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## **Appendix E      Flood Risk Clarifications – Envirocentre, December 2018.**

# Riverside West: Flood Risk Clarifications – Briefing Note 01

## Introduction

1. This briefing note has been produced to summarise the analysis undertaken to establish the extent of flooding from Loch Lomond affecting the Pier Head area of the West Riverside masterplan (Area C). This note is intended to inform a meeting with SEPA to discuss clarifications requested in relation to the above areas.
2. The development extents shown on the masterplan are indicative at this stage and do not represent a detailed design, purely the general area where activities are proposed.

## Area C - Pier Head

3. A review of existing information has been undertaken to establish the zones of flooding influence from Loch Lomond and the River Leven flooding to inform the masterplan layout.
4. A key element of the masterplan is providing a hotel with loch frontage that can be appropriately sited without any negative impacts on flood risk.
5. A detailed modelling study of the River Leven was undertaken for West Dunbartonshire Council by Jacobs in 2002 and the hydrological inputs were updated 2009. This model extended from Loch Lomond to the Firth of Clyde and has been used to inform design flood levels for the masterplan.
6. Consultations with SEPA resulted in an updated review of the hydrological conditions, with projected 1 in 200 year return period flows increasing by between 2% - 9% depending on the method of analysis (single site analysis and pooling group respectively). The Jacobs 2009 report included model scenarios for the 1 in 200 year, 500 year (equivalent to 1 in 200 year + 11%) and 200 year future climate scenario (1 in 200 year plus 20%). These three model scenarios were considered to remain appropriate to inform the masterplan development.
7. The 2009 model has three cross sections around the Pier Head area (XS\_116, XS\_227 & XS\_338) along with an upstream water level (XS\_0) and remaining model sections XS\_412 onwards downstream along the River Leven. The model cross sections around the Pier Head area extend to the high points of the right bank of the river channel and the 2009 mapping projected these levels to surrounding areas using a sparse coverage of topographic data in this area.
8. Review of the model results across the range of modelled flows show that the water levels adjacent to the pier head area are essentially level, with a variation of 0.01 m over the three cross sections spanning a distance approximately 250 m, a pattern that occurs under all modelled flow scenarios. From XS\_338 downstream there is a consistent drop in water levels downstream through all modelled flow scenarios. The model section plan and results are enclosed again for ease of reference.
9. Possible changes in model channel cross sections in the vicinity of the site since the original model development are considered to be low given that there will be a negligible sediment input from the loch and the channel banks are well vegetated and relatively stable. West Dunbartonshire Council were consulted and they did not have the original model sections used in the study.
10. The 2009 study included an extreme value analysis on the water levels recorded on Loch Lomond at Ross Priory, approximately 6 km from the site (1978-2008). This analysis included the highest recorded loch level

to date, which was on 14/12/06 and taken to be 10.223 mAOD, while the SEPA record notes this as being 10.374 mAOD, a difference of 0.15 m. The 2009 study predicts a 1 in 200 year return period loch level of 10.51 mAOD. A loch level – river flow relationship was derived between the gauged loch and river data. This had good agreement between measured events, however at the more extreme events, the estimates were slightly lower than that of the extreme value analysis.

11. The enclosed layered pdf (Drawing 169659\_061) contains individual layers with the flood levels noted in paragraphs 5 and 7 above than can be turned on and off. The flood extents for the 2009 model are included as the extents shown in the original 2009 report and also as the predicted flood levels plotted against the detailed 2017 topographic survey (Sheets 1-3 of this survey are enclosed for reference). The 2009 model sections, existing site details and proposed masterplan zones are also provided as individual layers for reference, however these are based on a sparse topographic dataset and are only considered indicative. Some points to note from this are:
  - a. The 1 in 100 year return period event (10.08 mAOD) is confined to the margins of the River Leven. When these levels are extrapolated around the model sections back into the loch, these show the south western car park area also being inundated, but from the loch.
  - b. The 1 in 200 year return period event (10.24 mAOD) extends from the loch into the Pier Head area and into the wider car park area. The river remains within bank at XS\_227 and XS\_338.
  - c. The 1 in 500 year return period event – 1 in 200 year +11% (10.45 mAOD) extends from the loch and covers the majority of the existing car park area. The river remains within bank at XS\_227 and XS\_338, however a spill commences from the loch area to the river between the sections where the low point is 10.34 mAOD from the topographic survey.
  - d. The 1 in 200 year return period event +20% (10.57 mAOD) extends across a very similar area to that of the 1 in 500 year with slight increases in extent around the margins.
  - e. The 1 in 200 year return period level for Loch Lomond (10.51 mAOD) extends across the majority of the Pier Head area, indicating this area would be influenced by loch flooding during this event. The extents are very similar area to that of the 1 in 500 year model run, with slight increases around the margins.
12. The points set out above confirm that the flood progression across the Pier Head area initiates from the loch into the lower lying south western car park area. As water levels rise, the loch continues to inundate the site from the north west, with the loch and river at a similar level. At levels above 10.34 mAOD the hydraulic connection extends further to the south east towards XS\_338, however levels upstream of XS\_338 remain essentially level.
13. It is recognised that the interactions between river and loch flooding are closely interlinked at this location where the river flows out from the loch. However, given the review of design event water levels and flood propagation, it is considered that the south western zone of the Pier Head area is predominantly at risk from loch flooding as shown through the extent of the 1 in 100 year return period levels. As events become more extreme, loch levels rise as they drive the flows in the river, and closer to the river and toward the south eastern zone of this area, river flooding will become more predominant.
14. The masterplan development retains the existing car park use in the Pier Head area and introduces a Visitor Hub, Hotel and Water Park, as shown in Drawing 169659\_061. It should be noted that at this stage the layout is that of a notional masterplan and not a detailed design.
15. Adopting the 1 in 200 year return period event +20% future climate scenario as the design flood extent, and the 1 in 100 year return period event as an indicator of loch flooding influence, only the reconfiguration of the

existing car parking lies within the flood risk zone of the River Leven. The Water Park lies within the flood risk zone of Loch Lomond and is considered a water compatible development, while a small proportion of the Hotel is shown to also encroach into the Loch Lomond flood risk zone. The Visitor Hub remains outwith the flood risk zones. A long section showing the ground levels through the elements presently shown in the Loch Lomond flood zone is shown in Drawing 169659\_061 and is plotted in Figure 1 along with modelled water levels which is appended to this note.

