

Parc Cybi, Anglesey:
Plot Drainage Statement

Nov 2008

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1. Introduction

Atkins was commissioned in 2005 by the Welsh Assembly Government to investigate options and prepare detailed designs for foul and surface water disposal for the proposed Parc Cybi Business Park development in Anglesey, North Wales. The Parc Cybi site has been identified as a major strategic business investment site for North West Wales. It is located on the southern edge of Holyhead on the west side of A55 Junction 2, and has been formally designated for development in unitary development plans. The Welsh Assembly Government has obtained outline planning consent for the 50 Ha business park development, which is located in an area of outstanding natural beauty and archaeological interest. The main adoptable drainage and highway infrastructure on the site is programmed for completion in 2008. The installation of this infrastructure will facilitate the development of the plots within the site.

This report sets out the design philosophy for foul and surface water drainage for the development, which has been agreed with relevant regulatory authorities and will be issued to developers of the plots as the basis of the drainage design for each plot.

2. Site Description

The site is located approximately 1km south of the centre of Holyhead and immediately north of Trearddur Bay. The A55 forms the eastern boundary to the site. Similarly, Kingsland Road lies adjacent to the site's western boundary. The site's topography ranges from 6 - 12 m AOD with gentle undulating topography interrupted by rock outcrops running east to west. A number of rock outcrops occur throughout the site with the highest points of around 18 m AOD. The proposed development project included creation of:

1. A new road linking A55 Junction 2 with the Trearddur Bay - Kingsland road, joining it at a new roundabout near to the Leisure Centre, which is under construction and will be completed before the business park units are developed;
2. Development of 9 plots for business purposes (circa 48 Ha for business development), and
3. A 3 Ha housing development site north of the proposed link road.

The above features are shown on the Drainage Masterplan that is included in Appendix A.

3. Site Drainage

3.1. Foul Water Drainage

A new foul drainage system has been installed as part of the main infrastructure works for the development. This system discharges to the public foul sewer network. The main foul drainage infrastructure has been designed in accordance with Sewers for Adoption 6th Edition (SfA 6) and includes connections to proposed development plots. The main foul drainage system is in the process of adoption by Dwr Cymru.

In accordance with SFA 6, any subsequent foul drainage system serving multiple buildings may also be offered to Dwr Cymru for their adoption, providing they meet the required standards. Foul drainage systems serving individual units or plots should be designed in accordance with SfA 6 or the Building Regulations Part H (2002) depending on whether the system is to be offered for adoption or remain in private ownership.

The peak design foul discharge rate from the whole development should not exceed 36 l/s. This flow rate has been calculated using guidance given in SfA 6 and is based on the developable site area identified on the site master plan that was current at the time the drainage design for the site was undertaken (circa 26ha). The following Foul Drainage Schedule for Plots details maximum permitted discharges and connection points for each plot.

The limited discharges stated relate to groups of buildings within the plot and should be calculated pro rata for individual buildings.

Foul Drainage Schedule for Plots

Type of development	Buildings type/number	Max buildable area (ha)	Maximum flow permitted (l/s) ¹	Type of connection (gravity/possible pumping)	Connection point to the site drainage (MH)
Plot 1- Residential	-	156 dwelling units	7.3	g	MH13a
Plot 2 - Commercial/Industrial	2001	2.82	3.1	g	MH 8 (MH11)
	2002			g	MH8
Plots 3 + 9a - Commercial/Industrial	2003	2.54	2.8	g	MH6
	2004			g	MH6
	2005			g	MH6
Plot 4a – Hotel	1001	1.61	1.8	g	MH11.1
Plots 4b and 5 - Commercial/Industrial	1002-1003	2.82	3.1	g	MH8.1
	1004			g	MH8.1
	1005			g	MH8.1
	1006			g	MH8.1
	1007			g	MH8.1
	1008			g	MH8.1
Plot 6 - Commercial/Industrial	3001	1.40	1.6	pp	MH6.1
	3002			g	MH6.1
Plot 6a - Commercial/Industrial	3003	1.40	1.6	g	MH5.1
	3004			g	MH5.1
Plot 7 - Commercial/Industrial	3005	1.5	1.7	pp	MH3.1
	3006			g/pp	MH3.1
Plot 8 - Commercial/Industrial	5001	6.44	7.1	g	MH3.5
Plot 9b - Commercial/Industrial	4001	1.39	1.5	g	MH2
Plot 10 - Commercial/Industrial	4002	3.73	4.1	g	MH1
	4003			g	MH1
	4004			g	MH1
	4005			g	MH1

¹ - for industrial/commercial sites of 1.1 l/s/ha of buildable area (as per SfA 6)

- for residential units peak design flow rate was calculated on the basis of SfA 6 guidance – 4000 l/dwelling unit/day

The developer shall ensure that the design of the foul drainage systems that may serve more than one units within a plot does not preclude a gravity connection (unless pumping connection required) to the common pipework from other units within the plot. The design shall also ensure that the common pipework has sufficient capacity to all other units within the plot.

