

Administration,
Environmental Licensing Programme,
Office of Climate, Licensing & Resource Use,
Environmental Protection Agency,
headquarters,POBox3000,
Johnstown, Castle Estate,
County Wexford.
Your Ref.:A0432-01

Our reference:MS/SAL/11

28 February 2011

Sub.: Saleen Agglomeration (Register No. A0432-01) Regulation 25(c)(ii) Further Information Response

Dear Sir/Madam,

With reference to your letter of the 14 of December 2010, please find the following attached:

- 1 Original of the Saleen Agglomeration (Register No. A0432-01) Regulation 25(c)(ii) Further Information Response.
- 1 Copy of the Saleen Agglomeration (Register No. A0432-01) Regulation 25(c)(ii) Further Information Response.
- 1 Original copy of attachments (Birdwatch Data,Dixon Brosnan Report,Cork County Data MI Cork Harbour Shellfish data, and CoCork Data2009 Harbours EPA(2))
- 1 Copy of Attachments (Birdwatch Data,Dixon Brosnan Report,Cork County Data MI Cork Harbour Shellfish data, and CoCork Data2009 Harbours EPA(2))
- 1 CDROM with the Further Information Response & Attachments in PDF Format.

Yours faithfully,

Ms Patricia Power,
Director of services, Water Services,
Cork County Council,
County Hall, Cork.

Saleen Village Regulation 25 Further Information Response

- Question 1 Assess the likelihood of significant effect of the waste water discharges from the above agglomerations on the relevant European sites by referring to Circular L8/08 “Water Services Investment and Rural Water Programmes – Protection of Natural Heritage and National Monuments” issued by the Department of Heritage and Local Government. In particular, the flow diagram in Appendix 1 should be completed and the results of each section recorded. Provide details of the results of this assessment within one month of the date of this notice and provide a reasoned response for the decision. If significant effects are likely then an appropriate assessment must be carried out and a report of this assessment forwarded to the Agency by within 1 month of the date of this notice. You are advised to provide the requested information in accordance with the “Note on Appropriate Assessments for the purposes of the Waste Water Discharge (Authorisation) Regulations, 2007 (S.I. 684 of 2007)”

Wastewater Discharge Licence Application: A0434-01

Circular L8/08 2 September 2008

Water Services Investment and Rural Water Programmes –
Protection of Natural Heritage and National Monuments

Introduction

1.1 Saleen is located approximately 8 kilometres south of Midleton, on the R630, and approximately 8 kilometres northeast of Whitegate. The village is located at the southern end of Cork harbour in an area comprising considerable natural and scenic amenities. Poulrabibe Inlet, which is located to the west of the village is designated as part of an extensive nature conservation area. The village is currently served by a septic tank. The Saleen stream runs adjacent to the village and it meets the Cloyne river approximately 400m southwest of the village. The existing septic tank is located immediately northeast of the confluence. The Cloyne river becomes tidal downstream of the confluence where it becomes Saleen Creek.

1

- 1.2 The assessment has been prepared in accordance with the following guidance:

European Commission (2000) Managing Natura 2000 sites: the provisions of Article 6 of the Habitats Directive 92/43/EEC.

European Commission (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC.

Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities. Environment, Heritage and Local Government,

2009.

2 Appropriate Assessment Screening Matrix

2.1 Description of project	
Location	Saleen WWTP, Saleen Village, East Cork.
Description of the key components of the project	There is no waste water treatment plant at present .The village is currently served by a septic tank.
Distance from designated sites in potential impact zone*	Approx. 0.5km

2.2 Description of the Natura 2000 sites within the potential impact zone ¹	
Name	Cork Harbour Special Protection Area
Site Code	4130
Site Description	<p>The Cork Harbour SPA is an estuarine complex which is primarily comprised of intertidal habitats, mainly mudflats as well as some other coastal and marine habitats. These habitats support very high numbers of wintering waterfowl, that feed on the macroinvertebrates inhabiting the mudflats. The Harbour regularly supports in excess of 20,000 wintering birds, making it an internationally important site and the fifth most important wintering waterfowl site in the country.</p> <p>Discharges from the Cloyne Wastewater Treatment Plant enter Saleen Creek (Poulnabibe Inlet) in the east of Cork Harbour. This small relatively enclosed estuary supports mudshores, mixed sediment shores and areas of saltmarsh habitat. The main habitats of importance within the creek are mudshores and mixed sediment shores which are used by waders, while the upper shore and saltmarsh habitats provide important high tide water roosts. The open water</p>

¹ Natura 2000 sites within the potential impact zone of the proposed development have been identified in accordance with guidance provided in the NPWS circular L8/08.

	<p>within the creek and adjacent to it is important for grebes and sea ducks.</p> <p>More information on the Cork Harbour SPA and on Saleen Creek (Poulnabibe Inlet) is contained appendix 1 of this document. Bird count data is provided in appendix 4.</p>
Qualifying Interests of Cork Harbour SPA.	<p>Internationally important numbers of Black-tailed Godwit and Redshank; Nationally important numbers of Cormorant, Shelduck, Oystercatcher, Golden Plover, Lapwing, Dunlin, Curlew and Common Tern; 20,000 wintering waterbirds. <i>Source - National Parks and Wildlife Service</i></p> <p>All of these species excepting Golden Plover and Common Tern are regularly recorded at Saleen Creek. Of these species, Saleen Creek holds >5% of the mean and/or peak totals for Cork Harbour for Redshank, Oystercatcher and Curlew.</p> <p>See appendix 4 for bird count data for Saleen 1998/2000 - 2007/2008.</p>
Other Notable Features of Cork Harbour SPA and Saleen Creek.	<p>Little Grebe, Great-crested Grebe, Grey Heron, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Grey Plover, Black-headed Gull, Common Gull, Lesser Black-backed Gull, wetland and water birds. <i>Source - National Parks and Wildlife Service</i></p> <p>Of these species, Saleen Creek holds >5% of the mean and/or peak totals for Cork Harbour for Little Grebe, Great-crested Grebe, Grey Heron, Wigeon, Teal, Shoveler, Red-breasted Merganser, Black-headed Gull and Common Gull Source I-WeBS Data.</p> <p>Other species frequently recorded at Saleen in numbers > 5% of the mean and/or peak totals for the harbour include Mallard, Little Egret, Ringed Plover, Mediterranean Gull, Bonapartes Gull, Black-headed Gull, Common Gull, Herring Gull and Kingfisher.</p> <p>See appendix 4 for bird count data for Saleen 1998/2000 - 2007/2008.</p>
Conservation Objectives	<p>To avoid deterioration of the habitats of the qualifying species and species of special conservation interest, or significant disturbance to these species, thus ensuring that the integrity of the site is maintained.</p> <p>To ensure for the qualifying species and species of special conservation interest that the following are maintained in the long-term.</p> <ul style="list-style-type: none"> ○ the population of the species as a viable component of the site; ○ the distribution and extent of habitats supporting

	<p>the species;</p> <ul style="list-style-type: none"> ○ the structure, function and supporting processes of habitats supporting the species; <p>Source - National Parks and Wildlife Service</p>
--	--

2.3 Assessment Criteria

<p>Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.</p>	<p>Discharge from Saleen Septic Tank: Wastewater collected in the village of Saleen discharges via a septic tank into Saleen Creek approx. 0.5km upstream of the SPA/SAC</p> <p>The discharge from the septic tank consists of primary treated effluent</p> <p>Other Discharges in the East of the Harbour:</p> <p>Discharge from Cloyne WWTP: Treated effluent from the Cloyne Waste Water Treatment Plant is discharged to Spital Stream. This stream enters Saleen Creek approx 2.7km upstream of the Cork Harbour SPA.</p> <p><i>Untreated waste from Aghada and Whitegate discharge directly into the Harbour along the southern boundary of the SPA.</i></p> <p><i>Treated waste from a combination of two sources (Midleton WWTP and Irish Distillers Ltd) discharges into the East Channel of the Harbour at Rathcoursey.</i></p>
<p>Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site taking into account the following:</p> <ul style="list-style-type: none"> ○ Size and scale ○ Land-take ○ Distance from the Natura 2000 site or key features of the site: ○ Resource requirements (water abstraction etc.) 	<p>Discharges could give rise to elevated nutrients entering Saleen Creek and the eastern portion of Cork Harbour. Increased nutrient levels may impact on the ecology of an area by changing the composition of floral communities and reducing the ability of less robust plants to survive. Increased nutrient levels may also result in increasing the invertebrate populations in the estuary, thereby increasing bird population levels.</p> <p>However the potential for the treatment plant discharge to result in elevated nutrients within the harbour is reduced by two main factors:</p> <ol style="list-style-type: none"> 1. The treated effluent enters the Cork Harbour SPA which is a large and well exchanged body of water with unlimited dilution capacity.

<ul style="list-style-type: none"> ○ Emissions (disposal to land, water or air) ○ Excavation Requirements ○ Transportation Requirements ○ Duration of construction, operation, decommissioning ○ Other. 	<p>1. Treated effluent discharges into Harbour body The treated effluent enters the Cork Harbour SPA at Poul nabibe which is a large and well exchanged body of water with unlimited dilution capacity. The Poul nabibe Inlet to which the effluent discharges is long, narrow and shallow which is thoroughly mixed (Dixon Brosnan, 2003). This along with the endless dilution capability of the harbour body of water means that the discharge is properly diluted once within the SPA.</p>
<p>Describe any likely changes to the site arising as a result of:</p> <ul style="list-style-type: none"> ○ Reduction in habitat area ○ Disturbance to key species ○ Habitat or species fragmentation ○ Reduction in species density ○ Changes in key indicators of conservation value (water quality etc) ○ Climate Change 	<p>Reduction in habitat area: <i>The effluent from Saleen septic tank is discharging to a large well-exchanged body of water where dilution and dispersion potential is high. No significant impacts are evident or predicted on habitats within Saleen Creek or Cork Harbour or the Great Island Channel arising from this operation .</i></p> <p>Disturbance to key species: <i>The operation at Saleen does not cause any disturbance to species within the SPA.</i></p> <p>Habitat or species fragmentation: No habitat fragmentation has been caused as a result of the operation of this facility.</p> <p>Reduction in species density: The effluent is discharging to a large well-exchanged body of water where dilution and dispersion potential is high. No significant impacts are evident or predicted on species for which the SPA is designated.</p> <p>Some reduction in bird species density may occur on completion of the WWTP at Saleen(not constructed yet) which will further reduce nutrient inputs to this part of Cork Harbour. However this potential impact is uncertain and could only be confirmed by ongoing monitoring and study. The reduction of nutrient inputs to the system would be likely to reduce the trophic status of the harbour and have a positive impact on the environment generally.</p> <p>Changes in key indicators of conservation value eg water quality: While there is no ongoing monitoring of water quality for either the Spital, Cloyne, or Saleen streams, some sampling and testing were done and submitted as part of the Saleen Wastewater Discharge Certificate Application. This testing, while insufficient for a complete analysis indicates that there is no deterioration in water quality associated with the Saleen discharge.</p>

Describe any likely impacts on the Natura 2000 site as a whole in terms of: <ul style="list-style-type: none"> ○ Interference with the key relationships that define the structure of the site ○ Interference with key relationships that define the function of the site 	<p>Interference with the key relationships that define the structure of the site: The structure of the SPA is not impacted by the operation of this facility.</p> <p>Interference with key relationships that define the function of the site: The function of the SPA is not impacted by the operation of this facility.</p>
Describe from the above those elements of the project of plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	No significant impacts are predicted.

3. Finding of No Significant Effects Report Matrix

Name of project or plan	Saleen WWTP discharge
Name and location of Natura 2000 site	Cork Harbour Special protection Area
Description of the project or plan	The Saleen sewerage network which is operated by Cork County Council comprises of a septic tank which was built in 1965 approximately. When the tank was built the Population Equivalent PE contributing to it was far less than at present. The current PE contributing to the septic tank is approximately 490.
Is the project or plan directly connected with or necessary to the management of the site (provide details)?	No
The assessment of significance of effects	
Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 Site.	Discharges from the Saleen Septic Tank either alone or in combination with discharges from other sources could give rise to elevated nutrients entering Saleen Creek and the eastern portion of Cork Harbour. Increased nutrient levels may impact on the ecology of an area by changing the composition of floral communities and reducing the ability of less robust plants to survive. Increased nutrient levels may also result in increasing the invertebrate populations in the estuary, thereby increasing bird population levels.

Explain why these effects are not considered significant.	<p>The effluent from Saleen septic tank is discharging to a large well-exchanged body of water where dilution and dispersion potential is high. No significant impacts are evident or predicted on species for which the SPA is designated.</p> <p>Available water quality data from EPA for Cork Harbour (2009) and Marine Institute (2010) both show a body of water that is in compliance both with water quality and shellfish designation standards.</p>
List of agencies consulted: provide contact name and telephone or email address	Birdwatch Ireland - Data request.
Response to consultation	Birdwatch Ireland sent on Bird count data.

Data collected to carry out the assessment			
Who carried out the assessment	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed
Mahmoud Shaladan and Madeleine Healy of Cork County Council	<p>IWebs Bird Data supplied by BirdWatch Ireland; Assessment Report at Saleen, Report prepared by Dixon Brosnan 2003;</p> <p>EPA Cork Harbour water quality monitoring</p> <p>Marine Institute Cork Harbour Shellfish designated waters - monitoring data.</p> <p>Cork Harbour Site Synopses – submitted with application</p>	Desktop review of cited data.	This report.

- Question 2 Confirm the design capacity of the waste water treatment plant and the current population equivalent (PE) being treated at the plant. Confirm current PE includes the maximum average weekly loading for the agglomeration having taken into account local festivals , peak holiday seasons ,etc.
The existing foul collection system drains to a septic tank located 200m to south of the village. The tank was put in place to serve 40 PE, the present loading is approximately 490 PE.
- Question 3 Provide a revised drawing clearly detailing the boundary of the agglomeration to which this application relates. Please note that the agglomeration boundary shall include all areas serviced by the sewer network and shall include the waste treatment plant. All areas of the agglomeration shall be connected by the agglomeration body.
Refer to Drawing No. B1_Map3 revised
- Question 4 Provide the name of the receiving water body to which the effluent from the primary discharge drains. Provide the national grid reference for the location where the drain /unnamed stream enters a significant water body .
Receiving water is Saleen Creek at Grid Reference 188586/067641

For inspection purposes only.
Consent of copyright owner required for any other use.

2009 harbour data (Data Source Harbour Monitoring by EPA) Coastal Waters Cork H

Sample_ID	Station_No	Sample_Label	Date_Surveyed	Time	Depth_Bed	Depth_samp	Salinity
92488	LE380	LE380CR	01/07/2009	14:02:00	19.5	19.1	34.46
92219	LE380	LE380B	01/07/2009	11:58:00	15.4	14.7	33.94
101403	LE380	LE380BR	15/09/2009	16:33:00	19.7	19.4	32.9
101263	LE380	LE380B	15/09/2009	11:47:00	17.4	17.1	32.89
92499	LE380	LE380S	01/07/2009	11:58:00	15.4	0	32
92488	LE380	LE380CR	01/07/2009	14:02:00	19.5	0	30.02
101404	LE380	LE380SR	15/09/2009	16:33:00	19.7	0	25.76
101264	LE380	LE380S	15/09/2009	11:47:00	17.4	0	19.68
92211	LE610	LE610B	01/07/2009	12:12:00	16.5	16.1	34.87
92236	LE610	LE610S	01/07/2009	12:12:00	16.5	0	34.06
101285	LE610	LE610B	15/09/2009	12:11:00	16.1	15.9	33.26
101286	LE610	LE610S	15/09/2009	12:11:00	16.1	0	31.13
915	LE610	LE610B	22/01/2009	12:03:00			
945	LE610	LE610S	22/01/2009	12:03:00			

Mean Value 31.2475
 95% percentile
 Median 32.9
 90% percentile

EQS Standard

Compliance

Note*-value dependent on Salinity

indicates parameters for compliance

For inspection purposes only. Consent of copyright owner required for any other use.

harbour

Temp	pH	Secchi	O_Saturatio	DO_mgL	BOD	TON	NH3	PO4
17.11	8.17	2	97.8	7.7	3.1	0.101	0.045	5
17.25	8.12	2	96.9	7.6	2.2	0.051	0.057	7
15.04	8	2.5	98.9	8.1	0.49999	0.184	0.185	6
14.99	7.97	2.1	95.9	7.9	1.1	0.193	0.191	8
17.73	8.17	2	107.2	8.4	3.6	0.105	0.041	2.5
18.1	8.17	2	117.9	9.3	3.1	0.101	0.045	5
15.32	7.95	2.5	100.9	8.6		0.466	0.233	17
15.02	7.9	2.1	93.5	8.3	1	1.05	0.271	28
18.19	8.11	3.5	100.9	7.7	2.3	0.005	0.04	2.5
17.32	8.11	3.5	100.7	7.9	2.1	0.011	0.048	2.5
15.06	8.07	3.2	100.9	8.3	1.4	0.128	0.145	2.5
14.96	8	3.2	100.2	8.3		0.342	0.174	9
	7.96					0.185	0.032	22
	7.94					0.96	0.082	30
16.34083	8.045714		100.975		2.039999	0.277286	0.1135	10.5
			112.015		3.375			
								0.0065

>80%*
 <120%*
 Yes at DO lower limit
 Yes at DO upper Limit

ce purposes

For inspection purposes only.
 Consent of copyright owner required for any other use.