16. For any aspects of the masterplan development that may encroach into the flood risk zone of Loch Lomond, two zones of potential compensatory storage have been identified and are shown on Drawing 169659\_061. These are in areas that would only influence water levels on Loch Lomond and would not influence conveyance of flows to or from the River Leven.
17. The above demonstrates that development as shown indicatively by the masterplan layout can be accommodated within the Pier Head area without adversely impacting flood risk. Final designs would require to confirm that this remained the case through the detailed design phase supported by an updated flood risk assessment.



## **Jacobs 2009 River Leven Model Results**





Key

- 1% AEP (100 year return period)
- 0.5% AEP (200 year return period)
- 0.2% AEP (500 year return period)
- New Flood Wall
- New Flood Embankment
- 0.5m Depth of water for 1%AEP

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West Dunbartonshire Council LA 09051L 2001.

2. The extent of inundation is indicative only, and is based on limited ground level survey information.

0 DEC 08 REVIEW OF FIRST ISSUE DL JS BS

Rev Rev. Date Purpose of revision Drawn Checked Approved

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Client WEST DUNBARTONSHIRE COUNCIL

Project RIVER LEVEN FLOOD STUDY  
REVIEW & UPDATE OF ORIGINAL WORK

Drawing title LOCATION PLAN AND  
INDICATIVE EXTENT OF INUNDATION AND  
LOCATION OF POSSIBLE FLOOD DEFENCES  
SHEET 1 OF 8

Drawing status

Scale 1:2500 @ A1 DO NOT SCALE

Jacobs No. B1888300

Client no.

Drawing number B1888300-LP-001 Rev 0

This drawing is not to be used in whole or part other than for the intended purpose and project as defined on this drawing. Refer to the contract for full terms and conditions.



**Predicted Peak Water Level (mAOD)**

<b>Node</b>	<b>50%AEP Q&amp;T</b>	<b>20%AEP Q&amp;T</b>	<b>10%AEP Q&amp;T</b>	<b>4%AEP Q&amp;T</b>	<b>2%AEP Q&amp;T</b>	<b>1%AEP Q&amp;T</b>	<b>0.5%AEP Q&amp;T</b>	<b>0.2%AEP Q&amp;T</b>	<b>0.5%AEP+CC Q&amp;T</b>	<b>0.5%AEP+ Narrow Channel</b>	<b>0.5%AEP Q&amp;T</b>
XS_0	9.17	9.45	9.62	9.81	9.96	10.11	10.27	10.48	10.61		10.27
XS_116	9.15	9.43	9.59	9.78	9.93	10.08	10.23	10.44	10.56		10.23
XS_227	9.15	9.43	9.59	9.78	9.93	10.08	10.24	10.45	10.57		10.24
XS_338	9.14	9.42	9.58	9.77	9.92	10.07	10.23	10.44	10.57		10.23
XS_412	9.13	9.41	9.57	9.76	9.91	10.06	10.22	10.43	10.55		10.22
XS_486	9.12	9.40	9.56	9.75	9.90	10.05	10.20	10.41	10.54		10.20
XS_579	9.11	9.38	9.55	9.74	9.89	10.03	10.19	10.40	10.53		10.19
XS_658	9.10	9.37	9.53	9.73	9.87	10.02	10.18	10.39	10.51		10.18
XS_749	9.08	9.36	9.52	9.71	9.86	10.01	10.16	10.37	10.50		10.16
XS_841US	9.07	9.34	9.50	9.69	9.84	9.99	10.14	10.35	10.48		10.14
XS_841DS	9.06	9.33	9.49	9.68	9.83	9.98	10.13	10.34	10.46		10.13
XS_968	9.04	9.31	9.47	9.66	9.80	9.94	10.10	10.31	10.43		10.10
XS_1039U	9.01	9.29	9.44	9.63	9.77	9.91	10.06	10.26	10.39		10.06
XS_1039D	9.01	9.28	9.43	9.62	9.76	9.90	10.05	10.25	10.38		10.05
XS_1136	8.98	9.25	9.41	9.59	9.73	9.87	10.02	10.22	10.34		10.02
XS_1136U	8.91	9.19	9.34	9.53	9.67	9.80	9.95	10.15	10.27		9.95
XS_1136D	8.90	9.17	9.32	9.51	9.65	9.78	9.92	10.12	10.22		9.94
XS1	8.89	9.16	9.31	9.49	9.63	9.76	9.91	10.10	10.20		9.91
XS2	8.85	9.14	9.30	9.48	9.62	9.76	9.91	10.10	10.21		9.91
XS3	8.63	8.90	9.05	9.22	9.35	9.47	9.61	9.78	9.88		9.61
XS4	8.52	8.81	8.96	9.14	9.27	9.40	9.54	9.72	9.82		9.54
XS5	8.38	8.68	8.84	9.03	9.16	9.30	9.44	9.63	9.73		9.44
XS6	8.27	8.57	8.74	8.92	9.06	9.20	9.34	9.53	9.63		9.34
XS7	8.16	8.46	8.63	8.81	8.95	9.09	9.24	9.42	9.53		9.24
XS8	8.03	8.32	8.50	8.68	8.82	8.96	9.10	9.28	9.37		9.10
XS9	7.89	8.18	8.36	8.55	8.70	8.84	8.98	9.16	9.25		8.98
XS10	7.83	8.10	8.28	8.47	8.62	8.76	8.90	9.08	9.17		8.90
XS11	7.76	8.05	8.23	8.43	8.58	8.72	8.87	9.06	9.16		8.87
XS12	7.69	7.97	8.15	8.35	8.50	8.64	8.79	8.97	9.06		8.79
XS13	7.65	7.93	8.11	8.32	8.46	8.61	8.76	8.94	9.04		8.76
XS14	7.61	7.89	8.07	8.27	8.42	8.57	8.72	8.91	9.00		8.72
XS15	7.52	7.79	7.96	8.15	8.29	8.43	8.57	8.74	8.82		8.57

**Extracts from 2017 Topographic Survey (sheets 1-3)**



LEGEND	
	Acir Values
	Bambuses
	Robinson-Six
	C.S. Benchmark
	Sublot
	Box Step
	British Telecom
	Cable T-V
	Cablest
	Cover Pipe
	Crown
	Electricity Pole
	Earth Road
	Fire Hydrant
	Flair Level
	Flag Pole
	Gully
	Gas Pipe
	Gas Post
	Gas Valve
	Small IC
	Inspection Cover
	Transformer IC
	Ward Level
	Monument Road Sign
	Ward Outlet
	Levelled
	Lamp Post
	Masonry IC
	Meter
	Circular Manhole
	Manhole
	Transformer Manhole
	Monitor
	Measuring Post
	Water Post
	Post
	Post Box
	Pipe
	Tree AV
	Roosting Eye
	Reference Mark
	Road Sign
	Spot Level
	Spy Coin
	Spy
	Tree Stump
	Tap
	Thatched Level
	Telephone Pole
	Trough
	Traffic Signal
	Vent
	Water Level
	Tree
	Bush

CONTROL STATION COORDINATES			
STN	EASTING	NORTHING	LEVEL
ST1	238933.238	681892.505	11.356
ST2	238889.834	682002.526	10.695
ST3	238779.390	682231.971	14.413
ST4	238689.573	682321.028	12.104
ST5	238587.020	682212.872	11.836
ST6	238322.124	685168.275	12.231
ST7	238163.869	681957.329	18.189
ST8	238236.025	681881.711	15.735
ST9A	238249.188	682027.118	11.290
ST9B	238202.256	681749.826	17.836
ST8B	238603.044	681724.364	17.481
ST8C	238722.896	681779.390	13.581
ST8D	238822.784	681842.403	11.889



INDICATIVE OF NORTH

Notes:

All levels shown are relative to the Ordnance Survey active GPS network.