Common pipework shall be laid at the following minimum gradients to ensure compliance with the above requirements:

D 100 mm – 1:80 (provided at least 1WC is connected)

D 150 mm – 1:150 (provided at least 5WCs are connected).

The developer should make reference to the 'as-built' records for details of pipe diameters and invert levels at the stated connection points. Connections should be made soffits level.

3.2. Surface Water Drainage

3.2.1. Introduction

In accordance with current planning guidance, TAN 15 in particular, surface water arising from the site will be managed using Sustainable Drainage Systems (SUDS). The design of the SUDS has been based upon the principles given in the CIRIA C697: 'Sustainable Drainage Systems Design Manual' (2007), which promotes the strategy of dealing with stormwater as close to source as possible. Broad agreement for the use of SUDS at the Parc Cybi development was given by Ynys Mon County Council and by Welsh Assembly Government who prize the potential benefits they bring to the environment. The purpose of a SUDS system is to minimise the impact that a development such as Parc Cybi has on the natural environment, with particular reference to the effects large impervious surfaces and sources of pollution have on nature. Negative impacts on development brings, with respect to drainage, include:

- Changes in flow characteristics of runoff. Runoff from hard surfacing and building roofs is quicker than from natural surfaces; this can cause flooding downstream.
- Changes in the quality of runoff. Runoff from the sites is likely to be more polluted than runoff from natural surfaces as pollutants from activities on the sites (e.g. oil from car parks) can be washed into the drainage system. Conventional drainage systems are not designed to remove pollution.
- Biodiversity and amenity losses.

All drainage systems have been designed to accommodate storm return periods of up to 1 in 30 year return frequency (site attenuation features to 100 years with an additional 20 % factor of safety to take account of climate change in accordance with TAN 15). Flows arising from exceedance events will either pond on the surface and enter the drainage system as the drainage system draws down, or follow flood routes over the surface and into the site attenuation features. Flows from the site will enter either one of two unnamed watercourses at rates equivalent to that of the pre-developed site. These rates are referred to as greenfield rates. The following greenfield runoff rates for Parc Cybi have been agreed with the Environment Agency Wales for different return periods:

Storm Return Period (1 in x years)	Predicted Greenfield Runoff (l/s/ha)
2.34	5.08
5	7.49
10	9.04
30	12.42
50	14.28
100	16.72

These rates should be used in the design of the future pond serving plot 8. The discharges from this pond should be restricted to the rates stated in the table above.

Due to the space constraints for the attenuation pond serving all other plots, discharges from the car parks and hardstandings need to be restricted to 5 l/s/ha and the limited rates for each plot are detailed in the Surface Drainage Schedule for Plots.

Surface water drainage systems serving individual units or plots should be designed in accordance with SfA 6 or the Building Regulations Part H (2002) depending on whether the system is to be offered for adoption or remain in private ownership.

The developer shall ensure that the design of the surface water drainage systems that may serve more than one unit within a plot does not preclude a gravity connection to the common pipework from other units within the plot. The design shall also ensure that the common pipework has sufficient capacity to all other units within the plot.

Common pipework shall be laid at the following minimum gradients to ensure compliance with the above requirements:

- D100 mm – 1:100
- D150 mm – 1:150 (1:100 if offered for adoption)
- D225 mm – 1:225 (1:170 if offered for adoption)
- D300 mm – 1:240
- D375 mm - 1:320
- D450 mm – 1:400

The developer should make reference to the 'as-built' records for details of pipe diameters and invert levels at the stated connection points. Connections should be made soffits level in accordance with normal drainage construction practice.

3.2.2. Carriageway Drainage and Main Site Drainage

The main surface water drainage system within the spine road has already been installed. Land drainage associated with the highway drainage has been constructed as part of the preliminary infrastructure work.

In order to provide pollution mitigation for surface water runoff from the main carriageway of the spine road, bio-swales have been designed along the shoulder of the main carriageway to accept water from the road before it discharges into the main surface water drain. Bio-swales have been utilised to attenuate flows, provide habitat for wildlife and the primary phase of

treatment. Road runoff will be conveyed from the road surface by traditional gullies into the bio-swales before discharge into the main surface water drain.

