JOB NUMBER 19223

PHASE 1 PROPOSED REDEVELOPMENT OF LISKEARD CATTLE MARKET LISKEARD CORNWALL

STRATEGY FOR SURFACE WATER DRAINAGE INCLUDING FOUL DRAINAGE ASSESSMENT REVISION A

FOR CORNWALL COUNCIL

FEBRUARY 2020

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1.0 INTRODUCTION

1.1 Cornwall Council are currently proposing to redevelop the site of the former Cattle Market in Liskeard, Cornwall (please refer to Appendix A for a plan showing the site location).

1.2 The proposed development site has is being submitted for detailed planning consent for a development including creative workshops, market facilities and car parking

1.3 The Planning Policy Guidance to the National Planning Policy Framework dated March 2012 states that a Flood Risk Assessment (FRA) is required where a proposed development is greater than 1 ha in size or in an area where the Environment Agency (EA) have indicated there may be drainage problems, ie Critical Drainage Areas.

1.4 The proposed site is smaller than 1Ha but within a Critical Drainage Area. Accordingly, a Flood Risk Assessment (FRA) has been prepared by Cormac in support of the planning application. MBA Consulting have been commissioned to prepare a Surface Water Strategy to support the planning application for the proposed development.

1.5 This report therefore details broad proposals for the disposal of surface water from the site.

1.6 The report includes an initial assessment of the foul drainage of the site.

1.7 The report also outlines suggested design details to be subject to planning conditions.

2.0 SITE LOCATION AND DESCRIPTION

2.1 The site lies within the centre of Liskeard in Cornwall Ordnance Survey Grid Reference (OSGR) SX 25040 64390.

2.2 The site is a brownfield site whose uses currently comprise redundant cattle market and car parking.

2.3 The proposed development site slopes gradually to the north and east.

2.4 The site area is 0.5153 Ha overall.

3.0 SURFACE WATER DRAINAGE DESIGN STRATEGY

3.1 The design of the surface water drainage is required to follow the 'Drainage Guidance for Cornwall' issued by the Environment Agency (EA) published as part of the Cornwall Council Strategic Flood Risk Assessment (SFRA). These both comply with the Planning Policy Guidance for the National Planning Policy Framework dated March 2012. Compliance is deemed to satisfy the Environment Agency in controlling the risk of flooding of and from the proposed development.

3.2 The site is in an area designated as being inside the Liskeard Critical Drainage Area in the Cornwall Council SFRA (see appendix B).

3.3 This follows the principle of drainage to infiltration where possible, but otherwise restricting flows from the site to the 1 in 10 year greenfield run-off rate. This is required up to and including for the 1 in 100 year storm and making allowance for a 40% increase in rainfall intensity.

3.4 The site is currently drained unattenuated to the public sewer system and/or highway drainage system via a series of storm drains and sewers.

3.5 The site has not been the subject of an intrusive site investigation but is within an area where soils are likely to suit the use of soakaways. The proposed development contains sufficient open space to allow the use of soakaways should infiltration rates prove adequate.

3.6 Verification of whether infiltration techniques are suitable for the site will be required once intrusive site investigation has been undertaken. This will require investigation of groundwater levels and quality as well as contamination of soils due to past uses of the site.

3.7 Alternatively, and only if infiltration should prove insufficient to allow the use of soakaways, it will be necessary to attenuate the surface water on site and discharge via control device to the adjacent combined sewers.

3.8 The critical drainage area guidance requires the flows from the site to be limited to the 1 in 10 year greenfield runoff rate (GFR). Although fully developed appendix C contains a calculation of the equivalent greenfield runoff rates. The 1 in 10 year GFR is 2.674 lt/s. In order to minimise the risk of blockage to is necessary to provide a 100mm diameter orifice in the control device which will require the flow to be increased to 5lt/s.

3.9 The current site has no means of limiting flows from the site and appendix C also includes an assessment of the urban runoff from the site. this shows the current unrestricted 1 in 100m year urban runoff to be 14.031lt/s. as such the proposed attenuation would provide a 64% reduction if flows from the site.

3.10 Appendix C, therefore, also includes an initial attenuation calculation showing the size of attenuation tank that would be required it attenuation is needed. There is sufficient space to accommodate this within the development site.

3.11 Appendix D contains South West water record of the sewers in the vicinity. This shows combined sewers in both Fairpark Road and Market Approach to which connection can be made should it be required.