Appendix 4: Bird Count Data, Saleen Creek and Cork Harbour 1998/1009 - 2007/2008 from I-WeBS

			1998/ 1999	1999/ 2000	2000/ 2001	2001/ 2002	2002/2003	2003/2004	2004/ 2005	2005/ 2006	2006/ 2007	2007 /2008	Saleen		Cork Harbour		% of mean total occurring at Saleen	% of peak total occurring at Saleen
	National	Internati-onal											Mean	Peak	Mean	Peak		
Mute Swan	110	110	1	2	2	2	1	1		3			1	3	64	73	1.56	4.11
Canada Goose									13				3	13	18	23	17	57
Shelduck	150	3,000	59	75	42	52	30	41	60	44	34	29	42	60	1,286	1,946	3.27	3.08
Wigeon	820	15,000	129	95	122	73	173	102	97	179	149	124	130	179	2,010	2,926	6.46	6.11
Teal	450	5,000	72	101	81	168	199	223	188	248	184	226	214	248	1,079	1,611	19.83	15.39
Mallard	380	20,000	29	26	28	56	41	46	39	46	91	82	61	91	496	628	12.3	14.49
Shoveler	25	400					4	7		4			2	7	43	62	4.65	11.29
Red- breasted Merganser	35	1,700			2	8	8	9	2	1	2		3	9	79	88	3.8	10.22
Red-throated Diver	20	3,000								1			0	1	0	1	0	100
Little Grebe	25	4,000	11	13	9	11	9	9	5	8	14	8	9	14	72	88	12.5	15.9
Great Crested Grebe	55	3,600	13	6	5	8	6	16	7	13	4	5	9	16	109	137	8.25	11.68
Cormorant	140	1,200	7	7	6	4	6	3	6	6	7	7	6	7	297	370	2.02	1.89
Little Egret		1,300	9	4	7	10	10	10	23	17	17	18	17	23	134	166	12.68	13.86
Grey Heron	30	2,700	7	4	8	6	5	7	6	6	4	5	6	7	87	135	6.9	5.18
Moorhen	20						2			1			0	1	37	55	0	1.81
Oystercatch er	680	10,200	129	172	136	150	175	147	135	137	94	176	138	176	1,721	2,076	8.02	8.48
Ringed Plover	150	730	14		14		19		13	41			11	41	41	68	26.83	60.29
Lapwing	2,100	20,000	36	8	7	2		2	12		1		3	12	3,947	4,864	0.08	0.25
Knot	190	4,500								5		1	1	5	110	124	0.9	4.03
Dunlin	880	13,300	256	31	26	10	164	28	64	6	37	54	38	64	4,204	4,785	0.09	1.34
Ruff		12,500										1	0	1	1	3	0	33
Snipe		20,000					2	6	2	5		1	3	6	45	75	6.67	1.33
Black-tailed Godwit	140	470	61	22	16	55	75	52	121	72	129	101	95	129	2,410	3,337	3.94	3.87
Bar-tailed Godwit	160	1,200	1	2	4	4	2	1	13	5	1	1	4	13	312	405	1.28	3.2
Curlew	550	8,500	121	81	82	89	96	91	103	90	115	152	110	152	1,636	2,317	6.72	6.56
Common Sandpiper										1	1		0	1	2	4	0	25
Spotted Redshank		900	3	2								1	0	1	1	2	0	50
Greenshank	20	2,300	8	10	13	11	12	4	9	12	8	10	9	12	68	83	13.23	14.46

Redshank	310	3,900	123	106	135	129	116	116	144	126	173	161	144	173	1,723	2,295	8.35	7.54
Turnstone	120	1,500	61	26	52	33	35	12	26	73	54	17	36	73	154	214	23.38	34.11
Mediterranean Gull						1		4	4	5	6	48	13	48	22	48	59	100
Bonaparte's Gull										1				1	0	1	0	100
Black-headed Gull	20,000		190	177	167	107	176	57	187	184	221	212	172	221	2,373	2,954	7.25	7.48
Common Gull	16,000		7	47	41	88	264	39	103	21	65	84	62	103	220	290	28.18	35.51
Lesser Black-backed Gull	4,500		7	42	3	77	1	1	2	1	5	9	4	9	297	630	1.35	1.43
Herring Gull	13,000		2	3	4	1	6	3	7	3	5	3	4	7	56	123	7.14	5.69
Great Black-backed Gull	4,800		1	4	1	14	4	9	8	4	3	4	6	9	185	385	3.24	2.33
Sandwich Tern				2		22			2	6		3	2	6	49	225	4.08	2.66
Kingfisher					1		1		1	1	1	1	1	1	2	3	50	33.33

For inspection purposes only.
Consent of copyright owner required for any other use.

Copy of Marine Insitute Monitoring Data -Cork Harbour Shellfish Water Monitoring

Year	Sample	Date	Time	Station	Latitude	Longitude
10	1050	21/01/10	14:35	Cork Harbour - North Channel	51.8837	-8.2670
10	1118	21/02/10	17:28	Cork Harbour - North Channel	51.8840	-8.2690
10	1185	31/03/10	14:54	Cork Harbour - North Channel	51.8837	-8.2677
10	1252	21/04/10	19:15	Cork Harbour - North Channel	51.8843	-8.2683
10	1319	14/05/10	14:58	Cork Harbour - North Channel	51.8842	-8.2688
10	1355	30/06/10	15:23	Cork Harbour - North Channel	51.8842	-8.2685
10	1448	13/07/10	14:15	Cork Harbour - North Channel	51.8842	-8.2670
10	1521	24/08/10	13:02	Cork Harbour - North Channel	51.8843	-8.2682
10	1589	24/09/10	16:25	Cork Harbour - North Channel	51.8840	-8.2683
10	1659	29/10/10	09:05	Cork Harbour - North Channel	51.8837	-8.2690
10	1049	21/01/10	13:22	Cork Harbour - Rostellan North	51.8577	-8.1963
10	1117	21/02/10	16:27	Cork Harbour - Rostellan North	51.8578	-8.1963
10	1184	31/03/10	14:11	Cork Harbour - Rostellan North	51.8577	-8.1967
10	1251	21/04/10	18:11	Cork Harbour - Rostellan North	51.8577	-8.1967
10	1318	14/05/10	14:11	Cork Harbour - Rostellan North	51.8577	-8.1963
10	1354	30/06/10	14:31	Cork Harbour - Rostellan North	51.8577	-8.1963
10	1447	13/07/10	15:31	Cork Harbour - Rostellan North	51.8577	-8.1963
10	1519	24/08/10	14:21	Cork Harbour - Rostellan North	51.8577	-8.1963
10	1587	24/09/10	15:21	Cork Harbour - Rostellan North	51.8575	-8.1963
10	1657	29/10/10	10:15	Cork Harbour - Rostellan North	51.8583	-8.1963
10	1048	21/01/10	12:59	Cork Harbour - Rostellan South	51.8492	-8.1953
10	1116	21/02/10	15:56	Cork Harbour - Rostellan South	51.8492	-8.1950
10	1183	31/03/10	13:46	Cork Harbour - Rostellan South	51.8492	-8.1957
10	1250	21/04/10	17:31	Cork Harbour - Rostellan South	51.8492	-8.1953
10	1317	14/05/10	13:45	Cork Harbour - Rostellan South	51.8492	-8.1938
10	1353	30/06/10	14:09	Cork Harbour - Rostellan South	51.8492	-8.1950
10	1446	13/07/10	15:15	Cork Harbour - Rostellan South	51.8492	-8.1953
10	1518	24/08/10	13:41	Cork Harbour - Rostellan South	51.8492	-8.1947
10	1586	24/09/10	15:11	Cork Harbour - Rostellan South	51.8492	-8.1958
10	1656	29/10/10	10:41	Cork Harbour - Rostellan South	51.8492	-8.1938
10	1520	31/08/10	12:36	Cork Harbour - Rostellan West	51.8493	-8.2050
10	1588	24/09/10	15:02	Cork Harbour - Rostellan West	51.8493	-8.2050
10	1658	29/10/10	11:43	Cork Harbour - Rostellan West	51.8493	-8.2050

Shellfish Water Regulations S.I. 268 of 2006

Shellfish Waters Mandatory Limits	7.0 to 9.0	<40	
Shellfish Waters Guide Limits	n/a	12 to 38	
Compliance with Shellfish Waters Mandatory Limits	yes	yes	n/a
Compliance with Shellfish Waters Guide Limits	yes	yes	n/a

Programme compliance with SI 268 of 2006

Temp	pH	Salinity	DO (mg/L)	DO (% sat)	Colour	Suspended Solids (mg/l)
7.6		19	10.6	100		
6.2	8.5	28	10.1	100	5.6	20
10.3		25	9.2	96		
12.5	8.4	28	9.8	109		
13.2	8.2	32	9.5	110	5.4	16
21.1	8.2	33	8	109		
17.9	7.7	30	8.8	112		
17.9	8.1	32	7.3	94	9.3	39
15.2	7.9	33	9	111		
11.5	7.7	32	8.1	90		
7.7		17	10.7	101		
6.3	8.8	28	11	110	<4	9
11.3		28	9.8	105		
12.0	8.4	30	8.8	101		
16.0	8.4	32	12.7	155	4.7	17
21.4	8.5	33	11	152		
17.8	8.3	32	11.9	150		
18.3	8.1	33	7.8	101	5.3	53
15.8	7.9	34	10.5	131		
12.2	7.7	32	8.2	92		
7.2		25	10.1	99		
7.2	8.7	30	10.5	105	<4	4
10.2		21	10	102		
12.5	8.5	32	10.4	119		
15.4	8.3	31	12.7	153	<4	16
18.9	8.3	33	10.4	137		
18.2	8.3	32	11	142		
19.1	8.5	32	11.1	146	6	18
15.7	8.1	33	10.5	130		
11.9	7.7	32	8.1	92		
15.8	8.2	34	9.1	112	8.7	<2
15.4	8.0	34	9.2	113		
12.5	7.8	33	8.4	96		

For inspection purposes only. Consent of copyright holder required for any other use.

≥70	Deviation not >10				
≥80	n/a				
yes	n/a	yes			
yes	n/a	n/a			

DixonBrosnan

environmental consultants

Consent: Copyright owner required for any other use.
For inspection purposes only.

Project Wastewater discharge assessment at Saleen, Co. Cork				
Client Cork County Council				
Project ref	Report no	Client ref	Pages	
02070	02070.1	David Clarke	57	
DixonBrosnan The Cedars Bridewood Ovens Co Cork Tel 086 8511 437 carl@dixonbrosnan.com www.dixonbrosnan.com				
Date	Ver	Status	Prepared by	Chkd
April 03	1	Issue to client	Carl Dixon	DB
14.11.07	2	Reissued, formatting revised	Carl Dixon	DB
This report and its contents are copyright of DixonBrosnan. It may not be reproduced without permission. The report is to be used only for its intended purpose. The report is confidential to the client, and is personal and non-assignable. No liability is admitted to third parties.				
©DixonBrosnan 2007 v121107				

Original title page

Dixon.Brosnan
environmental consultants

PROJECT TITLE	
Assessment of a wastewater discharge at Saleen, Co. Cork.	
CLIENT	
Cork County Council	
CLIENT REF.	D.B REF.
-	02070038
APPROVED BY	DATE
Carl Dixon Project Manager	April 2003
	ON BEHALF OF DIXON.BROSNAN

Dixon.Brosnan, Tellengana Lodge, Blackrock Road, Cork, Ireland.
Tel: (021) 4968 600 Fax: (021) 4968 210 Email: dixonbrosnan@eircom.net

EXECUTIVE SUMMARY

Dixon.Brosnan were commissioned by Cork County Council to carry out an environmental assessment of a proposed upgrade to the sewage treatment system serving Saleen, Co. Cork. The assessment included the examination of the most suitable means of disposal of treated wastewater and the treatment standard required. The impacts of the proposed development were examined with respect to the existing environment.

Saleen is a small village situated 5km south of Midleton. The village is currently served by a septic tank system located on a site to the southwest of the village. Cork County Council have identified that the existing system is no longer satisfactory and proposes to install an improved wastewater treatment plant near the existing site. The outfall from the proposed plant will be located upstream of the line of high water of ordinary or medium tides, and therefore a foreshore licence under the Foreshore Act, 1933, will not be required.

Saleen village is drained by Saleen Stream which meets the Cloyne River approximately 400m southwest of the village. The existing septic tank is located immediately northeast of their confluence. Cloyne River becomes tidal downstream of the confluence where it becomes Saleen Creek. The study site is included in a Special Protection Area (SPA) under European Council Directive 79/409/EEC on the conservation of wild birds.

The Cloyne River, Saleen Stream and Saleen Creek are not known to be of particular fisheries significance. Information obtained from the Department of Communications, Marine and Natural Resources on current licensed aquaculture sites in proximity to Saleen indicates that all such sites in Cork Harbour are located to the north of Great Island. Oyster trestles observed at the mouth of Saleen Creek are not included in the Department's list of licensed sites.

The Cloyne River catchment is relatively small in area and there are no long term water quality data available. No direct measures of flows are available for either Saleen Stream or the Cloyne River. Flowrates were calculated on the basis of known flow data for an adjacent catchment which matches the Cloyne catchment in many respects. Samples taken at the study site during the preparation of this report indicate that water quality in the Cloyne River was slightly unsatisfactory at the time of sampling, with elevated nutrient levels present.

Following an assessment of disposal options, it is recommended that the proposed upgraded discharge is directed to the Cloyne River. The available dilution capacity is sufficient to treat up to 1500p.e., although dilution is relatively restricted at this loading. Further expansion may be deemed possible in the future, subject to more detailed long-term assessments being undertaken of flow rates and water quality in the Cloyne system.

Minimum treatment standards recommended are as follows: BOD - 15mg/l, SS - 30mg/l, total N -20mg/l and total P - 1mg/l. The quality standards recommended are relatively restrictive, with some degree of both nitrogen and phosphorous removal required. In addition, a high quality effluent will be required from the secondary clarifier (if installed) in order to meet the strict BOD limit recommended. The requirement for a high quality effluent is a product of limited available dilution, moderate background water quality and the complications associated with discharging a nitrogenous waste stream to a saline environment of some ecological importance. A number of other recommendations are made in the report regarding the proposed discharge.

*For inspection purposes only.
Consent of copyright owner required for any other use.*

 CONTENTS

1. INTRODUCTION	5
-----------------	---

PART 1: EXISTING ENVIRONMENT

2. CATCHMENT OVERVIEW	8
3. ABSTRACTIONS & DISCHARGES	11
4. FLOW DATA	12
5. HABITAT DESIGNATIONS & FISHERIES	14
6. WATER QUALITY MANAGEMENT PLAN	16
7. EXISTING WATER QUALITY DATA - CORK COUNTY COUNCIL	16
8. EXISTING WATER QUALITY DATA - EPA	16
9. ESTUARIES	18
10. SITE SURVEYS	18
11. NOISE & ODOUR	21
12. INTERPRETATION - EXISTING ENVIRONMENT	22

PART 2: LEGISLATION & STANDARDS

13. SURFACE WATER DIRECTIVE	24
14. BATHING WATER DIRECTIVE	24
15. FRESHWATER FISH DIRECTIVE	25
16. SHELLFISH DIRECTIVE	25
17. URBAN WASTE WATER TREATMENT DIRECTIVE	26
18. PHOSPHOROUS REGULATIONS	27
19. NITRATES DIRECTIVE	28
20. ROYAL COMMISSION STANDARDS	29

21. NOISE & ODOUR	30
22. INTERPRETATION - LEGISLATION & STANDARDS	31
<i>PART 3: TREATMENT, IMPACTS & RECOMMENDATIONS</i>	
23. PROPOSED DEVELOPMENT	33
24. ON-SITE DISPOSAL	35
25. DISCHARGE TO SALEEN STREAM	35
26. DISCHARGE TO CLOYNE RIVER	36
27. DISCHARGE TO SALEEN CREEK	37
28. DISCHARGE TO CORK HARBOUR	38
29. SUMMARY OF DISPOSAL OPTIONS	38
30. IMPACTS	39
31. WASTE ASSIMILATIVE CAPACITY & BOD	40
32. SUSPENDED SOLIDS	41
33. NITROGEN	42
34. PHOSPHOROUS	44
35. PATHOGENS	45
36. ECOLOGY & FISHERIES	47
37. RECOMMENDED TREATMENT STANDARDS	47
38. MIXING ZONE	48
39. RECOMMENDATIONS	49
<hr/>	
REFERENCES	52
APPENDICES	53

For inspection purposes only.
Consent of copyright owner required for any other use.

1. INTRODUCTION

1.1 Dixon.Brosnan were commissioned by Cork County Council to carry out an environmental assessment of a proposed upgrade to the sewage treatment system serving Saleen, Co. Cork. The assessment included the examination of the most suitable means of disposal of treated wastewater and the treatment standard required. The impacts of the proposed development were examined with respect to the existing environment.

1.2 Saleen is a small village situated 5km south of Midleton (Figure 1). The village is currently served by a septic tank system located on a site 300m southwest of the village. Cork County Council have identified that the existing system is no longer satisfactory and proposes to install an improved wastewater treatment plant (WWTP) near the existing site. The location of the existing site is indicated in Figure 1. The outfall from the proposed WWTP will be located upstream of the line of high water of ordinary or medium tides, and therefore a foreshore licence under the Foreshore Act, 1933, will not be required.

1.3 The upgraded plant will facilitate the construction of new housing developments in Saleen, a number of which may be permitted following the installation of improved treatment.

1.4 The proposed development is below the threshold above 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 documents *Guidelines on the information to be contained in Environmental Impact Statements* (2002) and *Advice notes on current practice in the preparation of Environmental Impact Statements* (1995) were consulted during the preparation of the report.

1.5 The report is presented in three parts as follows:

Part 1: Existing environment

Part 2: Legislation & standards

Part 3: Treatment, impacts & recommendations.

Figure 1.