The co-ordinates shown on this plan are relative to a LOCAL GRID.  
The survey is orientated approximately to grid north.



Client : PETER BRETT  
2nd FLOOR, 160 WEST GEORGE STREET  
GLASGOW  
G2 2HG

Project Title:

TOPOGRAPHICAL SURVEY

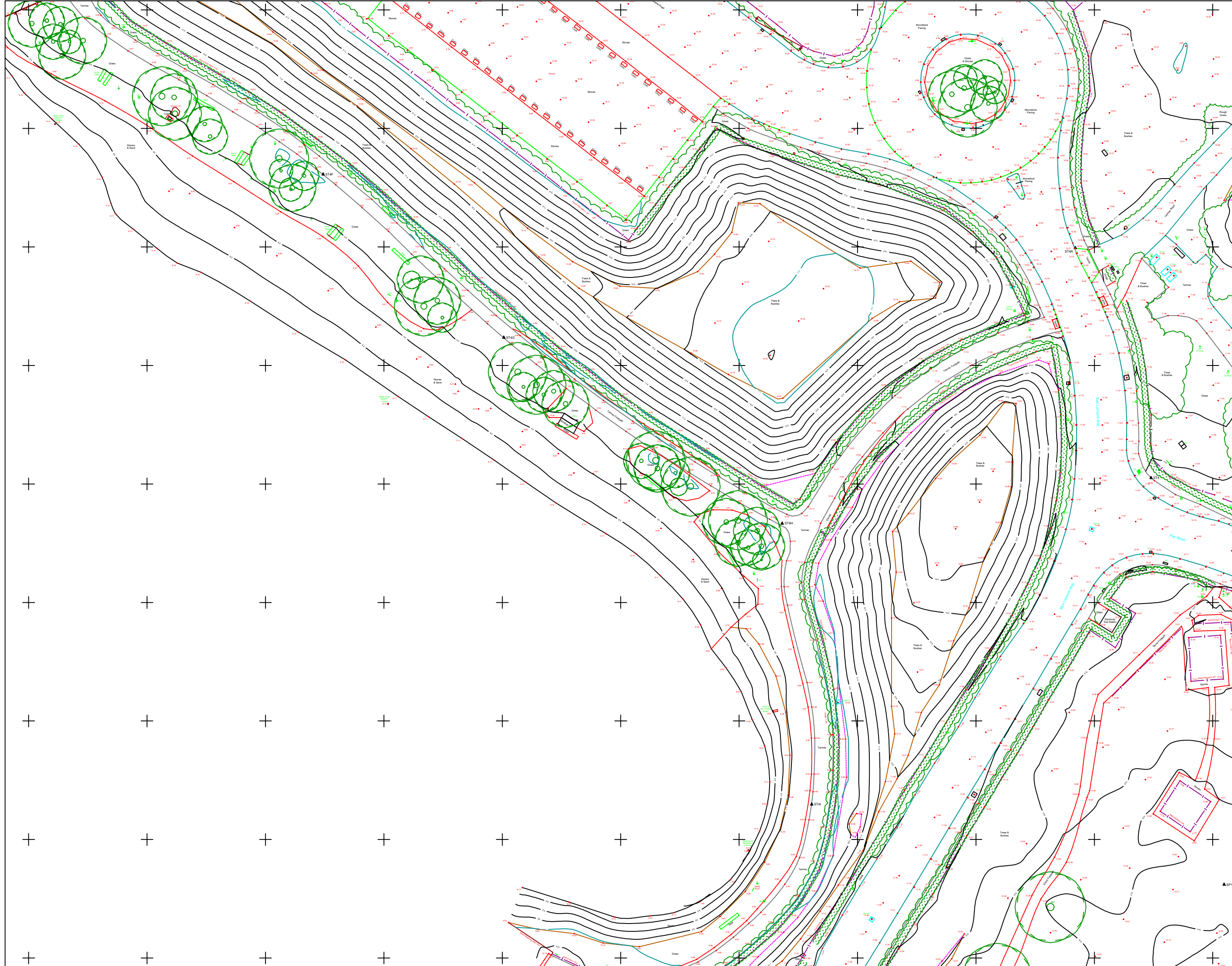
LAND AT BEN LOMOND WAY

BALLOCH

LOCH LOMOND

Sheet Title : <b>SHEET 1 OF 25</b>		Scale : <b>1:200</b>	
Surveyed date : <b>30/05/17</b>	Issued date : <b>31/05/17</b>	Enquiry No : <b>19353</b>	Project No : <b>12063</b>
Surveyed by : <b>S/F/P.McL</b>	Processed by : <b>DJ</b>	Checked by : <b>KRJA</b>	Approved by : <b>JMK</b>



[illegible]

CONTROL STATION COORDINATES			
STN	EASTING	NORTHING	LEVEL
ST1	236833.238	681882.508	11.354
ST2	236887.834	682002.506	10.605
ST3	236779.300	682221.971	14.413
ST4	236669.673	682321.028	12.144
ST5	236627.620	682118.972	11.836
ST6	236322.145	682159.275	12.251
ST7	236153.690	681997.329	16.189
ST8	236326.053	681881.711	15.735
ST9A	236691.168	682027.115	11.250
ST9A	236502.258	681749.826	17.836
ST9B	236803.404	681724.364	17.481
ST9C	236722.896	681771.380	11.971
ST9D	236822.784	681842.403	11.897



INDICATIVE OF NORTH

Notes:  
All levels shown are relative to the Ordnance Survey active GPS network.

