Attachment C2 Outfall Design and Construction

Attachment Dunmanway – C2 – 21 Location of All Discharge Points

GW01DWAY
DUNMANWAY PACKAGE PLANT
PRIMARY EFFLUENT
DISCHARGE POINT
E: 123829
N: 053210

SW09
COMBINED SEWER
OVERFLOW POINT
E: 123730
N: 053010

SW04DWAY
SECONDARY DISCHARGE POINT
PROPOSED EMERGENCY OVERFLOW
LONG BRIDGE PUMPING STATION
E: 124081
N: 053008

SW08DWAY
COMBINED SEWER
OVERFLOW POINT
E: 122787
N: 052453

SW03DWAY
SECONDARY DISCHARGE POINT
EMERGENCY OVERFLOW
LONG BRIDGE PUMPING STATION
E: 124057
N: 053010

SW01DWAY
DUNMANWAY WWTP
PRIMARY EFFLUENT
DISCHARGE POINT
E: 124142
N: 052545

SW05DWAY
SECONDARY DISCHARGE POINT
EMERGENCY OVERFLOW
QUARRY ROAD PUMPING STATION
E: 123566
N: 052546

SW02DWAY
DUNMANWAY WWTP
PROPOSED PRIMARY EFFLUENT
DISCHARGE POINT
E: 124122
N: 052532

SW07DWAY
COMBINED SEWER
OVERFLOW POINT
E: 123235
N: 052182

SW06DWAY
SECONDARY DISCHARGE POINT
PROPOSED EMERGENCY OVERFLOW
QUARRY ROAD PUMPING STATION
E: 123566
N: 052546

MAP REPRODUCED BY PERMISSION OF
ORDNANCE SURVEY IRELAND
(CORK CCMA 9802)

AMENDMENT DETAILS	DATE

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PROJECT: DUNMANWAY EPA DISCHARGE LICENSE APPLICATION

CLIENT: CORK COUNTY COUNCIL

DRAWING TITLE: ATTACHMENT C.2 – LOCATION OF ALL DISCHARGE POINTS

SCALE: 1:10000	JOB NO:	DRAWING NO:
DATE: JULY'08	DRAWN BY: JH	2846	DUNMANWAY_C2_21

Attachment D1 Discharge to Surface/Groundwaters

Tables D.1 (i) (a), (b) and (c)

Tables D.1 (ii) (a), (b) and (c)

Table D.1 (iii) (a)

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

Discharge Point Code: SW01-Dunmanway

Source of Emission:	Dunmanway WWTP Primary Discharge
Location:	Milleenanannig, Dunmanway
Grid Ref. (12 digit, 6E, 6N):	124143E, 52536N
Name of receiving waters:	River Bandon
River Basin District:	South Western River Basin District
Designation of receiving waters:	SAC
Flow rate in receiving waters:	0.07 $m^3.sec^{-1}$ Dry Weather Flow 0.14 $m^3.sec^{-1}$ 95%ile flow

Emission Details:

(i) Volume emitted			
Normal/day	864m^3	Maximum/day	864m^3
Maximum rate/hour	100m^3	Period of emission (avg)	60 min/hr 24 hr/day 365 day/yr
Dry Weather Flow	Not available		

TABLE D.1(i)(b): EMISSIONS TO SURFACE/GROUND WATERS - Characteristics of the emission (Primary Discharge Point)

Discharge Point Code: SW01-Dunmanway

Number	Substance	As discharged	
		Max. daily average	
1	pH	6.5-8.5	
2	Temperature	25 °C	
3	Electrical Conductivity(@25°C)	1000	
		Max. daily average (mg/l)*	**kg/day***
4	Suspended Solids	75	64.8
5	Ammonia (as N)	25	21.6
6	Biochemical Oxygen Demand	65	56.16
7	Chemical Oxygen Demand	200	172.8
8	Total Nitrogen (as N)	50	43.2
9	Nitrite (as N)	Not available	Not available
10	Nitrate (as N)	Not available	Not available
11	Total Phosphorus (as P)	5	4.32
12	Orthophosphate (as P)[Note 1]	4	3.456
13	Sulphate (SO_4)	Not available	Not available
14	Phenols (sum) [Note 2] (ug/l)	Not available	Not available

Note 1: For waste water samples this monitoring should be undertaken on a sample filtered on 0.45µm filter paper.
Note 2: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

TABLE D.1(i)(c): DANGEROUS SUBSTANCE EMISSIONS TO SURFACE/GROUND WATERS

Primary Discharge Point - Characteristics of the emission

Discharge Point Code: SW01-Dunmanway

Number	Substance	As discharged		
		Max. daily average (µg/l)	**kg/day***	**kg/year***
1	Atrazine	Not available	Not available	Not available
2	Dichloromethane	Not available	Not available	Not available
3	Simazine	Not available	Not available	Not available
4	Toluene	Not available	Not available	Not available
5	Tributyltin	Not available	Not available	Not available
6	Xylenes	Not available	Not available	Not available
7	Arsenic	Not available	Not available	Not available
8	Chromium	Not available	Not available	Not available
9	Copper	Not available	Not available	Not available
10	Cyanide	Not available	Not available	Not available
11	Fluoride	150	0.1296	47.304
12	Lead	Not available	Not available	Not available
13	Nickel	Not available	Not available	Not available
14	Zinc	Not available	Not available	Not available
15	Boron	Not available	Not available	Not available
16	Cadmium	Not available	Not available	Not available
17	Mercury	Not available	Not available	Not available
18	Selenium	Not available	Not available	Not available
19	Barium	Not available	Not available	Not available

Note 1: For waste water samples this monitoring should be undertaken on a sample filtered on 0.45µm filter paper.
Note 2: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

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

Discharge Point Code: SW01-Dunmanway (Proposed)