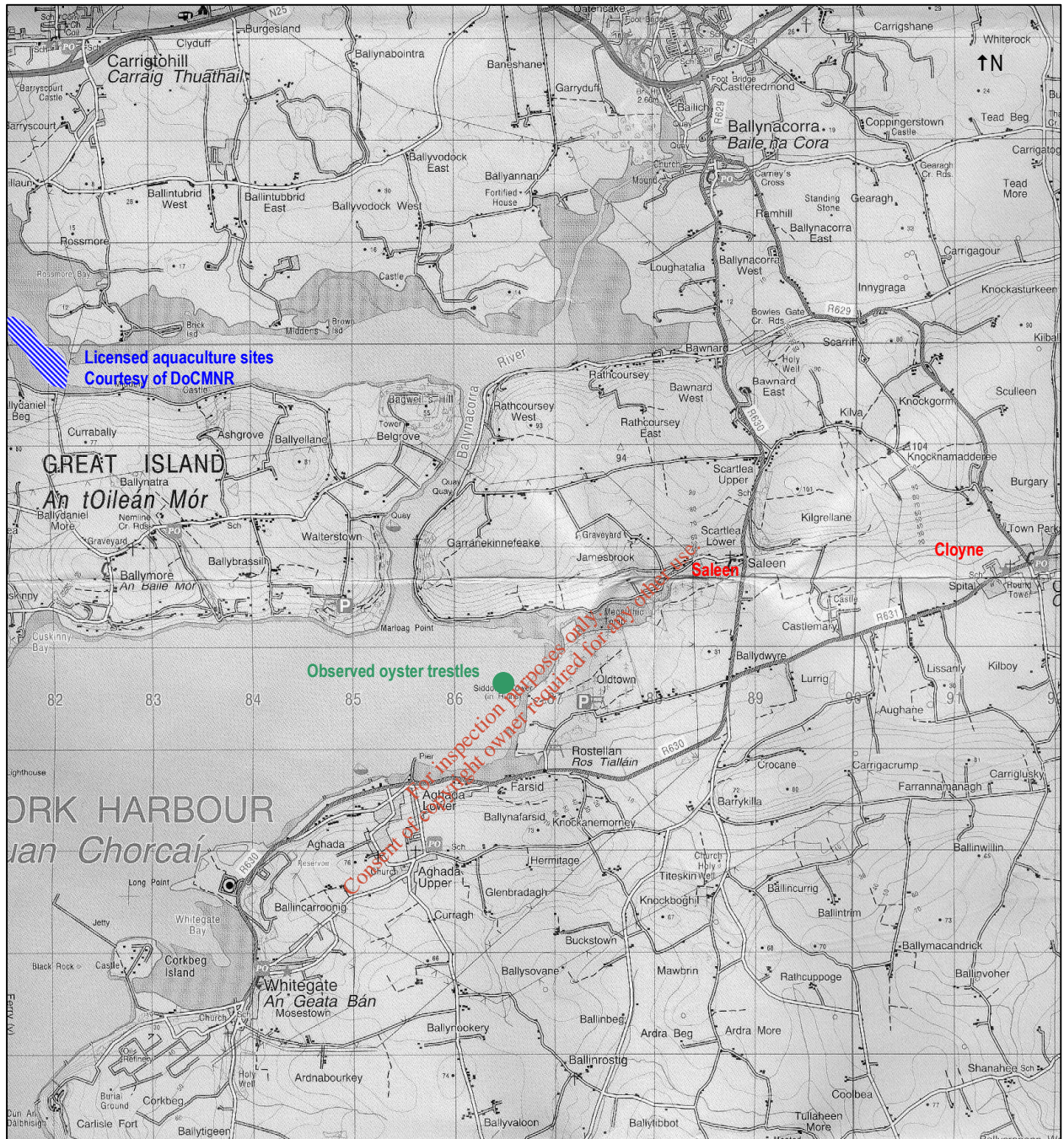
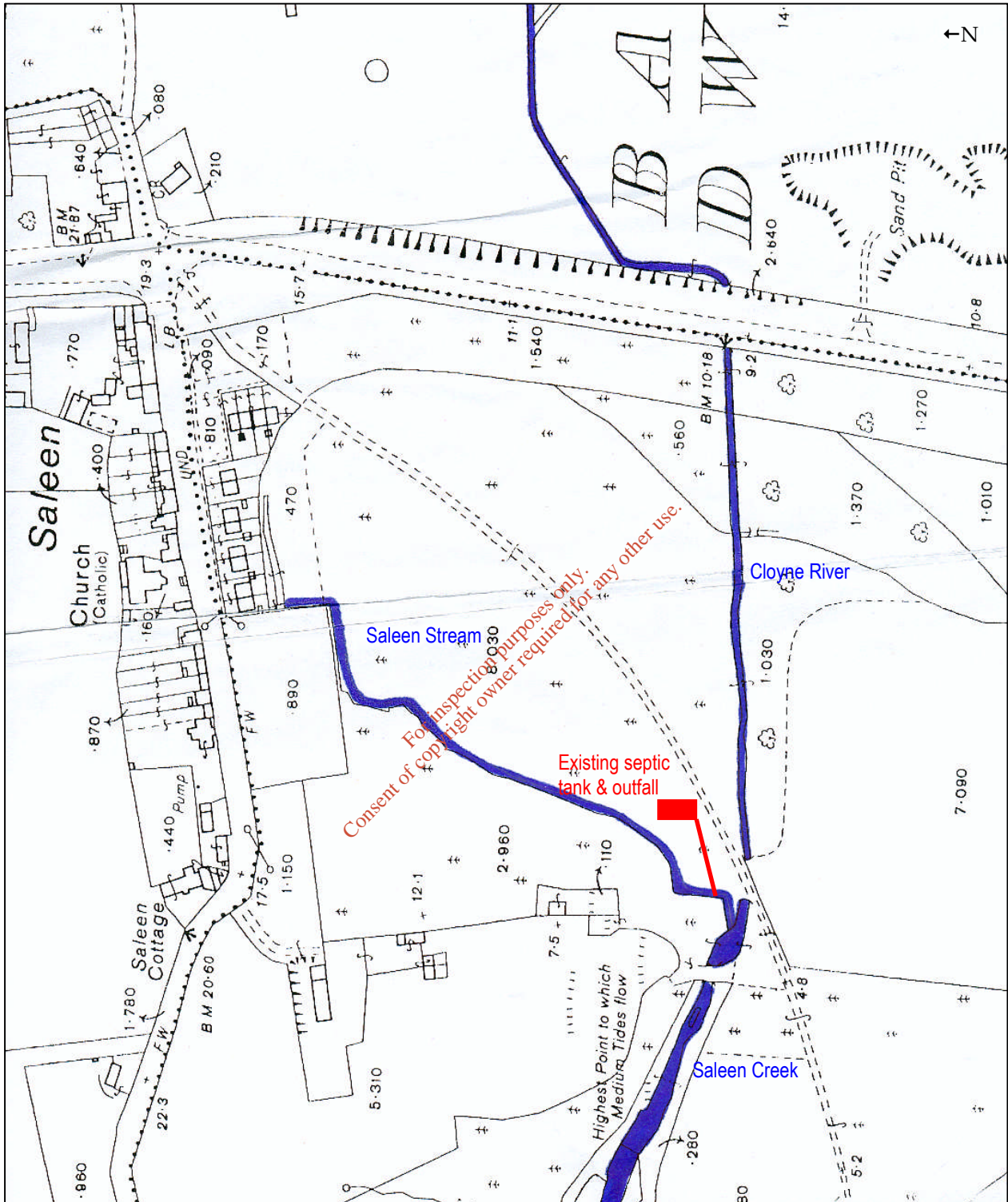


Figure 2.



PART 1: EXISTING ENVIRONMENT

2. CATCHMENT OVERVIEW

2.1 GEOLOGY & SOILS

2.1.1 Geologically, Saleen lies on the northern border of the Cloyne syncline. The geology of the area is characterised by the Gyleen and Ballytrasna formations to the north and the Waulsortian limestone of the Cloyne syncline to the south. The Ballytrasna formation is typically composed of 90% dusky red mudstone while the remainder comprises pale red fine-medium grained sandstone. The Gyleen formation is typically comprised of 20% medium grained sandstone with large and small scale cross lamination and about 80% mudstones. The Waulsortian limestones are largely calcareous mudstones, wackestones and packstones, many of them containing original cavities filled with internal sediments. The facies is some 420m thick in the Cloyne Syncline. The site of the WWTP is situated over Waulsortian limestone.

2.1.2 The subsoils in the catchment identified on the 1905 Drift Map of Cork are till, gravel and alluvium. Till is restricted to low-lying ground and is described as a massive grey-brown diamicton, rich in clays and silts. Till is generally assumed to have a moderate permeability. The Cloyne esker runs from Cloyne to Saleen and in parts is composed of deep gravel. Sand and gravel deposits have a high permeability. Deposits of white clayey sand and clay also occur on the karst limestone surface in the Cloyne and Rostellan areas. The coast at Saleen is characterised by alluvium which underlies the WWTP site.

2.1.3 Subsoil cover is thin in the vicinity of Cloyne village but limited bore hole data indicate that thickness varies from almost zero to over ten metres and that lateral changes can be sharp. Similarly, the thickness of silica, sand and clay deposits are variable. No information is available on the depth of alluvial soils.

2.2 AQUIFER CLASSIFICATION & GROUNDWATER VULNERABILITY

2.2.1 The Geological Survey of Ireland was consulted regarding percolation characteristics of the rock types and soils in the Saleen area. The Draft Vulnerability Classification Map prepared for the South County Cork Groundwater Protection Scheme gives vulnerability classifications for this area. The geology in the immediate vicinity of the existing WWTP is classified as 'High Vulnerability'. A narrow strip of land running adjacent to the south shore of Saleen Creek has been awarded an 'Extreme Vulnerability' classification. This strip of ground is immediately west of the WWTP site.

2.2.2 The Draft Aquifer and Hydrogeological Data Map prepared for the South County Cork Groundwater Protection Scheme provides a classification scheme for aquifers. The site of the treatment plant at Saleen lies over an area classified as a

'Regionally Important Aquifer', reflecting the underlying karst limestone geology. Saleen village and the area to its north overlay a 'Locally Important Aquifer - Moderately Productive only in Local Zones'. This corresponds to an underlying geology of sandstone/mudstone rocks which underlie the upland ridges between the limestone valleys.

2.3 HYDROLOGY

2.3.1 Surface water and ground water arising at Saleen village flows through an unnamed stream which runs in a southwesterly direction and is culverted under the village. For ease of reference this stream will be referred to as Saleen Stream throughout this report. Saleen Stream meets an unnamed river 375m southwest of the village; this river will be referred to hereafter as the Cloyne River. The existing WWTP is located in a forested area 300m southwest of the village, immediately northeast of the Cloyne River and Saleen Stream confluence. The WWTP currently discharges into Saleen Stream 20m upstream of this confluence. The local area is indicated in Figure 2.

2.3.2 Saleen Stream is a small watercourse and is heavily shaded by forestry. The stream arises immediately north of the village and derives from groundwater sources. Local knowledge indicates that the stream flows continuously throughout the year. The substrate is generally soft, and aquatic vegetation is absent from the areas immediately upstream and downstream of the existing WWTP discharge point. A visual examination of the stream indicates that the discharge is impacting on the stream, and discharge detritus are visible near the outfall point. Dense growths of sewage fungus are also noticeable.

2.3.3 The Cloyne valley floor, through which the Cloyne River flows, reaches a maximum elevation of 30m near Cloyne village and drops to sea level at the coast. Due to the flat nature of the local terrain, the Cloyne River is slow flowing throughout much of its length. The river substrate is generally soft with large dense mats of aquatic vegetation such as fool's watercress (*Apium nodiflorium*). The adjoining land is of good agricultural quality, consisting of improved pasture and arable crops including sugar beet. The land is intensively managed and will therefore be in receipt of chemical and/or organic fertilisers on a regular basis. This type of management, coupled with access for cattle to drinking points on the river, may result in deteriorations in water quality.

2.3.4 The Cloyne River is fed by a number of tributaries in its upper catchment. The relatively steep hills in the north of the catchment are characterised by poorer quality land with coarse unmanaged vegetation. These hills reach a maximum elevation of 105m north of Cloyne, and represent the remains of old erosion surfaces gradually falling towards a former coastline. Sections of both deciduous and evergreen forestry have been planted on the higher ground. The largest tributary of the Cloyne River drains these upland areas and meets the river 1km west of Cloyne. This tributary is a fast flowing stream with a rocky substrate and therefore differs from the main channel. A cursory examination of the stream suggests that water quality within this tributary is satisfactory. No signs of excessive siltation or macrophyte growth were noted and sensitive macroinvertebrate taxa are present. The main channel is more

likely to receive excessive nutrients due to the intensive management of the surrounding land.

2.3.5 The main channel of the Cloyne River is relatively short, running for 3km from Cloyne village to its confluence with Saleen Stream. Approximately 10-20m downstream of the confluence the river becomes tidal. This point marks the beginning of Saleen Creek, a tidal creek which meanders continuously and is characterised by large mudflats on both sides. The mudflats are normally exposed during low tides, and the river is confined to a narrow channel through the flats. A road runs along the northern margin of the creek while much of the southern shore is wooded. Saleen Creek discharges to Cork Harbour through an enclosed inlet known locally as Poul nabibe.

2.3.6 Cartographic information from the Ordinance Survey (1935 ed. 1:10560 map) indicates that the 'Highest Point to which Ordinary Tides Flow' occurs 100m downstream of the Cloyne River and Saleen Stream confluence. However, a visual examination of the site suggests that tides probably reach a small footbridge located 10m downstream of the confluence. Surveys suggest that high spring tides may reach the confluence, but further penetration inland is unlikely given the local topography.

2.3.7 Salinity readings taken on the Cloyne River during the course of site surveys indicated no saline influence on the river upstream of the footbridge. Some saline influence was detected approximately 40m downstream of the footbridge with salinity values ranging from 0.7 to 1.1ppt detected (normal seawater contains 35ppt salinity). The river widens at this point with extensive mud flats and seaweed becoming evident.

2.3.8 The Cloyne River upstream of Saleen Creek drains a catchment area of 10km². An additional 0.5km² is drained by Saleen Stream. As the WWTP site is located near the base of these catchments, the complete catchment areas discharge past the WWTP outfall point. Local knowledge and regional surveys undertaken by the Geological Survey of Ireland indicate that the limestone bedrock in this area of Cork is extensively drained by networks of subterranean streams, many of which rise to the surface at springs before disappearing again in swallow holes. It follows that the true extent of individual stream/river catchments is difficult to assess. During site surveys, flow rates observed in both watercourses were larger than their respective catchment sizes would suggest, reflecting the probable influence of groundwater contributions.

3. ABSTRACTIONS & DISCHARGES

3.1 The underlying geology of this area of Cork is such that good quality groundwater is readily available. Consequently public water provided by the local authority to the only settlements in the catchment under consideration (Cloyne and Saleen) is supplied ultimately from groundwater sources. Water supplied to the Cloyne area is abstracted from a number of groundwater wells near the village and currently totals 2000m³/day. While these wells lie on the fringes of the Cloyne River surface water catchment, they are most likely continuous with the underlying groundwater hydrology. Cloyne village may be considered to be a net contributor to the surface water balance of the catchment.

3.2 Saleen's water supply is taken from the River Dower, located in the Womanagh catchment to the east of Cloyne. The River Dower originates from a significant underground spring, and the daily abstraction rate here is 5900m³/day. The River Dower abstraction is used to supply a number of settlements and industry in the Cloyne region, a small fraction of which is supplied directly to Saleen. It follows that Saleen is also a net contributor to the water balance of the catchment. Dixon.Brosnan are not aware of any surface water abstraction points in the Cloyne catchment.

3.3 The Cloyne-Saleen catchment is entirely agricultural with little or no industry evident. It has been confirmed by Cork County Council's Environment Department that there are no licensed discharges in the catchment. The catchment area was inspected during the preparation of this report in order to determine the existence of unlicensed discharges. No discharges of significance were observed, although the possibility of agricultural or domestic discharges - whether from point or diffuse sources - cannot be discounted.

3.4 Most wastewater arising in Saleen is currently discharged to the existing septic tank system. It is proposed that all discharges at Saleen - existing and proposed - will be treated at the upgraded facility, and there will be no individual discharges in the village or its environs outside of isolated domestic septic tanks. At Cloyne all wastewater discharges to a modern WWTP and constructed wetland and there are no isolated discharges here. It follows that the only discharges to the Cloyne River of significance are those from Cloyne and Saleen WWTPs. Ongoing monitoring at Cloyne WWTP indicates that wastewater treatment efficiency here is satisfactory. This plant is currently treating a wastewater loading of 800p.e.

3.5 An inspection of the planning history at Saleen indicates that a residential planning development will be commenced in the near future. Due to the village's attractive location on the R630 regional route, it is likely that further developments will be considered in due course. Wastewater arising from such developments will most likely discharge to the upgraded WWTP, and separate discharge points to the Saleen Stream or Cloyne River are unlikely. Accordingly some expansion capacity will be required in the proposed plant.

4. FLOW DATA

4.1 No direct measures of flow are available for either Saleen Stream or the Cloyne River. There are no flow recording devices or staff gauges maintained by any authority on either watercourse. Flow recording devices were not installed during the preparation of this report as winter precipitation would distort flowrates.

4.2 Due to the karstic nature of the limestone bedrock and the presence of springs in the area, estimates of flow based on catchment may be inaccurate. Observations made during site surveys indicate that flows noted exceeded those expected in catchments of this size. In the absence of river-specific flow data, flowrates may be derived from flow data for alternative catchments. It is important that the catchments used are close to the catchment under consideration in order to minimise meteorological differences. Topographical and geological differences should also be minimised. Flow data are available for two catchments in proximity to the Cloyne-Saleen system: the Owenacurra and the Carrigacrump valleys.

4.3 OWENACURRA RIVER

4.3.1 The Owenacurra River is approximately 24km long and flows in a southerly direction through a relatively narrow valley before discharging to an enclosed corner of Cork Harbour north of Saleen. The river drains a catchment of 170km².

4.3.2 The EPA Hydrometric Office have registered an automatic flow recorder on the Owenacurra at Ballyedmond (NGR 185900 76600). Flow data recorded over 25 years since 1977 indicate that the average flow rate is 1.82m³/s, with a 95th percentile of 0.2m³/s. The catchment area discharging through the recorder station is 75km², indicating a unit area 95th percentile flow rate of 2.7l/s/km².

4.3.3 The Owenacurra River is considerably different in character to the Cloyne River. Upstream of Ballyedmond the underlying geology consists of mudstone and sandstone. The upper reaches of the Owenacurra drain afforested and marginal agricultural land. The river rises at an elevation of approximately 120m and falls to an elevation of 30m at Ballyedmond. The length of the river from its source to Ballyedmond is 9km. In contrast the Cloyne River drops approximately 30m from source to sea level over a distance of 3km, over an underlying geology primarily of limestone. It follows that flow data from the Owenacurra system will not be representative of the Cloyne catchment.

4.4 CARRIGACRUMP VALLEY

4.4.1 The Carrigacrump valley lies to the south of the Cloyne valley, separated from the latter by a ridge of hills reaching a maximum elevation of 80m. The valley floor elevation does not exceed 30m. The unnamed river draining the valley rises at Ballyfin before meeting a tributary near Titeskin Bridge. The combined rivers flow northeastwards to Cork Harbour at Rostellan.

4.4.2 The EPA Hydrometric Office have maintained a staff gauge previously on the river at Titeskin (NGR 188700 64900). Flow data were obtained for the period December 1979 to September 1992, although the data set is incomplete and only 22 readings are available. The lowest reading recorded was $0.01340\text{m}^3/\text{s}$ on October 26 1989. This corresponds to the period when traditionally Irish rivers are at their annual lowest. In the absence of more accurate data, this figure may be used as an approximate value for dry weather flow.

4.4.3 The catchment area of the Carrigacrump valley upstream of the staff gauge is 5.8km^2 . The unit area dry weather flow is therefore of $2.311/\text{s}/\text{km}^2$. Interestingly, this figure is consistent with the unit area 95th percentile flowrate recorded in the Owenacurra River.

4.4.4 The Cloyne and Carrigacrump Rivers pass through valleys with similar topographies. Both have an underlying limestone geology and both are of similar length. The source of both rivers lies at approximately the same elevation. Their proximity minimises precipitation differences. It follows that flowrate data obtained with respect to the Carrigacrump catchment will approximate flowrates in the Cloyne catchment.

4.4.5 Based on a unit area flow rate of $2.311/\text{s}/\text{km}^2$, the dry weather flow in the Cloyne catchment may be estimated at $23.11/\text{s}$ at its confluence with the Saleen Stream. The catchment area for Saleen Stream was calculated to be 0.5km^2 . The dry weather flow in this stream may be estimated at $1.171/\text{s}$. As the Saleen stream is largely derived from groundwater, this figure is considered significantly conservative.