The co-ordinates shown on this plan are relative to:  
The survey is orientated approximately to grid north



**Learn Survey Services**  
LHO-NORM-HIDROGENIC

Client : PETER BRETT  
2nd FLOOR, 160 WEST GEORGE STREET  
GLASGOW

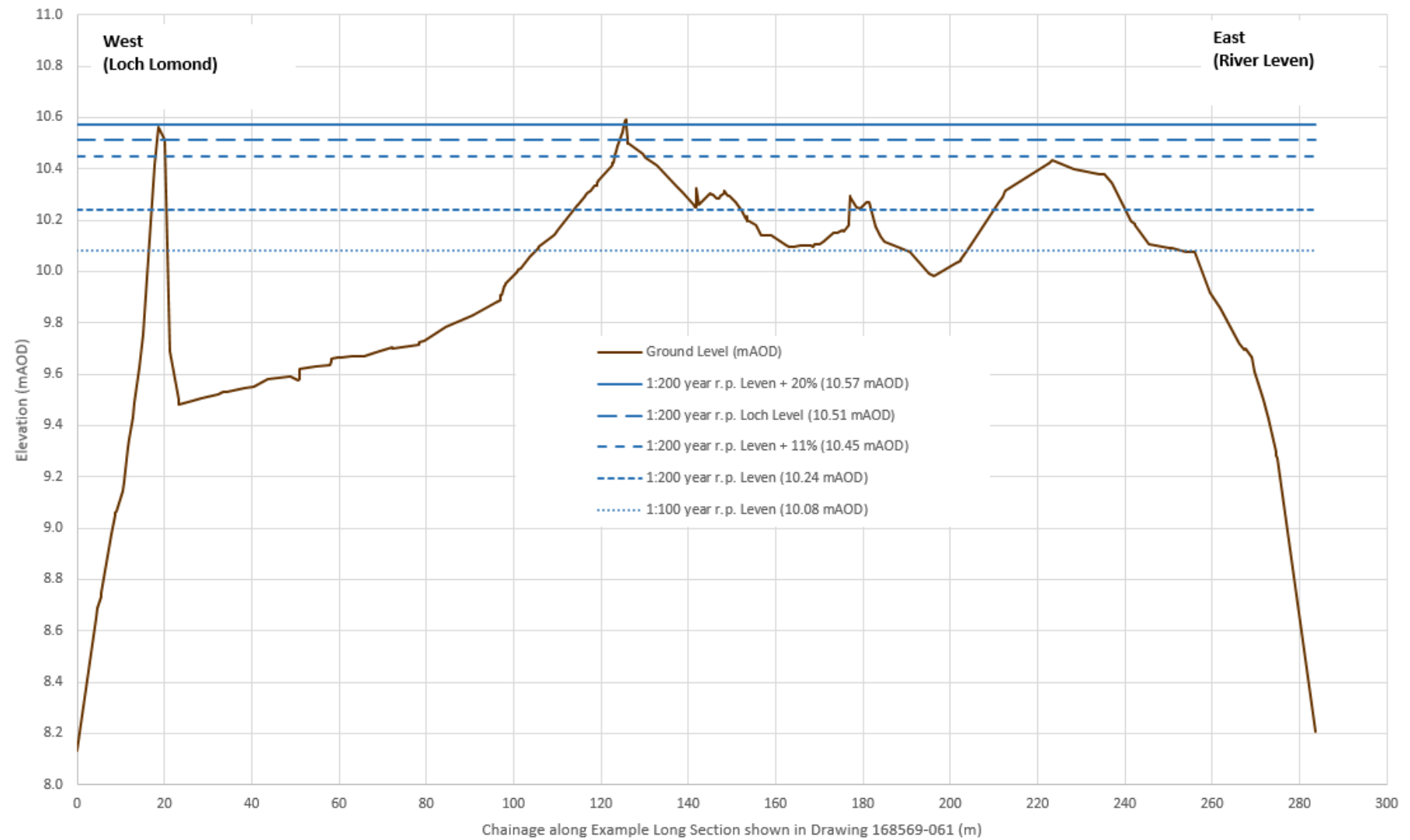
Project Title :  
TOPOGRAPHICAL SURVEY  
LAND AT BEN LOMOND WAY  
BALLOCH  
LOCH LOMOND

Sheet Title : <b>SHEET 3 OF 25</b>		Scale :
Surveyed date : <b>30/05/17</b>	Issued date : <b>31/05/17</b>	Enquiry No : <b>19353</b>
Surveyed by : <b>SF/P.McL</b>	Processed by : <b>DJ</b>	Checked by : <b>KRJA</b>