Source of Emission:	Dunmanway WWTP Primary Discharge
Location:	Milleenanannig, Dunmanway
Grid Ref. (12 digit, 6E, 6N):	124122E, 52532N
Name of receiving waters:	River Bandon
River Basin District:	South Western River Basin District
Designation of receiving waters:	SAC
Flow rate in receiving waters:	0.07 $m^3.sec^{-1}$ Dry Weather Flow 0.14 $m^3.sec^{-1}$ 95%ile flow

Emission Details:

(i) Volume emitted			
Normal/day	Not Available	Maximum/day	864m^3
Maximum rate/hour	Not Available	Period of emission (avg)	60 min/hr 24 hr/day 365 day/yr
Dry Weather Flow	Not Available		

TABLE D.1(ii)(b): EMISSIONS TO SURFACE/GROUND WATERS - Characteristics of the emission (1 table per discharge point)

(Secondary Discharge Point)

Discharge Point Code: SW01 Dunmanway proposed

Number	Substance	As discharged	
		Max. daily average	
1	pH	6.5 -8.5	
2	Temperature	25°C	
3	Electrical Conductivity (@25°C)	1000	
		Max. daily average (mg/l)	**kg/day**
4	Suspended Solids	35	30.24
5	Ammonia (as N)	Not available	Not available
6	Biochemical Oxygen Demand	25	21.6
7	Chemical Oxygen Demand	125	108
8	Total Nitrogen (as N)	25	21.6
9	Nitrite (as N)	Not available	Not available
10	Nitrate (as N)	Not available	Not available
11	Total Phosphorus (as P) Note 1	2.0	1.728
12	Orthophosphate (as P)	1.6	1.3824
13	Sulphate (SO_4)	Not available	Not available
14	Phenols (sum) Note 2 (ug/l)	Not available	Not available

Note 1: For waste water samples this monitoring should be undertaken on a sample filtered on 0.45µm filter paper.
Note 2: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

TABLE D.1(ii)(c): DANGEROUS SUBSTANCE EMISSIONS TO SURFACE/GROUND WATERS

Secondary Discharge Point - Characteristics of the emission (1 table per discharge point)

Discharge Point Code: SW01 Dunmanway proposed

Number	Substance	As discharged		
		Max. daily average (µg/l)	kg/day	kg/year
1	Atrazine	Not available	Not available	Not available
2	Dichloromethane	Not available	Not available	Not available
3	Simazine	Not available	Not available	Not available
4	Toluene	Not available	Not available	Not available
5	Tributyltin	Not available	Not available	Not available
6	Xylenes	Not available	Not available	Not available
7	Arsenic	Not available	Not available	Not available
8	Chromium	Not available	Not available	Not available
9	Copper	Not available	Not available	Not available
10	Cyanide	Not available	Not available	Not available
11	Fluoride	Not available	Not available	Not available
12	Lead	Not available	Not available	Not available
13	Nickel	Not available	Not available	Not available
14	Zinc	Not available	Not available	Not available
15	Boron	Not available	Not available	Not available
16	Cadmium	Not available	Not available	Not available
17	Mercury	Not available	Not available	Not available
18	Selenium	Not available	Not available	Not available
19	Barium	Not available	Not available	Not available

TABLE D.1(ii)(a): EMISSIONS TO SURFACE/GROUND WATERS
(Secondary Discharge Point) (1 table per discharge point)

Discharge Point Code: SW02 Dunmanway

Source of Emission:	Emergency Overflow Long Bridge Pumping Station
Location:	Dunmanway North
Grid Ref. (12 digit, 6E, 6N):	124057E, 53010N
Name of receiving waters:	River Bandon
River Basin District:	South Western River Basin District
Designation of receiving waters:	SAC
Flow rate in receiving waters:	0.07 $m^3.sec^{-1}$ Dry Weather Flow 0.14 $m^3.sec^{-1}$ 95%ile flow

Emission Details:

(i) Volume emitted			
Normal/day	Not Available	Maximum/day	Not Available
Maximum rate/hour	Not Available	Period of emission (avg)	Not available min/hr hr/day day/yr
Dry Weather Flow	Not Available		

TABLE D.1(ii)(b): EMISSIONS TO SURFACE/GROUND WATERS - Characteristics of the emission (1 table per discharge point)

(Secondary Discharge Point)

Discharge Point Code: SW02 Dunmanway

Number	Substance	As discharged	
		Max. daily average	
1	pH	Not available	
2	Temperature	Not available	
3	Electrical Conductivity (@25°C)	Not available	
		Max. daily average (mg/l)	**kg/day**
4	Suspended Solids	Not available	Not available
5	Ammonia (as N)	Not available	Not available
6	Biochemical Oxygen Demand	Not available	Not available
7	Chemical Oxygen Demand	Not available	Not available
8	Total Nitrogen (as N)	Not available	Not available
9	Nitrite (as N)	Not available	Not available
10	Nitrate (as N)	Not available	Not available
11	Total Phosphorus (as P) Note 1	Not available	Not available
12	Orthophosphate (as P)	Not available	Not available
13	Sulphate (SO_4)	Not available	Not available
14	Phenols (sum) Note 2 (ug/l)	Not available	Not available

Note 1: For waste water samples this monitoring should be undertaken on a sample filtered on 0.45µm filter paper.
Note 2: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

TABLE D.1(ii)(c): DANGEROUS SUBSTANCE EMISSIONS TO SURFACE/GROUND WATERS

Secondary Discharge Point - Characteristics of the emission (1 table per discharge point)

