Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2501	F	68.6	60.41	8.19
2502	F	66.81	61.01	5.8
2701	F	62.71	58.88	3.83
2702	F	63.33	59.24	4.09
2801	F	62.54	58.65	3.89
3501	F	65.78	60.02	5.76
3601	F	64.08	59.49	4.59
4501	F	-	-	-
4502	F	-	-	-
4503	F	-	-	-
4504	F	-	-	-
4800	F	-	95.37	-
4901	F	64.41	59.19	5.22
5500	F	-	-	-
5801	F	65.64	59.93	5.71
6501	F	66.31	64.9	1.41
6502	F	-	-	-
6701	F	66.05	60.5	5.55
7501	F	66.75	63.41	3.34
7502	F	66.64	63.12	3.52
7503	F	66.73	65.52	1.21
7504	F	66.62	65.23	1.39
7601	F	67.37	-	-
7602	F	67.26	61.95	5.31
7701	F	67.18	61.37	5.81
8501	F	65.87	64.65	1.22
8502	F	66.13	64.36	1.77
8503	F	65.84	63.98	1.86
1852	S	62.49	59.74	2.75
2551	S	-	61.12	-
2651	S	63.75	60.26	3.49
2751	S	62.73	60.14	2.59
3551	S	-	60.66	-
4551	S	-	-	-
4552	S	-	-	-
4553	S	-	-	-
4554	S	-	-	-
4951	S	63.93	60.28	3.65
5551	S	-	-	-
5552	S	-	-	-
5851	S	65.61	61.67	3.94
5852	S	-	-	-
5853	S	65.61	61.33	4.28
5854	S	-	-	-
6551	S	66.38	64.8	1.58
6552	S	-	64.54	-
6553	S	66.33	64.09	2.24
6554	S	66.03	-	-
6555	S	-	-	-
6751	S	66.2	62.25	3.95
7551	S	66.79	63.38	3.41
7552	S	66.67	63.36	3.31
7553	S	-	64.88	-
7554	S	66.54	64.84	1.7
7555	S	66.46	64.67	1.79
7556	S	66.76	64.48	2.28
7557	S	66.66	64.28	2.38
7651	S	67.36	63.04	4.32
7652	S	67.58	62.78	4.8
7751	S	67.7	62.54	5.16
8551	S	66	64.23	1.77
8552	S	65.83	64.04	1.79
8553	S	-	64.27	-
8554	S	66.1	63.82	2.28
8555	S	65.82	63.64	2.18
8556	S	-	64.91	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

TECHNICAL NOTE

Appendix F

RSK Report ref: 313114-02 (00) Willen Road, Newport Pagnell Geotechnical and Geo-environmental ground investigation – Phase 2 June 2017, Section 8.3;

8.3 Geotechnical

The exploratory holes revealed that the site is underlain by a variable thickness of made ground comprising various types of backfill over Felmersham Member and Glacial Till, with Peterborough Member encountered at depth.

The natural strata deposits and Peterborough Members were encountered at depths of between 1.0m and 4.90m bgl, but generally below 3.0m bgl, although they were found to be shallower in the north east of the site.

Foundations would need to be deepened and be taken down through the Made Ground to varying depths of between 1.00 and 4.30m bgl into suitable strength strata. In doing this there are numerous practical considerations, which, would constrain and may potentially preclude the use of a traditional deepened spread foundation. Therefore, when considering the above issues, it is anticipated that the use of traditional deepened spread foundations may not be economic, thus it is anticipated that a piled solution will need to be considered for structural foundations.

Typical pile working loads vary from 262 kN on a 350mm diameter pile at 10 mbgl to 480 at 15 mbgl. If higher loads are required than a typical pile working load of 536 kN using a 600mm diameter at 10 mbgl pile increasing to 929 kN at 15 mbgl. A full breakdown the typical pile working loads is presented in Table 24.

When considering floor slabs for buildings of this size suspended floors acting upon the foundations are not normally economic due to the widths between spans and loads carried. Therefore, ground bearing floor slabs are the only real option. When taking into account the variable depths of uncompacted and unconsolidated fill present it is clear that ground improvement or piling of the variable made ground beneath the floor slabs would be necessary to support the slab and reduce the risks of differential settlement and bearing capacity failure from occurring. At this stage, based upon the information available it is suggested that ground bearing floor slabs would need to be supported on piles or would require ground improvement or a combination of compaction and surcharging to make them viable and avoid differential settlement risks.

From consideration of sulphate content results the Design Sulphate Class of DS-5 AC-5 may be assumed for design purposes for foundations.

One soakaway test was completed in TP138 in the southeast of the site due to access restrictions. This soakaway was undertaken in clayey silty sand and gravel of the Felmersham member but recorded no drop in water level during the test. It is therefore deemed that a soakaway drainage system will not be feasible on the site.

