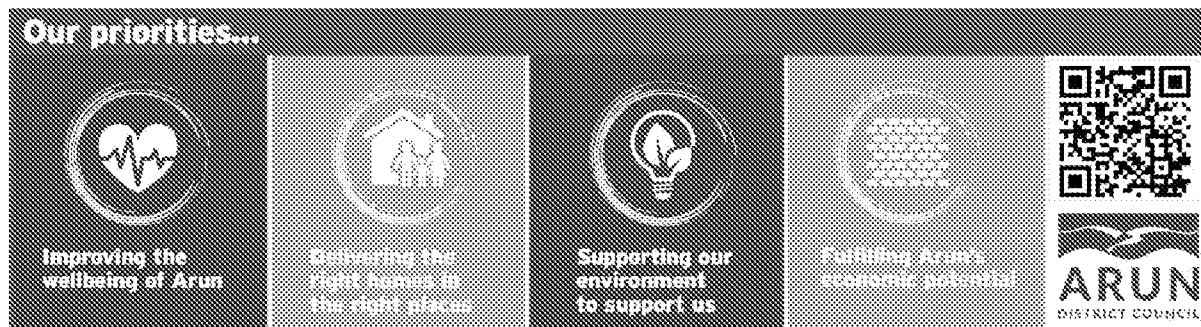


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From: Paul Cann <Paul.Cann@arun.gov.uk>
Sent: Wednesday, May 24, 2023 3:13 PM
To: Planning.Responses <Planning.Responses@arun.gov.uk>
Cc: Karl McLaughlin <Karl.McLaughlin@arun.gov.uk>
Subject: RE: Planning Consultation on: P/88/22/DOC

Please find enclosed our consultants comments in respect to surface water drainage and essentially recommending discharge of conditions 10 and 12.

Regards

Paul Cann
Principal Drainage Engineer, Coastal Engineers and Flood Prevention

T: 01903 737819

E: paul.cann@arun.gov.uk

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Littlehampton, West Sussex, BN17 5LF
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From: Land Drainage <Land.Drainage@arun.gov.uk>
Sent: Thursday, April 13, 2023 11:04 AM
To: Paul Cann <Paul.Cann@arun.gov.uk>
Subject: FW: Planning Consultation on: P/88/22/DOC

From: Planning.Responses <Planning.Responses@arun.gov.uk>
Sent: Thursday, April 13, 2023 10:03:53 AM (UTC+00:00) Monrovia, Reykjavik
To: Land Drainage <Land.Drainage@arun.gov.uk>
Subject: Planning Consultation on: P/88/22/DOC

To: **Engineers (Drainage)**

NOTIFICATION FROM ARUN DISTRICT COUNCIL

TOWN AND COUNTRY PLANNING ACT 1990

Application No: P/88/22/DOC
Registered: 24th May 2022
Site Address: Land North of Sefter Road & 80 Rose Green Road Pagham
Description of Works: Approval of details reserved by condition imposed under P/134/16/OUT relating to conditions 10-surface water drainage, 12-maintenance and management of surface water drainage system, 14-foul drainage system, 16-external lighting, 17-Construction Management Plan, 22-setting out when roads, footpaths, cycleways and emergency routes are to be construction, 26-street lighting and 28 (part)-energy conservation and renewable energy.

The Council have received the above application to discharge conditions. I shall be pleased to receive any observations you may wish to make in respect of those conditions relating to your field of expertise.

[Click here to view the Discharge of Condition application](#)

[Click here to view conditions on original application - click on decision tab](#)

Should you wish to make any comments click on the link www.arun.gov.uk/planning and click into ?Enter Comment? or if this is not possible email your response to planning.responses@arun.gov.uk by **5th May 2023**.

Please be aware that any comments you may make will be available on our website so please do not insert personal details or signatures on your reply.

In the absence of a reply within the period stated, I shall assume that you have no observations to make.