Discharge Point Code: SW02 Dunmanway

Number	Substance	As discharged		
		Max. daily average (µg/l)	kg/day	kg/year
1	Atrazine	Not available	Not available	Not available
2	Dichloromethane	Not available	Not available	Not available
3	Simazine	Not available	Not available	Not available
4	Toluene	Not available	Not available	Not available
5	Tributyltin	Not available	Not available	Not available
6	Xylenes	Not available	Not available	Not available
7	Arsenic	Not available	Not available	Not available
8	Chromium	Not available	Not available	Not available
9	Copper	Not available	Not available	Not available
10	Cyanide	Not available	Not available	Not available
11	Fluoride	Not available	Not available	Not available
12	Lead	Not available	Not available	Not available
13	Nickel	Not available	Not available	Not available
14	Zinc	Not available	Not available	Not available
15	Boron	Not available	Not available	Not available
16	Cadmium	Not available	Not available	Not available
17	Mercury	Not available	Not available	Not available
18	Selenium	Not available	Not available	Not available
19	Barium	Not available	Not available	Not available

TABLE D.1(ii)(a): EMISSIONS TO SURFACE/GROUND WATERS
(Secondary Discharge Point) (1 table per discharge point)

Discharge Point Code: SW03 Dunmanway

Source of Emission:	Emergency Overflow Quarry Road Pumping Station
Location:	Brookpark, Dunmanway
Grid Ref. (12 digit, 6E, 6N):	123566E, 52546N
Name of receiving waters:	Dirty River
River Basin District:	South Western River Basin District
Designation of receiving waters:	None
Flow rate in receiving waters:	Not available $m^3.sec^{-1}$ Dry Weather Flow Not available $m^3.sec^{-1}$ 95%ile flow

Emission Details:

(i) Volume emitted			
Normal/day	Not Available	Maximum/day	Not Available
Maximum rate/hour	Not Available	Period of emission (avg)	Not available_____min/hr _____hr/day _____day/yr
Dry Weather Flow	Not Available		

TABLE D.1(ii)(b): EMISSIONS TO SURFACE/GROUND WATERS - Characteristics of the emission (1 table per discharge point)

(Secondary Discharge Point)

Discharge Point Code: SW03 Dunmanway

Number	Substance	As discharged	
		Max. daily average	
1	pH	Not available	
2	Temperature	Not available	
3	Electrical Conductivity (@25°C)	Not available	
		Max. daily average (mg/l)	**kg/day**
4	Suspended Solids	Not available	Not available
5	Ammonia (as N)	Not available	Not available
6	Biochemical Oxygen Demand	Not available	Not available
7	Chemical Oxygen Demand	Not available	Not available
8	Total Nitrogen (as N)	Not available	Not available
9	Nitrite (as N)	Not available	Not available
10	Nitrate (as N)	Not available	Not available
11	Total Phosphorus (as P) Note 1	Not available	Not available
12	Orthophosphate (as P)	Not available	Not available
13	Sulphate (SO_4)	Not available	Not available
14	Phenols (sum) Note 2 (ug/l)	Not available	Not available

Note 1: For waste water samples this monitoring should be undertaken on a sample filtered on 0.45µm filter paper.
Note 2: USEPA Method 604, AWWA Standard Method 6240, or equivalent.

TABLE D.1(ii)(c): DANGEROUS SUBSTANCE EMISSIONS TO SURFACE/GROUND WATERS

Secondary Discharge Point - Characteristics of the emission (1 table per discharge point)

Discharge Point Code: SW03 Dunmanway

Number	Substance	As discharged		
		Max. daily average (µg/l)	**kg/day**	**kg/year**
1	Atrazine	Not available	Not available	Not available
2	Dichloromethane	Not available	Not available	Not available
3	Simazine	Not available	Not available	Not available
4	Toluene	Not available	Not available	Not available
5	Tributyltin	Not available	Not available	Not available
6	Xylenes	Not available	Not available	Not available
7	Arsenic	Not available	Not available	Not available
8	Chromium	Not available	Not available	Not available
9	Copper	Not available	Not available	Not available
10	Cyanide	Not available	Not available	Not available
11	Fluoride	Not available	Not available	Not available
12	Lead	Not available	Not available	Not available
13	Nickel	Not available	Not available	Not available
14	Zinc	Not available	Not available	Not available
15	Boron	Not available	Not available	Not available
16	Cadmium	Not available	Not available	Not available
17	Mercury	Not available	Not available	Not available
18	Selenium	Not available	Not available	Not available
19	Barium	Not available	Not available	Not available

TABLE D.1(iii)(a): EMISSIONS TO SURFACE/GROUND WATERS
(Storm Water Overflow) (1 table per discharge point)

Discharge Point Code: SW02 Storm Overflow

Source of Emission:	Emergency Overflow Long Bridge Pumping Station
Location:	Dunmanway North
Grid Ref. (12 digit, 6E, 6N):	124057E, 53010N
Name of receiving waters:	River Bandon
River Basin District:	South Western River Basin District
Designation of receiving waters:	SAC
Flow rate in receiving waters:	Not available $m^3.sec^{-1}$ Dry Weather Flow Not available $m^3.sec^{-1}$ 95%ile flow

Emission Details:

(i) Volume emitted			
Normal/day	Not Available	Maximum/day	Not Available
Maximum rate/hour	Not Available	Period of emission (avg)	Not available Min/hr ____hr/day ____day/yr

TABLE D.1(iii)(a): EMISSIONS TO SURFACE/GROUND WATERS
(Storm Water Overflow) (1 table per discharge point)

Discharge Point Code: SW03 Storm Overflow

Source of Emission:	Emergency Overflow Quarry Road Pumping Station
Location:	Brookpark, Dunmanway
Grid Ref. (12 digit, 6E, 6N):	123566E, 52546N
Name of receiving waters:	Dirty River
River Basin District:	South Western River Basin District
Designation of receiving waters:	None
Flow rate in receiving waters:	Not available $m^3.sec^{-1}$ Dry Weather Flow Not available $m^3.sec^{-1}$ 95%ile flow

Emission Details:

(i) Volume emitted			
Normal/day	Not Available	Maximum/day	Not available
Maximum rate/hour	Not Available	Period of emission (avg)	Not available Min/hr ____ hr/day ____ day/yr