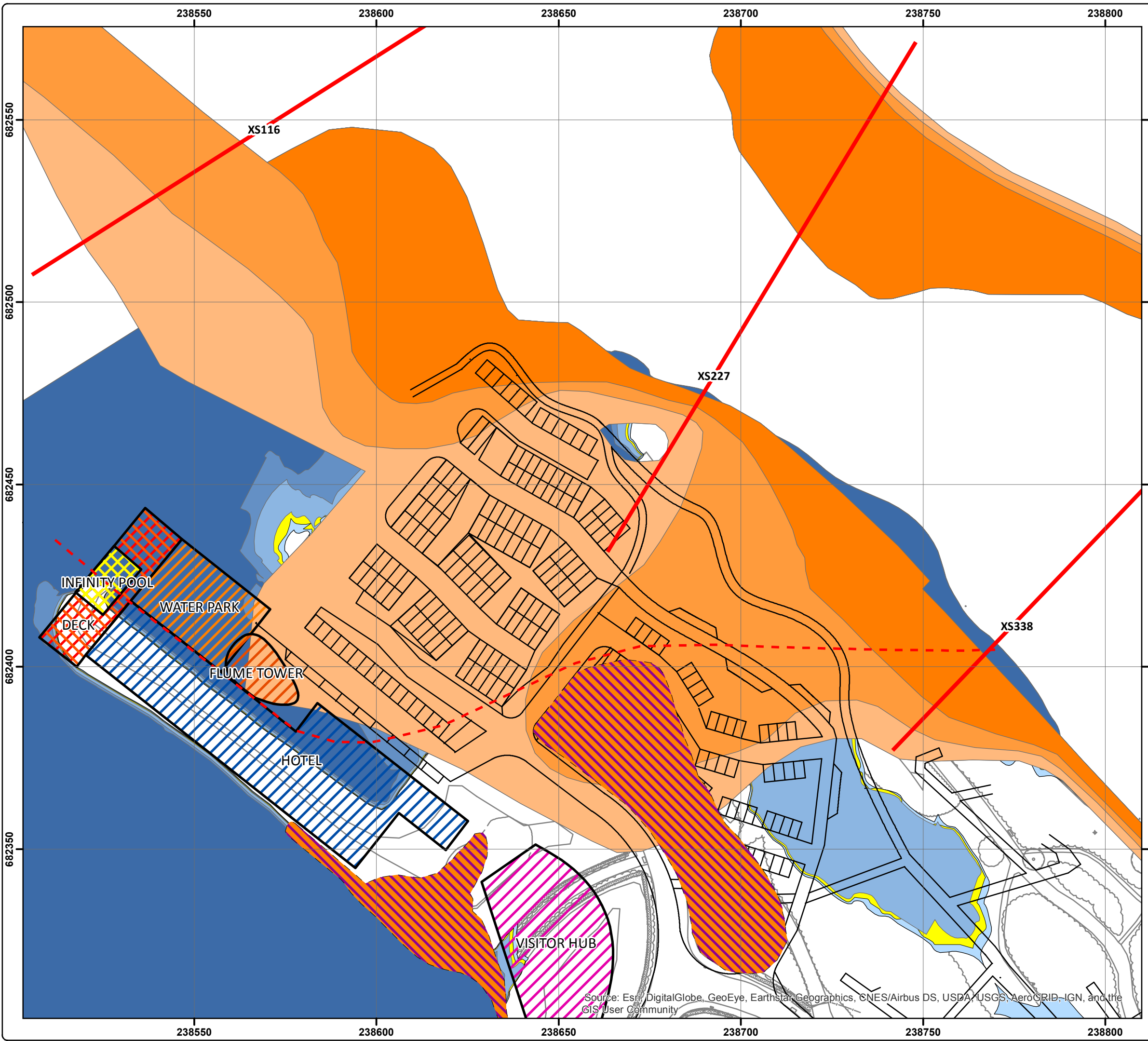




**Figure 1: Example long section through Pier Head area (alignment shown in Drawing 168569-061)**







**Legend**

- Jacobs 2009 Model Sections
- Example Long Section
- 2017 Topographic Survey
- 1:100 Year Event - 10.08 mAOD (2009 Topo)
- 1:200 Year Event - 10.24 mAOD (2009 Topo)
- 1:500 Year Event - 10.45 mAOD (2009 Topo)
- 1:100 Year Event - 10.08 mAOD (2017 Topo)
- 1:200 Year Event - 10.24 mAOD (2017 Topo)
- 1:500 Year Event - 10.45 mAOD (2017 Topo)
- 1:200 Year Event + Climate Change - 10.57 mAOD (2017 Topo)
- 1:200 Year Loch Event - 10.51 mAOD (2017 Topo)
- Potential Compensatory Storage Areas

**Development Footprint**

- Deck
- Flume Tower
- Hotel
- Infinity Pool
- Visitor Hub
- Water Park

Do not scale this map

Client  
TSL Contractors Limited


Project  
West Riverside Balloch

Title  
Flood Extents 2009 and 2017 Topo

Status  
**WORKING**

Drawing No. 168659-061	Revision
---------------------------	----------

Scale 1:1,000	<b>A3</b>	Date 5 Dec 2018
Drawn JS	Checked KMD	Approved KMD



Craighall Business Park, Eagle Street, Glasgow, G4 9XA  
Tel: 0141 341 5040  
Fax: 0141 341 5045

# Riverside West: Flood Risk Clarifications – Briefing Note 02

## Introduction

1. This briefing note has been produced to summarise the analysis undertaken to establish the extent of flooding associated with the West Riverside masterplan (Area E).
2. Clarifications have been requested by the Scottish Environment Protection Agency (SEPA) in their response letter, reference: PCS/159219 dated 22 June 2018, to the Planning Application: 2018/0133/PPP, to confirm the floodplain and the associated developable area in relation to Area E.
3. The development extents shown on the masterplan are indicative at this stage and do not represent a detailed design, purely the general area where activities are proposed.

## Area E - Woodbank

4. EnviroCentre Limited, in its submitted Flood Risk Assessment (FRA) report of March 2018, stated that detailed Ordnance Survey (OS) mapping indicated that there are 4 watercourses which run through this part of the site, however during the site walkover only two were noted as having significant flows. For the purposes of this FRA, the two watercourses are referred to as Unnamed Watercourse 1 (UW1) and Unnamed Watercourse 2 (UW2).

### Unnamed Watercourse 1 (UW1)

5. It was noted that UW1 flows along the north of the Woodbank site and runs in a steeply sloping channel through a stone culvert under the Old Luss Road. Any potential flooding arising from UW1 is likely due to the small culvert becoming blocked with debris. In such a scenario, the floodwater inundate the area surrounding the culvert inlet until it overtops onto the road above. It also stated that a stone wall is located above the right bank, along the northern boundary of the Woodbank site, which would prevent flows from routing onto the development site, and would direct flows onto Old Luss Road. There is effectively no floodplain associated with UW1 which would impact the development site.

### Unnamed Watercourse 2 (UW2)

6. This small burn flows through the south east corner of the Woodbank site, in a northerly direction. The watercourse routes from the caravan park to the east, and is culverted beneath Lower Stoney-mollan Road in a twin pipe arrangement, estimated to be approximately 0.5 – 0.6 m in diameter (each barrel). The burn then flows in a straightened canalised section with stone walls on either bank until it reaches Old Luss Road. It should be noted that it is left bank of this canalised stretch of UW2 that forms the effective boundary with Area E.
7. Whilst during the site walkover the inlet(s) to the culvert(s) under Old Luss Road were submerged, we have since obtained more information, through the photos taken by a resident and provided to SEPA. One of the photographs that have been made available to SEPA is reproduced as Figure 1.
8. It is evident from the photographs that there are 3 No. culverts with estimated diameters of at 0.6 m.



