

From: Simon Davis
Sent: 10 November 2020 16:13
To: Planning Scanning
Subject: FW: Land at Stakers Farm, Yapton - Y/71/20/RES & Y/72/20/RES

Application Correspondence "Correspondence on drainage"

Please add to Y/71/20/RES and Y/72/20/RES

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From: Laura Gibbons <Laura.Gibbons@arun.gov.uk>
Sent: 10 November 2020 15:25
To: Arek Kadlec [REDACTED]
Cc: Paul Cann <Paul.Cann@arun.gov.uk>; Chris Harrison [REDACTED] Christian O'Brien
[REDACTED] Brian Chamberlain [REDACTED] Jonathan Merrick
[REDACTED] Scott Webster [REDACTED] Simon Davis
<Simon.Davis@arun.gov.uk>
Subject: RE: Land at Stakers Farm, Yapton - Y/71/20/RES & Y/72/20/RES

Arek,

We are not willing to accept any reduction in what are already our minimum standards. Therefore, please reconsider your scheme and ensure that your design meets the following criteria:

- All structures half draining within 24 hours for the 1 in 10 year plus 40% climate change event.
- All pipes achieving 1m/s full bore velocity.
- All infiltrating devices must cater for the 1 in 10 year storm between the invert of the entry pipe to the soakaway, and the base of the structure.
- All SuDS features must be located outside of the utilisable open space. The LAP must not be within the basin. This is supported by the below text in blue.
- Adequate freeboard must be provided on open SuDS features.

Arun District Council Public Open Space, Playing Pitches and Built Facilities January 2020 SPD:

3.17 "It is essential that SUDS do not impact on the usable levels of public open space also required as part of new housing developments. SUDS whilst providing benefit in the correct capacity within development, should not be included in the 'usable open space calculations'"

Appendix 2, p.33 "Public open space should be: (1) Located within new residential areas in accessible parts of the development avoiding conflict with major hazards such as busy roads and not immediately adjacent to SUDs"

Appendix 2, p.34 "Public open space should not be: (4) Including SUDs or drainage areas which whilst an environmental benefit is recognised as not being permanently publicly accessible i.e. in water holding periods."

Arun Design Guide SPD (Emerging):

Page 69 states that SuDS should be in addition to usable open space.

You may need to consider using shallow conveyance features such as swales. You are always going to have significant difficulty in discharging to shallow infiltration features via piped networks.

Kind regards,

Laura Gibbons

Drainage Engineer

Engineering Services

Please note that I work Tuesdays 08:00-16:00 for Arun only.



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Arun District Council, Civic Centre, Maltravers Rd, Littlehampton, West Sussex, BN17 5LF

From: Arek Kadlec [REDACTED]
Sent: 09 November 2020 19:33
To: Laura Gibbons <Laura.Gibbons@arun.gov.uk>
Cc: Paul Cann <Paul.Cann@arun.gov.uk>; Chris Harrison [REDACTED] Christian O'Brien [REDACTED] Brian Chamberlain [REDACTED] Jonathan Merrick [REDACTED] Scott Webster [REDACTED]
Subject: Land at Stakers Farm, Yapton - Y/71/20/RES & Y/72/20/RES

Dear Laura,

Thank you for your comments relating to our drainage proposals – much appreciated.
The below is a bit of an introduction to our responses and some items that we would like to discuss should you and Paul agree to our request for an on-line meeting via Teams

We generally support your comments and views regarding the overall engineering design principles, however we believe that in order to deliver this particularly challenging site some alternative and less common principles of design are needed. This must be however recognised and coupled with a fact that the natural site carries many constraints that compromise the feasibility of 'idealised' designs.

The overall fact for the drainage strategy is that infiltration techniques will not work at depths greater than 600mm-750mm below existing ground level. This was confirmed by the SI company and by specific BRE365 testing. Below

that depth the ground becomes less able to support infiltration and winter groundwater monitoring showed elevated water table which again restrict the depth to which infiltration can be effectively used.

The use of 'site wide' infiltration features (i.e. infiltration blanket, basin) took local topography under consideration and such infiltration features were sited across the site to be at its lowest (or close to lowest) levels. However as the site itself is only moderately sloping and the fact of a limited depth to use infiltration meant that the available 'drainage drop' across the site was also limited.

Furthermore reviewing Arun DC checklist and local surface water policies we understood that wholesale land raising is not desirable and should be avoided. In order to provide 'ideal' drainage falls warranting self-cleansing velocities a significant portion of the site levels would have to be altered by importing soil and creating non naturally high spots that could alter the prevailing overland flow routes.