Yours sincerely

Jessica Riches

Planning Case Officer- Arun District Council

Telephone: 01903 737852

Email: jessica.riches@arun.gov.uk

PLCOND00 (ODD) 2020

North of Sefter Road, Pagham – P/88/22/DOC Comments Tracker				Initial Issue Date: 12-10-2022 Issue Date: - Revision 1.2	
	ADC Drainage Comments 11-10-22	Applicants Response	ADC Drainage Comments 18-11-22	Applicants Response	ADC Drainage Comments 25-01-23
I hereby confirm the surface water drainage design and maintenance manual is satisfactory and recommend discharge of conditions 10 & 12.					
ADC Drainage Comments 24-05-23					
The updated information supplied April 23 reflects on the variation from the geocellular tank reverting back to an open surface water basin (Ref:5) with the footpath conflict issue removed. I understand the matter of the footpath routing will be reviewed on the future phasing.					
We are satisfied that all comments previously raised are closed (see below).					
The updated drawings, supporting information and calculations are acceptable.					
	Initial/Planning:				
1.	The link to your updated drawing/calculations has expired so some comments raised below may have been addressed.	Updated link with drawings addressing comments below where required	Noted.	-	
2.	Please provide a copy of your final hydrological assessment report inclusive of groundwater monitoring.	Refer to 305035 LD1	Noted.	-	
3.	Please provide a copy of your catchment area plans together with any classification of urban creep being applied. Please note the SW basin areas must be included.	Refer to 10768/1611 10% urban creep added on impermeable roofs. SW basin top bank areas added on network calcs. Runoff coefficient set to 1 for both summer/winter	Please annotate the top of bank areas and advise which node these are applied. The catchment plan does not coincide with the WSCC S38 plan where '100%' highway corridor shall be used (i.e. full service margins). Please provide confirmation from Andrew Howick's team if otherwise agreed.	The total area of the basins up to the top of bank are noted on Drg 1140 and this area is assigned to a pipe number as shown on Drg 1611. The catchment of the highway only includes the carriageway where the footway falls towards the verge and is set back from the carriageway. This has been discussed with Chris Pratt of WSCC who is dealing with the Section 38 and he agrees with this strategy.	Noted and Closed.
4.	Further to item 3 above, and the design evolution from the planning approved FRA, please qualify the QBAR rates are representative of the developed area being positively drained.	Qbar rates for each network and for the overall site generated. Total discharge flow does not exceed the calculated Qbar for the proposed impermeable areas.	As previously advised please provide an explanatory breakdown so we can verify QBAR (derived from area positively drained), plan 1611 cumulative areas and the 1D modelling cumulative areas.	On Drg 1611 there is now a table of impermeable areas, with totals for each network, which corresponds to the areas used in the Qbar calculations and MD network area summaries.	Noted (Please refer to comment 49 below).
5.	In light of the above please also advise (via plan) on future phase catchment area allowances that have been annotated to ensure these are not underestimated.	Allowances for potential school site/care home/residential development at north-west corner of the site. Refer to 10768/1611 Also, relevant notes in drainage plan (10768/1602) and section 104 Agreement plan (10768/1140)	Noted & Closed.	-	
6.	Please confirm if further site investigations of the anti-tank ditch/culvert 'line & level' has been undertaken.	No line and level survey available. CCTV surveys undertaken to determine levels/status of anti-tank drain. Any repairs to the anti-tank drain to be undertaken by the land owner and this has been concluded as part of our land drainage consent	Noted & Closed. It is noted that repairs are required and this in hand.	-	
7.	FEH data highlights a significant upstream catchment of the order of 1.66km ² . How have the risk of potential site-wide	Development is bounded to the north by an existing ditch. EA Surface Water flood maps	The southern bund solution is generally accepted to protect existing dwellings, however with reference to drawing 1825/P8	The bund has now been extended around the corner of the Basin 4, see revised plans	Noted and Closed.