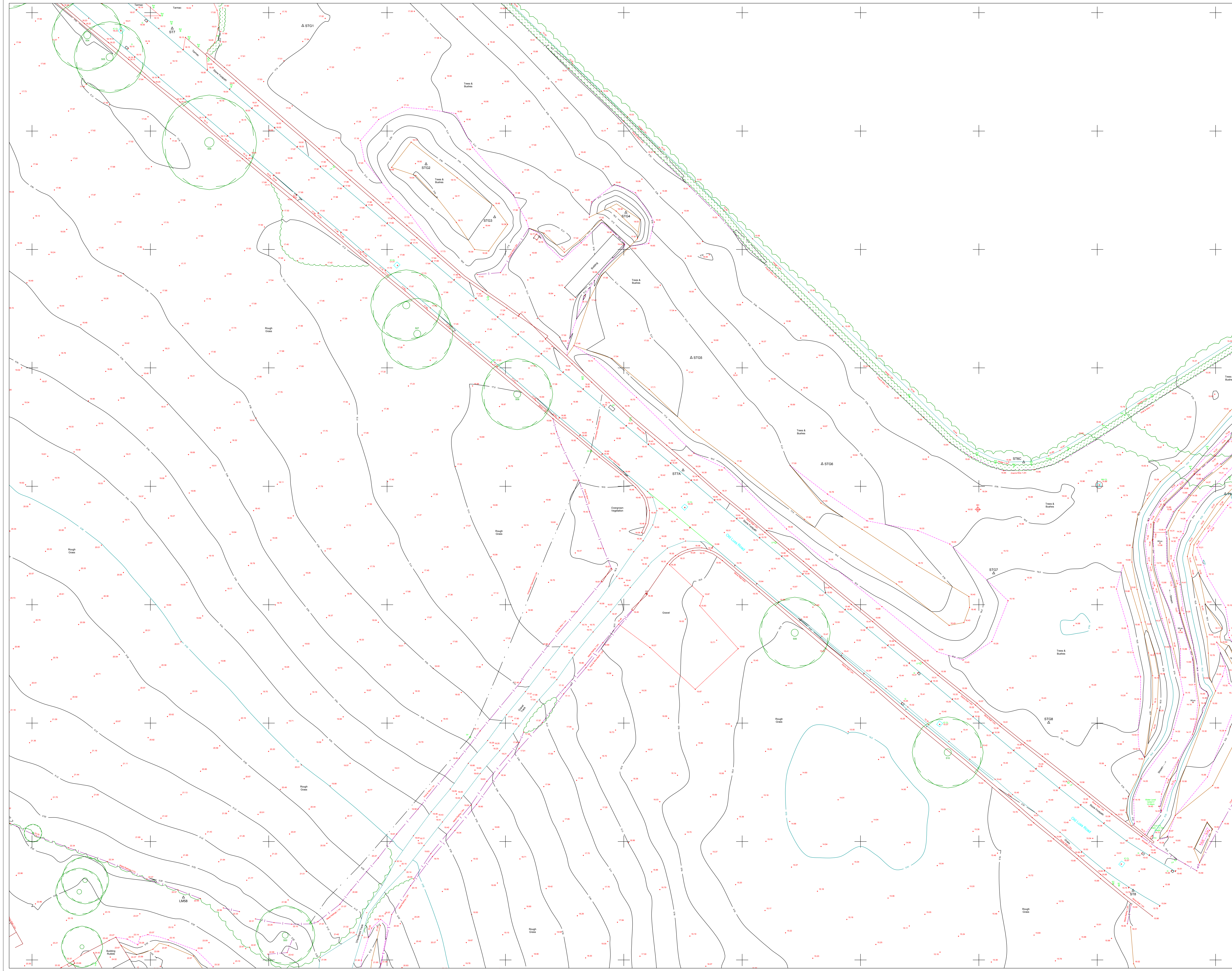
**Figure 1: The two photographs of the 3 culverts viewed from downstream of Old Luss Road**

9. Based on this information, all flow emerging on the downstream side of the 2 No. similarly sized (0.5 – 0.6 m dia.) culverts under Lower Stoneyrollan Road would be conveyed by the 3 culverts under Old Luss Road as their hydraulic conveyance capacity is larger, as long as the capacity is maintained. Any flooding due culvert capacity exceedance will first occur at the inlet to culverts under Lower Stoneyrollan Road with the floodwater being conveyed overland in the north-easterly direction, away from the development site. To appreciate the topography in the surrounding area of UW2 in the vicinity of Woodbank Site, a topographic contour map developed from a 2017 topographic survey of the site supplemented by LiDAR ground model data outwith the site boundary is enclosed as Drawing 168659-062.
10. However, as the photos show the culverts under Old Luss Road are presently partially blocked due to sediment build up and therefore their conveyance capacity is significantly reduced. This clearly is a maintenance issue. Assuming the scenario of restricted capacity within the culverts persisted, it is anticipated that flood flows would accumulate around the inlet and potentially spill onto both the Woodbank site and also onto the existing residential gardens to the east. The available topographic survey for Woodbank Site (Sheet 16 of 25 enclosed), includes only a small part of the left bank (of UW2 around the Old Luss Road culvert inlet. A review of this topographic survey shows that ground levels on the rise up to 16.00 mAOD close to the inlet. Thereafter, as one moves away from the UW2 in the north-westerly direction, close to Old Luss Road, onto the site the levels drop forming a small depression-like feature.
11. Despite this drop in ground levels, no fluvial floodwater is expected to spread further onto the site until the 16.00 mAOD level is breached. However, before this breach could occur parts of the right bank and the road level will have already been topped. Therefore, a larger amount of the overtopping floodwater would flow in the north-easterly direction over the road and through the residential gardens as dictated by the relatively flatter topography as shown in Appendix A, where the level on Old Luss Road adjacent to Hillend Cottage is shown as 15.70 mAOD.
12. On the left bank, due to the relatively steeper sloping nature of the Woodbank site, as one moves eastwards/ south-eastwards, it is not considered that flooding would extend far onto the site and so only a small corner of the development area may potentially be affected. As noted above, if a reasonable maintenance regime of culverts is implemented, it is unlikely there would be any flooding to the site. To account for the uncertainty in implementing such a maintenance regime by allowing a sufficient buffer of at least 5 m wide will ensure that no part of the proposed development will be at medium – high likelihood of flood risk.
13. The above demonstrates that development as shown indicatively by the masterplan layout can be accommodated without adversely impacting flood risk. Final designs would require to confirm that this remained the case through the detailed design phase supported by an updated flood risk assessment.







[illegible]



## Kenneth MacDougall

---

**From:** Kenneth MacDougall  
**Sent:** 15 January 2019 13:44  
**To:** 'brian.fotheringham@Sepa.org.uk'  
**Cc:** 'Nick Gair (nicholas.gair@sepa.org.uk)'; Campbell Fleming; Ian Buchan  
**Subject:** 168659: West Riverside - Area C  
**Attachments:** 1139\_SK20 A3 Pierhead Hotel Footprint Updated.pdf

Brian

Following on from our earlier phone call, attached is the proposed revised layout that brings the hotel development out of the flood risk zone.

From our understanding at the meeting last week, the Water Park is considered 'Least Vulnerable' consistent with 'assembly and leisure' use and a re-development of similar existing use, so would be appropriate in the location shown.

We assume that with a footprint of ~850 m<sup>2</sup> in the flood risk zone (existing ground levels range between 9.5 – 10.2 mAOD, design flood 10.57 mAOD), the Water Park would require appropriate compensatory storage as part of the detailed design stage?

The Flume Tower is an open structure and the Deck and Infinity Pool are shown at a level of 15 mAOD on the masterplan, expected to project out above the existing ground.