4.4.6 It has been noted in 3.4 that a modern WWTP and constructed wetland at Cloyne currently treats a loading of 800p.e. Ongoing monitoring of the wastewater stream indicates that the daily discharge volume varies from 140 to $300\text{m}^3/\text{day}$, inclusive of storm water. Investigations are underway to divert the storm water loading. Storm water arises from precipitation within the catchment and it follows that the volume of storm water discharging to the Cloyne River will be accounted for in the catchment flowrate calculations described above. Potable water at Cloyne, however, is supplied from outside of the surface water catchment (from 3.1), and therefore this portion of the discharge at the WWTP is not accounted for in the calculations. Surveys at the Cloyne WWTP indicate that the dry weather flow of the wastewater portion is $140\text{m}^3/\text{day}$.

4.4.7 From the foregoing, the volume of the Cloyne River downstream of the WWTP discharge at Cloyne village is increased by $140\text{m}^3/\text{day}$ over the catchment based flowrate of $23.11/\text{s}$ noted in 4.4.5. The combined daily flowrate is therefore estimated at $2140\text{m}^3/\text{day}$.

5. HABITAT DESIGNATIONS & FISHERIES

5.1 DESIGNATIONS

5.1.1 The study site does not form part of any Natural Heritage Area (NHA), Special Area of Conservation (SAC), Statutory Nature Reserve or National Park. The site, however, is included in a Special Protection Area (SPA) under European Council Directive 79/409/EEC on the conservation of wild birds (the 'Birds Directive'). Additionally, the site at Saleen lies immediately south of the Great Island Channel SAC designated under European Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive').

5.1.2 The Natural Habitats Regulations, 1997 (S.I. No. 94 of 1997) transposed the Habitats Directive into Irish law. The Regulations specify a number of legal provisions for Special Areas of Conservation including a requirement for the assessment of developments which may have a significant impact on a SAC. This requirement is addressed by the preparation of this report.

5.1.3 The Great Island Channel is an integral part of Cork Harbour and has been designated both as a SAC (site code 1058) and as a SPA (as part of Cork Harbour SPA). A site synopsis for the designated areas in Cork Harbour is presented in Appendix I. Two designated habitats listed in Annex II of the Habitats Directive are found within the channel, namely sheltered tidal sand and mudflats, and Atlantic Salt Meadows. The mudflats support a range of macro-invertebrates and green algal species such as sea lettuce and *Enteromorpha* with occasional invasion by cord grass. The salt marshes are scattered and are estuarine on mud substrate. Typical species include sea purslane, sea lavender and thrift.

5.2 BIRDS

5.2.1 Cork Harbour is significantly important for birds and in particular for wintering wildfowl. The three main areas of bird importance are the North Channel, Harper's Island and Belvelly-Marino Point. A variety of birds can be found within the Great Island Channel including teal, dunlin, godwit, curlew and golden plover. Populations of shelduck and grey plover are considered to be of national importance. Cork Harbour itself holds internationally important numbers of black-tailed godwit and redshank, and nationally important numbers of nineteen other species.

5.2.2 Saleen Creek is an ideal bird watching location, being one of the best sites in Ireland to view little egrets. Large numbers of waterfowl congregate on the mudflats from late summer to early spring. Species include shelduck, whimbrel, curlew, cormorant, black headed gull, golden plover, redshank, lapwing and widgeon. Oystercatchers and ringed plovers also occur at the creek.

5.2.3 As detailed above, the Great Channel SAC and SPA are of considerable ecological value and their protection and conservation are of primary importance. The site synopsis suggests that the main threats to these areas arise from road works, infilling, sewage outflows and possible marina developments.

5.2.4 Estuaries are highly productive environments and the elevated nutrient levels deposited by both freshwater rivers and the sea result in high invertebrate numbers. These invertebrates support the high populations of wading birds that commonly occur on mudflats. The SPA which includes Saleen Creek was designated on the basis of its importance for birds and in particular for waterfowl feeding on the mudflats. Given the high bird numbers currently using Saleen Creek, the poor performance of the existing WWTP does not appear to have detracted from the suitability of this environment for birds and may have indirectly benefited birds by increasing the invertebrate populations on which they feed.

5.2.5 Increased nutrient levels may impact on the ecology of an area by changing the composition of floral communities and reducing the ability of less robust plants to survive. Following a number of site investigations and discussions with Dúchas, no evidence of any such changes has been noted. The provision of an upgraded WWTP will result in a reduction in nutrient levels reaching Saleen Creek. The impact is expected to be neutral to slightly negative on the size of local bird populations. However, a beneficial impact is expected on other forms of aquatic life.

5.3 FISHERIES

5.3.1 Cloyne River, Saleen Stream and the result of their confluence (Saleen Creek) are not known to be of particular fisheries significance. Due to its limited size, Saleen Stream is unlikely to support any fish apart from eels. The larger Cloyne River may contain brown trout, although the river is not a recognised fishery.

5.3.2 Discussions with the South Western Regional Fisheries Board during the preparation of this report indicate that there are no fish stock data available for the river, and the Board have suggested that an assessment of fish stocks should be included in any assessment of the receiving waters. Following further communication with the Board it was agreed that seasonal factors and the possibility of salmonid spawning precluded electro-fishing surveys in time for inclusion in this report. It is recommended therefore that a representative stretch of the Cloyne River upstream of Saleen Creek be assessed using a backpack electrofishing unit in summer 2003.

5.4 SHELLFISH AQUACULTURE

5.4.1 Cork is an important region for mariculture, and both pacific oysters (*Crassostrea gigas*) and native oysters (*Ostrea edulis*) are harvested and sold from Cork Harbour. Information obtained from the Department of Communications, Marine and Natural Resources (DoCMNR) on current licensed aquaculture sites in proximity to Saleen indicates that all such sites are located to the north of Great Island. These sites are not situated in proximity to the discharge point and are unlikely to be affected by the discharge at Saleen. The site locations are indicated in Figure 1.

5.4.2 During site inspections it was noted that a large block of trestles with immature pacific oysters is currently located at the mouth of Saleen Creek as it opens into the bay. The location of same is indicated in Figure 1. The site is not included in the

DoCMNR list of licensed aquaculture sites and it is not known how long these trestles have been in use.

6. WATER QUALITY MANAGEMENT PLAN

6.1 The Local Government (Water Pollution) Act, 1977, provides for one or more local authorities to take co-ordinated action on a river catchment basin by the preparation and implementation of river catchment water quality management plans. No such plans have been formally adopted by Cork County Council for the Cloyne River catchment.

6.2 The above management function has now been superseded by EU Directive 2000/60/EC establishing a framework for Community action in the field of water policy. Under the Water Framework Directive local authorities are obliged to prepare river basin management plans which will include coastal margins. A management programme is currently under preparation for the Cork area.

7. EXISTING WATER QUALITY DATA - CORK COUNTY COUNCIL

7.1 Cork County Council monitors most freshwaters throughout its functional area in accordance with various legal instruments. Due to the limited sizes of the Cloyne River and Saleen Stream, however, these watercourses are not included in any County Council sampling programmes and thus no monitoring data are held on file.

8. EXISTING WATER QUALITY DATA - EPA

8.1 BIOLOGICAL MONITORING PROGRAMME

8.1.1 The Environmental Protection Agency carries out a biological assessment of most river channels in the country on a regular basis. The assessments are used to derive a Q-value - an indication of the biological quality of the water. The EPA Q-value scheme is summarised in Table 8.1. The EPA also undertake chemical monitoring of rivers, chiefly of behalf of a number of local authorities. No biological monitoring has been carried out in the Cloyne River catchment, and there are no chemical data available. Reference is made to the biotic index scheme in Section 10.4.

Table 8.1 EPA Biotic Index Scheme.

Q-VALUE	WATER QUALITY	POLLUTION	CONDITION (likelihood of interference with uses)
5	Good	Unpolluted	Satisfactory
4	Fair	Unpolluted	Satisfactory
3	Doubtful	Moderately polluted	Unsatisfactory
2	Poor	Seriously polluted	Unsatisfactory
1	Bad	Seriously polluted	Unsatisfactory

Source: EPA

8.2 ESTUARINE & COASTAL WATERS MONITORING PROGRAMME

8.2.1 The EPA have been monitoring Ireland's most important inshore coastal waters since 1992. The monitoring programme includes Cork Harbour (referred to as the Lee Estuary). Monitoring is carried out in order to identify sensitive areas in the context of the Nitrates and Urban Waste Water Treatment Directives discussed in Part 2.

8.2.2 On the basis of samples taken, the Lee Estuary has been identified as being eutrophic in the context of the Directives noted in 8.2.1. While most coastal waters considered to be eutrophic were designated as sensitive areas under the Urban Waste Water Treatment Regulations, 2001 (SI No. 254 of 2001), the Lee Estuary was not designated pending the completion of ongoing surveys.

8.2.3 An assessment of the harbour water quality is given in the Agency's *Water Quality in Ireland 1998-2000* (2002) based on results of surveys undertaken during this period. While the surveys included all parts of the harbour inside Roche's Point, the harbour area most relevant to the current proposal - the East Channel and Saleen Creek - is not specifically addressed in the document.

8.2.4 The EPA conclude that oxygen levels in the outer harbour were close to normal during the surveys. It is also noted that oxidised nitrogen, BOD, ammonium and orthophosphate concentrations were generally low during the survey period. Significantly, the waters at Ballinacurra Estuary (north of the study area) were observed to be phosphorous limited. While the dynamics at this estuary do not directly apply to the Saleen Creek area, it is reasonable to assume that the East Channel area may also be phosphorous limited. This assumption is supported by the EPA's observation that outer harbour samples indicated limited phosphorous levels on occasion.

8.2.5 The most recent EPA data on Cork Harbour is presented in the Agency's 2001 document *Measurement and modelling of nutrient dynamics of two estuaries in Ireland - Wexford and Cork Harbours (Synthesis Report)*. The report documents the development of a harbour specific mathematical model of phytoplankton distribution throughout the harbour. It is concluded in the report that Cork Harbour is currently eutrophic, with significant nutrient inputs attributable to catchment run-offs and outfalls. It follows that a reduction in nutrient levels in harbour discharges will benefit the quality of harbour waters.

9. ESTUARIES

9.1 Approximately 50% of Ireland's population lives within 10km of the coastline, and an estimated 80% of sewage and biodegradable wastes are discharged to estuarine and coastal waters in Ireland (Wilson, 1998). Riverine inputs, both natural and anthropomorphic in origin, also contribute high levels of nutrients and estuarine sediments are often major sinks for nitrogen. An overview of monitoring of Irish estuaries by the EPA and others suggests however that '*the quality of estuarine and coastal waters around the country has remained generally high*' (EPA, 2002), despite the fact that most estuaries receive sewage discharges.

9.2 In estuarine environments, the behaviour of discharge plumes and their mixing zones will be influenced by the nature of the estuary and consequent stratification. Department of the Environment Technical Committee on Effluent and Water Quality Standards *Memorandum No. 1: Water Quality Guidelines* (1978) describes three stratification extremes created by estuary topography. Saleen Creek approaches one of these extremes, being long, narrow and shallow. *Memorandum No. 1* notes that such estuaries will be thoroughly mixed, with a salinity gradient from the inland end to the sea.

9.3 No studies have been undertaken on the dynamics of Saleen Creek. Such studies are beyond the scope of this report; indeed Kramer *et al* (1994) state that estuarine studies are onerous in themselves. In the absence of detailed information, *Memorandum No. 1* notes that dilution capacities within an estuary are more safely determined using freshwater flow data only.

9.4 In the assessment of the impact of proposed wastewater discharges to enclosed estuarine environments, *Memorandum No. 1* notes that a limit of 200mg/l BOD may be discharged where the daily discharge does not exceed 100lbs. (45kg) BOD. This limit is increased to 400mg/l in the case of open estuaries and bays.

10. SITE SURVEYS

10.1 A number of surveys were undertaken at and in the environs of the WWTP site as follows: catchment assessment, percolation assessment, chemical survey and biological survey. The results of the catchment assessment have been described in Section 2. The remaining surveys are discussed below.

10.2 PERCOLATION ASSESSMENT

10.2.1 The area surrounding the WWTP site consists of forested land on low-lying ground. There has been significant disturbance in the local area, with concomitant recolonisation by dense bramble. Some sections have been naturally recolonised by trees including alder and birch. Other sections have been replanted with deciduous

species. Due to the dense vegetative growth and the disturbed nature of the soil, accurate percolation tests were not feasible.

10.2.2 As detailed in NSAI Standard Recommendation S.R.6: 1991 *Septic Tank Systems - Recommendations for Domestic Effluent Treatment and Disposal from a Single Dwelling House*, vegetation type can provide an indication of drainage characteristics and the height of the ground water table. Species noted on the site such as rush (*Juncus* sp.) and lesser reedmace (*Typha latifolia*) are generally indicative of poor drainage and possible water-logging during wet weather. Some standing water was noted in channels around the site.

10.2.3 Preliminary surveys during this study indicate that soils are heavy and may have a high clay content in certain areas. Such conditions on a low-lying site will generally preclude on-site disposal via percolation.

10.3 CHEMICAL SURVEY

10.3.1 In order to determine the current water quality of the watercourses within the study area, samples were taken at four locations on January 10 2003. The sampling locations, and results of analyses undertaken by Water Technology Ltd., are presented in Tables 10.1 and 10.2 respectively.

Table 10.1 Sampling locations January 10 2003.

REF.	LOCATION	REASON FOR SELECTION
C1	Cloyne River 15m u/s of confluence with Saleen Stream	To ascertain water quality u/s of confluence
C2	Cloyne River 1m d/s of confluence with Saleen Stream	To ascertain water quality d/s of confluence
S1	Saleen Stream 10m u/s of existing WWTP discharge	To ascertain water quality u/s of existing effluent discharge from WWTP
S2	Saleen Stream 5m d/s of existing WWTP discharge	To ascertain impact of WWTP discharge

10.3.2 Suspended solids levels in the Cloyne River were satisfactory, while both sampling sites on the Saleen Stream were found to have elevated levels. In part this may reflect the silty nature of the latter. The elevated level at station S2 may also be attributable to the discharge from the existing treatment plant. This level exceeded the 25mg/l limit specified by the Freshwater Fish Directive.

10.3.3 Concentrations of ammonia, nitrite and nitrate were elevated at all stations, with general increases noted downstream of the existing WWTP discharge. Relevant standards in the Fisheries and Surface Water Directives were breached in many instances. Orthophosphate levels were also high in both watercourses and indicative of some eutrophication.

Table 10.2 Water quality, January 10 2003.

PARAMETER	C1 (mg/l)	C2 (mg/l)	S1 (mg/l)	S2 (mg/l)
pH	6.78	6.83	6.95	6.96
Biochemical oxygen demand	<1	<1	<1	<1
Suspended solids	3	8	22	27
Ammonia (NH ₃ -N)	0.07	0.03	0.01	0.48
Nitrite (NO ₂ -N)	0.008	0.008	0.012	0.043
Nitrate (NO ₃ -N)	5.0	4.9	6.5	6.7
Orthophosphate (o-PO ₄ -P)	0.100	0.090	0.012	0.043
Total phosphorous (t-PO ₄ -P)	0.27	0.28	<1	<1

Analysis: Water Technology Ltd.

10.3.4 While BOD levels recorded at all sites were low, results obtained from both watercourses were generally unsatisfactory. It is not known if elevated concentrations of nutrients recorded in the Cloyne River were a result of a recent isolated pollution event or if chronic problems persist. In Saleen Stream, elevated levels of nutrients and suspended solids would appear to be linked in part to the existing WWTP discharge.

10.3.5 It must be noted that the chemical data discussed above arise from one sampling occasion. No long term data are available for these sites. Where such data do not exist, it is recommended that any WWTP developments be accompanied by an ongoing review of water quality.

10.4 BIOLOGICAL SURVEY

10.4.1 In the absence of any EPA biological quality data as noted in 8.1, a biological survey was undertaken on both watercourses in question on January 20 2002. The purpose of the survey was to assess the impacts of the existing discharge on the long term water quality of the stream; the determination of such long term impacts is not possible on the basis of chemical data. The survey will also provide a baseline against which future comparisons may be made.

10.4.2 A biological survey will provide an accurate assessment of water quality when carried out during the summer or autumn, and in this respect the timing of the survey described was not ideal. However results obtained are significant in the absence of other data.

10.4.3 Samples were taken at three locations; the locations and results obtained are presented in Table 10.3. A summary of the biological report is given in Appendix II.

Table 10.3 Q-values obtained January 20 2002.

SITE	LOCATION	Q-VALUE
B1	Cloyne River 50m u/s of confluence with Saleen Stream	Q3(3-4)
B2	Cloyne River 5m d/s of confluence with Saleen Stream	Q2-3
B3	Saleen Stream 4m d/s of discharge from WWTP	Q1

10.4.4 Sampling station B1 was a poor sampling site with a muddy substrate and limited areas of gravel. Poor quality surface runoff from an adjacent field and from cattle drinking points may be having a localised impact on water quality at this location. A Q-value of Q3(3-4) was awarded, indicating moderate quality. Suitable sampling sites are limited at this location due to heavy shading, and it is recommended that this stretch of river be re-sampled in June 2003 to more accurately assess local water quality.

10.4.5 Site B2 was situated 5m downstream of the Cloyne-Saleen confluence. The station was a good sampling location with a mixed substrate of gravel, cobbles and larger stones. The presence of polychaete worms here is indicative of some saline influence. A rating of Q2-3 was assigned to this site, indicating reduced quality, and this site is most likely being affected by the existing WWTP discharge.

10.4.6 Site B3 was situated on Saleen Stream 4m downstream of the existing discharge. The site was characterised by extensive growths of sewage fungus and strong odours. This section of the watercourse is being affected by the WWTP discharge on an ongoing basis, and was assigned a Q value of Q1 indicating very poor quality. This site is seriously polluted with consequent impacts on macro-invertebrate populations.

11. NOISE & ODOUR

11.1 Saleen village is a small settlement located on regional route R630. There are no industrial noise sources in the vicinity of the village, and the noise environment is dominated by traffic (local and through-flow). Occasional noise emissions will arise from domestic sources (eg. children), agriculture (eg. tractors) and natural noise (eg. wind, birds).

11.2 The local air environment is also rural, with no sources of industrial atmospheric emissions present in the immediate locality. An oil refinery at Whitegate and a power generating station at Aghada, both within 7km of the village, may give rise to occasional odours. In addition, the village's location at the northeastern corner of Cork Harbour may result in infrequent odours arising from the pharmaceutical industry concentrated at Ringaskiddy.