TECHNICAL NOTE

Appendix G

FEH Data;

VERSION	"FEH CD-ROM"	Version	3	exported a	14:03:33	GMT	Tue	30-Jan-18	
CATCHMENT	GB	487500	242750	SP 87500	42750				
CENTROID	GB	486133	241280	SP 86133	41280				
AREA	6.625								
ALTBAR	79								
ASPBAR	46								
ASPVAR	0.57								
BFIHOST	0.302								
DPLBAR	2.53								
DPSBAR	22.7								
FARL	0.888								
FPEXT	0.1242								
FPDBAR	0.729								
FPLOC	0.568								
LDP	5.21								
PROPWET	0.3								
RMED-1H	10.6								
RMED-1D	29.2								
RMED-2D	36.5								
SAAR	611								
SAAR4170	627								
SPRHOST	50.15								
URBCONC1990	0.615								
URBEXT1990	0.2002								
URBLOC1990	0.969								
URBCONC2000	0.758								
URBEXT2000	0.2438								
URBLOC2000	0.965								
C	-0.02629								
D1	0.34714								
D2	0.24911								
D3	0.28014								
E	0.30917								
F	2.43649								
C(1 km)	-0.026								
D1(1 km)	0.34								
D2(1 km)	0.262								
D3(1 km)	0.276								
E(1 km)	0.31								
F(1 km)	2.433								

TECHNICAL NOTE

Job Name: Land at Caldecote Farm, Newport Pagnell

Job No: 38748

Note No: TN2028/001 Rev B

Date: 12th February 2020 – Updated 28th July 2021

Prepared By: J Balzer

Subject: **Preliminary Surface Water Drainage Strategy – Supplementary Information**

Item	Subject
1	**Introduction** This Technical Note has been prepared by Stantec UK Ltd on behalf of Newlands Developments in response to comments raised by Milton Keynes Council (MKC) Lead Local Flood Authority (LLFA) following their review of the surface water drainage strategy prepared to support a planning application for the proposed development Land at Caldecote Farm, Newport Pagnell (Planning ref. 19/02402/FUL). This Technical Note should be read in conjunction with Technical Note TN2015/001 Rev B – 'Preliminary Surface Water Drainage Strategy' updated July 2020, submitted as part of the planning application.
2	**Milton Keynes Council Lead Local Flood Authority Statutory Response** MKC as LLFA has reviewed the preliminary surface water drainage strategy submitted as part of the previous planning application and raised comments on the surface water drainage strategy. A copy of the letter containing the comments received from MKC as LLFA on the 15th October 2019 is contained within **Appendix A** for reference. The following 3 comments were raised. We have provided a response to each in turn:- *1. Surface Water Pumping* *According to the submitted drainage strategy, surface water will be restricted to 4 l/s/ha by using a surface water pump. Pumping of surface water is an unsustainable drainage method. Pumps present a significant residual risk if they are not maintained or fail during a storm event. Our preference is for gravity discharge to the surface water drainage system, mimicking the natural drainage of the site and reducing energy consumption as stated in paragraph 6.3.5 and 6.3.28 of the Flood and Water Supplementary Planning Document (SPD).* *We require that the applicant attempts to discharge as much surface water run-off via gravity as possible. This can be achieved through the use of larger areas of shallow attenuation or alternative SuDS approaches.* *If it can be demonstrated that a partial or completely pumped drainage system is the only viable option we would require that the residual risk of flooding due to the failure of the pumps be investigated. We would require that the flood level be determined under the following conditions:* • *The pumps were to fail; and* • *The attenuation storage was 50% full; and* • *A design storm occurred* *The floor levels of the affected properties must be raised above this level and all flooding must be safely stored onsite.*

Item	Subject
	Thorough liaison with MKC as LLFA, it has been agreed that the required Design Storm event to review is the 1 in 100 year event plus 20% climate change, and that any exceedance flow arising from this storm event can be managed on-site. This is recorded in an email dated 18th December 2019 contained within **Appendix A**. It was also agreed that as the masterplan is not yet fixed, any detailed design required to establish floor levels based on the top flood water level would be conditioned, and that demonstrating the residual risk of flooding by means of volume of exceedance flows is acceptable at this stage of the development design. In response to Point 1, surface water run-off from the development is ultimately pumped off-site due to the level difference between the proposed development and the nearest viable discharge point at the existing unnamed watercourse (Internal Drainage Board (IDB) reference 18a) and not being able to achieve a gravity outfall. Therefore, a pumped drainage system is the only viable option to discharge surface water from the development – as fully detailed in Section 4 of TN2015/001 Rev B. Calculations have been undertaken in MicroDrainage Source Control to consider the residual risks in the context of a pumped solution, and identify the volume of exceedance flows which may need to be contained within the development during surface water flood conditions. For the purpose of these scenarios, a 12 hour storm duration for the 1 in 100 year plus 20% climate change rainfall event has been used as this requires the largest amount of storage volume. <u>Scenario 1 - 1 in 100 year rainfall event plus 20% climate change</u> A 12 hour storm duration for the 1 in 100 year plus 20% climate change rainfall event results in a storage volume of **9,284m³**. This could be accommodated within the **12,800m³** storage provision currently proposed within the site, as detailed on Drawing 38748/100/011, included within Appendix C of TN2015-001 Rev B. <u>Scenario 2 - 1 in 100 year rainfall event plus 20% climate change with pumping station failure</u> For the purpose of this scenario, 3 days is considered a reasonable time should the pumping station fail, allowing time for the pumping station to be brought back online, or temporary pumping arrangements to be made if required. In this scenario, a storage volume of **14,938m³** is required, and an exceedance flow of **2,138m³** (**14,938m³** - **12,800m³**) is generated. This exceedance flow could be accommodated within the 300mm freeboard provided in each of the proposed ponds and an additional layer to the proposed underground storage modules. <u>Scenario 3 - 1 in 100 year rainfall event plus 20% climate change, occurring with attenuation at 50% capacity</u> For the purpose of this scenario, assessment has been undertaken to determine the storage volume required in the 1 in 100 year rainfall event plus 20% climate change, occurring with attenuation storage already at 50% capacity from previous rainfall events. This has determined that the 12 hour storm duration for 1 in 100 year plus 20% climate change rainfall event requires the largest amount of storage volume. Therefore:- • At the beginning of the 1 in 100 year plus 20% climate change rainfall event a storage volume of **4,642m³** is required (50% of the 1 in 100 year rainfall event plus 20% climate change). In parallel, after 12 hours the 1 in 100 year plus 20% climate change rainfall event will have contributed a further **11,508m³** of surface water to the attenuation. This volume is based upon no pumping. This results in a total rainfall volume of **16,150m³**.

