

Penarth Heights

Drainage Strategy

ON BEHALF OF CREST NICHOLSON (SW)



FEBRUARY 2007

Cole Easdon Consultants



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**PROPOSED RESIDENTIAL DEVELOPMENT
AT
PENARTH HEIGHTS
PENARTH**

DRAINAGE STRATEGY

CLIENT: CREST NICHOLSON (SOUTH WEST) LIMITED

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**Drainage Strategy
Proposed Residential Redevelopment
Penarth Heights**

Cole Easdon Consultants (CEC)

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References:

1. Site Investigation Report by Capita Symonds (October 2005)
2. Geo-Environmental Report by Capita Symonds (May 2006)

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1.0 INTRODUCTION

Background

- 1.1 Cole Easdon Consultants have been instructed by Crest Nicholson (South West) Limited to review the Drainage Strategy Study (Issue 2) relating to a proposal to redevelop land at Penarth Heights, Cardiff. The development is to comprise of some 377 new dwellings. The land is allocated by the Local Planning Authority for housing. This update of the Drainage Strategy Study relates to negotiation that has been undertaken between the various interested parties during the past 6 months period. During this time period negotiations have taken place with the Local Planning Authority, Welsh Water, Vale of Glamorgan Council and the Environment Agency.
- 1.2 The redevelopment site is located on the northern side of Penarth town centre, and is served by the existing highway network. Refer to Figure 1 (Location Plan) in Appendix 1. The proposed development would replace the existing, largely disused development of some 329 residential units known as 'Billybanks'. The site area is some 7.0 hectares (16.62 acres). In addition, the developer would also be responsible for the improvement to areas known as Plassey Square, The Bowl, Paget Road play area and Arcot Street Triangle.
- 1.3 Immediately to the north of the proposed re-development site is a rock escarpment, below which is located the highway known as Terra Nova Way, as well as relatively recent residential development which extends around the Portway Marina and along the southern edge of the River Ely estuary. This latter estuary and the River Taff combine to form the 'Penarth Flats'. The Cardiff Bay Barrage forms a man-made barrier between the Penarth Flats and the mouth of the River Severn. Recent waterfront development is evident in this vicinity.

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- 1.4 To the south and east of the proposed re-development site are Paget Road, Harbour View Road, Plassey Square, and Plassey Street. It should be noted that existing terraced housing off Plassey Square, High Street, Arcot Street etc. will remain. Refer to Drawing Nos. 2025/500 (Sheets 1 and 2) for precise site boundary (Appendix 5).

Need for Study

- 1.5 This revised Study discusses a drainage methodology that will provide for the satisfactory disposal of surface runoff as well as efficient foul water discharge, with respect to the proposed development by Crest Nicholson.
- 1.6 The Study accompanies a detailed Planning Application for the site.

Consultations

- 1.7 To prepare this Report, Cole Easdon Consultants have continued over the past 18 month period to discuss drainage matters with officers representing the Environment Agency, Vale of Glamorgan Council (VGC) and Welsh Water. We have reviewed ground investigation data prepared by Capita Symonds in June 2005. We have also undertaken investigations regarding the existing drainage and sewerage network within the site locality.

Scope of Study

- 1.8 This Study is divided into the following sections:
- In Section 2.0, we describe the characteristics of the existing development site.
 - In Section 3.0, we discuss how the surface water runoff relating to the developed site could be serviced by means of surface water drainage.
 - In Section 4.0, we discuss the foul water drainage strategy.
 - Conclusions are presented in Section 5.0.

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1.9 The following abbreviations are used within the Study:

VGC – Vale of Glamorgan Council

EA – Environment Agency

CN – Crest Nicholson

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2.0 EXISTING SITE CHARACTERISTICS

Topography

- 2.1 The site is located on a ridge that extends from Penarth Headland to a spur to the west. It was formerly a quarry in the late 19th and early to mid 20th century. Highview and Harbour View Roads are routed along the top of this ridge. Refer to Figure 1 within Appendix 1. Existing ground levels fall away to the north and south of these highways. A cliff is located along the northern boundary of the site. A 35 metre level difference exists between ridge top and bottom of cliff (Terra Nova Way). A topographical survey has been undertaken and ground levels are shown on Drawing Nos. 2025/500 (Sheets 1 and 2), also enclosed within Appendix 5.

Geology

- 2.2 Geological records indicate that the site consists mainly of made ground (generally clay fill) associated with filled quarries underlain by St Mary's Well Bay Formation; alternating thin unevenly bedded calcilutite and shelly calcareous shaley mudstone. The underlying Penarth Group (mudstone and thin sandstone/limestone layers) exists below the St Mary's Well Bay Formation. We understand that a number of geological faults cross the site.