	exceedance flow arriving along the northern boundary been assessed and mitigated. Noting the proposals elevate the site above natural ground further evidence is required to ensure overland flow conveyance is not compounded.	(high/medium/low probability) do not indicate any flood risk from surface water, and exceedance flows from northern catchment flows towards natural watercourses not affecting the proposed development. Approved FRA does not recommend storage allowance within our site for catchments beyond site's boundary and therefore these areas are excluded. Similarly, exceedance flow routes show surface water flowing towards attenuation ponds without posing any risk to adjacent developments. Proposed bunds along the southern line of proposed ponds will provide additional protection to the southern existing properties.	to extend bund further around south-west low corner. It is not clear how the northern perimeter ditch conveys intercepted run-off around the development. Please update the drainage drawings to clarify the corridors, buffers, top of bank, bottom of banks, direction of flow, culverts etc. Where this ditch lies inside the development boundary upgrades and desilting may be necessary. If this is proven to not compound flow conveyance this comment can be closed.	enclosed. The existing ditch on the north of the site is outside the boundary of the development and cannot be surveyed at the moment. Noted.	
	LPA Policy:				
8.	Engineering drawing must show 3.0m buffer zones from all SuDS features & the anti-tank ditch route.	Buffer zone hatched areas added on drawings 10768/1601-1607.	Agreed and closed.	-	
9.	Engineering drawing must show 5.0m easement zones from all ordinary watercourses. The existing watercourses are on the topographical survey, however are not clear; suggest these are subtly hatched to stand out.	Easement zones added on drawings 10768/1601-1607	Noted, however the existing ditch corridors are very faint on the pdf's. please can these be enhanced. (See note 7 above)	Noted, the hatch on these have been amended, see enclosed latest plans.	Noted and Closed.
10.	With reference to drawing 1602/P6 the buffer in between the diverted watercourse and SW basin 5 does not comply with the minimum 3.0m.	Proposed diversion and pond orientation adjusted to comply with 3m requirement.	Agreed and closed.	-	
11.	There should be at least a 1.0m service margin (max 1:20 slope) between the edge of footpaths and all SW basins top of bank. Basins 1, 4, 5, 6 may be affected.	Service margin added on drawings 10768/1601-1607. Maintenance of SuDS features does not form an issue.	Path 351 is very close to SW basin 5 top of bank. Drawing 1822/P7 illustrates the northmost level difference exceeds 600mm height or worse. Drawing 1634, section K-K does not identify this. This does not comply as commented previously. The path surface level alongside SW basin 6 is at 5.6m close to the top of bank being 5.35m.	Looking at this we now think that there is insufficient space to fit in a pond basin here with 3m buffer zone, since we cannot move the path as it is on the agreed planning layout. Changing the pond shape makes the pond outfall not possible or the pond too shallow. Therefore, this pond has been substituted for a tank as now shown on the enclosed plan.	Noted and Closed. Where this basin may have formed part of earlier planning layouts, an NMA may be required.
12.	None of the details advise as to whether the SW basins will be fenced or will require safety equipment. Please clarify.	Updated S38 plan and screenwall/fences drawings show 0.4m knee rail fence around ponds. We are currently in discussions with highways authority to decide the extent of fencing around ponds (if fencing goes around all ponds or just adjacent to footways/cycleways). Refer to drawings 10768/1130 & 10768/1811-1815	Noted, please advise final strategy once agreed with WSCC. (See note 11 above)	Will do.	Noted and Closed.
13.	Permeable pavement shall be promoted where feasible. The eastern portion of the site appears to have very little areas utilised.	Permeable paving areas agreed through the planning process and are as shown on plans	We acknowledge the scheme adheres to the planning approved strategy but would welcome any further shared area designations such as the 3 No. shared drive areas alongside SW basins 2 & 3.	Noted. However, the client does not wish to deviate from the planning layout.	Noted and Closed.
	Flood Risk:				