3.12 Appendix E includes details of the design information which is suggested should be subject to planning conditions.

4.0 FOUL DRAINAGE ASSESSMENT

4.1 There are two combined sewers available for connection within or adjacent to the site subject to detailed design. These are shown in the SWW record plan included in Appendix D.

4.2 Given the proposed site levels a connection to the combined sewer in Market Approach will be required to serve the development. The proposed use of the development does not generate significant foul flows and initial assessments suggest that this combined sewer should be adequate to receive these flows.

5.0 CONCLUSIONS

5.1 It is concluded that the design of a surface water drainage system using the principles of SUDS and compliant with the requirements of the Cornwall Strategic Flood Risk Assessment is achievable within the confines of the site.

5.2 The foul drainage capacity has been assessed and it is concluded that, subject to detailed design, the proposed development can be accommodated within the foul sewer network.

Signed..... Dated: February 2020
DAVID FERGUSSON BSc., C.Eng., MICE
FOR AND ON BEHALF OF
MBA CONSULTING

APPENDIX A

Shared Surface:
70m²

Phase 1G
243m²

Phase 1H
423m²

Phase 1F
1148m²

Phase 1E
595m²

Phase 1D
320m²

Phase 1A
863m²

Phase 1B
321m²

Phase 1C
1240m²

HM Government

European Union
European Regional
Development Fund

Liskeard Cattle Market
Phase 01 with Workshed and Topo Overlay
Cornwall Council

Drawing No. 01623_SK039
Scale @ A3 NTS Rev D1
Date: 13.02.20

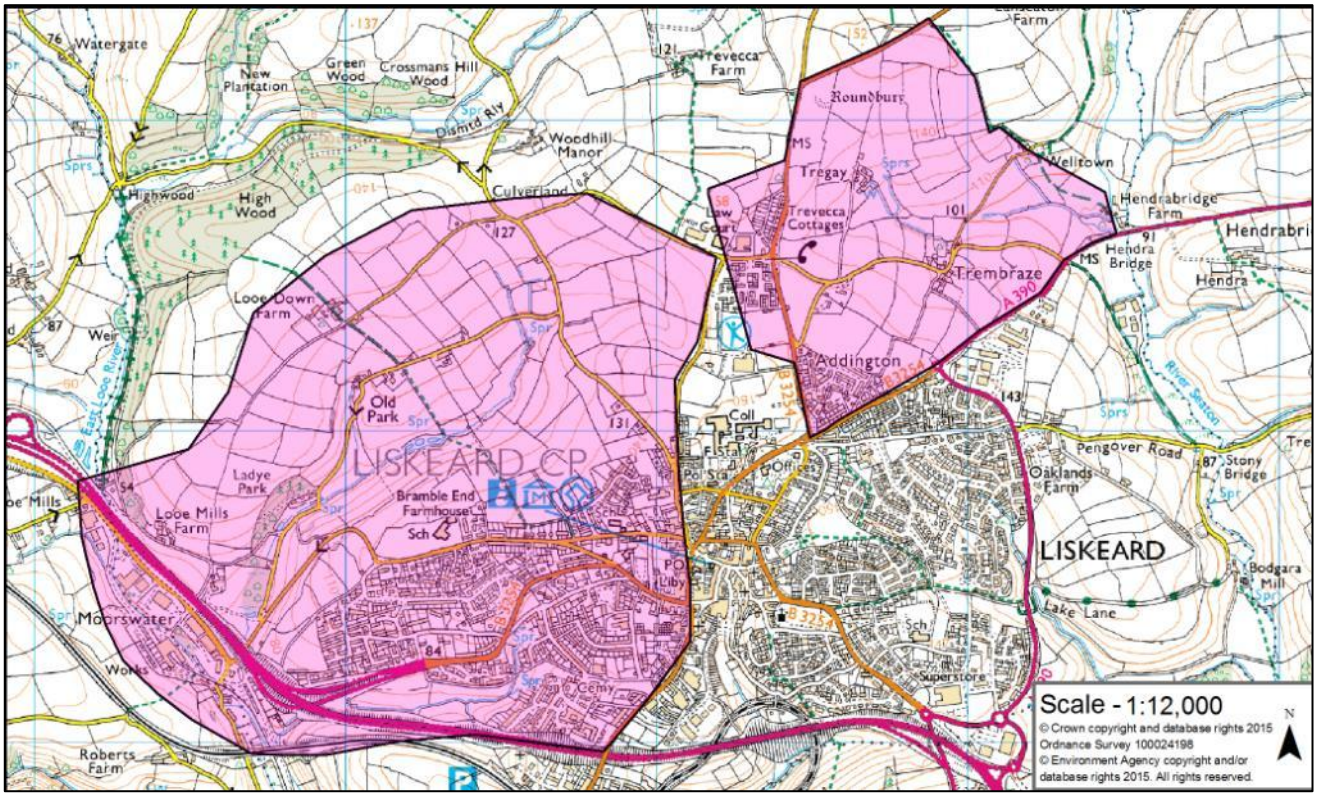
jtp

APPENDIX B

Critical Drainage Area (CDA)

Cornwall – Liskeard

May 2015



Catchment Drainage / Flooding Issues

Moorswater has historically suffered from flooding due to inadequately sized culverts and bridges being unable to pass flood flows effectively. The small, steep catchment around Liskeard is identified for possible future growth. Any increase in surface water runoff to this catchment area will further increase flood risks to properties.

The Addington area has been identified for development. Historically flooding occurred to properties in Trembraze from surface water flowing down the highway and from a perched watercourse in the area. Properties at Hendra Bridge are low lying and also at risk from flooding. Any increase in surface water run-off will increase the frequency and depth of flooding to these locations.