Existing Drainage Disposal Systems

- 2.3 The existing drainage system serving both the present housing within the site, and its environs has been established by:
- i) Review of Welsh Water sewer records;
 - ii) Liaison with personnel from Welsh Water and VGC;
 - iii) Visual inspection of manholes;
 - iv) Tracing and CCTV survey.

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Sewer Records

- 2.4 Examination of Welsh Water Sewer Records has revealed the following information:
- i) The area to the south and east of the development site is served by three separate combined public sewer systems;
 - ii) The area to the north of the site is served by one public foul water sewer only;
 - iii) The area to the west of the site is not served by any public sewers;
 - iv) There are no separate surface water sewers in the area.
- 2.5 Refer to Drawing Nos. 2025/500 (Sheets 1 and 2) within Appendix 5, for existing drainage and sewerage layout.

Existing Public Combined Sewers

- 2.6 The combined public sewers to the south and east of the site are described as follows:
- i) A 375mm diameter combined public sewer is located in Paget Road and flows in an easterly direction;
 - ii) A Victorian built 1070mm x 570mm brick egg shaped combined public sewer is located in the lane behind housing which fronts Queens Road. A tracing survey has revealed that a section of this sewer crosses into the development area before connecting into a 1060mm x 660mm culvert located in the High Street. The section within the development area currently benefits from a 13 metres wide easement. Refer to Drawing No. 2025/500 (Appendix 5);
 - iii) A 300mm combined public sewer is located in Harbour View Road. It is routed along Plassey Square (west) before connecting into a 450mm diameter combined sewer in Plassey Street. The sewer flows in a westerly direction. A single manhole is located in Chichester Road. It is connected to the main sewer in Plassey Square via. a link between Nos. 17 and 17a Plassey Square;
 - iv) A 300mm diameter combined public sewer is routed along Plassey Square (East). The sewer connects into the same 450mm diameter combined sewer routed along Plassey Street.

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Public Foul Water Sewer to the North

- 2.7 The 225mm diameter public foul water sewer to the north of the site is routed in a northerly direction along Penarth Portway. A rising main connects to this sewer at the southern end of Penarth Portway. Refer to Drawing No. 2025/500 (Sheets 1 and 2).

Other adjacent Sewer Infrastructure

- 2.8 Liaison with VGC personnel has revealed the following:
- Separate foul and surface water sewers along Terra Nova Way. Council records of these sewers are not available. However, VGC have confirmed that the Council is directly responsible for these sewers and not Welsh Water. Site investigation has revealed that the surface water sewer within Terra Nova Way discharges to Penarth Harbour via Penarth Portway. The 150mm diameter foul sewer discharges to the public foul water sewer referred to in paragraph 2.7 above.

Site Investigation Work

- 2.9 A watercourse is located in the 'bowl area' located to the immediate north of the development site. The watercourse is routed down a steep escarpment. Site investigation has revealed the following:
- i) That no piped outlets exist into the watercourse;
 - ii) Stream flows issue is from one location, at the upstream end of the watercourse;
 - iii) The watercourse discharges to a 225mm diameter pipe via a headwall at the downstream end;
 - iv) The 225mm diameter pipe discharges to a gravel filter drain routed eastwards within the verge of Terra Nova Way. Some 100 metres downstream, the gravel filter drain discharges flows to a 450mm diameter drain. This drain discharges to an existing outfall in Penarth Marina. Refer to Drawing Nos. 2025/500 (Sheets 1 and 2). This drain also collects land and highway surface water via cut-off and highway drains as shown on the drawing.

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- 2.10 VGC have confirmed that they are responsible for maintenance of the watercourse, land drainage, pipework and outfall referred to in paragraph 2.9 above. The Council advise that the said drainage system was installed by Cardiff Bay, a Government agency established for the installation of the Cardiff Barrage. Cardiff Bay was disbanded on completion of the barrage and the system reverted to VGC (riparian) ownership.
- 2.11 VGC have advised that Penarth Marina is actually owned by the Council but leased to a private operator. It is understood that the CN was involved in the construction of the marina.
- 2.12 The EA has advised that the impounded water level within Cardiff Bay is 4.5m AOD. The surveyed water level within Penarth Marina is 4.43m AOD.

Existing On Site Drainage Network

- 2.13 We have assessed that the established surface and foul water drainage regimes serving the existing 'Billybanks' site can be divided into two separate catchments; east and west. Both sectors are characterised by urbanised development consisting of apartment blocks and hardstanding areas. Refer to Drawing Nos. 2025/500 (Sheets 1 and 2) (Appendix 5). As stated previously, these existing residential units are mostly vacated; however, the majority of these residential units will have generated foul water flows in the past. The surface water drainage system serving the site remains operational. The proposal relates to the redevelopment of a 'brownfield' site.

