Section F

Attachment F1

Map :

- Attachment F1 – Balt F1-01 Environmental Impact Areas

Supporting Information :

- Ecological Report by Dixon Brosnan Environmental Consultants – Assessment of the ecological impacts of providing an upgrade Wastewater Treatment System at Baltimore, Co. Cork.
- Ecological Report by Dixon Brosnan Environmental Consultants – Additional information on the ecological impacts of providing an upgrade Wastewater Treatment System at Baltimore, Co. Cork.
- Duchas Documentation – Site Synopsis Roaringwater Bay
- Historical Rainfall Data – Met Eireann
- Dispersion calculations for treated Effluent Outfall
- Hydroworks Model
- Design Calculations for storm Sewers
- Wastewater Treatment Plant – Design Data

NOTES

1. Do not scale, use figured dimensions only. If in doubt ask
2. All dimensions to be checked on site
3. Drawings to be read in conjunction with Licence application
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NORTH

LEGEND

- SPECIAL AREA CONSERVATION
- NATURAL HERITAGE AREA
- TRADITIONAL BATHING AREA
- LICENCED SHELLFISH BED

No.	Date	Dren	Chkd	Revision Description

Cork County Council, Western Division.

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WEST CORK

Job Title:
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Drawing Title:
ATTACHMENT_F.1
ENVIRONMENTAL_IMPACT_AREAS

Prepared By:	Checked By:	Date:
J.CREAGH	O.O'BRIEN	FEB.2009

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BALT_F1_01	1/25000	-

Dixon .Brosnan

environmental consultants

Project title	Assessment of the ecological impacts of providing an upgraded Wastewater Treatment System at Baltimore, Co. Cork.
Client	T.J. O' Connor & Associates
Client ref.	-
D.B ref.	DB5007
Revision	0-issue to client
Date	16 March 2004
approved by	Carl Dixon B. Sc. (Applied Ecology)
on behalf of Dixon.Brosnan	

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CONTENTS

1. INTRODUCTION

1.1 Dixon.Brosnan environmental consultants were asked by T.J O Connor & Associates to carry out an environmental impact assessment in respect of an upgraded wastewater treatment plant to be constructed at Baltimore, Co. Cork. The following ecological assessments were requested by the Heritage section of the Department of Environment (Duchas):

- *Biological communities over which the activity will impact including an inventory of flora and fauna (in fauna, epifauna and marine animals).*
- *If the development requires a foreshore licence the biological communities or habitats likely to be impacted must be described.*
- *Construction activities that may impact upon resident and/or transient bird and mammal populations.*
- *Will construction activities result in noise/visual disturbance to marine mammals?*

1.2 The proposed development is below the threshold at which an Environmental Impact Assessment is required under the European Communities (Environmental Impact Assessment) Regulations, 1989 (S.I. No. 349 of 1989), and accordingly this report does not purport to be an Environmental Impact Statement. However, the Environmental Protection Agency document *Advice notes on current practice in the preparation of Environmental Impact Statements* (2000) was consulted during the preparation of the report.

2. EXISTING TREATMENT

2.1 Wastewater from Baltimore and its environs is collected via the existing collection system, which includes pumping stations at the Cobh and at the pier. The collection system discharges wastewater into a septic tank at the shoreline between the North Pier and Bull Point. The septic tank provides primary treatment for the sewage. The treated effluent discharges via a 300 mm outfall to below the LWM near to the septic tank. During periods of high flow the septic tank is bypassed by the excess flows.

2.2 At present the sewage outfall discharges to a shallow bay and where movement of water is low. Limited dispersal of effluent would be expected during low tides. It is probable that this is having a negative ecological impact in the immediate area of the discharge.

2.3 The current population of Baltimore is 383 (Ref. 2002 Census Table 5). The future summertime populations in Baltimore are expected to rise to in excess of 2,000. Sewage is currently treated via a septic tank and thus it is assumed that primary treatment occurs prior to discharge. The Environmental Protection Agency Document '*Treatment Systems for Small Communities, Business, leisure centres and Hotels*' (EPA 1999) details wastewater inflow characteristics for domestic and commercial sources. These figures are shown in Table 1 & 2 below.

Table 1-Inflow wastewater characteristics

Parameters	*Units*	*Domestic sources*	*Treatment systems serving hotels/restaurants*
SS	Mg/l	163	293
BOD	Mg/l	168	470
COD	Mg/l	389	888
0-PO4	Mg/l	7.1	8.21
Total N	Mg/l	40.6	55
pH		7.5	7.37
Total -coli	CFU/100ml	1×10^8	1×10^8
E-coli	CFU/100ml	4×10^7	4×10^7

2.5 In reality the discharge from Baltimore will contain a mixture of wastewater from domestic and commercial sources. The BOD loading rate is an important parameter in the design of all biological wastewater treatment systems. For comparison purposes in the context of this report it will be assumed that the all the wastewater is derived from domestic sources. Based on the population equivalent of 383-winter population and a discharge volume of 180l/person/day the total BOD reaching the treatment plant is estimated at 11.58 kg/day. Based on a predicted summer population of 3,600 p.e., the total BOD reaching the treatment plant could be as high as 108.86 kg/day.

2.6 Based on the same population equivalents the amount of suspended solids reaching the treatment plant is estimated at 11.24 kg/day in winter at present and could be as high as 105.62 kg/day in summer assuming the population increases as predicted.

2.7 At present wastewater from Baltimore is treated via a septic tank. The main function of a septic tank is to act as primary settlement tank removing some of the BOD and the majority of the suspended solids. The EPA publication '*Primary, secondary and tertiary treatment*' (EPA 1997) estimates that typically 50-70% of suspended solids are removed in primary settlement tanks; BOD is reduced by 20-50% and the bacterial count by 25-75%. Assuming that the septic tank at Baltimore is currently working at average efficiency the approximate reductions are estimated as 60% for suspended solids and 35% for BOD. The reduction in bacterial count is estimated at 50%

2.8 This would result in a BOD discharge to the bay of 7.53 kg/day in winter (383 p.e) and could reach 70.76 kg/day in summer (3,600 predicted p.e.). The volume of suspended solids reaching the bay is estimated at 4.50 kg/day in winter and could reach a maximum value 42.25 kg/day in summer. These figures assume that all waste is domestic in origin.

2.9 Based on a 50% reduction in bacterial numbers, the level of bacteria in the final discharge is estimated at 5 X10^7 total coliforms and 2 X 10^7 CFU/100ml faecal coliforms.

2.10 Based on the above, the current discharge of sewage would be expected to cause deteriorations in water quality in respect of nutrients and bacterial levels. It is also noted that at times of peak flow an overflow system is in place leading to increased levels of nutrients in the discharge.

3. PROPOSED TREATMENT

3.1 Treatment Plant

It is proposed to construct a modern treatment plant to improve the level of treatment and to cater for the future increased loads. The plant is to be located at Bull Point. Standby power generation will be available on site in case of power failure. The new plant will consist of preliminary, secondary treatment and disinfection or their equivalent to achieve the standards as proposed in the table below. It is proposed to disinfect to the standard given below throughout the entire year. These proposed treatment standards, which are shown in Table 3, are in line with those specified by the Urban Wastewater Treatment Regulations, 2001 for non-sensitive waters.

Table 3: Proposed treatment standards.

Parameter	*Value*	*Unit*
Design Capacity	3,600	p.e.
BOD	25	mg/l
SS	35	mg/l
COD	125	mg/l
T. Coliforms	10,000	MPN/100 mls
F. Coliforms	2,000	MPN/100 mls

3.2 For ease of comparison between the current and proposed treatment the discharge per person is again estimated at 180 l/day and the winter population is left unchanged at 383 p.e. Using these figures the estimated loading of BOD discharged to the bay from the upgraded treatment plant is 1.72 kg/day in winter. Using a predicted maximum summer population of 3,600 p.e the summer discharge is estimated at 16.20 kg/day. Using the same figures the amount of suspended solids discharging to the bay is estimated at 2.41 kg/day in winter and the summer discharge at 22.68 kg/day.

Table 4 – A comparison of treatment efficiencies for SS and BOD

	Assuming primary treatment via existing septic tank *Winter p.e. 383,Summer p.e. 3,600* *180l/person/day* *BOD removal 35% approx.* *SS removal 60% approx.*	*New treatment plant.* *Winter p.e. 383,Summer p.e. 3,600* *180l/person/day* *BOD 25mg/l* *SS 35 mg/l*	*% reduction*
BOD (winter) kg/day	7.53	1.72	77.10%
BOD (summer) kg/day	70.76	16.20	77.10%
SS (winter) kg/day	4.50	2.41	46.44%
SS (summer) kg/day	42.25	22.68	46.44%

Table 5 – A comparison of treatment efficiencies for bacteria.

	Assuming primary treatment via existing septic tank Assumes removal rate of 50%	*New treatment plant*
T. Coliforms	5 X10^7 CFU/100ml	10,000 MPN/100ml
F. Coliforms	2 X 10^7 CFU/100ml	2,000 MPN/100ml

3.3 As detailed above the proposed works will substantially improve the quality of the effluent discharged to Baltimore Harbour. In the absence of an upgraded treatment plant and given the rise in population which is expected to occur in Baltimore the amount of nutrients and bacteria reaching the bay will significantly increase in the future.

3.4 Pumping Station

3.4.1 A pumping station is to be constructed alongside the existing septic tank. Collected wastewater will be pumped to the proposed treatment plant via a proposed rising main. The existing outfall will be used as an overflow. The existing outfall will be repaired or rehabilitated if necessary to provide the required future design life. The existing septic tank is to be used as a storm water storage tank to reduce the frequency of overflow events. The overflowed effluent shall receive screening to 6 mm, and shall be heavily diluted with large amounts of surface runoff. The treated effluent from the proposed Baltimore wastewater treatment plant at Bull Point is to be discharged to the Church Strand Bay below the low water mark.

3.5 Outfall

3.4.2 An outfall pipe is to be laid from the proposed Baltimore Wastewater Treatment Plant at Bull Point, across the foreshore and out into the middle of Church Strand Bay. The treated effluent from the treatment plant is to be discharged via the proposed outfall. The outfall will consist of a 300 or 375 mm (to be confirmed) diameter ductile iron pipeline, laid to 100 m beyond the high water mark. Repairs to the shoreline, pipe bedding and concrete surround to protect the pipe will be undertaken as associated site works. The recommended 2 m minimum depth of water at low tide will be available at all stage of the tide.

4. SITE DESIGNATION

4.1 Designations

Roaring water bay into which the treatment plant will discharge is a candidate Special Area of Conservation (cSAC). As detailed in the site synopsis included in Appendix 1, three marine habitats listed under the EU Habitats Directive, i.e. large shallow inlets and bays, marine caves and reefs are found within the bay.

4.2 The shallow intertidal reefs are diverse in places with kelp forest and a diverse communities of sponges and ascidians. Species of particular ecological interest include the sponge *Tethyspira spinosa,* the red alga *Phyllophora sicula* and the scarce hydroid *Tamarisca tamarisca.*

4.3 The sedimentary communities in Roaringwater Bay are of particular interest and species of note include the calcareous free-living red alga *Lithophyllum dentatum* and the rare filamentous red alga *Spyridia filimentosa.*

4. 4 Three terrestrial habitats listed under the EU Habitats Directive, i.e. dry heath, sea cliffs and lowland hay meadows are found within Roaringwater Bay. In addition to typical heath species a number of more uncommon species occur within this habitat including Hairy Birdsfoot Trefoil (*Lotus subbiflorus*), the Common Birdsfoot (*Ornithopus perpusillus*), Spotted Rockrose (*Tuberaria guttata*), Pale Heath Violet (*Viola lactea*) and Lanceolate Spleenwort (*Asplenium billotii*) and Deptford Pink (*Dianthus armeria*).

4. 5 Seashore vegetation includes typical species such as Sea Pink (*Armeria maritima*) and Plantains (*Plantago maritima*, *P. coronopus*). Of particular note are two Red Data Book plants, Little Robin (*Geranium purpureum*) and Sea Pea (*Lathyrus japonicus*) occur rarely on shingle beaches.

4. 6 Otter and Grey seal, two mammal species listed on Annex II of the EU Habitats Directive, occur within the site and there are Arctic/Common Terns which are listed on Annex I of the EU Bird's Directive on Carrigviglash Rock. Choughs another species listed on Annex I of the Bird's Directive also occur within the site.

5. TOPOGRAPHY

5.1 The site of the proposed treatment plant is located on the northern tip of a headland to the northeast of Baltimore village. The topography is such that a narrow strait is formed between this headland and the opposing shoreline. This narrow strait creates a funnel effect resulting in faster water movement as the water moves through this relatively narrow channel.

5.2 To the west of the proposed site the nearest landmass is Sherkin Island, which is located approximately 1.75 km away. Thus there is a considerable amount of open water located to the west of the site resulting in relatively exposed conditions. This pattern is reflected in the structure of the coastline. To the west of the RNLI building a shingle beach gives way to low cliffs. These rocky cliffs are close to vertical with indentations worn into the cliff-face at intervals. There is little evidence of deposition of silt reflecting a high-energy environment.

5.3 To the east of the proposed site the strait widens as it opens into Church Strand Bay. The coastline is more sheltered although the Ilen River may have more of an impact on this location particularly during spate events. However the main channel of the Ilen River enters Roaringwater Bay to the north of the proposed site and greater impacts in respect of salinity and currents would be expected to occur in this area. As the strait opens into Church Strand Bay and current speeds decrease there is a much higher degree of deposition. Initially the substrate consists of a mixture of coarse mud and fine gravels. Moving eastward away from the strong ocean currents these sediments give way to mudflats.

5.4 Based on the surrounding landform the site would be considered as moderately exposed with strong currents pushing through the relatively narrow strait. This environment is erosive with deposition of silt limited.

6. MARINE ECOLOGY

6.1 A number of different habitat types are located at or close to the site of the proposed discharge pipe. Samples were taken of sediment and from rocky habitats in the tidal and subtidal zones and an inventory of the species noted ins attached in Appendix 2. The classification of these habitats follows the scheme outlined in the Heritage Council publication A *Guide to Habitats in Ireland* (Fossit, 2000). This classification scheme provides for two classifications namely:

- 1-Marine Littoral (Intertidal)
- 2-Marine Sublittoral (Subtidal)

6.2 Marine Littoral (Intertidal).

This category is further divided into two main habitat types namely:

- Littoral sediment
- Littoral rock

6.2.1 Marine Littoral (Intertidal) - Littoral sediment

A stony beach is situated adjacent to the RNLI building and will be affected by the proposed discharge pipe. This habitat is classified as "*Shingle and gravel shores LS1*". The upper section of this beach consists of cobbles and stones with low faunal biodiversity. The main species noted was sand hopper, which feeds on decaying organic matter at the upper limit of shoreline. This habitat lacks the sand and mud substrate, which is found to the west of the RNLI building and which supports a much greater diversity and density of macroinvertebrates. At the lower edges of the sublittoral zone the sediment particles become smaller in size and grade into sand and gravels. A more diverse fauna is evident here with lugworm and polychaete worms noted.

6.2.2 Marine Littoral (Intertidal) - Littoral rock

Two areas of rocky shore are situated at the proposed site and are separated by a shingle beach. These areas are classified as "*Moderately exposed rocky shores LR2*".A distinct zonation is evident; these patterns are related to the length of tidal emersion and are typical of rocky shores.

The splash zone is relatively narrow with typical lichen species including *Ramalina* spp, *Xanthoria* sp. and *Verrucaria maura.* Pools in the upper shore/splash zone are low in diversity with the green algae *Enteromopha* sp. common. *Cladophora* sp. is also present.

The mid and upper shores are dominated by barnacles and limpet and he snail species *Littorina saxitilis* is common. Seaweed species are found in a distinct pattern. The fucoid species channel wrack is more apparent on the upper shore with serrated wrack more common on the lower shore. Red algae such as *Chodrus crispus* and green algae such as *Ulva* sp. are found on pools on the middle shore and become more common on the lower shore and on the edges of the sublittoral kelp zone.

On the lower shore more faunal species were noted including common prawn, pipefish, common crab, edible crab, shanny and breadcrumb sponge. Mussels are generally absent although small clumps are present in crevices in the rock. Tubeworms are common on loose rocks on the lower shore.

6.3 Marine Sublittoral (Subtidal)

This category is further divided into two main habitat types namely:

- Sublittoral rock
- Sublittoral sediment

6.3.1 Sublittoral rock

The exposed rock in the tidal zone continues into the subtidal zone where if forms small reefs interspersed with coarse sediment. The tops of these reefs are evident during low spring tides and they are classified as *Moderately Exposed infralittoral rock SR2.*

This habitat type is dominated by kelp, which forms dense stands with mixed red and green algae. Species noted include *Laminaria digitata, Laminaria saccharina, Chorda flum* and *Palmaria palmate.* Painted topshell are common in this zone and other species noted include common starfish, tubeworm and brittlestar.

6.3.2 Sublittoral sediment

This classification includes habitats of the seabed where the substratum consists of unconsolidated material in a range of sizes. In this instance the sublittoral sediment which is interspersed with sublittoral rock. This habitat is classified as infralittoral mixed sediment SS4 and is characterised by various mixtures of sediments (gravel, sand and mud) with shells and large stones on the surface.

Species identified from sediment samples taken from this habitat includes lugworm, *Modiolus modiolus* (Horse mussel), *Xantho incisus* (Furrowed crab) and *Ophiura ophiura* (Brittle star). Large stones from the substrate surface were often dominated by tubeworm. Diversity in this habitat is relatively low and no uncommon species were noted.

7. TERRESTRIAL ECOLOGY

7.1 The proposed treatment plant will be locate to the southwest of the RNLI building and will occupy approximately 0.04 hectares. Construction of the treatment plant may take up to a year to complete. The area in which it is proposed to locate the plant was surveyed on two

dates in March and habitats classified to level 3 of the classification scheme outlined in *A Guide to Habitats in Ireland (Fosssit, 2000).*

7.2 The treatment plant will be located in a exposed field which is dominated by scrub and is classified as *Dense Bracken HD1*. Bracken cover exceeds 50% and is the dominant vegetation type. Bramble is also common. Other species noted include cleavers, nettle, vetches and the introduced species montbresia.

7.4 Elements of *Dry Siliceous heath HH1* and *Dry humid grassland GS3* were also noted. Typical species noted include ling, gorse, sheep sorrel, matgrass, and bents. A rocky outcrop supports additional species including stonecrop.

7.5 Low cliffs form the boundary with the shoreline and additional species grow on top of these cliffs. These include stunted blackthorn, red fescue and typical coastal species such as sea scurvy and thrift.

7.6 No rare or endangered species were noted in any of the habitats surveyed. However it is noted that early March is not ideal and it is recommended that a further site visit be carried out in the May-June period.

8. MAMMALS

8.1 Otters

Otters are found throughout Roaringwater Bay and a exhaustive survey of otter populations was conducted in 1990. The results of this survey were published as *Bulletin of Sherkin Island No. 12-"Otter survey of Roaringwater Bay; South West Cork* by Jeremy D. Wickens. The results from a more recent survey have not yet been published.

8.1.2 Signs of Otter Activity

The following were considered to be indicators of otter activity:

1-Spraints and anal glands

2-Footprints and sign heaps

3-Runs or paths

4- Feeding sites and prey item remains

8.1.3 Mainland Survey

Although parts of the mainland were surveyed the area in which the proposed development will be located was not included in the survey. In the 4.8km surveyed on the mainland a total

of 28 sites of otter activity were noted. These included 6 holts with the remainder consisting of spraint sites. The report concludes that otters are relatively common within Roaringwater Bay.

8.1.4 Site survey

A survey of the coastline in proximity to the site did not find any definitive evidence of otter activity. A worn path was noted extending along the cliff to the southwest of the RNLI station and to the east through a field on flatter ground. Animal droppings were located at different locations along the length of the path. No holts were located.

8.1.5 It has been well documented that otters will create paths between bodies of water and between holts and water. These paths are usually marked with spraint and/or anal gland secretions. However a number of other species including mink and fox will also use similar paths. In certain instances fox and mink scat were found at otter spraint sites along paths indicating that paths were "shared". The presence of spraints is therefore considered necessary to conclusively identify paths used by otters. As noted earlier animal droppings were noted at intervals along the path. The following protocols, which were used to identify otter spraints the 1990 survey, were employed during this survey.