Prior to agreeing this revised layout, we would seek your confirmation that the above is acceptable to SEPA.

I'm happy to be contacted to run through any queries (0141 341 5040 / ).

Kind regards  
Kenny

**Dr Kenneth A. MacDougall**  
**Projects Director**

Email: [kmacdougall@envirocentre.co.uk](mailto:kmacdougall@envirocentre.co.uk)



- Contaminated Land & Sediment
- Ecology
- Environmental Impact Assessment
- Water Management & Engineering



<http://www.nordoffrobbisscotland.org.uk/>  
EnviroCentre's nominate  
charity for 2018

**Registered Office:** EnviroCentre Ltd., Craighall Business Park, 8 Eagle Street, Glasgow G4 9XA.  
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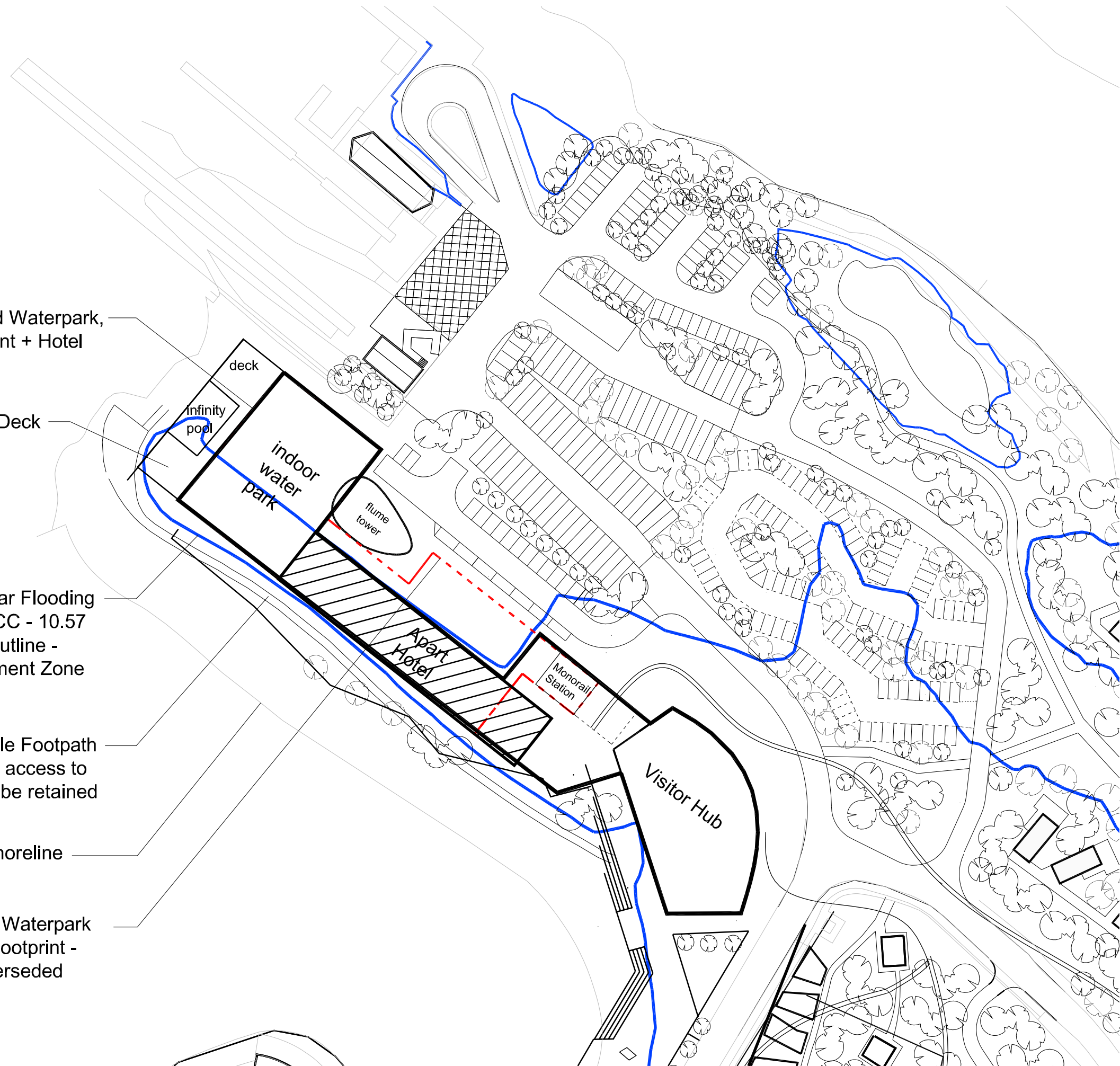
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Proposed Waterpark,  
Restaurant + Hotel  
Footprint

Outdoor Deck

1:200 Year Flooding  
Event + CC - 10.57  
mAOD Outline -  
Development Zone

Accessible Footpath  
providing access to  
beach to be retained

Beach Shoreline

Previous Waterpark  
+ Hotel Footprint -  
now superseded

Rev	Date	By	Notes

RISK REGISTER			
No.	Date	Description	

NOTES

**DO NOT SCALE**  
The Contractor must check & verify all Site & Building Dimensions, Levels & Sewer Inverts at DCM's before commencing work.  
This Drawing must be read with the NBS Contract Specification and any related Structural Engineer or Specialist Contractors Drawings.  
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## INFORMATION ONLY

Project  
West Riverside

Client  
TSL/Flamingo Land

Drawing  
Pierhead Hotel Footprint within Flood Development Zone

Job No.	Dwg No.		Rev.
1139	SK020		
Scale 1:2000	Sheet A3	Scale 	Sheet 
Drawn by ABL	Date Created 11/12/2018	Checked by RS	

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CAD Ref.  
INFORMATION ONLY

Our ref: PCS/162833  
Your ref: 168659

If telephoning ask for:  
Brian Fotheringham

Mr K MacDougall  
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Glasgow  
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01 February 2019

By email only to: [kmacdougall@envirocentre.co.uk](mailto:kmacdougall@envirocentre.co.uk)

Dear Sir

**The erection and operation of a tourism and leisure led mixed use development including hotel, bunkhouse accommodation and self-catering holiday lodges, self-catering boathouse accommodation, residential development, leisure and recreational facilities including swimming pool, water park, visitor reception and education/interpretation facilities, hot food/café restaurant uses, brewery; ancillary uses including retail, facade retention of Woodbank House and conversion of existing outbuildings, public realm enhancements including public square improvements, footpaths and cycleways, external activity areas including forest adventure rides, tree top walkway, monorail, events/performance areas, picnic areas and play areas, staff and service areas; landscaping, new access from Ben Lomond Way and Pier Road; and site development infrastructure (including SUDS, and parking).**

**Land At Pier Road, Ben Lomond Way And Old Luss Road, Known As West Riverside And Woodbank House, Balloch.**

I refer to the recent email consultation emails which SEPA in December 2018 and January 2019, in respect of the above proposed development.