With the above explanation in mind we would like to offer the below responses to your crucial comments:

Site-wide responses

- We were led by Paul – as per e-mail attached - to believe that climate change was to be added to the 1 in 100 yrs event and not to the 1 in 10. We agree with such approach as it is not normal design practice or policy to apply climate change to storms of less than 100 yrs return period.
- Your comment *"Invert levels of pipes should not be at the base of infiltrating structures"*. We would fully support such approach on an ideal site however the site's existing constraints and aim to not have a wholesale land raising means that it will not be achievable to comply with this request. The site is fairly level with infiltration limited to the top 600mm-750mm. Having typical cover to the pipe of say 350mm-450mm and then pipe diameter of approx. 150mm itself means that the invert level of the incoming pipe is some 600mm below ground level. That is the level where infiltration was confirmed and therefore it is also generally used to set the approximate base of infiltration features. Having this at a greater depth would not work as infiltration was limited to such depths by the SI company undertaking site tests. This approach, although not the ideal, still works as an effective way of discharging the water to ground and therefore serves its purpose.
- Your comment *"Pipes must achieve 1m/s self-cleansing velocity. There are currently numerous pipes that do not achieve this"*. We understand this comment and on ideal site it is always followed, however as described above the site is fairly flat offering little falls and with infiltration restricted to the top 600mm-750mm we can not provide steep gradient as the pipes would be protruding through the ground at the system's most upstream and distant location – unless we adopt the wholesale land raising, however we believe that this is not desirable. The system however offers an ample means of access for maintenance and with relatively large diameter pipes blockages and silt removal is eased. The site will have a management company that will undertake strict maintenance actions when needed and inspection intervals can be adjusted to identify early signs of potential malfunction of the system

Responses to the 38 Units scheme comments

- Your comment *"Please provide 300mm of freeboard on basin above 1 in 100 year plus climate change event level"*. The basin itself is only 160mm deep at its lowest therefore providing such freeboard is not feasible. The arrangement of having infiltration blanket with basin above it provides also amenity and biodiversity pillars of SuDS. Should we be required to provide 300mm freeboard the design might not be able to accommodate such solution – unless the site's ground rising is accommodated however this was discounted as per above explanation of not having wholesale ground raising. By the price of compromising on amenity and biodiversity the open feature could be replaced by an enclosed infiltration blanket (perhaps with the use of geocellular units) that is not required to have freeboard. Please advise if that is more suitable and would be your preferred option in this instance?
- Your comment *"The basin fails to meet half drain time requirements. With half drain time exceeding 24 hours for the 10 year plus climate change event. This is not acceptable. Water also emerges to the surface of the basin in the climate change event. Given the location of the LAP within the basin, this is not acceptable."* We have not generally applied climate change to an event of a 1 in 10 yrs as per Paul's advice and for such event the basin will half-empty within 24 hours and with climate change added it only misses this criterion by 57 minutes. Regarding the location of LAP within the basin could you be so kind please and provide the local policy document that describes such situation as the CIRIA's document in point 22.6 allows such set-up with flooding frequency of between 1 to 5 years – which is criterion we have adopted in the design.

Responses to the 70 Units scheme comments

- Your comment *"A half drain time of less than 1440minutes must be provided for the 1 in 10 year plus climate change event, with urban creep allowance. This does not appear to be being achieved"*. As per Paul's e-mail we have used climate change to assess the 'no flooding' scenario for the 1 in 100 yrs event but designed for half drain on 1 in 10 year without climate change, as is the norm
- Your comment *"Half drain time results for lesser events for the permeable paving network must be provided."* We understand that this comment comes from the wish to half-drain the calculated storage within 24 hours to provide sufficient storage for a subsequent storm. Whilst the majority of the permeable paving system drains its half-volume within the 24 hours for the design storm of 1 in 10 yrs 48 hours duration (which is a suggested storm duration in CIRA C753 document, section 24.2.3 "Rainfall to be used in calculations" and "Design rainfall" sub-section) few sections exceeded the 24 hour time period. We have however catered for such instance and provided sufficient storage within the system and a volume of the subsequent 1 in 10 yrs storm

can be accommodated within permeable paving without surface flooding. Please see below the snapshots from the Microdrainage model results that shows required storage for the 1 in 10 yrs storm event and storage achieved in the system for the 1 in 100 yrs with climate change event – this shows that the storage for the 100 yrs event is twice the storage required for the 1 in 10 yrs thus mimicking the overall principle behind half-emptyingtime.