11.3 From the foregoing, the noise and odour environment at Saleen village is generally rural in character. The most intrusive feature is the noise level arising from passing traffic, particularly traffic associated with the installations noted in 11.2. It is recommended that the proposed upgrade to the WWTP does not give rise to intrusive noise or odour emissions in the village or its environs.

12. INTERPRETATION - EXISTING ENVIRONMENT

12.1 This section provides a summary of information documented in Part 1 (Sections 2 to 11) regarding the existing environment.

12.2 The Cloyne River catchment is of relatively small size and has not been included in Cork County Council or EPA river monitoring programmes in the past. Consequently there are no long term water quality data available for the Cloyne River or its tributaries. In addition, there are no water quality or river basin management plans for the catchment in existence. While ongoing and past monitoring programmes have been carried out in Cork Harbour, there are little or no data available in relation to the corner of the harbour under consideration.

12.3 Cartographic information from the Ordnance Survey (1935 ed. 1:10560 map) indicates that the 'Highest Point to which Ordinary Tides Flow' occurs 100m downstream of the Cloyne River and Saleen Stream confluence. A visual examination of the study site suggests that tides probably reach a small footbridge located 10m downstream of the confluence. Thus the WWTP site lies at the downstream tip of the Cloyne catchment and in close proximity to the estuary head.

12.4 Information obtained from the Geological Survey of Ireland indicates that the geology in the immediate vicinity of the WWTP site is classified as 'High Vulnerability'. In addition, the site lies over a 'Regionally Important Aquifer', reflecting the underlying karst limestone geology. Preliminary surveys undertaken indicate that soils at the site are heavy and may have a high clay content in certain areas. Such conditions on a low-lying site will generally preclude on-site disposal via percolation.

12.5 There are no surface water abstractions in the Cloyne catchment. All potable water is taken from a number of groundwater wells in the region, and thus Cloyne and Saleen villages are net contributors to the surface water system. There are only two discharges of significance in the catchment: the discharge under consideration and a treated wastewater discharge at Cloyne. Ongoing monitoring of the latter indicates that wastewater treatment efficiency here is satisfactory.

12.6 No direct measures of flow are available for either Saleen Stream or the Cloyne River. Flowrates were calculated on the basis of known flow data for an adjacent catchment which matches the Cloyne catchment in many respects. Using this data, the unit area dry weather flow rate in the catchment was estimated at 2.23l/s/km².

The daily flowrate in the Cloyne River is increased by an estimated 140m³ (dry weather flow) downstream of the Cloyne WWTP outfall.

12.7 The study site is included in a Special Protection Area (SPA) under European Council Directive 79/409/EEC on the conservation of wild birds. Saleen Creek, immediately downstream of the WWTP site, is recognised nationally as an important little egrets viewing location. Given the link between nutrient discharges and bird feeding sites, it is likely that the proposed development will have a neutral to slightly negative impact on feeding bird populations via a reduction in nutrient availability for animal and plant growth. A beneficial impact is expected, however, on other forms of aquatic life.

12.8 Cloyne River, Saleen Stream and Saleen Creek are not known to be of particular fisheries significance. A closer inspection of fish stocks is recommended during summer 2003.

12.9 Information obtained from the Department of Communications, Marine and Natural Resources on current licensed aquaculture sites in proximity to Saleen indicates that all such sites in Cork Harbour are located to the north of Great Island. An observed pacific oyster trestle located at the mouth of Saleen Creek is not included in the Department's list of licensed sites.

12.10 Water samples taken at the study site during the preparation of this report indicate that water quality in the Cloyne River was slightly unsatisfactory at the time of sampling, with elevated nutrient levels present. It is not known if these levels were attributable to a recent isolated pollution event or if chronic problems persist. BOD and suspended solid levels, however, were satisfactory. Chemical and biological samples taken from Saleen Stream indicate the water quality is currently suffering as a result of the existing WWTP discharge.

12.11 The local environment at the study site is rural in character, with little or no noise or air nuisance present. Despite the dominance of traffic noise on regional route R630, it is imperative that the rural environmental character be maintained with no air or noise emissions from the treatment facilities proposed.

PART 2: LEGISLATION & STANDARDS

13. SURFACE WATER DIRECTIVE

13.1 Council Directive 75/440/EEC of 16 June 1975 concerning the quality of surface water intended for the abstraction of drinking water in the Member States was incorporated into Irish law by the European Communities (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, 1989 (S.I. No. 294 of 1989). The Regulations set out quality standards for a total of 39 parameters for waters which are to be treated for distribution, with the standards varying with the degree of treatment provided.

13.2 There are no abstraction points on the Saleen River downstream of Saleen, and none are proposed. The area's proximity to Cork Harbour and its consequent susceptibility to tidal influence precludes any abstraction on this stretch of the river. It follows that the Surface Water Directive is not of significance here.

14. BATHING WATER DIRECTIVE

14.1 Council Directive 76/160/EEC of 8 December 1975 concerning the quality of bathing water, and the numerous Irish follow-up Quality of Bathing Waters Regulations (the most recent being S.I. No. 177 of 1998) lay down quality requirements for inland and coastal waters at designated bathing areas. The quality standards refer chiefly to microbiological parameters, with provision for monitoring of other parameters where it is suspected that conditions have deteriorated.

14.2 There are no designated bathing areas on the Cloyne River or in Cork Harbour. The nearest beach is located at White Bay at the harbour mouth. Some aquatic activities such as wind surfing are carried out along the coastline by Aghada, approximately 2km southwest of the Poul nabibe inlet. While due regard should be given to the amenity value of this area of the harbour, the provisions of the Bathing Water Directive do not directly apply.

15. FRESHWATER FISH DIRECTIVE

15.1 Council Directive 78/659/EEC of 18 July 1978 on the quality of fresh waters needing protection in order to support fish life was given Irish effect by the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988). The Regulations specify a separate range of standards for salmonid and cyprinid fish in waters designated as needing protection or improvement for their support.

15.2 The Cloyne River is not designated under the Regulations, and it is not expected that the river will be designated in the immediate future. The fisheries significance of the river has been discussed in Section 5.

15.3 Notwithstanding the absence of any fisheries designation, the Freshwater Fish Directive carries some weight due to its strict limits and the consequent suitability of a watercourse for other uses should it meet these limits. The most significant wastewater parameters are presented in Table 15.1 with respect to the Directive.

Table 15.1 Freshwater Fish Directive limits.

PARAMETER	SALMONID LIMIT	CYPRINID LIMIT
BOD	3mg/l	6mg/l
Suspended solids	25mg/l	25mg/l
Ammonia - N	0.02mg/l ¹ 0.82mg/l ²	0.02mg/l ¹ 0.82mg/l ²
Nitrate - N	-	-
Orthophosphate - P	-	-
Total phosphorous - P	0.062mg/l ³	0.124mg/l ³

¹Un-ionised ammonia

²Total ammonium

³Not specified as limit but rather 'may be regarded as indicative in order to reduce eutrophication'.

15.4 Limits specified in Table 15.1 will be used where applicable in the assessment of wastewater impacts on receiving freshwaters.

16. SHELLFISH DIRECTIVE

16.1 Council Directive 79/923/EEC of 30 October 1979 on the quality required by shellfish waters, and the associated Quality of Shellfish Waters Regulations, 1994 (S.I. No. 200 of 1994) specify designated coastal and brackish waters needing protection or improvement in order to support shellfish. Specified limit values apply to these areas. There are no designated shellfish areas on this stretch of the Irish coastline, and thus the Directive and Regulations do not apply.

16.2 Pursuant to Council Directive 91/492/EEC (as amended by Council Directive 97/61/EC) which lays down the health conditions for the production and the placing

on the market of live bivalve molluscs, the Minister for the Marine and Natural Resources issued the Live Bivalve Molluscs (Production Areas) (No. 2) Designation, 2002 in which a number of production areas are listed from which molluscs may be taken. The designation requires that all mussels and oysters harvested in Cork Harbour may be placed on the market for human consumption only after treatment in a purification centre or after relaying which ensures that requirements specified in Directive 91/492/EEC are met.

16.3 Directive 91/492/EEC specifies, *inter alia*, that shellfish tissue is required to contain limited numbers of faecal coliforms. It is noted that live bivalve molluscs must not exceed, in 90 per cent of samples, the limits of a five-tube, three-dilution MPN-test of 6,000 faecal coliforms per 100g of flesh, or 4,600 E.Coli per 100g of flesh. Despite the absence of a formal shellfish designation within Cork Harbour under S.I. No. 200 of 1994, it is advisable that the microbiological quality of the northeast harbour area is not affected by the proposed upgrade. It should be noted that there are no disinfection facilities within the existing treatment system at Saleen, and the proposed upgrade will result in a significant improvement at the very least.

17. URBAN WASTE WATER TREATMENT DIRECTIVE

17.1 The Environmental Protection Agency Act, 1992 (Urban Waste Water Treatment) Regulations, 1994 (S.I. No. 419 of 1994) were issued to give effect to EU Council Directive 91/271/EEC concerning urban waste water treatment. The Regulations specify that wastewater arising from populations of less than 2,000 shall, by the end of 2005, be subject to appropriate treatment prior to discharge. Appropriate treatment is defined as

...any process and/or disposal system which after discharge allows the receiving waters to meet the relevant quality objectives and the relevant provisions of the Directive and of other Community Directives.

This requirement applies to freshwater and estuarine discharges.

17.2 Wastewater quality limits specified in the Second Schedule of the Regulations note that the final concentrations of BOD and suspended solids shall not exceed 25mg/l and 35mg/l respectively. These limits apply, however, only to treated discharges from populations over 2,000 (10,000 where the discharge is coastal); the relevant discharge standards to be applied are to be determined from '*...other relevant Community Directives*'. Other directives of immediate relevance are Directives 75/440/EEC and 76/160/EEC, both of which have been discussed above.

17.3 The Urban Waste Water Treatment Directive notes in Annex IIA that a water body (freshwater, estuarine or coastal) must be identified as a sensitive area if certain criteria are met and to where treated waste from agglomerations of greater than 10,000 p.e. will discharge. Neither the Cloyne River nor Saleen Creek have been designated as sensitive areas. The designation process is directed at agglomerations

significantly larger than that under consideration here. Cork Harbour has not been designated as a sensitive area at the time of writing. It is expected that the harbour will be designated in the near future pending the completion of nutrient studies.

17.4 The Directive specifies a number of obligations regarding the design of wastewater treatment plants as follows:

(a) Such plants shall be designed, constructed, operated and maintained to ensure sufficient performance under all normal local climatic conditions.

(b) When designing the plants, seasonal variations of the load shall be taken into account.

(c) Waste water treatment plants shall be designed or modified so that representative samples of the incoming waste water and of treated effluent can be obtained before discharge to receiving waters.

(d) The points of discharge of urban waste water shall be chosen, as far as possible, so as to minimize the effects on receiving waters.

It is recommended that items (a), (b) and (c) are taken into account at the design and installation stage of any extensions to the existing treatment plant. Item (d) is addressed in this report.

18. PHOSPHOROUS REGULATIONS

18.1 The Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorous) Regulations, 1998 (S.I. No. 258 of 1998) were introduced to counter eutrophication observed throughout Irish watercourses and also to comply with Council Directive 76/464/EEC on pollution caused by certain dangerous substances discharged into the aquatic environment. The Regulations oblige local authorities to maintain or improve the water quality at any part of a river, by 2007, by reference to the biotic index (Q-value) or to the concentration of molybdate-reactive phosphate (largely orthophosphate). The target values specified are set out in the third schedule of the Regulations and are reproduced in Table 18.1.

18.2 The target values specified in the Regulations were adopted on the basis of the empirical relationship between the biotic indices and orthophosphate concentrations in Irish waters as monitored extensively by the EPA. Some concern has been expressed that this simplistic approach does not apply equally throughout Irish watercourses, with consequent complications in the assessment of existing and proposed discharges. These and other difficulties may be addressed in the incorporation of the EU Water Framework Directive into Irish law.

Table 18.1 Phosphorous Regulations target values.

EXISTING Q-VALUE	EITHER TO BE APPLIED	
	TARGET Q-VALUE	TARGET MRP ($\mu\text{g/l}$)
5	5	15
4-5	4-5	20
4	4	30
3-4	4	30
3	3-4	50
2-3	3-4	50
≤ 2	3	70

Source: Phosphorous Regulations, 1998

18.3 The limited size of the Cloyne River and its tributaries is such that the catchment has been generally ignored in the preparation and application of water quality plans by the EPA and Cork County Council to date. Thus there are no biological data available from the EPA, and the catchment has not been included in any local authority implementation report prepared in accordance with the Phosphate Regulations.

18.4 In the absence of any specific requirements under the Regulations, it is recommended that biological data discussed in Section 10.4 be used in the application of local quality objectives. Any recommendation made below on discharge points will be accompanied by a review of existing and target Q-values specified in the Regulations.

19. NITRATES DIRECTIVE

19.1 Council Directive 91/676/EEC of 12 December 1991 concerning the protection of waters against pollution caused by nitrates from agricultural sources obliges member states to identify Nitrate Vulnerable Zones within which restricted agricultural practices will apply. Zone designation is undertaken by reference to a number of criteria listed in Annex I of the Directive including excessive nitrate concentrations in surface or ground waters and high trophic status. With respect to surface waters, the Directive notes that sensitive waters shall be identified where nitrate levels exceed the maximum concentration specified in the Surface Water Directive ie. 11.3mg/l N.

19.2 No surface waters have been designated as Nitrate Vulnerable Zones in Cork. In addition, nitrate levels presented in 10.3 indicate that nitrate concentrations are currently satisfactory in the Cloyne River in the context of the Directive.

20. ROYAL COMMISSION STANDARDS

20.1 The standards noted in the *Eight Report of the Royal Commission on Sewage Disposal* (1912) have played an important part in water quality management since their publication. The standards are summarised in Table 20.1.

Table 20.1 Royal Commission standards, 1912.

DILUTION	STANDARD (mg/l)		TREATMENT REQUIRED
	BOD mg/l	SS mg/l	
8-150	20	30	Primary & secondary
150-300	-	60	Chemical precipitation
300-500	-	150	Plain sedimentation
>500	-	-	No treatment

Source: Royal Commission, 1912.

20.2 The normal standard fixed was 20mg/l BOD and 30mg/l suspended solids. The Commission did not include a quality standard for receiving waters in their recommendations, but noted that river waters with a BOD of 4mg/l will be ordinarily free from signs of pollution.

20.3 In accordance with the Commission's report, most river authorities have traditionally sought a minimum dilution of 1:8 in the discharge of treated wastewater to a watercourse, regardless of treatment efficiency.

20.4 The Commission standards formed the basis of *Memorandum No. 1: Water Quality Guidelines* (1978) issued by the Irish Department of the Environment Technical Committee on Effluent and Water Quality Standards. The majority of quality standards specified in the memorandum have since been superseded by more recent legislation and standards such as those described above. *Memorandum No. 1* specifies that the maximum BOD concentration in salmonid freshwaters and estuarine waters should not exceed 4mg/l. While the river under consideration has not been designated as salmonid, it is recommended that this stricter limit be applied.

20.5 *Memorandum No. 1* makes recommendations regarding discharges to estuarine environments (Section 9). Maximum BOD loadings recommended in the document are considered lenient in the context of modern legislation and standards, and the stricter limits applicable to freshwater situations are considered more appropriate to the discharge assessed in this report.

21. NOISE & ODOUR

21.1 There are no national noise limits in place in Ireland. Most developments are usually restricted by way of noise conditions in relevant planning permissions or Environmental Protection Agency licences. In the granting of permission to developments, the authorities will often refer to the EPA document *Integrated Pollution Control Licensing – Guidance note for noise in relation to scheduled activities* (1995) which notes that the noise level at a sensitive location should be kept below an L_{Ar} value of 55dB during the hours 0800-2200, and below 45dB outside of these hours, the L_{Ar} being equal to the L_{Aeq} (the average noise level) plus a penalty applied where the noise is tonal or impulsive. The guidance note states in particular that audible tones and impulsive noise at sensitive locations should be avoided at night, irrespective of the noise level.

21.2 The EPA guidance note defines a noise sensitive location as

Any dwelling house, hotel or hostel, health building, educational establishment, places of worship or entertainment, or any other facility or area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.

It follows that the any local residence or establishment, internally and externally, in the vicinity of the WWTP site is a noise sensitive location within the terms of the guidance note.

21.3 While the EPA document was prepared as a guidance note for activities specified only in the First Schedule to the EPA Act (1992) and subsequently in follow-up Orders, the absence of other Irish guides or standards lends the document some significance and consequently the document now carries some weight outside of the industrial sectors regulated by the EPA.

21.4 There are no odour limits specified in Irish legislation, and only the Air Pollution Act, 1987 makes any reference to odour nuisance. In the absence of any limits, the EPA in their document *Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels* (1999) have recommended minimum buffer zones to be applied around WWTPs over certain threshold p.e. values. The zones have been selected to reduce both odour and noise impacts. The document notes that for systems designed to treat greater than 161p.e., a buffer zone of 50m should allowed ie. the WWTP should not be located nearer than 50m to existing development. It is further noted that at least 30m of this distance should be in the possession of the WWTP operator.

22. INTERPRETATION - LEGISLATION & STANDARDS

22.1 There are no abstraction points on the Cloyne River or Saleen Stream downstream of Saleen, and none are proposed. It follows that the Surface water Directive is not of significance here. In addition the Nitrates Directive does not apply.

22.2 There are no designated bathing areas on the Cloyne River, Saleen Creek or in Cork Harbour. While due regard should be given to the amenity value of this area of the harbour, the provisions of the Bathing Water Directive do not directly apply.

22.3 Neither the Cloyne River nor Saleen Stream have been designated under the Salmonid Regulations, and it is not expected that either will be designated in the immediate future. The fisheries significance of the river has been discussed in Section 5. Notwithstanding the absence of any fisheries designation, the Freshwater Fish Directive and Salmonid Regulations are of some significance, and it is recommended that the potential impact of the proposed upgrade is assessed with reference to Table 15.1.

22.4 There are no designated shellfish areas in Cork Harbour and thus the Shellfish Directive and Regulations do not apply. However, a number of oyster beds are located in the northeast of Cork Harbour, and it is recommended that the suitability of the harbour for this activity should not be affected by the proposed upgrade. Relevant legislation on the harvesting of molluscs makes specific reference to faecal coliform numbers in shellfish tissue. It has been noted above that there are no disinfection facilities within the existing treatment system at Saleen, and the proposed upgrade will result in a significant improvement at the very least.

22.5 Neither the Cloyne catchment nor Cork Harbour have been designated as sensitive areas in the context of the Urban Waste Water Treatment Directive. With reference to the proposal under consideration, the Directive notes that the proposed discharge shall be subject to appropriate treatment prior to discharge, where appropriate treatment is described as that which will allow compliance with other relevant Directives. The most pertinent of these is the Freshwater Fish Directive. The Urban Wastewater Directive specifies that the point of discharge of the treated wastewater shall be chosen so as to minimize the effects on receiving waters.