Eastern Sector – Existing Surface Water Drainage Network

- 2.14 Roof water from the existing Prince Charles Court (Block 1) enters a private 225mm diameter combined sewer. This private sewer is routed in an easterly direction through VGC owned land before discharging to the public combined sewer located in Paget Road. Refer to Drawing No. 2025/500 (Sheet 2).

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- 2.15 Highway and roof surface water from the remainder of the eastern sector discharges to a soakaway located in VGC owned land located to the north of the site. Refer to Drawing Nos. 2025/500 (Sheets 1 and 2).

Eastern Sector – Foul Water Drainage Network

- 2.16 Foul water from the eastern sector discharges by gravity to the private combined sewer (225mm diameter) referred to in paragraph 2.14 above. Foul water discharge from the children's nursery entered the same network when the nursery was operational.

Western Sector – Foul and Surface Water Drainage Network

- 2.17 Both foul and surface water flows from the existing development gravitate via private drains and sewers to a 225mm diameter public combined sewer routed between property nos. 1 Hill Terrace and 147 Plassey Street. This sewer, in turn, discharges to a public combined sewer located in Plassey Street. Refer to Drawing No. 2025/500 (Sheet 1).
- 2.18 Surface water runoff from an existing hardstanding area located to the north of Highview Road drains to a soakaway. Refer to Drawing No. 2025/500 (Sheets 1 and 2).

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3.0 PROPOSED SURFACE WATER DRAINAGE STRATEGY

3.1 We have assessed from our analysis work and discussions with the various parties that an appropriate surface water disposal strategy to serve the redevelopment site needs to consider the following issues:

- i) Existing site drainage and hydrology;
- ii) Requirements of Welsh Water, VGC and the EA;
- iii) The adoption of principles contained within Sustainable Urban Drainage Systems (SuDS) are to be included within the proposed strategy for surface water approval, where feasible;
- iv) The potential adoption by Welsh Water (or other Statutory Body) of the new drainage network.

3.2 Existing site drainage and hydrology are discussed in Section 2.0.

Welsh Water Requirements

3.3 Welsh Water has advised Cole Easdon Consultants of the following requirements/ comments regarding any surface water strategy for the development. Copies of Welsh Water's correspondence are contained in Appendix 2.

3.3.1 A dedicated sewer for the disposal of development surface water runoff to Penarth Marina would be adoptable.

3.3.2 The maximum gradient in any surface water sewer shall be such that the resulting velocity does not exceed 3.5m/sec.

3.3.3 Energy interceptors for the purpose of velocity reduction are acceptable and adoptable. Detailed proposals will require Welsh Water approval, and these may consist of a series of backdrop manholes.

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- 3.3.4 The introduction of ground drainage measures such as Stormcell/tank sewers/hydrobrakes will be adoptable.
- 3.3.5 Reed beds and oil interceptors will not adoptable by Welsh Water.
- 3.3.6 Land drainage discharge will not permitted into adoptable sewers. Consequently, any sewers which are to be located downstream of land drains, watercourses and reed beds will be unadoptable.
- 3.3.7 Welsh Water are prepared to accept sewers within the development for adoption. However, planting of trees and shrubs will not be permitted within sewer easements. Additionally, tree barriers comprising of pipe wrap are required in areas where tree distance to sewers and pumping mains is less than that as prescribed within *Sewers For Adoption (6th)*.
- 3.3.8 Welsh Water has also confirmed that there are no public surface water sewers in the area, and there is no capacity within the existing public combined sewers to accept additional surface water discharge (from the development) that is greater than existing permitted runoff. Furthermore, Welsh Water has advised that a 'like for like' discharge of existing and proposed surface water flow to public combined sewers will only be considered if alternative disposal options (e.g. soakaways) to serve the development site have been proved unviable. Any surface water runoff from the site into the adjacent public combined sewerage system will need to have separate foul and surface water connections to the public sewer. Furthermore, even for the 'like for like' situation, Welsh Water will insist on attenuation of surface water runoff within the site.
- Welsh Water have agreed that attenuation will be based on there being no net increase in surface water runoff from the site into the 'Plassey Street' combined sewer.