Table 6. Identification of animal droppings

Species	*Length MM*	*Diameter MM*	*Colour/Appearance*	*Odour*
Otter (*Lutra lutra*)	10-100	7-25	Grey/green/black/brown. Fish bones or crab shells visible. Rounded at one end-other tapered. Sometimes tapered. Sometimes accompanied by mucus gel and/or anal gland secretion.	Pungent thick fish odour. Not acrid or unpleasant .Retains the odour when old or washed out
Mink (*Mustella vison*)	10-70	5-10	Grey/green/black/brown. Fish bones, crab carapaces visible externally. (Beetle wing covers occasionally). Cylindrical often in X pattern. Occasionally accompanied by mucus gel and/or anal gland secretion	Pungent musky earthy odour acrid and bitter, unpleasant looses odour when old particularly if a high proportion of sat is crab remains
Fox (*Vulpes vulpes*)	40-80	10-25	Grey/ black/brown. Crab debris. Beetle wing covers. Amphipods & in summer blackberry pips. Visible externally. Tapered along its length Rounded at one end. Sandy or soily appearance.	Powerful, acrid extremely unpleasant. Retains odour until broken down. Fox scats do not remain whole as long as otter.

Table 6. Identification of animal droppings (continued).

Species	*Length MM*	*Diameter MM*	*Colour/Appearance*	*Odour*
Seabird i	10-50	10-15	Grey/brown/white. Fish bones, crab debris, small molluscs. Amphipods, sand, small feathers visible externally. Rounded at ends sometimes "squared off" Often granular appearance	Weak fishy odour with slight acidity. Retains odour until broken down. Does not remain whole as long as otters.
Pellet ii	30-50	10-25	Pale, green translucent. Large fish bones visible externally. Bones loosely packed often teardrop shaped.	Strong fish odour very similar to otter spraint. Not unpleasant yet with slight acidity. Retains smell yet quickly looses shape.

Source: *Bulletin of Sherkin Island No. 12-"Otter survey of Roaringwater Bay; South West Cork* by Jeremy D. Wickens

8.1.6 Based on the characteristics noted in Table 1 the animal dropping noted in proximity to the site were identified as those of fox and seabirds. No anal gland secretions were noted. Evidence of rats and rabbits was also noted.

8.1.7 Human Disturbance

The site itself is subject to a degree of disturbance. This includes the use of the RNLI building, recreational activity including visits by tourists in summer and walking of dogs. To southwest of the site there is boatyard and slipway and beyond this the village itself. To the east there are a number of moored craft in the channel and sea traffic in the general area is high. Approximately 200m east of the RNLI building there is a block of oyster trestles growing Pacific oysters (*Crassostrea gigas*). New building works are evident in this area and spoil heaps associated with this activity are situated close to the shore. The site is therefore cut off to a degree with the village of Baltimore to the southwest and building activity, mooring of boats and activity associated with mariculture to the west.

It was noted in the report on the 1990 survey that where land- and sea-based activity coincides the number of sites of otter activity decreases. On a similar note it was noted that no signs of otter activity was noted 100-200m east of Turk Head Pier and that no signs of otter activity was noted to the west of the island of Inishleigh where a large number of oyster

trestles were located. It is considered likely that the level of human disturbance at the site prevents otters from breeding.

8.2 Cetaceans

Two cetaceans species bottlenose dolphin (*Tursiops truncatus)* and harbour porpoise (*Phocoena phocoena)* may occur within Roaringwater Bay. Although no specific information is available it is considered unlikely that these species spend large amounts of time in proximity to the proposed site given the level of human disturbance. The effect of sewage discharges on cetaceans may include effects from chemical compounds and effects from bacterial contamination. Raw sewage may contain a variety of substances including bacterial, viral and protozoan pathogens, organotins and heavy metals and a variety of organic and inorganic wastes. In particular bacteria are present in large concentrations in raw sewage and bacteria associated with water contaminated by human pathogens have been documented in marine mammals. (UK Marine SAC Project). Given that the proposed treatment plant will significantly reduce the numbers of bacteria and nutrients reaching the bay the upgrade of the treatment system should have positive benefits in respect of cetaceans.

8.3 Seals

Grey seals (*Halichoerus grypus*) are widely distributed around the Irish coast although breeding is thought to take place predominantly on offshore island and remote mainland sites between the months of September and November (Kiely, O *et al*, 1998). In Roaringwater Bay seal colonies are located in the Calf Islands, which are located 7.5 km west of the proposed site. Given the distance involved no disturbance of breeding colonies is expected to occur.

9. BIRDS

9.1 The site in which the treatment plant is to be located consists of mixed scrub dominated by bracken and bramble. Although some typical species were noted i.e. wren, stonechat, hooded crow and meadow pipit this habitat is not of particular value and its removal will have a marginal and localised effect on terrestrial bird species.

9.2 As noted earlier in this report the area to be affected consists of a mixture of rocky shore and shingle habitats. These types of habitats do not attract the high numbers of migrant waders more commonly associated with mudflats where there are high macroinvertebrate numbers. Typical species noted include gull species (lesser black-backed gull and herring gull), oystercatcher and cormorant. All of the species noted are common inhabitants of these types of habitats.

9.3 To the east of the site the presence of finer sediments attracts more waders; however this area will be unaffected by construction activity. The reduction in nutrients reaching the bay may, over time, lead to a reduction in macroinvertebrate density which in turn could impact on feeding birds. However this effect is unlikely to be of major significance.

9.4 Three bird species (common tern, artic tern and chough) included in Annex I of the Bird Directive are found within Roaringwater Bay. The artic/common tern colony is located on Carrigviglash Rock which is situated approximately 5.75km north west of the proposed site and no direct impact is therefore likely. The removal of a small area of bracken scrub will not have significant impacts on choughs.

10. POSSIBLE IMPACTS

10.1.1 Noise Impacts

Noise impacts are likely to significant during the construction phase which will involve the dredging of a trench approximately 100m into the bay. As noted earlier in this report the area in which the plant is located has significant amounts of sea traffic and other human disturbance. The noise levels should therefore be considered in the context of relatively high background noise levels. Although the treatment plant may take up to a year to complete the dredging operation will take approximately 4-8 weeks to complete.

10.1.2 Impacts on Mammals

Although there is no evidence to suggest that cetaceans, seals or otters breed in proximity to the proposed site these species may feed in the area. Some adaptation to increased noise levels is likely for any species, which habitually occur in this area, and in this context the increase in noise levels is unlikely to have a significant impact. Seals and otters are highly mobile and can move quickly away from external disturbance.

10.3 Impacts on Birds

There is evidence to suggest that noise does have an impact on certain bird species by affecting the ability of birds to effectively communicate and by direct disturbance. There is very little information available on the effects of noise on waterfowl, and it is particularly sparse with regard to port and harbour operations. A British Trust for Ornithology (BTO) review reports that evidence of noise disturbance during construction operations has been found for certain wildfowl and wader species (BTO 1990). However evidence suggest that in general, wildlife, including birds, adjust to noise levels, even sudden noises, as indicated by the existence of SPAs near to 24 hour container terminals in the UK which have been there for years. However, the ability of waterfowl species to habituate to certain

forms of disturbance and their ability to compensate for lost feeding time due to disturbance is poorly understood (BTO 1990).

The most valuable habitats for feeding birds are located to the east of the proposed site (photos 7 & 8) and are less likely to suffer significant levels of disturbance. Some level of disturbance from work with oyster trestles, building activity and the mooring of boats already occurs in these areas.

11. SUMMARY OF IMPACTS

Table 7 : Summary of impacts

Habitat/Species	*Habitat Value*	*Potential impacts without mitigation*	*Comments*
Intertidal Littoral sediment Photo 1	Low conservation value	High	The shingle beach will be affected by works for the pipeline. Biodiversity in this type of habitat generally low.
Intertidal Littoral rock Photos 1 & 3	Moderate to High conservation value	Moderate	Rocky outcrops on the upper to lower shore will be affected. Although moderately diverse this type of habitat is common within the bay.
Sublittoral rock Photo 4	Moderate to High conservation value	High	High diversity of kelp and encrusting organisms on small offshore reefs. Will be partially affected by works for pipeline
Sublittoral sediment Photos 5 & 6	Low to Moderate conservation value	Moderate	Biodiversity relatively low. Will be affected by dredging for pipeline.
Terrestrial Habitats Dense Bracken HD1 Dry Siliceous heath HH1 /Dry humid grassland GS3	Low conservation value	High	This habitat type is common on marginal land in West Cork. The dominance of bracken has significantly reduced biodiversity.
Dry humid grassland GS3 on clifftop	Moderate conservation value	Low	Contains typical coastal plant species. Used as a pathway by mammal species.
Otters	High conservation value	Low	No evidence of breeding or feeding otters. If otters do feed in this area the disruption will be relatively short in duration.
Seals	High conservation value	Low	No evidence of breeding seals. Localised disruption of feeding may occur over a short time frame.
Cetaceans	High conservation value	Low	Presence in proximity to the site unlikely. Minimal impact expected.
Birds	Moderate to high conservation value	Low	Some disruption to species associated with rocky shores. Waders feed on more sheltered shores to the east and direct disturbance and loss of feeding time is unlikely to be significant. Some loss of habitat for terrestrial species.

12. RESIDUAL IMPACTS

12.1 After construction, benthic communities should recolonise disturbed areas, with an accompanying re-establishment of fish in these areas. For example a number of species have recolonised concrete structures associated with the RNLI building. However concrete surfaces may lack the structural complexity of natural rock and certain niches may no longer be available. A reduction in overall biodiversity is therefore likely.

12.2 The location of the outflow pipe is such that effective dispersal of effluent will occur. Deposition of fine silt in the sublittoral sediment was not noted. Some deposition of silt would be expected to occur on gravel/mud shores in more sheltered conditions to the east of the site. However in the context of existing mudflats the deposition of silt and/or increased nutrients is unlikely to have a significant ecological impact at this location.

12.3 Overall the reduction in suspended solids, nutrients and bacterial loadings should have a beneficial impact on the ecology and water quality of Roaringwater Bay.

13. MITIGATION MEASURES

13.1 Following construction of the wastewater treatment plant it is recommended that noise levels do not exceed 55db during daylight hours and 45db at night. This level of noise is relatively low in the context of a busy harbour with heavy sea traffic. This level of noise should not preclude the return of mammal species, which may have been disturbed by the construction activity.

13.2 Where possible the original sediments from both the littoral and sublittoral zones should be reused as backfill where possible. Prior to reuse or disposal of sediment chemical testing should be conducted to determine if the waste has hazardous properties. Following testing a suitable use/disposal solution can be determined.

13.3 The vegetation on the top of the cliff face is used as a path by mammal species and should remain open. This precludes the use of continuous fencing and vertical concrete faces etc. which could block this path.

13.4 Although it is not envisaged that blasting will be required any such work should not be carried out prior to consultation and agreement with Duchas and the development of specific protocols to prevent impacts on mammals and birds.

13.5 The small offshore reefs (classed as sublittoral rock) support a variety of flora and fauna are considered to be of conservation value. It is recommended that the discharge pipe be situated so as to minimise the impact on this habitat. A further site visit by an ecologist is recommended as not all species were identifiable due to seasonal factors.

14. CONCLUSIONS

14.1 Roaringwater Bay into which the upgraded treatment plant discharges is a cSAC.

14.2 Marine habitats will be affected by the construction of the pipeline. These include littoral and sublittoral rock and sediment. Although a variety of floral and fauna species were detected during surveys, the habitats noted are locally common and no rare or endangered species were noted.

14.3 The terrestrial habitat to be affected is dominated by bracken with smaller areas of Dry Siliceous heath HH1 and Dry humid grassland GS3. Some typical costal species were also noted. These habitats are locally common and not considered to be of particular conservation value.

14.4 Although otters are common in the bay no evidence of their presence was detected at the site or in the immediate environs. The level of human disturbance may be preventing this species from breeding on or close to the site.

14.5 Seals do not breed in proximity to the site however they may occur in proximity to the site on occasions. Given the limited duration of the works (4 weeks) no significant impact is likely to occur.

14.6 Harbour porpoise and bottlenose dolphin have been recorded from the bay, however it is considered unlikely that these species will regularly occur in proximity to the site. Given the limited duration of the dredging works (4-7 weeks approximately) no significant impact is likely to occur.

14.7 Birds may be affected by noise and disturbance, however the species noted in proximity to the site are expected to be relatively tolerant of this type of disturbance. Waders, which may be more susceptible to lost feeding time, occur on sheltered mudflats to the east of the site and are not likely to be significantly affected by the development.

15. PHOTOGRAPHS

Photo 1 showing shingle beach, rocky outcrop and offshore reefs

Photo 2 showing shingle beach, rocky outcrop and slipway for RNLI.

Photo 3 showing mid to lower shore. Rocks on the middle shore heavily encrusted with barnacles. Serrated wrack and evident on lower shore.

Photo 4 showing kelp taken at a low spring tide.

Photo 5 Shallow subtidal zone with kelp and red algae evident

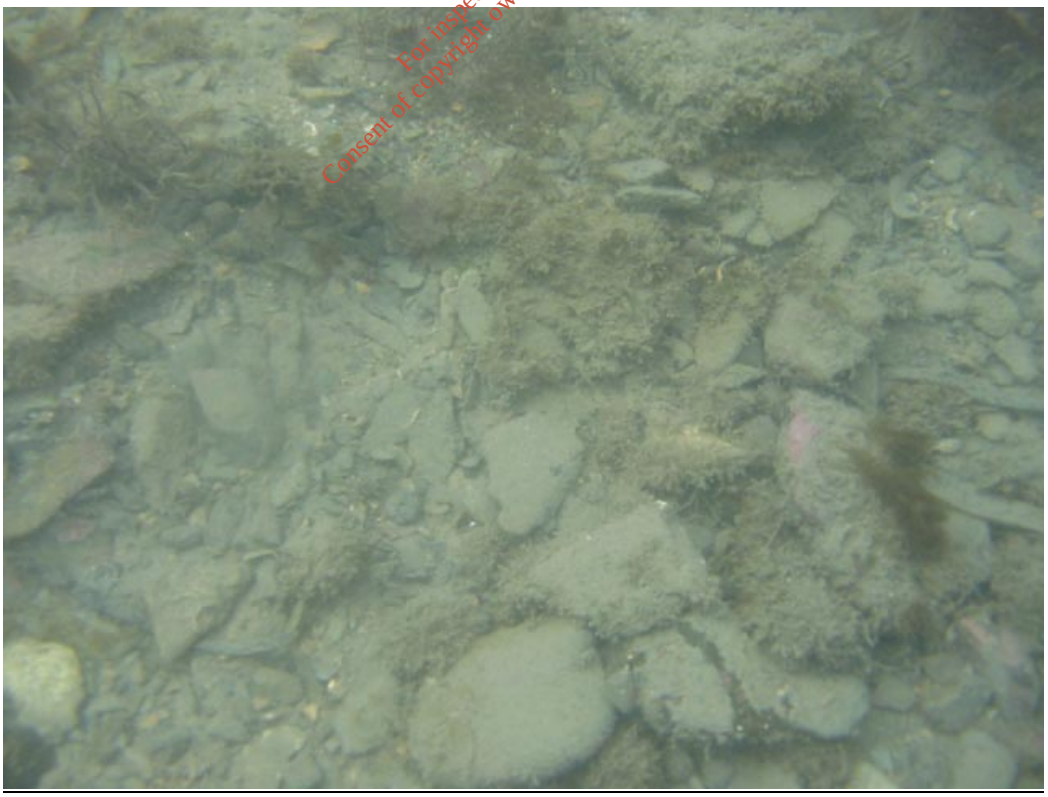

Photo 6 Sublittoral sediment

Photo 7 More sheltered conditions and finer sediment to the east of the RNLI building which is visible in the background. Oyster trestles visible to the right of picture.

Photo 8 mud flats to the east of the site and unaffected by the developement. Feeding ground for waders.

APPENDIX 1: SITE SYNOPSIS

SITE NAME: ROARINGWATER BAY AND ISLANDS

SITE CODE: 000101

Roaringwater Bay, Co. Cork, is a wide shallow bay located on the southwest coast. The site includes the immediate coastline on the mainland from Long Island to Baltimore together with the whole bay and most of the islands. Bedrock is composed of a series of Devonian Old Red Sandstone reefs that run parallel to troughs of Devonian Carboniferous marine clastics in a north east/south west direction. These reefs emerge to form the islands on the south side of the bay and within the bay. Generally the coast is low-lying but the southern edge rises, in line with the hills behind Baltimore, to culminate in a summit of 160m on Cape Clear.

The bay itself has a wide variety of reef and sediment habitats, subject to a range of wave exposures and tidal currents, and has been selected for three marine habitats listed under the EU Habitats Directive, i.e. large shallow inlets and bays, marine caves and reefs. The shores of the bay range from the exposed, rocky shores of South Sherkin Island, to the sheltered rock, sand and mud communities of the Inner Bay and estuarine communities where the rivers enter the bay. The shallow subtidal reefs have good examples of kelp forest community grazed by the sea urchin *Echinus esculentus*. The animal dominated reefs includes the feather star *Antedon bifida* community, the hydroid *Sertularia argentia* and *Hydralmania falcata* community, and sponge and ascidian communities some of which are species rich and in which two rare species occur; the sponge *Tethyspira spinosa* and the rare red alga *Phyllophora sicula*. The scarce hydroid *Tamarisca tamarisca* occurs at a number of sites within the bay. These communities are typical of very sheltered areas with some current present. The cave community on Sherkin Island is home to the rare filamentous red alga, *Pterosiphonia pennata*. The sedimentary communities in Roaringwater Bay are exceptional. Of particular interest is the extensive bed of the calcareous free living red alga *Lithophyllum dentatum*, (generally termed maerl but may be locally know as 'coral') which is the largest in the country for this species. This bed typically contains specimens that are very large and uniquely flattened in form with the rare filamentous red alga *Spyridia filimentosa*. *Lithophyllum dentatum* is only known from 2 other sites. There are also other maerl communities and several seagrass beds (*Zostera marina*) which may co-occur with a particularly good example in Horseshoe Bay, Sherkin Island.

The terrestrial habitats are also of conservation interest and include three habitats listed under the EU Habitats Directive, i.e. dry heath, sea cliffs and lowland hay meadows. The coastal heath vegetation is typified by an abundance of Autumn Gorse (*Ulex gallii*), Heather (*Calluna vulgaris*) and Bell Heather (*Erica cinerea*). This is regularly burnt in most places so that there are clearings where grasses and herbs such as Wood Sage (*Teucrium scorodonia*), Common Violet (*Viola riviniana*) and Tormentil (*Potentilla erecta*) have a temporary rise to prominence before the shrubs grow again. Outcrops of rock bring variety into the heath and are the sites of the more interesting species. These include many southern plants, for example the rare Red Data Book species Hairy Birdsfoot Trefoil (*Lotus subbiflorus*), the Common Birdsfoot itself (*Ornithopus perpusillus*), Spotted Rockrose (*Tuberaria guttata*), Pale Heath Violet (*Viola lactea*) and Lanceolate Spleenwort (*Asplenium billotii*). In addition there is a small amount of Deptford Pink (*Dianthus armeria*), the only place it grows in Ireland though it was likely to have been introduced. Flushes and damp places through this vegetation support some interesting liverworts as well as Birdsfoot Clover (*Trifolium ornithopodioides*) and the special annual plants of the south-west, Chaffweed (*Anagallis minima*), Yellow Centaury (*Cicendia filiformis*) and Allseed (*Radiola linoides*). Chamomile (*Chamaemelum nobile*) is also common with Yellow Bartsia (*Parentucellia viscosa*) somewhat less so.

Close to the sea the vegetation responds with Sea Pink (*Armeria maritima*) and Plantains (*Plantago maritima*, *P. coronopus*) and, locally, with Dotted Sedge (*Carex punctata*) and the Slender Spikerush (*Eleocharis uniglumis*). Two other Red Data Book plants, Little Robin (*Geranium purpureum*) and Sea Pea (*Lathyrus japonicus*) occur rarely on shingle beaches while Ray's Knotgrass (*Polygonum raii*) is more widespread. Several streams have been ponded by such beaches to create marshes of Reed (*Phragmites australis*) where Marsh Pennywort (*Hydrocotyle vulgaris*), Marsh Cinquefoil (*Potentilla palustris*) and Marsh Orchids (*Dactylorhiza majalis*, *D. incarnata*) are frequent together with some Creeping Willow (*Salix repens*) and Gypsywort (*Lycopus europaeus*). On Cape Clear a similar marsh has developed into a bog with abundant bog mosses (*Sphagnum* spp.), Bogbean (*Menyanthes trifoliata*) and St John's Wort (*Hypericum elodes*). Sand is a notable feature of Sherkin Island and occurs to a small extent elsewhere. Wild Radish (*Raphanus raphanistrum*), Crested Hairgrass (*Koeleria macrantha*) and Sea Storksbill (*Erodium maritimum*) grow in this habitat with a little Haresfoot Clover (*Trifolium arvense*), Knotted Clover (*T. striatum*) and the Red Data Book Lesser Centaury (*Centaurium pulchellum*).

