13.0 WATER

13.1 Receiving Environment

Surface Water Environment

13.1.1 There are two surface water systems that are in close proximity to the proposed site: the Grand Canal and the Camac River.

13.1.2 The Camac River rises on the south margin of County Dublin, some 900 feet above sea level, and flows through Tallaght parish, Saggart, Rathcoole, Kilbride, Bluebell, Ballyfermot, Drimnagh, and St. James's parish, by Golden-bridge. (q.v.) and Kilmainham, and discharges to the River Liffey immediately downstream of Heuston Station.

13.1.3 A tributary of the Camac runs along the northern boundary of the site, this is known as the Galback System, and is comprised of the Galback Stream, which the Gallanstown Stream and the Blackditch Stream join approximately 0.5 km upstream of the site.

13.1.4 The Gallanstown Stream rises in Ronanstown and joins the Blackditch Stream (which rises in the vicinity of Wheatfield prison) east of Killeen Road, before flowing into the Galback Stream.

13.1.5 The Galback Stream flows in an open channel between the Killeen Road and the Kylemore Road; this is the section that runs along the northern border of the site, before being culverted under the Kylemore Road, and then beneath the Grand Canal.

13.1.6 The Stream is culverted for much of its path downstream of the site to its confluence with the Camac River, via a culvert within the Bluebell Industrial Estate. [1]

13.1.7 Water sampling of the Galback Stream and Grand Canal was carried out by AWN Consulting Ltd during a site visit (November 2004), which showed the water quality at the time of sampling.

13.1.8 Water analysis results are shown in Table 13.1.

Table 13.1: Water Sampling Results 30 m upstream and downstream of the site

Parameter	Units	Sample No.			
		1	2	3	4
pH	pH Unit	7.6	7.4	7.5	7.5
Temperature	Deg. C	8.6	8.6	9.3	9.4
Conductivity	µS/cm	642	646	593	574
Dissolved Oxygen	mg/l	9.8	9.9	4.3	4.1
BOD	mg/l	<2	<2	<2	10
Mineral Oil	µg/l	N/A	N/A	<10	<10
Diesel Range Organics	µg/l	N/A	N/A	<10	<10
Oils/Fats/Greases	mg/l	N/A	N/A	<1	<1
Total Ox. Nitrogen (as N)	mg/l	2.5	2.5	1.6	0.4
Orthophosphate (as PO4)	mg/l	<0.03	<0.03	0.11	4.24
Suspended Solids	mg/l	<10	<10	<10	<10

Sample 1 - Grand Canal, Downstream of Site

Sample 2 - Grand canal, Upstream of Site

Sample 3 - Galback Stream (system), Upstream of Site

Sample 4 - Galback Stream (system), Downstream of Site

13.1.9 The quality of the Grand Canal was good at the time of sampling, with high dissolved oxygen levels, low BOD levels and low orthophosphate levels, however there was no significant difference between upstream and downstream sample results.

13.1.10 There were no traces of oils, fats, or greases, nor of hydrocarbons, however, nutrient levels were high and oxygen levels were low showing a watercourse of poor quality.

13.1.11 The Camac water quality has been monitored continuously over the past 30 years by the EPA [2] and more recently as part of the Three Rivers Programme - a water quality assessment carried out on the Rivers Liffey (of which the Camac is a tributary), Boyne and Suir [3].

13.1.12 Tables 13.2 – 13.4 show the most recent water quality for the Camac River. Station 0400 (Kylemore Road Bridge) is located on the Camac, upstream of where the Galback enters the Camac, Station 0453 (Lansdowne Valley Weir) is located downstream of the confluence of the Camac and the Galback and Station 0500 is located downstream of the Lansdowne Valley Weir close to Emmet Road.