Attachment E2 Monitoring and Sampling

Attachment Dunmanway – E2 – 22 Sampling and Monitoring Points

SW03DWAY
MONITORING & SAMPLING POINT
MAIN STREET STORM OVERFLOW
E: 123730
N: 053010

SW05DWAY
MONITORING & SAMPLING POINT
SECONDARY DISCHARGE POINT
LONG BRIDGE PUMPING STATION
E: 124035
N: 053017

aSW01uDWAY
MONITORING & SAMPLING POINT
E: 124197
N: 053006

SW01DWAY
MONITORING & SAMPLING POINT
DUNMANWAY WWTP PRIMARY
EFFLUENT DISCHARGE POINT
E: 124143
N: 052536

SW04DWAY
MONITORING & SAMPLING POINT
SECONDARY DISCHARGE POINT
EMERGENCY OVERFLOW
QUARRY ROAD PUMPING STATION
E: 123562
N: 052546

SW02DWAY
(TO BREWERY RIVER)
MONITORING & SAMPLING POINT
STORM OVERFLOW
E: 123271
N: 052182

aSW01dDWAY
MONITORING & SAMPLING POINT
BEALBOY BRIDGE
E: 125676
N: 051303

N

MAP REPRODUCED BY PERMISSION OF ORDNANCE SURVEY IRELAND (CORK CCMA 9802)

	AMENDMENT DETAILS	DATE

T.J.O'CONNOR & ASSOCIATES
CONSULTING ENGINEERS
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Tel: 295 2321 Fax: 295 4541

PROJECT: DUNMANWAY EPA DISCHARGE LICENSE APPLICATION

CLIENT: CORK COUNTY COUNCIL

DRAWING TITLE: ATTACHMENT E.2 – SAMPLING & MONITORING POINTS

SCALE: 1:10000	JOB NO: 2846	DRAWING NO: DUNMANWAY_E2_22
DATE: JULY'08	DRAWN BY: JH	

Attachment E4 Sampling Data

Attatchment E4-Dunmanway Outlet

Sample Date	07/02/2008	03/04/2008	22/05/2008	04/06/2008	19/06/2008	07/02/2008	30/07/2008			
Sample	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Average	Kg/day	Kg/year
Flow M^3/Day	*	*	*	*	*	*	*	864	*	*
pH	7.1	*	7.2	7.2	7.2	7.1	7	7.133333	*	*
Temperature ℃	*	*	*	*	*	*	*	*	*	*
Cond 20℃	*	509	377	167	417	194	204	311.3333	*	*
SS mg/L	40	74	152	57	59	122	81	83.57143	72.20571	26355.09
NH_3 mg/L	11.8	24.5	12.6	*	18.1	4.1	6	12.85	11.1024	4052.376
BOD mg/L	44.2	87.4	311	45.4	85.7	35	44.1	93.25714	80.57417	29409.57
COD mg/L	133	280	570	118	200	85	105	213	184.032	67171.68
TN mg/L	15.9	46	17.5	8.7	77	2.3	35.15	28.93571	25.00046	9125.167
Nitrite mg/L	*	*	*	*	*	*	0.951	0.951	0.821664	299.9074
Nitrate mg/L	*	*	*	*	*	*	23	23	19.872	7253.28
TP mg/L	2.28	*	0.96	1.83	3.53	1.82	2.44	2.143333	1.85184	675.9216
O-PO4-P mg/L	1.48	4.28	1.4	1.09	2.26	0.5	1.48	1.784286	1.541623	562.6923
SO4 mg/L	<30	*	*	*	*	*	<30	<30	<23.7	<8650.5
Phenols µg/L	*	*	*	*	*	*	<0.10	<0.10	<0.079	<28.835
Atrazine µg/L	*	*	*	*	*	*	<0.01	<0.01	<0.0079	<2.8835
Dichloromethane	*	*	*	*	*	*	<1	<1	<0.79	<288.35
Simazine µg/L	*	*	*	*	*	*	<0.01	<0.01	<0.0079	<2.8835
Toluene µg/L	*	*	*	*	*	*	<1	<1	<0.79	<288.35
Tributyltin µg/L	*	*	*	*	*	*	*	*	*	*
Xylenes µg/L	*	*	*	*	*	*	<1	<1	<0.79	<288.35
Arsenic µg/L	*	*	*	*	*	*	<0.96	<0.96	<0.7584	<276.816
Chromium mg/L	*	*	<0.02	<0.02	*	*	<0.01	<0.01667	<0.06667	<24.33455
Copper mg/L	*	*	<0.02	<0.02		*	0.0394	0.0394	0.034042	12.42518
Cyanide µg/L	*	*	*	*	*	*	<5	<5	<3.95	<1441.75
Fluoride	*	*	*	*	*	*	140	140	120.96	44150.4
Lead mg/L	*	*	<0.02	<0.02	*	*	0.0116	0.0116	0.010022	3.658176
Nickel mg/L	*	*	<0.02	<0.02	*	*	<0.05	<0.03	<0.03	<10.95
Zinc mg/L	*	*	0.061	0.062	*	*	0.07361	0.065537	0.056624	20.66764
Boron mg/L	*	*	0.051	<0.02	*	*	<0.2	0.051	0.044064	16.08336
Cadmium mg/L	*	*	<0.02	<0.02	*	*	<0.001	<0.013667	<0.01181	<4.31
Mercury µg/L	*	*	*	*	*	*	<0.2	<0.2	<0.158	<57.67
Selenium µg/L	*	*	*	*	*	*	<0.74	<0.74	<0.5846	<213.379
Barium mg/L	*	*	0.024	0.039	*	*	0.0435	0.0355	0.030672	11.19528