Item	Subject
	• However, during the 12 hour storm, **2,376m³** of surface water will have been pumped from the attenuation facilities. This results in a storage volume of **13,774m³** being required and an exceedance flow of **974m³** (**13,774m³ - 12,800m³**) is generated. Beyond hour 12, the attenuation facilities revert back to normal conditions. This exceedance flow could be accommodated within the 300mm freeboard provided (**2,617m³**) in each of the proposed ponds. <u>Scenario 4 - 1 in 100 year rainfall event plus 20% climate change, occurring with attenuation at 50% capacity and pumping station failure</u> For the purpose of this scenario, 3 days is considered a reasonable time should the pumping station fail, allowing time for the pumping station to be brought back online, or temporary pumping arrangements to be made if required. This results in a rainfall volume of **14,938m³**. An additional storage volume of **4,642m³** is required (50% of the 1 in 100 year rainfall event plus 20% climate change). This results in an overall storage volume of **19,040m³**, and an exceedance flow of **6,240m³** (**19,040m³ - 12,800m³**). This is the maximum volume of exceedance flow generated by the scenarios. Liaison has been undertaken with the LLFA which has confirmed that it can be demonstrated numerically that this exceedance flow can be accommodated / reduced further within the proposed surface water drainage system. The following options were agreed with the LLFA to reduce the exceedance flows:- • The 300mm freeboard provided in each of the proposed ponds will provide a total additional storage volume of **2,617m³**; • An additional layer could be provided to the proposed underground storage modules in order to provide a total additional storage volume of **2,505m³**; This results in a remaining volume of exceedance flow of **1,118m³** above ground. It is proposed that the remaining exceedance volume is contained within the development within car parking areas and dock levellers, whilst maintaining access and egress to the buildings, before excess surface water is ultimately routed back towards the attenuation features. It should be noted that as part of the detailed design process, the volume of storage available within the pipes and manholes will also be considered and therefore it is expected that the exceedance volume will reduce. Further liaison is proposed with the LLFA / IDB during the detailed design process to discuss and agree additional options available to reduce the exceedance flows which could include additional storage volume being provided by increasing the side slopes of the attenuation ponds from 1 in 3 to 1 in 2.5 or providing vertical sides slopes. Noting that any pond with vertical sides would be appropriately fenced off to prohibit general access to these ponds and would need to be considered carefully in the overall detailed design process. A summary of storage volumes required in the scenarios are set out in Table 1 below:-

Item	Subject

Table 1 – Summary of storage volumes required

Scenarios	Pump Rate	Storage Volume Required	Remaining Exceedance Flow
Scenario 1 1 in 100 year rainfall event plus 20% climate change	55l/s	**9,284m³** (50% of the 1 in 100 year rainfall event plus 20% climate change rainfall event = **4,642m³**)	**0m³**
Scenario 2 1 in 100 year rainfall event plus 20% climate change with pumping station failure	0l/s	**14,938m³** assuming pumping station is off-line for up to 3 days	**2,138m³**
Scenario 3 1 in 100 year rainfall event plus 20% climate change, occurring with attenuation at 50% capacity	55l/s	**4,642m³ + 11,508m³ – 2,376m³ = 13,774m³**	**974m³**
Scenario 4 1 in 100 year rainfall event plus 20% climate change, occurring with attenuation at 50% capacity and pumping station failure	0l/s	**14,938m³ + 4,642m³ = 19,040m³** assuming pumping station is off-line for up to 3 days	**6,240m³**

Microdrainage Source Control calculations have been included within **Appendix B.**

