

Technical Note: Spindlewood Drive, Bexhill-on-Sea

Author(s): Simon Maiden-Brooks *BSc. (Hons) MSc. C.Eng C.WEM MCIWEM*
Technical Director & Partner



Date: 16 April 2019

Project: 1764 – Spindlewood Drive

Revision: 2_Final

1. Background Information

- 1.1. Herrington Consulting Ltd. was commissioned in 2017 by **Bedford Park Developments** to prepare a Flood Risk Assessment (FRA) and Drainage Strategy for the proposed development at Spindlewood Drive, Bexhill-on-Sea.
- 1.2. Following submission of the FRA report, an objection was raised by the Environment Agency (EA) and Natural England (NE) to the proposals for a wetland on the eastern field. The wetland was specified in the drainage strategy as a sustainable solution to store surface water run-off from the proposed development, before discharging to the neighbouring watercourse (Cole Stream) at an attenuated rate.
- 1.3. A meeting was held on 29th of August 2018 at Rother District Council (RDC) offices with NE, EA, RDC, Pevensey and Cuckmere Water Level Management Board (PCWLM), East Sussex Lead Local Flood Authority (LLFA), Bedford Park Developments, Aspect Ecology and Herrington Consulting in attendance. The primary focus of the meeting was to address the concerns raised by NE and EA in relation to the Appropriate Assessment and the proposed wetland, and to determine what additional information would be required to be submitted to address these concerns.
- 1.4. Herrington Consulting recorded the key points and actions from the meeting, and a copy of these actions were circulated to the group for comment (email dated 07 September 2018).
- 1.5. The actions were updated on receipt of the comments received back and re-circulated in an e-mail as a progress report (e-mail dated 21 September 2018).
- 1.6. A copy of all of the relevant correspondence has been appended for reference, and from this information it is evident that all in attendance were in agreement that the content of the e-mail was a true reflection of the discussions and actions agreed.
- 1.7. Herrington Consulting subsequently prepared a technical addendum to the drainage strategy, a copy of which is appended for reference. This report was circulated to the group on the 3rd October 2018.
- 1.8. RDC informed Bedford Park Developments on 12th November 2018 that SPINDAG had prepared a report authored by Geoffrey Lawson (dated October 2018). This report had not been disclosed until this point.

- 1.9. Herrington Consulting agreed to address the pertinent points raised in the October 2018 Lawson report to ensure that all of the technical aspects discussed during the August meeting were suitably addressed in an updated report.
- 1.10. A revision was subsequently made to the Herrington Consulting technical addendum.
- 1.11. During the preparation of the revision to the technical addendum, in response to the October 2018 Lawson report, a further updated report was received from RDC on 5th December 2018. This second report was again authored by Geoffrey Lawson and provided further commentary on his October 2018 report, referencing the findings of the Herrington Consulting technical addendum. An email objection was also received from the Cooden Beach Golf Club, Cooden Sea Road, Bexhill on 5th December 2018 via RDC.
- 1.12. At this time, Herrington Consulting was also made aware that NE had made representations to the Local Plan BEX9 in November 2018, with an objection pending on the application. This objection was, however, submitted *before* the additional justification was fully considered.
- 1.13. On the 7th December 2018, Herrington Consulting submitted the following to RDC via e-mail:
 - A letter addressed to NE refencing all of the new objector comments and addressing the three key points NE raised in their response (ref: 262909, 13 November 2018).
 - A revised technical addendum (Revision 1)
 - A set of revised drawings: section details and wetland plan for the redesign wetland (*taking into considerations the comments raised by SPINDAG*)

All of the above has been appended for reference.
- 1.14. Since fully addressing all of NE's concerns, NE has subsequently withdrawn their objection in respect of the application and have now offered 'no objection', subject to conditions which have been agreed between all parties.
- 1.15. Our current position, which is aligned with that of the Statutory consultees and RDC officers, is that all necessary details have been provided to clearly evidence that a viable strategy is available to deliver a technical solution for draining the proposed development. A 'worst case' scenario has been adopted throughout the technical work, testing the sensitivity of the system to the assumptions made using professional judgment. The purpose of preparing the strategy in this way was to ensure an extremely robust case is presented.
- 1.16. On 20th December 2018, Herrington Consulting received a revised report by Geoffrey Lawson, entitled *"Report in response to the Technical Addendum on the SuDS Attenuation Pond /Wetland for the Spindlewood Drive development scheme dated 11th December 2018."*

- 1.17. On 2nd January 2019, Herrington Consulting received a revised Supplementary Note by Geoffrey Lawson, stating “...to be considered with my report in response to the Herrington TA dated 11th December 2018 and published on 21st December 2018.”
- 1.18. On 21st January 2019, Herrington Consulting received another revised Supplementary Note by Geoffrey Lawson, entitled “...Response to the Appropriate Assessment published on 3rd January 2019 and the December 11th 2018 SuDS proposals for Spindlewood Drive development. RR/2017/170S/P”. Dated 14th January 2019.
- 1.19. On 4th April 2019, Herrington Consulting received the SPINDAG Green pack 2 entitled “Probity in Planning and Planning Application ref: RR/2017/1705/P (land off Spindlewood Drive)” Dated 27th February 2019.
- 1.20. The four additional reports submitted by SPINDAG following the submission of the Herrington Consulting technical addendum (revision 1) have been reviewed by Herrington Consulting with respect to the flood risk and drainage matters raised.
- 1.21. Although the content of the subsequent SPINDAG reports has been considered, it should be recognised that Geoffrey Lawson is not a qualified hydrologist and the reports prepared by Mr Lawson do not provide any empirical evidence to back up the assertions made. The assumptions made with each of the Lawson reports, and the position taken with respect to groundwater levels, varies in each of the responses; all with the objective of undermining the proposals for development at this location.
- 1.22. Conversely, Herrington Consulting has responded to address the technical concerns raised, ensuring transparency and demonstrating a willingness to address the concerns which could have some bearing on the outcome of the technical work presented. In our professional opinion, limited weight can be afforded to the objections raised by SPINDAG, which have nevertheless been addressed as part of the revised technical information submitted on 7th December 2018 (ref: point 1.13 above).
- 1.23. The statutory experts agree with the conclusions of the Herrington Consulting technical addendum (revision 1) and whilst we set out the chronology of the work undertaken by SPINDAG, we would kindly request that the Inspector considers the overall context when reaching a view on the facts presented.

2. Summary of Technical Information Provided

- 2.1. Figure 1 below is an extract from the Herrington Consulting Technical Addendum (revision 1), submitted to RDC on 7th December 2018, delineating the proposed drainage layout at Spindlewood Drive.

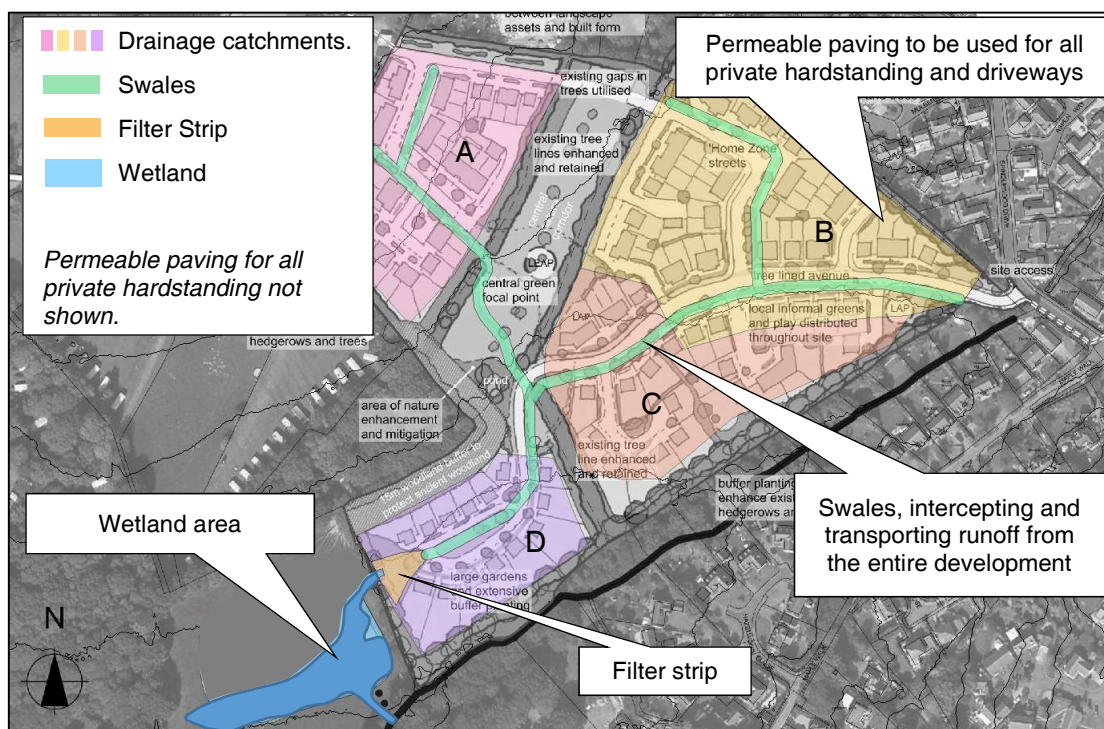


Figure 1 – Indicative drainage layout plan showing the proposed SuDS and revised wetland extent, following natural the natural topography.

- 2.2. The proposed drainage strategy uses a combination of Sustainable Drainage Systems (SuDS) to provide stormwater storage, habitat space, and benefits to water quality. The details can be found in the technical addendum appended, however, in summary water from the proposed development is discharged into a series of swales passing through the development, which flow into a filter strip (shown in Figure 1). This system provides a mechanism for transporting surface water runoff across the site and trapping any contaminants *before* they are discharged into the adjacent proposed wetland.
- 2.3. The proposed wetland area has been designed to provide habitat space, water quality improvements and to store water in a controlled way, before allowing clean water to be discharged to the adjacent Cole Stream at an attenuated rate (replicating the undeveloped conditions).
- 2.4. The technical work undertaken is based on the Index Methodology outlined in CIRIA C753 and has shown that a minimum of 3 levels of pollution treatment can be provided by this system.

- 2.5. Supplementary topographic data has been submitted to demonstrate how the land levels currently fall. This information has been used within the drainage model prepared for the site to demonstrate that the drainage system will function as designed.
- 2.6. In the absence of seasonal groundwater records, information has been taken from local borehole records, to provide an assumed groundwater level on which to design the wetland system.
- 2.7. During the meeting held with EA, NE, RDC, PCWLM and the LLFA in August 2018, it was agreed that a worst-case scenario should be considered, whereby the groundwater level is assumed to be elevated. It was agreed during the same meeting that seasonal groundwater monitoring could be requested as part of a planning condition and this should be undertaken before any further detailed design of the wetland (prior to construction).
- 2.8. In response to the comments raised by SPINDAG, and in particular the comments from Geoffrey Lawson relating to the higher than anticipated groundwater level and potential need for ballasting, the wetland system was redesigned. The redesign was based on the assumption that the groundwater level was significantly higher than was first assumed in the original FRA and technical addendum, and presented two possible cases;
 - 2.8.1. The groundwater level was assumed to be higher than Geoffrey Lawson had conservatively predicted and stated within his reports. The groundwater was assumed to be ~1.6m below the surface of the existing ground level across the entire site. Based on the current historic information available, this assumption represents a conservative and realistic scenario, which calibrates well to observed events.
 - 2.8.2. A sensitivity exercise was also undertaken, whereby the groundwater was assumed to be elevated even further, i.e. located at the surface. Although there is no evidence to suggest that the groundwater has reached the surface at this location in the past, this additional test was undertaken to provide additional confidence that an engineering solution would be possible if the seasonal groundwater testing showed this to be the case.
- 2.9. The re-designed drainage system was submitted alongside a series of engineering drawings delineating the location of the wetland and providing a series of section drawings through the wetland, all of which clearly relate to the assumed high groundwater level (refer to 2.8.1).

3. Conclusions

- 3.1. The revised Herrington Consulting technical addendum revision 1 (appended) demonstrates that the wetland can be designed to ensure that it will not have a detrimental impact on the SAC/Ramsar site, or the Pevensey Levels.
- 3.2. The Herrington Consulting technical addendum (revision 1) has been presented to NE, EA, PCWLM, LLFA and RDC for approval and all are satisfied that the wetland can function as designed, without having a negative impact in relation to Policy BEX9: with specific reference to part (xi)...*"in accordance with policy DEN5 'Sustainable Drainage', at least two forms of appropriate SuDS are incorporated and an Appropriate Assessment under the Habitats Regulations demonstrates beyond reasonable scientific doubt that these can be delivered on the site without harming the integrity of the Pevensey Levels Special Area of Conservation/RAMSAR site;"*
- 3.3. The sensitivity test further demonstrates that the even in the unlikely event that the groundwater is found to be located within a few centimetres of the surface, there is a viable engineering solution available to drain the site, one which will not have a detrimental impact on the SAC/RAMSAR site or the Pevensey Levels.
- 3.4. Both Natural England and the Environment Agency have since withdrawn their objections to the proposed wetland, based on the detailed correspondence and technical information presented. The detailed e-mail correspondence (appended for reference) demonstrates that the concerns raised have been addressed in full and consequently, the proposed development will meet the requirements of Policy BEX9.
- 3.5. It is recognised that seasonal groundwater testing has been conditioned and the recommendation stands that this testing will be required to confirm the assumptions made by all parties in respect to the technical work, before a detailed design is finalised and construction is permitted.
- 3.6. In summary, all of the Statutory Consultees fully agree with the approach Herrington Consulting and Bedford Park Developments has adopted in the additional justification and detailed information provided.
- 3.7. Bedford Park Developments has accepted all of the conditions suggested by NE, EA and LLFA and ESCC SuDS and on this basis, each of these expert Statutory bodies have concluded that the proposals are deliverable and acceptable (subject to meeting the requirements of those conditions). Bedford Park Development remain fully committed to working with each of the Statutory organisations moving forward.
- 3.8. Through the work and dialogue undertaken via the planning application, the query raised by the Inspector has been successfully addressed. Notwithstanding this, Herrington Consulting Ltd. would be happy to attend the hearing to provide further detail and clarification if that would assist.

4. Appendix

- Relevant e-mail correspondence in chronological order
- Herrington Consulting Technical Addendum (Revision 1) – Issued December 2018
- Herrington Consulting Letter to Natural England to address concerns raised. – Issued December 2018
- Relevant Technical Drawings and Sections – Issued December 2018

From: Ben Ellis <ben@bedfordparkdevelopments.co.uk>

Sent: 07 December 2018 13:52

To: Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>

Cc: Jo Edwards <Jo.Edwards@rother.gov.uk>; alison.giacomelli@naturalengland.org.uk; Revai Kinsella <Revai.Kinsella@eastsussex.gov.uk>; Page, Sophie <Sophie.Page@environment-agency.gov.uk>; Stephen Hayward <stephen@herringtonconsulting.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; Sebastian Bures <Sebastian@herringtonconsulting.co.uk>

Subject: Re: RR/2017/1705/P Spindlewood Drive - SUDS

Many thanks Simon.

Alison - just to add to Simons note/ letter, I have confirmed to Jo that we are in full acceptance of all of your suggested conditions, including the additional point regarding oil interceptors, as set out in your response. We have also agreed the approach regarding the S.106 and full consultation with NE, EA and ESCC throughout the detailed design process.

Kind regards

Ben

Ben Ellis MRTPI BSc (Hons)
For Bedford Park

From: Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>

Sent: 07 December 2018 13:42

To: Ben Ellis <ben@bedfordparkdevelopments.co.uk>; Jo Edwards <Jo.Edwards@rother.gov.uk>; 'alison.giacomelli@naturalengland.org.uk' <Alison.Giacomelli@naturalengland.org.uk>; 'Revai Kinsella' <Revai.Kinsella@eastsussex.gov.uk>; Page, Sophie <Sophie.Page@environment-agency.gov.uk>

Cc: Stephen Hayward <stephen@herringtonconsulting.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; Sebastian Bures <Sebastian@herringtonconsulting.co.uk>

Subject: RE: RR/2017/1705/P Spindlewood Drive - SUDS

Dear Jo, Alison, et al

As promised, please find attached the following:

1. The letter to NE – refencing all of the new objector comments and addressing the three key points NE has raised previously.
2. The revised technical note _Rev1
3. The revised drawings: section details and wetland plan for the redesign wetland.

Hopefully the attached is self-explanatory and will address the points we have discussed previously, elevating any concerns regarding the design of the wetland and groundwater.

I am away from the office today, however, I am back in on Monday next week and happy to provide any further clarification if required.

Kind regards

Simon (M-B)

Simon Maiden-Brooks BSc. (Hons) MSc. C.Eng C.WEM MCIWEM
Technical Director & Partner
Tel: 01227 833855



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From: Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>
Sent: 05 December 2018 17:09
To: 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Jo Edwards <Jo.Edwards@rother.gov.uk>
Cc: Stephen Hayward <stephen@herringtonconsulting.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>
Subject: RE: RR/2017/1705/P Spindlewood Drive - SUDS

Dear Jo,

To echo Ben's comments and to provide a further update. I have today had a long conversation with Alison to discuss the changes we have made to the technical addendum and to explain why we have undertaken these.

We have considered Mr Lawson's reports (including the latest) and the golf club's response. Although we recognise that there are some valid points for consideration, we do not feel that it is appropriate to undertake a detailed technical appraisal to highlight the numerous inaccuracies that have been presented in Mr Lawson's 3 reports. Instead, we have reviewed our design, in accordance with; our previous discussions, the points raised in the current objections, and my recent conversation with NE.

In summary, we are in the process of providing a revised version of the technical addendum which clearly highlights the changes that we have made (highlighted in a separate colour for transparency and comparison). I have also drafted a detailed response to NE to address the points raised.

We are hoping to get these finalised and over to you before the end of this week as Ben has suggested.

Meanwhile, should you require any further input or information pertaining to the application at this stage, please do not hesitate to contact me.

Kind regards

Simon (M-B)

Simon Maiden-Brooks BSc. (Hons) MSc. C.Eng C.WEM MCIWEM
Technical Director & Partner
Tel: 01227 833855



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From: Jo Edwards <Jo.Edwards@rother.gov.uk>

Sent: 05 December 2018 12:29

To: 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Stephen Hayward

<stephen@herringtonconsulting.co.uk>; Simon Maiden-Brooks

<simon.mb@herringtonconsulting.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>

Subject: RR/2017/1705/P Spindlewood Drive - SUDS

Hi All,

I wondered when you might be in a position to issue your response to NE's latest comments taking into account Mr Lawson's report. In that regard I have attached an updated report from him that I received last week – I've been on leave until today. I have also attached an objection from the golf club. I thought you might wish to see both in advance of sending me your full response that I need to complete my appropriate assessment to send to NE.

Best regards

Jo

Jo Edwards BA (Hons) MRTPI
Major Applications and Appeals Manager
Strategy and Planning
Rother District Council

From: Giacomelli, Alison (NE) <Alison.Giacomelli@naturalengland.org.uk>

Sent: 13 November 2018 18:35

To: Jo Edwards <Jo.Edwards@rother.gov.uk>; 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>

Cc: 'Revai Kinsella' <Revai.Kinsella@eastsussex.gov.uk>; 'Page, Sophie' <Sophie.Page@environment-agency.gov.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>; Stephen Hayward <stephen@herringtonconsulting.co.uk>

Subject: RE: Spindlewood Drive

Dear Jo,

Apologies for the delay in responding. I have taken today to review Mr Lawson's report that you forwarded yesterday, and which I think does raise some questions that it would be helpful for the applicant to consider. I think this is necessary so that it is clear that the Appropriate Assessment has considered all the potential implications, and so that all necessary mitigation measures are secured. Without this, any decision could be subject to challenge.

However, once the clarification requested has been received, we would have no objection to the proposal, subject to the mitigation measures set out in the letter, and any additional mitigation revealed by the further information request.