Minimum Drainage Standards Required

All new developments will have to play their part in reducing current rainfall runoff rates. This requirement also applies to brownfield sites that will have to match the same standards. The surface water drainage hierarchy should be followed by using infiltration as far as is practicable. Further guidance on such systems can be found in the CIRIA SuDS Manual and in Lead Local Flood Authority guidance.

All off-site surface water discharges from developments should mimic greenfield performance up to a maximum 1 in 10 year discharge rate. On site all surface water should be safely managed up to the 1 in 100 plus climate change conditions. This will require additional water storage areas to be created thereby contributing to a reduction in flooding downstream.

APPENDIX C

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MasterDrain
HY 10.11

Job No. 19223			
Sheet no. 1			
Date 19/02/20			
Project Phase 1 Liskeard cattle Market	By DF	Checked	Reviewed
Title equivalent greenfield run off			

Hydrological Data:-

FSR Hydrology:-

Location = LISKEARD	Grid reference = SX2564
M5-60 (mm) = 18	r = 0.24
Soil runoff = 0.30	SAAR (mm/yr) = 1310
WRAP = 2	Area = England & Wales
Hydrological area = 8	Hydrological zone = 3

Soil classification for WRAP type 2
i) Very permeable soils with shallow ground water;
ii) Permeable soils over rock or fragipan, commonly on slopes in western Britain associated with smaller areas of less permeable wet soils; (fragipan - a natural subsurface horizon having a higher bulk density than the solum above. Seemingly cemented when dry but showing moderate to weak brittleness when moist. The layer is low in organic matter, mottled and slowly or very slowly permeable to water. It is found in profiles of either cultivated or virgin soils but not in calcareous material).
iii) Moderately permeable soils, some with slowly permeable subsoils.

Design data:-

Area = 0.00473 Km^2 - 0.473 Ha - 4730 m^2

Calculation method:-

Runoff is calculated from:-

$$Q_{BAR(rural)} = 0.00108\ AREA^{0.89} \cdot SAAR^{1.17} \cdot SOIL^{2.17}$$

where

AREA = Site area in Km^2
SAAR = Standard Average Annual Rainfall (mm/yr)
SOIL = Soil value derived from Winter Rainfall Acceptance Potential
$Q_{BAR(rural)}$ = Runoff (cumecs)

$Q_{BAR(rural)}$ is then multiplied by a growth factor - GC(T) - for different storm return periods derived from EA publication W5-074/A.