Sample Date	17/01/2007	06/02/2007	07/03/2007	12/04/2007	03/05/2007	13/06/2007	04/07/2007	09/08/2007	06/09/2007	24/10/2007
Sample	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent
Flow M^3/Day	*	*	*	*	*	*	*	*	*	*
pH	7.3	7.1	7.3	7.3	7.3	7.4	7.1	7.2	7.4	7.3
Temperature ℃	*	*	*	*	*	*	*	*	*	*
Cond 20℃	*	*	*	*	*	*	*	*	*	*
SS mg/L	25	82	37	55	114	102	47	51	71	30
NH_3 mg/L	*	*	*	*	*	*	17.7	12.7	25	19.2
BOD mg/L	36	208	65	83	84	78	57	40	65	37
COD mg/L	65	410	129	231	295	244	167	142	253	124
TN mg/L	24	10.8	12.5	*	26	54	*	24.8	28	27
Nitrite mg/L	*	*	*	*	*	*	*	*	*	*
Nitrate mg/L	*	*	*	*	*	*	*	*	*	*
TP mg/L	188	7.18	2.49	6.58	8.13	2.45	5.4	3.48	7.55	6.48
O-PO4-P mg/L	*	*	*	*	*	*	*	*	*	4.09
SO4 mg/L	*	*	*	*	*	*	32.7	<30	37.8	31.5
Phenols µg/L	*	*	*	*	*	*	*	*	*	*
Atrazine µg/L	*	*	*	*	*	*	*	*	*	*
Dichloromethane	*	*	*	*	*	*	*	*	*	*
Simazine µg/L	*	*	*	*	*	*	*	*	*	*
Toluene µg/L	*	*	*	*	*	*	*	*	*	*
Tributyltin µg/L	*	*	*	*	*	*	*	*	*	*
Xylenes µg/L	*	*	*	*	*	*	*	*	*	*
Arsenic µg/L	*	*	*	*	*	*	*	*	*	*
Chromium mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*
Copper mg/L	*	*	*	*	*	*	*	<0.02	0.021	*
Cyanide µg/L	*	*	*	*	*	*	*	*	*	*
Fluoride	*	*	*	*	*	*	*	*	*	*
Lead mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*
Nickel mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*
Zinc mg/L	*	*	*	*	*	*	*	0.055	0.05	*
Boron mg/L	*	*	*	*	*	*	*	*	*	*
Cadmium mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*
Mercury µg/L	*	*	*	*	*	*	*	*	*	*
Selenium µg/L	*	*	*	*	*	*	*	*	*	*
Barium mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*

*Predicted daily flow

12/12/2007
Effluent
*
7.2
*
*
19
*
16.24
49
11.4
*
*
1.31
0.88
*
*
*
*
*
*
*
*
*
*
*
*
*
*
*
*
*
*
*
*

Attatchment E4-CSO Long Bridge

Sample Date	21/05/2008	30/07/2008
Sample		
Flow M^3/Day	*	*
pH	7.6	*
Temperature °C	*	*
Cond 20°C	*	*
SS mg/L	70	*
NH_3 mg/L	0.5	*
BOD mg/L	14.8	*
COD mg/L	<21	*
TN mg/L	1.4	*
Nitrite mg/L	*	0.02
Nitrate mg/L	*	<1.78
TP mg/L	0.21	*
O-PO4-P mg/L	0.06	*
SO4 mg/L	*	*
Phenols µg/L	*	*
Atrazine µg/L	*	*
Dichloromethane	*	*
Simazine µg/L	*	*
Toluene µg/L	*	*
Tributyltin µg/L	*	*
Xylenes µg/L	*	*
Arsenic µg/L	*	*
Chromium mg/L	*	<0.01
Copper mg/L	*	0.0369
Cyanide µg/L	*	*
Fluoride	*	260
Lead mg/L	*	0.0059
Nickel mg/L	*	<0.005
Zinc mg/L	*	0.0578
Boron mg/L	*	<0.2
Cadmium mg/L	*	<0.001
Mercury µg/L	*	*
Selenium µg/L	*	*
Barium mg/L	*	0.0274

Attatchment E4-CSO Quarry Road

Sample Date	21/05/2008	30/07/2008									
Sample	CSO	*									
Flow M^3/Day	*	*									
pH	7.3	*									
Temperature °C	*	*									
Cond 20°C	*	*									
SS mg/L	188	*									
NH_3 mg/L	*	*									
BOD mg/L	36	*									
COD mg/L	200	*									
TN mg/L	4.2	*									
Nitrite mg/L	*	0.206									
Nitrate mg/L	*	4.2									
TP mg/L	1.05	*									
O-PO4-P mg/L	0.09	*									
SO4 mg/L	*	*									
Phenols µg/L	*	*									
Atrazine µg/L	*	*									
Dichloromethane	*	*									
Simazine µg/L	*	*									
Toluene µg/L	*	*									
Tributyltin µg/L	*	*									
Xylenes µg/L	*	*									
Arsenic µg/L	*	*									
Chromium mg/L	*	*									
Copper mg/L	*	*									
Cyanide µg/L	*	*									
Fluoride	*	90									
Lead mg/L	*	*									
Nickel mg/L	*	*									
Zinc mg/L	*	*									
Boron mg/L	*	*									
Cadmium mg/L	*	*									
Mercury µg/L	*	*									
Selenium µg/L	*	*									
Barium mg/L	*	*									