Regards,
Alison

Alison Giacomelli
Sussex and Kent Area Team

From: Jo Edwards <Jo.Edwards@rother.gov.uk>
Sent: 12 November 2018 16:55
To: 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Stephen Hayward <stephen@herringtonconsulting.co.uk>; Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>
Cc: 'Alison.Giacomelli@naturalengland.org.uk' <Alison.Giacomelli@naturalengland.org.uk>; 'Page, Sophie' <Sophie.Page@environment-agency.gov.uk>; 'Revai Kinsella' <Revai.Kinsella@eastsussex.gov.uk>
Subject: RR/2017/1705/P - Local resident analysis of report to inform an AA

Dear Ben et al,

Please find attached a copy of a report with attachments prepared by a local resident for your information and response if you wish.

This has also now been uploaded to the application webpage.

Best regards

Jo

Jo Edwards BA (Hons) MRTPI
Major Applications and Appeals Manager
Strategy and Planning
Rother District Council

Tel No: 01424 787601
Email: jo.edwards@rother.gov.uk
Website: www.rother.gov.uk

From: Ben Ellis <ben@bedfordparkdevelopments.co.uk>
Sent: 12 November 2018 10:33
To: Giacomelli, Alison (NE) <Alison.Giacomelli@naturalengland.org.uk>
Cc: Jo Edwards <Jo.Edwards@rother.gov.uk>; Stephen Hayward <stephen@herringtonconsulting.co.uk>; Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>; Revai Kinsella <Revai.Kinsella@eastsussex.gov.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; Page, Sophie <sophie.page@environment-agency.gov.uk>
Subject: Re: RR/2017/1705/P Spindlewood Drive

Dear all

I hope all are well? Thank you Revai for issuing your consultation response already. We are grateful for your comment of 'no objection' and I am happy to confirm that we accept and will agree to all of your suggestions in respect of conditions etc.

Alison/ Sophie - it would be great if you could issue your responses also. I hope that the updated technical details and the commitments offered also meet your approval.

Jo - we have been discussing conditions. Please incorporate Revai's points and we can discuss any further conditions.

Many thanks

Ben

Ben Ellis MRTPI BSc (Hons)
For Bedford Park

Bedford Park 

From: Revai Kinsella <Revai.Kinsella@eastsussex.gov.uk>

Sent: 12 October 2018 15:41

To: Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>; 'Giacomelli, Alison (NE)' <Alison.Giacomelli@naturalengland.org.uk>; Jo Edwards <Jo.Edwards@rother.gov.uk>; Stephen Hayward <stephen@herringtonconsulting.co.uk>; 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; 'Page, Sophie' <sophie.page@environment-agency.gov.uk>

Cc: Su DS Consultations - Flood <Su.DS@eastsussex.gov.uk>

Subject: RE: RR/2017/1705/P Spindlewood Drive

Afternoon,

Sincere apologies for the late response.

I note that treatment will be provided by permeable pavement (level 1), swale (level 2), filter strip (level 3) and the wetland (level 4). If I remember correctly from the meeting, anything within the development parcels was to be disregarded at this stage due to the uncertainty in implementation. Therefore the only treatment levels that can be demonstrated are the 3 stages from swales, filter strip and wetland. If it is possible to ensure that the swales shown on the indicative layout are retained through the reserved matters and implementation, then the solution does offer enough treatment.

From the topo survey, raising the land around Catchment D to approximately 6m AOD means increasing levels by almost 2m in some areas. The impact of this on overland surface water flows should be assessed, an overland flow 2D model for before and after might be necessary, to ensure that this will not increase flows to some areas.

In terms of maintenance responsibility, a statement to the effect that the communal SuDS could be offered for adoption by a water company, if Sewers for Adoption 8 is in operation at the time of implementation would help in assuring everyone that maintenance responsibility is guaranteed in perpetuity. I appreciate that it all depends on what will be in operation at the time this scheme is taken forward to implementation.

Kind regards
Revai

Revai Kinsella

Flood and Water Officer
Pevensey and Cuckmere Water Level Management Board

01273 335534
07785 406974

<https://www.wlma.org.uk/pevensey-cuckmere/development/eastsussex.gov.uk>



From: Simon Maiden-Brooks [<mailto:simon.mb@herringtonconsulting.co.uk>]

Sent: 10 October 2018 7:09 PM

To: 'Giacomelli, Alison (NE)'; Jo Edwards; Stephen Hayward; Revai Kinsella; 'Ben Ellis'; Andrew Holyoak; 'Page, Sophie'

Subject: RE: RR/2017/1705/P Spindlewood Drive

Dear Jo et al,

I am writing in response to your email dated 5 October 2018, and Alison's recent email dated 9 October 2018.

We have reviewed the points you have both raised in detail and I have tried to contact Revai to establish whether there are any additional points the LLFA require us to consider in relation to our recent report.

I would comment as follows, with the aim of addressing each of the points raised, referencing our previously agreed meeting minutes.

1. Paragraph numbers will be added to the final revision of the report for ease of reference.
2. Jo and Alison's points are noted in relation to the private permeable paving. This option was included within the report to demonstrate that an alternative solution to a traditional piped drainage system for each property is available. In our experience this type of SuDS is considered preferable and requires minimal maintenance (often dealt with by covenant). However, as acknowledged in Alison's email, even if the development is not constructed using private permeable paving systems, the pollution mitigation calculations demonstrate that the scheme still meets the required standards. The exact

proposals for the house drainage would be presented as part of the detailed design for the development, however, we agreed during our meeting that the wider drainage system should be specified (e.g. swales, filter strip and wetland) and the detailed house drainage would be dealt with by condition. This approach has been implemented when preparing the report.

3. Regarding the construction of the wetland, during our meeting the group expressed a preference to exclude presenting a number of 'options' in the report. I raised the question of which system would be considered most preferable and Alison's response was that we (as engineers) should state the most appropriate system. We have taken this approach, specifying a double lined construction for the wetland and justifying the rationale behind this. Notwithstanding this, I recognise that NE England's position is that concrete is not necessarily 'unacceptable' and as such, we will rephrase this section of the report to state that concrete liners are acceptable to NE, but may not be the most appropriate solution at this location due to the sensitive nature of this site.
4. The technical appraisal has considered the requirement to line the swales and considering that there would be ~1m between the base of the swale and the wetland, on balance it is not considered necessary to line the swales. Further groundwater testing at the detailed design stage would help to refine the design of the swale, which has been suggested by condition.
5. It is acknowledged that the borehole records were recorded in August 1998 and at this point groundwater levels were 2m bgl. However, it is for this very reason we agreed at the meeting to adopt a more precautionary approach by undertaking sensitivity testing in the absence of long-term seasonal groundwater monitoring. We have assumed the groundwater levels are much higher than the 1998 records and are congruent with the water level within the adjacent watercourse, circa 3m AODN (recently surveyed). Even in the event that the wetland is raised by a further 1m, the system is still shown to function and as such, provides some degree of flexibility for the final detailed design when the results of the testing become available. Notwithstanding this, we believe that the approach taken does represent the worst case. If groundwater levels are shown to be elevated much above the level stated in the report, based on the existing land levels, the area suggested to be boggy would instead be flooded. There is no historic evidence or records, photographic or otherwise, to suggest that this is the case. As such, 3m AODN is considered to be appropriate.
6. Regarding the land raising a copy of the topographic survey showing the existing ground levels is appended to the report. However, typical land levels in the southern part of the site (where the units are currently shown to be located) suggest approximately 0.5m - 1m of land raising would be required. We have worked on many schemes where this has been shown to be achievable. If the wetland is raised further, or if the final position of the units is closer to the watercourse, additional raising may be required to offset the increase, albeit this is likely to be less than 1m.

I trust the above information addresses the points raised and is in line with our previous discussions. I will try and make contact with Revai again tomorrow to see if there are any further comments and we will await the EA's comments in due course. I did discuss the option of the charging agreement with Sophie during the meeting, with the aim of speeding up the process with the EA, however, to date I have not received this charging agreement. As such, I would appreciate if the EA could try to

expedite a response from the groundwater sector to avoid any further delays with respect to the application.

Kind regards

Simon (M-B)

Simon Maiden-Brooks BSc. (Hons) MSc. C.Eng C.WEM MCIWEM
Technical Director & Partner
Tel: 01227 833855



Specialists in Coastal, Flood Risk Management & Daylight Analysis
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From: Page, Sophie <Sophie.Page@environment-agency.gov.uk>
Sent: 11 October 2018 11:33
To: Jo Edwards <Jo.Edwards@rother.gov.uk>; Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>; 'Giacomelli, Alison (NE)' <Alison.Giacomelli@naturalengland.org.uk>; Stephen Hayward <stephen@herringtonconsulting.co.uk>; 'Revai Kinsella' <Revai.Kinsella@eastsussex.gov.uk>; 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>
Subject: RE: RR/2017/1705/P Spindlewood Drive

Hi Jo

We have reviewed the submitted addendum to the FRA/SWMS from a groundwater perspective and are satisfied that the pollution control measures included in the SuDS design adequately mitigate against groundwater pollution.

I am awaiting further comments before sending our formal response to you but will get this to you next week.

Kind regards

Sophie

Sophie Page

Planning Advisor, Sustainable Places, Kent, South London and East Sussex
Environment Agency | Orchard House, Endeavour Park, London, Addington, West Malling, Kent, ME19 5SH

From: Giacomelli, Alison (NE) <Alison.Giacomelli@naturalengland.org.uk>
Sent: 09 October 2018 18:42
To: Jo Edwards <Jo.Edwards@rother.gov.uk>; Stephen Hayward

<stephen@herringtonconsulting.co.uk>; Simon Maiden-Brooks
<simon.mb@herringtonconsulting.co.uk>; 'Revai Kinsella' <Revai.Kinsella@eastsussex.gov.uk>; 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; 'Page, Sophie' <sophie.page@environment-agency.gov.uk>
Subject: RE: RR/2017/1705/P Spindlewood Drive

Thank you, Stephen, for sending the technical addendum through.

My initial thoughts are:

- Permeable paving on private driveways should not be relied upon to provide water quality treatment as private householders can't be relied upon to maintain them for the lifetime of the development. Info on how to maintain them could be given to the first occupiers, but I'm not sure there's a way to make sure this is passed on when the property is sold on. Although, as Jo says, if maintenance is not an issue, or enforcement is possible, then private permeable paving could be included.
- Even if permeable paving is not included in the risk index, then the swales/filter strip/wetland system is sufficient (as shown in table 1).
- Borehole records – If I've understood correctly, the borehole test was in August 1998 and showed water entering at a depth of 2m below ground level. If this was the summer water level, then presumably, winter groundwater levels are likely to be higher.
- Groundwater level – Page 5 says that groundwater levels are likely to be around 3m AODN, as if they were higher the surrounding area would be flooded. I understood from local people that the field with caravans near the proposed wetland had been inaccessible due to waterlogging earlier this year. So I wonder whether 3mAODN is sufficiently precautionary. Also, I wondered whether the potential gradient in groundwater levels had been taken account of?
- Swales – will these need to be lined, as that will have implications for management and maintenance?
- Lining the wetland area – Concrete lining isn't necessarily unacceptable to NE – there are probably pros and cons to each different type of lining. Our concern is that the method chosen is suitable to stop contaminants reaching the groundwater and lasts for the lifetime of the development. Whatever method is chosen has a risk of failing. Therefore, the proposal for a secondary sacrificial liner is helpful.

I hope these comments are helpful.

Regards,
Alison

Alison Giacomelli
Sussex and Kent Area Team

Tel: 0208 225 7693

From: Jo Edwards [<mailto:Jo.Edwards@rother.gov.uk>]

Sent: 05 October 2018 15:22

To: 'Stephen Hayward' ; Simon Maiden-Brooks ; 'Revai Kinsella' ; 'Ben Ellis' ; Andrew Holyoak ; 'Page, Sophie' ; Giacomelli, Alison (NE)

Subject: RE: RR/2017/1705/P Spindlewood Drive

Hi Stephen et al,

From my non-technical angle I have a few comments:

1. Could paragraph nos. be added for ease of reference?
2. We have resisted permeable paving in private driveways and hardstandings elsewhere. Is it acceptable here. There would presumably need to be some type of enforcement of future occupiers maintaining these areas in accordance with the manual or isn't that critical?
3. Page 7, land raising to ~6m AODN – what are the existing levels here?

Thanks

Jo

Jo Edwards BA (Hons) MRTPI
Major Applications and Appeals Manager
Strategy and Planning
Rother District Council

Tel No: 01424 787601

Email: jo.edwards@rother.gov.uk

Website: www.rother.gov.uk

From: Jo Edwards <Jo.Edwards@rother.gov.uk>

Sent: 03 October 2018 14:58

To: Stephen Hayward <stephen@herringtonconsulting.co.uk>; Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>; 'Revai Kinsella' <Revai.Kinsella@eastsussex.gov.uk>; 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; 'Page, Sophie' <sophie.page@environment-agency.gov.uk>; 'alison.giacomelli@naturalengland.org.uk' <alison.giacomelli@naturalengland.org.uk>; Richard Wilson <Richard.Wilson@rother.gov.uk>

Subject: RE: RR/2017/1705/P Spindlewood Drive

Hi All,

May I ask that within 5 working days you have a quick look through the attached to see that it includes everything that you need it to and to give Herrington's an opportunity to address anything raised. I will then place this or an amended version on line and set the clock running on a formal 21 day consultation period.

Best Regards

Jo

Jo Edwards BA (Hons) MRTPI
Major Applications and Appeals Manager
Strategy and Planning
Rother District Council

Tel No: 01424 787601

Email: jo.edwards@rother.gov.uk

Website: www.rother.gov.uk

From: Stephen Hayward [<mailto:stephen@herringtonconsulting.co.uk>]

Sent: 03 October 2018 10:46

To: Simon Maiden-Brooks; Jo Edwards; 'Revai Kinsella'; 'Ben Ellis'; Andrew Holyoak; 'Page, Sophie'; 'alison.giacomelli@naturalengland.org.uk'

Subject: RE: RR/2017/1705/P Spindlewood Drive

Dear All,

Further to Simon's email below, and as agreed following the meeting please find attached the technical addendum for Spindlewood Drive, for your review and comment.

I will follow up with each of you via phone to make sure the document has been received and that you are happy with the contents and approach.

If you have any questions or comments please do not hesitate to contact me,

Kind Regards,

Stephen Hayward BSc (Hons) ARSM MCIWEM
Drainage Analyst

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Unit 6 - Barham Business Park - Elham Valley Road - Canterbury - Kent - CT4 6DQ

From: Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>

Sent: 21 September 2018 18:21

To: 'Jo Edwards' <Jo.Edwards@rother.gov.uk>; 'Revai Kinsella' <Revai.Kinsella@eastsussex.gov.uk>; 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; 'Page, Sophie' <sophie.page@environment-agency.gov.uk>; 'alison.giacomelli@naturalengland.org.uk' <alison.giacomelli@naturalengland.org.uk>

Cc: Stephen Hayward <stephen@herringtonconsulting.co.uk>

Subject: RE: RR/2017/1705/P Spindlewood Drive

Dear All,

Further to our previous e-mail correspondence and as a way of a progress update, please find attached comments (in blue) below on my original e-mail minutes of our meeting.

Kind regards

Simon (M-B)

Simon Maiden-Brooks BSc. (Hons) MSc. C.Eng C.WEM MCIWEM
Technical Director & Partner
Tel: 01227 833855

The logo for Herrington Consulting Limited, featuring the word 'herrington' in a grey sans-serif font, with 'CONSULTING' and 'LIMITED' in a smaller, orange, all-caps sans-serif font below it.

Dear All,

Thank you for your time last week regarding the proposed development at Spindlewood, which I am sure you will agree was a very positive meeting. We were able to discuss all remaining concerns, worked through these and agree a clear way forward in terms of additional information required, e.g. the addendum to the AA. As such, I have provided a summary of the discussions below for clarity.

It is understood that the Local Planning Authority (LPA – Rother District Council), Natural England (NE), the Environment Agency (EA) and the Lead Local Flood Authority (LLFA – East Sussex County Council) **and the Pevensey and Cuckmere Water Level Management Board** require additional information on the drainage proposals for Spindlewood Drive. This additional information is required to confirm that the drainage system and wetland area will be viable and furthermore, will provide sufficient treatment for the runoff discharged from the site if groundwater levels are elevated.

To confirm the viability of the SuDS scheme, the following additional information is required to be submitted:

1. Confirmation that the combination of SuDS used across the site will provide at least 3 levels of water quality treatment for runoff draining offsite.

A 3 stage SuDS system will be specified within the report referencing CIRIA C753 simple index approach calculation to ensure that appropriate pollution mitigation measures incorporated into the proposals and will be acceptable to the EA as requested (EA e-mailed dated 12-09). NE has further re-iterated this point in the e-mail dated 20-09-18 and has stated even at outline stage, NE require details of exactly what is being proposed.

2. An assessment of the land levels across the site to ensure that, based on a block masterplan layout, the entire site can be drained to the wetland area (e.g. via swales), even in the event that the wetland area has to be raised. It was agreed that this can be demonstrated by undertaking a site specific topographic survey and the singular cross section and singular longitudinal sections discussed during the meeting were considered appropriate. The site specific topographic survey will be used to verify the aerial height (LiDAR) data for the wider site and the topographic survey should include the bank of the river and the water level. This will enable an outline drainage design to be tested.

A topographic survey has been commissioned and we (Herrington Consulting/Bedford Park Developments) are now in receipt of the results. HC be will progressing with the section drawings and analysis w/c 24-09-18.

3. Details of suitable methods for tanking the wetland area in the event groundwater levels are elevated, that do not include using a concrete lining. It is proposed to submit the worst case scenario in all instances to provide a conservative approach when designing the wetland (as requested by NE). Details of the proposed size of the bund are also to be provided (as requested by NE).

In terms of changes to water levels, NE has confirmed (e-mail dated 20-09-18) that, provided it can be demonstrated that the SuDS will ensure no change from the greenfield run-off rate, this can be considered satisfactorily addressed.

4. The overall management of SuDS should be specified within the addendum report (although it was agreed by the group that specific company names will not be provided). Any future management should ensure the SuDS are maintained in perpetuity and that specialists are used to ensure that the method of pollution treatment specified will not be compromised (e.g. tearing wetland/pond liners etc.).

NE would like the information provided to be clear about what method of construction is chosen, how the high groundwater level will be addressed, and how the system will be maintained into the future (e-mailed dated 20-09-18). The group agreed that a management regime and group/party such as the one discussed and used elsewhere (e.g. North Barnhorn) will be specified. The group also agreed that the detail could be addressed via a suitable condition, as until the final scheme is agreed and consent has been secured, it will not be possible to appoint a management organisation. Notwithstanding this, we have since been in contact with the management

organisation for the neighbouring development, who has confirmed that they would be willing to adopt the drainage at Spindlewood.

Whilst HC has contacted parties and will make all requirements clear - this aspect must be covered via condition as Bedford Park Developments cannot agree a management regime before outline consent is approved and the detailed design is available.

5. Indicative foul water connections to be shown on the layout plan to indicate the possible connection points to the public foul sewer. It was agreed by the group that the development will not discharge foul effluent to a package treat plant and instead will be directed to the public sewer. If pumped, a back-up pump will be specified to ensure that the risk of pollution to the SSSI/RAMSAR/SAA is mitigated should the primary pump fail. This detail will be included within the addendum report, however, the group agreed that it was sufficient at this time to agree a suitably worded condition in respect of future detailed design.