Otter and Grey seal, two mammal species listed on Annex II of the EU Habitats Directive, occur within the site. Large seabird populations breed on some of the islands in the bay. These include Arctic/Common Terns (122 pairs in 1984) on Carrigviglash Rock. Terns are listed on Annex I of the EU Bird's Directive. On Cape Clear and the Calf and Goat Islands the 1990 totals were Fulmar (472 pairs), Cormorant (51 pairs), Shag (67 pairs), Black Guillemot (99 pairs), Lesser Black-backed Gull (252 pairs), Great Black-backed Gull 67 (pairs) and Herring Gull (185 pairs). There are also significant numbers of Choughs (18 pairs in 1992), another species listed on Annex I of the Bird's Directive. An important bird observatory is located on Cape Clear Island.

In conclusion, Roaringwater Bay and Islands is a site of exceptional conservation importance, supporting diverse marine and terrestrial habitats, six of which are listed under the EU Habitats Directive. The site is also notable for the presence of Otter and Grey Seal plus a number of rare species and also supports important sea bird colonies.

APPENDIX 2: SPECIES LISTS-MARINE

Species from rocky shore - littoral and sublittoral zones

Flora
Pelvetia canaliculta (Channeled wrack)
Fucus serratus (serrated wrack)
Laminaria digitata (kelp)
Chondus crispus (Carragheen moss)
Gigartina stellata
Palmaria palmata
Lomentaria articulata
Ulva lactuca

Fauna
Calliostoma zizyphinum (Painted topshell)
Littorina littorea(Common periwinkle)
Littorina saxatilis
Gibbula cineria (Grey topshell)
Chthamalus stellatus (barnacle)
Pomotocerous lamarki. (Tube Worm).
Archidonis pseudoargus (Sea lemon)
Halichondria panicea (breadcrumb sponge)
Carcinus maenus (common shore crab)
Cancer pagurus (edible crab)
Asterias rubens (common starfish)
Mytilus edulis (mussel)
Chthamalus stellatus (barnacle)
Ledipopleurus asellus (Coat of mail chiton)
Patella vulgata (common limpet)
Gammurus duebeni (freshwater shrimp)
Talitrus saltator (sand hopper)
Leander serratus (common prawn)
Actinia equina (beadlet anemone)
Anemonia sulcata (opulet anemone)
Taelia felina (anemone)
Syngathidae sp. (Pipefish)
Goby (species not identified)
Blennius pholis (shanny)
Thick lipped grey mullet (Chelonlabrosus)
Species of hydrozoa and bryozons colonizing the brown seaweeds.

Sediment Samples from littoral and sublittoral zones

Sample 1- sublittoral zone
Consists of stones with fine mud.

Turritella communis (tower shell)
Hinia incrassata (Thick lipped dogwhelk)
Modiolus modiolus (Horse mussel) Small size.
Tubificid sp. worms (sludge worms).

Sample 2- lower edge of littoral zone during low spring tide

Consists of very fine anoxic mud.

Gibbula cinera
Littorina saxatalis
Tubificid sp.worms (sludge worms).
Arenicola marina (lugworm)

Sample 3- littoral zone lower shore

Stony sample with shells and mud.

Crab of order portunidae
Carcinus maenes (Common shore crab).
Nemertean worms 2 separate species that were not identifiable.

Sample 4- littoral zone lower shore

Littorina littorea(Common periwinkle)
Actinia equina (Beadlet anenome)
Tubificid worms (sludge worms).
Eulalia viridis

Sample 5- sublittoral zone

Gravel, some stones and fine mud

On rocks, Chthamalus stellatus and Pomotocerous lamarki.
Tapes decussates
Tubificid worms (sludge worms)
Xantho incisus (Furrowed crab)
Ophiura ophiura (Brittle star)

APPENDIX 3: REFERENCES

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Dixon .Brosnan environmental consultants	
Project title	Additional information on the ecological impacts of providing an upgraded Wastewater Treatment System at Baltimore, Co. Cork.
Client	T.J. O' Connor & Associates
Client ref.	-
D.B ref.	DB5007
Revision	0-issue to client
Date	26 October 2004
approved by	Carl Dixon B. Sc. (Applied Ecology)
on behalf of Dixon.Brosnan	

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1. INTRODUCTION

Dixon.Brosnan environmental consultants were asked by T.J O Connor & Associates to carry out an environmental impact assessment in respect of an upgraded wastewater treatment plant to be constructed at Baltimore, Co. Cork. The following ecological assessments were requested by the Heritage section of the Department of Environment (Duchas):

- *Biological communities over which the activity will impact including an inventory of flora and fauna (in fauna, epifauna and marine animals).*

- *If the development requires a foreshore licence the biological communities or habitats likely to be impacted must be described.*

- *Construction activities that may impact upon resident and/or transient bird and mammal populations.*

- *Will construction activities result in noise/visual disturbance to marine mammals?*

Following surveys at the site a report on its ecology was produced in March 2004. Following a review of this report, further information was requested by Duchas. This report addresses the following requests.

1.Clarification on the discharge point and its position in relation to photo 4 in the original Dixon.Brosnan report.

2. Identification of species not originally surveyed and additional information on sublittoral/fringe areas following the completion of a dye study.

DIXON.BROSAN RESPONSE

1.Clarification on the discharge point and its position in relation to photo 4 in the original Dixon.Brosnan report.

Photo 4 of the original Dixon.Brosnan Report was taken at a low spring tide and showed rocky habitats adjacent to the route of the pipeline. The rocky outcrop, which is covered with kelp and visible in the foreground, is relatively close to the line of the discharge pipe. However it will not be affected by construction of the pipeline. Photograph A below shows the approximate area of littoral/sublittoral habitat, which will be affected by the pipeline.

2. Identification of species not originally surveyed and additional information on sublittoral/fringe areas following the completion of a dye study.

Subsequent to the initial Dixon.Brosnan report Irish Hydrodata conducted a dye study. The objective of this study was to predict the probable dispersion route of effluent, which would be discharged from the new pipeline.

A dive survey was carried in October 2004 to provide additional information on the habitats, which could be affected directly by the pipeline construction, and habitats occurring along the predicted dispersal route of the effluent. Further details of this survey are given in Appendix 1.

Transect along the proposed pipeline

The littoral habitats which will be affected by the construction of the pipeline (*Shingle and gravel shores LS1, Moderately exposed rocky shores LR2)* were examined during the initial survey. The fringe habitat (between the littoral and sublittoral zones) is generally similar to the rocky shore habitat noted in the original survey. A list of the species noted is listed under Sample E.

A dive survey was conducted along the pipeline route and two samples were taken. Sample A was taken from sediment at the beginning of the sublittoral zone. This habitat is classified (Fossit, 2000) as infralittoral mixed sediment SS4 and is characterised by various mixtures of sediments (gravel and sand) with shells and large stones on the surface. Species diversity was low and few species were recorded from this location.

A second sample (Sample B) was taken from the discharge point. The habitat as this location is also classified as infralittoral mixed sediment SS4 and is characterised by various mixtures of sediments (gravel and sand) with shells and large stones on the surface. Species diversity was generally low although Tube building Terebellid bristleworms of species *Eupolymnia sp.* and juvenile cockles *Cerastoderma edule* were noted.

Samples taken along predicted dispersal route

Two additional samples were taken namely Sample C taken along the predicted dispersal route (spring tide) approximately 100m north east of the discharge point and Sample D taken approximately 100m south west of the discharge point. The area from which sample C was taken is classified as Infralittoral muds SS3. The fauna at this location is dominated by Terebellid bristleworms and Tubificid worms. At low tide extensive mud flats are visible further east. The area from which sample D was taken is classified as Infralittoral mixed sediment SS4 and is similar to Sample B with a mixture of gravel, shells and larger stones. It is noted however that the dispersal route of the discharge will depend on tides and winds and this survey covers a small fraction of the dispersal patterns. However this survey does indicate a general change from mixed coarser sediment at the outfall to finer muds in Church Strand Bay.

TERRESTRIAL HABITATS

No additional uncommon floral species were noted. An otter spraint was noted at the tip of the rocky outcrop located to the south west of the treatment plant however it is still considered unlikely that otters breed close to the site of the treatment plant. However as noted during the initial survey the vegetation on the top of the cliff face is used as a path by mammal species and should remain open. This precludes the use of continuous fencing and vertical concrete faces etc. which could block this path.

CONCLUSIONS

The habitats which will be affected by the pipeline will be Shingle and gravel shores LS1, Moderately exposed rocky shores LR2 and infralittoral mixed sediment SS4. These habitats are generally common in the area and no uncommon species were noted. The construction of the pipeline is therefore unlikely to have a significant ecological impact.

Areas of sublittoral rock which support dense growths of seaweed and which are partially uncovered at low spring tides are located to the south west of the proposed pipeline route. This type of habitat is not common in the immediate area and the pipeline route will avoid these rocky outcrops.

A dive survey along the predicted route of the effluent following construction of the pipeline indicates that the habitat located to the south west of the discharge point consists primarily of infralittoral mixed sediment SS4 and is similar to the habitats located at the discharge point.

To the north east of the discharge point the habitat was classified as Infralittoral muds SS3 and is dominated by typical oligochaete species.

APPENDIX 1

Description of sublittoral flora and fauna biotopes and sediment type from dive survey in Baltimore.

Date: 26/10/04
For: Dixon Brosnan
By: Shore Explorers marine research services

Materials and methods

The aim of the survey was to provide descriptions of the sublittoral habitats. On Sunday 17/10/04, four dives were carried out using SCUBA equipment. Each dive covered a 40m transect recording details of underwater flora and fauna. For each dive, a description was made of habitats within the site. Figure 1 shows location of dives A,B,C,D.

Figure 1: Sample collection sites Baltimore Harbour. Map not to scale.

The relative abundance of all conspicuous species present was recorded and classified as rare, occasional, frequent, common, abundant or super abundant using the scales in Hiscock (1990). Samples were taken for later identification of specimens.
Sediment samples were taken for benthos. A subsample of these was used for particle size analysis (PSA). Samples were kept cool in a cooler box to prevent decomposition effecting grain size. Sediments were sieved through full set of sand sieves and fractionated to gather fauna using a sprinkler. Samples were sorted using a white squared tray. Identification was carried out using a binocular viewer X100 and identified using Hayward and Ryland (1998). Specimen were not fixed but identified live. Sediments were classified according to the Wentworth scale (Wentworth 1922).

Inspection of admiralty chart showed topography and tidal currents in the area.

Results

Sample A:
Maximum depth of dive: 1m
Sediment type: silt covered pebbles and finer stones.
Benthos:

Annelids	
Serpulid bristleworms	
*Pomoteocerous triqueter (*Keel worm) on rocks.	Abundant
Echinoderms: Ophiura	
brittle star *Ophiura ophiura* and annelid worms.	Common
Crustaceans	
Carcinus maenes (shore crab)	
Pagarus sp.(hermit crabs)	
Green macroalgae	
Ulva lactuca (Sea lettuce)	Occasional

Sample B:
Maximum depth of dive:3m
Sediment type: silt with pebbles and granules.
Benthos:

Annelids	
Tube building Terebellid bristleworms *Eupolymnia sp.*	
Bivlaves	
Juvenile cockles *Cerastoderma edule.*	Frequent
Juvenile Tellinid	Occasional
juvenile Lutrariidaen	Occasional

Sample C:
Maximum depth of dive: 2.5m
Sediment type: Very fine sand and silt.
Benthos:

Brown macro algae	
Laminaria saccharina (sugar belt kelp)	Frequent
Cystoseira tamariscifolia.	Occasional

Green macro algae
Cladophora rupestris Occasional
Annelids
terebellid bristleworms Occasional
Tubificid worms Occasional

Sample D:
Maximum depth of dive: 4m
Sediment type: silty, gravelly bottom with pebbles present.
Annelid: polychaetes
Terebellid bristleworms abundant
Crustaceans:
Carcinus maenes shore crab occasional
Pagurus sp. (hermet crabs) occasional
Green macroalgae
ulva lactuca. occasional

Sample E:
Sample location: lower littoral zones.
Rock covering
Annelid
Serpulid bristleworm
Pomotocerous triqueter
Spirorbid bristleworm
Spirorbid sp.
Crustaceans
Semibalanus balanoides
Polyplacophoran mollusc
Chiton shell *Lepido chiton sp*
.
Brown Macroalgae:
Ascophyllum nodosum with epiphyte *Polysiponia lanosa.*
Laminaria digitata with colonies of bryozoans.
Fucus serratus with crustose and foliose bryozoans and epifauna of *Palmaria palmata.*
Greeen Macroalgae
Enteromorpha intestinalis
Red Macroalgae
Palmaria palmata
Gigartina stellata
Chondus Crispus with epifauna of colonial bryozoans.

Other factors,

Baltimore harbour is an area of extensive oyster and mussel farming. Studies have shown that improvement of water quality increases classification of bivalves farmed in the area so this should not be a problem. Loose bags of *Crassostrea gigas* were found on the shores surveyed.

Sherkin Island Marine Station has been monitoring the flora and fauna of the coast around Baltimore for the last twenty years (Bishop, 2003). This is the longest recording of marine life in the world.

Laminaria saccharina located at sample site C is a species indicative of sheltered conditions.

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DUCHAS DOCUMENTATION

SITE SYNOPSIS

SITE NAME: ROARINGWATER BAY

SITE CODE: 000101

Roaringwater Bay occurs at the south-western extremity of Cork. It is an island-filled bay bounded by Cape Clear and Sherkin on the south and the Mizen Head peninsula on the north. The site includes the immediate coastline on the mainland from Long Island to Baltimore together with the whole bay and most of the islands. Generally it is a low-lying coast of rather slatey sandstone but the southern edge rises, in line with the hills behind Baltimore, to culminate in a summit of 160m on Cape Clear.

The main vegetation is a coastal heath with an abundance of Autumn Gorse (Ulex gallii), Heather (Calluna vulgaris) and Bell Heather (Erica cinerea). This is regularly burnt in most places so that there are clearings where grasses and herbs such as Wood Sage (Teucrium scorodonia), Common Violet (Viola riviniana) and Tormentil (potentilla erecta) have a temporary rise to prominence before the shrubs grow again. Outcrops of rock bring variety into the heath and are the sites of the more interesting species. These include many southern plants, for example the rare and protected (Flora Protection Order, 1987) Hairy Birdsfoot Trefoil (Lotus subbiflorus), the commom Birdsfoot itself (Ornithopus perpusillus), Spotted Rockrose (Tubberaria guttata), Heath Violet (Viola lactea) and Lanceolate Spleenwort (Asplenium billotii) which generally grows on walls. In addition there is a small amount of Deptford Pink (Dianthus armeria), the only place it grows in Ireland though it was likely to have been introduced. Flushes and damp places through this vegetation support some interesting liverworts as well as Birdsfoot Clover (Trifolium ornithopodioides) and the special annual plants of the south-west, Chaffweed (Anagallis minima), Yellow Centaury (Cicendia filiformis) and Allseed (Radiola linoides). Chamomile (Chamaemelum nobile) is also common with yellow Bartsia (Parentucellia viscosa) somewhat less so.

Close to the sea the vegetation responds with Sea Pink (Armeria maritima) and Plantains (Plantago maritima, P. coronopus) and, locally, with Dotted Sedge (Carex punctata) and the Slender Spikerush (Eleocharis uniglumis). Little Robin (Geranium purpureum) occurs rarely on shingle beaches while Ray's Knotgrass (Polygonum raii) is more widespread.

Several streams are ponded by such beaches to create marshes of Reed (Phragmites australis) where Marsh Pennywort (Hydrocotyle vulgaris), Marsh Cinquefoil (Potentilla palustris) and Marsh Orchids (Dactylorhiza majalis. D. incarnata) are frequent together with some Creeping Willow (Salix repens) and Gypsywort (Lycopus europaeus). On Cape Clear a similar marsh has developed into a bog with abundant Sphagnum moss (S. squarrosum), Bogbean (Menyanthes trifoliata) and St John's wort (Hypericum elodes). Sand is a notable feature of Sherkin Island and occurs to a small extent elsewhere. Wild Radish (Raphanus raphanistrum), Crested Hairgrass (Koeleria macrantha) and Sea Storksbill (Erodium maritimum) grow in this habitat with a little

Haresfoot Clover (Trifolium arvense), Knotted Clover (T. striatum) and the rare Lesser Centaury (Centaurium pulchellum), protected by the Flora Protection Order, 1987.

The littoral and sub-tidal regions are also rich in species as they include a very wide range of habitat. The southern, coral-forming seaweed Lithophyllum dentatum is just one of many notable species. Common seals occur on several of the islands where there are also large seabird populations. These included 122 prs of Arctic/Common Terns (1984) on Carrigviglash Rock which was 42% of all those in Cork in that year. On Cape Clear and the Calf and Goat Islands the 1990 totals were Fulmar 472 prs, Cormorant 51 prs, Shag 67 prs, Black Guillemot 99 prs, Lesser Black-backed Gull 252 prs, Great Black-backed Gull 67 prs and Herring Gull 185 prs. There are also significant numbers of Choughs (18prs in 1992).

While the rare species have been singled out in this account they go to show that Roaringwater Bay is an exceptional site, probably because it lies at one of the climatic extremes in the country. Both on land and in the sea it represents a unit of unique ecological interest.

11th July, 1995.