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Environment Agency Requirements

- 3.4 The EA has advised Cole Easdon Consultants of the following requirements/comments regarding any surface water disposal strategy for the development. Copies of Environment Agency correspondence are contained in Appendix 2.
- 3.4.1 The EA has no specific attenuation requirements relating to surface water development discharge to Cardiff Harbour or the Marina. A free discharge from the development is permissible.
- 3.4.2 The EA has advised that a discharge consent is not required for the drainage of uncontaminated surface water and roof water to Penarth Marina or harbour waters.
- 3.4.3 The EA will require the introduction of oil interceptors relating to the disposal of surface water from car parking spaces and driveways within the site discharging to watercourses, surface water sewers or soakaway for the following reasons:
- § the sensitive nature of Cardiff Bay and Penarth Flats;
 - § the heavy development congestion already experienced by this locality;
 - § the extent of the proposed development size and car parking provision;
 - § to reduce any negative environmental impact
- 3.4.4 A discharge consent will not be required for discharge passing through oil interceptors.
- 3.4.5 Additionally, the EA recommend the use of source control techniques such as permeable pavements and soakaways (sustainable drainage solutions) in uncontaminated areas.

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Vale of Glamorgan Council (VGC) Requirements

- 3.5 VGC have advised Cole Easdon Consultants of the following requirements/comments regarding any surface water proposal for the development. Copies of VGC correspondence are contained in Appendix 2.
- 3.5.1 VGC will not require specific pollutant removal mechanisms for proposed surface water runoff from the development.
- 3.5.2 VGC will insist, should any of their own drains/sewers be used for the discharge of redevelopment surface water, on the following:
- i) a condition survey of existing pipework to prove structural integrity and performance to the satisfaction of VGC;
 - ii) a network analysis being undertaken for the proposed and existing pipework, so as to ensure that adequate capacity exists within the network, without giving rise to or exacerbating flooding between the proposed point of connection from the development into the existing system and the Marina downstream of the site;
 - iii) appropriate provision for on-site attenuation so as to ensure that existing downstream flood risk is not worsened for storm events up to and including the 100 year storm event;
 - iv) it granting final approval of development discharge into VGC pipework, this following the submission of a detailed proposal and network analysis for the consideration of the Drainage, Highways and Parks & Gardens Departments;
 - v) the payment of Commuted Sums. These sums being calculated by consideration of the annual maintenance cost over a 25 year period.
 - vi) VGC accept in principle a surface water proposal permitting free discharge to Penarth Marina.
- 3.5.3 VGC have also advised that no reserve capacity exists within the VGC maintained foul and surface water sewers routed along Terra Nova Way and Penarth Portway, all as discussed in Section 2.0.

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Sustainable Urban Drainage Systems (SUDS)

- 3.6 We consider and recommend that the proposed development for residential purposes, will require the design of a fully engineering drainage system, incorporating present engineering standards and practices. The design is required to incorporate the principles of SuDS wherever possible.
- 3.7 SuDS are designed with the following objectives in mind:
- § to control the rate of runoff from a development;
 - § to improve runoff quality

Potential for Sewerage Adoption

- 3.8 The potential for the adoption, by a relevant statutory body of the proposed drainage network is discussed within paragraphs 3.3, 3.4 and 3.5 above. Table 3.1 below summarises the various drainage elements and adoption authorities.

Table 3.1 – Listing of Adoption Authorities

Adoption Authority	Pumping Stations	Oil Interceptors /Reed Beds	Land Drainage	· Tank Sewers · Energy Dissipaters · Hydrobrakes · Stormcell	S104 pipework (Combined roofs & highways	Soakaway
VGC		?	ü			
Private		ü				ü
Welsh Water	ü			ü	ü	

• Agreed Strategy for Surface Water Discharge (Refer to Drawing No. 2025/ 501 in Appendix 5)

- 3.9 Having assessed the various requirements of the individual bodies, discussed above, and having liaisons with these same parties over the past months, the following strategy has been agreed as appropriate for the development site.

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3.10 Surface water runoff from the redeveloped site is to be catered for by the following methodology.

3.11 The site is to be split into two separate catchments for the disposal of surface water from the development. The catchment areas relate to the site topography and can be defined as follows:

§ *Catchment 1* : This area relates to the western sector of the development, south of Highview Road.

§ *Catchment 2* : This area relates to the remainder of the development site.

Table 3.2 below summarises the existing discharges.