Purpose designed attenuation system controls surface water runoff on site to pre-development site rates. An existing ditch has been utilised for attenuation and a new pond has been constructed in the wetland area at the eastern boundary of the site which discharges into the watercourse draining through the A55 culvert. These features will attract and support a variety of flora and fauna and enhance the biodiversity of the site. The attenuation ponds will form the final phase of treatment and attenuation for run-off from the main carriageway before surface water runoff is discharged beyond the site.

3.2.3. Plot Drainage

The Welsh Assembly Government's aspiration is that all new buildings in Wales from 2011 onwards should be built to zero carbon standards. As from 2007, WAG is making BREEAM 'Excellent' or equivalent a core condition of its funding for projects and programmes involving new buildings. That means that the units proposed to be build on this site should be designed to meet those WAG standards. For further information regarding BREEAM scoring, please refer to the British Research Establishment website (www.breeam.org).

Surface water run-off from plots has been divided into two categories:

- Roof run-off, which is relatively unpolluted, and
- Other hardstanding areas, which have a risk of surface water pollution from diffuse pollution sources and accidental spillages.

In that respect, there are different criteria for surface water disposal from those two sources.

3.2.3.1. Roof Drainage

Surface water runoff from all roofs shall be allowed to discharge freely to the site attenuation ponds/wetlands via the common main drainage infrastructure, providing that the maximum roof areas per plot are not exceeded (for further reference for each plot please see Surface Drainage Schedule further in this text).

This approach ensures that the relatively unpolluted roof runoff passes through the drainage system and does not dilute the potentially contaminated car park runoff thus preventing its effective treatment. In order to further BREEAM requirements, rainwater harvesting either in water butts or in underground tanks and utilising of green roofs should be considered.

3.2.3.2. Other Hardstanding Areas

SUDS use on all Business Park plots is a requirement and these systems could be used to meet both quantity and quality requirements for surface water disposal from individual boundaries of units to be developed.

Quantity Requirements

Drainage runoff from all carparks, access roads and hardstanding areas within the boundaries of individual units shall be attenuated and only the restricted flows, not exceeding 5 l/s/ha, shall be discharged from the areas occupied by the developed units. The exception to this is plot 8 as the final discharge point rates should depend on the capacity of the proposed pond to be constructed within the plot prior to final discharge beyond the site. Plot drainage should be designed so that flows arising from the drainage system do not present a flood risk to buildings. Further guidance can be found in CIRIA guidance C635: 'Designing for exceedance in urban drainage - good practice', 2006.

Quality Requirements

As runoff from these areas is at the risk of being polluted, utilisation of SUDS to treat surface water runoff has been required. In order to maximise the benefits of SUDS systems and minimise the risk of polluted water from being conveyed to the existing wetland and ponds, a

SUDS treatment train has been anticipated to link different SUDS techniques in series. The treatment train concept is based on a series of complementary techniques to achieve enhanced water quality. For the proposed development plots, two levels of SUDS techniques need to be provided for water discharging from each individual unit, or group of units to be developed. As the existing wetland and ponds count as one level of treatment in this train, all plots are required to provide at least one additional level within the individual development plot boundary. Each of the following techniques proposed for Parc Cybi should be treated as one level of treatment in the treatment train:

- Minimising impermeable paved area wherever possible - allowing surface water runoff to drain naturally, through landscape areas,
- Utilising green planters,
- Utilising grass strips and permeable surfaces where possible (car parks) – offering alternatives to conventional hard surfaces. These systems attenuate flow and provide natural filters to treat contaminants at the source,
- Utilising swales to convey stormwater from the plots and to connect to the main drainage network.

Selection and design of individual SUDS types should depend on individual plot topography and final plot layouts. Use of SUDS on these developments will have positive impact on BREEAM scoring. For further information regarding BREEAM scoring, please refer to the British Research Establishment website (www.breeam.org).

3.2.3.3. Residential Area (Plot 1)

Surface water flows arising from the development of residential area for storm events up to 1 in 100 years return frequency shall be discharged into the main drainage system without restriction, providing that no more than 60% of total plot area is covered by impermeable surfaces (roofs, roads, hardstandings, etc.). Plot drainage should be designed so that flows arising from the drainage system do not present a flood risk to buildings. Further guidance can be found in CIRIA guidance C635: 'Designing for exceedance in urban drainage - good practice', 2006.

Although it is advisable to use SUDS for surface water attenuation, there is no need to utilise SUDS for pollution control purposes on this plot, as the downstream pond already provides one level of treatment recommended by the Environment Agency for residential sites.