HISTORICAL RAINFFALL DATA- MET EIREANN

STATION NAME: Baltimore

RP5 60min= 15.5 MM : RP5 2d=55.0 MM : ANNUAL RAINFALL = 1100

RAINFALL IN MM. FOR A RANGE OF DURATION AND RETURN PERIOD

	RETURN PERIOD (YEARS)						
DURATION	1/2	1	2	5	10	20	50
15 min	4.7	5.9	6.6	8.9	10.9	13.0	16.5
30 min	6.3	7.8	8.8	11.9	14.5	17.3	22.0
60 min	8.4	10.4	11.6	15.5	18.6	22.2	27.7
2 hr	11.3	13.9	15.2	19.8	23.4	27.3	33.3
4 hr	15.3	18.4	20.2	25.9	30.2	34.9	42.1
6 hr	18.8	22.5	24.3	30.8	35.7	40.7	48.7
12 hr	23.8	28.5	30.8	39.0	45.3	51.5	61.7
24 hr	30.1	35.4	38.8	47.8	54.5	62.2	72.7
48 hr	36.7	43.1	47.2	58.3	66.5	75.8	88.6

DISPERSION CALCULATIONS FOR TREATED EFFLEUNT OUTFALL

(a) Dilutions Provided To Effluent Before Reaching Nearest Shellfish Beds:

- Distance between outfall and nearest shellfish beds = 300m
  Assume forward velocity of effluent = 0·1 m/s

  Volume of receiving water, V_w, assuming a conservative lateral dispersion of half the rate of forward progressions, giving a plume plan area of (150m*300m)/2 and average depth of 2.0m: **$V_w = 45 * 10^3$ m^3**

- DWF = 2669 pe @ 227 l/h/d $*10^{-3}$ /24hrs = 25·2m^3/hr
  Assume average discharge rate of 1.5 DWF = 37.9 m3/hr

  ⇒ Time of travel, t = 300 / 0·1 = 0·83 hr
  Volume of effluent = 37.9 m^3/hr * 0·83 hr = 31.5 m^3 i.e. **V_e = 31.5 m^3**

- **Dilution = V_w / V_e = 45 $*10^3$ / 31.5 = 1428**

(b) Decay Rate:

- % remaining = 100 $e^{-k\,t}$
- t = 0·83 hr ; assume k = 1
- **% remaining = 100 $e^{-0.83}$ = 44%**

(c) Faecal Coliform Concentrations Reaching Nearest Shellfish Area:

Raw Sewage

10^8 fc/100ml — Concentration of influent

SECONDARY — *Reduced by factor of 10*

10^7 fc/100ml

Disinfection — *Reduced to Bathing Waters Reg's Standard*

$2*10^3$ fc/100ml

DILUTION — **REDUCED BY FACTOR OF 1428**

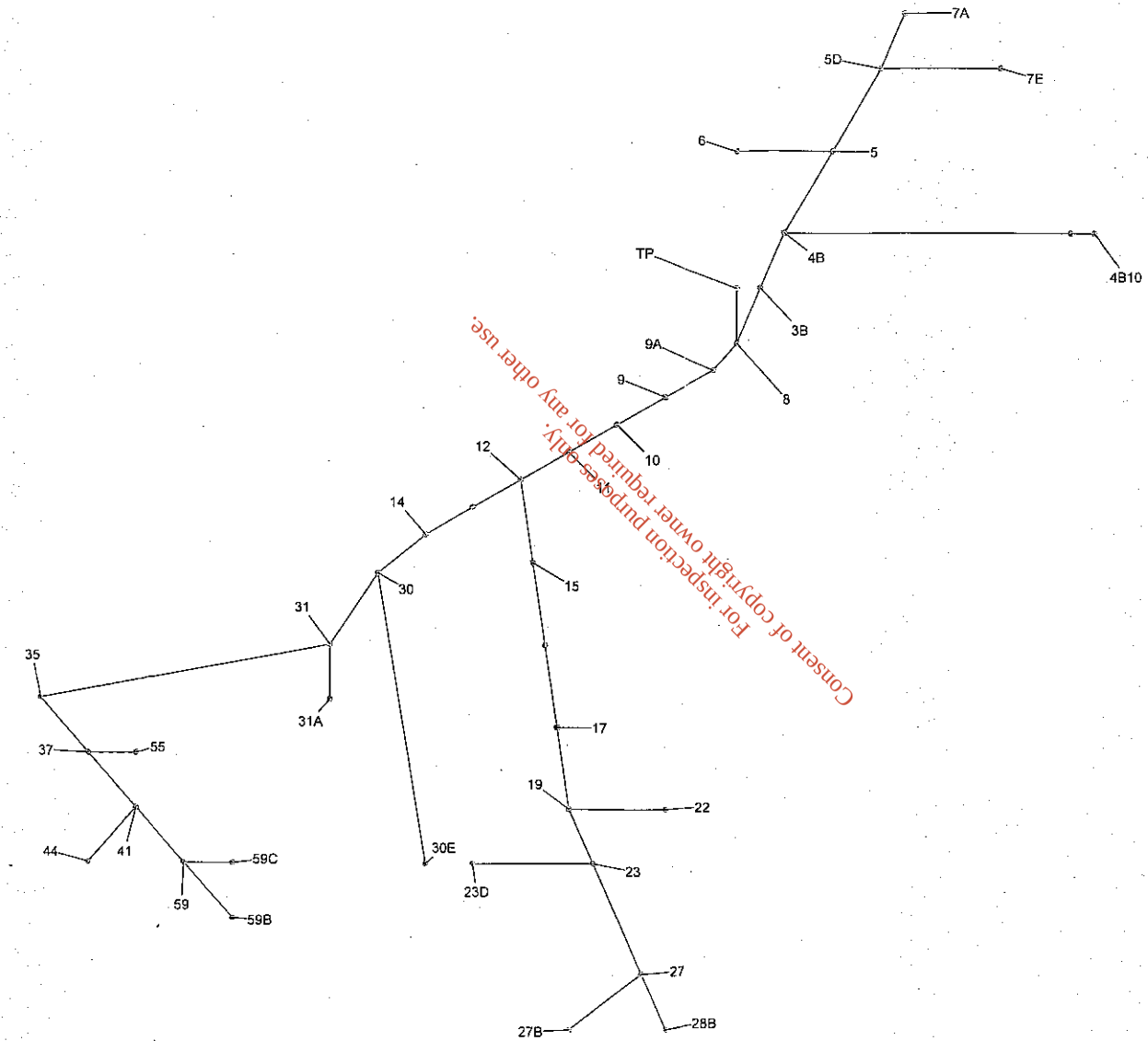
1.4 fc/100ml

DECAY / DIE-OFF — **REDUCED TO 44%**

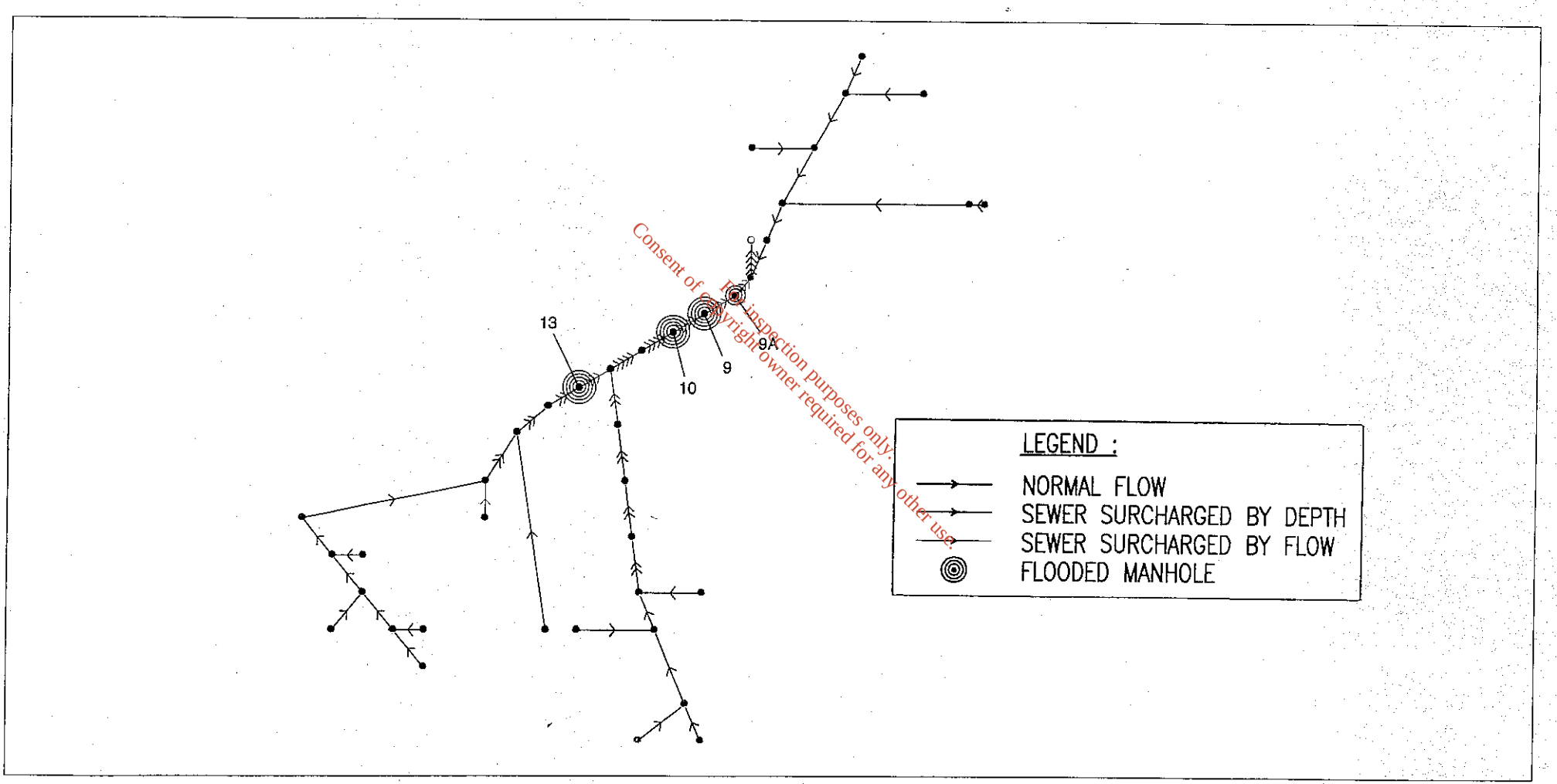
0.6 fc/100ml — Concentration at nearest shellfish bed

RESULTS OF HYDROWORKS MODEL

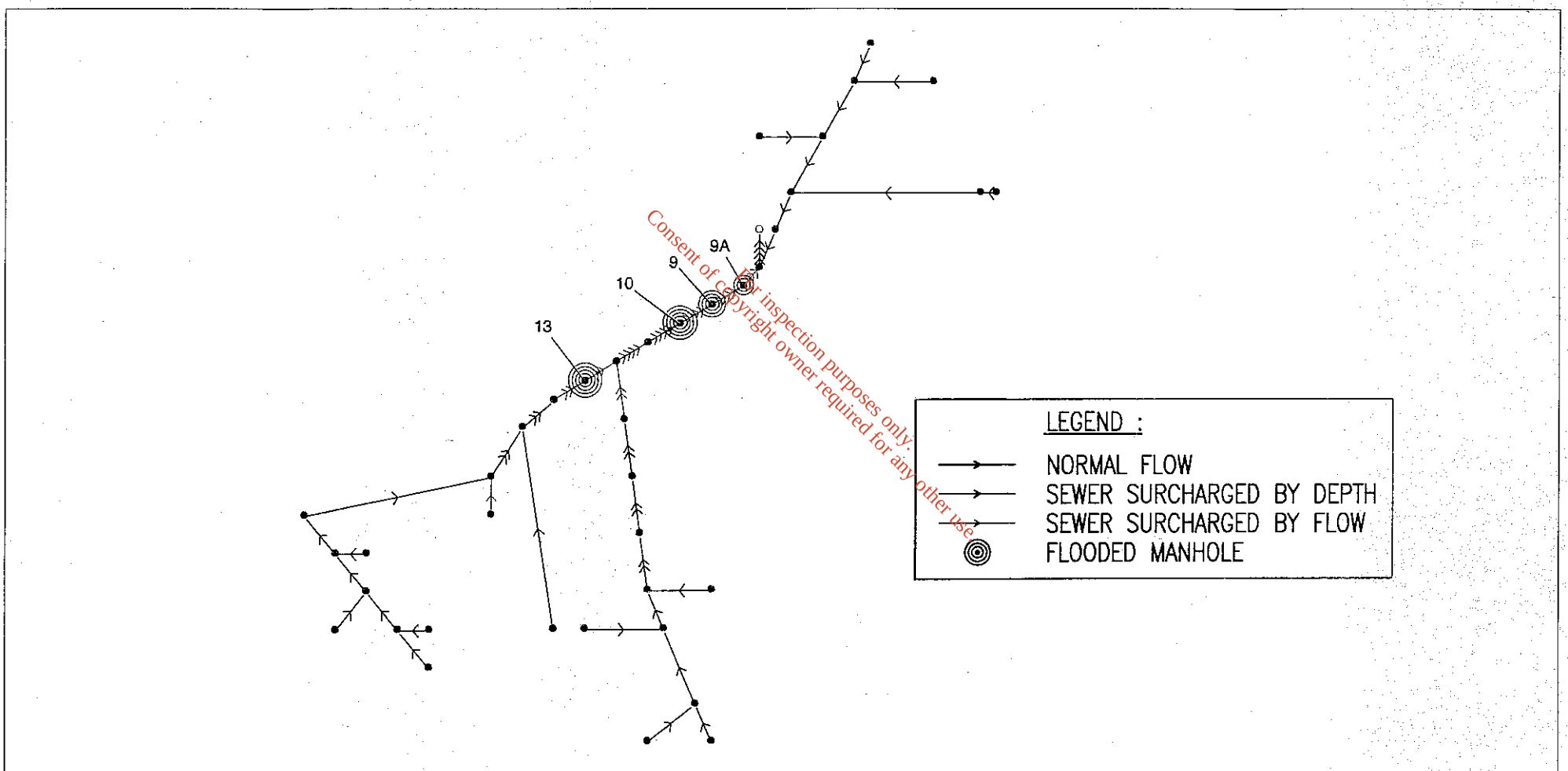
Date : 09:53:59 01/03/00	File : f:\priv\dmch\hydrow~1\baltimor\balti1.dsd	Schematic Layout of Baltimore SS (Exst.)



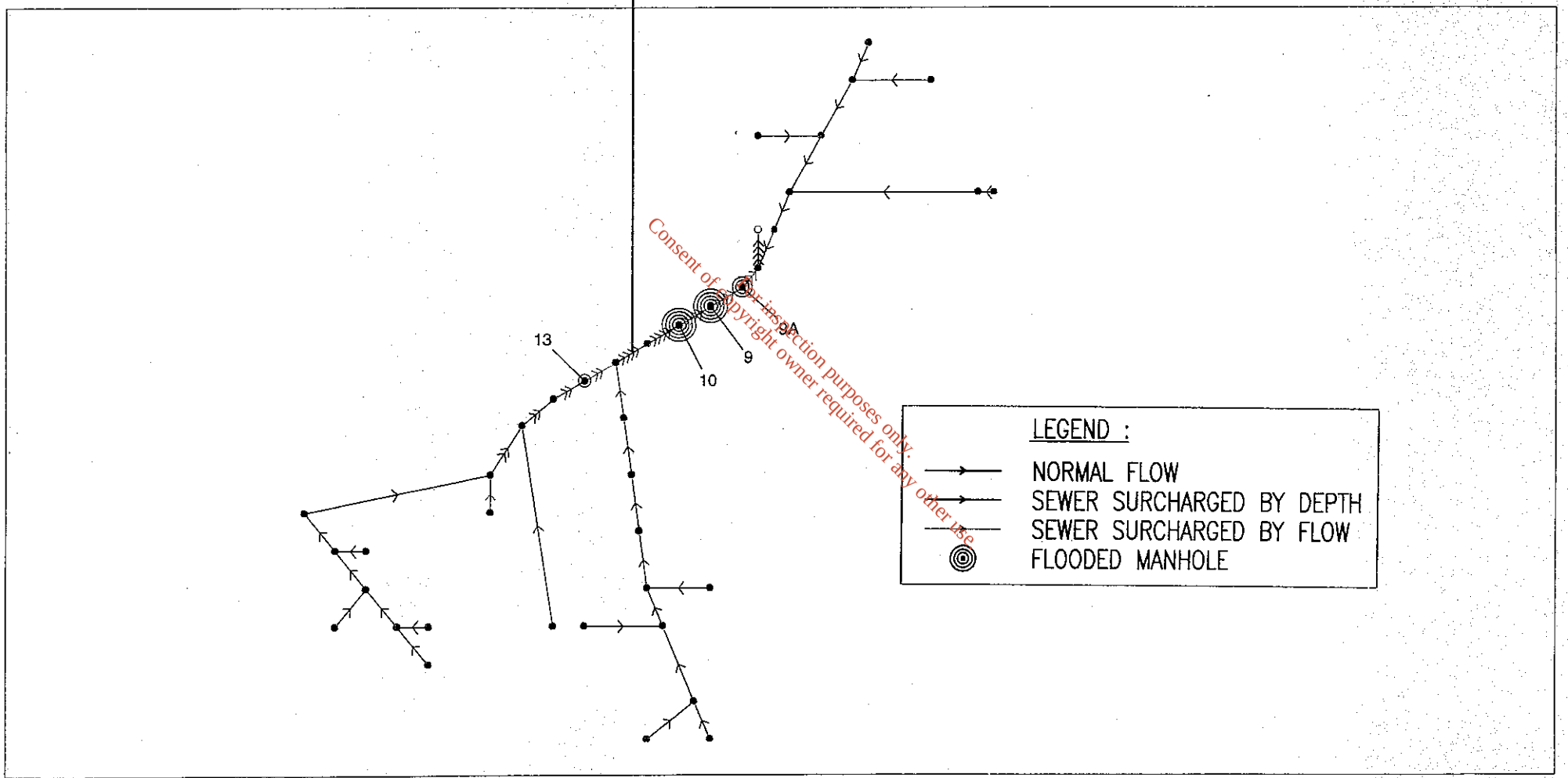
Date : 12:38:32 18/04/00	File : f:\priv\drnch\hydrow~1\baltimor\baltimor\r0000001.spr (balti1.dsd)
Plan of Existing System, Existing Winter Load	Maxima



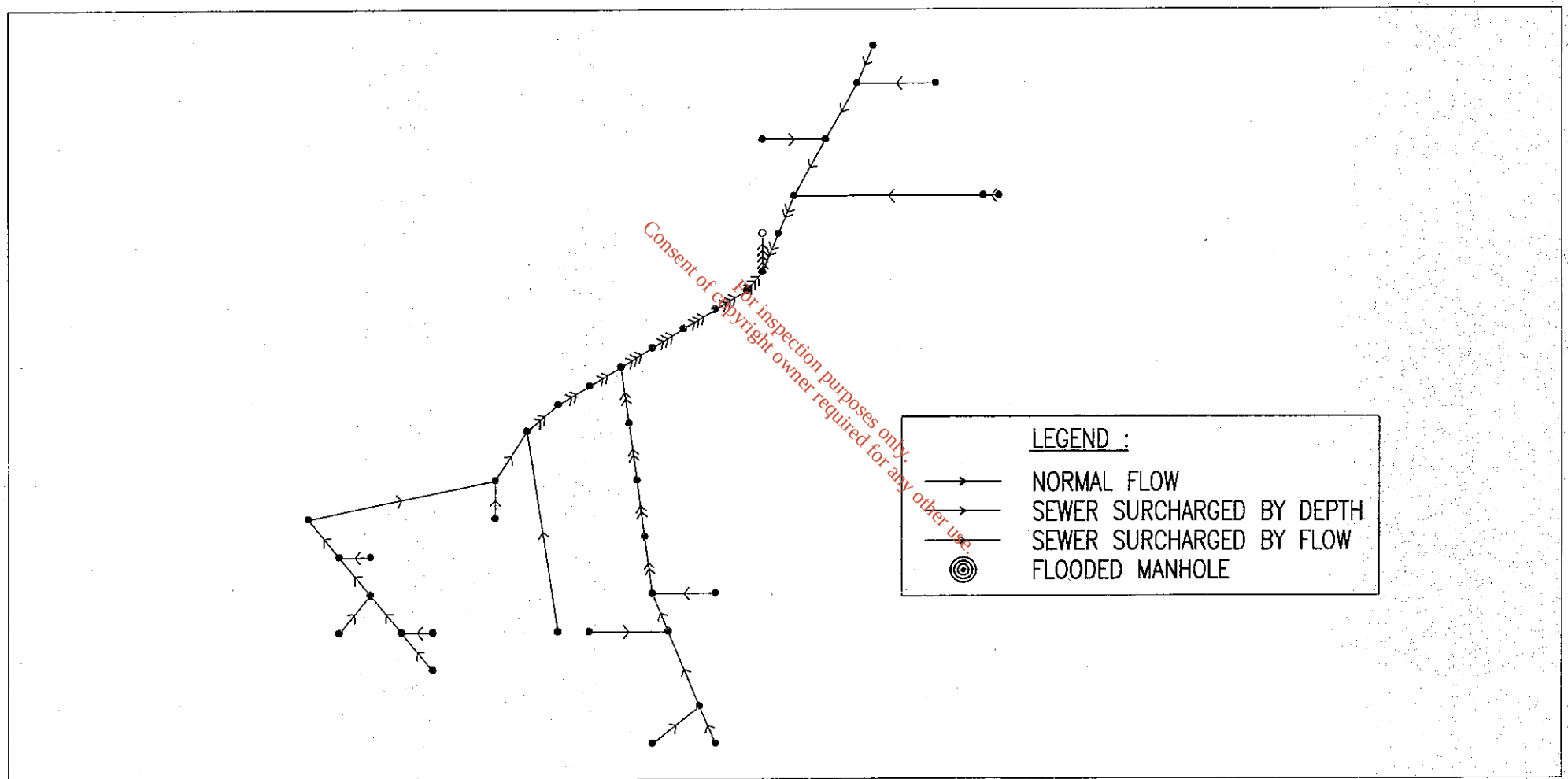
Date : 12:26:50 18/04/00	File : f:\priv\dmch\hydrow~1\baltimor\baltimor\r0000018.spr (balti2.dsd)
Plan of Existing System, Existing Summer Load	Maxima



Date : 12:31:45 18/04/00	File : f:\priv\dmch\hydrow~1\baltimor\baltimor\r0000007.spr (balti3.dsd)
Plan of Existing System, Future Summer Load	Maxima