Table 3.2 – Summary of Surface Water Discharge Rates

Storm Return Period	Existing Soft Area Runoff (Site)		Existing Hard Area Runoff	
	Contributing Area (ha)	Run-off (l/s)	Contributing Area (ha)	Run-off (l/s)
1 in 2 year	A3-6: 1.96 A7: 1.03 A8: 0.72	16 9 7	A2: 0.55 A9: 0.11 A10: 0.01 A11: 1.477	91 18 2 244
1 in 30 year	A3-6: 1.96 A7: 1.03 A8: 0.72	31 17 13	A2: 0.55 A9: 0.11 A10: 0.01 A11: 1.477	167 33 3 448
1 in 100 year	A3-6: 1.96 A7: 1.03 A8: 0.72	38 22 16	A2: 0.55 A9: 0.11 A10: 0.01 A11: 1.477	213 43 4 572

§ Catchment 2 - Free Discharge to Penarth Marina via Section 104 Sewers

3.12 Unattenuated roof, highway and driveway surface water runoff from Catchment 2 (of the development), to the north of Highview Road, will discharge to Penarth Marina via proposed pipework to be adopted by Welsh Water under a Section 104 Agreement.

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- 3.13 Energy dissipation facilities (backdrop manholes) are to be located down the embankment to the north of the development.
- 3.14 This strategy assumes a free discharge with no on-site attenuation. The Environment Agency has advised that a free discharge to Penarth Marina is acceptable.
- 3.15 From our discussions and meetings, we can confirm that this strategy is acceptable in principle to Vale of Glamorgan Council, Welsh Water and the Marina owners.
- 3.16 Anticipated free discharge flows have been calculated and are presented in Table 3.3 below.

Table 3.3 – Estimated Unattenuated Runoff from Redevelopment to North of Highview Road (Catchment 2)

Storm Event	Runoff/Discharge (l/s)
2 Year	322
30 Year	607
100 Year	780

- 3.17 An off-line oil interceptor will be located on the proposed S104 sewer discharging to the Penarth Marina. The interceptor will be privately maintained by a management company. An off-line oil interceptor arrangement is acceptable to Welsh Water.

§ Catchment 1 – Surface Water Runoff Disposal

- 3.18 With respect to surface water runoff from Catchment 1 the following strategy is agreed.

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- 3.19 The surface water flows from roofs, highways and driveways within Catchment 1 (of the redeveloped site) will discharge to the existing public combined sewer in Plassey Street, as per the current situation for the existing development. This will be achieved by the installation of a new adoptable sewer (by Welsh Water), across land owned by the Vale of Glamorgan Council and, beneath the public highway known as Hill Terrace.
- 3.20 However, Welsh Water has advised that a 'like for like' discharge of existing and proposed surface water flows to the Plassey Street public combined sewer will only be approved subject to:
- i) Confirmation that alternative soakaway and infiltration options have been proved unviable;
 - ii) no other surface water drainage disposal option is considered viable;
 - iii) there being no net increase in discharge to the Plassey Street combined sewer. It is agreed that the proposed discharge rate must be restricted to the limiting capacity flow rate of the last connecting pipe to the Plassey Street combined sewer.
 - iv) A separate surface water connection is made to the Plassey Street combined sewer.

Appraisal of Alternative Drainage Disposal Options (Catchment 1)

i) Soakaways

- 3.21 A site investigation undertaken by Capita Symonds in May 2005 has confirmed that the strata within this catchment consists of clay overlying weathered mudstone. Refer to Appendix 4 for bore logs. Both materials have very low rates of permeability and are considered to be unsuitable for drainage disposal by soakaway and infiltration methods. We consider that soakaway drainage is unsuitable for this site.

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ii) Lack of Surface Water Public Sewerage Infrastructure

- 3.22 No public surface water sewers exist in the locality. The only other alternative for disposal would be the installation of a surface water pumping station to pump flows from the lowest part of the catchment into a gravity sewer to be located on the northern side of Highview Road. Welsh Water have agreed that this option would not be acceptable.

iii) Attenuation

- 3.23 The existing discharge rate (from Catchment 1) has been determined by calculation of the limiting capacity of the last connecting pipe to the Plassey Street sewer and is based on pipe size and gradient. Refer to Appendix 3 for calculations. Appropriate attenuation storage (some 350m³) will be provided for surface water runoff from the development (Catchment 1) so as to limit discharge to the Plassey Street combined sewer to the existing discharge rate for storms up to and including the 30 year event. Table 3.4 below indicates existing and proposed discharge rates together with attenuation requirements. Attenuation is to be in the form of adoptable oversize pipes. Flow control will be achieved via the installation of a hydrobrake, all to be adopted by Welsh Water.

Table 3.4 – Surface Water Attenuation Requirement for Catchment Area 1

Proposed impermeable Area (ha)	Limiting Discharge (l/s)	Attenuation (1:30 year) (m³)
2.11	189	350

- 3.24 A separate surface water connection from the development site will be made to the Plassey Street sewer.
- 3.25 Welsh Water has confirmed that an oil interceptor will not be required for car space surface water discharge flowing into the Plassey Street public combined sewer.

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3.25 Contd.

Hydrocarbons are currently removed at the downstream sewage treatment works. The EA has confirmed that this arrangement is acceptable.

