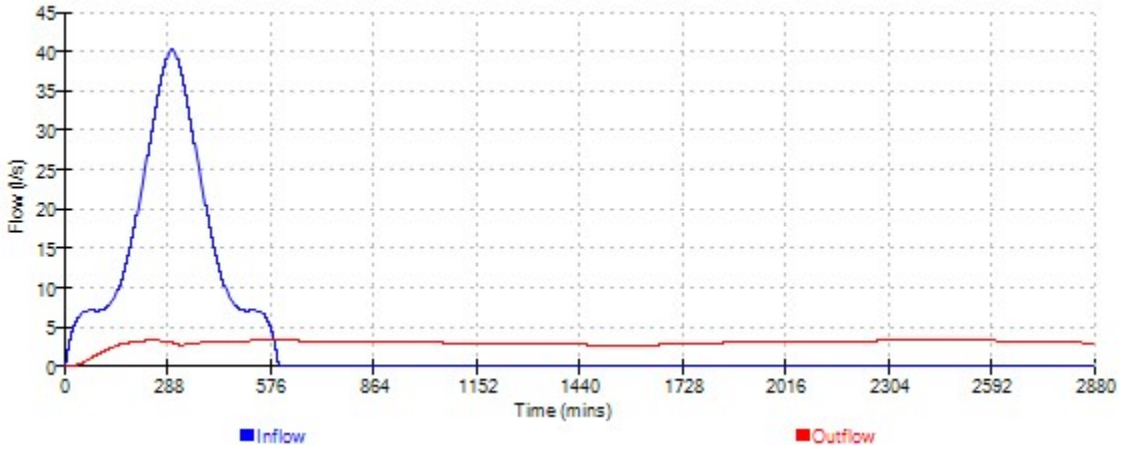
Event: 480 min Winter

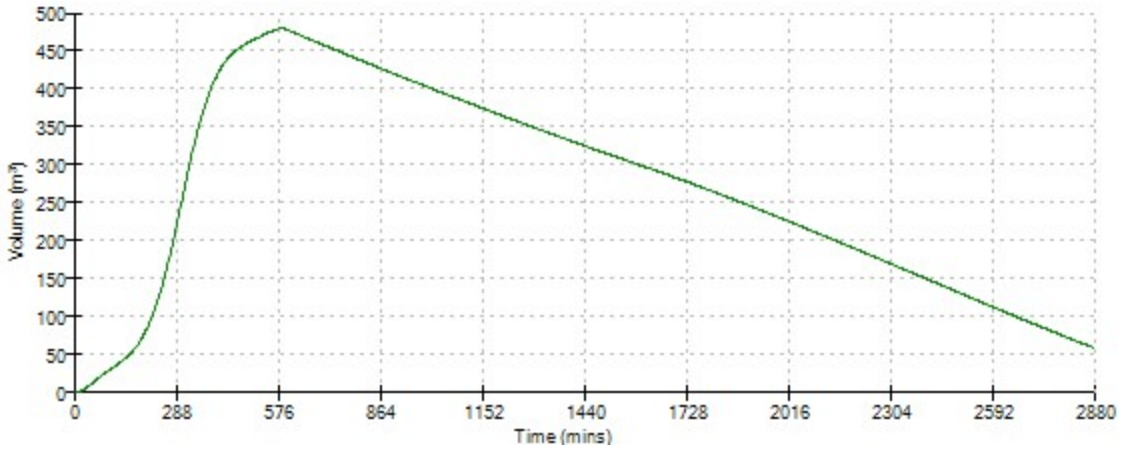


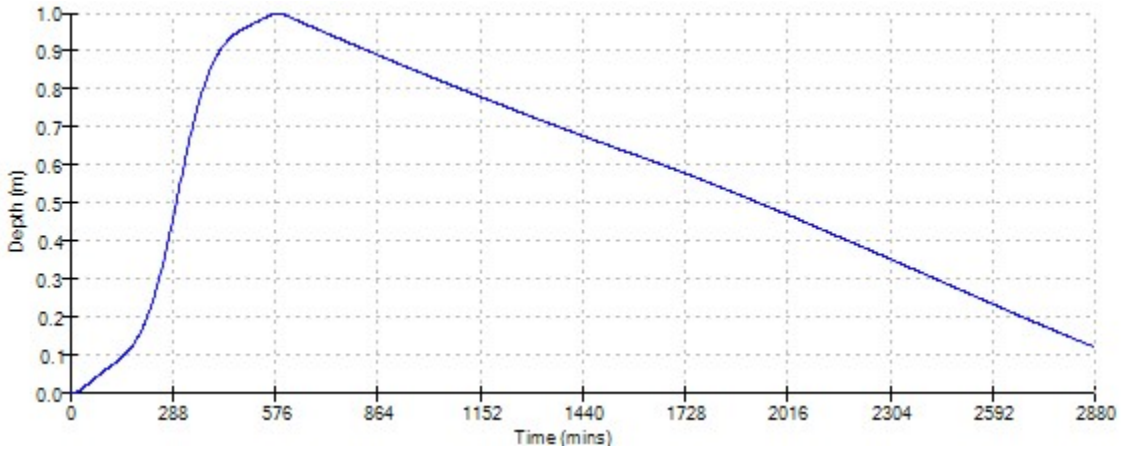




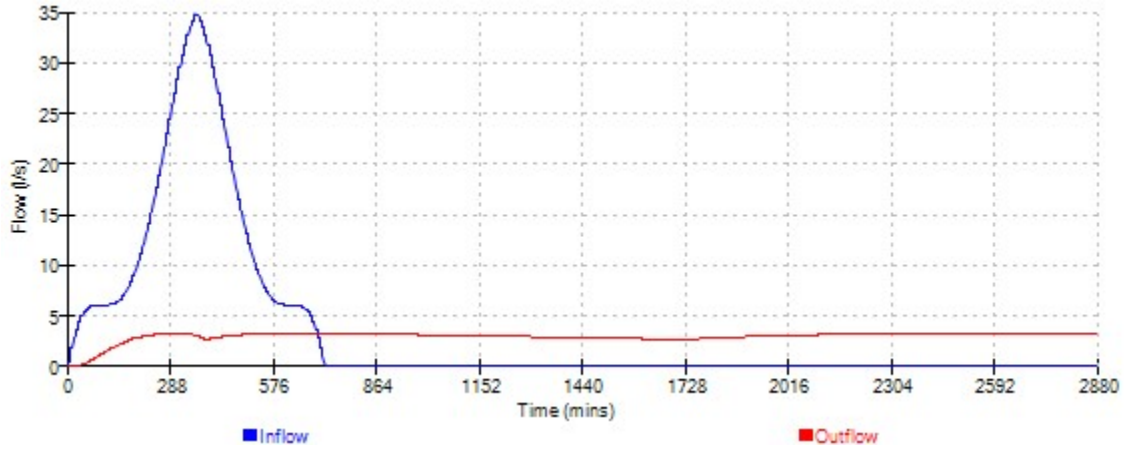
Event: 600 min Winter

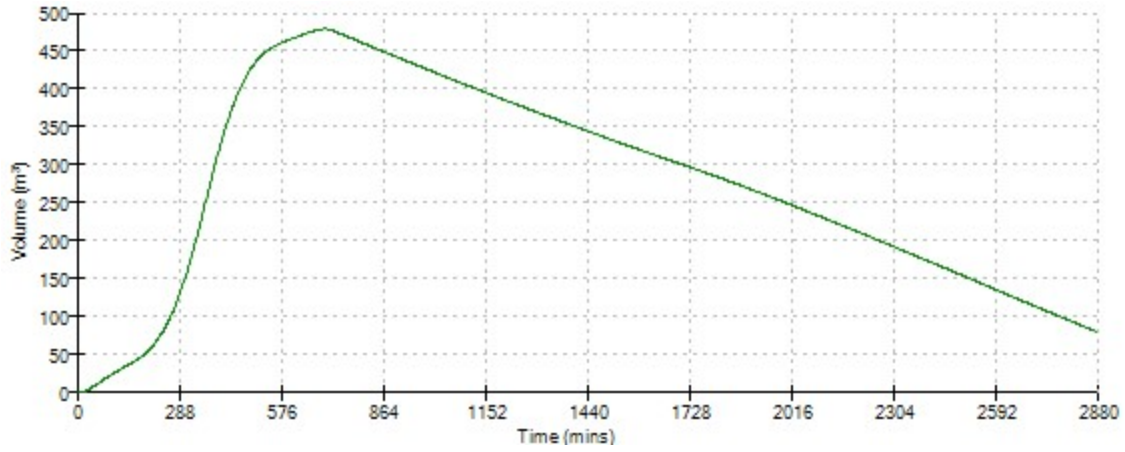


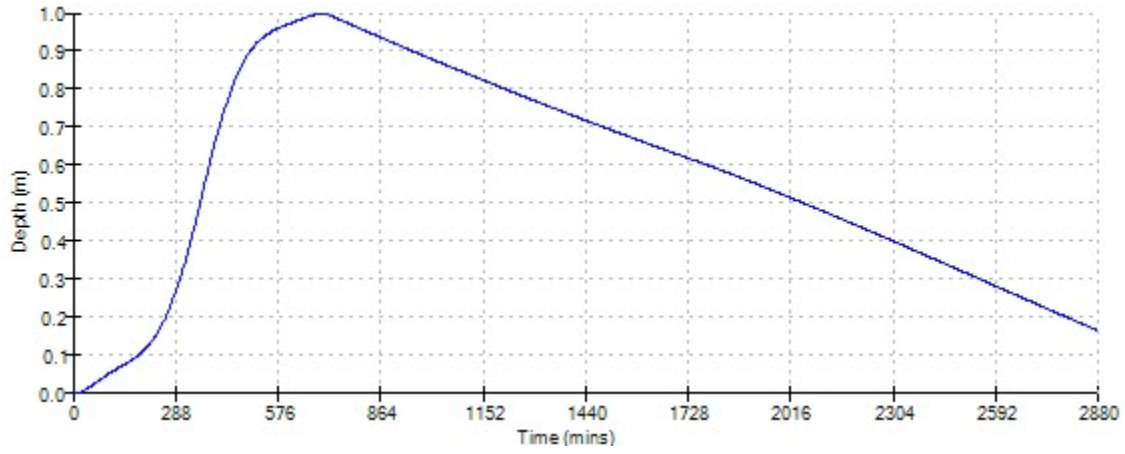




Event: 720 min Winter







Appendix I Maintenance Schedule

Operation and Maintenance Requirements for Attenuation Storage Tanks

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove If necessary	Every 5 years or as required

Ref. Table 21.3, CIRIA C753 'The SuDS Manual'

The maintenance requirements detailed above are to be undertaken by the site owner.

Name: .....

Position: .....

Date: .....

Signed on behalf Of the site owner .....

Appendix J Concept Designer's Risk Assessment

CONCEPT DESIGNER'S RISK ASSESSMENT

Project:	Riverview Road, Bromborough	**Project No:**	12416
Client:	Slackwood 8 Ltd		
Report Reference:	12416-FCA and Drainage Strategy-04		

Prepared by:	Ceire McGough	**Date:**	12/08/2021
Checked by:	Aled Williams	**Date:**	13/08/2021