3.2.3.4. Plot 8

Surface water from the plot 8 will discharge via a future pond into the watercourse forming the boundary of plot 8. This is a different watercourse from the one receiving discharges from other plots. Discharge requirements from roofs and other hardstanding areas should depend on the capacity of the proposed pond to be built within the plot prior to final discharge beyond the site. The agreed restricted greenfield runoff flows from the plot to the watercourse should be calculated according to the table provided in section 3.2.1.

Part of the main highway drainage discharges via an existing bio-swale on site. The potential developer should make an effort to retain this bio-swale. However, in the case that it has to be removed in order to provide adequate space for the future pond, the developer should incorporate within the design of the pond an equivalent level of treatment for the highway runoff in addition to the treatment for the runoff from the development plot. More details on SUDS pollution mitigation levels and SUDS treatment trains could be found in CIRIA C697: 'Sustainable Drainage Systems Design Manual' (2007).

In addition to the above the developer of Plot 8 shall ensure that any surface water flows generated within the areas to the south west of the site can continue to be conveyed across Plot 8 to the existing watercourse, without presenting an increased flood risk to the properties on the adjacent existing housing area. Within the vicinity of Plot 8 there is an existing stone culvert that should be taken into account by the developer prior to construction. Further investigations should be undertaken by the developer to confirm the location, depth, condition

and purpose of the culvert. The approximate location of the culvert is shown on the Drainage Masterplan that is included in Appendix A.

Surface Drainage Schedule for Plots

Type of development	Roof drainage			Car parks/hardstanding drainage		
	Maximum roof area (m2)	Discharge limit (l/s)	Discharge point (SW)	Max car park/hardstanding and green area (ha)	Discharge limit (l/s)	Discharge point (SW)
Plot 1 (residential)	21450 (max 60% site area to be developed)	No limit – free discharge	SW11	14300 ²	No limit – free discharge	SW11
Plot 2	3100	No limit – free discharge	SW9	4.16	20.8	SW9
Plots 3 + 9a	2000 + 1000	No limit – free discharge	SW5	2.03 + 0.65	10.1 + 3.2	SW5
Plot 4a (hotel)	1700	No limit – free discharge (the footprint of the hotel should not impair the hydraulic performance of the swale)	SW10.1	1.04	5.3	SW10.1
Plot 4b	3250	No limit – free discharge	SW8.1	2.43	12.1	SW8.1
Plot 5	3000	No limit – free discharge	SW7.1	2.64	13.2	SW7.1
Plot 6	6800	No limit – free discharge	SW4.1	3.02	15.1	SW4.1
Plot 6a	3300	No limit – free discharge	Existing ditch	2.56	12.8	Existing ditch
Plot 7	4700	No limit – free discharge	Existing ditch	3.70	18.5	Existing ditch
Plot 8	17350	No limit – free discharge	To the future pond ³	9.18		To the future pond
Plot 9b	3400	No limit – free discharge	SW1	2.07	10.4	SW1
Plot 10	8000	No limit – free discharge	SW1	5.78	28.9	To the pond

² Total plot area minus the roof area

³ Pond shall be restricted to the Greenfield runoff rates detailed in Section 3.2.1.

4. Construction and Maintenance

Any construction works within the plots shall be designed not to disturb main drainage systems already in place. Special attention needs to be taken to secure integrity of bio-swales and ponds already in place. For further guidance on protection of SUDS systems during construction, please refer to 'CIRIA SUDS construction handbook C697, 2007'.

The main foul drainage system has been submitted for adoption by Dwr Cymru. The main surface water infrastructure and attenuation ponds are to be adopted by Ynys Mon with the Welsh Assembly Government currently taking responsibility for the maintenance of the swales and bio-swales. However, this commitment may be reviewed if the swales were utilised for draining areas other than the public highway.

It should be noted that at the present time neither Dwr Cymru nor Ynys Mon will adopt SUDS systems within individual plots. Developers will be responsible for providing alternative means of operating and maintaining these SUDS in accordance with the best practice guidelines.

Prior to connection of the foul or surface water systems to the existing adopted foul and surface water drainage, agreement needs to be sought from Dwr Cymru and Ynys Mon. Discussions with the relevant authorities should commence at the earliest opportunity in the design process to ensure that the design of the foul and surface water systems within each development plot comply fully with the requirements of this drainage statement and the adopting authorities.

In addition to the above, the developers of each individual plot shall submit their detailed drainage proposals to the Welsh Assembly Government for approval prior in conjunction with the submission of any planning application to Ynys Mon.

Appendix A – Drainage Masterplan