It was agreed by the group that that this additional information will be provided as a concise addendum to the original FRA/SWMS report, and this will be appended to the Appropriate Assessment (AA) that has already been prepared. (ACTION: Herrington Consulting to prepare addendum and associated plans, sections and calculations as necessary – estimated timescale within the next 5 weeks, following receipt of the topographic survey, see text below). **HC are aiming to prepare the update within the next 2 weeks to enable a draft to be circulated to all.**

It was acknowledged by the group that this additional detail should be sufficient to satisfy the previous concerns raised, however, the EA are to confirm whether any further details are required in relation to the AA. (ACTION: Aspect to liaise with EA regarding confirmation of the additional information required to complete the AA – estimated timescale within the next 3-4 weeks **Aspect still awaiting comments from EA**)

The group agreed that undertaking groundwater investigations at this time was considered impractical, as groundwater levels at the end of summer are likely to be relatively low and not representative at this time of the year. Consequently, it was agreed that the revised drainage strategy should assume a worst case scenario with respect to groundwater levels (i.e. assuming groundwater levels will be high - coincident with the maximum water level in the channel and informed by BGS data). **NE has confirmed they agree with this approach (e-mail dated 20-09-18)**

Regarding timescales, the topographic survey is to be commissioned immediately based on the agreed specification discussed during the meeting (ACTION: Bedford Park Developments to commission topographic surveyor **Completed**). It is estimated that the survey can be completed within the next 3 weeks, however, this will be confirmed once a contractor has been appointed (Herrington Consulting to liaise with surveying contractor regarding anticipated timescales for delivery and report back to the group **Completed**). Once the topographic information is available, the addendum can be completed within 2 weeks **Progressing**.

The addendum will be circulated to the group for initial comments, before being submitted formally to the LPA (i.e. formal consultation process). It is recognised that the EA has a 20 working day statutory response time to respond to all formal enquires and as such, the EA will raise a provisional charging agreement which can be implemented if required to expedite the time it will take the EA to respond to any pre-development enquires relating to the project (ACTION: EA to raise a provisional charging agreement with Bedford Park Developments for use if required **Still Awaiting Charging agreement from EA**).

The LPA will aim to complete the formal response and submit the application before the December 2018 planning committee.

Kind regards

Simon (M-B)

Simon Maiden-Brooks BSc. (Hons) MSc. C.Eng C.WEM MCIWEM
Technical Director & Partner
Tel: 01227 833855

From: Giacomelli, Alison (NE) <Alison.Giacomelli@naturalengland.org.uk>
Sent: 20 September 2018 16:24
To: Page, Sophie <Sophie.Page@environment-agency.gov.uk>; Ben Ellis <ben@bedfordparkdevelopments.co.uk>; Jo Edwards <Jo.Edwards@rother.gov.uk>
Cc: Revai Kinsella <Revai.Kinsella@eastsussex.gov.uk>; Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; Stephen Hayward <stephen@herringtonconsulting.co.uk>; Birch, Jane <jane.birch@environment-agency.gov.uk>
Subject: RE: RR/2017/1705/P Spindlewood Drive

Dear Ben and Jo,

Apologies for not replying sooner regarding the note of the meeting held regarding the Spindlewood Drive proposal. I agree that it captures the points discussed at the meeting.

The comments below are intended to add a bit more detail on Natural England's comments, and I hope will be helpful to Herringtons in putting together the additional material regarding the drainage plan.

To reiterate, Natural England's concern is that potential impacts on the Pevensey Levels SAC and Ramsar site are avoided/mitigated, and that there is enough certainty over the deliverability of those avoidance/mitigation measures such that Rother will be able to conclude that there will be no adverse effect on the integrity of the SAC/Ramsar features. As those features are found in the ditches across the SAC/Ramsar, and are sensitive to water level changes and water quality, those are the issues we are concerned about.

Our view is that these issues could potentially be successfully addressed by SuDS and by connection to mains sewerage. In terms of changes to water levels, provided it can be demonstrated that the SuDS will ensure no change from the greenfield run-off rate, this can be considered satisfactorily addressed.

In terms of surface water quality, we would refer to the index approach in the CIRIA guidance. Following this guidance, a 3-stage SuDS system is necessary. As different SuDS components have different capacities for addressing water quality, it is important to be clear, even at this outline stage, exactly what is being proposed.

You have confirmed that topographical surveys will be carried out, which is helpful. However, seasonal groundwater level surveys are not proposed. As this is the case, and as agreed at the meeting, the SuDS presented must provide the necessary water level and water quality attenuation for a worst case scenario. The SuDS should work in the high groundwater level scenario, whilst also avoiding infiltration. If I understood what was discussed correctly, I think this means building up the banks around the wetland system to provide the necessary storage capacity. High groundwater levels also mean that some form of impermeable liner is needed.

The meeting notes below refer to the method of tanking not using concrete. NE has concerns about construction of a large concrete basin, in terms of management and maintenance of the SuDS into the future, and the impact this would have on the wetland within it. Constructed wetlands are possible, but require more specialised management than a more natural system. However, a geotextile membrane would be prone to tearing during de-silting, leaking from the joints between sheets (as there is a very large area to cover), and measures would have to be taken to counter the buoyancy from the high groundwater levels. Therefore, NE would like the information provided to be clear about what method of construction is chosen, how the high groundwater level will be addressed, and how the system will be maintained into the future.

Similarly, it may be that the swales have to be lined, which may impact on their maintenance. I wonder whether the water table rises with the rising ground, and whether there is any risk of spring lines forming if terracing is required on the slightly more steeply sloping parts of the site?

We welcome confirmation in the meeting note that discussions have started regarding a management company. It will be necessary for them to understand the construction and consequent management, so that they understand what they are potentially taking on.

I hope these comments are helpful. I look forward to seeing the information being prepared by Herringtons.

Regards,
Alison

Alison Giacomelli
Sussex and Kent Area Team

From: Page, Sophie <Sophie.Page@environment-agency.gov.uk>
Sent: 12 September 2018 14:17
To: Ben Ellis <ben@bedfordparkdevelopments.co.uk>; Jo Edwards <Jo.Edwards@rother.gov.uk>
Cc: Revai Kinsella <Revai.Kinsella@eastsussex.gov.uk>; Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; alison.giacomelli@naturalengland.org.uk; Stephen Hayward <stephen@herringtonconsulting.co.uk>; Birch, Jane <jane.birch@environment-agency.gov.uk>
Subject: RE: RR/2017/1705/P Spindlewood Drive

Dear Ben

Please see below comments from my colleague in our Groundwater and Contaminated Land Team.

We haven't seen the overall design yet however we would like to comment on the pollution prevention aspect (Water Quality). A 3 stage SUDs system sounds great and we would expect a CIRIA C753 simple index approach calculation to make sure that appropriate pollution mitigation measures are acceptable. With regards to the high groundwater levels, we may have to look at this again when we see the plans.

[We expect to be able to provide an appropriate planning condition.](#)

Trust this is helpful

Kind regards

Sophie Page

Planning Advisor, Sustainable Places Kent, South London and East Sussex
Environment Agency

From: Ben Ellis [<mailto:ben@bedfordparkdevelopments.co.uk>]

Sent: 12 September 2018 10:22

To: Jo Edwards

Cc: Revai Kinsella ; Simon Maiden-Brooks ; Andrew Holyoak ; Page, Sophie ;
alison.giacomelli@naturalengland.org.uk; Stephen Hayward ; Birch, Jane

Subject: Re: RR/2017/1705/P Spindlewood Drive

Dear all

The survey work is taking place today and the additional information will hopefully follow very shortly.

Further to Jo's email below, please can Alison and Sophie confirm the minutes. To assist, due to timeframes, unless you have any points to raise we will take that as confirmation of the minutes, actions arising and strategy / approach we have agreed.

Sophie / Jane - Andy has been trying to get hold of you to discuss any additional biodiversity points you wish to make. At the meeting we ran through the extensive efforts made throughout the process - both pre and post application - to take on board all ecological advice and comments. It may of course be that this simply needs to be presented in a different format for the AA, which we understand and will be doing shortly.

Many thanks all.

Kind regards

Ben

Ben Ellis MRTPI BSc (Hons)
For Bedford Park

Bedford Park ||||

From: Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>

Sent: 10 September 2018 14:22

To: 'Jo Edwards' <Jo.Edwards@rother.gov.uk>; 'Revai Kinsella' <Revai.Kinsella@eastsussex.gov.uk>; 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; 'Page, Sophie' <sophie.page@environment-agency.gov.uk>; 'alison.giacomelli@naturalengland.org.uk' <alison.giacomelli@naturalengland.org.uk>

Cc: Stephen Hayward <stephen@herringtonconsulting.co.uk>

Subject: RE: RR/2017/1705/P Spindlewood Drive

Thank you Jo and Revai for confirming the agreed minutes and actions from our meeting.

Revai, noted regarding your comments in relation to representing two organisations (ESCC LLFA and PCWLMB) – apologies for not noting this in the text.

To confirm the topographic surveyor has been instructed, however, we are in the process of confirming timescales for the delivery on the information.

Kind regards

Simon (M-B)

Simon Maiden-Brooks BSc. (Hons) MSc. C.Eng C.WEM MCIWEM
Technical Director & Partner
Tel: 01227 833855

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From: Jo Edwards <Jo.Edwards@rother.gov.uk>

Sent: 10 September 2018 14:13

To: 'Revai Kinsella' <Revai.Kinsella@eastsussex.gov.uk>; Simon Maiden-Brooks <simon.mb@herringtonconsulting.co.uk>; 'Ben Ellis' <ben@bedfordparkdevelopments.co.uk>; Andrew Holyoak <andrew.holyoak@aspect-ecology.com>; 'Page, Sophie' <sophie.page@environment-agency.gov.uk>; 'alison.giacomelli@naturalengland.org.uk' <alison.giacomelli@naturalengland.org.uk>

Cc: Stephen Hayward <stephen@herringtonconsulting.co.uk>

Subject: RE: RR/2017/1705/P Spindlewood Drive

Thanks Revai,

Sophie and Alison are you also able to confirm that the content Simon's email reflects the agreed actions so far as the EA and NE are concerned?

Thanks

Jo

Jo Edwards BA (Hons) MRTPI
Major Applications and Appeals Manager
Strategy and Planning
Rother District Council

From: Revai Kinsella [<mailto:Revai.Kinsella@eastsussex.gov.uk>]

Sent: 10 September 2018 14:11

To: 'Simon Maiden-Brooks'; Jo Edwards; 'Ben Ellis'; Andrew Holyoak; 'Page, Sophie'; 'alison.giacomelli@naturalengland.org.uk'

Cc: Stephen Hayward
Subject: RE: RR/2017/1705/P Spindlewood Drive

Afternoon

Simon's email below does capture the discussion and agreed additional work at the meeting.

I was however representing two organisations, the Lead Local Flood Authority (ESCC) and the Pevensey and Cuckmere Water Level Management Board whose area starts just at edge of the redline for the site.

Kind regards

Revai Kinsella

Flood and Water Officer
Pevensey and Cuckmere Water Level Management Board

01273 335534

07785 406974

<https://www.wlma.org.uk/pevensey-cuckmere/development/eastsussex.gov.uk>



From: Simon Maiden-Brooks [<mailto:simon.mb@herringtonconsulting.co.uk>]
Sent: 07 September 2018 17:36
To: Jo Edwards; 'Ben Ellis'; Andrew Holyoak; 'Page, Sophie'; 'alison.giacomelli@naturalengland.org.uk'; Revai Kinsella
Cc: Stephen Hayward
Subject: Re: RR/2017/1705/P Spindlewood Drive

Dear All,

Thank you for your time last week regarding the proposed development at Spindlewood, which I am sure you will agree was a very positive meeting. We were able to discuss all remaining concerns, worked through these and agree a clear way forward in terms of additional information required, e.g. the addendum to the AA. As such, I have provided a summary of the discussions below for clarity.

It is understood that the Local Planning Authority (LPA – Rother District Council), Natural England (NE), the Environment Agency (EA) and the Lead Local Flood Authority (LLFA – East Sussex County Council) require additional information on the drainage proposals for Spindlewood Drive. This additional information is required to confirm that the drainage system and wetland area will be viable and furthermore, will provide sufficient treatment for the runoff discharged from the site if groundwater levels are elevated.

To confirm the viability of the SuDS scheme, the following additional information is required to be submitted:

1. Confirmation that the combination of SuDS used across the site will provide at least 3 levels of water quality treatment for runoff draining offsite.

2. An assessment of the land levels across the site to ensure that, based on a block masterplan layout, the entire site can be drained to the wetland area (e.g. via swales), even in the event that the wetland area has to be raised. It was agreed that this can be demonstrated by undertaking a site specific topographic survey and the singular cross section and singular longitudinal sections discussed during the meeting were considered appropriate. The site specific topographic survey will be used to verify the aerial height (LiDAR) data for the wider site and the topographic survey should include the bank of the river and the water level. This will enable an outline drainage design to be tested.

3. Details of suitable methods for tanking the wetland area in the event groundwater levels are elevated, that do not include using a concrete lining. It is proposed to submit the worst case scenario in all instances to provide a conservative approach when designing the wetland (as requested by NE). Details of the proposed size of the bund are also to be provided (as requested by NE).

4. The overall management of SuDS should be specified within the addendum report (although it was agreed by the group that specific company names will not be provided). Any future management should ensure the SuDS are maintained in perpetuity and that specialists are used to ensure that the method of pollution treatment specified will not be compromised (e.g. tearing wetland/pond liners etc.). The group agreed that a management regime and group/party such as the one discussed and used elsewhere (e.g. North Barnhorn) will be specified. The group also agreed that the detail could be addressed via a suitable condition, as until the final scheme is agreed and consent has been secured, it will not be possible to appoint a management organisation. Notwithstanding this, we have since been in contact with the management organisation for the neighbouring development, who has confirmed that they would be willing to adopt the drainage at Spindlewood.

5. Indicative foul water connections to be shown on the layout plan to indicate the possible connection points to the public foul sewer. It was agreed by the group that the development will not discharge foul effluent to a package treat plant and instead will be directed to the public sewer. If pumped, a back-up pump will be specified to ensure that the risk of pollution to the SSSI/RAMSAR/SAA is mitigated should the primary pump fail. This detail will be included within the addendum report, however, the group agreed that it was sufficient at this time to agree a suitably worded condition in respect of future detailed design.

It was agreed by the group that this additional information will be provided as a concise addendum to the original FRA/SWMS report, and this will be appended to the Appropriate Assessment (AA) that has already been prepared. (ACTION: Herrington Consulting to prepare addendum and associated plans, sections and calculations as necessary – estimated timescale within the next 5 weeks, following receipt of the topographic survey, see text below).

It was acknowledged by the group that this additional detail should be sufficient to satisfy the previous concerns raised, however, the EA are to confirm whether any further details are required in relation to the AA. (ACTION: Aspect to liaise with EA regarding confirmation of the additional information required to complete the AA – estimated timescale within the next 3-4 weeks)

The group agreed that undertaking groundwater investigations at this time was considered impractical, as groundwater levels at the end of summer are likely to be relatively low and not representative at this time of the year. Consequently, it was agreed that the revised drainage strategy should assume a worst case scenario with respect to groundwater levels (i.e. assuming groundwater levels will be high - coincident with the maximum water level in the channel and informed by BGS data).

Regarding timescales, the topographic survey is to be commissioned immediately based on the agreed specification discussed during the meeting (ACTION: Bedford Park Developments to commission topographic surveyor). It is estimated that the survey can be completed within the next 3 weeks, however, this will be confirmed once a contractor has been appointed (Herrington Consulting to liaise with surveying contractor regarding anticipated timescales for delivery and report back to the group). Once the topographic information is available, the addendum can be completed within 2 weeks.

The addendum will be circulated to the group for initial comments, before being submitted formally to the LPA (i.e. formal consultation process). It is recognised that the EA has a 20 working day statutory response time to respond to all formal enquires and as such, the EA will raise a provisional charging agreement which can be implemented if required to expedite the time it will take the EA to respond to any pre-development enquires relating to the project (ACTION: EA to raise a provisional charging agreement with Bedford Park Developments for use if required).

The LPA will aim to complete the formal response and submit the application before the December 2018 planning committee.

Kind regards

Simon (M-B)

Simon Maiden-Brooks BSc. (Hons) MSc. C.Eng C.WEM MCIWEM
Technical Director & Partner
Tel: 01227 833855

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From: Jo Edwards <jo.edwards@rother.gov.uk>
Sent: Friday, September 7, 2018 4:56 pm
To: 'Ben Ellis'; Andrew Holyoak; Simon Maiden-Brooks; 'Page, Sophie';
'alison.giacomelli@naturalengland.org.uk'; Revai Kinsella
Subject: RR/2017/1705/P Spindlewood Drive

Dear All,

Further to our meeting on the 29th August I understood that an email was to be circulated by Ben's team shortly after setting out the understood scope of the additional work to be undertaken for agreement in writing by all consultees and the Council. I haven't seen that so wonder if it has been circulated. Ben would you advise please?

Sophie, I did ask that you circulate a suitably redacted example of what EA would expect to see in an AA. Are you able to do that?

Best Regards

Jo

Jo Edwards BA (Hons) MRTPI
Major Applications and Appeals Manager
Strategy and Planning
Rother District Council

**Technical Addendum to the FRA/SWMS report
for Spindlewood Drive, Bexhill-on-Sea
Revision 1**

Author: Stephen Hayward BSc (Hons) ARSM MCIWEM

Date: 11 December 2018

Director Sign Off:

email: stephen@herringtonconsulting.co.uk

Simon Maiden-Brooks BSc. (Hons) MSc. C.Eng C.WEM MCIWEM

Project: 1764 – Spindlewood Drive

1. Background and Scope of Appraisal

1.1 On the 29th of August 2018 a meeting was held with the aim of overcoming the objection to the proposed development at Spindlewood Drive, with Officers present from the organisations listed below,

- Pevensey and Cuckmere Water Level Management Board (PCWLM),
- Natural England (NE),
- The Environment Agency (EA),
- East Sussex Lead Local Flood Authority (LLFA),
- Rother District Local Planning Authority (LPA).

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1.2 Herrington Consulting has subsequently been commissioned by Bedford Park Developments to provide a technical addendum to the Flood Risk Assessment and Surface Water Management Strategy Completed in July 2017 (reference: "1764_FRA_Spindlewood Drive, Bexhill-on-Sea [July 17] Final") to address the points agreed during the meeting.

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1.3 Following feedback from both NE and EA to the first revision of this technical note, sections of this report have been updated to address the comments raised. These changes are highlighted in blue text to assist with any future review of the report.

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2. Description of Proposed Drainage Strategy

The proposed drainage strategy uses a combination of SuDS to provide stormwater storage, habitat space, and benefits to water quality. A description of each element of the proposed drainage system is provided below:

- 2.2** Permeable paving: Runoff from the roof of each property will be drained into permeable paving located across the private driveways and private hardstanding adjacent to each property. Each permeable paving system will store a small volume of water before discharging at a restricted rate into swales crossing the site. Ideally a Type B permeable paving system, which permits some infiltration, would be used. For this purpose of this assessment a conservative approach has been adopted, and it is assumed that the infiltration rate is poor and high groundwater levels will prohibit the use of infiltration SuDS. Consequently, a Type C, tanked permeable paving system has been specified.
- 2.3** Swales: Runoff from the roads will be directed into swales located adjacent to the carriageway. This runoff will be combined with the runoff discharged from the permeable paving systems described in the text above. The swales will be used to transport runoff across the site, before it is discharged into a receiving filter strip, which will be hydraulically connected to a large wetland area.
- 2.4** Filter Strip: Runoff discharged from the swales will drain across a densely planted filter strip, containing native grasses and a series of ephemeral pools. To protect the wetland and reduce the potential for contaminants to be discharged offsite, this filter strip will be specifically designed to slow the rate at which runoff crosses the site, thus capturing sediment and potential contaminants.
- 2.5** Wetland: Runoff discharged from the filter strip will drain into a large constructed wetland. This wetland will contain several features to improve the effectiveness of the wetland area, providing habitat space and water quality improvements. Due to the potentially high groundwater levels in this area the wetland will be tanked with an impermeable geotextile membrane. An orifice plate flow control device will be used to restrict the rate runoff is discharged from the wetland into the adjacent watercourse.
- 2.6** A drainage layout plan showing the relationship between the swales, filter strip and wetland is appended to this report (refer to section below).