Reviewed by:	Victoria Griffin	**Date:**	13/08/2021

Requirement:

The Construction (Design and Managment) Regulations 2015 (CDM 2015) place an obligation on the Designer to take all reasonable steps to provide, with the design, sufficient information about the design, construction or maintenance of the structure, to adequately assist the client, other designers and contractors to comply with their duties under CDM. The Designer has undertaken this assessment to identify any extra-ordinary risks, or those that would not be expected on this particular project by an experienced and competent Contractor. The aim is to avoid needless paperwork and bureaucracy and ensure the assessment is project specific, relevant and proportionate to the risk.

DRA Summary

Each of the following risk areas has been considered using the question below. Is a risk present which is considered to be **extra-ordinary or unexpected** in this instance?

If **YES** - A detailed risk assessment is required at design stage
If **UNKNOWN** - Insufficient information has been provided at concept design stage and the risks are unknown. Further consideration must be given at design stage(s)
If **NO** - No further action is required.

Hazard Ref.	Risk Areas	YES, UNKNOWN or NO	Comments
1	Ground Conditions	Unknown	Made Ground imported
2	Hazardous Environment	Unknown	Made Ground imported
3	Existing Working Environment	Unknown	
4	Existing Services	Unknown	
5	Proximity to Other Structure(s)	Unknown	
6	Near Waterbody / flood risk	Yes	River Mersey 70m east of the site
7	Proximity to Other Activities	Unknown	
8	Sequence of Construction	Unknown	
9	Access	Unknown	
10	Interfaces	Unknown	
11	Confined Space Working	Unknown	
12	Maintenance Considerations	Unknown	
13	Working at Height	Unknown	
14	Steep Slopes	Unknown	Ground raising has elevated site above land to the east
15	Demolition / Refurbishment / Repair	Unknown	
16	Welfare	Unknown	
17	Occupational Health	Unknown	
18	Environmental Issues	Unknown	
19	Other Significant Hazards not Identified Above	Unknown	
20	Residual Risk to Future Users	Unknown	