14.	As you are no doubt aware there have been occurrences of historic flooding within the site and to neighbouring properties along the southern boundaries (catchment 1 FRA fig 3). Whilst a drawing 1610 denotes overland flow/exceedance routes the LPA requires further supporting evidence of the final surface level design. A few site cross sections would also assist in observing the extent of ground level raising.	EA Flood maps high risk show no flooding, medium risk show very localised flooding not exceeding 300mm depth, and low risk flood depth does not exceed 300mm. The risk to the future development as well as neighbouring properties will be mitigated through the proposed finished levels of the development as well as having SuDS basins at the lowest part of the site. As an additional measure, proposed bunds 500mm height running along the southern line of the proposed ponds will provide protection to the southern existing properties during events more severe than the design storm. For the design storm system does not flood at any point. For site sections refer to drawings 10768/1639-1640.	Agreed and closed.	-	
15.	Please update drawing 1610 with colour level banding (and/or contours) and annotate ultimate low points.	Height bands and contours added on drawing 10768/1610	Agreed and closed.	-	
16.	In addition to the above please provide the elevation design and surface finish for the perimeter footpaths. It may be necessary to include further provision of subtle berms and low points to mitigate potential exceedance flow off site.	Refer to levels drawing 10768/1821-1826	Agreed and closed.	-	
	General:				
17.	SW pipe downstream of SWHM1.19 is 900mm diameter so headwall 8 is huge for an 8l/s flow restriction. Drawing 1504 shows the flow control manhole however does not advise as to which storm severity the weir crest level is breached and the additional flow conveyed during these short occurrences to inform the size.	Headwalls design is based on depth of pond and pipe diameter. Flow is controlled in the manhole and not via the headwall. Weir crest level for all flow control chambers has been set as the maximum water level of the critical duration of 100yrs+40%CC. These levels obtained from Windes calculations. 900mm provided pipe used to prevent blockages in the culvert.	Agreed and closed.	-	
18.	Drawing 1620 to be updated to highlight flow control manholes.	10768/1620 schedules updated.	Agreed and closed.	-	
19.	Headwall schedule to be provided.	Headwall schedule added on drawing 10768/1502	Headwall 17 & 18 do not comply with WSCC S278/38 standards. Bagwork headwalls are only intended for gullies. These headwalls shall comply with WSCC detail 32 (dictated by pipe size).	Noted. The Table on Drg 1502 & The section on drawing 1638 now shows headwalls as per WSCC Detail no.32.	Noted and Closed.
20.	SW outfall to the anti-tank 600mm diameter culvert at SWMH1.25 must be adjusted to be soffit to soffit.	The whole surface water drainage network has been set as high as possible, slightly compromising the minimum acceptable cover between ground levels and adoptable pipe soffits. Icosa Water has recognised this and accepted our proposals - technical approval has been issued. All pipes have been set at gradients to achieve a minimum of 1m/s self-cleansing velocity and as a result connections into the anti-tank drain are 150mm higher than the interpolated existing invert level. We also explored the option of using double pipes, however smaller pipe sizes require steeper gradients to achieve	Disagree. The strategy has been set/accepted for the need to elevate the entire site and so would be designed from the ultimate outfall to head of run to conclude the final surface design. This would ensure best practise is achieved. It is noted that this outfall is only 150mm off from achieving a soffit to soffit connection. A slightly larger pipe size could also improve this or refinement of basin inverts given freeboard is healthy. Pumping would not be necessary here.	There has been further discussion regarding the outfalls so these have been left as per the original design now.	Noted in this instance we will accept this relaxation from standard.