Sustainable Drainage (SuDS)

- 3.26 The implementation of SuDS within the agreed drainage study has been considered within this study. However, due to physical constraints in the forms of impermeable strata and soil contamination constraints, it is not possible to incorporate source control techniques (soakaways) for surface water runoff.

Impermeable Strata

- 3.27 As mentioned in paragraph 3.21, a site investigation undertaken by Capita Symonds in May 2005 has confirmed that the strata within the development site consists of made ground/clay overlying weathered mudstone. Refer to Appendix 4 for bore logs. These strata are impermeable. The made ground consists of clay and ash. Areas of clay will not have sufficient permeability to support soakaways, and this includes most of the eastern sector of the site. Areas of ash in the western sector of the site are inter-layered with clay. The use of soakaways in this sector will also be not feasible.

Contamination

- 3.28 The site investigation undertaken by Capita Symonds in May 2005 identified elevated contamination levels within ash fill material that was used to infill areas to the north of Highview Road and the allotments. The extent of the contaminated area is shown on Drawing No. 2025/500. According to the Remediation Statement (Capita Symonds, May 2006) the contaminated material comprises of incinerated material, mainly ash and clinker elevated in concentrations of zootoxic and ecotoxic metals with some polyaromatic hydrocarbons.
- 3.29 Following discussions with the EA, the agreed remediation strategy will be to significantly reduce the flow of water through the ash fill area by provision of a 0.6 metre deep capping layer of clean material. Furthermore, the Environment Agency has advised that soakaway drainage is not suitable within areas of contamination.

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Attenuation

- 3.30 As already stated infiltration drainage techniques (soakaways and permeable pavements) are not suitable for the proposed development area for reasons discussed in paragraphs 3.26 to 3.28. Additionally, the EA has advised that there are no attenuation requirements for surface water discharge to Penarth Marina. As such, there is no requirement for on-site storage in the form of 'above or below' ground storage. In any case, it would be difficult to incorporate on-site storage due to the steep topography of the development site.
- 3.31 Attenuation will be provided for surface water discharging to the public combined sewer in Plassey Street for the Catchment 1 strategy. This is so as to ensure that there will be no net increase in the discharge rate to the existing sewer, and therefore no net increase to the risk of downstream sewer flooding. Attenuation will be provided by on-site oversize pipes (adoptable by Welsh Water).

Water Quality

- 3.32 Water quality SuDS will be incorporated into the drainage strategy through the implementation of an offline oil interceptor. The interceptor will remove hydrocarbon contamination from surface water runoff discharging from car parking spaces and driveways.

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4.0 FOUL WATER DRAINAGE STRATEGY

4.1 The proposed foul water strategy to serve the development has considered the following issues:

- i) Existing site drainage;
- ii) Welsh Water and Environment Agency requirements;
- iii) Adoption potential.

4.2 Existing site drainage is discussed in Section 2.0.

Welsh Water Requirements

4.3 Welsh Water has advised Cole Easdon Consultants of the following requirements/ comments regarding any foul water strategy for the development. Copies of Welsh Water's correspondence are contained in Appendix 2.

4.3.1 Existing private sewers to be offered for adoption must:

- i) Comply with '*Sewers for Adoption*' (6th Edition) with regard to construction and performance;
- ii) Be subjected to a condition survey to prove structural integrity and performance to the satisfaction of Welsh Water.

4.3.2 Proposed sewers within the development will be accepted for adoption subject to compliance with '*Sewers for Adoption*'. However, planting of trees and shrubs will not be permitted within any required sewer easements. Additionally, tree barriers comprising of pipe wrap are required in areas where tree distance to sewers and pumping mains is less than that as prescribed within *Sewers For Adoption* (6th).

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Pumping Station

4.4 The foul water pumping station required for the development site is to be designed in accordance with '*Sewers for Adoption*' (6th Edition) and Welsh Water requirements. Layout requirements relating to site and access should be so arranged to ensure:

- i) There is sufficient space to accommodate a (4,000 gallon) tanker off the highway and a large van and generator within the site;
- ii) There is sufficient space between the various units on the site to enable maintenance operations to be carried out;
- iii) There is sufficient space to carry out pump maintenance;
- iv) The doors of the kiosk open safely;
- v) The pump delivery pipework is opposite the inlet sewer;
- vi) The pumping station should not be located within a public or private highway, in locations which may be used for car parking or in places where maintenance work will obstruct rights of way;
- vii) The pumping station should be located no closer than 15 metres to habitable buildings as measured from the pumping station site boundary to the nearest point on habitable buildings;
- viii) All pumping sites shall be enclosed with galvanised steel palisade security fencing 2 metres high or an equivalent brick wall. It should also be noted that the Local Planning Authority may determine the requirements for fencing under the Planning Application. Welsh Water have verbally advised that if alternatives are to be considered then as a minimum, the fencing needs to be secure and easily maintainable;
- ix) Welsh Water advises that the minimum indicative pumping station compound size is 10m x 8m. The short side should be parallel to the public highway.