Item	Subject
	2. Surface Water Discharge Rates *'It has been proposed to discharge surface water at a controlled rate of 4 l/s/ha for all events up to and including a 1 in 100 year event with a 40% allowance for climate change before discharging into 18a drain, which is under the ownership of Bedford Group of Drainage Boards. However, the greenfield run-off rate for the undeveloped site has not been provided.* *All new developments on greenfield land are required to discharge the run-off from impermeable areas at the same greenfield run-off rate, or less than, if locally agreed with an appropriate authority. The applicant has not demonstrated that the peak discharge rate for all events up to and including the 1% Annual Exceedance Probability (AEP) critical storm event, including an appropriate allowance for climate change, will not exceed that of the existing site. This may increase the flood risk on site and in surrounding areas.* *Although a principle agreement has been provided from the IDB, this agreement is dated from October 2017 and the capacity of the drain may have since changed. A new agreement from the IDB should therefore be sought.* It has been reconfirmed with the IDB that the surface water from the development is still to be discharged at a rate of 4/l/s per impermeable hectare for all rainfall events. Correspondence from the IDB has been included within **Appendix C.** *3. Hydraulic Calculations Required* *The surface water strategy must demonstrate that the storage volume required to attenuate surface water run-off from the critical 1% Annual Exceedance Probability (AEP) critical storm event, including an appropriate allowance for climate change, can be provided on site. This should be demonstrated by supporting hydraulic calculations. At present, this information has not been provided.* As agreed with the LLFA, a design storm of 1 in 100 year plus 20% climate change has been used and calculations have been undertaken using Microdrainage Source Control to confirm the total storage attenuation volumes required. The storage volume required to attenuate surface water run-off from this event is **9,284m³**, the Microdrainage Source Control calculations have been included within **Appendix B**. The on-site attenuation features, as indicated on Drawing 38748/100/011 included within Appendix C of TN2015-001 Rev B, have been sized to accommodate a 1 in 100 year storm event plus an allowance of 40% for climate change. These features have a total indicative attenuation volume of **12,800m³** which is subject to detailed design. Therefore, the surface water run-off arising from a 1 in 100 year storm event plus 20% climate change allowance has the capacity to be attenuated on-site, and within the preliminary surface water drainage strategy. As set out within Section 2 above, the residual risk of a pumped outfall has also been tested.

TECHNICAL NOTE

Item	Subject
8	**Conclusion and Summary** This Technical Note has been prepared in response to comments raised by MKC LLFA in response to the preliminary surface water drainage strategy prepared for an outline planning application for the proposed development Land at Caldecote Farm, Newport Pagnell (Planning ref. 19/02402/FUL). The response to these comments may be summarised as follows:- • The residual risk of flooding under the following scenarios have been considered:- o The pumps were to fail; and o The attenuation storage was 50% full; and o A design storm occurred; The exceedance flow has been determined and mitigation measures detailed in order to reduce this volume. It is proposed that the remaining exceedance volume is to be contained within the development within car parking areas and dock levellers, whilst maintaining access and egress to the buildings, before excess surface water is ultimately routed back towards the attenuation features; • It has been reconfirmed with the IDB that surface water from the development is still to be discharged at a rate of 4/l/s per impermeable hectare; • Surface water run-off arising from a 1 in 100 year storm event plus 20% climate change allowance can be attenuated on-site; • It is anticipated that a standard planning condition will be applied to the planning consent, requiring the submission of the detailed design of surface water drainage infrastructure to the planning authority prior to commencement of development;

DOCUMENT ISSUE RECORD

Technical Note No	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Director)
38748/2028/TN001	A	12/02/20	JB	WC	JSH	PJ
38748/2028/TN001	B	28/07/21	JB	SG	JSH	-

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TECHNICAL NOTE

Appendix A

MKC LLFA statutory response to LPA
Correspondence with MKC LLFA dated 18th December 2019

Lead Local Flood Authority
Milton Keynes Council

Reply to Jessica Prest
Call 01223 703802
E-mail Jessica.Prest@Milton-Keynes.gov.uk

MILTON KEYNES COUNCIL LLFA statutory response to LPA

Attention: Elizabeth Verdegem

Date: 15/10/2019
Ref: 19/02402/FUL

Dear Elizabeth

Subject: 19/02402/FUL- Land At Caldecote Farm, East of The M1 Motorway, Adjacent To Willen Road

Full planning application for the erection of two storage and distribution units (use class B8), with associated access, car parking, servicing, landscaping, earthworks, on and off-site drainage and off-site highway works.

Thank you for your consultation which we received on the 25th September 2019.

We have reviewed the following documents:

- Surface Water Drainage, BWB Consulting Ltd, NPG-BWB-EWE-XX-RP-YE-0001_FRA. Dated: 27/03/2019.

At present we **object** to the grant of planning permission for the following reasons:

1. **Surface water pumping**

According to the submitted drainage strategy, surface water will be restricted to 4 l/s/ha by using a surface water pump. Pumping of surface water is an unsustainable drainage method. Pumps present a significant residual risk if they are not maintained or fail during a storm event. Our preference is for gravity discharge to the surface water drainage system, mimicking the natural drainage of the site and reducing energy consumption as stated in paragraph 6.3.5 and 6.3.28 of the Flood and Water Supplementary Planning Document (SPD).

We require that the applicant attempts to discharge as much surface water runoff via gravity as possible. This can be achieved through the use of larger areas of shallow attenuation or alternative SuDS approaches.