22.6 The limited size of the Cloyne River and its tributaries is such that the catchment has been generally ignored in the preparation and application of water quality plans by the EPA and Cork County Council to date. Therefore, in the absence of any specific requirements under the Phosphate Regulations, it is recommended that biological data obtained during the preparation of this report be used in the application of local quality objectives.

22.7 The 1912 Royal Commission report notes that a wastewater discharge to a watercourse should comply with a 20mg/l BOD and 30mg/l suspended solids standard, and a minimum dilution of 8. This standard is generally the minimum allowed in the disposal of treated wastewater, and has been endorsed by the Irish Department of the Environment Technical Committee on Effluent and Water Quality Standards.

22.8 In the assessment of noise and odour impacts, the EPA document *Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels* (1999) specifies recommended minimum buffer zones to be applied around WWTPs over certain threshold sizes. The document notes that for systems designed to treat greater than 161p.e., a buffer zone of 50m should be allowed, of which 30m should be in the possession of the WWTP operator.

22.9 In summary, the article of legislation of greatest significance with respect to the discharge is the Freshwater Fish Directive. Compliance with limits specified in this article will generally ensure compliance with provisions of other relevant legislation. While the Bathing Waters and Shellfish Directives do not directly apply, it is recommended that the suitability of the local harbour area for amenity and mollusc harvesting activities should not be affected by the microbiology of the proposed discharge.

For inspection purposes only.
Consent of copyright owner required for any other use.

PART 3: TREATMENT, IMPACTS & RECOMMENDATIONS

23. PROPOSED DEVELOPMENT

23.1 The septic tank system currently serving Saleen was originally designed to treat wastewater arising from twelve houses in the village. Since its installation, a number of additional connections have been made and the system is now entirely overloaded. The level of treatment being provided at present is unsatisfactory, and the impacts on the receiving watercourse have been noted in Part 1. Cork County Council proposes to install an improved wastewater treatment plant at this site. It should be noted that, given the current unsatisfactory level of treatment, the proposed upgrade can only improve the quality of the discharge.

23.2 The existing system is most likely in a state of poor repair. Any decision to retain the system and to link it to the new plant should be accompanied by a complete assessment of the structural integrity of the tank. Given the costs associated with such a survey, the difficulties in establishing the defined percolation area, if any, and the proximity of the tank to the tidal waters of Saleen Creek, it is recommended that the tank be decommissioned in its entirety .

23.3 Following discussions with Cork County Council, the wastewater loading arising at Saleen is 800p.e., inclusive of imminent planning developments. It is proposed to increase the design capacity of the upgraded system, initially to 1000p.e. and possibly ultimately to 1200-1500p.e., to allow for the future development of the Saleen area. In order to facilitate gradual expansion of the plant, and the possibility of further development in the long term, it is recommended that a WWTP of modular design be installed.

23.4 The EPA document *Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels* (1999) notes that recent research suggests that *per capita* wastewater flow averages 180l/day, and the document recommends this figure be used. Accordingly this per capita wastewater flow is now accepted as the standard flow to be used in the design of wastewater treatment systems. Using this flow rate, the average daily volume (dry weather flow - DWF) of wastewater arising from design populations of 1000, 1200 and 1500p.e. will be 180, 216 and 270m³/day respectively.

23.5 As there are no industrial discharges to the existing sewerage network, the wastewater arising in Saleen is domestic in nature. The characteristics of such wastewater streams have been documented by the EPA (1999) and are summarised in Table 23.1. No unusual variations in the existing wastewater profile have been reported.

Table 23.1. Domestic inflow wastewater characteristics from EPA study.

PARAMETER	MEAN
SS	163mg/l
BOD	168mg/l
COD	389mg/l
o-PO ₄ -P	7.1mg/l
Total N	40.6mg/l
NH ₃ -N	31.5mg/l
NO ₃ -N	0.25mg/l
NO ₂ -N	0.04mg/l
pH	7.5
Total coliforms	1x10 ⁸ CFU per 100ml
Faecal coliforms	4x10 ⁷ CFU per 100ml

Note: Results suggest settlement in some cases.

Source: EPA

23.6 The quality and characteristics of the current discharge have not been taken into account in this report as it is recommended that this discharge will be eliminated.

23.7 The current surface water/stormwater disposal system is not entirely known. It is suspected that surface water arising in the village is directed to Saleen Stream which flows underneath the village. It is advisable that an assessment be carried out of all premises in the village area to ensure that grey water entry to the surface water system is limited.

23.8 If surface water is prevented from entering the WWTP facility, it is recommended that the treatment plant does not include an overflow. In such circumstances it is advisable that the packaged treatment plant tender specifications include provision for a flow balancing system to cater for flows up to 6 DWF.

23.9 A number of options are available for the treatment and disposal of wastewater as follows:

- (i) on-site disposal
- (ii) discharge to Saleen Stream
- (iii) discharge to Cloyne River
- (iv) discharge to Saleen Creek
- (v) discharge to Cork Harbour

These options are examined in Sections 24 to 28 respectively.

23.10 Subject to a successful *Part Eight* planning application, in support of which this document will be submitted, it is expected that design and construction procedures will be commenced in 2003/2004, with commissioning of the WWTP in 2004/2005.

24. ON-SITE DISPOSAL

24.1 The disposal of treated wastewater in a manner which reduces or eliminates a discharge to surface waters may be effected by ground-disposal using a percolation area, infiltration area or evapo-transpiring beds. Various forms of surface disposal on land have been described such as irrigation and grass plots; such systems are not recommended at the location under consideration due to possible odour and insect nuisance.

24.2 A preliminary percolation assessment undertaken at the WWTP site is described in 10.2. It was noted that soils on the site are heavy and may have a high clay content in certain areas. Vegetation indicative of wetter conditions was also observed.

24.3 It is considered that the site is not suitable for conventional on-site disposal of waste water via percolation. While a raised percolation bed may be employed on an unsuitable soil type, it is not recommended that such a system be utilised at the WWTP site due to the poor percolation characteristics of the existing soil, the low elevation of the site and the likelihood of a high water table. Furthermore, the high vulnerability of the local geology and the location of a regionally important aquifer nearby have been noted in Section 2. Notwithstanding the foregoing, the proposed design capacity of the upgraded system is such that the land take required by any percolation proposals will be excessive and will render the project uneconomical.

25. DISCHARGE TO SALEEN STREAM

25.1 Wastewater discharged from the existing septic tank eventually outfalls to Saleen Stream which lies adjacent to the site. Although small in volume with a limited catchment, local information indicates that the stream flows continuously throughout the year, albeit at low levels during the summer months. That the bed does not completely dry up during drought periods suggests the possibility of spring inflow.

25.2 It was noted in 4.4.5 that the dry weather flow in Saleen Stream was estimated at 1.17l/s. On the basis of this flow, the discharge from the proposed minimum loading of 1000p.e. (180m³/day) will result in a dilution of less than one. It follows that the current flowrate within the stream is significantly less than required. While the dry weather flow data obtained most likely underestimates the dilution capacity available, and the more useful 95th percentile flowrate is likely to be 2-4 times the dry weather flow, it is nonetheless apparent that the stream flowrate will limit the treatment capacity of the upgraded WWTP and will hinder any expansion plans in the future.

25.3 Notwithstanding the foregoing, biological quality data determined during the preparation of this report (Section 10.4) indicate that Saleen Stream is suffering from a degree of organic pollution, attributable in part to the existing discharge.

Unsatisfactory levels of physico-chemical water quality parameters were recorded both upstream and downstream of the discharge. It follows that the waste assimilative capacity of the stream will be minimal in its current state. In this context, the termination of the existing discharge is seen as an essential step in the restoration of stream water quality.

26. DISCHARGE TO CLOYNE RIVER

26.1 While the Cloyne catchment is relatively small in area, the underlying geology is such that the Cloyne River is fed by a number of spring sources throughout the catchment. Data presented in 4.4.5 indicate that the dry weather flow may be estimated at 23.1l/s immediately upstream of the Saleen Stream confluence. An additional dry weather volume of 140m³/day arises from the WWTP at Cloyne.

26.2 As noted in 2.3.1, the Cloyne River meets Saleen Stream immediately downstream of the existing discharge. By locating the outfall from the proposed WWTP on the Cloyne River in proximity to this confluence, the river stretch subjected to the above dilutions will be shortened and additional dilution will be afforded by Saleen Stream. Dilution calculations below include the additional flow provided by Saleen Stream. The combined dry weather flow of the stream, the Cloyne River and Cloyne WWTP is 2240m³/day.

26.3 It is proposed to provide treatment facilities for a 1000p.e. loading initially, with possible later increases to 1200p.e. and 1500p.e. The dilution capacities available for these loadings are summarised in Table 26.1 based on a dry weather flow of 2240m³/day.

Table 26.1 Available dilutions in Cloyne River.

LOADING	DILUTION
1000p.e.	1 : 12.4
1200p.e.	1 : 10.4
1500p.e.	1 : 8.3

26.4 It should be noted that the dilutions presented in Table 26.1 were calculated on the basis of dry weather flow data due to the absence of preferable 95th percentile figures. Such figures will usually be 2-4 times dry weather flow levels. In order to maintain a worst-case scenario, assimilation capacities are determined below using dry weather flow dilutions.

26.5 From Table 26.1 the dilution capacities available for treated discharges arising from 1000p.e., 1200p.e. and 1500p.e. are greater than the 1:8 standard specified by the Royal Commission (1912) which is normally sought by river authorities (Section 20). The available dilutions are, however, not significantly greater than the standard.

27. DISCHARGE TO SALEEN CREEK

27.1 Saleen Creek is the local name for that stretch of the Cloyne River which is subject to tidal influence. It has been noted in 2.3.6 that cartographic information suggests that the 'Highest Point to which Ordinary Tides Flow' occurs 100m downstream of the Cloyne River and Saleen Stream confluence. During site surveys, however, visual and physico-chemical assessments suggested that high tides most likely flow to within 10m of the confluence on occasion, possibly reaching the confluence during spring tides.

27.2 In the search for greater dilution capacities on a watercourse, the relocation of a proposed outfall downstream will usually provide greater assimilative capacity due to increased flowrates associated with the larger catchment drained. This will be particularly the case where a tributary meets the watercourse in the intervening stretch. It follows that the relocation of the proposed discharge point from the existing WWTP site near the Cloyne River to Saleen Creek should theoretically provide greater dilution and assimilative capacity.

27.3 Despite the foregoing, surveys undertaken at the study site indicate that the installation of the proposed outfall at Saleen Creek will not prove advantageous and may, in fact, create localised problems. There are no tributaries of any significance discharging to the Cloyne River-Saleen Creek system downstream of Saleen Stream. While some increased flow may be provided in the Creek by surrounding land runoff, the additional land area drained is relatively small, not exceeding 1km² at a point 500m downstream of the WWTP site.

27.4 The discharge of treated wastewater directly to Saleen Creek will most likely result in localised difficulties associated with the mixing zone. Estuarine mudflats may become highly productive environments where sustained inputs of nutrients are provided. The discharge of poor quality effluent from septic tanks and malfunctioning WWTP units has resulted in localised problems in the past at Cork sites such as Rosscarbery, Clonakilty and Courtmacsherry, although agricultural inputs and flow restrictions were also suspected here. Problems arising from such discharges relate chiefly to excessive growth of algae and odours deriving from summertime decay of same. While the provision of modern WWTP units has significantly reduced incidences of algal blooms on estuarine mudflats, problems may be encountered in estuarine mixing zones immediately around WWTP outfalls due to limited flushing and mudflat dynamics. Such problems are less evident in running freshwater environments. Where the local ecology is of some importance such as at Saleen Creek, the provision of an estuarine outfall becomes less favourable. In addition, costs and access difficulties associated with the construction of a discharge mains render this option unfavourable.

28. DISCHARGE TO CORK HARBOUR

28.1 It has been noted in 17.1 that the Urban Waste Water Treatment Regulations, 1994 specify that coastal wastewater discharges from populations of less than 10,000 shall, by the end of 2005, be subject to appropriate treatment prior to discharge. Appropriate treatment is defined as that required to meet relevant provisions of other Community Directives such as those discussed in Part 2 of this report. Council Decision 98/249/EC on the conclusion of the convention for the protection of the marine environment of the north-east Atlantic also places an onus on authorities to ensure no marine pollution arises from land-based discharges to the marine environment; authorities who discharge treated effluent to sea-waters in accordance with the Urban Waste Water Treatment Directive will meet the requirements of the Convention.

28.2 The installation of a harbour discharge would require the provision of a mains sewer to transport treated wastewater from the WWTP site. In order to avoid localised ecological problems such as those discussed in 27.4, a mains of approximate length 2km would be preferable. The route of such a mains would most likely be through Saleen Creek (with concomitant construction and ecological difficulties) or overland through private lands at Oldtown to the southwest of Saleen. Neither option is attractive, and both are expensive.

28.3 The disposal of wastewater off-shore has proven to be an economically attractive means of discharge in coastal locations. Almost unlimited dilution, and the absence (perceived or otherwise) of strict quality objectives such as those applicable to land discharges, reduces or eliminates the need for expensive treatment facilities. Such benefits, however, would not arise with respect to any proposed discharge to Cork Harbour. As discussed in Section 8.2, the harbour has been categorised as eutrophic by the EPA, and ongoing nutrient studies will most likely conclude that a sensitive designation under the Urban Waste Water Treatment Regulations is merited. It follows that this normally attractive disposal option will be less favourable due to the requirement for full treatment, in addition to mains installation costs.

29. SUMMARY OF DISPOSAL OPTIONS

29.1 Due to the poor percolation characteristics of the soil on the WWTP site, and its potential to become waterlogged as a result of the elevated water table, on-site disposal options are restricted. The high vulnerability of the local geology and the location of a regionally important aquifer nearby further preclude this option.

29.2 A discharge to Saleen Stream is restricted due to its low flows and current poor water quality. A discharge to Saleen Creek or Cork Harbour will be rendered impractical by mains construction costs. While such costs may often be offset against reduced treatment requirements in coastal discharges, full secondary treatment will

be required as a minimum due to existing nutrient problems and ecological considerations.

29.3 A discharge to the Cloyne River remains as the only practical option and this option is examined further below. The existing WWTP site lies close to the river, thereby minimising capital construction costs. This option will also be the most favourable on ecological grounds. The available dilution capacity is sufficient to treat up to 1500p.e.

29.4 While the estimated dilution available does not significantly exceed the 1:8 Royal Commission standard, it is recommended that the design of the proposed WWTP be such that future expansion to treat populations up to and greater than 1500p.e. is not prevented. Such future expansions may be deemed possible for a number of reasons:

(a) Detailed flow data may be recorded during the intervening period. Such data may be used in the calculation of future dilution capacities in the river.

(b) The available dilution was determined using the estimated dry weather flow, and not the larger and more usually applied 95th percentile flow. The normal flow is likely to significantly exceed this level - EPA notes that the average flows in Irish rivers correspond to the 30th percentile flow (1997). Groundwater charging is also a significant contributor to this catchment. Further dilution attributable to tidal influence has not been assumed in flow calculations.

(c) The Royal Commission 1:8 dilution standard was prepared on the basis of a discharge containing 20mg/l of BOD and 30mg/l of suspended solids. No reference was made to discharges containing the lower concentrations more readily achievable today.

30. IMPACTS

30.1 Possible impacts arising from the discharge of the treated wastewater are examined below. The determination of downstream parameter concentrations has been carried out using background levels measured during the site survey of January 10 2003. Levels recorded in the sample taken upstream of the Cloyne River-Saleen Stream confluence have been used in preference to the downstream sample to avoid impacts associated with the discharge from the existing septic tank.

30.2 Of critical importance is the awareness that calculation of parameter concentrations is carried out on the basis of samples taken on January 10 2003. Such samples provide a snapshot picture of water quality at the time of sampling, and may not accurately indicate long term quality trends. In the absence of long term data no alternative exists but to use such figures. It is always advisable that wastewater discharge assessments are accompanied by extended water quality surveys where possible.

30.3 Mass balance equations may be used to determine the concentration of a parameter in a watercourse downstream of its discharge. A typical equation is as follows:

$$T = (FC + fc) / (F + f) \text{ Equation } i$$

where T = downstream pollutant concentration
 F = upstream river flow
 C = background pollutant concentration
 f = effluent flow
 c = effluent pollutant concentration

31. WASTE ASSIMILATIVE CAPACITY & BOD

31.1 The waste assimilative capacity (WAC) of a watercourse is the mass of BOD which the watercourse can healthily absorb in one day. The WAC is a function of the existing BOD in the watercourse, the maximum permissible BOD and the minimum flow rate. The WAC may be determined as follows:

$$WAC = (C_{\max} - C_{\text{back}}) \times F_{95} \text{ Equation } ii$$

where WAC = waste assimilative capacity
 C_{\max} = maximum permissible BOD
 C_{back} = background upstream BOD

F_{95} = 95th percentile flow

31.2 Dry weather flow data are used below in the absence of 95th percentile data. Thus a worst-case scenario is maintained. The additional flow available downstream of Saleen Stream is included, given a dry weather flow of 2240m³/day.

31.3 Department of the Environment *Memorandum No. 1: Water Quality Guidelines* (1978) specifies that the maximum BOD concentration in salmonid freshwaters and estuarine waters should not exceed 4mg/l. While the rivers under consideration have not been designated as salmonid, it is recommended that this stricter limit be applied.

31.4 The background BOD in the Cloyne River upstream of the WWTP site was noted in 10.3 to be less than 1mg/l. No long term BOD data are available with which to describe continuous quality. Applying the determined dry weather flow of 2240m³/day at this location, the WAC was estimated to be 6.7kg BOD/day.

31.5 *Memorandum No. 1* notes that a discharge to a watercourse should not increase the BOD within the watercourse by more than 1mg/l. Using mass balance *Equation i*, the maximum concentrations of BOD in the final wastewater discharge required to

meet this stipulation were determined for design loadings of 1000, 1200 and 1500p.e. The BOD limits are presented in Table 31.1.

Table 31.1 BOD loadings to Cloyne River.

DESIGN LOADING	BOD LIMIT (mg/l)	DOWNSTREAM BOD CONCENTRATION (mg/l)	BOD LOADING (kg/day)
1000p.e.	15	2.0	2.70
1200p.e.	12	2.0	2.59
1500p.e.	10	2.0	2.7

31.6 It is recommended that treatment to 15mg/l be installed initially to cater for up to 1000p.e. Well maintained secondary treatment plants may produce a clarifier effluent of 15mg/l without modification, and it is therefore recommended that a secondary stage aerobic facility or similar be installed, with ongoing monitoring of treatment efficiency following commissioning. Improvement of treatment efficiency or expansion to greater than 1000p.e. may be facilitated at a later date by retrofitting of tertiary treatment filtration.