3.1 *Drainage Layout Plan*

3.1 The development site has been split into four separate drainage catchments which are labelled A-D on Figure 1 Below. Figure 1 also indicates where the proposed SuDS could be located across the site.

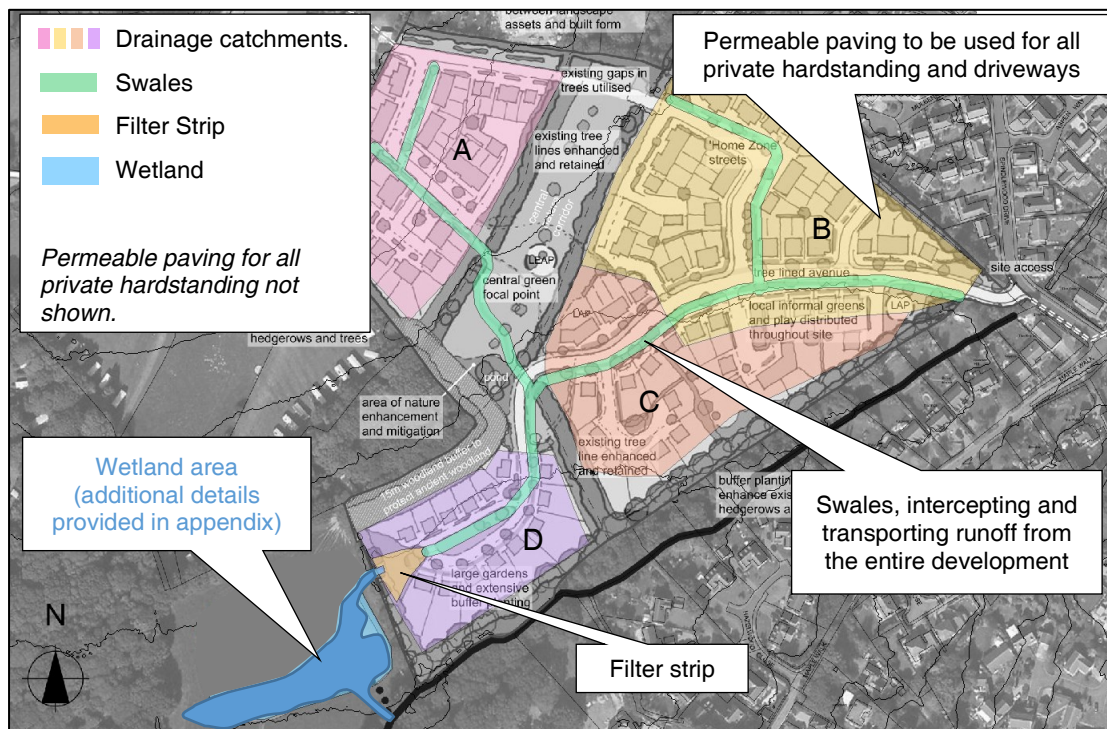


Figure 1 – Indicative drainage layout plan showing the proposed SuDS and revised wetland extent, following natural the natural topography.

4. Pollution Control

- 4.1** As Requested by the PCWLM, NE, and the EA, the SuDS used across the site must provide at least 3 levels of water quality treatment for runoff draining offsite (into the Pevensey levels). In addition, the EA has also requested that the Index Approach (referenced within CIRIA C753) is used to confirm that an appropriate level of pollution control is provided by the proposed drainage system.
- 4.2** The potential sources for contaminants as well as the treatment levels provided by each of the SuDS included within the proposed drainage strategy is therefore are outlined below:
- 4.3** Permeable paving: Provides 2 levels of treatment if unlined Type A or Type B systems are used, and 1 Level of treatment if a lined Type C system is used. For the purpose of this assessment it is assumed that Type C lined permeable paving systems will be used, due to the potential for high groundwater levels. Consequently, taking the most conservative approach, it is assumed that the permeable paving will only provide 1 level of treatment. Notwithstanding this, further site testing at the detailed design stage may suggest that Type A or Type B systems can be specified, which will simply provide additional benefits.
- 4.4** Swales: The swales transporting water through the site will provide 1 level of treatment.
- 4.5** Filter strip: The filter strip transporting water to the wetland will provide 1 level of treatment.
- 4.6** Wetland area: The wetland area will provide at least 1 level of treatment. Depending on the final design of the wetland, internal features could provide additional levels of treatment. For this

assessment, a worst-case scenario has been assumed and as such, the wetland will provide at least 1 level of treatment for runoff.

4.7 Levels of treatment for each element of the proposed drainage systems

The levels of pollution treatment provided to runoff draining from each of the individual drainage systems within the site is outlined below.

- Runoff from the proposed **roofs** -> permeable paving (1 level) -> swale (1 level) -> filter strip (1 level) pre-treatment area -> wetland (at least 1 level)

Total = At least 4 levels of treatment

- Runoff from the proposed **driveways and private hardstanding** -> permeable paving (1 level) -> swale (1 level) -> filter strip (1 level) -> wetland (at least 1 level)

Total = At least 4 levels of treatment

- Runoff from the **roads** – Swale (1 level) -> filter strip (1 level) -> wetland (at least 1 level)

Total = At least 3 levels of treatment

4.8 The LPA recognise that there is the potential for residents to disregard the recommended maintenance procedures for private SuDS (i.e. permeable paving across driveways). Under this circumstance the neglect of the SuDS maintenance can limit the effectiveness of the system to provide the necessary treatment for runoff. Nonetheless, it is unlikely that all of the residents will neglect their maintenance responsibilities and even in a worst case (i.e. assuming all residents fail to maintain their driveways), it is evident from the analysis above that at least 3 levels of protection would still be provided by the wider SuDS system for any runoff draining from the roofs or private hardstanding areas.

4.9 Consequently, it is evident that surface water discharged from each element of the site will receive a minimum of 3 levels of pollution treatment before being discharged offsite. This approach assumes a worst-case scenario, [whereby permeable paving is not used within the development](#).

4.10 Index methodology

Calculations to determine the potential impact of the development on pollutants discharged offsite have also been carried out in accordance with the Index Methodology outlined in CIRIA C753.

4.11 The indices for pollution produced by each source of runoff has been assessed against the indices for pollution control provided by each of the proposed SuDS. The results of this analysis are summarised in Table 1 (below). For this assessment a conservative approach has been taken which assumes all of the proposed SuDS will be tanked to minimise the risk of pollutants being discharged to groundwater. More detailed index methodology calculations are included within the appendix of this report.

Potential Source of pollutants	Total suspended solids (TSS)	Metals	Hydro-Carbons
Roofs			
Pollution from the Roofs	0.2	0.2	0.05
Treatment provided to runoff from the roofs	1.45	1.4	1.525
Summary	Exceeds requirements	Exceeds requirements	Exceeds requirements
Hardstanding			
Pollution from the private hardstanding	0.5	0.4	0.4
Treatment provided to runoff from the private hardstanding	1.45	1.4	1.525
Summary	Exceeds requirements	Exceeds requirements	Exceeds requirements
Roads			
Pollution from the Trunk Roads	0.7	0.6	0.7
Treatment provided to runoff from the Trunk Roads	0.9	1	1.05
Summary	Exceeds requirements	Exceeds requirements	Exceeds requirements

Table 1 - CIRIA C753 simple index approach to water quality management.

- 4.12** From Table 1 (above), it is evident that for all the potential sources of pollutants; roofs, hardstanding, and roads, the treatment provided by the proposed SuDS will be sufficient to minimise the risk of any pollutants being discharged offsite.

5. Land Levels Across the Site

- 5.1** The viability of the proposed wetland area and potential to drain runoff across the site via swales has been assessed. This analysis has been based on the current land levels extracted from a site-specific topographic survey and assumes groundwater levels are at their highest (i.e. a worst-case scenario).

5.2 Topographic survey and LiDAR data

Land levels have been determined using a combination of Topographic LIDAR data and a site-specific topographic survey. The survey sections provided have been used to validate the topographic LIDAR data for the wider site area, and confirm that the levels extracted from the LIDAR data are coincident with the land levels extracted from the topographic survey. A survey of the existing watercourse has also been undertaken to determine the potential level for an outfall structure from the wetland, as well as to help estimate groundwater levels across the site.

5.3 Borehole records

The closest borehole to the proposed wetland area shows groundwater at approximately 2m below ground level, a copy of the stratigraphic log from this borehole record is appended to this report. It is not clear from the record if the water encountered was seepage within the soils, or if the saturated zone (e.g. groundwater table) was encountered. Based on the approximate location of this borehole and the assumption that the level from the borehole is reflective of the groundwater table, (i.e. not seepage) it is estimated that groundwater levels were at approximately 2.5m AODN.

5.4 Groundwater level

Based on the topography around the proposed wetland and adjacent watercourse, taken from the topographic survey, it is likely that groundwater levels higher than 3.0m AODN would result in a large volume of floodwater being discharged across the neighbouring fields and woodland. When compared to the estimated groundwater level from borehole records, discussed above, it is assumed that the existing groundwater level will be located at ~2.5m AODN. In the absence of seasonal groundwater monitoring and no evidence of above ground flooding at this location, this groundwater level is still considered to be appropriate. Notwithstanding this, following the additional concerns that have been raised in relation to the accuracy of the assumed groundwater level, further sensitivity analysis has been undertaken and the wetland area has been redesigned to take these considerations into account.

5.5 The additional sensitivity testing accounts for any fluctuations in the groundwater level, with the base of the redesigned wetland located at 4m AODN. The shape of the wetland has been amended using the natural topography of the land to minimise the opportunity to intersect the groundwater table. In the unlikely event that the seasonal groundwater monitoring shows the levels to rise significantly (i.e. to the point at which they intersect the the surface of the existing ground), the wetland could instead be created by increasing the crest height of the adjacent bund (to approximately 1.5m). This would enable the wetland to be created above the existing ground level, which would negate the requirement to excavate.

5.6 There is no historic evidence to suggest above ground flooding has occurred in the past and therefore, it is assumed that the groundwater level is maintained by the adjacent watercourse. As such, the scenarios discussed above are considered to present a worst-case scenario, but nevertheless, demonstrate that the wetland can be designed to ensure that it will not have a detrimental impact on the SAC/Ramsar site, or indeed the Pevensy Levels.

5.7 Wetland sections

Based on the site-specific topographic survey, two section drawings have been produced. These sections are taken perpendicular to each other, through the proposed wetland area and include the existing groundwater level (assumed from the borehole) and an elevated groundwater level (by 0.5m). A copy of these sections are included within the Appendix of this report and an extract from section through the outfall and watercourse is provided Figure 2 (below).

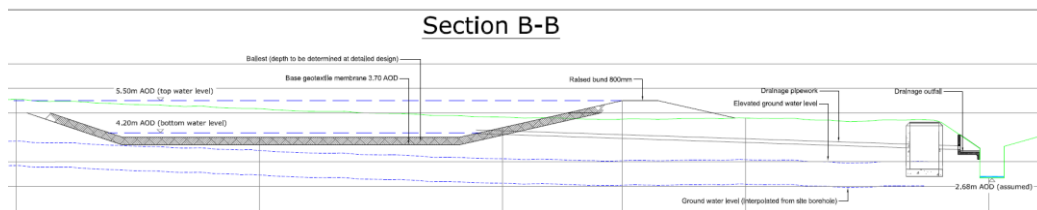


Figure 2 – Extract from section drawing through the proposed wetland.

5.8 The wetland has been redesigned to follow the natural contours of the site, reducing the overall footprint. The volume of storage required to attenuate the surface water runoff discharged from the proposed development remains unchanged (3,230m³), however, the base of the wetland will be excavated to a level no lower than 4m AODN. 1m of soil will therefore remain between the base of the wetland (adjacent to the watercourse) and the current (assumed) groundwater level, based on the borehole information. At the northern edge of the wetland the liner would be located 0.5m above the groundwater level.

A fluctuation in the groundwater level of 0.5m (i.e. 3m AODN adjacent to the watercourse) has been plotted using a hydraulic gradient which matches the existing topography. When plotted on the section it is evident that the base of the wetland is still located above the elevated groundwater level.

5.9 The construction phase could be timed to coincide with low groundwater levels (e.g. summer months), minimising the risk to the groundwater and negating the requirement to dewater.

5.10 The active water depth within the wetland is shown to be 1.3m deep, with a permanent wet area (assumed to be 200mm in depth) included on the section detail. With the base of the wetland located at 4m AODN this provides ~ 700mm below the invert of the filter strip. This provides the opportunity to provide a series of staged shallow entry pools, offering further opportunities for pollution control and silt entrapment. It is envisaged that the flow control device and outfall will be located no lower than 4.2m AODN. Alternatively, if seasonal groundwater monitoring indicates that the groundwater level is higher than estimated, it is evident that the wetland can be raised above the ground and still be located 200mm below the invert level of the filter strip.

5.11 Swale sections

The section drawings run from the wetland area (in the south east of the site), to the north east and north west corners of the site. These sections show the existing land levels and potential gradients of the proposed swales, which will be used to transport runoff across the site. Where the swales reach drainage catchment D it is assumed that a 1:100 gradient will be continued through

the site, cutting slightly into the existing topography to allow this swale to drain into the filter strip and wetland area at a level of ~ 6.2m AODN. As this level is located approximately 0.7m above the maximum water level within the wetland, it is evident that the wetland area could be raised if it is deemed necessary at the detailed design stage, [once the results of the site-specific groundwater monitor are available](#).

- 5.12** Calculations have been undertaken to determine the required sizes of swales needed to transport runoff across the site, to ensure that these features can be accommodated within the current masterplan layout. To achieve this, the outline masterplan layout has been split into 4 drainage catchments (A-D) and the capacity of the swales in each catchment has been assessed. These calculations assume that ~60% of the area within each drainage catchment will be developed as hardstanding, roofs, or roads, once the development is constructed. A summary of these calculations is provided in Table 2 (below).

Parameter	Drainage Catchment A	Drainage Catchment B	Drainage Catchment C	Drainage Catchment D
Area of drainage catchment	1.1ha	1.9ha	1.1ha	0.7ha
Assumed area of impermeable surfacing (~60% of drainage catchment)	0.7ha	1.1ha	0.7ha	0.4ha
Combined area draining to swale from all upstream drainage catchments	0.7ha	1.1ha	1.8ha	2.9ha
Peak runoff rate under the design rainfall event *rounded to nearest 10l/s	~500 l/s	~790 l/s	1290 l/s	2070 l/s
Approximate swale gradient within catchment area	~ 1:50	~ 1:70	~ 1:100	~ 1:100
Required width of swale assuming 1:3 side slope	~ 3m wide	~ 3m wide	~ 4m wide	~ 7m wide

Table 2 – Summary of calculations for the proposed Swales.

- 5.13** From the section drawings, and calculations included within Table 2 above, it is evident that a solution for draining runoff from the entire site via swales is achievable. It is recognised that the location and detailed design of the swales will need to be refined following determination of a fixed masterplan layout and these swales will be required to be connected to the filter strip, draining to the wetland area.
- 5.14** As detailed in the original FRA report, some land raising would be required for the proposed units in the south of Drainage Catchment D to permit these areas to drain via gravity into to a swale crossing drainage catchment D. The land levels would need to be raised to a level of ~6m AODN,

which would also reduce the risk of flooding in the event that the swales become full (e.g. during an exceedance event).

- 5.15** The LLFA has requested additional information to ensure that alterations in land levels resulting from construction of the proposed development and wetland area do not impact on the risk of flooding. Reference to the EA's Surface Water Flood Mapping, shows that; the proposed land raising, and dwellings, are located outside of the extent of flooding depicted by the high-risk scenario mapping (i.e. an event with a return period of 1:1000 years). Further to this, reference to the EA's Flood Zone Maps also show that the proposed area of development is located within Flood Zone 1, which shows that the risk of flooding from fluvial sources is very low at this location (i.e. less than a 0.1% chance in any one year). Based on this information alone, it is concluded that the development site is unlikely to displace floodwater and the risk of raising the land in the proposed area of development is unlikely to have a detrimental impact. Notwithstanding this, if further evidence is required to confirm this, a 2D hydrodynamic model can be constructed as part of the detailed design for the site and this requirement can form part of a planning condition if deemed appropriate.
- 5.16** To ensure this is included within the final detailed design for the drainage system, it is recommended that a suitably worded condition is implemented on planning permission for the site to ensure that the principle of the SuDS design remains unchanged.
- 5.17** Section drawings are appended to this document showing how the proposed swales which are to be incorporated into the scheme based on the existing topography.

6. *Tanking the Wetland*

- 6.1** To ensure that the wetland area is suitably designed for the highest groundwater levels predicted, NE has requested confirmation on the method of construction for the proposed wetland.
- 6.2** It is assumed that groundwater levels could be within 1m of the base of the wetland and as a result the entire wetland will be tanked using an impermeable geotextile liner as a precaution. This impermeable liner will be located beneath the wetland area to prevent potential contaminants from leaching into the underlying groundwater.
- 6.3** A secondary sacrificial liner will also be required ~ 300mm above the primary geotextile liner. This liner will need to be easily identifiable e.g. coloured orange. The purpose of this second geotextile layer is to alert maintenance operators if their activities or the activities of local wildlife e.g. burrowing animals or desilting of the sediment forebay, come close to puncturing the primary lining material.
- 6.4** An alternative and equally effective solution for lining the pond would be to use a minimum 500mm thick impermeable clay lining. If a clay lining is used as an alternative to the impermeable geotextile membrane, then a secondary sacrificial geotextile should also be used to protect the clay layer beneath.

- 6.5** Another alternative solution could be to use a concrete lining material, however, due to the sensitive nature of the site this is not considered the most appropriate solution for this location. Consequently, this option has been discounted.

7. *Proposed Discharge Rates and Storage Volume Calculations*

- 7.1** As agreed with the LLFA, the development will discharge surface water runoff at the greenfield runoff rate (Qbar) for all return period rainfall events. This will ensure long-term storage for stormwater is provided and both the rate and volume of surface water runoff discharged offsite will provide a sustainable solution. A summary of the Micro Drainage calculations for the wetland, which provides the primary storage for the site, is shown in Table 3 below.

Wetland area		
Total area draining to wetland	2.9ha	
Climate change allowance	40%	
Dimensions	2750m ² x 1.5m (deep)	
Active storage depth	1.30m	
Flow Control Device	Vortex Flow control device (Hydro-Brake or similar)	
Overflow control device	Weir and natural spillway (swale).	
Return Period	Greenfield Runoff Rates	Post development runoff rates (restricted to Qbar)
1 in 2yr+cc	10.7 l/s	10.7 l/s
1 in 30yr+cc	24.5 l/s	10.7 l/s
1 in 100yr+cc	34.2 l/s	10.7 l/s

Table 3 – Summary of storage requirements and pre and post development discharge rates from the proposed Wetland Area.

- 7.2** From Table 3 it is evident that the rate surface water runoff is discharged offsite will not be increased. As a result, the proposals will not increase the risk of flooding within the surrounding area. The outputs from the Micro Drainage calculations summarised in Table 3 (above) are included within the appendix of this report.
- 7.3** If the LLFA, NE, PCWLM prefer discharge rates to match greenfield runoff rates for all return period rainfall events, rather than restricting to Qbar, it is acknowledged that this can be achieved by utilising an orifice plate flow control device, rather than the vortex flow control device (Hydro-Brake, or similar).

8. Management and Maintenance

8.1 NE and the LLFA have requested additional information is provided on the management and maintenance for the proposed SuDS. This information is provided below and includes details on how the scheme will be adopted by a management company.

8.2 Maintenance responsibilities

Maintenance for the private SuDS e.g. permeable paved driveways and private hardstanding areas, will become the responsibility of the individual property owners. An owner's manual detailing the maintenance requirements for each property, e.g. how to maintain permeable paving, will need to be provided to residents.

8.3 For the communal SuDS, including the; swales, filter strip and wetland, a specialist management company will be tasked with the ongoing maintenance and management of these features. This company will be responsible for all of the SuDS maintenance, including specialist tasks, such as emptying sediment forebays, and maintaining vegetation.