If it can be demonstrated that a partial or completely pumped drainage system is the only viable option we would require that the residual risk of flooding due to the failure of

the pumps be investigated. We would require that the flood level be determined under the following conditions:

- The pumps were to fail; and
- The attenuation storage was 50% full; and
- A design storm occurred

The floor levels of the affected properties must be raised above this level and all flooding must be safely stored onsite.

2. **Surface water discharge rates**

It has been proposed to discharge surface water at a controlled rate of 4 l/s/ha for all events up to and including a 1 in 100 year event with a 40% allowance for climate change before discharging into 18a drain, which is under the ownership of Bedford Group of Drainage Boards. However, the greenfield runoff rate for the undeveloped site has not been provided.

All new developments on greenfield land are required to discharge the runoff from impermeable areas at the same greenfield runoff rate, or less than, if locally agreed with an appropriate authority. The applicant has not demonstrated that the peak discharge rate for all events up to and including the 1% Annual Exceedance Probability (AEP) critical storm event, including an appropriate allowance for climate change, will not exceed that of the existing site. This may increase the flood risk on site and in surrounding areas.

Although a principle agreement has been provided from the IDB, this agreement is dated from October 2017 and the capacity of the drain may have since changed. A new agreement from the IDB should therefore be sought.

3. **Hydraulic calculations required**

The surface water strategy must demonstrate that the storage volume required to attenuate surface water run-off from the critical 1% Annual Exceedance Probability (AEP) critical storm event, including an appropriate allowance for climate change, can be provided on site. This should be demonstrated by supporting hydraulic calculations. At present, this information has not been provided.

Informatives

IDB Consent
This site falls within the Bedford Group of Drainage Boards. Under the Land Drainage Act 1991, any person carrying out works on an ordinary watercourse in an IDB area requires Land Drainage Consent from the IDB prior to any works taking place. This is applicable to both permanent and temporary works. Note: In some IDB districts, Byelaw consent may also be required.

Pollution Control
Surface water and groundwater bodies are highly vulnerable to pollution and the impact of construction activities. It is essential that the risk of pollution (particularly during the

construction phase) is considered and mitigated appropriately. It is important to remember that flow within the watercourse is likely to vary by season and it could be dry at certain times throughout the year. Dry watercourses should not be overlooked as these watercourses may flow or even flood following heavy rainfall.

Balzer, Jordan

Subject: FW: 38748 Land at Caldecote Farm - Planning Ref: 19/02402/FUL

From: Prest, Jessica [mailto:Jessica.Prest@milton-keynes.gov.uk]
Sent: 18 December 2019 10:59
To: Griffiths, Sian <s[redacted]>
Cc: Horne, James <j[redacted]; James, Paul (Northampton) <[redacted]>
Subject: RE: 38748 Land at Caldecote Farm - Planning Ref: 19/02402/FUL

Good morning Sian,

Thank you for providing clarification on the highlighted sentence, I had misunderstood your previous email.

Yes, I can confirm that is correct and we both seem to be on the same page based on our discussion over the phone yesterday.

Kind regards,
Jessica

Jessica Prest
Flood and Water Management Team
(Please note I work part-time for Milton Keynes)

Phone: 01223 703802
Email: jessica.prest@Milton-Keynes.gov.uk

From: Griffiths, Sian [mai[redacted]]
Sent: 18 December 2019 09:48
To: Prest, Jessica
Cc: Horne, James; James, Paul (Northampton)
Subject: [EXT] RE: 38748 Land at Caldecote Farm - Planning Ref: 19/02402/FUL

Morning Jessica

Thank you for getting back to me yesterday.

With regard to the sentence I have highlighted in your email below, we have modelled the storage on site to store up to and including the 1 in 100 year event plus 20% additional allowance for climate change.

As I understood from our conversation yesterday, the exceedance flows created when running the model using the pump failure conditions (attenuation 50% full with a 1 in 100 year event plus 20% for climate change) do not have to be stored within the attenuation provided, we just need to show that it can be contained safely within the development site?

Thank you.

Sian

Kind regards,

Sian Griffiths EngTech MICE
Senior Engineer

[redacted]
Northampton-uk

PBA has joined the Stantec family, find out more at stantec.com/uk

---

From: Prest, Jessica [mailto:Jessica.Prest@milton-keynes.gov.uk]
Sent: 17 December 2019 17:07
To: Griffiths, Sian <s[redacted]
Subject: RE: 38748 Land at Caldecote Farm - Planning Ref: 19/02402/FUL

Dear Sian,

Many thanks for your email. Please accept my apologies, as I may not have been clear on the phone, we do require the pump failure modelling to be performed using the design flood event (i.e. the 1 in 100 year event plus 20% climate change). However, there is by no means any requirement to ensure that all flooding occurring during failure is attenuated within the onsite storage, we just need to see demonstration that if this event does occur, the flood water can be safely managed on site (with a supporting exceedance flow plan highlighting anticipated flood depths, volumes and distribution associated with this). Although, if you are saying that system flooding has been modelled to occur in a 1 in 100 year event plus climate change (even without pump failure), it may be that the amount of attenuation on site will need to be increased.

Unfortunately, we are unable to accept a 1 in 10 year follow on event as we need to see pump failure modelling for the very worst case scenario and we need to remain consistent in our requirements.

Please do not hesitate to get in touch if you have any further questions.