Date : 12:05:17 18/04/00	File : f:\priv\dmch\hydrow~1\baltimor\baltimor\r0000008.spr (balti4.dsd)
Plan of Proposed System, Future Summer Load	Maxima



HydroWorks(tm) SIM

Summary output from pre-processor

Version 5.0.054 dated Oct 1999

Licence Number - WS016603PM

oduced from file ...\balti4.dsd
nd use definitions from ...\default.lud

otal contributing area (ha)	1.2
Total pipe length (m)	3690
r of computational nodes	915
mber of int. nodes / ponds	39
Number of outfalls	1
Number of links	39

******** Land use data ********

nd use Index	Population Density (person/ha)	DWF Infiltration Index	Flow Index	Connectivity (%)	< Surface 1 > Runoff Index	< Surface 1 > Pollut Index	< Surface 2 > Runoff Index	< Surface 2 > Pollut Index	< Surface 3 > Runoff Index	< Surface 3 > Pollut Index
1	50	1	0	100	10	1	20	1	21	1
2	50	2	0	100	10	2	20	2	21	2
3	100	3	0	100	10	3	20	3	21	3
4	100	4	0	100	10	4	20	4	21	4
5	150	5	0	100	10	5	20	5	21	5
6	150	6	0	100	10	6	20	6	21	6
7	150	7	0	100	10	7	20	7	21	7
8	150	8	0	100	10	8	20	8	21	8
9	0	9	0	100	10	9	20	9	21	9
10	0	10	0	100	10	10	20	10	21	10
11	100	11	0	100	10	11	20	11	21	11
12	100	12	0	100	10	12	20	12	21	12
99	0	0	-1	0	10	1	20	1	21	1

********** Node data **********

Node Ref	Map Reference	Ground Level (m AD)	Area (ha)	Connection Density	Floor Level (m AD)	Chamber Area (m2)	Roof Level (m AD)	Shaft Area (m2)	Flood Type	< Flood Area 1> Level (m AD)	< Flood Area 1> Area (ha)	< Flood Area 2> Level (m AD)	< Flood Area 2> Area (ha)

59B	0040000600	44.77	0.014	0.0	43.660	0.7	43.810	0.7	1	45.77	0.00	143.77	0.01
59C	0040000700	37.38	0.001	0.0	36.000	0.8	36.225	0.8	1	38.38	0.00	136.38	0.00
59	0030000700	37.98	0.014	0.0	35.760	0.8	35.985	0.8	1	38.98	0.00	136.98	0.01
44	0010000700	36.99	0.014	0.0	35.000	0.7	35.150	0.7	1	37.99	0.00	135.99	0.01
41	0020000800	29.76	0.001	0.0	28.330	0.8	28.555	0.8	1	30.76	0.00	128.76	0.00
55	0020000900	30.78	0.028	0.0	29.710	0.7	29.860	0.7	1	31.78	0.00	129.78	0.03
37	0010000900	24.04	0.014	0.0	22.250	0.8	22.475	0.8	1	25.04	0.00	123.04	0.01
35	0000001000	16.06	0.001	0.0	15.050	0.8	15.275	0.8	1	17.06	0.00	115.06	0.00
31A	0060001000	14.70	0.100	0.0	13.500	0.7	13.650	0.7	1	15.70	0.01	113.70	0.10
31	0060001100	14.70	0.200	0.0	13.300	0.8	13.525	0.8	1	15.70	0.02	113.70	0.20
30E	0080000700	30.23	0.001	0.0	28.810	0.8	29.035	0.8	1	31.23	0.00	129.23	0.00
30	0070001230	13.25	0.001	0.0	12.100	0.8	12.325	0.8	1	14.25	0.00	112.25	0.00
14	0080001300	12.55	0.001	0.0	11.450	0.8	11.675	0.8	1	13.55	0.00	111.55	0.00
13	0090001350	10.34	0.001	0.0	9.440	0.8	9.665	0.8	1	11.34	0.00	109.34	0.00
28B	0130000400	49.08	0.014	0.0	47.840	0.7	47.990	0.7	1	50.08	0.00	148.08	0.01
27B	0110000400	44.50	0.021	0.0	42.400	0.7	42.550	0.7	1	45.50	0.00	143.50	0.02
27	0125000500	42.49	0.042	0.0	40.270	0.8	40.495	0.8	1	43.49	0.00	141.49	0.04
23D	0090000700	30.93	0.028	0.0	29.430	0.8	29.655	0.8	1	31.93	0.00	129.93	0.03
23	0115000700	27.09	0.500	0.0	25.330	0.8	25.555	0.8	1	28.09	0.05	126.09	0.50
22	0130000800	25.70	0.028	0.0	24.500	0.7	24.650	0.7	1	26.70	0.00	124.70	0.03
19	0110000800	25.46	0.001	0.0	24.030	0.8	24.255	0.8	1	26.46	0.00	124.46	0.00
17	0107500950	17.82	0.014	0.0	16.790	0.8	17.015	0.8	1	18.82	0.00	116.82	0.01
16	0105001100	16.63	0.014	0.0	15.360	0.8	15.585	0.8	1	17.63	0.00	115.63	0.01
15	0102501250	12.69	0.001	0.0	11.430	0.8	11.655	0.8	1	13.69	0.00	111.69	0.00
12	0100001400	11.14	0.001	0.0	8.950	0.9	9.250	0.9	1	12.14	0.00	110.14	0.00
11	0110001450	9.67	0.001	0.0	7.870	0.9	8.170	0.9	1	10.67	0.00	108.67	0.00
10	0120001500	7.70	0.001	0.0	6.350	0.9	6.650	0.9	1	8.70	0.00	106.70	0.00
9	0130001550	6.81	0.001	0.0	6.060	0.9	6.360	0.9	1	7.81	0.00	105.81	0.00
9A	0140001600	6.94	0.035	0.0	6.000	0.9	6.300	0.9	1	7.94	0.00	105.94	0.04
7A	0180002250	24.26	0.001	0.0	23.610	0.8	23.835	0.8	1	25.26	0.00	123.26	0.00
7E	0200002150	29.08	0.001	0.0	27.000	0.8	27.225	0.8	1	30.08	0.00	128.08	0.00
5D	0175002150	24.53	0.001	0.0	23.210	0.8	23.435	0.8	1	25.53	0.00	123.53	0.00
6	0145002000	24.51	0.001	0.0	22.710	0.8	22.935	0.8	1	25.51	0.00	123.51	0.00
5	0165002000	20.25	0.028	0.0	17.850	0.8	18.075	0.8	1	21.25	0.00	119.25	0.03
4B10	0220001850	22.01	0.014	0.0	21.680	0.7	21.780	0.7	1	23.01	0.00	121.01	0.01
4B9	0215001850	21.37	0.014	0.0	20.770	0.8	20.995	0.8	1	22.37	0.00	120.37	0.01
4B	0155001850	14.43	0.001	0.0	13.060	0.8	13.285	0.8	1	15.43	0.00	113.43	0.00
3B	0150001750	8.13	0.021	0.0	6.980	0.9	7.280	0.9	1	9.13	0.00	107.13	0.02
8	0145001650	7.19	0.001	0.0	5.650	0.9	5.950	0.9	1	8.19	0.00	106.19	0.00
TP*	0145001750	7.00											

Nodes marked '*' are outfalls

******** Catchment data *******

Node Ref	Area (ha)	Land Use	Population	Soil Class	DWF Idx	<Infiltration> Flow (m3/s)	Index	Rain Prof	< Surface 1 > Area (ha)	Run	Pol	< Surface 2 > Area (ha)	Run	Pol	< Surface 3 > Area (ha)	Run	Pol	Conn (%)
59B	0.014	99	0	4	0	0.00013	0	1	0.014	10	1	0.000	20	1	0.000	21	1	0
59C	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0
59	0.014	99	0	4	0	0.00013	0	1	0.014	10	1	0.000	20	1	0.000	21	1	0
44	0.014	99	0	4	0	0.00013	0	1	0.014	10	1	0.000	20	1	0.000	21	1	0
41	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0
55	0.028	99	0	4	0	0.00025	0	1	0.028	10	1	0.000	20	1	0.000	21	1	0

37	0.014	99	0	4	0	0.00013	0	1	0.014	10	1	0.000	20	1	0.000	21	1	0		
35	0.001	99	0	4	0	0.00025	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
31A	0.100	99	0	4	0	0.00000	0	1	0.100	10	1	0.000	20	1	0.000	21	1	0		
31	0.200	99	0	4	0	0.00000	0	1	0.200	10	1	0.000	20	1	0.000	21	1	0		
30E	0.001	99	0	4	0	0.00202	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
30	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
14	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
13	0.001	99	0	4	0	0.00032	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
28B	0.014	99	0	4	0	0.00100	0	1	0.014	10	1	0.000	20	1	0.000	21	1	0		
27B	0.021	99	0	4	0	0.00019	0	1	0.021	10	1	0.000	20	1	0.000	21	1	0		
27	0.042	99	0	4	0	0.00038	0	1	0.042	10	1	0.000	20	1	0.000	21	1	0		
23D	0.028	99	0	4	0	0.00035	0	1	0.028	10	1	0.000	20	1	0.000	21	1	0		
23	0.500	99	0	4	0	0.00000	0	1	0.165	10	1	0.000	20	1	0.335	21	1	0		
22	0.028	99	0	4	0	0.00025	0	1	0.028	10	1	0.000	20	1	0.000	21	1	0		
19	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
17	0.014	99	0	4	0	0.00013	0	1	0.014	10	1	0.000	20	1	0.000	21	1	0		
16	0.014	99	0	4	0	0.00013	0	1	0.014	10	1	0.000	20	1	0.000	21	1	0		
15	0.001	99	0	4	0	0.00010	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
12	0.001	99	0	4	0	0.00051	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
11	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
10	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
9	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
9A	0.035	99	0	4	0	0.00169	0	1	0.035	10	1	0.000	20	1	0.000	21	1	0		
7A	0.001	99	0	4	0	0.00050	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
7E	0.001	99	0	4	0	0.00320	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
5D	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
6	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
5	0.028	99	0	4	0	0.00025	0	1	0.028	10	1	0.000	20	1	0.000	21	1	0		
4B10	0.014	99	0	4	0	0.00063	0	1	0.014	10	1	0.000	20	1	0.000	21	1	0		
4B9	0.014	99	0	4	0	0.00234	0	1	0.014	10	1	0.000	20	1	0.000	21	1	0		
4B	0.001	99	0	4	0	0.00524	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		
3B	0.021	99	0	4	0	0.00619	0	1	0.021	10	1	0.000	20	1	0.000	21	1	0		
8	0.001	99	0	4	0	0.00000	0	1	0.001	10	1	0.000	20	1	0.000	21	1	0		

Total population	0
Total infiln. flow (m3/s)	0.02941
Total area surface 1 (ha)	0.841
Total area surface 3 (ha)	0.335

********** Link data **********

Link	D/S <		Conduit			> <	Roughness	> <	Sed	> <	Upstream				> <	Downstream				>	Slope	Conduit	No.	S
eference	Node	Len	Shape	Width	Hgt	Bottom	Top	Dpth	Ty	Invert	<Loss	>	Set		Invert	<Loss	>	Set			Cap	Comp	M	
		(m)		(mm)	(mm)			(mm)		(m AD)	T	Coeff	Eff		(m AD)	T	Coeff	Eff			(m3/s)	Node		
59B.1	59	50	CIRC	150	150	1.50	1.50	0	0	43.660	1	1.00	0		35.760	1	1.00	0		0.1580	0.062	18	0	
59C.1	59	20	CIRC	225	225	1.50	1.50	0	0	36.000	1	1.00	0		35.760	1	1.00	0		0.0120	0.050	5	0	
59.1	41	125	CIRC	225	225	1.50	1.50	0	0	35.760	1	1.00	0		28.330	1	1.00	0		0.0594	0.112	29	0	
44.1	41	75	CIRC	150	150	1.50	1.50	0	0	35.000	1	1.00	0		28.330	1	1.00	0		0.0889	0.046	26	0	
41.1	37	80	CIRC	225	225	1.50	1.50	0	0	28.330	1	1.00	0		22.250	1	1.00	0		0.0760	0.126	19	0	
35.1	37	100	CIRC	150	150	1.50	1.50	0	0	29.710	1	1.00	0		22.250	1	1.00	0		0.0746	0.042	34	0	
37.1	35	95	CIRC	225	225	1.50	1.50	0	0	22.250	1	1.00	0		15.050	1	1.00	0		0.0758	0.126	22	0	
35.1	31	240	CIRC	225	225	1.50	1.50	0	0	15.050	1	1.00	0		13.300	1	1.00	0		0.0073	0.039	54	0	
31A.1	31	50	CIRC	150	150	1.50	1.50	0	0	13.500	1	1.00	0		13.300	1	1.00	0		0.0040	0.010	18	0	
31.1	30	95	CIRC	225	225	1.50	1.50	0	0	13.300	1	1.00	0		12.100	1	1.00	0		0.0126	0.051	22	0	
30E.1	30	220	CIRC	225	225	1.50	1.50	0	0	28.810	1	1.00	0		12.100	1	1.00	0		0.0760	0.126	50	0	

30.1	14	30	CIRC	225	225	1.50	1.50	0	0	12.100	1	1.00	0	11.450	1	1.00	0	0.0217	0.067	8	0
14.1	13	75	CIRC	225	225	1.50	1.50	0	0	11.450	1	1.00	0	9.440	1	1.00	0	0.0268	0.075	18	0
13.1	12	45	CIRC	225	225	1.50	1.50	0	0	9.440	1	1.00	0	8.950	1	1.00	0	0.0109	0.048	11	0
28B.1	27	140	CIRC	150	150	1.50	1.50	0	0	47.840	1	1.00	0	40.270	1	1.00	0	0.0541	0.036	48	0
27B.1	27	85	CIRC	150	150	1.50	1.50	0	0	42.400	1	1.00	0	40.270	1	1.00	0	0.0251	0.025	29	0
27.1	23	230	CIRC	225	225	1.50	1.50	0	0	40.270	1	1.00	0	25.330	1	1.00	0	0.0650	0.117	52	0
23D.1	23	140	CIRC	225	225	1.50	1.50	0	0	29.430	1	1.00	0	25.330	1	1.00	0	0.0293	0.078	32	0
23.1	19	15	CIRC	225	225	1.50	1.50	0	0	25.330	1	1.00	0	24.030	1	1.00	0	0.0867	0.135	5	0
22.1	19	85	CIRC	150	150	1.50	1.50	0	0	24.500	1	1.00	0	24.030	1	1.00	0	0.0055	0.011	29	0
19.1	17	80	CIRC	225	225	1.50	1.50	0	0	24.030	1	1.00	0	16.790	1	1.00	0	0.0905	0.138	19	0
17.1	16	55	CIRC	225	225	1.50	1.50	0	0	16.790	1	1.00	0	15.360	1	1.00	0	0.0260	0.074	13	0
16.1	15	60	CIRC	225	225	1.50	1.50	0	0	15.360	1	1.00	0	11.430	1	1.00	0	0.0655	0.117	14	0
15.1	12	25	CIRC	225	225	1.50	1.50	0	0	11.430	1	1.00	0	8.950	1	1.00	0	0.0992	0.144	7	0
12.1	11	15	CIRC	300	300	1.50	1.50	0	0	8.950	1	1.00	0	7.870	1	1.00	0	0.0720	0.264	5	0
11.1	10	20	CIRC	300	300	1.50	1.50	0	0	7.870	1	1.00	0	6.350	1	1.00	0	0.0760	0.271	5	0
10.1	9	65	CIRC	300	300	1.50	1.50	0	0	6.350	1	1.00	0	6.060	1	1.00	0	0.0045	0.065	12	0
9.1	9A	30	CIRC	300	300	1.50	1.50	0	0	6.060	1	1.00	0	6.000	1	1.00	0	0.0020	0.044	6	0
9A.1	8	70	CIRC	300	300	1.50	1.50	0	0	6.000	1	1.00	0	5.650	1	1.00	0	0.0050	0.069	13	0
7A.1	5D	40	CIRC	225	225	1.50	1.50	0	0	23.610	1	1.00	0	23.210	1	1.00	0	0.0100	0.046	10	0
7E.1	5D	70	CIRC	225	225	1.50	1.50	0	0	27.000	1	1.00	0	23.210	1	1.00	0	0.0541	0.107	17	0
5D.1	5	190	CIRC	225	225	1.50	1.50	0	0	23.210	1	1.00	0	17.850	1	1.00	0	0.0282	0.077	43	0
6.1	5	35	CIRC	225	225	1.50	1.50	0	0	22.710	1	1.00	0	17.850	1	1.00	0	0.1389	0.171	9	0
5.1	4B	120	CIRC	225	225	1.50	1.50	0	0	17.850	1	1.00	0	13.060	1	1.00	0	0.0399	0.091	28	0
4B10.1	4B9	75	CIRC	150	150	1.50	1.50	0	0	21.630	1	1.00	0	20.770	1	1.00	0	0.0115	0.017	26	0
4B9.1	4B	470	CIRC	225	225	1.50	1.50	0	0	20.770	1	1.00	0	13.060	1	1.00	0	0.0164	0.059	105	0
4B.1	3B	65	CIRC	225	225	1.50	1.50	0	0	13.060	1	1.00	0	6.980	1	1.00	0	0.0935	0.140	15	0
3B.1	8	200	CIRC	300	300	1.50	1.50	0	0	6.980	1	1.00	0	5.650	1	1.00	0	0.0066	0.080	34	0
8.1	TP	10	CIRC	300	300	1.50	1.50	0	0	5.650	1	1.00	0	5.000	1	1.00	0	0.0650	0.251	5	0

nd of summary listing

DESIGN CALCULATIONS FOR STORM SEWERS

DESIGN CALCULATIONS FOR SEWERS

Storm Sewers

1. Method of Calculation

The flow to be conveyed by the sewers was calculated using the Modified Rational Method:

$$Q = C_R * Cv \{I*A/0.36\}$$

where **Q** is the flow (l/s)

C_R is the Routing Factor, which is a constant (1.3) for the Modified Rational Method.

Cv is the Volumetric Runoff Coefficient. It is the proportion of water falling on the site that enters the drainage system. For permeable areas, Cv ranges between 0.1 and 0.5, depending on the specific site conditions. Two major factors influencing the value of Cv in Baltimore are the steep slopes of the area and the high bedrock in the area. These two factors increase the proportion of run-off entering the system, resulting in a relatively high value of Cv. Hence, a value of 0.4 is adopted for Cv for permeable areas.

For impermeable areas, Cv ranges between 0.6 and 0.9. A value of 0.75 is adopted for Cv for impermeable areas.

I is the maximum rainfall intensity of a storm event. An intensity of 50mm/hr is adapted.

A is the area of the catchment area (hectares)

After establishing the flow to be conveyed by the sewer, the diameter and gradient of the pipe are selected. The capacity of the chosen pipe is determined using Pipeflow computer package. Pipeflow calculates the capacity of a pipe using the Colebrook-White equation.

Provided that the chosen pipe has the capacity to cater for the flow to be conveyed, the sewer is accepted.

2. Proposed Storm Sewer from Relief Road (eastern end) to Outfall (Ref. Figure Nr. 5.10)

The catchment areas contributing to the flow in this sewer are shown in Figure Nr. M1. Area Nr. 1 is almost fully developed with low density housing. Most of this area currently drains to the existing storm sewer on the relief road (eastern end). Values for the variables relating to Area Nr. 1 are A = 1.8 ha, Cv = 0.75.

$\Rightarrow$ Q = 1.3*0.75*50*1.8/0.36 = 244 l/s

Area Nr. 2 is almost completely undeveloped. However, this area is within the development boundary (Ref. Figure Nr. 1.1). To allow for development of this area, a value of 0.75 is adapted for Cv. The size of Area Nr. 2 is 1.4 ha.

$\Rightarrow$ Q = 1.3*0.75*50*1.6/0.36 = 217 l/s

Area Nr. 3 is undeveloped. It is assumed that this area will remain as a permeable area. Hence, a value of 0.4 is assumed for Cv. The area is 2.7 ha.

$\Rightarrow$ Q = 1.3*0.4*50*2.7/0.36 = 195 l/s

The total flow from these catchment area is:

244 + 190 + 195 = 629 l/s

The capacity of a 525mm dia. sewer at a 1:43 gradient is 658 l/s. Such sewer is adopted from where it begins, at the relief road (eastern end) to the town centre.