Table 13.2: EPA Q Ratings for the Camac River

No.	1981	1983	1984	1986	1987	1988	1989	1990	1991	1994	1996	1998
0400	1/0	2/0	1	3	1	2-3	1	1	2	1	1	3
0453	-	-	-	-	-	-	-	-	-	-	-	-
0500	1/0	1	1	1	1	2	1	1	2/0	1/0	1-2	1-2

Table 13.3: Locations of Sampling Stations on the Camac River

No.	Location
0380	0.2 km u/s Kylemore Rd Br
0400	Kylemore Rd Br
0453	Lansdowne Valley Park at weir
0500	Camac Close Emmet Rd

13.1.13 Q ratings are biological ratings given to a water body, with Q1-2 representing seriously polluted water, and Q5 representing water of excellent quality.

13.1.14 The Q ratings for the Camac show that the river water quality declined from upstream to downstream of where the Galback enters the Camac River, from a Q3 rating to Q1-2, in 1998.

13.1.15 It is not likely that the reduction in quality is due in any significant way to the Galback tributary, as the path of the Camac becomes more industrialised and urbanised along this stretch.

13.1.16 However, it can be concluded that the River Camac is classed as seriously polluted in the vicinity of the proposed site and the quality of the Galback Stream is likely to be similar to the Camac, based on the fact that the catchment of both rivers in the Ballyfermot area is very similar in nature.

Table 13.4: Dublin Corporation Water Quality Data 1998-2000 (a-d)

Station No.	pH (pH units)			Conductivity (µS cm^{-1})			Temperature (deg C)		
	Min	Med	Max	Min	Med	Max	Min	Med	Max
0380	7.8	8.2	8.5	390	609	1047	4.6	11.1	18.0
0500	8.0	8.2	8.3	537	613	865	10.3	12.6	16.4

Station No.	Dissolved Oxygen (% Saturation)			Dissolved Oxygen (mg $O_2 1^{-1}$)			B.O.D (mg $O_2 1^{-1}$)		
	Min	Med	Max	Min	Med	Max	Min	Med	Max
0380	69	96	120	7.4	10.4	13.5	2.0	3.0	8.0
0600	88	95	110	9.4	10.5	12.8	2.0	3.0	4.0

Station No.	Total Ammonia (mg N 1^{-1})			Un-Ionised Ammonia (mg NH_3 1^{-1})		
	Min	Med	Max	Min	Med	Max
0380	0.03	0.08	0.22	0.001	0.004	0.008
0500	0.05	0.11	0.42	0.002	0.003	0.023
0600	0.03	0.09	0.21	0.001	0.004	0.021

Station No.	Oxidised Nitrogen (mg N 1^{-1})			Ortho-Phosphate (mg P 1^{-1})		
	Min	Med	Max	Min	Med	Max
0380	1.6	3.0	4.4	0.08	0.20	0.38
0500	1.4	1.5	2.1	0.03	0.20	0.43
0600	1.0	2.3	4.4	0.08	0.16	0.39

13.1.17 The chemical data in Table 13.4 does not show a significant deterioration in physio-chemical water quality over the same time period with the only notable change from upstream to downstream of the Galback confluence being an increase in temperature and a slight increase in Total Ammonia.

13.1.18 The Three Rivers Project data presented in Table 13.5 also does not show a significant deterioration in water quality in the area, but it does show lower levels of total ammonia than the Corporation (City Council) data.

Table 13.5: Three Rivers Project Water Quality Data 1998 – 2000 (a-d)

Station No.	pH			Conductivity ($\mu S\ cm^{-1}$)			Temperature (deg C)		
	Min	Med	Max	Min	Med	Max	Min	Med	Max
0400	8.0	8.2	8.6	236	599	671	5.1	11.0	18.1
0453	8.0	8.2	8.6	276	599	663	5.4	11.0	17.5
0500	7.7	8.2	8.7	433	576	646	4.3	10.4	17.1

Station No.	Dissolved Oxygen (% Saturation)			Dissolved Oxygen ($mg\ O_2 1^{-1}$)		
	Min	Med	Max	Min	Med	Max
0400	83	98	117	8.6	10.7	14.7
0453	83	97	109	8.6	10.7	12.6
0500	79	98	120	8.0	11.3	14.4