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4.4 Contd.

- x) Welsh Water advise that although it is normal practice to provide an emergency overflow, the company acknowledges that an emergency overflow discharging effluent to Penarth Marina will not be acceptable to the Environment Agency. On-site storage will therefore be required (160 litres/ dwelling) in case of emergency/ pump breakdown etc.

Existing Public Sewer (Combined) within Development Site Boundary

- 4.5 A Victorian built 1070mm x 570mm brick egg shaped combined sewer is located in a lane behind housing which fronts Queens Road. A tracing survey has revealed that a section of this sewer crosses into the development area before connecting into a 1060mm x 660mm culvert located in the High Street. The section within the development area currently benefits from a 13 metre wide easement. Refer to Drawing Nos. 2025/500 and 501.
- 4.6 No development will be permitted within the easement. Additionally, building foundations will be taken down to such a depth or designed in such a way that they do not place loading on the sewer. Planting of trees or deep-rooted shrubs will not be permitted within the easement.
- 4.7 Welsh Water has advised that the placement of soil fill to 2.5 metres maximum depth over the sewer would be acceptable in principle.

Environment Agency Requirements

- 4.8 The Environment Agency has advised that they would not be prepared to permit the discharge of untreated sewerage from an emergency overflow into the Cardiff Bay area.

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- **Appropriate Strategies for Foul Water Discharge (Refer to Drawing No. 2025/501 in Appendix 5)**

4.9 We now consider appropriate strategies for foul water disposal with regard to this site.

4.10 The site can be split into separate catchments for the disposal of foul water from the development. The catchment areas relate to the site topography and can be defined as follows:

Catchment 1 : This area relates to the western sector of the development south of Highview Road

Catchment 2 : This area relates to the remainder of the development site.

Table 4.1 below summaries the existing and proposed discharges for catchments 1 and 2.

Table 4.1 – Summary of Existing and Proposed Foul Water Discharge

Connection to Public Sewer	Existing Discharge		Proposed Discharge	
	No. of Dwellings	Flow (l/s)	No. of Dwellings	Flow (l/s)
Plassey Street Combined Sewer (Catchment 1)	194	9	128	6.0
Paget Road Combined Sewer (Catchment 2)	136	6.3	249	11.5
	Children's Nursery	3.6		
	Block 1 (roof) Surface Water	<u>26 (2 yr)</u> <u>Σ 36</u>		

Catchment 1 – Foul Water Disposal

4.11 It is proposed to discharge foul flows to the public combined sewer in Plassey Street via the existing public combined sewer in Hill Terrace, as per the current situation for the existing development. This will be achieved by the installation of a new adoptable sewer across third party land and beneath the public highway known as Hill Terrace.

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- 4.12 A connection into the Plassey Street combined sewer as described in Paragraph 4.14 is acceptable to Welsh Water for the proposed development discharge rate. Sufficient capacity exists within the public sewer to accept proposed discharge rates as presented in Table 4.1.

Catchment 2 – Foul Water Disposal

- 4.13 It is proposed to discharge foul flows to the existing 375mm diameter public combined sewer located in Paget Road for this element of the development. Under this proposal, all catchment discharge would gravitate to a new pumping station to be located as shown on Drawing No. 2025/501. Pumped flows would discharge via a new rising main, gravity sewer and manhole connecting to the abovementioned existing public sewer. A typical foul water pumping station layout is shown on Drawing No. 2025/502.
- 4.14 Welsh Water has advised that this proposal and connection to the Paget Road sewer is acceptable in principle subject to detailed design. Welsh Water are satisfied that sufficient capacity exists within the public sewer to accept proposed discharge rates as presented in Table 4.1.
- 4.15 Welsh Water advise that although it is normal practice to provide an emergency overflow, the company acknowledges that an emergency overflow discharging effluent to Penarth Marina is not acceptable to the Environment Agency. As such, it is proposed to provide on-site storage in lieu of an emergency overflow. On-site storage will be provided in accordance with the minimum requirement of 160 litres/ dwelling referred to in '*Sewers for Adoption 6th Edition*' (Clause 2.17) and the '*Welsh Water Addendum to Sewers for Adoption 5th Edition*'.
This equates to a total storage requirement of 40m³ (for 249 dwellings) to be provided in the wet well and incoming sewer.