31.7 Daily BOD loadings from the proposed WWTP at the levels of treatment proposed in Table 31.1 are included in Column 4 of the table. Loadings in all cases are significantly less than the WAC determined in 31.4 and thus sufficient capacity is available to assimilate same.

32. SUSPENDED SOLIDS

32.1 Of the various standards and articles of legislation discussed in Part 2, the strictest suspended solids limits are specified in the Freshwater Fish Directive which notes that a guide limit of 25mg/l of suspended solids is desirable in fresh waters. A similar maximum concentration is specified by the Salmonid Waters Regulations. The application of this limit will ensure compliance with those specified in the Urban Waste Water Treatment Directive and in *Memorandum No. 1*.

32.2 Based on a suspended solids concentration of 3mg/l recorded upstream of the WWTP site (from 10.3), a discharge concentration of 30mg/l will result in downstream levels outside of the mixing zone as indicated in Table 32.1.

Table 32.1 Suspended solid levels downstream of discharge.

DESIGN LOADING	DOWNSTREAM SUSPENDED SOLIDS CONCENTRATION (mg/l)
1000p.e.	5.0
1200p.e.	5.4
1500p.e.	5.9

32.3 Downstream levels in all cases are significantly less than the 25mg/l limit specified, and it is therefore recommended that at least a 30mg/l suspended solids limit be applied.

33. NITROGEN

NOTE: ALL CONCENTRATIONS BELOW IN MG/L AS N UNLESS OTHERWISE SPECIFIED.

33.1 Elemental nitrogen may be present in a number of forms in a wastewater discharge. Ammonia and nitrates are of most significance, with the relative proportions of their take-up by plants and algae varying with their ratio, the local conditions and the species involved. The nitrite form is an intermediate stage in the conversion of these two parameters.

33.2 A reduction in nitrogen levels being discharged to Cork Harbour will be welcomed in the context of nutrient studies documented in 8.2.5. Of great importance is that the proposed discharge does not elevate nitrate levels in the receiving watercourse significantly and does not affect the status of the aquatic environment with respect to the 11.3mg/l limit specified in the Nitrates Directive (Section 19).

33.3 Nitrogen present as nitrate will rarely impact directly on fish life and thus there are no limits specified in the Freshwater Fish Directive or Salmonid Regulations. Nitrite limits specified in these instruments are rarely encountered. Of more significance are levels of ammonia, particularly the un-ionised form. The European Inland Fisheries Advisory Commission (1970) have reported that an un-ionised concentration of 0.02mg/l NH_3 will present a long term sub-lethal dose for salmonid and cyprinid fish. Due to the inter-relationship between the various forms of ammonia present, the pH and temperature, many texts specify total ammonia concentrations - at varying pH and temperature - which will contain this 0.02mg/l un-ionised NH_3 . Based on this relationship, the Freshwater Fish Directive and Salmonid Regulations have specified maximum 'total ammonium' concentrations of 0.82mg/l N.

33.4 Additional concerns arise where nitrogenous effluents are discharged to saline waters as nitrate rather than phosphate tends to be the limiting nutrient in coastal and marine environments. Nitrogen levels usually show a marked seasonal variation in estuaries, with highest levels in winter/early spring and lowest in late spring/summer due to the uptake of this nutrient by growing plants. In estuarine environments the discharge of nitrogenous effluents may promote algal growth on mudflats, and consequently *Memorandum No. 1* recommends a nitrate water quality standard for estuarine and coastal waters of 1mg/l outside of the mixing zone. While it has been recommended above that the proposed WWTP will discharge to the Cloyne River, the river becomes tidal within 100m of the proposed outfall point and it follows that nitrogen levels within the discharge are of some importance. As existing nitrate levels in the Cloyne River exceed this limit, it is recommended that the proposed discharge does not appreciably increase these background nitrate concentrations.

33.5 From the foregoing, nitrogen standards may be summarised as follows:

Table 33.1 Nitrogen standards of relevance.

STANDARD	LIMIT	COMMENT
Nitrates Directive	11.3mg/l	Nitrate as N
Freshwater Fish Directive	0.82mg/l	Total ammonium as N
Salmonid Regulations	0.82mg/l	Total ammonium as N
<i>Memorandum No. 1</i>	1mg/l	Nitrate as N in estuaries outside of mixing zones

33.6 Most modern treatment units produce a nitrified effluent, with the major portion of nitrogen converted from ammonia to nitrates as a result of nitrification processes incorporated in the design. Due to the conversion dynamics within secondary stage treatment units, it is difficult to specify separate concentrations of ammonia and nitrates to be met in the treated effluent, and the application of a total nitrogen limit – consisting of ammonia, nitrates and intermediate stages – provides a more common sense approach.

33.7 The background nitrogen concentration recorded on January 10 2003 was 5.1mg/l, inclusive of nitrate, nitrite and ammonia. Using Equation i, the downstream nitrogen concentrations arising from various nitrogen loadings in the proposed wastewater discharge have been calculated, and levels are presented in Table 33.2.

Table 33.2 Nitrogen levels downstream of discharge.

DESIGN LOADING	40mg/l N	30mg/l N	20mg/l N	10mg/l N	5mg/l N
1000p.e.	7.7	6.9	6.2	5.5	5.1
1200p.e.	8.2	7.3	6.4	5.5	5.1
1500p.e.	8.8	7.8	6.7	5.6	5.1

33.8 The calculations indicate that, with respect to all three design loading scenarios, nitrogen removal down to a discharge concentration of 5mg/l will be necessary to prevent any increase over background river concentrations. At discharge concentrations of greater than 20mg/l, downstream nitrogen levels will be significantly elevated in the context of levels noted in Table 33.1.

33.9 Without the installation of specific nitrogen-removal processes such as anoxic zones, secondary stage treatment units will not significantly reduce nitrogen levels but merely convert the various forms present to oxidised nitrate, with consequent reductions in ammonia concentrations. Thus the normal influent nitrogen concentration of approximately 40mg/l may not be greatly decreased during the treatment process. It follows that some form of nitrogen removal will be required at the proposed WWTP to reduce concentrations to satisfactory levels. The modular design of modern WWTP units allows additional nitrification to be introduced following commissioning.

33.10 In the setting of maximum nitrogen limits in the treated discharge, it should be noted that levels presented in Table 33.2 were determined using grab samples taken on January 10 2003. As noted previously, such samples may not accurately reflect

long term quality trends in a watercourse. In these circumstances it will be imprudent to recommend the installation of maximum nitrogen removal facilities where ongoing monitoring of river quality may indicate that such facilities are not required. Accordingly it is recommended that provision be made initially (up to 1000p.e.) for nitrogen removal down to 20mg/l, with provision for later reduction to 10mg/l where (a) ongoing monitoring indicates that downstream nitrogen levels are elevated or grab samples originally taken were not representative, or (b) it is proposed to increase the loading being discharged to the WWTP.

33.11 In certain proprietary treatment systems available today, installation costs associated with nitrogen removal to 20mg/l and to 10mg/l are not greatly different, and if such a system is chosen it is recommended that initial provision for the latter limit is made. This is particularly the case where the cost of retrofitting of additional reduction facilities may be significantly higher than first-day installation costs.

33.12 As noted above, the majority of effluent nitrogen will be present as nitrate with little residual ammonia in the discharge. Calculations indicate that the application of a 20mg/l nitrogen limit will result in downstream ammonia concentrations significantly less than the 0.82mg/l limit noted in 33.3 above.

34. PHOSPHOROUS

34.1 While nitrogen rather than phosphorous will tend to be the limiting nutrient in saline waters, phosphorous may nonetheless play a part in the nutrient balance of Saleen Creek. It has been noted in 8.2 that there is some evidence that parts of Cork Harbour are phosphorous limited. In the Cloyne River downstream of the proposed WWTP outfall, phosphorous will most likely be limiting, and thus phosphorous loadings are of relevance.

34.2 Within the aquatic environment phosphorous will be present in a number of forms, both organic and inorganic, and within solution or bound in solids. All forms present are referred to as total phosphorous. A significant fraction of total phosphorus is available for biological metabolism and is termed orthophosphate. The analytical procedure used in the determination of orthophosphate is the molybdate-reactive method which is used to derive the concentration of molybdate-reactive phosphate (MRP) in a sample. Although the MRP may slightly overestimate the level of orthophosphate present, the two expressions have become synonymous.

34.3 It has been stated in 8.1 that there are no EPA monitoring stations in the Cloyne catchment, and consequently there are no biological Q-values to which the Phosphorous Regulations apply. In addition, there are no phosphate criteria applicable in the context of sensitive areas designated under the Urban Waste Water Treatment Directive.

34.4 The Freshwater Fish Directive does not include a limit for phosphates in freshwaters. However, the Salmonid Regulations note that a limit value of 0.124mg/l

of total phosphorous may be regarded as indicative in order to reduce eutrophication in cyprinid waters ie. waters not designated specifically as salmonid such as the river under consideration. In the absence of other relevant guidelines it is recommended that this limit be applied below. No limit is proposed for orthophosphate as this parameter has been factored in the derivation of the total phosphorous limit.

34.5 The background total phosphorous level recorded on January 10 2003 was significantly high at 0.27mg/l, with an orthophosphate concentration of 0.10mg/l. The biological Q-value obtained at the same sampling station during the survey of January 20 2003 was Q3(3-4) indicating moderate pollution. The Phosphorous Regulations note that this Q-value corresponds to an annual MRP level of 0.05-0.07mg/l (Section 18) which is less than the level recorded in the grab sample. On the basis that MRP constitutes approximately 70-95% of total phosphorous, the current annual median total phosphorous concentration may be estimated at 0.1mg/l. It follows that the phosphorous concentrations recorded may be significantly higher than the expected annual median levels, and the use of the former in determining treatment levels required may be superfluous. Thus the estimated annual median total phosphorous concentration of 0.1mg/l is used below.

34.6 Where the current Q-value is Q3(3-4), the Phosphorous Regulations specify a target Q-value of Q3-4 and MRP level of 0.05mg/l. Due to the relatively limited dilution available (based on a worst-case scenario dry weather flow), a total phosphorous concentration of 2mg/l in the treated discharge will result in significantly high phosphorous levels downstream of the outfall (greater than 0.2mg/l P). Downstream phosphorous levels will also remain high where an estimated 95th percentile flow of approximately three times the dry weather flow is applied to the calculations. It follows that phosphorous removal to at least 1mg/l will be required. Based on a current annual median total phosphorous concentration of 0.1mg/l, a treated discharge level of 1mg/l will result in a downstream concentration of 0.17mg/l outside of the mixing zone at a 1000p.e. loading.

34.7 It is therefore recommended that a phosphorous treatment limit of 1mg/l be applied in order to assist in the meeting of requirements specified in 34.4-34.6 above. It is also recommended that an ongoing phosphorous and Q-value monitoring programme be implemented following commissioning of the proposed WWTP to assess long term treatment efficiency and localised impacts.

35. PATHOGENS

35.1 There are no drinking water abstraction points in the Cloyne River or Saleen Creek downstream of the proposed WWTP site, and thus pathogens in the treated discharge are not of direct relevance to humans. The creek area is, however, a recognised bird feeding ground. Furthermore, the location of a number of oyster trestles at the mouth of the creek, 2km downstream of the existing WWTP site, is of some importance. Certain aquatic activities are also carried out in the Aghada area as noted in 14.2.

35.2 Table 23.1 indicates that domestic wastewater will contain on average 100 million and 40 million colony-forming units of total and faecal coliforms respectively per 100ml. These organisms, while not overtly pathogenic in themselves, are used as indicators of pathogenic activity. Due to growth and decay dynamics within bacterial populations, normal mass balance calculations cannot be applied in the assessment of bacteriological impacts. Significant variations in local environmental conditions and wastewater microbiological characteristics do not facilitate the generation of discharge-specific models.

35.3 All treatment processes applied to wastewater will provide some degree of coliform reduction, usually via the filtration of suspended solids in the wastewater stream. Gray (1999) reports that conventional treatment will remove up to 90% of bacterial pathogens. He also notes that dilution and the effects of natural biotic and abiotic factors in surface waters will reduce the density of pathogens further.

35.4 Given the difficulties associated with the modelling of microbiological impacts of a discharge, the varying treatment abilities of treatment plants, and the absence of coliform quality objectives applicable to treated discharges, no specific coliform standards are recommended. Alternatively it is recommended that a monitoring programme is undertaken following the commissioning of the WWTP selected. An ongoing examination of key microbiological parameters, including total and faecal coliforms, faecal streptococci and sulphite-reducing clostridia, may be used to determine the overall treatment efficiency of the system chosen.

35.5 On the basis of (i) the level of treatment which will be applied to the discharge, (ii) the dilution available within the Clovna River-Saleen Creek system, (iii) the decay of micro-organisms in the natural environment, (iv) the distance between the proposed WWTP outfall and the creek mouth, and (v) the significant dilution available in the northeast harbour, no impacts on the trestles or on aquatic activities are expected. It is recommended that the design of the WWTP be such that the post-installation of disinfection equipment is facilitated if deemed necessary following an assessment of the results obtained from the sampling programme. It should also be noted that the existing treatment system at Saleen is unsatisfactory and any upgrade to the system can only improve the quality of the wastewater stream.

35.6 Feeding by birds in areas immediately downstream of wastewater discharges has been highlighted in the past as a potential risk. Studies have shown that gulls in particular are liable to feed in such locations. Concern arises where there are one or more open water supply reservoirs in proximity to the feeding site, with possible contamination arising from bird droppings. There are no uncovered water storage reservoirs near the study site, and drinking water at Saleen is supplied from distant groundwater sources. This problem is therefore not expected to arise. Submersion of the outfall pipe will further minimise this risk.

36. ECOLOGY & FISHERIES

36.1 It has been noted in Section 5 that the Cloyne catchment is of limited fisheries significance. The South Western Regional Fisheries Board have recommended that a fish stock assessment be undertaken in the future. The determination of maximum limits to be applied to the treated wastewater discharge has been addressed above in the context of the Freshwater Fish Directive and Salmonid Waters Regulations. Treatment in accordance with the specified limits will therefore be in keeping with the requirements of these articles of legislation, and no negative impacts on fisheries are expected. The outfall location and design should be chosen so as to avoid large plumes which may prove a barrier to fish movement or damage certain fish habitats.

36.2 The ecological importance of Saleen Creek has been noted in Section 5. It was also noted that the reduction in nutrient levels being discharged to the creek which will arise following the proposed WWTP upgrade may be expected to have a neutral to slightly negative impact on the size of local bird populations due to a decrease in mudflat productivity. Water quality downstream of the WWTP outfall is expected to improve as the existing discharge is decommissioned, with a concomitant improvement in aquatic ecology.

36.3 It is recommended that an annual biological survey is undertaken at stations B1 and B2 indicated in Table 10.4. Results recorded from the surveys may be used to assess the ecological health of the river and the treatment efficiency of the proposed WWTP.

37. RECOMMENDED TREATMENT STANDARDS

37.1 Treatment standards determined above are summarised in Table 37.1. It is recommended that the effluent discharge be monitored to ensure the pH does not fall outside the range 6-9. It should be noted that the standards are presented as a minimum; the Cloyne River and Saleen Creek will benefit from stricter standards where applied. Treatment standards have been recommended on the basis of dilution factors determined using estimated dry weather flow data, thereby maintaining a strict worst case scenario approach. It is important to reiterate that the standards are based in part on 'snapshot' samples taken during the preparation of this report, and future ongoing monitoring is recommended below.

Table 37.1 Recommended treatment standards at Saleen WWTP.

PARAMETER	STANDARD
BOD	15mg/l
SS	30mg/l
Total N	20mg/l
Total P	1mg/l

37.2 The quality standards recommended are relatively restrictive, with both nitrogen and phosphorous removal recommended. In addition, a high quality effluent will be required from the secondary clarifier (if installed) in order to meet the strict BOD limit recommended. The requirement for a high quality effluent is a product of limited available dilution, moderate background water quality and the complications associated with discharging a nitrogenous waste stream to a saline environment of some ecological importance.

37.3 It is recommended that a reliable and robust treatment unit be installed, with provision for retrofitting of certain components if required. The treatment standards noted in Table 37.1 may be provided to tendering suppliers.

37.4 The secondary effluent may be discharged directly after phosphorous removal and without further tertiary treatment. It is recommended that a sampling point be included on the discharge mains within the WWTP site. It is also recommended that a sampling programme is initiated following commissioning of the system. The programme should include monthly monitoring of the effluent during the first six months of operation, and thereafter at intervals in accordance with statutory or maintenance requirements. Samples should also be taken downstream of the outfall outside of the mixing zone. The following parameters are recommended for analysis: pH, BOD, SS, NH₃, NO₃, o-PO₄, t-PO₄, total and faecal coliforms, faecal streptococci and sulphite-reducing clostridia. Results of analyses should be used in any retrospective fine-tuning of the treatment plant installed.

37.5 Calculations made during the preparation of this report, and impacts determined on the basis of same, were carried out using a steady dry weather flow from the WWTP ie. 1DWF. At peak times, discharge flowrates in WWTP systems may increase to 3DWF or greater. During such times, short term increases in nutrient loadings will be expected which will be matched by decreased loadings at other times. Such short term fluctuations in the discharge flowrate are not expected to negatively impact on the Cloyne River in the longer term, and there are no designated biological monitoring stations downstream of the WWTP site which may be sensitive to such fluctuations.

38. MIXING ZONE

38.1 It was noted in 2.3.6 that spring tides may reach the Saleen Stream-Cloyne River confluence, although further movement inland is unlikely. In order to minimise the inflow of tidal waters towards the proposed WWTP outfall, it is recommended that the outfall be located at least 20m upstream of the confluence. Complete mixing is expected upstream of Saleen Creek.

38.2 Due to the limited dilution available in the Cloyne River, the selection of outfall location is of some importance. It is recommended that the outfall be situated near the centre of the watercourse in order to avoid incomplete mixing along one side of the river. The invert level should be so as to ensure submersion at all times.

38.3 Site surveys indicate that there are no salmonid spawning sites in this stretch of the Cloyne River. Nonetheless it is recommended that the South Western Regional Fisheries Board be consulted on this matter prior to finalising the outfall position and means of construction.

38.4 As noted previously, the WWTP site lies upstream of normal tidal influence. It is possible that exceptional high spring tides may approach the proposed outfall location, although no such observations were made during surveys undertaken in the course of this project. In the event of such tides, flushing of discharges may be limited, particularly where such tides may coincide with times of peak discharges. Accordingly it is recommended that a detailed study of salinity profiles in the Cloyne River is undertaken at times of high spring tides prior to commissioning of the proposed WWTP. Where surveys suggest the possibility of limited flushing during such periods, it is recommended that provision be made for the installation of flow control devices on the WWTP outfall (eg. balancing tanks) or, less preferably, on the Cloyne River (eg. weirs).