Station No.	Total Ammonia ($mg\ N\ 1^{-1}$)			Un-Ionised Ammonia ($mg\ NH_3\ 1^{-1}$)		
	Min	Med	Max	Min	Med	Max
0400	<0.01	0.05	0.18	<0.001	0.002	0.009
0453	0.01	0.09	0.21	<0.001	0.004	0.010
0500	0.01	0.08	0.68	<0.001	0.003	0.026

Station No.	Oxidised Nitrogen ($mg\ N\ 1^{-1}$)			Ortho-Phosphate ($mg\ P\ 1^{-1}$)		
	Min	Med	Max	Min	Med	Max
0400	-	-	-	0.06	0.23	0.51
0453	0.8	2.1	3.9	0.07	0.21	0.38
0500	-	-	-	0.07	0.22	0.59

13.1.19 In summary, it can be concluded that the quality of the Galback System and the Camac River is poor.

13.1.20 When compared with the limits for the Surface Water Regulations (S.I. No. 294 of 1989), which are shown in Table 13.6 it can be seen that the water upstream of the site had orthophosphate levels just above the A3 limit, whilst the downstream sample was well above the A3 limit.

13.1.21 The BOD level for upstream of the site was of A1 water quality, however the downstream sample was above the A3 limit.

13.1.22 Dissolved oxygen levels for both upstream and downstream of the site were at A3 standard, 37 % and 35% respectively.

Table 13.6: Surface Water Regulations Limits

Test Parameter	S.I. 294 of 1989 - Surface Water Regulations		
	A1 Waters	A 2 Waters	A 3 Waters
pH (ph Units)	5.5 - 8.5	5.5 - 9.0	5.5 - 9.0
Conductivity (µS/cm)	1000	1000	1000
Nitrate (mg NO_3-N/l)	11.3	11.3	11.3
Nitrite (mg NO_2-N/l)	<0.015	<0.015	<0.015
Ammonium (mg NH_4-N/l)	0.2	1.5	4
Iron (mg Fe/l)	0.2	2	2
Colour (mg/l Pt)	20	100	150
Dissolved O_2 (%)	>60	>60	>30
B.O.D. (mg O_2/l)	5	5	7
Suspended Solids mg/l	50	50	50
Orthophosphate (mg P/l)	0.03	0.03	0.03

13.2 Groundwater Environment

13.2.1 Groundwater can be defined as water that is stored in, or moves through, pores and cracks in sub-soils.

13.2.2 The potential of rock to store and transport water is governed by permeability of which there are two types, intergranular and fissure permeability. Intergranular permeability is found in sediments, sands, gravels and clays and fissure permeability is found in bedrock, where water moves through (and is stored in) cracks, fissures, planes and solution openings.

13.2.3 Aquifers are rocks that contain sufficient void spaces and which are permeable enough to allow water to flow through them in significant quantities.

13.2.4 From studying the bedrock geology maps of the Ballyfermot area from the GSI [4], the underlying bedrock in the area is comprised of Carboniferous age (over 300 million years ago).

13.2.5 The proposed site is located on Calp Limestone, a dark grey, fine-grained, graded limestone with interbedded black, poorly fossilised shales [4].

13.2.6 The GSI (Geological Survey of Ireland), EPA, and the Department of Environment and Local Government (DoELG) have developed a programme of Groundwater Protection Schemes, with the aim of maintaining the quantity and quality of groundwater in Ireland, and in some cases improving groundwater quality, by applying a risk assessment approach to groundwater protection and sustainable development. [5]

13.2.7 The Ground Water Protection Scheme divides a chosen area into a number of Groundwater Protection Zones, according to the degree of protection required for the aquifer, based on aquifer importance and aquifer vulnerability.

13.2.8 The Groundwater Protection Scheme for County Dublin has not yet been completed. However, under the European Water Framework Directive, the aquifer classification part of the scheme has been carried out for all of Ireland.