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5.0 CONCLUSIONS AND DISCUSSIONS

Surface Water Disposal Strategy

5.1 The surface water disposal strategy presented in this report is based on the following:

- i) existing site drainage and hydrology;
- ii) consideration of sustainable urban drainage systems (SuDS);
- iii) Welsh Water, VGC and Environment Agency requirements;
- iv) adoption potential for the proposed drainage network;

5.2 The site can be split into two separate catchments for the disposal of surface and foul water from the development. The catchment areas relate to the site topography and can be defined as follows:

§ *Catchment 1* : This area relates to the western sector of the development, south of Highview Road.

§ *Catchment 2* : This area relates to the remainder of the development site.

5.3 Unattenuated roof, highway and driveway surface water from the development to the north of Highview Road (within Catchment 2) will discharge to Penarth Marina via proposed pipework to be adopted by Welsh Water under a Section 104 Agreement.

5.4 This strategy assumes a free discharge with no on-site attenuation. The Environment Agency has advised that a free discharge to Penarth Marina is acceptable.

5.5 We can confirm that this strategy is acceptable in principle to Vale of Glamorgan Council, Welsh Water and the Marina owners.

5.6 An off-line oil interceptor will be located on the proposed S104 sewer discharging to Penarth Marina. The interceptor will be privately maintained.

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- 5.7 It is proposed to discharge surface water flows from roofs, highways and driveways within Catchment 1 (redeveloped site) to the existing public combined sewer in Plassey Street, as per the current situation for the existing development. This will be achieved by the installation of a new adoptable sewer across land owned by the Vale of Glamorgan council and beneath the public highway known as Hill Terrace. Appropriate attenuation storage (some 350m³) will be provided for surface water runoff from the development (Catchment 1) so as to limit discharge to the Plassey Street combined sewer to the existing discharge rate for storms up to and including the 30 year event. Attenuation will be in the form of adoptable oversize pipes. Flow control will be achieved via the installation of a hydrobrake.
- 5.8 Welsh Water has confirmed in principle that it would be prepared to adopt pipework carrying roof and highway surface water from the development to the Marina outfall (Catchment 2) and public sewer (Catchment 1).

Sustainable Drainage (SuDS)

- 5.9 The implementation of SuDS has been considered within this study. However, due to limiting physical constraints (presence of impermeable strata and soil contamination) it will not be possible to incorporate source control (infiltration) techniques for surface water runoff.
- 5.10 The Environment Agency has advised that there is no attenuation requirement for surface water discharge from the development to Penarth Marina. As such, there is no requirement for on-site storage above or below ground storage.
- 5.11 Attenuation will be provided for surface water discharging to the public combined sewer in Plassey Street for the Catchment 1 strategy. This is so as to ensure that there will be no net increase in the discharge rate to the existing sewer, and therefore no net increase to the risk of downstream sewer flooding. Attenuation will be provided by on-site adoptable oversize pipes

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- 5.12 Water quality SuDS will be incorporated into the drainage strategy through the implementation of an offline oil interceptor for the Catchment 2 strategy. The interceptor will remove hydrocarbon contamination from surface water runoff discharging from car parking spaces and driveways.

Foul Water Disposal Strategy

- 5.13 It is proposed to discharge foul flows (within Catchment 1) to the public combined sewer in Plassey Street via the existing public combined sewer in Hill Terrace, as per the current situation for the existing development. This will be achieved by the installation of a new adoptable sewer across third party land and beneath the public highway known as Hill Terrace.
- 5.14 It is proposed to discharge foul flows (within Catchment 2) to the existing 375mm diameter public combined sewer located in Paget Road for this element of the development. Under this proposal, all catchment discharge would gravitate to a new pumping station to be located as shown on Drawing Nos. 2025/501. Pumped flows would discharge via a new rising main, gravity sewer and manhole connecting to the abovementioned existing public sewer.
- 5.15 On-site storage will be provided in accordance with the minimum requirement of 160 litres/ dwelling referred to in '*Sewers for Adoption*' (Clause 2.17) and the '*Welsh Water Addendum to Sewers for Adoption 5th Edition*'.
- 5.16 Welsh Water has advised that the proposed foul water disposal strategies are acceptable to the Company in principle. Welsh Water are satisfied that sufficient capacity exists within the public sewers to accept the proposed discharge rates. Furthermore, the Company has advised that connecting pipework, rising mains and pumping station relating to the development would all be adoptable by Welsh Water under a Section 104 Agreement.

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General Comment

- 5.17 All surface and foul water sewers, pumped mains and the pumping station will be designed and constructed in accordance with *Sewers For Adoption – 6th Edition*.