8.4 Typical maintenance and management requirements for each of the proposed SuDS are included with the appendix of this report.

9. Foul Water Management Strategy

9.1 In addition to managing surface water runoff, it is also necessary to ensure that the proposals can drain foul effluent from the site.

9.2 The development site is located in close proximity to the existing public sewer network and consequently, the use of package treatment systems is not considered appropriate. A new connection to the public sewer system will therefore be required.

9.3 The proposed foul drainage strategy is to drain the entire development site via gravity to a new pumping station located in the south east corner of the site. This pumping station will lift effluent into the existing sewer system via a rising main. The proposed point of connection between the site and existing sewers will be at the existing pumping station within Spindlewood Drive, to the north east of the site.

9.4 The new pumping station, to be constructed onsite, will need to be built in accordance with the requirements outlined in Sewers for Adoption volume 7, or more recent volumes if available at the time of construction. This new pumping station will also need to include a set of backup pumps in the event the primary pump fails.

9.5 Figure 3 (below) is an indicative foul drainage layout plan showing how foul effluent could be drained across the site and discharged into a new pumping station, before being pumped into the existing sewer system.

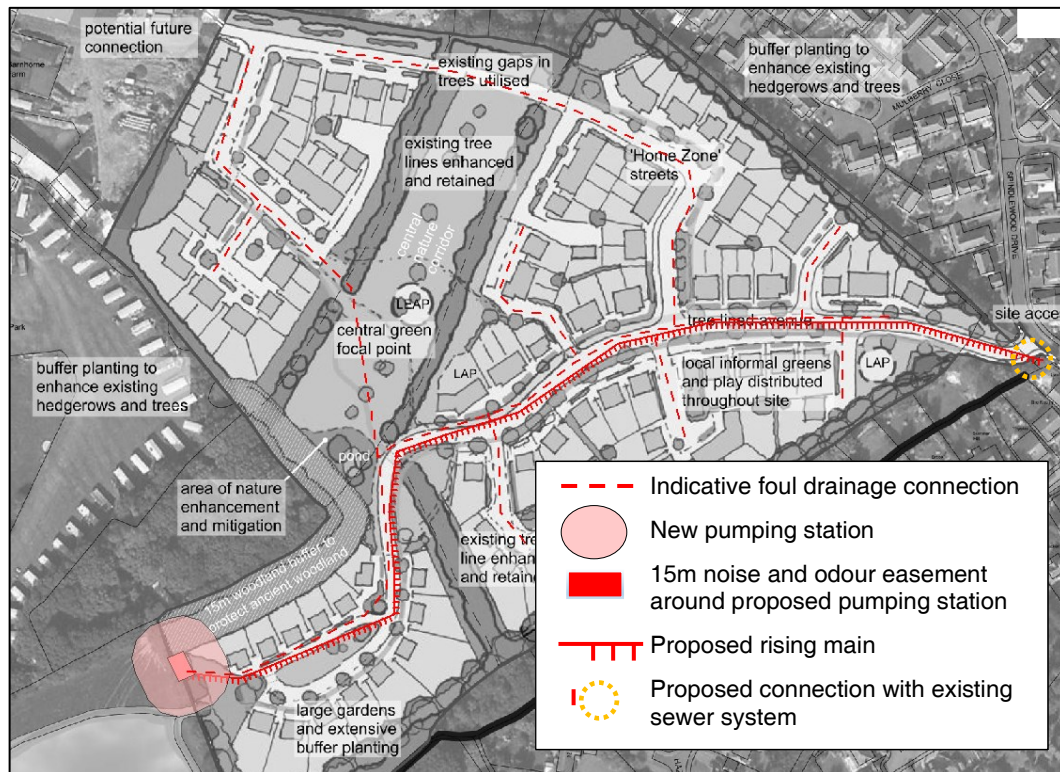


Figure 3 – Indicative foul drainage strategy.

9.6 From Figure 3 (above) it is evident that a solution for draining foul effluent into the existing public sewer system is available.

9.7 To ensure that the development proposals do not have an adverse impact on the existing sewer system in this area, it will be necessary to confirm that there is sufficient capacity within the existing sewers to accommodate the additional foul effluent discharged from the development. It is recommended that a Grampian Condition is imposed following award of outline planning permission for the site, which will require any necessary upgrades to the existing public sewer system to be completed prior to construction.

10. Summary and Conclusions

10.1 A description of the proposed drainage system has been provided and each of the SuDS elements discussed. The drainage proposals comprise draining all of the runoff from the private roofs and hardstanding areas to permeable paving, which will be discharged into a series of swales located adjacent to the access roads. These swales will be designed to intercept runoff from the carriageway and transport runoff across the site, into a vegetated filter strip. The filter strip will be connected to a large wetland area. A layout plan and the supporting calculations have been appended to this report to demonstrate how this can be achieved.

10.2 An assessment into the potential pollution control of the proposed SuDS has been undertaken and this has confirmed that at least 3 levels of water quality treatment will be provided for all sources of runoff across the development. In addition, the proposed SuDS also provide sufficient pollution control based on Simple Index Approach detailed in CIRIA C753. It is therefore considered that

sufficient pollution mitigation measures have been incorporated into the proposed drainage strategy (based on a worst-case scenario).

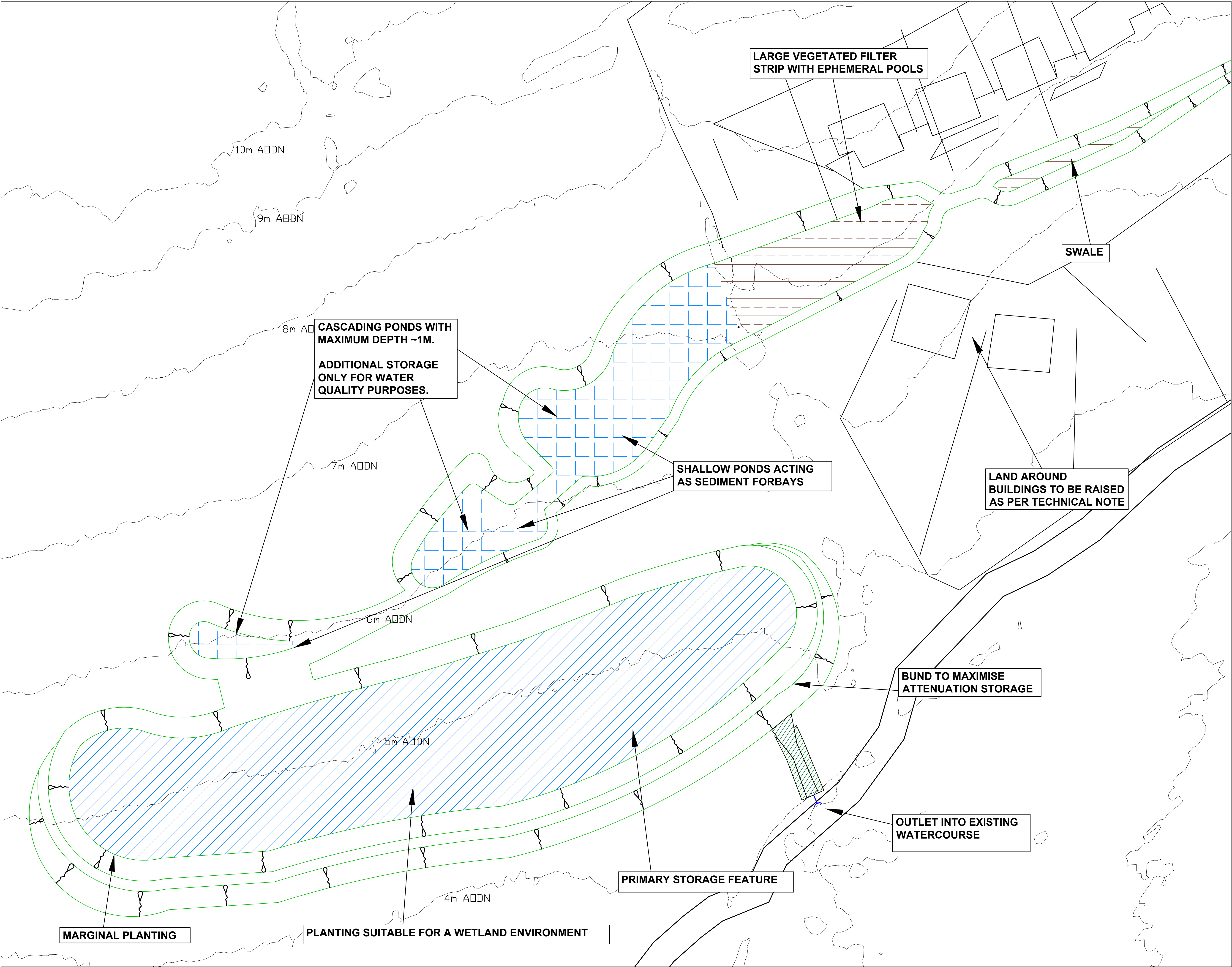
- 10.3** Land levels across the site have been confirmed using a combination of topographic LIDAR data and a site-specific topographic survey. This level data has been used to assess the viability of the proposed wetland based on a worst-case groundwater level, as well as the potential for draining runoff across the entire site via swales. *In addition, a sensitivity analysis has been undertaken and the wetland redesigned accordingly, which allows for a fluctuation in the groundwater level.* It is concluded that even if groundwater levels are found to be elevated, the proposed wetland will be viable and it will be possible to drain runoff into the wetland from the north east and north west corners of the site using swales. On this basis the drainage strategy is shown to be achievable.
- 10.4** Details of the wetland have been provided and an assumption has been made that groundwater levels will be elevated to within 1m of the base of the wetland (as a worst-case scenario). On this basis, it is envisaged that the wetland will be tanked to prevent runoff from infiltrating into underlying groundwater. To tank the wetland area an impermeable geotextile membrane has been specified. Section drawings of the wetland have been produced which show the groundwater level, proposed bund height and impermeable lining in relation to the surveyed watercourse.
- 10.5** The maintenance and management requirements for the proposed SuDS have been outlined and it is envisaged that the permeable paving, used for the private driveways and hardstanding will remain the responsibility of the individual property owners. For the communal SuDS; swales, filter strip, and wetland area, a specialist maintenance and management company will need to be tasked with responsibility for maintaining the proposed drainage system in perpetuity. The applicant has confirmed that they are happy for ongoing maintenance to be managed by a *specialist* management and maintenance company, and this was agreed by all parties at the meeting held on the 29th August 2018 as an acceptable way forward. Following award of planning permission, this element can be dealt with by a suitably worded planning condition.
- 10.6** The potential options for managing foul effluent discharged from the proposed development have also been assessed. The proposed foul drainage strategy is to drain foul effluent from the development to a new pumping station located in the south east corner of the site. This pumping station will lift effluent into the existing public sewer network located within Spindlewood Drive. To provide some resilience, backup pumps will be required and should be incorporated into the detailed design. To ensure that the existing sewer network has adequate capacity to accommodate the additional foul effluent discharged from the proposed development, upgrades to the existing sewers may be necessary. The applicant has confirmed that they are willing to accept a Grampian Condition to ensure that any required upgrade works are carried out prior to the developments construction.
- 10.7** In conclusion, the additional analysis undertaken as part of this technical addendum confirms that there is a viable, sustainable solution for draining both surface water runoff and foul effluent from the proposed development at Spindlewood Drive, Bexhill-on-Sea. On this basis, the information

provided will be sufficient to allow the current objections to be removed and furthermore, it was agreed that any outstanding details can be addressed through appropriate planning conditions.

- 10.8** In respect of the detailed application stage and the subsequent discharge of conditions, the applicant is committed to working with all parties and fully involving them on any aspect to ensure all matters are addressed to their satisfaction. We are happy for this to form part of the conditions in this respect.

Appendices

- Drainage Layout Plan Wetland
- Summary of Index Method Calculations
- Topographic Survey
- Borehole log
- Wetland section drawings
- Swales section drawings
- Peak runoff rates and storage calculations
- Maintenance and management tables



- Notes**
1. Contains Ordnance Survey data © Crown copyright and database right 2018.
 2. All dimensions are in metres unless otherwise stated elsewhere.
 3. Proposed drainage positions will be subject to detailed design.
 4. The size and extent of the pond will be subject to infiltration testing and trial holes.
 5. All drainage systems will need to be installed and designed for suitable loading requirements.

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00	First issue	LA	SMB	06/12/2018
Rev	Description	Made	Checked	Date
CLIENT				
Exigo Project Solutions				
PROJECT				
Spindlewood Drive, Bexhill-on-sea				
SCALE	PROJ REF	ORIGINATOR	CHECKED BY	
1:100	1764	LA	SJB	
DWG REF.			DWG No.	
SuDS Layout Plan			1764-P3-10	

Classification of area draining to SuDS (classes 1-5)		Classification Lookup Table	
1		1	Residential Roof areas
		2	Commercial Roof areas (where solids and metals could reach the roof)
		3	Driveways, and low traffic areas, residential carparks, offices, schools etc
		4	Commercial yards, non-residential parking e.g. hospitals, carparks, all roads (excluding extremely low traffic roads, and high traffic trunk roads such as motorways).
		5	High traffic trunk roads including motorways, lorry parks, areas likely to have heavy pollution such as haulage yards, industrial sites, locations where chemicals or fuels are delivered, manufactured or stored.
List of SuDS used to treat runoff			
SuD A	Permeable Paving (tanked)		
SuD B	Swale (tanked)		
SuD C	Filter Strip (tanked)		
SuD D	Wetland		
Pollution produced by the development			
Total Suspended Solids	Metals	Hydrocarbons	
0.2	0.2	0.05	
Pollution treatment from SuDS			
Total Suspended Solids	Metals	Hydrocarbons	
1.45	1.4	1.525	
Summary			
-1.25	-1.2	-1.475	
Pollution Treatment Sufficient			

Spindlewood Drive	
Undertaken By: SAH	
Checked By:	
Calculations Undertaken: 25/09/2018	

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Classification of area draining to SuDS (classes 1-5)		Classification Lookup Table	
3		1	Residential Roof areas
		2	Commercial Roof areas (where solids and metals could reach the roof)
		3	Driveways, and low traffic areas, residential carparks, offices, schools etc
		4	Commercial yards, non-residential parking e.g. hospitals, carparks, all roads (excluding extremely low traffic roads, and high traffic trunk roads such as motorways).
		5	High traffic trunk roads including motorways, lorry parks, areas likely to have heavy pollution such as haulage yards, industrial sites, locations where chemicals or fuels are delivered, manufactured or stored.
List of SuDS used to treat runoff			
SuD A	Permeable Paving (tanked)		
SuD B	Swale (tanked)		
SuD C	Filter Strip (tanked)		
SuD D	Wetland		
Pollution produced by the development			
Total Suspended Solids	Metals	Hydrocarbons	
0.5	0.4	0.4	
Pollution treatment from SuDS			
Total Suspended Solids	Metals	Hydrocarbons	
1.45	1.4	1.525	
Summary			
-0.95	-1	-1.125	
Pollution Treatment Sufficient			

Spindlewood Drive	
Undertaken By: SAH	
Checked By:	
Calculations Undertaken: 25/09/2018	

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Classification of area draining to SuDS (classes 1-5)		Classification Lookup Table	
4		1	Residential Roof areas
		2	Commercial Roof areas (where solids and metals could reach the roof)
		3	Driveways, and low traffic areas, residential carparks, offices, schools etc
		4	Commercial yards, non-residential parking e.g. hospitals, carparks, all roads (excluding extremely low traffic roads, and high traffic trunk roads such as motorways).
		5	High traffic trunk roads including motorways, lorry parks, areas likely to have heavy pollution such as haulage yards, industrial sites, locations where chemicals or fuels are delivered, manufactured or stored.
List of SuDS used to treat runoff			
SuD A	Swale (tanked)		
SuD B	Filter Strip (tanked)		
SuD C	Wetland		
SuD D	None		
Pollution produced by the development			
Total Suspended Solids	Metals	Hydrocarbons	
0.7	0.6	0.7	
Pollution treatment from SuDS			
Total Suspended Solids	Metals	Hydrocarbons	
0.9	1	1.05	
Summary			
-0.2	-0.4	-0.35	
Pollution Treatment Sufficient			

Spindlewood Drive

Undertaken By: SAH

Checked By:

Calculations Undertaken: 25/09/2018

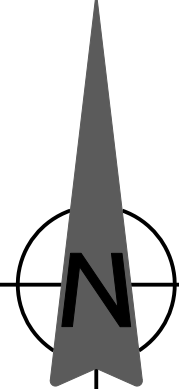
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Notes

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All ground features that were visible at the time of the survey have been located, however there may have been items obscured while the survey was being conducted.



Grid - In metres to OSNG by using the national GNSS network.

Datum - In metres AOD by using the national GNSS network.

Ground contours are shown at 0.5m intervals

KEY

Rev	Date	Drawn	Description	Ch'k'd
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Client