No. 1

Select Output Rank by

Maximum Level

Summary of Results for 2880 minute 1

Pipe Number	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Flo C
1.000	1	2880 minute 10 year Winter I+0%	2880	6.650	6.073	0.000	
1.001	2	2880 minute 10 year Winter I+0%	2880	6.562	6.074	0.000	
1.002	3	2880 minute 10 year Winter I+0%	2880	6.475	5.793	0.000	
1.003	4	2880 minute 10 year Winter I+0%	2880	6.012	5.514	0.000	
1.004	5	2880 minute 10 year Winter I+0%	2880	5.675	5.128	0.000	
2.000	6	2880 minute 10 year Winter I+0%	2880	5.800	4.990	0.000	
2.001	7	2880 minute 10 year Winter I+0%	2880	5.650	4.944	0.000	
3.000	8	2880 minute 10 year Winter I+0%	2880	6.250	5.440	0.000	
3.001	9	2880 minute 10 year Winter I+0%	2880	5.750	5.210	0.000	
4.000	10	2880 minute 10 year Winter I+0%	2880	6.580	5.740	0.000	
4.001	11	2880 minute 10 year Winter I+0%	2880	6.550	5.736	0.000	
4.002	12	2880 minute 10 year Winter I+0%	2880	6.450	5.736	0.000	
5.000	13	2880 minute 10 year Winter I+0%	2880	6.620	5.810	0.000	
5.001	14	2880 minute 10 year Winter I+0%	2880	6.462	5.734	0.000	
4.003	15	2880 minute 10 year Winter I+0%	2880	6.325	5.734	0.000	
4.004	16	2880 minute 10 year Winter I+0%	2880	6.275	5.734	0.000	
4.005	17	2880 minute 10 year Winter I+0%	2880	6.250	5.734	0.000	
6.000	18	2880 minute 10 year Winter I+0%	2880	6.600	5.864	0.000	
6.001	19	2880 minute 10 year Winter I+0%	2880	6.300	5.864	0.000	
6.002	20	2880 minute 10 year Winter I+0%	2880	5.950	5.328	0.000	
7.000	21	2880 minute 10 year Winter I+0%	2880	6.325	5.624	0.000	
7.001	22	2880 minute 10 year Winter I+0%	2880	6.275	5.624	0.000	
8.000	23	2880 minute 10 year Winter I+0%	2880	6.120	5.310	0.000	
8.001	24	2880 minute 10 year Winter I+0%	2880	5.675	5.146	0.000	

Critical Summary of Results by Maxim

is too full, run simulations for longer or view [Help](#) for more details.

Pipe Number	US/MH Name	Event	Duration (mins)	US/CL (m)	Water Level (m)	Flooded Volume (m³)	Flo Ca
1.000	1	10080 minute 100 year Winter I+40%	10080	6.650	6.354	0.000	
1.001	2	10080 minute 100 year Winter I+40%	10080	6.562	6.354	0.000	
1.002	3	10080 minute 100 year Winter I+40%	10080	6.475	6.268	0.000	
1.003	4	10080 minute 100 year Winter I+40%	10080	6.012	5.799	0.000	
1.004	5	10080 minute 100 year Winter I+40%	10080	5.675	5.337	0.000	
2.000	6	360 minute 100 year Winter I+40%	360	5.800	5.091	0.000	
2.001	7	360 minute 100 year Winter I+40%	360	5.650	5.091	0.000	
3.000	8	15 minute 10 year Summer I+0%	15	6.250	5.440	0.000	
3.001	9	600 minute 100 year Winter I+40%	600	5.750	5.416	0.000	
4.000	10	2160 minute 100 year Winter I+40%	2160	6.580	5.923	0.000	
4.001	11	2160 minute 100 year Winter I+40%	2160	6.550	5.923	0.000	
4.002	12	2160 minute 100 year Winter I+40%	2160	6.450	5.923	0.000	
5.000	13	2160 minute 100 year Winter I+40%	2160	6.620	5.921	0.000	
5.001	14	2160 minute 100 year Winter I+40%	2160	6.462	5.921	0.000	
4.003	15	2160 minute 100 year Winter I+40%	2160	6.325	5.921	0.000	
4.004	16	2160 minute 100 year Winter I+40%	2160	6.275	5.921	0.000	
4.005	17	2160 minute 100 year Winter I+40%	2160	6.250	5.921	0.000	
6.000	18	240 minute 100 year Winter I+40%	240	6.600	6.098	0.000	
6.001	19	360 minute 100 year Winter I+40%	360	6.300	6.098	0.000	
6.002	20	720 minute 100 year Winter I+40%	720	5.950	5.591	0.000	
7.000	21	960 minute 100 year Winter I+40%	960	6.325	5.982	0.000	
7.001	22	960 minute 100 year Winter I+40%	960	6.275	5.982	0.000	
8.000	23	600 minute 100 year Winter I+40%	600	6.120	5.359	0.000	
8.001	24	600 minute 100 year Winter I+40%	600	5.675	5.359	0.000	

All your other comments not addressed in this e-mail will be dealt with by the necessary amendments to the drawings, calculations or additional response letter with written explanation.

I trust that the above will address your comments and concerns and we are happy to discuss further if needed.

Kind Regards



Arek Kadlec | Principal Engineer

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