Attatchment E4-Dunmanway Downstream

Sample Date	07/02/2008	03/04/2008	22/05/2008	19/06/2008	02/07/2008	30/07/2008			
Sample	River	River	River	River	River	River			
Flow M^3/Day	*	*	*	*	*	*			
pH	7	*	7.1	7.2	7.2	*			
Temperature °C	*	*	*	*	*	*			
Cond 20°C	*	132	94.6	*	101	*			
SS mg/L	<2.5	<2.5	3	<2.5	<2.5	*			
NH_3 mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	*			
BOD mg/L	<1.0	<1.0	*	*	<0.1	*			
COD mg/L	<21	*	*	*	*	*			
TN mg/L	2.4	*	0.6	47	<0.5	*			
Nitrite mg/L	*	*	*	*	*	0.027			
Nitrate mg/L	*	*	*	*	*	3			
TP mg/L	<0.2	<0.20	<0.2	<0.2	<0.2	*			
O-PO4-P mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	*			
SO4 mg/L	<30	*	*	*	*	*			
Phenols µg/L	*	*	*	*	*	*			
Atrazine µg/L	*	*	*	*	*	*			
Dichloromethane	*	*	*	*	*	*			
Simazine µg/L	*	*	*	*	*	*			
Toluene µg/L	*	*	*	*	*	*			
Tributyltin µg/L	*	*	*	*	*	*			
Xylenes µg/L	*	*	*	*	*	*			
Arsenic µg/L	*	*	*	*	*	*			
Chromium mg/L	*	*	*	<0.02	*	<0.01			
Copper mg/L	*	*	*	<0.02	*	<0.03			
Cyanide µg/L	*	*	*	*	*				
Fluoride	*	*	*	*	*	40			
Lead mg/L	*	*	*	<0.02	*	<0.003			
Nickel mg/L	*	*	*	<0.02	*	<0.005			
Zinc mg/L	*	*	*	<0.02	*	<0.01			
Boron mg/L	*	*	*	<0.02	*	<0.2			
Cadmium mg/L	*	*	*	<0.02	*	<0.001			
Mercury µg/L	*	*	*	*	*	*			
Selenium µg/L	*	*	*	*	*	*			
Barium mg/L	*	*	*	0.045	*	0.0665			

Attatchment E4-Dunmanway Upstream

Sample Date	07/02/2008	04/03/2008	22/05/2008	04/06/2008	19/06/2008	02/07/2008	30/07/2008		
Sample	River	River	River	River	River	River	River		
Flow M^3/Day	*	*	*	*	*	*			
pH	7.2	*	7.3	7.5	7.4	7.4			
Temperature °C	*	*	*	*	*	*			
Cond 20°C	*	124	89.5	128	*	83			
SS mg/L	<2.5	<2.5	3	<2.5	<2.5	<2.5			
NH_3 mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			
BOD mg/L	<1.0	<1.0	*	2.94	*	<0.1			
COD mg/L	<21	*	*	*	*	*			
TN mg/L	0.6	*	<0.5	<0.5	24	<0.5			
Nitrite mg/L	*	*	*	*	*	*	0.036		
Nitrate mg/L	*	*	*	*	*	*	2.7		
TP mg/L	<0.2	0.35	<0.2	<0.2	<0.2	<0.2			
O-PO4-P mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			
SO4 mg/L	<30	*	*	*	*	*			
Phenols µg/L	*	*	*	*	*	*			
Atrazine µg/L	*	*	*	*	*	*			
Dichloromethane	*	*	*	*	*	*			
Simazine µg/L	*	*	*	*	*	*			
Toluene µg/L	*	*	*	*	*	*			
Tributyltin µg/L	*	*	*	*	*	*			
Xylenes µg/L	*	*	*	*	*	*			
Arsenic µg/L	*	*	*	*	*	*			
Chromium mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	*			
Copper mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	*			
Cyanide µg/L	*	*	*	*		*			
Fluoride	*	*	*	*		*	50		
Lead mg/L	<0.02	<0.02	<0.02	<0.02	<0.02				
Nickel mg/L	<0.02	<0.02	<0.02	<0.02	<0.02				
Zinc mg/L	<0.02	<0.02	<0.02	<0.02	<0.02				
Boron mg/L	<0.02	<0.02	<0.02	<0.02	<0.02				
Cadmium mg/L	<0.02	<0.02	<0.02	<0.02	<0.02				
Mercury µg/L	*	*	*	*					
Selenium µg/L	*	*	*	*					
Barium mg/L	<0.02	<0.02	<0.02	<0.02	0.044				

Attatchment E4-Dunmanway Inlet

Sample Date	07/02/2008	04/06/2008	19/06/2008	02/07/2008	30/07/2008		09/08/2007	24/10/2007
Sample	Influent	influent	Influent	Inluent	Inluent		Influent	Influent
Flow M^3/Day	*	*	*	*			*	*
pH	*	*	*	*			*	7.2
Temperature °C	*	*	*	*			*	*
Cond 20°C	*	184	*	236			*	718
SS mg/L	*	60	*	*			*	231
NH_3 mg/L	16.7	*	29.5	*			*	38.5
BOD mg/L	*	*	*	*			*	*
COD mg/L	250	176	557	184			143	658
TN mg/L	*	27	*	*				54
Nitrite mg/L	*	*	*	*	0.407			*
Nitrate mg/L	*	*	*	*	16.7			*
TP mg/L	2.9	2.21	*	2.12				7.9
O-PO4-P mg/L	1.65	0.9	6.67	*				6.07
SO4 mg/L	31	*	*	*				52.4
Phenols µg/L	*	*	*	*				*
Atrazine µg/L	*	*	*	*				*
Dichloromethane µg/L	*	*	*	*				
Simazine µg/L	*	*	*	*				
Toluene µg/L	*	*	*	*				
Tributyltin µg/L	*	*	*	*				
Xylenes µg/L	*	*	*	*				
Arsenic µg/L	*	*	*	*				
Chromium mg/L			<0.02				<0.02	
Copper mg/L			<0.02				<0.02	
Cyanide µg/L							*	
Fluoride					210		*	
Lead mg/L			0.036				<0.02	
Nickel mg/L			<0.02				<0.02	
Zinc mg/L			0.06				0.083	
Boron mg/L			0.045				*	
Cadmium mg/L			<0.02				<0.02	
Mercury µg/L							*	
Selenium µg/L							*	
Barium mg/L			0.023				0.022	