39. RECOMMENDATIONS

39.1 It is recommended that the existing septic tank system be decommissioned and the existing discharge removed following commissioning of the upgraded plant.

39.2 It is recommended that all future developments in the village are accompanied by separate sewer systems, and that the existing network be separated as much as possible. It is advisable that an assessment be carried out of all premises in the village to ensure that grey water entry to the surface water system is limited.

39.3 It is recommended that a suitable grease trap/interceptor be stipulated in planning permissions granted to any developments proposed at Saleen which will include cooking facilities.

39.4 It is recommended that treated wastewater be discharged to the Cloyne River. The following treatment standards are recommended initially *as a minimum*:

PARAMETER	STABDARD
BOD	15mg/l
SS	30mg/l
Total N	20mg/l
Total P	1mg/l
pH	6-9

39.5 In the final selection of a treatment unit, it is recommended that the following criteria be applied by the supplier at the design stage:

(a) The plant should be designed, constructed, operated and maintained to ensure sufficient performance under all normal local climatic conditions.

- (b) Seasonal variations of the load should be taken into account.
- (c) If surface water is prevented from entering the WWTP facility (the preferred option), it is recommended that the treatment plant does not include an overflow. In this case it is recommended that the plant tender specifications include provision for a flow balancing system to cater for flows up to 6 DWF.
- (d) Provision should be made for possible future retrofitting of additional nitrogen removal and disinfection processes in the WWTP selected.
- (e) Sampling points should be provided on the influent and effluent lines to the selected WWTP unit.

39.6 It has been noted in 21.1 that the EPA's noise guidance note states that the noise level at a sensitive location should not exceed 55dB during daytime hours and 45dB at night-time. As the proposed WWTP will be operative during both periods, it is recommended that the 45dB limit be applied. Given the relatively isolated location of the WWTP site 300m southwest of Saleen village, the imposition of a 55dB limit at the boundary of the WWTP site will not breach 45dB at the nearest noise receptors. It is therefore recommended that a 55dB limit be applied at the WWTP site boundary. It is also recommended that the installed system does not result in impulsive or tonal noise emissions of any nature.

39.7 It is recommended that a buffer zone of at least 50m is allowed between the site of the proposed WWTP and the nearest existing development, of which 30m or more should lie within the WWTP site boundary in order to minimise odour nuisance.

39.8 It is recommended that the outfall be situated at least 20m upstream of the Saleen Stream-Cloyne River confluence, near the centre of the watercourse and so as to ensure submersion at all times. It is recommended that the South Western Regional Fisheries Board be consulted prior to finalising the outfall position and means of construction.

39.9 The construction phase of the WWTP development should be carried out in a manner which does not interfere with adjacent watercourses in any way. Untreated discharges to the river both during the construction phase and during commissioning should not be permitted.

39.10 It is advisable that a maintenance contract is agreed with the supplier of the treatment unit selected.

39.11 It is recommended that any proposed upgrade to the new WWTP or any increase in loadings to the plant is accompanied by a reassessment of waste assimilative capacities in the local catchment.

39.12 It is recommended that a monitoring programme is implemented following the commissioning of the treatment system selected. The programme should include monthly monitoring of the final effluent during the first six months of operation. Samples should also be taken downstream of the outfall outside of the mixing zone. The following parameters are recommended for analysis: pH, BOD, SS, NH₃, NO₃,

o-PO₄, t-PO₄, total and faecal coliforms, faecal streptococci and sulphite-reducing clostridia. Results of analysis should be used in any retrospective fine-tuning of the treatment plant installed, and to determine the need for disinfection of the wastewater stream or for the installation of additional nutrient removal.

39.13 It is recommended that an annual biological survey of the Cloyne River at this location is undertaken to assess the ecological health of the river.

39.14 Further salinity tests on the Cloyne River are advisable during spring tide events prior to commissioning in order to assess the likelihood of limited flushing at such times.

39.15 It is recommended that the design of the proposed WWTP be such that future expansion to treat populations up to and greater than 1500p.e. is not prevented, subject to future ongoing assessments of flow rates and water quality in the Cloyne system.

*For inspection purposes only.
Consent of copyright owner required for any other use.*

 REFERENCES

- Crites, R. & Tchobanoglous, G. 1998. *Small and decentralized wastewater management systems*. McGraw-Hill.
- Department of the Environment Technical Committee on Effluent and Water Quality Standards. 1978. *Memorandum No. 1: Water Quality Guidelines*.
- Environmental Protection Agency. 1995. *Advice notes on current practice in the preparation of environmental impact statements*.
- Environmental Protection Agency. 1997. *Hydrological Data: A listing of water level recorders and summary statistics at selected gauging stations*.
- Environmental Protection Agency. 1997. *Environmental Quality Objectives and Environmental Quality Standards – The Aquatic Environment, A Discussion Document*.
- Environmental Protection Agency. 1998. *R&D Report Series No. 3. Small Scale Wastewater Treatment Systems: Literature Review*.
- Environmental Protection Agency. 1999. *Wastewater Treatment Manuals: Treatment Systems for Small Communities, Business, Leisure Centres and Hotels*.
- Environmental Protection Agency. 2000. *Ireland's Environment: A Millennium Report*.
- Environmental Protection Agency. 2002. *Guidelines on the information to be contained in Environmental Impact Statements*.
- Environmental Protection Agency. 2002. *Water Quality in Ireland 1998-2000*.
- The European Inland Fisheries Advisory Commission. 1970. *Water Quality Criteria for European Freshwater Fish: Report on Ammonia and Inland Fisheries*. EIFAC Technical Paper No. 11
- Gray, N.F. 1999. *Water Technology*. Arnold.
- Kramer, J.M., Brockmann, U.H. & Warwick, R.M. 1994. *Tidal estuaries*. European Commission.
- Royal Commission. 1912. *Eight Report of the Royal Commission on Sewage Disposal*.
- Standard Recommendation S.R. 6. 1991 *Septic tank systems – recommendations for domestic effluent treatment and disposal from a single dwelling house*. National Standards Authority of Ireland.
- Wilson, J.G. 1998. *Eutrophication in Irish Waters*.

APPENDIX I: SITE SYNOPSIS

SITE NAME: GREAT ISLAND CHANNEL

SITE CODE: 001058

The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest. Geologically, Cork Harbour consists of two large areas of open water in a limestone basin, separated from each other and the open sea by ridges of Old Red Sandstone. Within this system, Great Island Channel forms the eastern stretch of the river basin and, compared to the rest of Cork Harbour, is relatively undisturbed.

The main habitats of conservation interest are the sheltered tidal mudflats and Atlantic salt meadows, both habitats listed on Annex I of the EU Habitats Directive. These habitats, along with brackish pools and open water, support a rich invertebrate fauna. Cord-grass (*Spartina* sp.) has colonised the mudflats in places, especially around Rossleague and Belvelly.

The site is also extremely important for wintering waterfowl and is considered to contain three of the top five areas within Cork Harbour, namely North channel, Harper's Island and Belvelly-Marino Point. An Foras Forbartha provided the following description in 1986:

Waders and wildfowl occur in large numbers during the winter. Shelduck are the most frequent duck species with 800-1000 birds centred on the Fota/Marino Point area. There are also large flocks of Teal and Wigeon, especially at the eastern end. Waders occur in the greatest density north of Rosslare with Dunlin, Godwit, Curlew and Golden Plover the commonest species. A population of about 80 Grey Plover is a notable feature of the area. All the mudflats support feeding birds; the main roost sites are at Weir Island and Brown Island and to the north of Fota at Killacloyne and Harpers Island. Ahanesk supports a roost also but is subject to disturbance. The numbers of Grey Plover and Shelduck, as given above, are of national importance.

The site is an integral part of Cork Harbour which is a wetland of international importance for the birds it supports. Overall, Cork Harbour regularly holds over 20,000 waterfowl and contains Internationally important numbers of Black-tailed Godwit (1,779) and Redshank (2,382) along with Nationally important numbers of nineteen other species. Furthermore, it contains the largest Dunlin (10,912) and Lapwing (14,713) flocks in the country. All counts are average peaks, 1984/85 - 1986/87. Much of the site forms part of Cork Harbour Special Protection Area, an important bird area designated under the Birds Directive.

While the main land use within the site is aquaculture (Oyster farming), the greatest threats to its conservation significance come from road works, infilling, sewage outflows and possible marina developments.

The site is of major importance for the three habitats listed on the EU Habitats Directive that it contains, as well as for its important numbers of wintering waders and wildfowl. It also supports a good invertebrate fauna.

APPENDIX II: BIOLOGICAL SURVEY SUMMARY

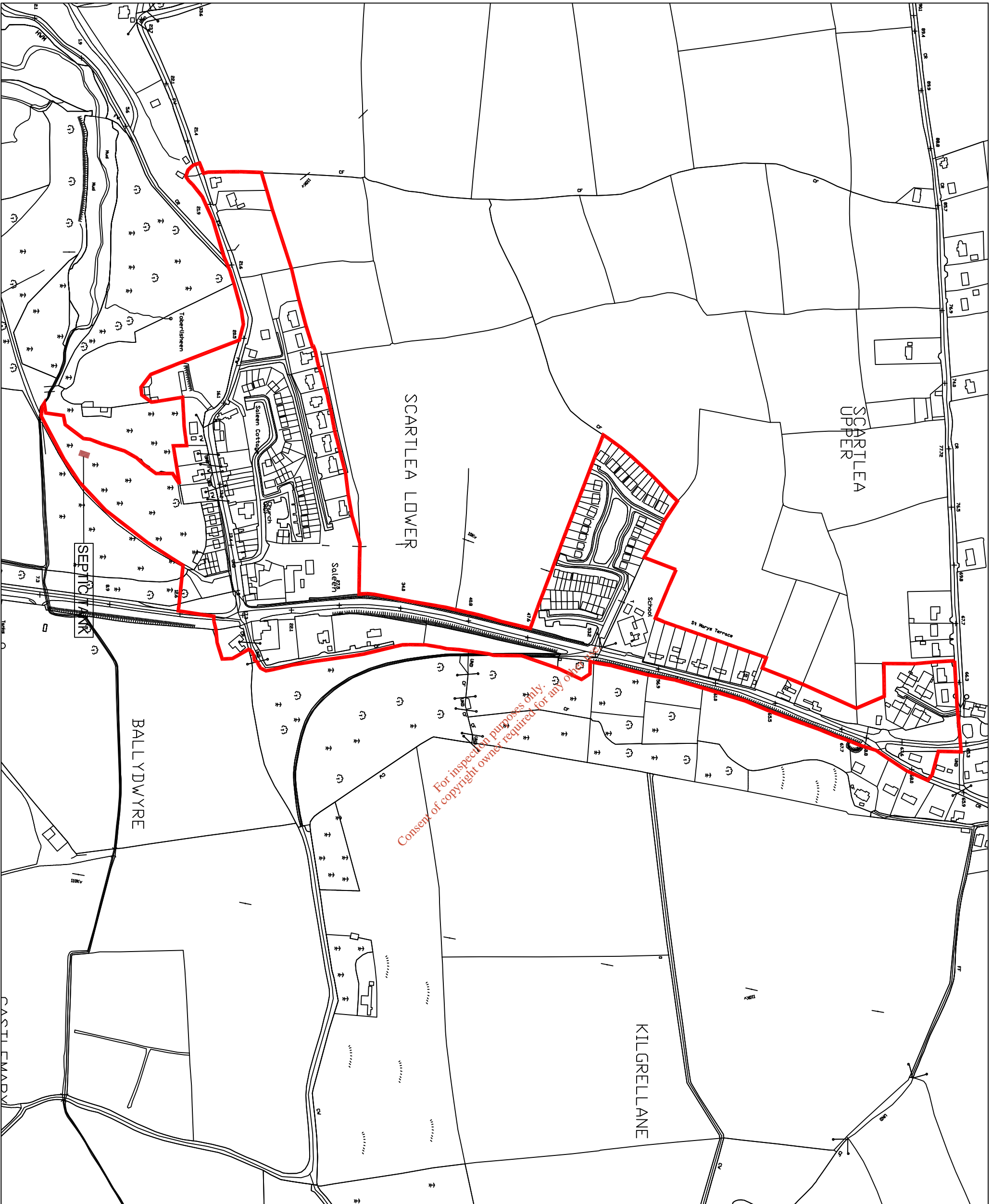
SITE B1		COMMENT
Temperature	9.1°C	On Cloyne River 50m u/s of confluence with Saleen Stream. Poor sampling location with mainly muddy substrate. Small area of gravel. May be localised impacts from land run-off and cattle drinking point. Water levels high during sampling period.
Summer shade (estimated)	70%	
Current	Fast but not turbulent	
Substrate	Generally soft Small area of gravel	
Depth	40cm	
Width	1m	
SITE B2		COMMENT
Temperature	9.2°C	On Cloyne River 5m d/s of confluence with Saleen Stream. Excellent sampling location with mixed gravel substrate. Polychaete worm indicative of saline influence. Water levels high - water opaque.
Summer shade (estimated)	10%	
Current	Fast turbulent	
Substrate	Mixed gravels and large stones	
Depth	15cm	
Width	1.5m	
SITE B3		COMMENT
Temperature	9.0°C	On Saleen Stream 4m d/s of existing WWTP discharge. Good sampling location with gravel and turbulent flow. Sewage fungus noted. Water quality poor.
Summer shade (estimated)	10%	
Current	Fast turbulent	
Substrate	Mixed gravels and large stones	
Depth	15cm	
Width	1.5m	

Results of the biological assessment at each site are presented with distribution of macroinvertebrate taxa. Sensitivities of different taxa, numbering method and method for determining Q-values are outlined in *The Biological Survey of River Quality 2000* (EPA, 2001).

	B1	B2	B3
<i>Baetis rhodani</i>	Small Numbers	Common	
<i>Gammarus sp.</i>	Common		
<i>Asellus sp.</i>			
Seristocomatidae	Small Numbers	Present	
Limniphilidae	Fair Numbers		
<i>Polycentropus sp.</i>			
Glossosomatidae		Common	
Tipulidae			
Tabanidae		Fair Numbers	
Simuliidae	Common		
Chironimidae	Small Numbers	Fair Numbers	
<i>Chironomous sp.</i>			Common
Elminthidae			
<i>Lymnea sp.</i>	Present	Numerous	
Tubificidae	Present		Dominant
Oligochaete			

STATION	Q-VALUE
B1	Q3(3-4)
B2	Q2-3
B3	Q1

All three sites appear to be suffering from some degree of organic pollution with unsatisfactory water quality at each site. Water quality at site B3 is particularly poor with a Q rating of 1 assigned. A Q value of 2-3 was assigned to site B2 suggesting that it is being affected by the wastewater discharge upstream. Site B1 which is not affected by the discharge from the WWTP was found to have the best water quality although it was still unsatisfactory. The most likely cause is localised agricultural impact.

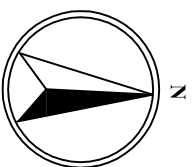


For inspection purposes only.
Consent of copyright owner required for any other use.

NOTES:

1. This drawing is the property of Cork County Council. It is a confidential document and must not be copied, used, or its content divulged without prior written consent.
2. Includes Ordnance Survey Ireland data reproduced under OSI Licence number: Cork County Council/CMA 2004/07. Unauthorised reproduction infringes Ordnance Survey Ireland and Government of Ireland copyright. © Ordnance Survey Ireland, 2004.
3. All levels refer to Ordnance Survey Datum, Malin Head.
4. DO NOT SCALE, use figured dimensions only, if in doubt ask.

**AGGLOMERATION
BOUNDARY**



Rev	Date	By	Description
A	21.02.11	NM	Agglom Brdy revised to include S.T.


CORK COUNTY COUNCIL
 SOUTHERN DIVISION
Niall O'Keefe, B.E. Chief Executive
 County Hill, Cork.
 Patricia Power,
 Director of Services,
 Area Operations South

Project: SALEEN WWTP
 WASTE WATER
 DISCHARGE LICENCE APPLICATION

Title: Application Form Attachment B1_Map3 Agglomeration Boundary Served By Waste Water Treatment Works			
Designed: MS	Checked: MS	Scale: 1:5,000 @ A3	Drawing No: B1_Map3
Drawn: NM	Approved: MS	Date: NOV 09	Status: A
File Path:			Rev: A

Attachment E4 Saleen Table E4 with values below LOD

Sample Date	06/10/2009		06/10/2009	
Sample	Saleen Septic Tank	Metal values below LOD	Saleen 100m downstream in stream	Saleen 100m downstream in stream values below LOD
Sample Code	GT1214	GT1214	GT1215	GT1215
Flow M ³ /Day	*	*	*	*
pH	7.4	*	7.3	7.3
Temperature °C	*	*	*	*
Conductivity uS/cm 20°C	399	*	534	534
Suspended Solids mg/L	28	*	11	11
Ammonia-N mg/L	4.9	*	1.2	1.2
BOD mg/L	13	*	5	5
COD mg/L	25	*	<21	<21
TN-N mg/L	12.99	*	8.65	8.65
Nitrite-N mg/L	0.145	*	0.115	0.115
Nitrate-N mg/L	8.185	*	6.615	6.615
TP-P mg/L	0.61	*	0.403	0.403
O-PO4-P mg/L	0.46	*	0.34	0.34
SO4 mg/L	<30	*	<30	<30
Phenols µg/L	<0.10	*	*	*
Atrazine µg/L	<0.01	*	*	*
Dichloromethane µg/L	<1	*	*	*
Simazine µg/L	<0.01	*	*	*
Toluene µg/L	<0.28	*	*	*
Tributyltin µg/L	not required	*	not required	not required
Xylenes µg/L	<0.73	*	*	*
Arsenic µg/L	<0.96	*	*	*
Chromium ug/L	<20	1ug/l	<20	1ug/l
Copper ug/L	<20	1ug/l	<20	1ug/l
Cyanide µg/L	<5	*	*	*
Fluoride µg/L	94	*	*	*
Lead ug/L	<20	1ug/l	<20	1ug/l
Nickel ug/L	<20	1ug/l	<20	1ug/l
Zinc ug/L	<20	1ug/l	<20	1ug/l
Boron ug/L	<20	1ug/l	<20	1ug/l
Cadmium ug/L	<20	1ug/l	<20	1ug/l
Mercury µg/L	<0.03	*	*	*
Selenium µg/L	1.2	*	*	*
Barium ug/L	<20	1ug/l	<20	6.13

For inspection purposes only. Consent of copyright owner required for any other use.

Note samples analysed for Dangerous substances in discharge and downstream of discharge

 value of 0 recorded as 1ug/l

Note Weather very wet at time of sampling