Calculated data:-

For areas less than 50Ha, a modified calculation which multiplies the 50Ha runoff value by the ratio of the site area to 50Ha is used
Reducing factor used for these calculations is 0.009

Mean Annual Peak Flow $Q_{BAR(rural)}$ = 1.79 l/s

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Job No.	19223
Sheet no.	2
Date	19/02/20
Project	Phase 1 Liskeard cattle Market
Title	equivalent greenfield run off
By	DF
Checked	
Reviewed	

Values for $Q_{BAR(rural)}$

Ret. per.	m³/hr	l/s	l/s/ha	Ret. per.	m³/hr	l/s	l/s/ha
1yr	5.491	1.525	3.225	100yr+20%	18.606	5.168	10.927
2yr	5.685	1.579	3.339	100yr+30%	20.157	5.599	11.837
5yr	8.076	2.243	4.743	100yr+40%	21.707	6.030	12.748
10yr	9.626	2.674	5.653	200yr	19.381	5.384	11.382
30yr	12.016	3.338	7.057	200yr + 30%	25.196	6.999	14.797
50yr	13.696	3.804	8.043	500yr	22.030	6.119	12.938
100yr	15.505	4.307	9.106	1000yr	25.260	7.017	14.835

Growth factors -

1yr	2yr	5yr	10yr	30yr	50yr	100yr	200yr	500yr	1000yr
0.85	0.88	1.25	1.49	1.86	2.12	2.40	3.00	3.41	3.91

The above is based on the Institute of Hydrology Report 124
to which you are referred for further details (see Sect 7).
Note that the 200 and above year growth curves were taken from W5-074.

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Job No. 19223			
Sheet no. 3			
Date 19/02/20			
Project Phase 1 Liskeard cattle Market	By DF	Checked	Reviewed
Title IoH 124 (Qbar(urban))Runoff calcs for LISKEARD			

Hydrological Data:-

FSR Hydrology:-

Location = LISKEARD — Grid reference = SX2564
M5-60 (mm) = 18 — r = 0.24
Soil runoff = 0.30 — SAAR (mm/yr) = 1310
WRAP = 2 — Area = England & Wales
Hydrological area = 8 — Hydrological zone = 3

Soil classification for WRAP type 2
i) Very permeable soils with shallow ground water;
ii) Permeable soils over rock or fragipan, commonly on slopes in western Britain associated with smaller areas of less permeable wet soils; (fragipan - a natural subsurface horizon having a higher bulk density than the solum above. Seemingly cemented when dry but showing moderate to weak brittleness when moist. The layer is low in organic matter, mottled and slowly or very slowly permeable to water. It is found in profiles of either cultivated or virgin soils but not in calcareous material).
iii) Moderately permeable soils, some with slowly permeable subsoils.

Design data:-

Area = 0.00473 Km² - 0.473 Ha - 4730 m² % Urbanisation = 100.00%

Calculation method:-

Runoff is calculated from:-

$$Q_{BAR(urban);} = Q_{BAR(rural)} (1 + URBAN)^{2NC}[1 + URBAN\{(21/CIND) - 0.3\}]$$

where:-

NC varies with the value of SAAR:-
for 500<SAAR<1100 mm then NC = 0.92 - 0.00024SAAR
for 1100<SAAR<3000 mm then NC = 0.74 - 0.000082SAAR

CIND = 102.4SOIL + 0.28(CWI - 125) CWI = Catchment Wetness Index

so

CIND =32.040 CWI =129.715 NC =0.633

For areas less than 50Ha, a modified calculation which multiplies the 50Ha runoff value by the ratio of the site area to 50Ha is used
Reducing factor used for these calculations is 0.009

$Q_{BAR(rural)}$ = 1.795 (l/s)

$Q_{BAR(urban)}$ = 5.846 (l/s)

$Q_{BAR(urban)}$ is then multiplied by a growth factor - GC(T) - for different storm return periods derived from EA publication W5-074/A.

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Job No.	19223
Sheet no.	4
Date	19/02/20
Project	Phase 1 Liskeard cattle Market
Title	IoH 124 (Qbar(urban))Runoff calcs for LISKEARD
By	DF
Checked	
Reviewed	

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HY 10.11

Calculated data:-

Mean Annual Peak Flow $Q_{BAR(urban)}$ = 5.85 l/s

Values for $Q_{BAR(urban)}$

Ret. per.	m³/hr	l/s	l/s/ha	Ret. per.	m³/hr	l/s	l/s/ha
1yr	17.890	4.969	10.506	100yr+20%	60.615	16.838	35.597
2yr	18.521	5.145	10.877	100yr+30%	65.666	18.241	38.564
5yr	26.309	7.308	15.450	100yr+40%	70.718	19.644	41.530
10yr	31.360	8.711	18.417	200yr	63.141	17.539	37.081
30yr	39.147	10.874	22.990	200yr + 30%	82.083	22.801	48.205
50yr	44.619	12.394	26.204	500yr	71.770	19.936	42.148
100yr	50.513	14.031	29.664	1000yr	82.293	22.859	48.328