At the town centre, an additional flow enters this sewer. The contributing area from the town centre is 0.5 ha. Since this area is impermeable, a value of 0.75 is taken for Cv.

$\Rightarrow$ Q = 1.3*0.75*50*0.5/0.36 = 68 l/s

A 300mm dia. branch sewer at a 1:80 gradient will convey this flow to the main storm sewer. The capacity of such a branch sewer is 110 l/s which is sufficient for a flow of 68 l/s.

The total flow to be conveyed in the main storm sewer increases to:

629 + 68 = 697 l/s

It is necessary to increase the size of the main storm sewer from 525mm dia. to 600mm dia. With a limiting gradient of 1:77, the capacity of a 600mm dia. sewer is 699 l/s.

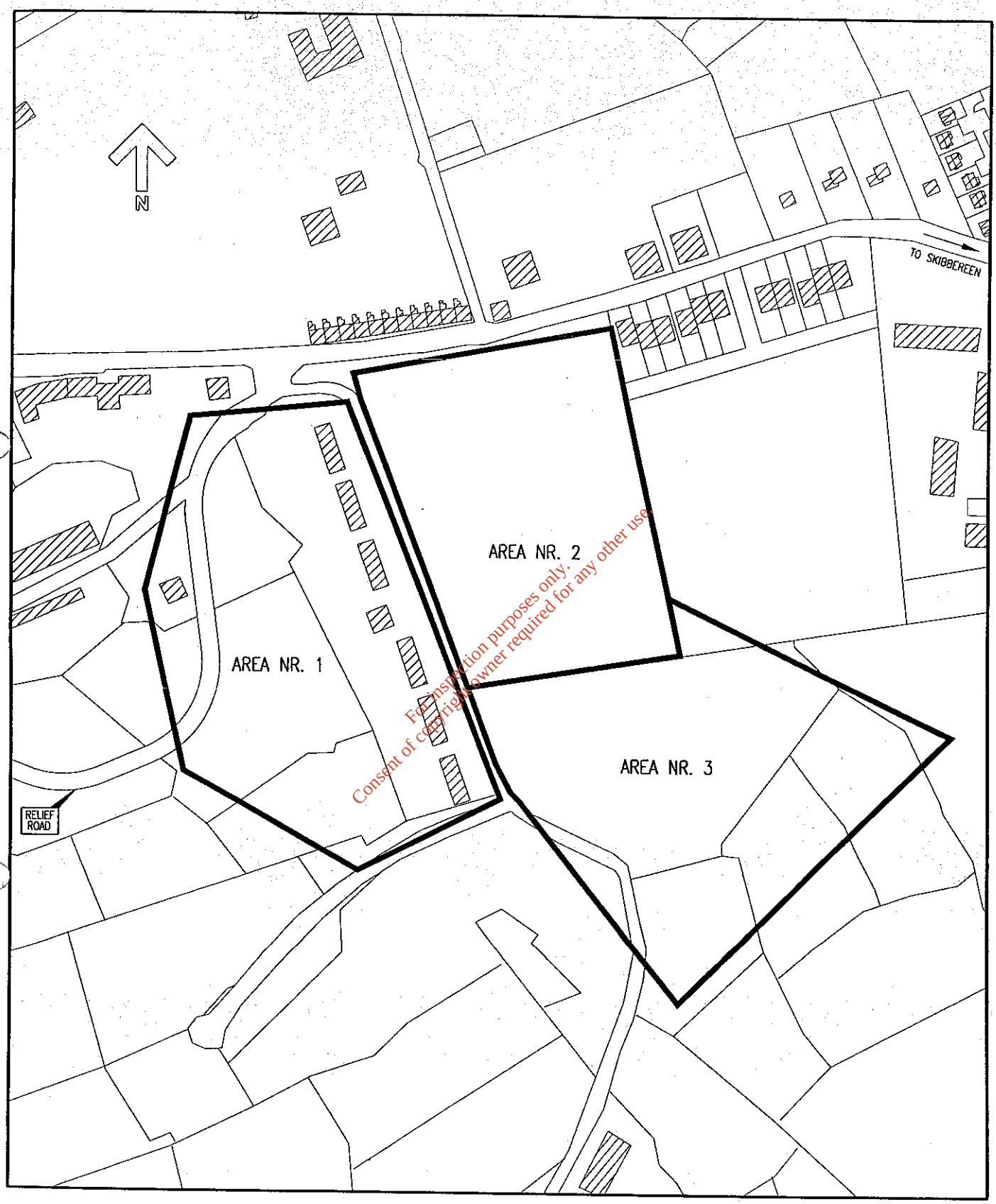


FIG. NR. M.1

BALTIMORE SEWERAGE SCHEME
CONTRIBUTING AREAS TO PROPOSED STORM SEWER
FROM RELIEF ROAD (EASTERN END)

SCALE 1:2500
DATE: APRIL '00
JOB NR. A6011
DRG NR. A6011-NK19

E.G. Pettit & Company
SPRINGVILLE HOUSE BLACKROCK ROAD CORK,
TEL. 021 966400 TELEX 76151 FAX:021 966153

3. Proposed Storm Sewer from Hill between Town Centre and Relief Road (Ref. Figure Nr. 5.11)

The catchment area is 0.85 hectares. Since the area is fully developed, Cv is set at 0.75.

$\Rightarrow$ Q = 1.3*0.75*50*0.85/0.36 = 115 l/s

A 300mm dia. pipe with a limiting gradient of 1:70 has a capacity of 117 l/s.

4. A separate storm sewer is required to cater for the flow from the hill behind Salisbury Terrace. There are two components to this flow:

(1) Flow intercepted behind Salisbury Terrace that is conveyed to the foul sewer.
(2) Flow that is conveyed to Baltimore Harbour by an open stream, two nr. 150 mmϕ pipes and culverts.

The proposed drainage system to convey this flow to Baltimore Harbour is shown in Figure 5.12.

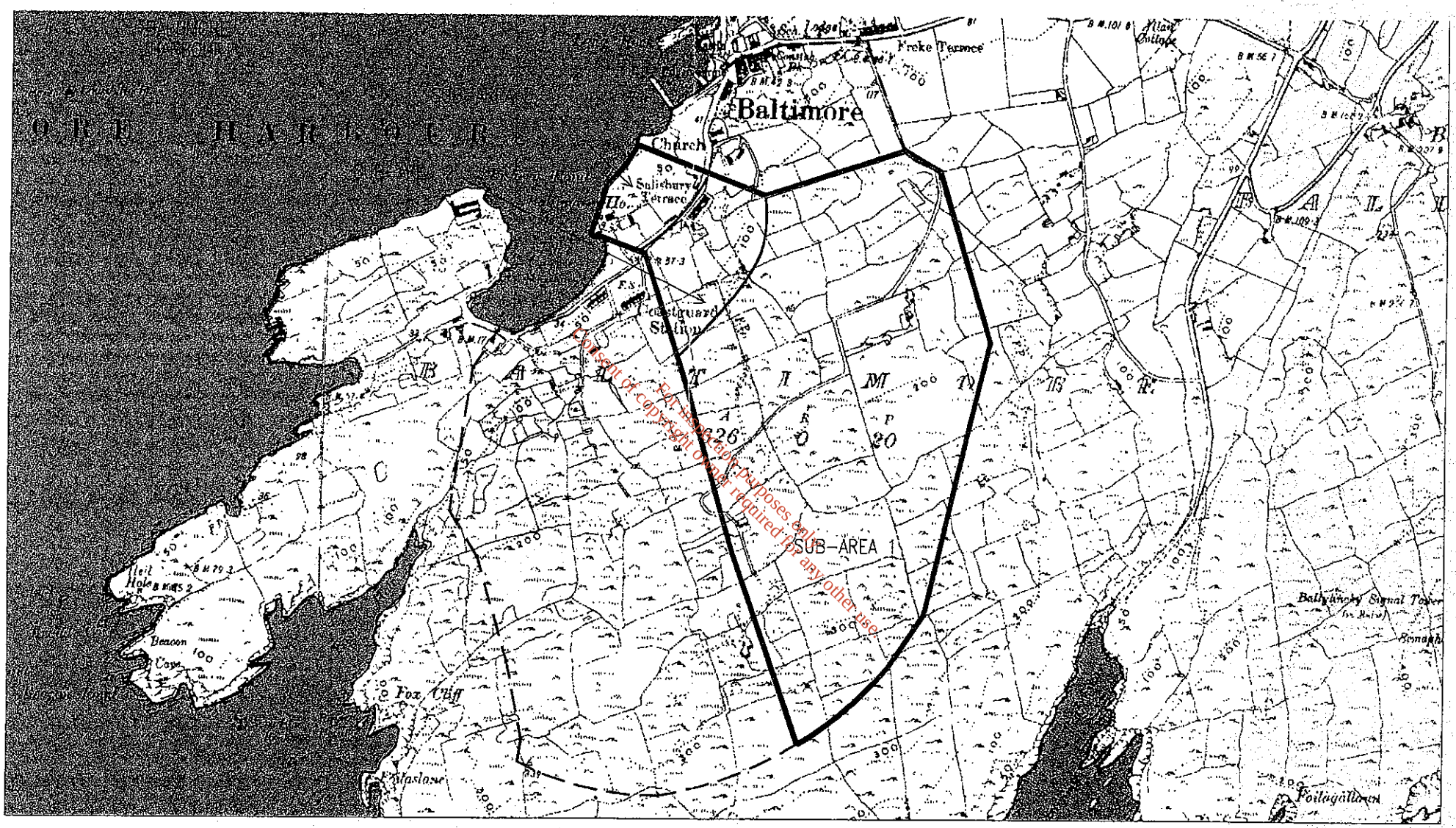
The relevant catchment area is shown in Figure Nr. M2. The area is 44 hectares. This is made up of three distinct areas.

Area 1 – Starting from the highest point of the catchment (south-eastern edge of catchment) down to the point where the drainage system begins. Area = 38 ha. A value of 0.4 is adapted for Cv as the area permeable $\Rightarrow$ Q = 1.3*0.4*50*38/0.36 = 2744 l/s.
If a 900mmϕ pipe is provided, the limited slope is 1:42 (capacity = 2758 l/s)

Area 2 – From the area where the drainage system begins down to the road. Area = 4 ha. A value of 0.75 is adapted for Cv as there is considerable residential development in this sub-catchment.
$\Rightarrow$ Q = 1.3*0.75*50*4/0.36 = 542 l/s
$\Rightarrow$ Total flow = 2744 + 542 = 3286 l/s

If the pipe is increased to 1050mm dia, the limiting slope is 1:65 (capacity = 3323 l/s)

Area 3 – From the road down to the foreshore. Area = 2 ha. This area will not be contributing to the design flow in the proposed drainage system because it is at a lower level than the system.



LEGEND:

CATCHMENT BOUNDARY OF INTEREST:-

CATCHMENT SUB-AREAS:-

OTHER CATCHMENTS:-

N

FIG. NR. M.2

BALTIMORE SEWERAGE SCHEME
CATCHMENT AREA

SCALE: 1:10000
DATE: APRIL '00
JOB NR. A6011
DRG NR. A6011-NK31

E.G. Pettit & Company
SPRINGVILLE HOUSE BLACKROCK ROAD CORK.
TEL. 021 966400 TELEX 76151 FAX:021 966153

The 1050 mm dia. pipe will flow along the Cove road to the point where it intercepts the existing 600mmϕ sewer from the relief road (southern end). The total flow from this point will be:

- From 1050mm dia. sewer : 3286 l/s
- From the 600mm dia. sewer that serves relief road (southern end) : Catchment area = 2.7 ha (see Figure Nr. M3)

Cv = 0.75 (since there is considerable residential development in this catchment area)

⇒ Q = 1·3*0·75*50*2·7/0·36 = 366 l/s

Total flow = 3286 +366 = 3652 l/s

A 1200mm dia. pipe with a limiting gradient of 1:100 is required (Capacity = 3,803 l/s)

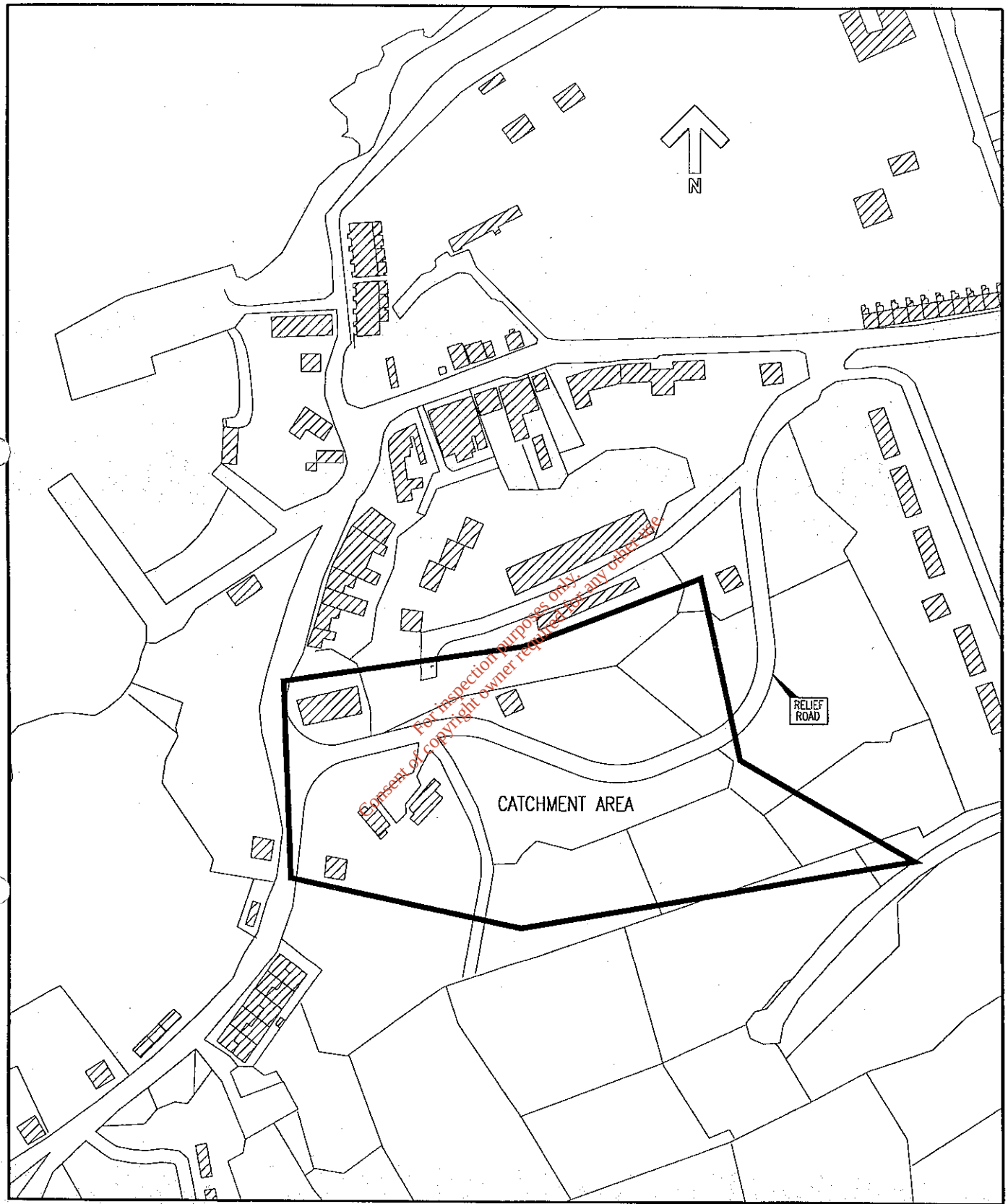


FIG. NR. M.3

BALTIMORE SEWERAGE SCHEME

CONTRIBUTING AREAS TO PROPOSED STORM SEWER FROM RELIEF ROAD (SOUTHERN SIDE)

SCALE 1:2500
DATE: APRIL '00
JOB NR. A6011
DRG NR. A6011-NK33

E.G. Pettit & Company
SPRINGVILLE HOUSE BLACKROCK ROAD CORK.
TEL. 021 966400 TELEX 76151 FAX:021 966153

WASTEWATER TREATMENT PLANT – DESIGN DATA

APPENDIX N

Baltimore Wastewater Treatment Plant

Design Data

1 Screening

Screen Type	Automatic, Mechanically Raked Fine Screen
Screenings Treatment	Washing, De-watering, Bagging.
Screening Aperture	6 mm
Screen Capacity	6.3 - 18.5 l/s

2 Inlet Flow Monitoring

Monitoring Equipment	In-line electromagnetic flowmeter Composite sampler
Design Capacity	6.3 - 18.5 l/s

3 Aeration Tank

Quantity	3 Nr Chambers
Operating Capacity	72 m^3 each
Aeration System	Diffused air

	Winter 2020	Summer 2020
Design BOD load	39 kg/day	160.1 kg/day
F/M (kg BOD/kg MLSS/day)	0.19	0.2
MLSS concentration	2,900 mg/l	3,700 mg/l
Operating Volume	72 m^3	216 m^3
Chambers operating	1 Nr.	3 Nr. in parallel
Oxygen Requirement	3.1 kg O_2/hr	12.8 kg O_2/hr
Air Requirement	74 Nm^3/hr	300 Nm^3/hr
Blowers Operating	1 Nr + standby	2 Nr + standby
Power Absorbed	3.8 kW	11.4 kW

4 Secondary Settlement Tanks

Settlement Tank type	Circular, Radial flow
Quantity	2 Nr
Internal Diameter	7.3 m
Operating Mechanism	Peripheral drive, rotating half bridge scraper system

	Winter 2020	Summer 2020
Tanks operating	1 Nr	2 Nr. in parallel
Peak Flowrate	8.0 l/s	18.5 l/s
Upward flow velocity (@ peak flow)	0.69 $m^3/m^2/hr$	0.80 $m^3/m^2/hr$

5 Sludge Pumping

	Winter 2020	Summer 2020
Sludge Return Rate (variable)	14 m^3/hr	33.3 m^3/hr
Excess Sludge Produced	43 kg ds/day	176 kg ds/day
Excess sludge pumping	9 m^3/day	35 m^3/day
Control Method	timer	timer

6 Sludge Thickening

Sludge Thickening Method	Gravity Belt Thickener
Required Sludge Thickness	6 % dry solids
Thickening Capacity	100 kg dry solids per hour

	Winter 2020	Summer 2020
Daily sludge volume (@0.5 %)	8.6 m^3	35 m^3
Operating Hours	3 hrs/week	12 hrs/week
Thickened sludge volume	5 m^3/week	20.5 m^3/week

7 Thickened Sludge Storage

Storage Tank Capacity	20.5 m^3
Stabilisation Method	Intermittent aeration

8 Disinfection

Disinfection Method	Ultra Violet Irradiation
Disinfection Standard	<2,000 Faecal Coliforms/100 ml as 95%ile

Section G

Attachment G1

Supporting Information :