		self-cleansing velocities and these gradients result in missing the outfall. Given that the proposed outfall manholes will be catchpit chambers with non-return valves fitted in last runs of the proposed network, we do not see the level difference being an issue. Impossible to achieve soffit to soffit level connection without pumping.			
21.	SW outfall to the anti-tank 600mm diameter culvert at SWMH21.7 must be adjusted to be soffit to soffit.	Response as above (comment 20)	We acknowledge this network has a few constraints, namely the triple pipe and OWC. The OWC must first be approved here. We trust you will review the design with a view to elevate the outfalls, possibly Icosa can accepted subtle variations. Once the above process has been explored we can consider the lower invert via a catchpit installation.	Noted. There has been further discussion regarding the outfalls so these have been left as per the original design now.	Noted and Closed.
22.	The anti-tank ditch/culvert falls westerly however the incoming lateral angle from SWMH21.7 exceeds 90degrees; suggest SWMH17.10 is adjusted.	Manhole SWMH17.10 adjusted	Agreed and closed.	-	
23.	Proposed fence/gate post sit above 600mm diameter culvert just north of SWCP17.8; foundation may conflict with culvert which has reduced cover.	Post adjusted. Contractor to ensure fence foundation spans either side of culvert note added on drawings 10768/1601-1607	Agreed and closed.	-	
24.	Please provide details of WASTOP product.	To be installed at the bottom end of the outlet pipe where it joins with the outfall manhole. For product details refer to "Althon_Aquatic_WaStop_Data_Sheet_7"	Agreed and closed.	-	
25.	Drawing 1506 illustrates triple 225mm diameter pipes passing under a culverted watercourse. These pipes do not provide the same conveyance capability of one 600mm diameter pipe. SWCP17.6 show benching however the manholes schedule denotes a catchpit. Both manhole details show incorrect/non compliant benching to DCG.	Triple 225mm pipe has been used to overcome clashes. Having a 600mm pipe below the culverted section of diverted ditch will result in losing connection into the outfall, when coming above the culverted section will result in lifting all the levels around this area over a meter, which we do not consider as an effective solution. The site is relatively flat with false falls to achieve longitudinal gradients required so any changes around this area will cause a domino of changes. Icosa Water who is adopting the main drainage runs have accepted this proposal. Refer to sections on drawing 10768/1638 and 10768/1506 Manhole detail on 10768/1506 adjusted.	Agreed, however it is not clear if the 2 No. spines will be encased in concrete to mitigate long term settlement issues.	The detail on Drgs 1506 and 1638 shows that the pipes are proposed to be bedded on class S surround since they have approx. 2m cover, and this is an adoptable standard. Not sure that settlement will be more likely due to the triple pipes situation, so don't proposed to use concrete bed and surround here.	Noted and Closed.
26.	Attenuation tank 1 illustrates triple 225mm manifold. These pipes do not provide the same conveyance capability of one 600mm diameter pipe and may affect 1D modelling results.	Tank specification is Wavin (widely accepted for attenuation/infiltration) and maximum diameter of inlet/outlet pipe is 225mm. For larger diameters a manifold connection is used. Please refer to product brochure document "08528_WAV_AquaCell Core-R BBA Updates_PIM_Web" and our drawing 10768/1503.	The manifold solution is accepted, however the updated 1D calculations have not been provide to confirm the corresponding nodes/links.	The triple 225 pipe connections to the tanks have now been added to the MD calcs, see enclosed.	Noted and Closed.