13.2.9 It can be seen from Figure 13.1, that the aquifer on which the proposed site is located is classed as an aquifer of Low Importance, which is generally moderately productive in local zones only.

13.2.10 The GSI Well Card Index, which is a record of wells drilled in Ireland has a number of records for the area around the site.

13.2.11 While much useful information can be obtained from this Index, it is by no means exhaustive, as it requires individual drillers to submit details of wells drilled in each area.

13.2.12 Table 13.7 shows the wells recorded in the vicinity of the site and the hourly abstractions from these wells.

LEGEND

LI – Locally Important

Location of Proposed Site

Project
CA Site at Labre park

Reference
04_2348SR01

Figure 13.1

Aquifer Classification

awn consulting
The Tecpro Building, Clonshaugh Industrial Estate, Dublin 17. Tel: +353 (0)1 847 4220 Fax: +353 (0)1 847 4257

Table 13.7: GSI well Card data

Well Ref.	Co-ordinates		Townland	Yield Class	Abstraction (m^3/hour)
	Easting	Northing			
W01	31120	23190	Drimnagh	Excellent	14.3
W04	31085	23092	Wilkinstown	Excellent	16
W05	30855	23095	Wilkinstown	Excellent	21.6
W06	30923	23161	Fox and Geese	Good	9.8
W07	30939	23161	Fox and Geese	Good	1.89
W09	30970	23275	Ballyfermot Lwr	Excellent	34.3
W10	31200	23160	Crumlin	Good	2.8

13.2.13 The well card data shows that there are a number of wells within a 2 km radius of the proposed site which are classed as excellent, according to the GSI records.

13.2.14 A site investigation carried out by AWN Consulting at the site in November 2004 involved the excavation of 6 No. trial pits across the site; these trial pit logs are presented and detailed in full in Appendix 12.1.

13.2.15 During the excavation of the trial pits, water ingress only occurred in two of the trial pits, TP 4 and TP 5, at 190 cm and 180 cm respectively (See Appendix 12.1). These trial pits were both within 15 m of the Grand Canal, which borders the site to the south, whereas all the other trial pits were at least 23 m away from the closest bank of the Canal, however it is unlikely that the water was coming from the Canal as the Canal is believed to have a largely well-sealed base, comprised of compacted clay.

13.2.16 This section of the site was wetter than the rest of the site and there was an open drainage ditch nearby, which contained standing water.

13.2.17 Water ingress was slow in both trial pits and seeped in from above the boulder clay layer, indicating that the water is most likely surface water perched on the boulder clay layer and was not a contiguous groundwater layer.

13.2.18 Met Eireann data in Table 13.8 shows that the Dublin area has experienced considerable rainfall over the past few months and therefore the water table was likely to be at a high winter level, at the time of the site investigation.

Table 13.8: Met Eireann rainfall Data 2003 – 2004

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2004	82.6	19.9	43.9	31.8	49.9	50.6	38.1	133.9	46.8	120.2	41.1	N/A	**661.3**
2003	62.6	20.9	27.1	37	97.4	86.8	47.6	14.5	37.4	106.6	55	60.4	**653.3**
Mean	69.5	50.4	53.5	51.1	54.8	55.8	50	71.1	66.4	70.1	64.3	75.8	**732.7**

13.3 Characteristics of the Proposal

During Construction

13.3.1 The proposed development will involve creating a hard standing area of 11,053m^2.

13.3.2 It is not envisaged that groundwater will be encountered during construction as during the site investigation, water was not encountered below 1.8 m depth, however if excavation is required on site to facilitate underground surface water attenuation tanks, it may be necessary to construct deeper excavations and groundwater may be encountered. Also, given the impervious nature of the boulder clay, it is likely that any surface water entering excavations will tend to pond on the boulder clay and will lodge in the excavations, similar to the current situation at the site.