- Recent Programme of Works

Cork County

Water Services Investment Programme 2007 - 2009

Schemes at Construction	W/S	Est. Cost
Cork North		
Mitchelstown Sewerage Scheme (Nutrient Removal)	S	221,000
Cork South		
Ballyvourney/ Ballymakeery Sewerage Scheme	S	3,049,000
Cobh/ Midleton/ Carrigtwohill Water Supply Scheme	W	10,135,000
Cork Lower Harbour Sewerage Scheme (Crosshaven SS) (G)	S	4,850,000
Cork Water Strategy Study (G)	W	941,000
Kinsale Sewerage Scheme	S	20,000,000
Midleton Sewerage Scheme (Infiltration Reduction) (G)	S	2,078,000
		41,274,000
Schemes to start 2007		
Cork North		
North Cork Grouped DBO Wastewater Treatment Plant (Buttevant, Doneraile & Kilbrin)	S	5,150,000
Cork West		
Skibbereen Sewerage Scheme	S	20,000,000
		25,150,000
Schemes to start 2008		
Cork North		
Mallow/ Ballyviniter Regional Water Supply Scheme (H)	W	8,632,000
Mallow Sewerage Scheme (H)	S	6,408,000
Cork South		
Ballincollig Sewerage Scheme (Nutrient Removal) (G)	S	948,000
Ballingeary Sewerage Scheme	S	1,296,000
Bandon Sewerage Scheme Stage 2	S	14,729,000
City Environs (CASP) Strategic Study (G)	S	153,000
Cloghroe Sewerage Scheme (Upgrade)	S	683,000
Coachford Water Supply Scheme	W	1,318,000
Garrettstown Sewerage Scheme	S	2,153,000
Inniscarra Water Treatment Plant Extension Phase 1	W	2,678,000
Little Island Sewerage Scheme (G)	S	2,200,000
Cork West		
Bantry Sewerage Scheme	S	7,148,000
Dunmanway Sewerage Scheme	S	2,153,000
Leap/ Baltimore Water Supply Scheme	W	6,365,000
Schull Water Supply Scheme	W	5,253,000
		61,137,000
Schemes to start 2009		
Cork North		
Banteer/Dromahane Regional Water Supply Scheme	W	1,576,000
Conna Regional Water Supply Scheme Extension	W	2,627,000
Cork NE Water Supply Scheme	W	4,326,000
Cork NW Regional Water Supply Scheme	W	6,046,000
Millstreet Wastewater Treatment Plant (Upgrade)	S	1,628,000
Cork South		
Ballincollig Sewerage Scheme (Upgrade) (G)	S	22,248,000
Cork Lower Harbour Sewerage Scheme (excl. Crosshaven SS)	S	73,542,000
Shannagarry/ Garryvoe/ Ballycotton Sewerage Scheme	S	3,780,000
Youghal Sewerage Scheme	S	14,420,000
Cork West		
Ballydehob Sewerage Scheme	S	683,000
Bantry Water Supply Scheme	W	14,935,000
Clonakilty Sewerage Scheme (Plant Capacity Increase)	S	3,677,000
Courtmacsherry/ Timoleague Sewerage Scheme	S	2,472,000
Dunmanway Regional Water Supply Scheme Stage 1	W	12,669,000
		164,629,000
Serviced Land Initiative		
Cork North		
Ballyclough Water Supply Scheme	W	139,000
Ballyhooley Improvement Scheme	W/S	139,000
Broghill- Rathgoggin Sewerage Scheme	S	406,000
Castlelyons Water Supply Scheme	W	115,000
Churchtown Sewerage Scheme (incl. Water)	W/S	543,000
Clondulane Sewage Treatment Plant	S	417,000
Freemount Sewerage Scheme	S	150,000
Pike Road Sewerage Scheme (incl. Water)	W/S	2,080,000
Rathcormac Sewerage Scheme (incl. Water)	W/S	555,000
Spa Glen Sewerage Scheme	S	736,000
Uplands Fermoy Sewerage Scheme (incl. Water)	W/S	1,174,000
Watergrasshill Water Supply Scheme (incl. Sewerage) (G)	W/S	4,151,000
Cork South		
Ballincollig Sewerage Scheme (Barry's Rd Foul and Storm Drainage) (G)	S	1,164,000
Belgooley, Water Supply Scheme (incl. Sewerage)	W/S	2,913,000
Blarney Water Supply Scheme (Ext. to Station Rd) (G)	W	416,000
Carrigtwohill Sewerage Scheme (Treatment and Storm Drain) (G)	S	7,632,000
Castlematyr Wastewater Treatment Plant Extension	S	1,200,000
Crookstown Sewerage Scheme (incl. Water)	W/S	1,200,000
Dripsey Water Supply Scheme (incl. Sewerage)	W/S	1,112,000
Glounthane Sewerage Scheme (G)	S	1,576,000
Innishannon Sewerage Scheme	S	277,000
Innishannon Wastewater Treatment Plant	S	694,000
Kerrypike Sewerage Scheme	S	832,000
Kerrypike Water Supply Scheme	W	416,000
Killeagh Wastewater Treatment Plant Extension	S	1,200,000
Killeagh Water Supply Scheme (includes Sewerage)	W/S	485,000
Killeens Sewerage Scheme	S	420,000
Kilnagleary Sewerage Scheme	S	694,000
Midleton Wastewater Treatment Plant Extension	S	4,050,000

Cork County contd.

Water Services Investment Programme 2007 - 2009

	W/S	Est. Cost
Mogeely, Castlemartyr & Ladysbridge Water Supply Scheme	W	2,566,000
North Cobh Sewerage Scheme (G)	S	3,193,000
Riverstick Water Supply Scheme (incl. Sewerage)	W/S	525,000
Rochestown Water Supply Scheme	W	2,700,000
Saleen Sewerage Scheme	S	1,051,000
Youghal Water Supply Scheme	W	2,300,000
Cork West		
Castletownshend Sewerage Scheme	S	1,576,000
		50,797,000
Rural Towns & Villages Initiative		
Cork North		
Buttevant Sewerage Scheme (Collection System)	S	2,446,000
Doneraile Sewerage Scheme (Collection System)	S	1,738,000
Cork South		
Innishannon (Ballinadee/ Ballinspittle/ Garrettstown) Water Supply Scheme	W	6,726,000
Cork West		
Ballylicky Sewerage Scheme	S	2,153,000
Baltimore Sewerage Scheme	S	3,162,000
Castletownbere Sewerage Scheme	S	5,402,000
Schull Sewerage Scheme	S	3,523,000
		24,950,000
Schemes to Advance through Planning		
Cork North		
Mitchelstown North Galtees Water Supply Scheme	W	3,152,000
Mitchelstown Sewerage Scheme	S	3,000,000
Newmarket Sewerage Scheme	S	3,152,000

	W/S	Est. Cost
Cork South		
Carrigtwohill Sewerage Scheme (G)	S	20,000,000
Cork Sludge Management (G)	S	14,420,000
Cork Water Supply Scheme (Storage - Mount Emla, Ballincollig & Chetwind) (G)	W	8,500,000
Inniscarra Water Treatment Plant (Sludge Treatment)(G)	W	5,356,000
Macroom Sewerage Scheme	S	5,150,000
Minane Bridge Water Supply Scheme	W	1,421,000
Cork West		
Bantry Regional Water Supply Scheme (Distribution)	W	9,455,000
Cape Clear Water Supply Scheme	W	1,679,000
Castletownbere Regional Water Supply Scheme	W	8,405,000
Glengarriff Sewerage Scheme	S	2,500,000
Roscarberry/Owenahincha Sewerage Scheme	S	1,576,000
Skibbereen Regional Water Supply Scheme Stage 4	W	7,880,000
		95,646,000
Water Conservation Allocation		**12,206,000**
Asset Management Study		**300,000**
South Western River Basin District (WFD) Project[1]		**9,400,000**
Programme Total		**485,489,000**

[1] This project is being led by Cork County Council on behalf of other authorities in the River Basin District

(H) Refers to a Hub as designated in the National Spatial Strategy

(G) Refers to a Gateway as designated in the National Spatial Strategy

Attachment G3

Supporting Information :

- Recent Programme of Works & Approved funding

Attachment G3 – Baltimore Wastewater Discharge Licence Application
Impact Mitigation

The proposed WWTP at Baltimore along with three other wastewater treatment plants have been grouped together to form a Design Build Operate Contract. This has just received departmental approval. The tenders are due to be returned by March 2009. The funding for this project is from the Water Services Investment Programme.

Likely Timeframes for the Works:

1. **Receipt of Tenders – March 2009**
2. **Start Construction – January 2010**
3. **Completion of Works – June 2011**

Cork County

Water Services Investment Programme 2007 - 2009

Schemes at Construction	W/S	Est. Cost
Cork North		
Mitchelstown Sewerage Scheme (Nutrient Removal)	S	221,000
Cork South		
Ballyvourney/ Ballymakeery Sewerage Scheme	S	3,049,000
Cobh/ Midleton/ Carrigtwohill Water Supply Scheme	W	10,135,000
Cork Lower Harbour Sewerage Scheme (Crosshaven SS) (G)	S	4,850,000
Cork Water Strategy Study (G)	W	941,000
Kinsale Sewerage Scheme	S	20,000,000
Midleton Sewerage Scheme (Infiltration Reduction) (G)	S	2,078,000
		41,274,000
Schemes to start 2007		
Cork North		
North Cork Grouped DBO Wastewater Treatment Plant (Buttevant, Doneraile & Kilbrin)	S	5,150,000
Cork West		
Skibbereen Sewerage Scheme	S	20,000,000
		25,150,000
Schemes to start 2008		
Cork North		
Mallow/ Ballyviniter Regional Water Supply Scheme (H)	W	8,632,000
Mallow Sewerage Scheme (H)	S	6,408,000
Cork South		
Ballincollig Sewerage Scheme (Nutrient Removal) (G)	S	948,000
Ballingeary Sewerage Scheme	S	1,296,000
Bandon Sewerage Scheme Stage 2	S	14,729,000
City Environs (CASP) Strategic Study (G)	S	153,000
Cloghroe Sewerage Scheme (Upgrade)	S	683,000
Coachford Water Supply Scheme	W	1,318,000
Garrettstown Sewerage Scheme	S	2,153,000
Inniscarra Water Treatment Plant Extension Phase 1	W	2,678,000
Little Island Sewerage Scheme (G)	S	2,200,000
Cork West		
Bantry Sewerage Scheme	S	7,148,000
Dunmanway Sewerage Scheme	S	2,153,000
Leap/ Baltimore Water Supply Scheme	W	6,365,000
Schull Water Supply Scheme	W	5,253,000
		61,137,000
Schemes to start 2009		
Cork North		
Banteer/Dromahane Regional Water Supply Scheme	W	1,576,000
Conna Regional Water Supply Scheme Extension	W	2,627,000
Cork NE Water Supply Scheme	W	4,326,000
Cork NW Regional Water Supply Scheme	W	6,046,000
Millstreet Wastewater Treatment Plant (Upgrade)	S	1,628,000
Cork South		
Ballincollig Sewerage Scheme (Upgrade) (G)	S	22,248,000
Cork Lower Harbour Sewerage Scheme (excl. Crosshaven SS)	S	73,542,000
Shannagarry/ Garryvoe/ Ballycotton Sewerage Scheme	S	3,780,000
Youghal Sewerage Scheme	S	14,420,000
Cork West		
Ballydehob Sewerage Scheme	S	683,000
Bantry Water Supply Scheme	W	14,935,000
Clonakilty Sewerage Scheme (Plant Capacity Increase)	S	3,677,000
Courtmacsherry/ Timoleague Sewerage Scheme	S	2,472,000
Dunmanway Regional Water Supply Scheme Stage 1	W	12,669,000
		164,629,000
Serviced Land Initiative		
Cork North		
Ballyclough Water Supply Scheme	W	139,000
Ballyhooley Improvement Scheme	W/S	139,000
Broghill- Rathgoggin Sewerage Scheme	S	406,000
Castlelyons Water Supply Scheme	W	115,000
Churchtown Sewerage Scheme (incl. Water)	W/S	543,000
Clondulane Sewage Treatment Plant	S	417,000
Freemount Sewerage Scheme	S	150,000
Pike Road Sewerage Scheme (incl. Water)	W/S	2,080,000
Rathcormac Sewerage Scheme (incl. Water)	W/S	555,000
Spa Glen Sewerage Scheme	S	736,000
Uplands Fermoy Sewerage Scheme (incl. Water)	W/S	1,174,000
Watergrasshill Water Supply Scheme (incl. Sewerage) (G)	W/S	4,151,000
Cork South		
Ballincollig Sewerage Scheme (Barry's Rd Foul and Storm Drainage) (G)	S	1,164,000
Belgooley, Water Supply Scheme (incl. Sewerage)	W/S	2,913,000
Blarney Water Supply Scheme (Ext. to Station Rd) (G)	W	416,000
Carrigtwohill Sewerage Scheme (Treatment and Storm Drain) (G)	S	7,632,000
Castlematyr Wastewater Treatment Plant Extension	S	1,200,000
Crookstown Sewerage Scheme (incl. Water)	W/S	1,200,000
Dripsey Water Supply Scheme (incl. Sewerage)	W/S	1,112,000
Glounthane Sewerage Scheme (G)	S	1,576,000
Innishannon Sewerage Scheme	S	277,000
Innishannon Wastewater Treatment Plant	S	694,000
Kerrypike Sewerage Scheme	S	832,000
Kerrypike Water Supply Scheme	W	416,000
Killeagh Wastewater Treatment Plant Extension	S	1,200,000
Killeagh Water Supply Scheme (includes Sewerage)	W/S	485,000
Killeens Sewerage Scheme	S	420,000
Kilnagleary Sewerage Scheme	S	694,000
Midleton Wastewater Treatment Plant Extension	S	4,050,000

Cork County contd.

Water Services Investment Programme 2007 - 2009

	W/S	Est. Cost
Mogeely, Castlemartyr & Ladysbridge Water Supply Scheme	W	2,566,000
North Cobh Sewerage Scheme (G)	S	3,193,000
Riverstick Water Supply Scheme (incl. Sewerage)	W/S	525,000
Rochestown Water Supply Scheme	W	2,700,000
Saleen Sewerage Scheme	S	1,051,000
Youghal Water Supply Scheme	W	2,300,000
Cork West		
Castletownshend Sewerage Scheme	S	1,576,000
		50,797,000
Rural Towns & Villages Initiative		
Cork North		
Buttevant Sewerage Scheme (Collection System)	S	2,446,000
Doneraile Sewerage Scheme (Collection System)	S	1,738,000
Cork South		
Innishannon (Ballinadee/ Ballinspittle/ Garrettstown) Water Supply Scheme	W	6,726,000
Cork West		
Ballylicky Sewerage Scheme	S	2,153,000
Baltimore Sewerage Scheme	S	3,162,000
Castletownbere Sewerage Scheme	S	5,402,000
Schull Sewerage Scheme	S	3,523,000
		24,950,000
Schemes to Advance through Planning		
Cork North		
Mitchelstown North Galtees Water Supply Scheme	W	3,152,000
Mitchelstown Sewerage Scheme	S	3,000,000
Newmarket Sewerage Scheme	S	3,152,000

	W/S	Est. Cost
Cork South		
Carrigtwohill Sewerage Scheme (G)	S	20,000,000
Cork Sludge Management (G)	S	14,420,000
Cork Water Supply Scheme (Storage - Mount Emla, Ballincollig & Chetwind) (G)	W	8,500,000
Inniscarra Water Treatment Plant (Sludge Treatment)(G)	W	5,356,000
Macroom Sewerage Scheme	S	5,150,000
Minane Bridge Water Supply Scheme	W	1,421,000
Cork West		
Bantry Regional Water Supply Scheme (Distribution)	W	9,455,000
Cape Clear Water Supply Scheme	W	1,679,000
Castletownbere Regional Water Supply Scheme	W	8,405,000
Glengarriff Sewerage Scheme	S	2,500,000
Roscarberry/Owenahincha Sewerage Scheme	S	1,576,000
Skibbereen Regional Water Supply Scheme Stage 4	W	7,880,000
		95,646,000
Water Conservation Allocation		**12,206,000**
Asset Management Study		**300,000**
South Western River Basin District (WFD) Project[1]		**9,400,000**
Programme Total		**485,489,000**

[1] This project is being led by Cork County Council on behalf of other authorities in the River Basin District

(H) Refers to a Hub as designated in the National Spatial Strategy

(G) Refers to a Gateway as designated in the National Spatial Strategy

Attachment G4

Supporting Information :

- Recent Programme of Works & Approved funding

Attachment G4 – Baltimore Wastewater Discharge Licence Application
Storm Water Flows

The proposed WWTP at Baltimore along with three other wastewater treatment plants have been grouped together to form a Design Build Operate Contract. This has just received departmental approval. The tenders are due to be returned by March 2009. The funding for this project is from the Water Services Investment Programme.

Likely Timeframes for the Works:

1. **Receipt of Tenders – March 2009**
2. **Start Construction – January 2010**
3. **Completion of Works – June 2011**

Cork County

Water Services Investment Programme 2007 - 2009

Schemes at Construction	W/S	Est. Cost
Cork North		
Mitchelstown Sewerage Scheme (Nutrient Removal)	S	221,000
Cork South		
Ballyvourney/ Ballymakeery Sewerage Scheme	S	3,049,000
Cobh/ Midleton/ Carrigtwohill Water Supply Scheme	W	10,135,000
Cork Lower Harbour Sewerage Scheme (Crosshaven SS) (G)	S	4,850,000
Cork Water Strategy Study (G)	W	941,000
Kinsale Sewerage Scheme	S	20,000,000
Midleton Sewerage Scheme (Infiltration Reduction) (G)	S	2,078,000
		41,274,000
Schemes to start 2007		
Cork North		
North Cork Grouped DBO Wastewater Treatment Plant (Buttevant, Doneraile & Kilbrin)	S	5,150,000
Cork West		
Skibbereen Sewerage Scheme	S	20,000,000
		25,150,000
Schemes to start 2008		
Cork North		
Mallow/ Ballyviniter Regional Water Supply Scheme (H)	W	8,632,000
Mallow Sewerage Scheme (H)	S	6,408,000
Cork South		
Ballincollig Sewerage Scheme (Nutrient Removal) (G)	S	948,000
Ballingeary Sewerage Scheme	S	1,296,000
Bandon Sewerage Scheme Stage 2	S	14,729,000
City Environs (CASP) Strategic Study (G)	S	153,000
Cloghroe Sewerage Scheme (Upgrade)	S	683,000
Coachford Water Supply Scheme	W	1,318,000
Garrettstown Sewerage Scheme	S	2,153,000
Inniscarra Water Treatment Plant Extension Phase 1	W	2,678,000
Little Island Sewerage Scheme (G)	S	2,200,000
Cork West		
Bantry Sewerage Scheme	S	7,148,000
Dunmanway Sewerage Scheme	S	2,153,000
Leap/ Baltimore Water Supply Scheme	W	6,365,000
Schull Water Supply Scheme	W	5,253,000
		61,137,000
Schemes to start 2009		
Cork North		
Banteer/Dromahane Regional Water Supply Scheme	W	1,576,000
Conna Regional Water Supply Scheme Extension	W	2,627,000
Cork NE Water Supply Scheme	W	4,326,000
Cork NW Regional Water Supply Scheme	W	6,046,000
Millstreet Wastewater Treatment Plant (Upgrade)	S	1,628,000
Cork South		
Ballincollig Sewerage Scheme (Upgrade) (G)	S	22,248,000
Cork Lower Harbour Sewerage Scheme (excl. Crosshaven SS)	S	73,542,000
Shannagarry/ Garryvoe/ Ballycotton Sewerage Scheme	S	3,780,000
Youghal Sewerage Scheme	S	14,420,000
Cork West		
Ballydehob Sewerage Scheme	S	683,000
Bantry Water Supply Scheme	W	14,935,000
Clonakilty Sewerage Scheme (Plant Capacity Increase)	S	3,677,000
Courtmacsherry/ Timoleague Sewerage Scheme	S	2,472,000
Dunmanway Regional Water Supply Scheme Stage 1	W	12,669,000
		164,629,000
Serviced Land Initiative		
Cork North		
Ballyclough Water Supply Scheme	W	139,000
Ballyhooley Improvement Scheme	W/S	139,000
Broghill- Rathgoggin Sewerage Scheme	S	406,000
Castlelyons Water Supply Scheme	W	115,000
Churchtown Sewerage Scheme (incl. Water)	W/S	543,000
Clondulane Sewage Treatment Plant	S	417,000
Freemount Sewerage Scheme	S	150,000
Pike Road Sewerage Scheme (incl. Water)	W/S	2,080,000
Rathcormac Sewerage Scheme (incl. Water)	W/S	555,000
Spa Glen Sewerage Scheme	S	736,000
Uplands Fermoy Sewerage Scheme (incl. Water)	W/S	1,174,000
Watergrasshill Water Supply Scheme (incl. Sewerage) (G)	W/S	4,151,000
Cork South		
Ballincollig Sewerage Scheme (Barry's Rd Foul and Storm Drainage) (G)	S	1,164,000
Belgooley, Water Supply Scheme (incl. Sewerage)	W/S	2,913,000
Blarney Water Supply Scheme (Ext. to Station Rd) (G)	W	416,000
Carrigtwohill Sewerage Scheme (Treatment and Storm Drain) (G)	S	7,632,000
Castlematyr Wastewater Treatment Plant Extension	S	1,200,000
Crookstown Sewerage Scheme (incl. Water)	W/S	1,200,000
Dripsey Water Supply Scheme (incl. Sewerage)	W/S	1,112,000
Glounthane Sewerage Scheme (G)	S	1,576,000
Innishannon Sewerage Scheme	S	277,000
Innishannon Wastewater Treatment Plant	S	694,000
Kerrypike Sewerage Scheme	S	832,000
Kerrypike Water Supply Scheme	W	416,000
Killeagh Wastewater Treatment Plant Extension	S	1,200,000
Killeagh Water Supply Scheme (includes Sewerage)	W/S	485,000
Killeens Sewerage Scheme	S	420,000
Kilnagleary Sewerage Scheme	S	694,000
Midleton Wastewater Treatment Plant Extension	S	4,050,000

Cork County contd.