27.	Drawing 1502 notes are blighted. Nor this drawing or the cross section advise on the foundation/bedding requirements; please clarify.	Units should be bedded on minimum 150mm thick well compacted Class 6A or 6K* well graded granular material with a 50mm topping of fine material (Class 6L*) to ensure units are level and stable. *Manual of contract documents for Highway Works: Volume (MCHW1) specification for Highway Works, Series 600. Sections on drawings 10768/1630-1636 updated.	Agreed and closed, however further updates should ensure the bedding hatch is contrastingly different.	Noted. The sections on Drg 1630-1636 have been amended to show a different hatch for the concrete bed now.	Noted and Closed.
28.	Drawing 1635 shows top of bank as 5.35m but section shows an odd steep section above which does not comply with a 1:3 maintainable slope.	Section M-M updated to comply with 1: 3 maintainable slopes	Agreed this now coincides with footpath levels as shown on drawing 1821/P7. Comment closed.	-	
29.	Drainage layouts show some permeable pavements areas with collector pipe, however no supporting detail. Further details of porous pavements are required and shall include full make-up, incoming inverts, check dams, etc. Diffusers are preferred and must be shown 5m clear of all structures.	External works private details show a section of permeable pavement with collector drain (10768/1901) and private drainage construction details shows the distribution tank detail within permeable paving (10768/1702). All diffusers are 5m from any structures.	Agreed and closed.	-	
30.	Please provide supplier details for all flow control devices/sump requirements.	Flow control devices design based on Hydro-International. Detailed plans and sections on drawings 10768/1504 – 1505 are based on supplier's dimensions.	Accepted subject to receiving supplier data sheets.	To follow	Noted, this information shall follow.
	Landscaping:				
31.	Proposed tree pits conflict with the culvert outfall to SW Basin 5; planting is not accepted within the 3.0m buffer/easement.	Landscape proposals updated and further updates are pending (more to do with street lighting). Drawings will be updated accordingly when landscape design is finalised	Accepted subject to receiving final landscaping design coordination. Noting the S38 interests and planting restrictions will we also require evidence from WSCC.	The plans have been updated with the latest landscaping proposals.	Noted and Closed.
32.	Numerous proposed planting is shown above the SW drain between headwall 11 and SWMH1.22.	Landscape proposals updated and further updates are pending (more to do with street lighting). Drawings will be updated accordingly when landscape design is finalised	Accepted subject to receiving final landscaping design coordination.	The plans have been updated with the latest landscaping proposals.	Noted and Closed.
33.	Numerous proposed planting is shown within SW Basin footprints; no planting is permitted within 3.0m buffer.	Landscape proposals updated and further updates are pending (more to do with street lighting). Drawings will be updated accordingly when landscape design is finalised	Accepted, subject to receiving final landscaping design coordination.	The plans have been updated with the latest landscaping proposals.	Noted and Closed.
	Public Highway Approvals:				
34.	Please provide evidence to clarify the extent of S278 off site highway works and S38 on site road adoption under WSCC.	S278 by others - Paul Bashams Associates. S38 – Refer to 10768/1130. Agreement plan currently with Highways Authority for comments	Noted, we trust comments have been shared in respect of the S278. It is noted that all road gullies are to be adopted and comply to the WSCC 180sqm catchment/gully criteria as demonstrates on drawings 1132-1136.	Yes, the S278 has been co-ordinated with the other consultants.	Noted and Closed.

35.	Please advise on the status i.e. technical approval together with any highway bespoke drainage design.	Agreement plan currently with Highways Authority for comments	Noted.	-	
36.	The new S278 bellmouth shows a 450mm diameter culvert with 2 No. terminal gullies linking to the west headwall. This is not an acceptable arrangement if using pre-cast headwalls as elsewhere. An interim catchpit to WSCC S278/38 standard details would be preferable.	S278 outside our scope of works – Undertaken and got it approved by Paul Bashams Associates.	Noted, we trust comments have been shared in respect of the S278. It shall be noted OWC's must be coordinated with WSCC & the LPA.	Yes, the S278 has been co-ordinated with the other consultants. The OWC will be separate for the S278 and main development.	Noted and Closed.
37.	S278 terminal gully positions to be checked once in receipt of levels design, catchments.	S278 outside our scope of works – GTA drawings reflect design by others	As above.	Yes, the S278 has been co-ordinated with the other consultants.	Noted and Closed.
	Public Sewer Approvals:				
38.	Please provide evidence to clarify the extent of S278 off site highway works and S38 on site road adoption under ICOSA.	S104: Refer to drawing 10768/1140 S38 : Refer to 10768/1130	Noted and closed.	-	
39.	Please advise if ICOSA are adopting the SW basins and if these comply with their design criteria/policy, in addition to DCG.	Icosa Water will not adopt attenuation ponds	Noted, with reference to conveyance drawing 1810 these area re to be 'privately managed land'. Please provide details of the management company arrangement in due course.	To follow	Noted to follow.
40.	Please advise on the status i.e. technical approval together with any highway bespoke drainage design.	Icosa Water Technical approval for S104 S38 under review by Highways Authority	Noted and closed.	-	
	Treatment:				
41.	No comments.				
	Hydraulic Calculations:				
42.	Whilst an extract plan has been provided with the pipe numbers this is complicated to cross reference to the engineering plans; please add the references to a CAD plan. This must include porous car park nodes and headwalls.	For pipe numbers in relation to Windes calcs refer to S104 drawing 10768/1140	Noted and closed.	-	
43.	Network 1 PN1.016 has a self-cleansing velocity of 0.46m/s; this must comply to a minimum of 0.75m/s BRegs or 1.0m/s DCG.	PN1.016: Dummy pipe linking Headwall 1 – Headwall 3 in detention basin 1	Noted and closed.	-	
44.	Network 2 PN3.000/PN1.005/PN1.008 have reduced self-cleansing velocity; this must comply to a minimum of 0.75m/s BRegs or 1.0m/s DCG.	PN3.000: Pipe running through attenuation tank 1 for jetting. PN1.005: Triple 225mm pipe used instead of 600mm pipe to overcome clashes. Selfcleansing velocity compromised as triple 225mm pipe is laid on 1:513 (1:556 is the flattest gradient achieving self-cleansing velocity for a 600mm pipe - Tables for the Hydraulic Design of Pipes, Sewers and Channels: 8th edition (Volume 2)). Refer to comment 25. Icosa has accepted this configuration PN1.008: Dummy pipe linking Headwall 13 – Headwall 14 in detention basin 6	Noted and closed.	-	
45.	It is evident the anti-tank 600mm diameter culvert serves a significant site-wide local catchment, therefore calculations must be	Outfall changed on calculations to surcharged outfall.	Noted and closed.	-	