Kind regards,
Jessica

Jessica Prest
Flood and Water Management Team
(Please note I work part-time for Milton Keynes)

Phone: 01223 703802
Email: jessica.prest@Milton-Keynes.gov.uk

From: Griffiths, Sian [mailto:s[redacted]]
Sent: 17 December 2019 15:03
To: Prest, Jessica
Cc: Balzer, Jordan; Horne, James; James, Paul (Northampton)
Subject: [EXT] 38748 Land at Caldecote Farm - Planning Ref: 19/02402/FUL

Dear Jessica

Further to our telephone conversation earlier today regarding your response to the surface water drainage strategy submitted in support of the application made for planning for the above development.

Please can you confirm that When determining the flood level if the pumps were to fail and the attenuation storage was 50% full, it is acceptable to use a 1 in 10 year follow on event as the design storm to show where flooding (if any) will be contained and how it will managed safely.

[redacted]

Calculations will be provided for the storage provision, demonstrating that the 1 in 100 year event plus 20% climate change can be contained safely on site.

Thank you.

Sian

Kind regards,

Sian Griffiths EngTech MICE
Senior Engineer

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TECHNICAL NOTE

Appendix B

Microdrainage Source Control Surface Water Attenuation Calculations

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Summer	3.687	3.687	55.0	6446.1	O K
120 min Summer	4.023	4.023	55.0	7356.8	O K
180 min Summer	4.210	4.210	55.0	7892.4	O K
240 min Summer	4.333	4.333	55.0	8257.6	O K
360 min Summer	4.486	4.486	55.0	8720.4	O K
480 min Summer	4.572	4.572	55.0	8986.2	O K
600 min Summer	4.619	4.619	55.0	9135.3	O K
720 min Summer	4.642	4.642	55.0	9207.7	O K
960 min Summer	4.555	4.555	55.0	8934.9	O K
1440 min Summer	4.320	4.320	55.0	8217.9	O K
2160 min Summer	4.039	4.039	55.0	7402.0	O K
2880 min Summer	3.817	3.817	55.0	6791.3	O K
4320 min Summer	3.443	3.443	55.0	5820.6	O K
5760 min Summer	3.084	3.084	55.0	4958.9	O K
7200 min Summer	2.733	2.733	55.0	4180.4	O K
8640 min Summer	2.387	2.387	55.0	3473.8	O K
10080 min Summer	2.054	2.054	55.0	2845.7	O K
60 min Winter	3.689	3.689	55.0	6451.3	O K
120 min Winter	4.027	4.027	55.0	7369.1	O K
180 min Winter	4.216	4.216	55.0	7911.4	O K
240 min Winter	4.342	4.342	55.0	8282.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Summer	56.904	0.0	6655.0	70
120 min Summer	33.148	0.0	7753.5	130
180 min Summer	24.165	0.0	8478.3	188
240 min Summer	19.310	0.0	9025.1	248
360 min Summer	14.076	0.0	9452.4	368
480 min Summer	11.248	0.0	9439.2	486
600 min Summer	9.452	0.0	9425.7	606
720 min Summer	8.200	0.0	9411.5	724
960 min Summer	6.407	0.0	9375.9	962
1440 min Summer	4.525	0.0	9261.4	1288
2160 min Summer	3.196	0.0	13457.1	1624
2880 min Summer	2.497	0.0	14019.9	2016
4320 min Summer	1.774	0.0	14937.7	2812
5760 min Summer	1.392	0.0	15625.2	3624
7200 min Summer	1.153	0.0	16180.1	4392
8640 min Summer	0.989	0.0	16648.7	5112
10080 min Summer	0.868	0.0	17054.9	5856
60 min Winter	56.904	0.0	6655.0	70
120 min Winter	33.148	0.0	7753.5	128
180 min Winter	24.165	0.0	8478.3	186
240 min Winter	19.310	0.0	9024.5	244

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
360 min Winter	4.498	4.498	55.0	8757.6	O K
480 min Winter	4.587	4.587	55.0	9035.3	O K
600 min Winter	4.639	4.639	55.0	9197.7	O K
720 min Winter	4.666	4.666	55.0	9284.2	O K
960 min Winter	4.589	4.589	55.0	9041.3	O K
1440 min Winter	4.363	4.363	55.0	8346.2	O K
2160 min Winter	4.028	4.028	55.0	7371.3	O K
2880 min Winter	3.747	3.747	55.0	6603.3	O K
4320 min Winter	3.206	3.206	55.0	5244.9	O K
5760 min Winter	2.655	2.655	55.0	4017.0	O K
7200 min Winter	2.103	2.103	55.0	2934.8	O K
8640 min Winter	1.562	1.562	55.0	2007.8	O K
10080 min Winter	1.049	1.049	55.0	1244.4	O K

9284.2m3 of storage volume required for a 1 in 100 year rainfall event plus 20% climate change allowance. This includes the pumps working at 55.04l/s.