SW01DWAY Dunmanway Outlet 2007

Sample Date	17/01/2007	06/02/2007	07/03/2007	12/04/2007	03/05/2007	13/06/2007	04/07/2007	09/08/2007	06/09/2007	24/10/2007	12/12/2007
Sample	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent
Flow M^3/Day	*	*	*	*	*	*	*	*	*	*	*
pH	7.3	7.1	7.3	7.3	7.3	7.4	7.1	7.2	7.4	7.3	7.2
Temperature °C	*	*	*	*	*	*	*	*	*	*	*
Cond 20°C	*	*	*	*	*	*	*	*	*	*	*
SS mg/L	25	82	37	55	114	102	47	51	71	30	19
NH_3 mg/L	*	*	*	*	*	*	17.7	12.7	25	19.2	*
BOD mg/L	36	208	65	83	84	78	57	40	65	37	16.24
COD mg/L	65	410	129	231	295	244	167	142	253	124	49
TN mg/L	24	10.8	12.5	*	26	54	*	24.8	28	27	11.4
Nitrite mg/L	*	*	*	*	*	*	*	*	*	*	*
Nitrate mg/L	*	*	*	*	*	*	*	*	*	*	*
TP mg/L	188	7.18	2.49	6.58	8.13	2.45	5.4	3.48	7.55	6.48	1.31
O-PO4-P mg/L	*	*	*	*	*	*	*	*	*	4.09	0.88
SO4 mg/L	*	*	*	*	*	*	32.7	<30	37.8	31.5	*
Phenols µg/L	*	*	*	*	*	*	*	*	*	*	*
Atrazine µg/L	*	*	*	*	*	*	*	*	*	*	*
Dichloromethane µg/L	*	*	*	*	*	*	*	*	*	*	*
Simazine µg/L	*	*	*	*	*	*	*	*	*	*	*
Toluene µg/L	*	*	*	*	*	*	*	*	*	*	*
Tributyltin µg/L	*	*	*	*	*	*	*	*	*	*	*
Xylenes µg/L	*	*	*	*	*	*	*	*	*	*	*
Arsenic µg/L	*	*	*	*	*	*	*	*	*	*	*
Chromium mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*
Copper mg/L	*	*	*	*	*	*	*	<0.02	0.021	*	*
Cyanide µg/L	*	*	*	*	*	*	*	*	*	*	*
Fluoride	*	*	*	*	*	*	*	*	*	*	*
Lead mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*
Nickel mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*
Zinc mg/L	*	*	*	*	*	*	*	0.055	0.05	*	*
Boron mg/L	*	*	*	*	*	*	*	*	*	*	*
Cadmium mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*
Mercury µg/L	*	*	*	*	*	*	*	*	*	*	*
Selenium µg/L	*	*	*	*	*	*	*	*	*	*	*
Barium mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*

SW01DWAY Dunmanway Outlet 2008

Sample Date	07/02/2008	22/05/2008	04/06/2008	19/06/2008	19/06/2008
Sample	Effluent	effluent	effluent	effluent	Effluent
Flow M^3/Day	*	*	*	*	*
pH	7.1	7.2	7.2	7.2	7.1
Temperature °C	*	*	*	*	*
Cond 20°C	*	377	167	417	194
SS mg/L	40	152	57	59	122
NH_3 mg/L	11.8	12.6	*	18.1	4.1
BOD mg/L	44.2	311	45.4	85.7	35
COD mg/L	133	570	118	200	85
TN mg/L	15.9	17.5	8.7	77	2.3
Nitrite mg/L	*	*	*	*	*
Nitrate mg/L	*	*	*	*	*
TP mg/L	2.28	0.96	1.83	3.53	1.82
O-PO4-P mg/L	1.48	1.4	1.09	2.26	0.5
SO4 mg/L	<30	*	*	*	*
Phenols µg/L	*	*	*	*	*
Atrazine µg/L	*	*	*	*	*
Dichloromethane µg/L	*	*	*	*	*
Simazine µg/L	*	*	*	*	*
Toluene µg/L	*	*	*	*	*
Tributyltin µg/L	*	*	*	*	*
Xylenes µg/L	*	*	*	*	*
Arsenic µg/L	*	*	*	*	*
Chromium mg/L		<0.02	<0.02		
Copper mg/L		<0.02	<0.02		
Cyanide µg/L					
Fluoride					
Lead mg/L		<0.02	<0.02		
Nickel mg/L		<0.02	<0.02		
Zinc mg/L		0.061	0.062		
Boron mg/L		0.051	<0.02		
Cadmium mg/L		<0.02	<0.02		
Mercury µg/L					
Selenium µg/L					
Barium mg/L		0.024	0.039		