During Operation

13.3.3 The operation of the Civic Amenity site will entail continuous movement of waste materials during the hours of operation.

13.3.4 Treated storm water runoff, excluding the runoff from the bunded areas, will be discharged to the Galback Stream.

13.3.5 Foul water drainage will be discharged to the existing foul sewer system in the area.

13.3.6 Drainage collected in bunded areas will be collected by an EPA or Local Authority permitted company and taken off site.

13.4 Possible Effects of a Proposal of this Kind

During Construction

13.4.1 Due to the proximity of the site to a number of industrial facilities, the finding of waste material during the site investigation and that a portion of the site has been used to store C&D waste, it is probable that there is historical contamination of the soil environment, which may have resulted in contamination of the perched waters on-site.

13.4.2 Earth moving machinery will be used at the site during the initial site preparation stage and the construction of the buildings and roads.

13.4.3 The potential impacts to the underlying soil, and therefore the groundwater environment, from the construction of the proposed development could derive from improper storage or accidental spillage of hydrocarbons, paints and solvents during the construction works.

13.4.4 These materials could impact negatively on groundwater quality, if allowed to infiltrate to ground during storage and dispensing operations.

13.4.5 Mitigation measures outlined in the following section will ensure that this potential impact is addressed.

13.4.6 The risk to the groundwater environment during construction is considered to be minimal across the majority of the site.

13.4.7 It can therefore be concluded that the construction stage of the project will not have a significant impact on the water environment provided the mitigation measures outlined in this section are followed.

13.4.8 It is important to note that the composition of the waste deposits at the site has not been determined to date and so there is a possibility that there has been historical soil, and therefore possibly groundwater, contamination from this waste at the site, although the possibility of groundwater contamination is considered unlikely due to the relatively impermeable boulder clay which underlies the site. This layer is likely to prevent migration of contaminants or contaminated perched water from the waste deposits at the site to the bedrock aquifer.

During Operation

13.4.9 There will be no emissions to the Grand Canal during operation of the proposed development. There will be a buffer zone between the Canal and the site to protect the canal from potential spillages or leaks.

13.4.10 Due to the nature of the development, there will be vehicles accessing the site during the hours of operation, including DCC street cleansing vehicles, service vehicles, staff vehicles and also private vehicles using the facility.

13.4.11 This may lead to emissions from vehicles such as hydrocarbons, from leaks or spills, which could cause contamination if released into the water environment via the surface water runoff.

13.4.12 There will also be storage of waste electrical and electronic equipment, and priority wastes, including paints, bleach, oils etc, which can have a significant impact on the soils environment should correct bunding and containment not be put in place at the facility.

13.4.13 Foul water drainage, from the proposed site offices, will be discharged to an existing public foul sewer in the area. This will not impact on the water environment.

13.4.14 There have been problems in the area in terms of surface water drainage, which have been assessed in Phase 3 of the GDSDS (Greater Dublin Strategic Drainage Study)[6].

13.4.15 The drainage issues are associated where the Galback Stream is culverted beneath the Kylemore Road and the culvert downstream of this again. The issues relate to blockages of the culvert beneath the Kylemore Road by debris, which can lead to flood waters backing up from this culvert.

13.4.16 The site is not currently at risk from flooding as assessed in the GDSDS study [1,6], as confirmed by Mr Brian Hennelly, DCC (Deputy Project Engineer GDSDS).

13.4.17 However, although the flooding issues mainly affect the areas downstream and upstream of the site, there may be a potential effect on the proposed site, especially with increasing development in the area and an increase of 8500 m^2 hard standing area on the site itself.

13.4.18 Provided the mitigation measures described in the following section are implemented, it can be concluded therefore that the operation of the proposed development will have no significant negative impact on the water environment.

13.5 Avoidance, Remedial or Reductive Measures

13.5.1 The Department of the Marine has published guidelines designed to ensure the impact of construction work on the water environment is minimised [7].

13.5.2 The UK Department of the Environment has also published guidance as to the approach to minimise impacts of construction and operation of developments on the water environment [8].