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
360 min Winter	14.076	0.0	9431.4	360
480 min Winter	11.248	0.0	9411.1	478
600 min Winter	9.452	0.0	9390.7	594
720 min Winter	8.200	0.0	9369.8	708
960 min Winter	6.407	0.0	9323.2	934
1440 min Winter	4.525	0.0	9212.0	1360
2160 min Winter	3.196	0.0	13457.1	1688
2880 min Winter	2.497	0.0	14019.9	2136
4320 min Winter	1.774	0.0	14937.8	2996
5760 min Winter	1.392	0.0	15625.2	3816
7200 min Winter	1.153	0.0	16180.6	4608
8640 min Winter	0.989	0.0	16648.7	5280
10080 min Winter	0.868	0.0	17054.9	5952

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 487500 242750 SP 87500 42750
C (1km)	-0.026
D1 (1km)	0.340
D2 (1km)	0.262
D3 (1km)	0.276
E (1km)	0.310
F (1km)	2.433
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.850
Cv (Winter)	0.850
Shortest Storm (mins)	60
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 13.760

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	3.440	4	8	6.880	8	12	3.440

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	1.400	1526.2	2.800	2163.3	4.200	2911.2
0.200	1068.4	1.600	1610.5	3.000	2263.4	4.400	3027.1
0.400	1139.0	1.800	1696.9	3.200	2365.7	4.600	3145.3
0.600	1212.0	2.000	1785.7	3.400	2470.3	4.800	3265.7
0.800	1287.1	2.200	1876.7	3.600	2577.1	5.000	3388.4
1.000	1364.6	2.400	1970.0	3.800	2686.2		
1.200	1444.3	2.600	2065.5	4.000	2797.6		

Pump Outflow Control

Invert Level (m) 0.000

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	55.0400	1.800	55.0400	3.400	55.0400	5.000	55.0400
0.400	55.0400	2.000	55.0400	3.600	55.0400	5.200	55.0400
0.600	55.0400	2.200	55.0400	3.800	55.0400	5.400	55.0400
0.800	55.0400	2.400	55.0400	4.000	55.0400	5.600	55.0400
1.000	55.0400	2.600	55.0400	4.200	55.0400	5.800	55.0400
1.200	55.0400	2.800	55.0400	4.400	55.0400	6.000	55.0400
1.400	55.0400	3.000	55.0400	4.600	55.0400		
1.600	55.0400	3.200	55.0400	4.800	55.0400		

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Summer	3.766	3.766	0.0	6655.5	O K
120 min Summer	4.162	4.162	0.0	7754.0	O K
180 min Summer	4.407	4.407	0.0	8478.8	O K
240 min Summer	4.587	4.587	0.0	9033.8	O K
360 min Summer	4.849	4.849	0.0	9878.3	O K
480 min Summer	5.042	5.042	0.0	10524.9	O K
600 min Summer	5.199	5.199	0.0	11055.5	O K
720 min Summer	5.333	5.333	0.0	11508.8	O K
960 min Summer	5.475	5.475	0.0	11990.0	O K
1440 min Summer	5.685	5.685	0.0	12702.6	O K
2160 min Summer	5.908	5.908	0.0	13457.6	O K
2880 min Summer	6.074	6.074	0.0	14020.4	O K
4320 min Summer	6.345	6.345	0.0	14938.2	O K
5760 min Summer	6.548	6.548	0.0	15625.7	O K
7200 min Summer	6.711	6.711	0.0	16180.6	O K
8640 min Summer	6.850	6.850	0.0	16648.7	O K
10080 min Summer	6.969	6.969	0.0	17054.9	O K
60 min Winter	3.766	3.766	0.0	6655.5	O K
120 min Winter	4.162	4.162	0.0	7754.0	O K
180 min Winter	4.407	4.407	0.0	8478.8	O K
240 min Winter	4.587	4.587	0.0	9033.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Summer	56.904	0.0	0.0	72
120 min Summer	33.148	0.0	0.0	132
180 min Summer	24.165	0.0	0.0	192
240 min Summer	19.310	0.0	0.0	252
360 min Summer	14.076	0.0	0.0	372
480 min Summer	11.248	0.0	0.0	492
600 min Summer	9.452	0.0	0.0	612
720 min Summer	8.200	0.0	0.0	732
960 min Summer	6.407	0.0	0.0	972
1440 min Summer	4.525	0.0	0.0	1452
2160 min Summer	3.196	0.0	0.0	2172
2880 min Summer	2.497	0.0	0.0	2892
4320 min Summer	1.774	0.0	0.0	4332
5760 min Summer	1.392	0.0	0.0	5776
7200 min Summer	1.153	0.0	0.0	7216
8640 min Summer	0.989	0.0	0.0	8656
10080 min Summer	0.868	0.0	0.0	10096
60 min Winter	56.904	0.0	0.0	72
120 min Winter	33.148	0.0	0.0	132
180 min Winter	24.165	0.0	0.0	192
240 min Winter	19.310	0.0	0.0	252

At the beginning of the 1 in 100 year rainfall event plus 20% climate change allowance (Hour 0), a storage volume of 4,642m3 is required (50% of the 1 in 100 year rainfall event plus 20% climate change allowance).

11,508m3 of surface water contributed to the attenuation facilities after 12 hour 1 in 100 year rainfall even plus 20% climate change allowance.

Storage volume of 14938.2m3 required for 1 in 100 year rainfall event plus 20% climate change allowance with pumping station failure for 3 days.