YOUR ENVIRONMENT
CHILGROVE BUSINESS CENTRE
CHILGROVE, WEST SUSSEX, PO18 9HU

Site

SPINDLEWOOD DRIVE
BEXHILL-ON-SEA

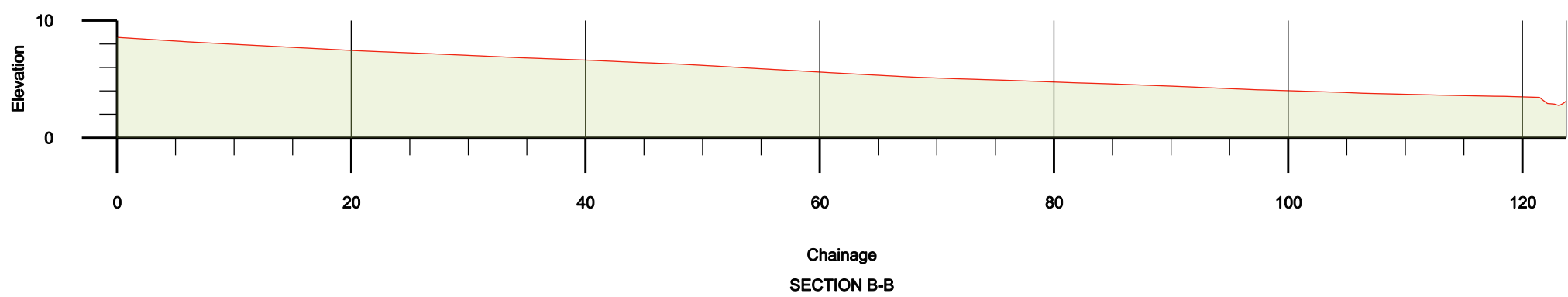
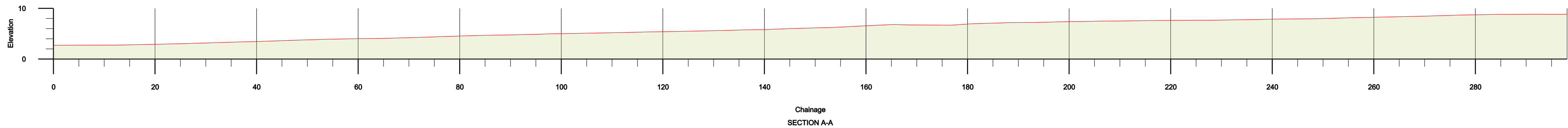
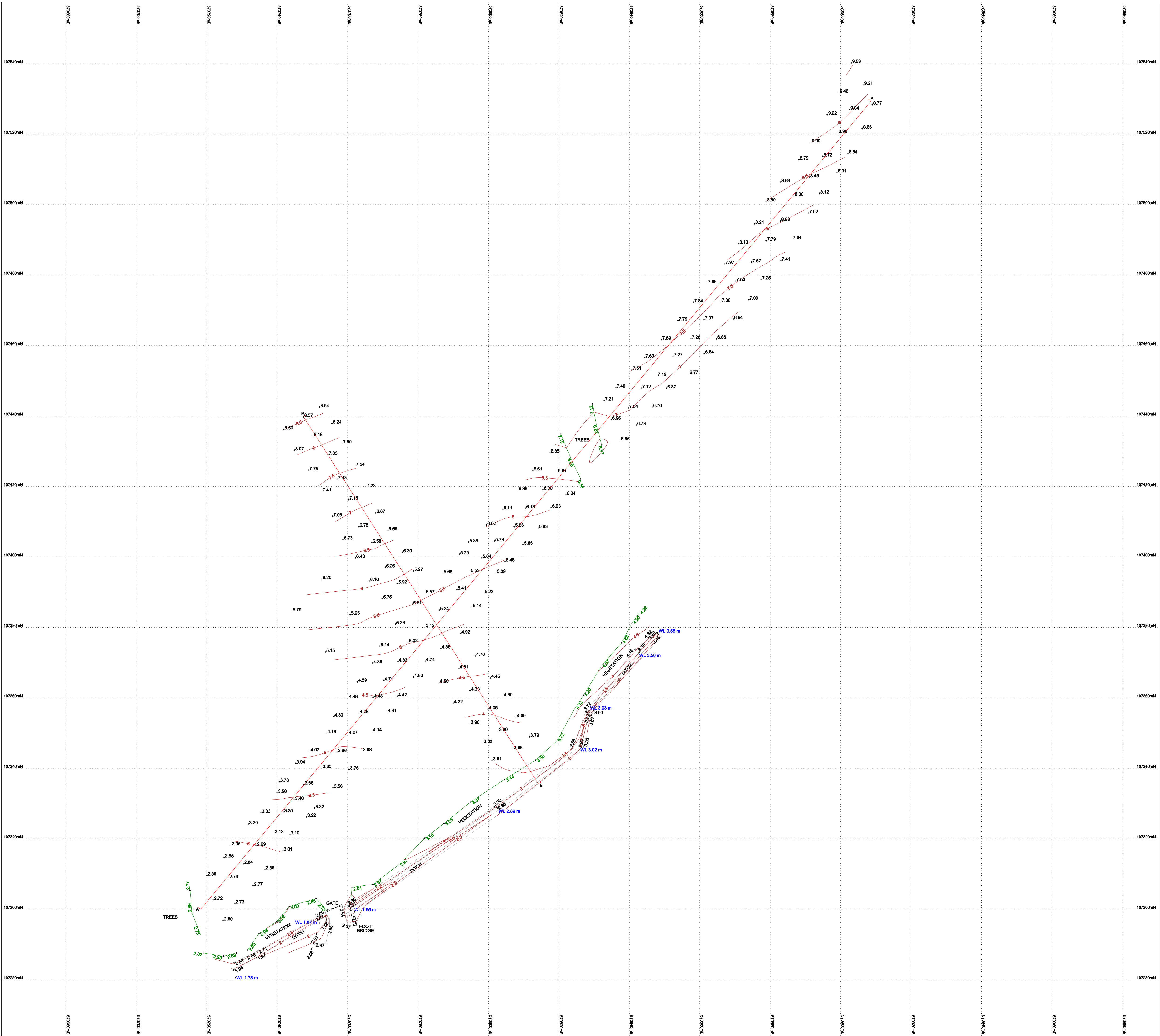
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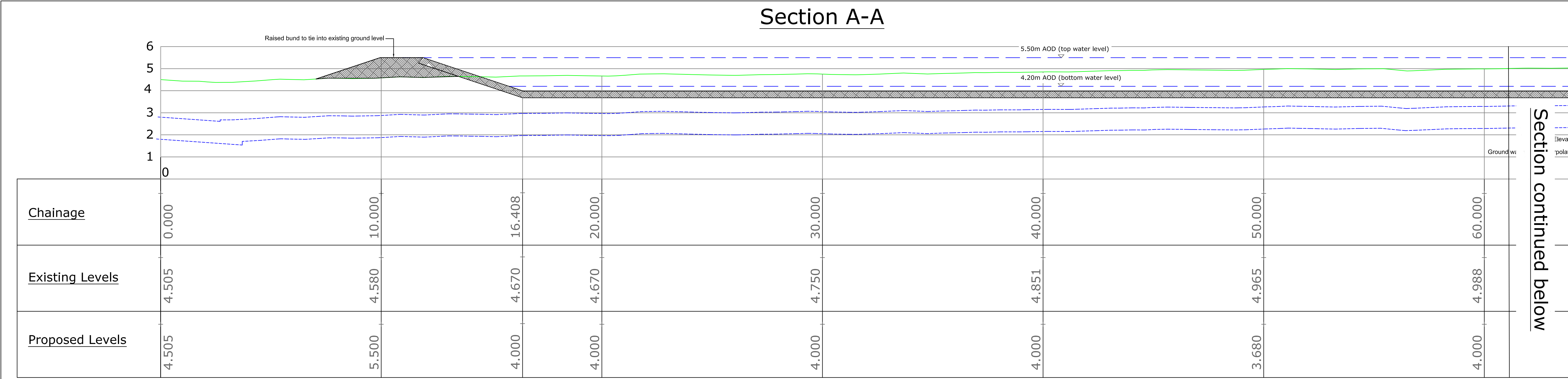
TOPOGRAPHICAL SURVEY

Surveyed	MR	Drawn	MR
Chk.	MR	Date	13/09/18

Scale	[A0 Sheet] 1:500	Drawing Reference	YE/LS/1870-1
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Job No	Rev
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Section Plan

Notes

1.

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2.

All dimensions are in metres unless otherwise stated elsewhere.

3.

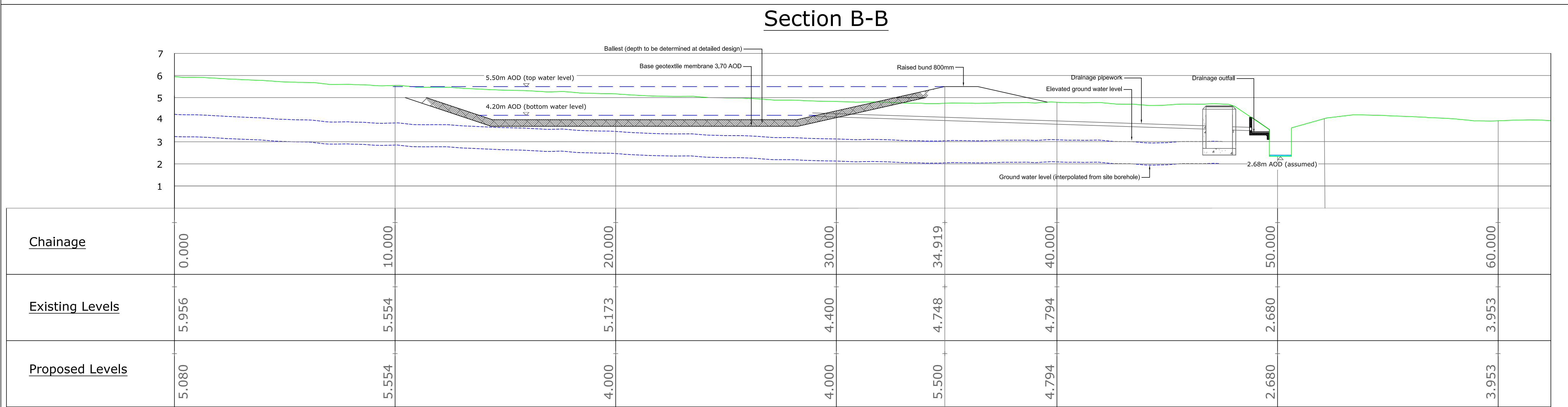
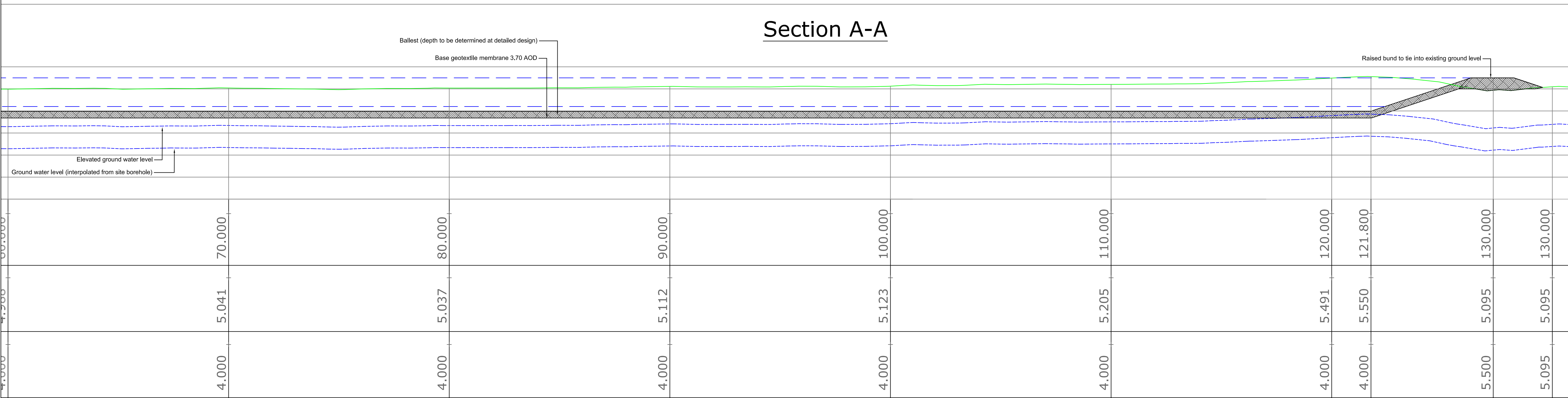
Proposed drainage positions will be subject to detailed design.

4.

The size and extent of the pond will be subject to infiltration testing and trial holes.

5.

All drainage systems will need to be installed and designed for suitable loading requirements.



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03

Pond revised for GW

SB

SMB

05/12/2018

02

Second issue

LA

SAH

15/10/2018

01

Section A-A Relocated

LA

SAH

26/09/2018

00

First issue

LA

SAH

27/08/2018

Rev

Description

Made

Checked

Date

CLIENT

Exigo Project Solutions

PROJECT

Spindlewood Drive, Bexhill-on-sea

SCALE

1:100

PROJ REF

2049

ORIGINATOR

LA

CHECKED BY

SJB

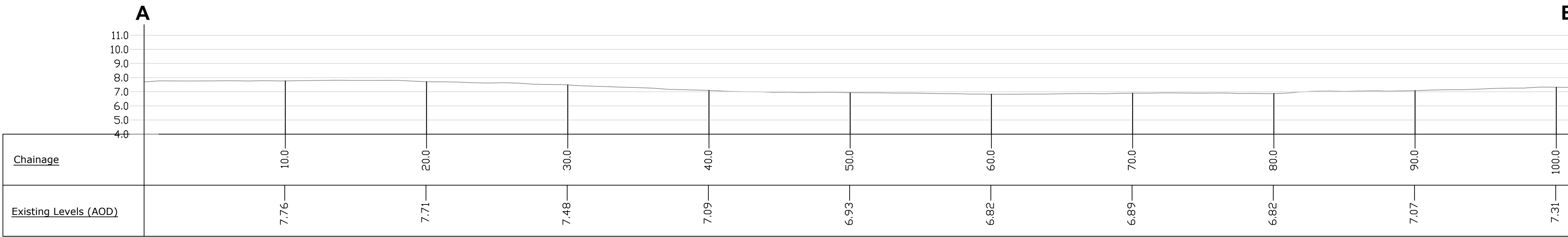
DWG REF.

Long Sections Through SuDS Features

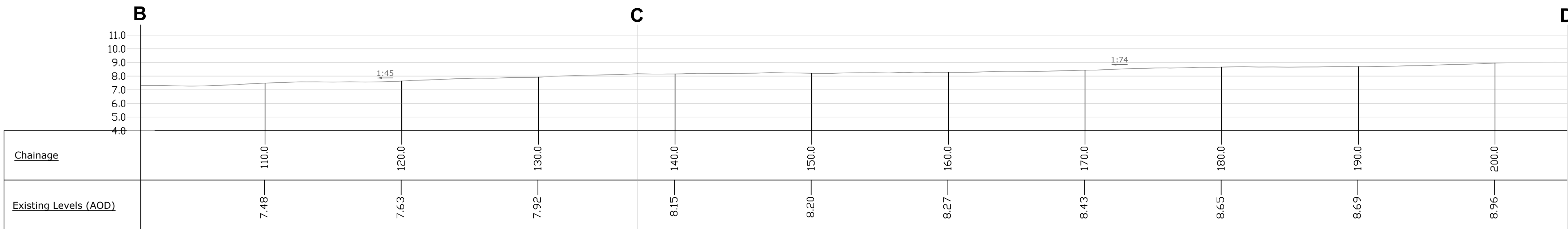
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1764-P3-01

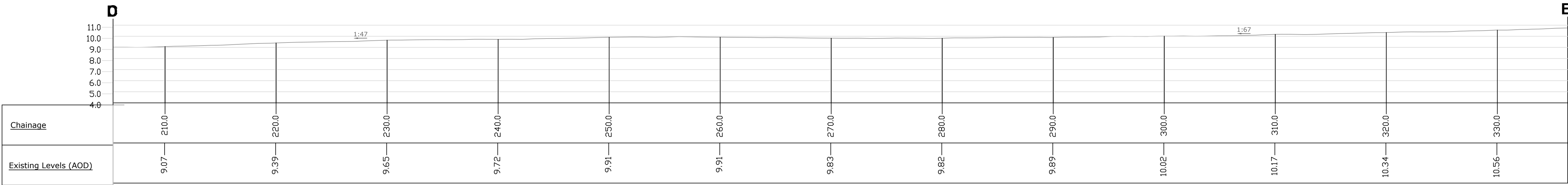
Section A-B



Section B-D



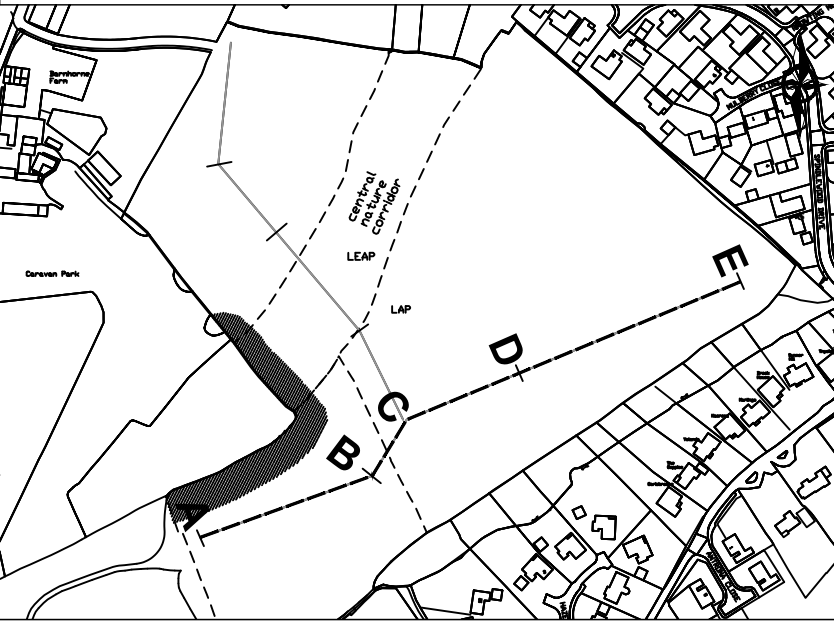
Section D-E



Notes

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3. Existing levels have been interpreted from LiDAR information, and is subject to further site survey.

Location Plan



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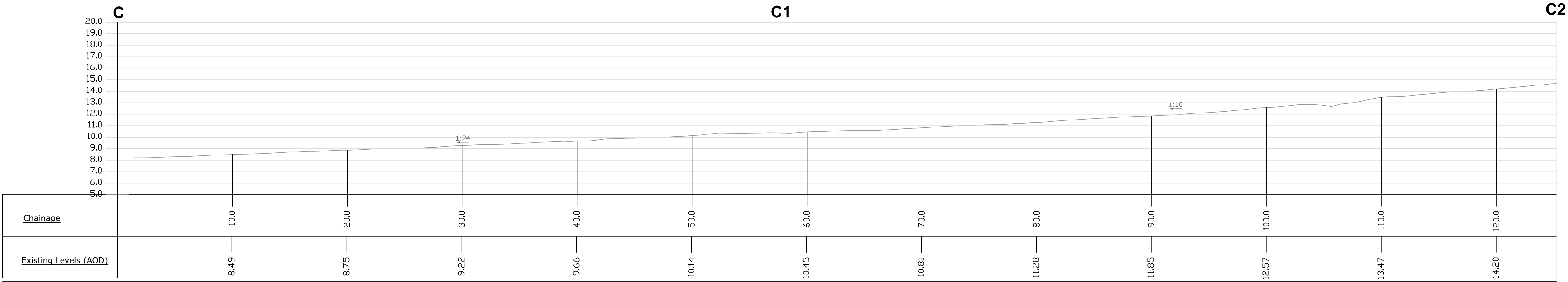
Unit 6-7 Barham Business Park
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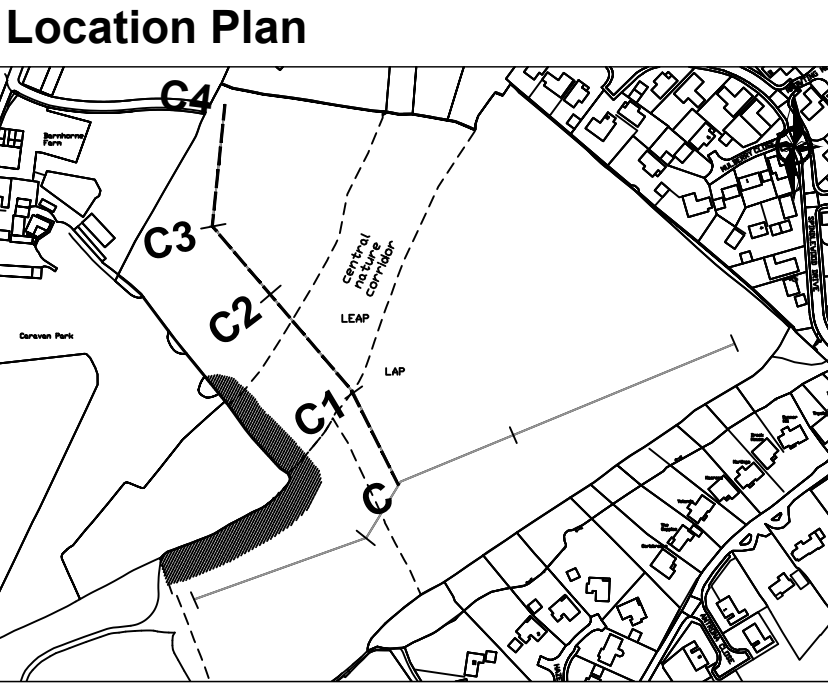
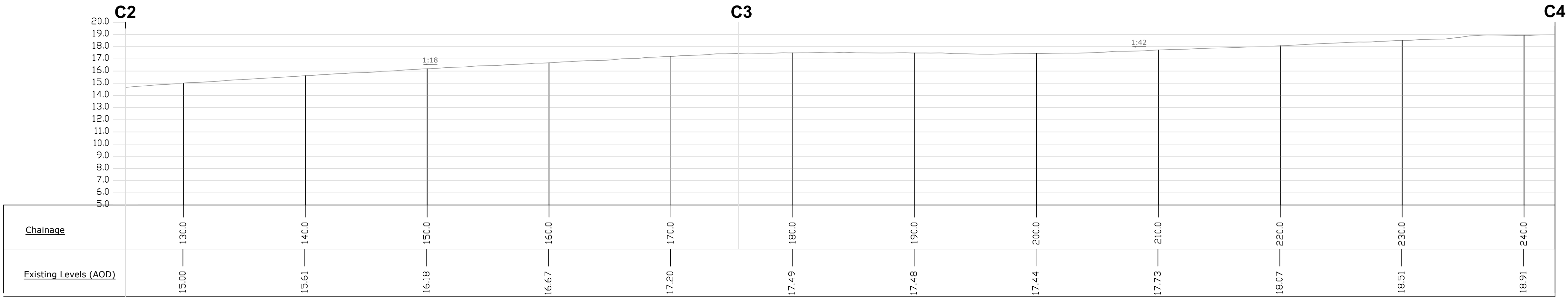
P2	Second issue	15/10/2018
P1	First issue	26/09/2018
Rev	Description	Date
PROJECT		
SPINDLEWOOD DRIVE, BEXHILL-ON-SEA		
SCALE		
NTS	PROJ REF 1764	ORIGINATOR SJB
DWG REF. EXISTING LONG SECTION A - E		CHECKED BY 1764-02