13.5.3 The guidelines in these publications have been used in the selection of the mitigation measures outlined in the following paragraphs.

During Construction

13.5.4 Prior to construction, it is recommended that a full risk assessment is carried out on the site to determine the full extent of the waste deposits and the effect they have had on the soil and water environments.

13.5.5 It is proposed to install 5 (no.) boreholes at the site for the purpose of monitoring for the presence of landfill gases, and for monitoring groundwater quality and groundwater levels.

13.5.6 If groundwater is encountered during construction, it will be sampled and analysed for potential contaminants.

13.5.7 If the groundwater is not contaminated, the water will be directed to a sedimentation tank prior to discharge to the stream.

13.5.8 Any groundwater discharge to the Galback Stream will be controlled to a rate agreed with Dublin City Council.

13.5.9 If the groundwater is found to contain contaminants, it will be taken off site for appropriate treatment and disposal by a suitably licensed contractor.

13.5.10 To minimise any impact on the underlying subsurface strata, and the groundwater environment, from potential material spillages all oils, solvents and paints used during construction will be stored within specially constructed dedicated temporary bunded areas.

13.5.11 Oil and fuel storage tanks shall be stored in designated areas, when not in use and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress) and fuel for vehicles will be stored in a mobile double-skinned tank.

13.5.12 Filling and draw-off points will be located entirely within the bunded area(s) and drainage from the bunded area(s) shall be diverted for collection and safe disposal.

13.5.13 Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area of the site.

13.5.14 Spill kits and hydrocarbon adsorbent packs will be stored in this area and operators will be fully trained in the use of this equipment.

13.5.15 Waste residuals will also be stored within temporary bunded storage areas prior to removal by an appropriate EPA approved waste management contractor for off-site treatment/recycling/disposal.

13.5.16 In terms of waste management, waste residuals will be stored within temporary bunded storage areas prior to removal by an appropriately licensed waste management contractor for off-site treatment, recycling or disposal. Any other building waste will be disposed of to on-site skips for removal by an appropriately licensed waste management contractor.

13.5.17 The combined application of these measures will ensure that inputs to, and subsequent contamination of, the surface water and groundwater environment do not occur at the site during the construction phase.

During Operation

13.5.18 In order to mitigate the potential for flooding at the site, DCC drainage department (and in particular the GDSDS team) will be consulted with regard to the possible use of permeable surfaces on the site and the provision of attenuation for stormwater to accommodate the 30 and 100 year storms.

13.5.19 SUDS (Sustainable Urban Drainage Systems), which is a sequence of management practices and control structures designed to drain surface water in a more sustainable fashion than some conventional techniques [11] will be applied to this site, in accordance with DCC drainage department guidelines, to limit stormwater runoff from the site to a rate acceptable to DCC.

13.5.20 The recommendations made in Phase 3 of the GDSDS report [6] will be considered in order to mitigate the potential for run off from the site to cause flooding and to assess the cumulative effects of development in the area.

13.5.21 In order to minimise emissions of fuel and contaminated runoff to the soil (and potentially the bedrock), suitable 3-chamber, Class I hydrocarbon interceptors and silt traps will be installed to treat drainage from hardstanding areas.

13.5.22 The installation of hydrocarbon interceptors will ensure that the surface water runoff from the roads and parking areas will not pollute the soil and water environment, and the silt traps will reduce the level of suspended solids in the runoff from the hard standing areas.

13.5.23 Hydrocarbon interceptors will be in accordance with European Standard prEN858 (Installations for the separation of light liquids) and the design of all bunds will conform to standard bunding specifications - BS8007-1987.

13.5.24 The storage areas for priority wastes, will be bunded, and all drainage from these areas will be collected in the bunded area, and either treated on-site or removed off-site for treatment at an appropriate, licensed facility.