	tested with a surcharged outfall. Due to the proximity of the site to the coast the downstream receiving network can be affected by the tide.				
46.	Calculations incorrectly model 'headwalls' as open manholes thus falsifying the available storage provision. Please correct the feature type and re-run. This can be accepted for the outfalls where surcharged outfalls are to be added.	Headwalls amended to junctions.	Noted and closed.	-	
47.	Engineering plans to denote footprint areas for porous paving and SW basins to correlate with calculations.	Drawings 10768/1601-1607 updated	Noted, however it is not clear where the SW basin areas are tallied.	Please refer to Drg 1611 which shows the areas of the basins and permeable paving with associated pipe numbers. This correlates with the MD calculations.	Noted and Closed.
48.	Please provide calculations for 30yr +40% and summarise maximum water levels for each SW basin.	Calculations attached. Max water levels added on sections. Refer to drawings 10768/1630-1636	Noted and closed.	-	
49.	Please summarise the half drain down time to 50% for each SW basin and permeable pavement. This shall be for 10yr, 30yr, 100yr.	Calculations attached	Network 1/2 graph outputs appear to show all half drain down times exceed 24hrs; please clarify the 1D modelling depths and hrs in a tabulated response. Please note that compliance is required for at least the 10yr+CC storm.	The Drainage strategy has been reviewed since we have noted that the half drain times did not comply on Network 1. We have therefore gone back to review the Qbar and restriction rates for the outfalls which dictate the Half drain times. The original Obar calculations were done with a soil value of 0.37. However, the site investigation found that the site is predominantly clay soil with no infiltration possible. Therefore, we have taken the view that it is reasonable to use a higher soil run-off value of 0.41 for the Obar calculations. See enclosed. This now gives 16.8 l/s for Network 1 area, and 3.5 l/s for Network 2 area. A total of 20.3 l/s. In order to get min practical flows the ratio of flow rates from Network 1 and 2 has been adjusted to give the following: Network 1 outfall restriction rate : 14.6 l/s and Network 2 outfall restriction rate 5.7 l/s (split between north and south connections, 4.1 l/s and 1.6 l/s respectively), which totals 20.3 l/s for the development. See enclosed the half drain times calculations and corresponding Hydrograph tables. These show that the Basins 'half-drain' now on a 1. in 10 year storm less than 24 hours (1440min). The half drain times for the tanks show automatically on the MD simulation results.	Noted. Regarding the calculation of QBAR, we concur with the soil classification. In summary this increases the maximum collated flows from 14.0l/sec to 20.3l/sec. The Network 1 half drain down times were previously inadequate, however with the revised pro-rata flow, are now compliant for a 10yr storm. The Network 2 half drain down times were previously ok so did not warrant a revised/increased flow. It is noted ,however the variations here are very minor so noting the freeboard for basin 6, in this instance these flows are accepted.
	Flotation Calculations:				
50.	Noting groundwater is very high at this location, please provide calculations for flotation for all SW basins based on the relevant recorded levels.	Flotation calculations for basins submitted. Also flotation calculations for adoptable manholes submitted and approved by Icosa Water	Flotation calculations for the basins are based on current GW results which may vary yet have no safety factor which is concerning. Flotation for manholes have a suitable safety factor and are acceptable.	The floatation calcs for the ponds were changed due to request from Laura Gibbons. See enclosed email. These were changed to show a factor of safety for the Uplift and downward forces separately. For further clarity we have now put the same figures into	Noted and Closed.