The additional information provided by the applicant is seeking to address the terms of our outstanding flood risk objection, with particular reference to the location of the hotel and the associated structures in the Pierhead area of the site (Area C), as detailed in SEPA's response PCS/159219 – 22 June 2018.

We have as requested given due consideration to the supplementary information provided and would offer the following revised comments for your information.

Please note that our advice at this stage is based on emerging proposals and we cannot rule out potential further information requests as the project develops.



Chairman  
Bob Downes

Chief Executive  
Terry A'Hearn

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## 1. Flood risk

- 1.1 We would confirm that if we were to be formally consulted on the amended site layout, as shown on Drawing No 1139 – SK020 we would be able to **remove our objection** to the proposed development on flood risk grounds. Notwithstanding this we would expect Loch Lomond & The Trossachs National Park to consult the relevant council to undertake their responsibilities as the Flood Risk Management Authority.
- 1.2 Our pre-application advice relies on the accuracy and completeness of the information supplied with this consultation. Should finalised development proposals differ in any future planning application we reserve the right to alter our position if we are of the opinion that such proposals would not meet with the principles of Scottish Planning Policy.

### Technical Report

- 1.3 We have previously commented on this proposal, raised a flooding objection and requested further information or modification to the site layout. A revised proposal has now been submitted and we would make the following comments.
- 1.4 Review of planning drawing 1139 SK020 indicates that the proposed hotel development has been moved outwith the floodplain which was the main reason for our flood risk objection. We are satisfied with the revised location of the hotel with the caveat that some uncertainty remains with the flood hazard. We do however accept that this risk has partly been mitigated by using climate change levels to inform the functional floodplain.
- 1.5 It is also agreed that given the nature of the site that the water park is a least vulnerable use and provided any loss of floodplain is subject to appropriate compensatory storage the proposal should have an overall neutral effect on flooding. Therefore based on the revised proposal we are satisfied that it is compliant with the principles of Scottish Planning Policy (SPP).
- 1.6 The SEPA Flood Maps have been produced following a consistent, nationally-applied methodology for catchment areas equal to or greater than 3km<sup>2</sup> using a Digital Terrain Model (DTM) to define river cross-sections and low-lying coastal land. The maps are indicative and designed to be used as a strategic tool to assess flood risk at the community level and to support planning policy and flood risk management in Scotland. For further information please visit <http://www.sepa.org.uk/environment/water/flooding/flood-maps/>.
- 1.7 We refer the applicant to the document entitled: "Technical Flood Risk Guidance for Stakeholders". This document provides generic requirements for undertaking Flood Risk Assessments and can be downloaded from <http://www.sepa.org.uk/media/162602/ss-nfr-p-002-technical-flood-risk-guidance-for-stakeholders.pdf>. Please note that this document should be read in conjunction Policy 41 (Part2).
- 1.8 Please note that we are reliant on the accuracy and completeness of any information supplied by the applicant in undertaking our review, and can take no responsibility for incorrect data or interpretation made by the authors.

If you have any queries relating to this letter, please contact me by telephone on 01698-839336 or by e-mail to [planning.sw@sepa.org.uk](mailto:planning.sw@sepa.org.uk)

Yours faithfully

Brian Fotheringham  
Senior Planning Officer  
Planning Service



*Disclaimer*

*This advice is given without prejudice to any decision made on elements of the proposal regulated by us, as such a decision may take into account factors not considered at this time. We prefer all the technical information required for any SEPA consents to be submitted at the same time as the planning or similar application. However, we consider it to be at the applicant's commercial risk if any significant changes required during the regulatory stage necessitate a further planning application or similar application and/or neighbour notification or advertising. We have relied on the accuracy and completeness of the information supplied to us in providing the above advice and can take no responsibility for incorrect data or interpretation, or omissions, in such information. If we have not referred to a particular issue in our response, it should not be assumed that there is no impact associated with that issue. For planning applications, if you did not specifically request advice on flood risk, then advice will not have been provided on this issue. Further information on our consultation arrangements generally can be found on our [website planning pages](#).*



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## **Appendix F     2017 Site Walkover Photographs**

## B SITE PHOTOGRAPHS



Number	Photo	Description
1		Unnamed watercourse 1 to the west of the site, north of the Woodbank site. Looking west towards the A82.
2		Small culvert below Old Luss Road routing the above watercourse below the road towards Drumkinnon Cottages.





Number	Photo	Description
3		Looking northwest across Woodbank site.
4		Unnamed watercourse passing beneath Lower Stoney-mollan Road. Looking South.

Number	Photo	Description
5		<p>Unnamed watercourse downstream of Lower Stoneymollan Road. Routing along the eastern boundary of the Woodbank site, looking north (downstream).</p>
6		<p>Unnamed watercourse downstream of the culvert beneath Old Luss Road as it routes towards the existing Loch Lomond Shores car park. Looking north.</p>








Number	Photo	Description
7		<p>Unnamed watercourse as it routes towards Loch Lomond Shores car park and passes beneath access road. Bank heights are approximately 2m on both sides at this point.</p>
8		<p>Unnamed watercourse as it flows through the car park area. Looking northwest (downstream).</p>





Number	Photo	Description
9		Unnamed watercourse to the northwest of the Loch Lomond Shores development as it routes to its outfall into the loch. Looking northeast (downstream).
10		Southern shore of Loch Lomond adjacent to the Sea Life Centre. Looking west.





Number	Photo	Description
11		Looking northwest along the shore of the loch in the Shore area of the development.
12		Head of the River Leven where it flows from Loch Lomond to the north. Looking north.

Number	Photo	Description
13		<p>Looking downstream along the River Leven from the Pierhead area of the site.</p>
14		<p>Looking north along footpath running parallel with the River Leven. This is within the 'Leven Riverfront' area of the site.</p>
15		<p>Looking north from the Balloch Station area of the site, along the corridor of the River Leven area.</p>



Number	Photo	Description
16		Slipway and jetty on the River Leven adjacent to the Balloch Station site area. Looking south.
17		Looking north along Pier Road with the lower ground to the east alongside the River Leven.

Number	Photo	Description
18		<p>Undulating ground in the Drumkinnon Woods area of the site. Looking south.</p>
19		<p>River Leven Barrage which is used to controls water levels within Loch Lomond and in the River Leven. Looking downstream.</p>