Water Services Investment Programme 2007 - 2009

	W/S	Est. Cost
Mogeely, Castlemartyr & Ladysbridge Water Supply Scheme	W	2,566,000
North Cobh Sewerage Scheme (G)	S	3,193,000
Riverstick Water Supply Scheme (incl. Sewerage)	W/S	525,000
Rochestown Water Supply Scheme	W	2,700,000
Saleen Sewerage Scheme	S	1,051,000
Youghal Water Supply Scheme	W	2,300,000
Cork West		
Castletownshend Sewerage Scheme	S	1,576,000
		50,797,000
Rural Towns & Villages Initiative		
Cork North		
Buttevant Sewerage Scheme (Collection System)	S	2,446,000
Doneraile Sewerage Scheme (Collection System)	S	1,738,000
Cork South		
Innishannon (Ballinadee/ Ballinspittle/ Garrettstown) Water Supply Scheme	W	6,726,000
Cork West		
Ballylicky Sewerage Scheme	S	2,153,000
Baltimore Sewerage Scheme	S	3,162,000
Castletownbere Sewerage Scheme	S	5,402,000
Schull Sewerage Scheme	S	3,523,000
		24,950,000
Schemes to Advance through Planning		
Cork North		
Mitchelstown North Galtees Water Supply Scheme	W	3,152,000
Mitchelstown Sewerage Scheme	S	3,000,000
Newmarket Sewerage Scheme	S	3,152,000

	W/S	Est. Cost
Cork South		
Carrigtwohill Sewerage Scheme (G)	S	20,000,000
Cork Sludge Management (G)	S	14,420,000
Cork Water Supply Scheme (Storage - Mount Emla, Ballincollig & Chetwind) (G)	W	8,500,000
Inniscarra Water Treatment Plant (Sludge Treatment)(G)	W	5,356,000
Macroom Sewerage Scheme	S	5,150,000
Minane Bridge Water Supply Scheme	W	1,421,000
Cork West		
Bantry Regional Water Supply Scheme (Distribution)	W	9,455,000
Cape Clear Water Supply Scheme	W	1,679,000
Castletownbere Regional Water Supply Scheme	W	8,405,000
Glengarriff Sewerage Scheme	S	2,500,000
Roscarberry/Owenahincha Sewerage Scheme	S	1,576,000
Skibbereen Regional Water Supply Scheme Stage 4	W	7,880,000
		95,646,000
Water Conservation Allocation		**12,206,000**
Asset Management Study		**300,000**
South Western River Basin District (WFD) Project[1]		**9,400,000**
Programme Total		**485,489,000**

[1] This project is being led by Cork County Council on behalf of other authorities in the River Basin District

(H) Refers to a Hub as designated in the National Spatial Strategy

(G) Refers to a Gateway as designated in the National Spatial Strategy

Agglomeration details

Leading Local Authority	Cork County Council
Co-Applicants	
Agglomeration	Baltimore
Population Equivalent	1950
Level of Treatment	Primary
Treatment plant address	Baltimore Septic Tank, Baltimore, Co. Cork
Grid Ref (12 digits, 6E, 6N)	104709 / 026634
EPA Reference No:	

Contact details

Contact Name:	Declan Groarke
Contact Address:	Water Services West, Cork County Council, Courthouse, Skibbereen, Co. Cork
Contact Number:	028-21299
Contact Fax:	028-21995
Contact Email:	declan.groarke@corkcoco.ie

Table D.1(i)(a): EMISSIONS TO SURFACE/GROUND WATERS (Primary Discharge Point)

Discharge Point Code: SW-1

Local Authority Ref No:	SW01 BALT	
Source of Emission:	Primary Discharge	
Location:	Baltimore Harbour	
Grid Ref (12 digits, 6E, 6N)	104654 / 026639	
Name of Receiving waters:	Baltimore Harbour	
Water Body:	Coastal Water Body	
River Basin District	South Western RBD	
Designation of Receiving Waters:	pNHS, SAC	
Flow Rate in Receiving Waters:	0	$m^3.sec^{-1}$ Dry Weather Flow
	0	$m^3.sec^{-1}$ 95% Weather Flow
Additional Comments (e.g. commentary on zero flow or other information deemed of value)	Coastal water - do not have a DWF value for receiving waters	

Emission Details:

(i) Volume emitted			
Normal/day	495 m^3	Maximum/day	1485 m^3
Maximum rate/hour	61.74 m^3	Period of emission (avg)	60 min/hr 24 hr/day 365 day/yr
Dry Weather Flow	0.01 m^3/sec		

Table D.1(i)(b): EMISSIONS TO SURFACE/GROUND WATERS - Characteristics of The Emission (Primary Discharge Point)

Discharge Point Code: SW-1

Substance	As discharged			
	Unit of Measurement	Sampling Method	Max Daily Avg.	kg/day
pH	pH	Grab	= 9	
Temperature	°C	Grab	= 0	
Electrical Conductivity (@ 25°C)	µS/cm	Grab	= 0	
Suspended Solids	mg/l	Grab	= 250	123.75
Ammonia (as N)	mg/l	Grab	= 25	12.38
Biochemical Oxygen Demand	mg/l	Grab	= 210	103.95
Chemical Oxygen Demand	mg/l	Grab	= 460	227.7
Total Nitrogen (as N)	mg/l	Grab	= 50	24.75
Nitrite (as N)	mg/l	Grab	= 0	0
Nitrate (as N)	mg/l	Grab	= 0	0
Total Phosphorous (as P)	mg/l	Grab	= 12	5.94
OrthoPhosphate (as P)	mg/l	Grab	= 10	4.95
Sulphate (SO_4)	mg/l	Grab	= 0	0
Phenols (Sum)	µg/l	Grab	= 0	0

For Orthophosphate: this monitoring should be undertaken on a sample filtered on 0.45µm filter paper
For Phenols: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

Table D.1(i)(c): DANGEROUS SUBSTANCE EMISSIONS TO SURFACE/GROUND WATERS - Characteristics of The Emission (Primary Discharge Point)

Discharge Point Code: SW-1

Substance	As discharged			
	Unit of Measurement	Sampling Method	Max Daily Avg.	kg/day
Atrazine	µg/l	Grab	= 0	0
Dichloromethane	µg/l	Grab	= 0	0
Simazine	µg/l	Grab	= 0	0
Toluene	µg/l	Grab	= 0	0
Tributyltin	µg/l	Grab	= 0	0
Xylenes	µg/l	Grab	= 0	0
Arsenic	µg/l	Grab	= 0	0
Chromium	µg/l	Grab	= 0	0
Copper	µg/l	Grab	= 0	0
Cyanide	µg/l	Grab	= 0	0
Flouride	µg/l	Grab	= 0	0
Lead	µg/l	Grab	= 0	0
Nickel	µg/l	Grab	= 0	0
Zinc	µg/l	Grab	= 0	0
Boron	µg/l	Grab	= 0	0
Cadmium	µg/l	Grab	= 0	0
Mercury	µg/l	Grab	= 0	0
Selenium	µg/l	Grab	= 0	0
Barium	µg/l	Grab	= 0	0

For Orthophosphate: this monitoring should be undertaken on a sample filtered on 0.45µm filter paper
For Phenols: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

Table D.1(iii)(a): EMISSIONS TO SURFACE/GROUND WATERS (Storm Overflow)

Discharge Point Code: SW-2

Local Authority Ref No:	SW02 BALT	
Source of Emission:	Stormwater Overflow	
Location:	Baltimore Harbour	
Grid Ref (12 digits, 6E, 6N)	104654 / 026639	
Name of Receiving waters:	Baltimore Harbour	
Water Body:	Coastal Water Body	
River Basin District	South Western RBD	
Designation of Receiving Waters:	pNHA, SAC	
Flow Rate in Receiving Waters:	0	$m^3.sec^{-1}$ Dry Weather Flow
	0	$m^3.sec^{-1}$ 95% Weather Flow
Additional Comments (e.g. commentary on zero flow or other information deemed of value)	Do not have any information stormwater overflows. Where zero flow indicated flow rate not applicable as receiving waters tidal.	

Emission Details:

(i) Volume emitted			
Normal/day	0 m^3	Maximum/day	0 m^3
Maximum rate/hour	0 m^3	Period of emission (avg)	0 min/hr 0 hr/day 0 day/yr
Dry Weather Flow	0 m^3/sec		

Table D.1(iii)(a): EMISSIONS TO SURFACE/GROUND WATERS (Storm Overflow)

Discharge Point Code: SW-3

Local Authority Ref No:	SW03 BALT	
Source of Emission:	Stormwater Overflow	
Location:	Baltimore Harbour	
Grid Ref (12 digits, 6E, 6N)	104602 / 026401	
Name of Receiving waters:	Baltimore Harbour	
Water Body:	Coastal Water Body	
River Basin District	South Western RBD	
Designation of Receiving Waters:	pNHA, SAC	
Flow Rate in Receiving Waters:	0	$m^3.sec^{-1}$ Dry Weather Flow
	0	$m^3.sec^{-1}$ 95% Weather Flow
Additional Comments (e.g. commentary on zero flow or other information deemed of value)	Do not have any information on Stormwater overflows. Where zero flow indicated flow rate not applicable as receiving waters tidal.	

Emission Details:

(i) Volume emitted			
Normal/day	0 m^3	Maximum/day	0 m^3
Maximum rate/hour	0 m^3	Period of emission (avg)	0 min/hr 0 hr/day 0 day/yr
Dry Weather Flow	0 m^3/sec		

Table D.1(iii)(a): EMISSIONS TO SURFACE/GROUND WATERS (Storm Overflow)

Discharge Point Code: SW-4

Local Authority Ref No:	SW04 BALT	
Source of Emission:	Stormwater Overflow	
Location:	Baltimore Harbour	
Grid Ref (12 digits, 6E, 6N)	104326 / 026013	
Name of Receiving waters:	Baltimore Harbour	
Water Body:	Coastal Water Body	
River Basin District	South Western RBD	
Designation of Receiving Waters:	pNHA, SAC	
Flow Rate in Receiving Waters:	0	$m^3.sec^{-1}$ Dry Weather Flow
	0	$m^3.sec^{-1}$ 95% Weather Flow
Additional Comments (e.g. commentary on zero flow or other information deemed of value)	Do not have any information on stormwater overflows. Where zero flow indicated flow rate not applicable as receiving waters tidal	

Emission Details:

(i) Volume emitted			
Normal/day	0 m^3	Maximum/day	0 m^3
Maximum rate/hour	0 m^3	Period of emission (avg)	0 min/hr 0 hr/day 0 day/yr
Dry Weather Flow	0 m^3/sec		

TABLE E.1(i): WASTE WATER FREQUENCY AND QUANTITY OF DISCHARGE – Primary and Secondary Discharge Points

Identification Code for Discharge point	Frequency of discharge (days/annum)	Quantity of Waste Water Discharged (m^3/annum)
SW-1	365	180675

TABLE E.1(ii): WASTE WATER FREQUENCY AND QUANTITY OF DISCHARGE – Storm Water Overflows

Identification Code for Discharge point	Frequency of discharge (days/annum)	Quantity of Waste Water Discharged (m^3/annum)	Complies with Definition of Storm Water Overflow
SW-2	0	0	No
SW-3	0	0	No
SW-4	0	0	No

TABLE F.1(i)(a): SURFACE/GROUND WATER MONITORING

Primary Discharge Point

Discharge Point Code:	SW-1
MONITORING POINT CODE:	aSW-1d
Grid Ref (12 digits, 6E, 6N)	104235 / 026201

Parameter	Results (mg/l)				Sampling method	Limit of Quantitation	Analysis method / technique
	30/10/08	01/01/09					
pH	= 8				Grab	2	Electrochemical
Temperature		= 0			Grab	0	Electrochemical
Electrical Conductivity (@ 25°C)	= 44				Grab	0.5	Electrochemical
Suspended Solids	= 116				Grab	0.5	Gravimetric
Ammonia (as N)	= 0.5				Grab	0.02	Colorimetric
Biochemical Oxygen Demand	= 2.48				Grab	0.06	Electrochemical
Chemical Oxygen Demand	= 69				Grab	8	Digestion & Colorimetric
Dissolved Oxygen		= 0			Grab	0	ISE
Hardness (as $CaCO_3$)		= 0			Grab	0	titrimetric
Total Nitrogen (as N)	< 1				Grab	0.5	Digestion & Colorimetric
Nitrite (as N)	= 0				Grab	1	Colorimetric
Nitrate (as N)	= 0				Grab	0.5	Colorimetric
Total Phosphorous (as P)	< 0.3				Grab	0.2	Digestion & Colorimetric
OrthoPhosphate (as P)	< 0.05				Grab	0.02	Colorimetric
Sulphate (SO_4)	= 2420.2				Grab	30	Turbidimetric
Phenols (Sum)	< 0.01				Grab	0.1	GC-MS 2

For Orthophosphate: this monitoring should be undertaken on a sample filtered on 0.45µm filter paper
For Phenols: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

Additional Comments:	saline interference in nitrate/nitrite test :results are not for reporting

TABLE F.1(i)(b): SURFACE/GROUND WATER MONITORING (Dangerous Substances)

Primary Discharge Point

Discharge Point Code:	SW-1
MONITORING POINT CODE:	aSW-1d
Grid Ref (12 digits, 6E, 6N)	104235 / 026201

Parameter	Results (µg/l)				Sampling method	Limit of Quantitation	Analysis method / technique
	30/10/08						
Atrazine	< 0.02				Grab	0.96	HPLC
Dichloromethane	< 5				Grab	1	GC-MS1
Simazine	< 0.02				Grab	0.01	HPLC
Toluene	< 0.1				Grab	0.02	GC-MS1
Tributyltin	< 0.02				Grab	0.02	GC-MS1
Xylenes	< 0.2				Grab	1	GC-MS1
Arsenic	< 0.2				Grab	0.96	ICP-MS
Chromium	< 20				Grab	20	ICP-OES
Copper	< 20				Grab	20	ICP-OES
Cyanide	< 5				Grab	5	Colorimetric
Flouride	= 720				Grab	100	ISE
Lead	< 20				Grab	20	ICP-OES
Nickel	< 20				Grab	20	ICP-OES
Zinc	< 20				Grab	20	ICP-OES
Boron	= 3045				Grab	20	ICP-OES
Cadmium	< 20				Grab	20	ICP-OES
Mercury	< 0.02				Grab	0.2	ICP-MS
Selenium	< 0.2				Grab	0.74	ICP-MS
Barium	< 20				Grab	20	ICP-OES

Additional Comments:	TBT value is 0.02ug/l as Sn saline interference in Flouride test ,Boron present in sea water at levels of 5000ug/litre, in saline estuaries-reference from 4500 B ,A (extract in 21st Edition Std Methods for examination of water and wastewaters)

Annex 2: Check List For Regulation 16 Compliance

Regulation 16 of the waste water discharge (Authorisation) Regulations 2007 (S.I. No. 684 of 2007) sets out the information which must, in all cases, accompany a discharge licence application. In order to ensure that the application fully complies with the legal requirements of regulation 16 of the 2007 Regulations, all applicants should complete the following.

In each case, refer to the attachment number(s), of your application which contains(s) the information requested in the appropiate sub-article.

Regulation 16(1) **In the case of an application for a waste water discharge licence, the application shall -**		**Attachment Number**	**Checked by Applicant**
(a)	give the name, address, telefax number (if any) and telephone number of the applicant (and, if different, of the operator of any treatment plant concerned) and the address to which correspondence relating to the application should be sent and, if the operator is a body corporate, the address of its registered office or principal office,	B.1	Yes
(b)	give the name of the water services authority in whose functional area the relevant waste water discharge takes place or is to take place, if different from that of the applicant,	Not Applicable	Yes
(c)	give the location or postal address (including where appropriate, the name of the townland or townlands) and the National Grid reference of the location of the waste water treatment plant and/or the waste water discharge point or points to which the application relates,	B.2	Yes
(d)	state the population equivalent of the agglomeration to which the application relates,	B.9(i)	Yes
(e)	specify the content and extent of the waste water discharge, the level of treatment provided, if any, and the flow and type of discharge,	C,D	Yes
(f)	give details of the receiving water body, including its protected area status, if any, and details of any sensitive areas or protected areas or both in the vicinity of the discharge point or points likely to be affected by the discharge concerned, and for discharges to ground provide details of groundwater protection schemes in place for the receiving water body and all associated hydrogeological and geological assessments related to the receiving water environment in the vicinity of the discharge.	F.1	Yes
(g)	identify monitoring and sampling points and indicate proposed arrangements for the monitoring of discharges and, if Regulation 17 does not apply, provide details of the likely environmental consequences of any such discharges,	E.2, E3	Yes
(h)	in the case of an existing waste water treatment plant, specify the sampling data pertaining to the discharge based on the samples taken in the 12 months preceding the making of the application,	E.4	Yes
(i)	describe the existing or proposed measures, including emergency procedures, to prevent unintended waste water discharges and to minimise the impact on the environment of any such discharges,	G.3	Yes
(j)	give particulars of the nearest downstream drinking water abstraction point or points to the discharge point or points,	Not Applicable	Yes
(k)	give details, and an assessment of the effects, of any existing or proposed emissions on the environment, including any environmental medium other than those into which the emissions are, or are to be made, and of proposed measures to prevent or eliminate or, where that is not practicable, to limit any pollution caused in such discharges,	F.1	Yes
(l)	give detail of compliance with relevant monitoring requirements and treatment standards contained in any applicable Council Directives of Regulations,	E.1,E.4	Yes
(m)	give details of any work necessary to meet relevant effluent discharge standards and a timeframe and schedule for such work.	G.1	Yes
(n)	Any other information as may be stipulated by the Agency.	Not Applicable	Yes
Regulation 16(3) **Without prejudice to Regulation 16 (1) and (2), an application for a licence shall be accompanied by -**		**Attachment Number**	**Checked by Applicant**
(a)	a copy of the notice of intention to make an application given pursuant to Regulation 9,	B.8	Yes
(b)	where appropriate, a copy of the notice given to a relevant water services authority under Regulation 13,	Not Applicable	Yes
(c)	Such other particulars, drawings, maps, reports and supporting documentation as are necessary to identify and describe, as appropriate -	B	Yes
(c) (i)	the point or points, including storm water overflows, from which a discharge or discharges take place or are to take place, and	B.3, B.4, B.5	Yes
(c) (ii)	the point or points at which monitoring and sampling are undertaken or are to be undertaken,	E.3	Yes
(d)	such fee as is appropriate having regard to the provisions of Regulations 38 and 39.	B.9(iii)	Yes

Regulation 16(4) An original application shall be accompanied by 2 copies of it and of all accompanying documents and particulars as required under Regulation 16(3) in hardcopy or in an electronic or other format as specified by the Agency.		Attachment Number	Checked by Applicant
1	An Original Application shall be accompanied by 2 copies of it and of all accompanying documents and particulars as required under regulation 16(3) in hardcopy or in electronic or other format as specified by the agancy.		Yes
Regulation 16(5) **For the purpose of paragraph (4), all or part of the 2 copies of the said application and associated documents and particulars may, with the agreement of the Agency, be submitted in an electronic or other format specified by the Agency.**		**Attachment Number**	**Checked by Applicant**
1	Signed original.		Yes
2	2 hardcopies of application provided or 2 CD versions of application (PDF files) provided.		Yes
3	1 CD of geo-referenced digital files provided.		Yes
Regulation 17 **Where a treatment plant associated with the relevant waste water works is or has been subject to the European Communities (Environmental Impact Assessment) Regulations 1989 to 2001, in addition to compliance with the requirements of Regulation 16, an application in respect of the relevant discharge shall be accompanied by a copy of an environmental impact statement and approval in accordance with the Act of 2000 in respect of the said development and may be submitted in an electronic or other format specified by the Agency**		**Attachment Number**	**Checked by Applicant**
1	EIA provided if applicable	Not applicable	Yes
2	2 hardcopies of EIS provided if applicable.	Not applicable	Yes
3	2 CD versions of EIS, as PDF files, provided.	Not applicable	Yes