13.5.25 A regular inspection and maintenance/desludging programme will be implemented whereby any oil/solids/debris trapped within the interceptors and silt traps will be removed and disposed of off-site by an appropriately licensed EPA approved waste disposal contractor.

13.6 Likely Effects of this Proposal

During Construction

13.6.1 Any predicted impacts during the construction phase will be short term and temporary in nature.

13.6.2 The storage of fuel and refuelling using fuels and oils according to best practice, together with the on site spill kit will ensure that any predicted impact on the soil environment is minimised.

13.6.3 By carrying out monitoring and sampling of groundwater encountered during construction, there will be no predicted impact on the water environment during this phase of the development.

13.6.4 By implementing the mitigation measures described in the previous section, the construction state of the project will have a minimal impact on the soils and geology environment.

During Operation

13.6.5 There will be a long term impact on the site as a result of the proposed development, due to the excavation of soil and by covering the majority if the site with hard-standing material.

13.6.6 This long-term effect will be positive in nature on the water environment.

13.6.7 There has been historic fly-tipping on the site, and some vehicles have also been recently abandoned. By developing the site and having organized waste collections and storage, with the correct procedures in place, the risk of potential contaminants entering the water environment is minimized.

13.6.8 In summary, provided the mitigation measures outlined in the previous section are implemented, there will be a long-term positive impact on the water environment as a result of the operational phase of the development.

13.7 Monitoring

13.7.1 Monitoring of perched groundwater prior to construction is recommended to determine whether contamination has occurred as a result of the waste deposits on the site.

13.7.2 Monitoring of bunded drainage will be carried out regularly.

13.7.3 The site will operate under an EPA waste licence, which may require surface water monitoring to be carried out on a regular basis to ensure that contamination of the nearby stream does not occur.

13.8 Reinstatement

13.8.1 N/A

13.9 Forecasting Methods

13.9.1 The assessment of the potential impact of the proposed development on the water environment was carried out according to the methodology specified by the Environmental Protection Agency (EPA) [9,10].

13.9.2 The Geological Survey of Ireland (GSI) geological maps and records for the area were inspected, with reference to hydrogeology.

13.9.3 A site visit was carried out in November 2004 to establish and assess the hydrological and hydrogeological environment in the vicinity of the site.

13.9.4 A preliminary site investigation was also conducted under the supervision of personnel from AWN Consulting Ltd and Patel Tonra Ltd during December 2004.

13.9.5 The findings of the site investigation have been referred to in this section and site logs are provided in Appendix 12.1 of the Soils section of this EIS.

13.10 Difficulties in Compiling Specified Information

13.10.1 N/A

13.11 References

1. Greater Dublin Strategic Drainage Study, Phase 2 – Model Preparation, Verification and System Performance Assessment Report. Dublin City Council & South Dublin County Council, October 2003
2. EPA Water Quality Database, 2002. EPA, Johnstown Castle, Wexford.
3. Three Rivers Project – Boyne and Liffey Status Report at September 2003 – Section 2. Water Quality. DoELG
4. Geology of Kildare – Wicklow, Sheet 16. McConnell, B. and Philcox, P., Geological Survey of Ireland, 1994.
5. Groundwater Protection Schemes, Dept. Environment and Local Government, EPA & Geological Survey of Ireland, 1999.
6. Greater Dublin Strategic Drainage Study, Phase 3 Report. Dublin City Council & South Dublin County Council, May 2004
7. Fisheries Guidelines for Local Authority Works, (Draft), Engineering Division, Department of the Marine and Natural resources, Leeson Lane, Dublin 2, July, 1997.
8. Environmental Assessment, A Guide to the Procedures, Department of the Environment, Welsh Office, Cardiff, 1989.
9. EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), Environmental Publications, 17 Duke Street, Dublin 2, 2003
10. EPA Guidelines on the Information to be Contained in Environmental Impact Statements, Environmental Publications, 17 Duke Street, Dublin 2, 2002
11. SUDS (Sustainable Urban Drainage Systems) Best Management Practices, CIRIA, 2001