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Section C-C2



Section C2-C4



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P2	Second issue	15/10/2018
P1	First issue	26/09/2018
Rev	Description	Date
PROJECT		
SPINDLEWOOD DRIVE, BEXHILL-ON-SEA		
SCALE		
NTS	PROJ REF 1764	ORIGINATOR SJB
		CHECKED BY
DWG REF.		DWG No.
EXISTING LONG SECTION C - C4		1764-03

Herrington Consulting Ltd					Page 0
Unit 6 - Barham Business Park Elham Valley Road Barham CT4 6DQ		1764 - Spindlewood Drive Wetland 40% CC			
Date 11/12/2018 File WETLAND.SRCX		Designed by SAH Checked by			
Micro Drainage		Source Control 2017.1.2			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	4.609	0.409	10.7	997.8	O K
30 min Summer	4.681	0.481	10.7	1176.6	O K
60 min Summer	4.763	0.563	10.7	1383.5	O K
120 min Summer	4.855	0.655	10.7	1618.6	O K
180 min Summer	4.913	0.713	10.7	1767.4	O K
240 min Summer	4.955	0.755	10.7	1876.3	O K
360 min Summer	5.015	0.815	10.7	2031.1	O K
480 min Summer	5.056	0.856	10.7	2138.6	O K
600 min Summer	5.086	0.886	10.7	2217.9	O K
720 min Summer	5.109	0.909	10.7	2278.2	O K
960 min Summer	5.124	0.924	10.7	2319.2	O K
1440 min Summer	5.129	0.929	10.7	2332.6	O K
2160 min Summer	5.109	0.909	10.7	2278.4	O K
2880 min Summer	5.087	0.887	10.7	2219.7	O K
4320 min Summer	5.083	0.883	10.7	2209.3	O K
5760 min Summer	5.067	0.867	10.7	2168.9	O K
7200 min Summer	5.046	0.846	10.7	2113.6	O K
8640 min Summer	5.022	0.822	10.7	2051.7	O K
10080 min Summer	4.998	0.798	10.7	1987.4	O K
15 min Winter	4.743	0.543	10.7	1332.0	O K
30 min Winter	4.836	0.636	10.4	1570.8	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	184.507	0.0	709.7	19	
30 min Summer	109.071	0.0	690.8	34	
60 min Summer	64.478	0.0	1211.0	64	
120 min Summer	38.116	0.0	1304.4	124	
180 min Summer	28.026	0.0	1299.6	184	
240 min Summer	22.532	0.0	1262.4	244	
360 min Summer	16.567	0.0	1227.2	362	
480 min Summer	13.320	0.0	1256.9	482	
600 min Summer	11.246	0.0	1281.5	602	
720 min Summer	9.794	0.0	1298.7	722	
960 min Summer	7.744	0.0	1305.9	962	
1440 min Summer	5.562	0.0	1291.3	1440	
2160 min Summer	3.994	0.0	2549.9	1928	
2880 min Summer	3.158	0.0	2409.8	2280	
4320 min Summer	2.364	0.0	2359.7	3072	
5760 min Summer	1.925	0.0	3956.6	3920	
7200 min Summer	1.641	0.0	4188.8	4760	
8640 min Summer	1.441	0.0	4334.4	5616	
10080 min Summer	1.290	0.0	4245.5	6448	
15 min Winter	184.507	0.0	627.6	19	
30 min Winter	109.071	0.0	586.5	34	
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Unit 6 - Barham Business Park Elham Valley Road Barham CT4 6DQ		1764 - Spindlewood Drive Wetland 40% CC			
Date 11/12/2018 File WETLAND.SRCX		Designed by SAH Checked by			
Micro Drainage		Source Control 2017.1.2			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	4.944	0.744	10.7	1848.0	O K
120 min Winter	5.066	0.866	10.7	2165.4	O K
180 min Winter	5.143	0.943	10.6	2368.1	O K
240 min Winter	5.199	0.999	10.7	2518.0	O K
360 min Winter	5.280	1.080	10.7	2734.1	O K
480 min Winter	5.337	1.137	10.7	2887.3	O K
600 min Winter	5.380	1.180	10.7	3003.4	O K
720 min Winter	5.413	1.213	10.7	3094.3	O K
960 min Winter	5.441	1.241	10.7	3169.8	O K
1440 min Winter	5.463	1.263	10.7	3229.6	O K
2160 min Winter	5.455	1.255	10.7	3209.4	O K
2880 min Winter	5.427	1.227	10.7	3130.6	O K
4320 min Winter	5.424	1.224	10.7	3122.3	O K
5760 min Winter	5.403	1.203	10.7	3067.6	O K
7200 min Winter	5.372	1.172	10.7	2982.6	O K
8640 min Winter	5.335	1.135	10.7	2883.2	O K
10080 min Winter	5.296	1.096	10.7	2776.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	64.478	0.0	1315.1	64	
120 min Winter	38.116	0.0	1268.3	122	
180 min Winter	28.026	0.0	1328.9	182	
240 min Winter	22.532	0.0	1374.9	240	
360 min Winter	16.567	0.0	1436.4	358	
480 min Winter	13.320	0.0	1475.7	476	
600 min Winter	11.246	0.0	1502.0	594	
720 min Winter	9.794	0.0	1519.8	710	
960 min Winter	7.744	0.0	1524.8	942	
1440 min Winter	5.562	0.0	1502.9	1400	
2160 min Winter	3.994	0.0	2868.9	2056	
2880 min Winter	3.158	0.0	2854.6	2680	
4320 min Winter	2.364	0.0	2795.3	3332	
5760 min Winter	1.925	0.0	5205.0	4272	
7200 min Winter	1.641	0.0	5294.0	5192	
8640 min Winter	1.441	0.0	5070.5	6136	
10080 min Winter	1.290	0.0	4971.8	7056	
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Unit 6 - Barham Business Park Elham Valley Road Barham CT4 6DQ	1764 - Spindlewood Drive Wetland 40% CC	
Date 11/12/2018 File WETLAND.SRCX	Designed by SAH Checked by	
Micro Drainage Source Control 2017.1.2		

Rainfall Details


Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 570550 107200 TQ 70550 07200
C (1km)	-0.024
D1 (1km)	0.352
D2 (1km)	0.294
D3 (1km)	0.396
E (1km)	0.308
F (1km)	2.413
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 2.900

Time (mins) Area
From: To: (ha)

0 4 2.900

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Unit 6 - Barham Business Park Elham Valley Road Barham CT4 6DQ	1764 - Spindlewood Drive Wetland 40% CC	
Date 11/12/2018 File WETLAND.SRCX	Designed by SAH Checked by	
Micro Drainage Source Control 2017.1.2		

Model Details

Storage is Online Cover Level (m) 5.500

Tank or Pond Structure

Invert Level (m) 4.200

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2380.0	1.300	2750.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-CHE-0138-1070-1300-1070
Design Head (m)	1.300
Design Flow (l/s)	10.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	No
Diameter (mm)	138
Invert Level (m)	4.200
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	10.7
Flush-Flo™	0.305	10.7
Kick-Flo®	0.423	6.3
Mean Flow over Head Range	-	8.0

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	4.1	1.200	10.3	3.000	16.1	7.000	24.4
0.200	8.4	1.400	11.1	3.500	17.4	7.500	25.3
0.300	10.7	1.600	11.8	4.000	18.6	8.000	26.1
0.400	6.4	1.800	12.5	4.500	19.7	8.500	26.9
0.500	6.7	2.000	13.2	5.000	20.7	9.000	27.6
0.600	7.3	2.200	13.8	5.500	21.7	9.500	28.4
0.800	8.4	2.400	14.4	6.000	22.6		
1.000	9.4	2.600	15.0	6.500	23.5		

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Operation and Maintenance Schedule – Pervious Pavement		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall or manufacturer's recommendations.
Occasional maintenance	Mow adjacent areas.	As required.
	Removal of weeds. If using glyphosate this must be applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving.	Whenever adjacent vegetation or soil comes within 50mm of the level of the paving.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	When damage to the paving system has occurred.
Monitoring	Initial inspection to ensure paving system has been installed correctly.	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Every 3 months or, ~48 hours after any large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually, more frequently in the first 3 years following installation.
	Monitor inspection chambers	Annually

General Operation and Maintenance Table for Pervious Pavements in accordance with CIRIA C753 The SuDS Manual.

Operation and Maintenance Schedule – Swales		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly, or when required following inspection
	Cut grass, manage other vegetation and remove nuisance plants	Monthly (during growing season), or as required following inspection
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly and following large storms.
	Inspect surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required following inspection
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation establish appropriate silt removal frequencies	Half yearly, to be adjusted dependant on siltation rates once confirmed.
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or reseedling	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Remove build-up of sediment	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

General Operation and Maintenance Table for Swales in accordance with CIRIA C753 The SuDS Manual.

Operation and Maintenance Schedule – Vegetated Filter Strip with Ephemeral Pools		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly, or when required following inspection
	Cut the grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly for the first year following installation, then as required
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, sedimentation and contamination (e.g. oils)	Monthly at start, then half yearly
	Inspect filter strip for channelling, repair where required.	Following large storms as well as monthly at start, then half yearly.
	Inspect silt accumulation rates and establish appropriate removal frequencies, desilt ephemeral pools.	Monthly for the first year, then half yearly.
Occasional maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over > 10% of the filter strip area.
Remedial Actions	Repair erosion or other damage by replanting or reseedling	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

General Operation and Maintenance Table for Filter Strips in accordance with CIRIA C753 The SuDS Manual.

Operation and Maintenance Schedule – Ponds and Wetland		
Maintenance Schedule	Required Action	Typical Frequency
Routine maintenance	Remove debris and litter from in and around the feature.	Monthly, or when required following inspection
	Cut grass and manage boundary planting.	Monthly (during growing season), or as required
	Remove nuisance plants or potentially invasive species.	Monthly at start, then as required
	Inspect inlets, outlets, banks and other features for damage. Repair damage if present.	Monthly inspection for the first year following installation then as required.
	Inspect water body for signs of poor water quality.	As required.
	Inspect siltation rates and establish program for silt removal.	Monthly inspection for the first year, followed by half yearly inspections. Inspection frequency should be increased if future development occurs upstream of the wetland area.
	To avoid impact to wildlife, ensure any silt is removed from the wetland on a regular basis, focusing on a quarter of the feature each time silt is removed.	Yearly
	Manage any aquatic vegetation within the ponds.	As required following inspection.
	Remove sediment from the forebay area.	As required based on siltation rates.
	Inspect quality of water draining from wetland area.	Yearly or as required by Natural England, the Environment Agency, or the Pevensey and Cuckmere Water Level Management Board.
	Inspection and repair of the watercourse downstream of the outfall structure.	Monthly for the first 3 months following installation, half yearly inspections to check for erosion.
Remedial Actions (Following Storms)	Repair erosion or other damage	As required
	Replant boundary or aquatic plants, where necessary	As required
	Aerate pond if signs of eutrophication are detected	As required
	Repair inlet and outlet structures.	As required
	Repair any riprap or erosion control / stability features.	As required
Maintenance for the Flow Control Device (Orifice Plate)	Regular inspection and cleaning to ensure flow control device and overflow channel do not become blocked by debris.	Following large storms, once every three months, or any time the overflow channel is activated.
	Clearance and removal of foliage and any other objects from the area around the flow control device.	As required following 3 monthly inspection
	Any other manufacturer specific maintenance requirements.	As required

General Operation and Maintenance Table for Ponds and Wetland in accordance with CIRIA C753 The SuDS Manual.

Date: 13 November 2018
Our ref: 262909
Your ref: RR/2017/1705/P



Jo Edwards
Rother District Council

Customer Services
Hornbeam House
Crewe Business Park
Electra Way
Crewe
Cheshire
CW1 6GJ

T 0300 060 3900

BY EMAIL ONLY

Dear Jo

Planning consultation: Outline application for residential development for c.160 dwellings with all matters other than access reserved
Location: Land off Spindlewood Drive, Bexhill

Thank you for your consultation on the above dated 19 October 2018 which was received by Natural England on the same date. Apologies for missing your deadline for comments, but I hope you will still find the following helpful.

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

SUMMARY OF NATURAL ENGLAND'S ADVICE

FURTHER INFORMATION REQUIRED TO DETERMINE IMPACTS ON DESIGNATED SITES

Whilst Natural England considers that mitigation measures are available to address the issues raised by the proposal, there are still a number of uncertainties that need to be resolved, to ensure that the full set of necessary mitigation measures are secured. This is necessary for an Appropriate Assessment to be able to determine, beyond reasonable scientific doubt, that an adverse effect on Pevensey Levels will be avoided. The applicant should therefore comment on:

- The measures that will be taken to address dewatering issues during construction of the wetland, and how any silt mobilised will be prevented from entering the SAC/Ramsar
- The implications of a groundwater gradient for the design of the wetland, particularly in terms of any additional ballast that might be necessary, and whether this would have any additional implications for the Pevensey Levels.
- Whether the displacement of groundwater from the construction of the wetland is likely to impact on the hydrological regime of the SAC/Ramsar, and if so whether any mitigation is necessary.

Natural England recommends seeking comment on the above issues to inform the Appropriate Assessment and to confirm that the mitigation measures presented in the Information to inform an Appropriate Assessment (IIAA Report) (Aspect Ecology, October 2018) are based on the worst-case groundwater scenario, and therefore present the full set of mitigation measures necessary.

Nevertheless, Natural England recognises the work undertaken by the applicant and presented in the IIAA Report. Therefore, subject to clarification and comment on the above three points, Natural England would be able to advise that we have no objection to the proposal subject to securing appropriate mitigation.

Once this clarification has been received, our advice would be in order to mitigate adverse effects on the integrity of the Pevensey Levels Special Area of Conservation and Ramsar site, and make the development acceptable, the following mitigation measures are required and should be secured:

- Fill material for land raising must be inert and free from contaminants that could potentially enter Pevensey Levels;
- The Construction Environment Management Plan (CEMP) must include (but not be limited to) the measures set out at paragraph 5.2.2 of the IIAA Report, and in particular, set out the measures necessary to prevent silt entering the SAC/Ramsar and avoid water quality impacts on the Pevensey Levels.
- The detailed SUDS design must include permeable paving, oil interceptors, swales, filter strip and wetland. The wetland should include all the features described in the Indicative Wetland Layout drawing in the IIAA Report. Any amendments to this SUDS strategy at the detailed design stage should be subject to consultation with Natural England, and should be reassessed under the Habitats Regulations.
- The detailed SUDS design should be informed by groundwater level monitoring covering a full winter and into the spring.
- As groundwater levels are high, an impermeable liner will be necessary. A secondary, sacrificial liner is also required to reduce the risk of leaks or accidental tearing during desilting.
- A S.106 agreement should secure the option to bring in additional land for mitigation if the detailed design demonstrates it is necessary.
- Specialist management of the SUDS is vital and should be secured in perpetuity.
- A detailed management and maintenance schedule should be produced for all the SUDS features described above. The schedule should include the requirement to report to a suitable authority, and allow for step-in rights for the local authority should the management company fail to provide an acceptable service.
- The detailed design must test the assumption that displacement of floodwater will be insignificant, and mitigate any impacts on the SAC/Ramsar if necessary
- Connection to mains sewerage is necessary. The pumping station to lift effluent to the rising main must include backup pumps to secure against the event the primary pump fails.

We advise that an appropriate planning condition or obligation is attached to any planning permission to secure these measures.

Natural England's advice on other natural environment issues is set out below.

Habitats Regulations Assessment (HRA)

The application site is in close proximity to the Pevensey Levels Special Area of Conservation (SAC) which is a European site. The site is also listed as Pevensey Levels Ramsar site¹ and notified at a national level as Pevensey Levels Site of Special Scientific Interest (SSSI). Please see the subsequent sections of this letter for our advice relating to SSSI features.

In considering the European site interest, Natural England advises that you, as a competent authority under the provisions of the Habitats Regulations, should have regard for any potential impacts that a plan or project may have². The [Conservation objectives](#) for each European site

¹ Listed or proposed Wetlands of International Importance under the Ramsar Convention (Ramsar) sites are protected as a matter of Government policy. Paragraph 118 of the National Planning Policy Framework applies the same protection measures as those in place for European sites.

² Requirements are set out within Regulations 63 and 64 of the Habitats Regulations, where a series of steps and tests are followed for plans or projects that could potentially affect a European site. The steps and tests set out within Regulations 63 and 64 are commonly referred to as the 'Habitats Regulations Assessment' process.

explain how the site should be restored and/or maintained and may be helpful in assessing what, if any, potential impacts a plan or project may have.

The consultation documents provided by your authority do not include information to demonstrate that the requirements of Regulations 63 and 64 of the Habitats Regulations have been considered by your authority, i.e. the consultation does not include an HRA. However, the applicant has produced a report titled 'Information to Inform an Appropriate Assessment' (IIAA Report) (Aspect Ecology, October 2018).

In advising your authority on the requirements relating to HRA, it is Natural England's advice that the proposal is not necessary for the management of the European site. Your authority should therefore determine whether the proposal is likely to have a significant effect on any European site, proceeding to the Appropriate Assessment stage where significant effects cannot be ruled out.

As noted in Natural England's letter dated 15 June 2018, a recent ruling has been made by the Court of Justice of the European Union (the CJEU) on the interpretation of the Habitats Directive in the case of People Over Wind and Sweetman vs Coillte Teoranta (ref: C-323/17). The case relates to the treatment of mitigation measures at the screening stage of a HRA when deciding whether an appropriate assessment of a plan/project is required. The Court's Ruling goes against established practice in the UK that mitigation measures can, to a certain degree, be taken into account at the screening stage.

As a result, it is Natural England's view that the proposal is likely to have a significant effect on Pevensey Levels SAC and Ramsar site, and that an Appropriate Assessment is necessary to ascertain whether there will be an adverse effect on the integrity of the sites. Therefore, Natural England agrees with the recommendation in the Information to inform an Appropriate Assessment under the Habitats Regulations, that the mitigation measures proposed should be taken into account at the Appropriate Assessment stage.

Further advice on mitigation

Natural England provided advice on the information required to enable an HRA to be completed in our letter dated 15 June 2018. Subsequently, discussions regarding the proposal with yourself, the applicant, the Environment Agency and the Lead Local Flood Authority (LLFA) have focussed on addressing this information requirement. The IIAA Report sets out the outcome of those discussions. Taking each of the areas of potential impact on Pevensey Levels in turn:

Water quality impacts during construction

Paragraph 5.2.2 of the IIAA Report sets out construction mitigation measures to be included in a Construction Environment Management Plan (CEMP). Natural England's view is that these standard best practice measures are necessary to avoid water quality impacts during construction.