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
360 min Winter	4.849	4.849	0.0	9878.3	O K
480 min Winter	5.042	5.042	0.0	10524.9	O K
600 min Winter	5.199	5.199	0.0	11055.5	O K
720 min Winter	5.333	5.333	0.0	11508.8	O K
960 min Winter	5.475	5.475	0.0	11990.0	O K
1440 min Winter	5.685	5.685	0.0	12702.6	O K
2160 min Winter	5.908	5.908	0.0	13457.6	O K
2880 min Winter	6.074	6.074	0.0	14020.4	O K
4320 min Winter	6.345	6.345	0.0	14938.2	O K
5760 min Winter	6.548	6.548	0.0	15625.7	O K
7200 min Winter	6.711	6.711	0.0	16180.6	O K
8640 min Winter	6.850	6.850	0.0	16648.7	O K
10080 min Winter	6.969	6.969	0.0	17054.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
360 min Winter	14.076	0.0	0.0	372
480 min Winter	11.248	0.0	0.0	492
600 min Winter	9.452	0.0	0.0	612
720 min Winter	8.200	0.0	0.0	732
960 min Winter	6.407	0.0	0.0	972
1440 min Winter	4.525	0.0	0.0	1452
2160 min Winter	3.196	0.0	0.0	2172
2880 min Winter	2.497	0.0	0.0	2892
4320 min Winter	1.774	0.0	0.0	4332
5760 min Winter	1.392	0.0	0.0	5776
7200 min Winter	1.153	0.0	0.0	7216
8640 min Winter	0.989	0.0	0.0	8656
10080 min Winter	0.868	0.0	0.0	10096

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 487500 242750 SP 87500 42750
C (1km)	-0.026
D1 (1km)	0.340
D2 (1km)	0.262
D3 (1km)	0.276
E (1km)	0.310
F (1km)	2.433
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.850
Cv (Winter)	0.850
Shortest Storm (mins)	60
Longest Storm (mins)	10080
Climate Change %	+20

Time Area Diagram

Total Area (ha) 13.760

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	3.440	4	8	6.880	8	12	3.440

Model Details

Storage is Online Cover Level (m) 10.000

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	1.400	1526.2	2.800	2163.3	4.200	2911.2
0.200	1068.4	1.600	1610.5	3.000	2263.4	4.400	3027.1
0.400	1139.0	1.800	1696.9	3.200	2365.7	4.600	3145.3
0.600	1212.0	2.000	1785.7	3.400	2470.3	4.800	3265.7
0.800	1287.1	2.200	1876.7	3.600	2577.1	5.000	3388.4
1.000	1364.6	2.400	1970.0	3.800	2686.2		
1.200	1444.3	2.600	2065.5	4.000	2797.6		

Pump Outflow Control

Invert Level (m) 0.000

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	0.0000	1.800	0.0000	3.400	0.0000	5.000	0.0000
0.400	0.0000	2.000	0.0000	3.600	0.0000	5.200	0.0000
0.600	0.0000	2.200	0.0000	3.800	0.0000	5.400	0.0000
0.800	0.0000	2.400	0.0000	4.000	0.0000	5.600	0.0000
1.000	0.0000	2.600	0.0000	4.200	0.0000	5.800	0.0000
1.200	0.0000	2.800	0.0000	4.400	0.0000	6.000	0.0000
1.400	0.0000	3.000	0.0000	4.600	0.0000		
1.600	0.0000	3.200	0.0000	4.800	0.0000		

TECHNICAL NOTE

Appendix C

IDB Correspondence Dated 22nd November 2019

From:	Trevor Skelding
To:	Horne, James
Subject:	RE: Land at Caldecote Farm, Newport Pagnell
Date:	22 November 2019 15:45:47
Attachments:	image001.png image002.png image003.png

James

Any surface water discharge into the land drainage system within the Board's district at this location shall be restricted to a maximum discharge rate of 4 l/s per contributing impermeable hectare. If the LA require a lesser rate then this would be accepted. The rate the Board quotes is the maximum acceptable. Please note that the downstream receiving watercourse must be the existing one that the land naturally drains to.

The discharge and any development within 9m of a watercourse within the Board's district will require its prior agreement and consent. The presumption is that the development is set 9m back from any watercourse.

Regards

Trevor Skelding MSc IEng MICE
Principal Engineer

Bedford Group of Drainage Boards|Vale House|Broadmead Road|Stewartby|Bedfordshire|MK43 9ND

[redacted] www.idbs.org.uk

From: Horne, James <[redacted]
Sent: 22 November 2019 15:16
To: Trevor Skelding <T[redacted]>
Cc: James, Paul (Northampton) [redacted]m>; Griffiths, Sian <[redacted]m>

Subject: Land at Caldecote Farm, Newport Pagnell

Dear Trevor,

Hope you are well.

With regards to the above scheme, we are preparing a response to MKC's LLFA (attached) comments on the planning application. In order to respond to Point 2, please can you confirm the content of the IDB's email to BWB dated 24th October 2017 (also attached) remains the same or has it changed.

Kind regards,

James Horne EngTech MICE

[redacted]

Northampton