Growth factors -

1yr	2yr	5yr	10yr	30yr	50yr	100yr	200yr	500yr	1000yr
0.85	0.88	1.25	1.49	1.86	2.12	2.40	3.00	3.41	3.91

The above is based on the Institute of Hydrology Report 124 to which you are referred for further details (see Sect 7). Note that the 200 year growth curve was taken from W5-074/A.

For WRAP type 1 soils, CIND can become negative for lower values of SAAR. In this case the CIND value is multiplied by -1 to return a positive value (CIND is very small at this point).

Attenuation Design with rainfall intensities calculated using full wallingford procedure manual method based upon the Flood Studies Report.

19223 Liskeard Cattle Market Phase 1

drainage area	Ad	4730.00	m2		Volume 3 Maps	r	0.24
					Z1 taken from Figure 6.3a		
Permitted outflow	Qp	5.00	l/s	minimum flow to prevent blockage of control	Z2 taken from Table 6.2		

Wallingford procedure									M5-60	18.00
Climate Change allowance										40%
Adjusted M5-60										25.20 mm

Trench Soakaway 1:1 storm return period

storm duration, d		Z1	M5 Rainfall	Z2 for	**l intensity, I**		Volume ir	Volume Out	Storage required
storm duration, d	**hours**		**mm**	**M100**	**mm/hr**	**m/hr**	**m3**	**m3**	**m3**
5.00	0.08	0.31	7.81	1.86	174.13	0.1741	68.64	1.50	67.14
10.00	0.17	0.46	11.59	1.94	134.62	0.1346	106.12	3.00	103.12
15.00	0.25	0.56	14.11	1.98	111.53	0.1115	131.88	4.50	127.38
30.00	0.50	0.75	18.90	2.02	76.40	0.0764	180.69	9.00	171.69
60.00	1.00	1.00	25.20	2.01	50.61	0.0506	239.39	18.00	221.39
120.00	2.00	1.30	32.76	1.95	31.91	0.0319	301.84	36.00	265.84
240.00	4.00	1.71	43.09	1.87	20.09	0.0201	380.19	72.00	308.19
360.00	6.00	2.00	50.40	1.81	15.18	0.0152	430.84	108.00	322.84
600.00	10.00	2.40	60.48	1.74	10.52	0.0105	497.40	180.00	317.40
1440.00	24.00	3.35	84.42	1.60	5.64	0.0056	639.82	432.00	207.82
2880.00	48.00	4.46	112.39	1.52	3.55	0.0036	806.83	864.00	-57.17

Volume required **322.84** m3

Provide 27m x 10m x1.3m deep = 324 m3

APPENDIX D

Date: 08/10/2019 09:40:35 User: Scale: 1:1250 at A3

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Exact positions & depths should be obtained by excavation trial holes and the map must not be relied on in the event of excavation or other works undertaken or planned in the vicinity of the Company's apparatus
Please note that not all mains, service pipes and other apparatus of the Company in the area of the plan are shown.

South West Water

Map data

0 40 80 m

APPENDIX E

Liskeard Cattle Market Phase 1 – details to be subject to planning condition

The following items are suggested to be the subject of a planning condition to be submitted once detailed design is completed.

1. A description of the foul and surface water drainage systems including:

    a) Layout plans
    b) Results of an intrusive site investigation including infiltration testing
    c) Supporting calculations for soakaways or attenuation tanks as appropriate
    d) Measures to deal with water quality of surface water runoff
    e) Typical construction details and specifications
    f) Permission from South West Water to communicate with the public sewers
    g) A plan indicating the provisions for exceedance pathways, overland flow routes and any proposed detention features

2. Construction phase drainage proposals including

    a) Construction water management plan
    b) Construction quality control procedure
    c) Construction timetable

3. Confirmation of who will maintain the drainage systems and a plan for the future maintenance and management, including responsibilities for the drainage systems and overland flow routes.

The detailed design of the drainage should follow the parameters identified in the drainage strategy or any other parameters agreed with the Lead local Flood Authority