However, the implications of the proposals described in the Technical Addendum to the FRA/SWMS Report (Technical Addendum) (Herringtons Consulting Ltd, 16 October 2018), require further consideration to determine the necessary mitigation measures during construction. In particular, paragraph 5.10 of that report states that land levels would need to be raised in part of the site. Therefore, in order to avoid an adverse effect, **a planning condition will be necessary to ensure that the fill material for land raising is inert and free from contaminants that could potentially enter Pevensey Levels.**

Further, Natural England has reviewed the 'Report on Spindlewood Development Site – SUDS – Bexhill' by G.P. Lawson, forwarded on 12 November 2018. This report raises questions about the design of the SuDS wetland and the level of excavation necessary. As the excavation may

The Government has produced core guidance for competent authorities and developers to assist with the Habitats Regulations Assessment process. This can be found on the Defra website. <http://www.defra.gov.uk/habitats-review/implementation/process-guidance/guidance/sites/>

encounter the groundwater table (depending on groundwater levels and influenced by the time of year), dewatering may be necessary. The IIAA Report (paragraph 5.2.2) includes reference to the use of silt traps during construction. However, given the size of the wetland construction and the amount of dewatering potentially required, these silt traps may need to be substantial. Natural England advises that, for your authority's Appropriate Assessment, it would be helpful if the applicant could comment on the measures that will be taken to address the dewatering issues, and how the silt will be prevented from entering the SAC/Ramsar.

To address impacts during construction, **it should be secured by planning condition that the CEMP set out the measures necessary to prevent silt entering the SAC/Ramsar and avoid water quality impacts on the Pevensey Levels.** This should include the measures set out at paragraph 5.2.2 of the IIAA Report, and may include further measures to avoid silt entering the SAC/Ramsar.

Surface water quality impacts during operation

Natural England's view is that, in principle, a suitably designed Sustainable Urban Drainage System (SUDS) could provide the treatment for surface water runoff necessary to avoid an adverse impact on the SAC/Ramsar. The SUDS treatment train set out in the IIAA Report comprises permeable paving, swales, a filter strip and wetland. Using the risk index approach in the CIRIA SuDS Manual (C753), the IIAA Report demonstrates (in Table 1 of the Technical Addendum) that, in principle, this treatment train is sufficient to address pollutants from the proposal.

Permeable paving is proposed for private driveways and hardstanding. Whilst permeable paving is welcomed, we advise that it cannot be taken into account in the calculations for water quality treatment. This is because maintenance by private individuals cannot be relied upon to ensure the efficacy of the paving in perpetuity. Nevertheless, we would wish to see permeable paving included in the detailed design for both private, and any public, hardstanding. Where permeable paving on public hardstanding is proposed, this should be included in the management and maintenance plan for the management company, and in which case, could be included in the water quality treatment calculations.

Table 1 in the Technical Addendum shows that, whilst the SUDS treatment train is sufficient to address road run-off, the mitigation index does not exceed the risk index by very much. The CIRIA SuDS Manual recommends that, where the receiving waters are particularly sensitive, even if the risk index is exceeded, a further treatment level should be added. Natural England, therefore, recommends that the surface water drainage scheme for the proposal includes oil interceptors on the roads, in addition to the SUDS proposed.

Therefore, **it should be secured by planning condition that the detailed SUDS design include permeable paving, oil interceptors, swales, filter strip and wetland. The wetland should include all the features described in the Indicative Wetland Layout drawing** at page 35 of the IIAA Report. These features are necessary for the wetland to achieve the desired level of water quality treatment. Any amendments to the SUDS strategy at the detailed design stage should be **subject to consultation with Natural England, and should be reassessed under the Habitats Regulations.**

In our letter of 15 June 2018, Natural England requested confirmation that the SUDS proposed is technically feasible given groundwater levels. During subsequent discussions with the applicant it was agreed that as groundwater monitoring for a full winter was not available, the design of the SUDS should be based on a 'worst-case' high groundwater level scenario. The topographic and inferred groundwater level calculations presented in the Technical Addendum indicate that the wetland will need to be lined. The proposal is that the lining will be either by a double geotextile membrane, or by a clay liner with additional sacrificial geotextile membrane. The **secondary, sacrificial liner is helpful in overcoming Natural England's concerns regarding the risk of leaks or accidental tearing during desilting, and should, therefore, be secured by condition.**

The detailed SUDS design should be informed by groundwater level monitoring covering a full winter and into the spring, to ensure that rainfall has time to make its way into the

groundwater. Monitoring across the site will ensure that any gradient in groundwater levels is defined. Natural England notes that the Technical Addendum assumes a level groundwater table, whereas the report submitted by Mr Lawson makes a cogent case for there being a gradient. The implication of a groundwater gradient is that the thicknesses of liner presented in the IIAA Report would not provide a sufficient counterweight to prevent the groundwater pressure deforming the base of the wetland and potentially causing structural failure.

Natural England's advice is that the Appropriate Assessment for the proposal should consider the full range of potential impacts from a 'worst case' groundwater level scenario. Mr Lawson's report calls into question whether the worst case has been presented, as a gradient in groundwater levels has not been considered. Therefore, it would be helpful if the applicant could comment on the implications of a groundwater gradient for the design of the wetland, and whether this would have any additional implications for the Pevensy Levels.

In our letter of 15 June 2018, Natural England asked for confirmation that the red line boundary of the proposal allowed sufficient space for the SUDS to deliver the necessary water quality and flood attenuation benefits. Paragraph 5.3.15 of the IIAA Report states that additional land is available, and can be secured by S.106 agreement, if the detailed SUDS design indicates it is necessary. Having discussed this with yourself, I am comfortable that this is a satisfactory mechanism to bring in additional land should it be required.

Our previous letter also asked for confirmation that sufficient space had been included in the design to allow for the spreading of silt, as removal off site is likely to be prohibitively expensive. In response to this, an area for silt spreading is included in the Indicative Wetland Layout presented in the IIAA Report. The option to increase the area covered by the SUDS through a S.106 is also helpful in this regard. Therefore, Natural England advises **the S.106 option to bring in additional land is a mitigation measure that is necessary to avoid an adverse effect** on the integrity of the SAC/Ramsar.

In order for the SUDS to remain effective for the lifetime of the development, as required by the Habitats Regulations, management and maintenance will be required. The IIAA Report confirms that this will be undertaken by a specialist management company, and the Technical Addendum includes typical maintenance and management requirements. **Specialist management is vital and should be secured by condition.**

Previous versions of the IIAA Report included a process whereby a management company maintains the SuDS to an agreed management regime and reports to a suitable authority, which we welcomed in our 15 June 2018 letter. This will hold the management company to account and ensure oversight. Aspect Ecology's letter (27 April 2018) also included a proposal for step-in rights for a suitable authority. We consider this necessary to ensure that sufficient safeguards are in place should the management company fail to maintain the SuDS to an adequate level, though a suitable authority still needs to be identified.

Natural England advises that a condition is attached to any planning consent to ensure that **a detailed management and maintenance schedule will be produced for all the SUDS features described above, and that the measures are in place to manage the SUDS in perpetuity.** These measures should allow for **step-in rights for the local authority should the management company fail to provide an acceptable service.** Again, we advise this should be secured by condition.

Water level impacts during construction and operation

As well as requiring good water quality, the features of the SAC and Ramsar require stable water levels. The Technical Addendum indicates that the SUDS will ensure that there is no change from the greenfield run-off rate. Natural England considers this necessary to avoid an adverse effect on integrity and so should be subject to planning condition.

Paragraph 5.11 of the Technical Addendum states that the land raising is unlikely to have a detrimental impact in terms of displacement of floodwater, but suggests that the detailed design

could incorporate a 2D hydrodynamic model if appropriate. Natural England advises that the **detailed design must test this assumption regarding displacement of floodwater, and mitigate any impacts on the SAC/Ramsar if necessary.**

As noted above, the construction of the wetland is likely to displace groundwater. It would be helpful if the applicant could comment on whether this would impact on the hydrological regime of the SAC/Ramsar, so that this issue can be considered in the Appropriate Assessment.

Water quality impacts from sewerage

In our letter dated 15 June 2018, Natural England requested details on how foul water will be addressed. Paragraph 5.3.17 of the IAA Report states that there will be a connection to the mains and the foul water will not be treated on site. Natural England's view is that **connection to mains is necessary** to avoid an adverse effect on the SAC/Ramsar, and should therefore be secured by condition. Paragraph 9.4 of the Technical Addendum states that a new pumping station will be required to lift effluent into the existing sewer system via a rising main, and that **backup pumps will be required in the event the primary pump fails**. Natural England's view is that this should also be secured by condition.

Pevensey Levels SSSI

Natural England accepts, for the reasons identified in the IAA Report that the application site is unlikely to provide foraging habitat for significant numbers of the species for which the SSSI is important, though some of those birds may use the site occasionally. Therefore, it is our view that the application site should not be considered functionally linked to the SSSI and its loss is not likely to have a significant impact on available foraging habitat for wintering waterbirds. Hence no further information on this point is required.

Please note that if your authority is minded to grant planning permission contrary to the advice in this letter, you are required under Section 281 (6) of the Wildlife and Countryside Act 1981 (as amended) to notify Natural England of the permission, the terms on which it is proposed to grant it and how, if at all, your authority has taken account of Natural England's advice. You must also allow a further period of 21 days before the operation can commence.

Other advice

Protected Species

Natural England has produced [standing advice](#)³ to help planning authorities understand the impact of particular developments on protected species. We advise you to refer to this advice. Natural England will only provide bespoke advice on protected species where they form part of a SSSI or in exceptional circumstances.

If you have any queries relating to the advice in this letter please contact me on 0208 225 7693.

We would be pleased to provide advice on the discharge of planning conditions or obligations attached to any planning permission to address the issues above.

Yours sincerely

Alison Giacomelli
Sussex and Kent Area Team

³ <https://www.gov.uk/protected-species-and-sites-how-to-review-planning-proposals>

Alison Giacomelli
Natural England
Sussex and Kent Area Team

By email only: Alison.Giacomelli@naturalengland.org.uk

Date: 06 December 2018
Your Ref: RR/2017/1705/P
Our Ref : SMB/WS18/8835
email : simon.mb@herringtonconsulting.co.uk

Dear Alison

Request for additional information in relation to the outline application for residential development at Land off Spindlewood Drive, Bexhill

I am writing in response to your recent letter addressed to Jo Edwards at Rother District Council [RDC] (dated 13 November 2018, ref: RR/2017/1705/P), in which you have requested further information to determine impacts on designated sites. As you will recall following our meeting at RDC offices on 29th August 2018, we discussed the outstanding issues relating to the drainage of the proposed development, and more specifically the requirements for the wetland area. A series of actions from the meeting were agreed and Bedford Park Developments commissioned Herrington Consulting to prepare a technical addendum aimed at providing the additional information requested during the meeting.

The technical addendum (dated 16th October 2018) was submitted to RDC and contained further details on how the site can be drained sustainably, without having a detrimental impact on the SAC/Ramsar. However, it is my understanding that a local objector (Mr Lawson) has since prepared a report to question the validity of the findings presented in the addendum report and this has resulted in Natural England (NE) requesting further clarification on some of the points raised within Mr Lawson's report.

The aim of this letter and the attached revised addendum note is therefore to address the three concerns raised within your letter, namely the following:

"The applicant should therefore comment on:

- The measures that will be taken to address dewatering issues during construction of the wetland, and how any silt mobilised will be prevented from entering the SAC/Ramsar*
- The implications of a groundwater gradient for the design of the wetland, particularly in terms of any additional ballast that might be necessary, and whether this would have any additional implications for the Pevensy Levels.*
- Whether the displacement of groundwater from the construction of the wetland is likely to impact on the hydrological regime of the SAC/Ramsar, and if so whether any mitigation is necessary."*

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Although it should be acknowledged that we do not necessarily agree with the findings, or indeed all of the content of Mr Lawson's report, I feel that there is limited merit in addressing each of the points Mr Lawson has raised in detail. Instead, we have reviewed the main concerns raised and those outlined in the three points listed above, with a view to addressing these within the revised analysis. We have therefore revisited the technical addendum report that we previously prepared and have undertaken further sensitivity testing to demonstrate that, through careful design, the proposed development will not have an adverse effect on Pevensey Levels.

It was agreed at the meeting with RDC that seasonal groundwater modelling will be undertaken before the detailed design of the wetland is complete and this will form part of a planning condition, as outlined on the second page of your response letter. As such, we have based our assessment on the data we currently have available, which references the borehole information to determine the existing groundwater level at the site. We stand by our original technical assessment with respect to the groundwater level adjacent to the watercourse and question how Mr Lawson, without access to further seasonal groundwater monitoring records, can draw the seemingly accurate conclusions he has reached within his report. Notwithstanding this, we have adopted a precautionary approach and have redesigned the wetland in such a way as to provide NE with the confidence that an alternative wetland design can be implemented successfully, and furthermore, that this new layout will ensure that there is no detrimental impact to the SAC/Ramsar site.

The main content of the technical addendum remains unchanged and the levels of pollution treatment previously agreed have been accepted by NE and the wider consultees (RDC, PCWLM, LLFA, EA). As such, this section of the report remains unchanged. The main amendments relate to the design of the wetland and the depth of the proposed excavation into the hillside. These are summarised in the following paragraphs and provide background, before addressing the three key points listed above.

Additional Analysis

In the revised analysis, the *current* groundwater level is still assumed to be located at ~2.5m AODN, adjacent to the channel – this is based on the hydraulic gradient from the borehole (located further upstream) and the water level within the Cole Stream, recorded on the topographic survey. Using the cross section from the topographic survey, the hydraulic gradient has been plotted, following the land levels from the top of the site to the watercourse. This approach is broadly congruent with the assumptions Mr Lawson has made in his report. Further sensitivity testing has been undertaken, whereby this groundwater level has been elevated by 0.5m at the watercourse. The same hydraulic gradient has been applied, based on the actual land levels, but using this higher groundwater level.

A new wetland shape has been designed to follow the natural topography of the land, to minimise the volume of material that is required to be excavated, minimising the potential to mobilise sediment and intersect the groundwater table. The volume of storage required for storm water runoff from the development has been calculated and the redesigned wetland has sufficient capacity to hold the runoff generated under the design event (i.e. a rainfall event with a 1 in 100 year return period, including a 40% allowance for climate change).

By raising the proposed outfall pipe within the wetland and providing some additional storage capacity within the base, it is also possible to ensure that the lower areas of the wetland will remain permanently wet (i.e. under lower return period events). This is shown in the new plans.

Water will enter the wetland via a series of cascading pools, incorporating a sediment trap. By limiting the depth of these features (e.g. to less than 1m in depth) it will prevent the pools from coming into contact with the groundwater, whilst still providing a mechanism by which to trap sediment and improve the water quality.

The main body of the wetland can be created by lowering the land between 0.5m – 1.5m, still retaining the same double liner system previously agreed. It is therefore possible to locate the base of the wetland at 4m AODN (1m higher than previously stated). The analysis and accompanying section drawing (Section B), shows that the base can be located above the current groundwater level. The additional sensitivity testing undertaken to increase the groundwater by a further 0.5m clearly shows that the base of the wetland will remain above the groundwater level predicted, even when applying the new hydraulic gradient which follows the existing ground level (refer to Section B drawing).

The material removed during the excavation process (if suitable), could be used to create the bund at the lower edge of the wetland. This bund is required to impound water and will tie the embankment back into the higher land levels to the north, to create a more natural looking feature. The analysis shows that the bund is only required to be raised 800mm above the existing ground level to provide the 1.5m of total storage depth (1.3m active storage, plus 200mm permanently wet area). Water tolerant planting can be specified throughout the cascaded pools and the main storage area within the wetland.

One of the main concerns raised in the objections received is in relation to the degree of sensitivity testing (i.e. whether the worst-case scenario has really been considered). Therefore, a further sensitivity has been considered, with the aim of investigating the impact if the groundwater is increased further still, i.e. almost to the surface. It is evident from the results of the revised analysis that if the groundwater level is found to be higher than expected, there is the opportunity to construct the wetland at a higher level than is shown in the section drawings (i.e. raise the base of the wetland further). By raising the crest height of the surrounding bund to approximately 1.5m above the current ground level, it could eliminate the requirement to excavate to any material to form the wetland, instead allowing the wetland to be created above the ground. Consequently, as groundwater is unlikely to rise above the surface, this provides an alternative solution which represents a 'worst case' scenario. This approach demonstrates that on receipt of the seasonal groundwater monitoring, there is the potential to construct the wetland in a way which will not influence the groundwater table.

Overcoming the NE Objection

Considering the above information, alongside the revised technical addendum and drawings, it is possible to address each of the three outstanding points raised by NE as follows:

- It has been shown that there is no requirement to construct the wetland below the groundwater table and as such, dewatering will not be required. This significantly reduces the risk of sediment becoming mobilised and entering the SAC/Ramsar. Special construction practises can be specified within the construction method statement, which if required, can be submitted for approval by NE *before* construction can commence. Typical practises could include ensuring all site vehicles have a dedicated wheel washing bay located offsite (away from the watercourse). Similarly, during the construction phase haul roads could incorporate localised catchment ditches to prevent any water (with sediment entrained) from entering the Cole Stream.

- The hydraulic gradient of the groundwater has been considered in further detail and three independent scenarios have been considered; current groundwater level, elevated groundwater level (+ 0.5m) and an more unrealistic scenario whereby the groundwater is located at the surface.

The elevated groundwater scenario (increased by 0.5m) is considered to present the most realistic winter levels and assumes a steeper hydraulic gradient than the level proposed in Mr Lawson's three reports.

i.e. the groundwater level shown by the Herrington Consulting which represents a +0.5m increase in the groundwater table, is shown to be located ~1.7m below ground level at the top of the site (9.2m AODN). The latest Lawson report [Nov18] states the following; *"The winter ground water level would therefore be 2.3 metres below the surface [at the same location] which is consistent with British Geological Survey data...."*[Lawson Nov. 2018].

As such, considering a higher groundwater gradient has been tested in the Herrington Consulting analysis, it is assumed that this scenario is appropriate to represent the worst-case. It is evident that the base of the redesigned wetland does not intersect the groundwater table when this hydraulic gradient is applied (refer to Section B). Ballast would only be required if the groundwater was to rise significantly, causing uplift forces. However, as this is considered to be the highest groundwater level and is unlikely to occur without the wetland being full (providing a natural ballast), additional artificial ballasting will not be required. Consequently, there will be no measurable impact on the Pevensey Levels as a result of the wetland.

- To mirror the findings of the above point, constructing the wetland above the groundwater will not have a detrimental impact on the hydrological regime of the SAC/Ramsar and as such, additional mitigation will not be required. The construction of the wetland can also be specified to take place when the groundwater levels are shown to be low, as this will further minimise the risk of the construction process having any adverse impact to the SAC/Ramsar.

Finally, I understand that the Cooden Beach Golf Club (CBGC) has also recently provided an objection letter [4th December 2018], stating that there is temporary pooling water on the golf course when the outfall of the Cole Stream is hydraulically locked (i.e. prevent from discharging freely to the sea at times of high tide). This information supports the Herrington Consulting findings, confirming that there is a natural hydraulic gradient towards the lowest point (i.e. the Cooden Beach golf course). The Cole Stream acts to lower the groundwater as it directs water towards this low point and as such, by attenuating the rate at which water is discharged from the proposed development site into the Cole Stream, it can only have a positive impact by reducing the rate at which water reaches the golf course during an extreme pluvial event.

Furthermore, by trapping additional water within the proposed wetland there is the potential to provide an overall betterment for golf club, by ensuring water is held higher up in the catchment. This allows time for the water on the golf course to discharge to the Cole Stream and then outfall to the sea once the tide has dropped. The remaining four points raised within the letter from the CBGC to RDC have all been addressed within the revised technical addendum report.

In summary, I trust that the above information contains sufficient detail and explanation of the additional work that has been undertaken by Herrington Consulting to demonstrate that there is a suitable and sustainable solution for managing the surface water at the proposed development site, and that the points raised within

your letter have been addressed in full. However, if you would like any additional detail or clarification pertaining to the above, then I would be happy to discuss further. In the meantime, I look forward to hearing from you.

Yours faithfully

A handwritten signature in black ink, appearing to be 'SB' with a stylized flourish.

Simon Maiden-Brooks BSc. (Hons) MSc. C.Eng C.WEM MCIWEM

Technical Director & Partner