				a standard spreadsheet (Rev C attached) which shows the overall FoS as 1.2 for all the basins. Also see attached the Tank Buoyancy calcs updated to the latest design.	
51.	Please advise if there are any areas of permeable pavement affected by groundwater. Where applicable provide further calculations.	N/A	Noted, however the area denoted on drawing 1601 are lower lying; please qualify the GW levels and formations.	The surface levels of the permeable paving are typically raised up higher than the existing ground level, with the formation on or slightly above the existing ground level. Therefore, groundwater will not affect the permeable paving construction.	Noted and Closed.
	Drainage & Maintenance Manual:				
52.	The report does not advise the ownership and maintenance responsibility of the SW basins.	Paragraph 5.1 updated	Agreed and closed. (See above)	-	
53.	Please provide a schematic drawing to denote the extent/areas for future maintenance, this shall be included / reference therein and highlight key SuDS features.	Refer to 10768/1810 Conveyance Plan also attached in Appendix A	Agreed and closed. Please note it is expected WSCC will also require further updates to this drawing.	Noted.	Noted and Closed.
54.	This report must also cover existing watercourses and culverts including the site specific anti-tank ditch. Please update section 6 accordingly.	Section 7 added	Agreed and closed.	-	
55.	In addition to the item above, please include a section for headwall, grills, trash screens, etc.	Section 8 & 9 added	Agreed and closed.	-	
	Further comments 18.11.2022				
56.	A footway crosses the existing watercourse in vicinity of detention basin No.6. Please provide further details including sections and tie-in gradients.			The footway crossing bridge is being designed by a structural engineer. Details to follow.	Noted, this will be covered under the OWC.
57.	Drawings 1601/P9 & 1602/P9 shows the anti-tank culvert running underneath new S38 road. If the existing culverts are damaged or unsuitable for additional vehicle loading these may need to be replaced and/or protected.			Noted. However, the existing anti-tank drain has approx. 1.8 or 1.9m cover over the pipe to the S38 road surface. The existing drain will be monitored during construction where other sewers cross the drain, and damage will be repaired.	Noted and Closed.
58.	All SW basin sections to be updated to denote fencing requirements agreed.			The fencing has now been added to the basin sections.	Noted and Closed.
59.	SW basin 6 has insufficient freeboard to top of bank. This should be at least 150mm for the 100yr plus CC event.			The latest MD calculations show that there is now sufficient freeboard in all the basins.	Noted and Closed.
60.	S104 drawing 1140/P12 & S38 drawing 1130/P7 show conflicting information. The SW sewer from SWMH17.1 to SWMH 17.9 is shown as 'highway drain' on the former and 'S104 sewer' on the latter? We assume ICOSA are adopting this and the geocellular tank or the S38 will be invalidated.			ICOSA have given an approval in principle to adopt this section. However, until this phase goes ahead it won't be adopted, see e-mail enclosed. Further negotiation with WSCC highways is required to see if they accept this situation in the short term.	Noted and Closed.