Dunmanway Outlet

Sample Date	17/01/2007	06/02/2007	07/03/2007	12/04/2007	03/05/2007	13/06/2007	04/07/2007	09/08/2007	06/09/2007	24/10/2007	12/12/2007
Sample	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent	Effluent
Flow M^3/Day	*	*	*	*	*	*	*	*	*	*	*
pH	7.3	7.1	7.3	7.3	7.3	7.4	7.1	7.2	7.4	7.3	7.2
Temperature °C	*	*	*	*	*	*	*	*	*	*	*
Cond 20°C	*	*	*	*	*	*	*	*	*	*	*
SS mg/L	25	82	37	55	114	102	47	51	71	30	19
NH_3 mg/L	*	*	*	*	*	*	17.7	12.7	25	19.2	*
BOD mg/L	36	208	65	83	84	78	57	40	65	37	16.24
COD mg/L	65	410	129	231	295	244	167	142	253	124	49
TN mg/L	24	10.8	12.5	*	26	54	*	24.8	28	27	11.4
Nitrite mg/L	*	*	*	*	*	*	*	*	*	*	*
Nitrate mg/L	*	*	*	*	*	*	*	*	*	*	*
TP mg/L	188	7.18	2.49	6.58	8.13	2.45	5.4	3.48	7.55	6.48	1.31
O-PO4-P mg/L	*	*	*	*	*	*	*	*	*	4.09	0.88
SO4 mg/L	*	*	*	*	*	*	32.7	<30	37.8	31.5	*
Phenols µg/L	*	*	*	*	*	*	*	*	*	*	*
Atrazine µg/L	*	*	*	*	*	*	*	*	*	*	*
Dichloromethane	*	*	*	*	*	*	*	*	*	*	*
Simazine µg/L	*	*	*	*	*	*	*	*	*	*	*
Toluene µg/L	*	*	*	*	*	*	*	*	*	*	*
Tributyltin µg/L	*	*	*	*	*	*	*	*	*	*	*
Xylenes µg/L	*	*	*	*	*	*	*	*	*	*	*
Arsenic µg/L	*	*	*	*	*	*	*	*	*	*	*
Chromium mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*
Copper mg/L	*	*	*	*	*	*	*	<0.02	0.021	*	*
Cyanide µg/L	*	*	*	*	*	*	*	*	*	*	*
Fluoride	*	*	*	*	*	*	*	*	*	*	*
Lead mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*
Nickel mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*
Zinc mg/L	*	*	*	*	*	*	*	0.055	0.05	*	*
Boron mg/L	*	*	*	*	*	*	*	*	*	*	*
Cadmium mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*
Mercury µg/L	*	*	*	*	*	*	*	*	*	*	*
Selenium µg/L	*	*	*	*	*	*	*	*	*	*	*
Barium mg/L	*	*	*	*	*	*	*	<0.02	<0.02	*	*

Dunmanway Outlet

Sample Date	07/02/2008	22/05/2008	04/06/2008	19/06/2008	19/06/2008							
Sample	Effluent	effluent	effluent	effluent	Effluent							
Flow M^3/Day	*	*	*	*	*							
pH	7.1	7.2	7.2	7.2	7.1							
Temperature °C	*	*	*	*	*							
Cond 20°C	*	377	167	417	194							
SS mg/L	40	152	57	59	122							
NH_3 mg/L	11.8	12.6	*	18.1	4.1							
BOD mg/L	44.2	311	45.4	85.7	35							
COD mg/L	133	570	118	200	85							
TN mg/L	15.9	17.5	8.7	77	2.3							
Nitrite mg/L	*	*	*	*	*							
Nitrate mg/L	*	*	*	*	*							
TP mg/L	2.28	0.96	1.83	3.53	1.82							
O-PO4-P mg/L	1.48	1.4	1.09	2.26	0.5							
SO4 mg/L	<30	*	*	*	*							
Phenols µg/L	*	*	*	*	*							
Atrazine µg/L	*	*	*	*	*							
Dichloromethane	*	*	*	*	*							
Simazine µg/L	*	*	*	*	*							
Toluene µg/L	*	*	*	*	*							
Tributyltin µg/L	*	*	*	*	*							
Xylenes µg/L	*	*	*	*	*							
Arsenic µg/L	*	*	*	*	*							
Chromium mg/L		<0.02	<0.02									
Copper mg/L		<0.02	<0.02									
Cyanide µg/L												
Fluoride												
Lead mg/L		<0.02	<0.02									
Nickel mg/L		<0.02	<0.02									
Zinc mg/L		0.061	0.062									
Boron mg/L		0.051	<0.02									
Cadmium mg/L		<0.02	<0.02									
Mercury µg/L												
Selenium µg/L												
Barium mg/L		0.024	0.039									

Attachment F1 Assessment of impact on the Receiving or Ground Water

TABLE F.1(i)(a): SURFACE/GROUND WATER MONITORING
(Primary Discharge Point – one table per upstream and downstream location)

Discharge Point Code: ***SWO1 DUNMANWAY***

MONITORING POINT CODE: ***aSWO1u DUNMANWAY***

Parameter	Results (mg/l[Note 1])				Sampling method (grab, drift etc.)	Limit of Quantitation	Analysis method / technique
	22/05/2008	04/06/2008	19/06/2008	02/07/2008			
pH	7.3	7.5	7.4	7.4	Grab	2	Electrochemical
Temperature	Not available	Not available	Not available	Not available	Grab	N/A	N/A
Electrical Conductivity (@20°C)	89.5	128	Not available	83	Grab	0.5 µmhos/cm	Electrochemical
Suspended Solids	3	<2.5	<2.5	<2.5	Grab	0.5 mg/L	Gravimetric
Ammonia (as N)	<0.1	<0.1	<0.1	<0.1	Grab	0.02 mg/L	Colorimetric
Biochemical Oxygen Demand	Not available	2.94	Not available	<0.1	Grab	0.06 mg/L	Electrochemical
Chemical Oxygen Demand	Not available	Not available	Not available	Not available	Grab	8 mg/L	Digestion + Calorimetric
Dissolved Oxygen	Not available	Not available	Not available	Not available	Grab	N/A	N/A
Hardness (as $CaCo_3$)	Not available	Not available	Not available	Not available	Grab	N/A	N/A
Total Nitrogen (as N)	<0.5	<0.5	24	<0.5	Grab	0.5 mg/L	Digestion + Calorimetric
Nitrite (as N)	Not available	Not available	Not available	0.036^	Grab	0.004mg/L	Colorimetric
Nitrate (as N)	Not available	Not available	Not available	2.7^	Grab	0.4 mg/L	Colorimetric

Total Phosphorus (as P)	<0.2	<0.2	<0.2	<0.2	Grab	0.2 mg/L	Digestion + Calorimetric
Orthophosphate (as P) - unfiltered	<0.05	<0.05	<0.05	<0.05	Grab	0.02 mg/L	Colorimetric
Sulphate (SO_4)	Not available	Not available	Not available	Not available	Grab	30 mg/L	Turbidimetric
Phenols (sum) Note 2 (ug/l)	Not available	Not available	Not available	Not available	Grab	0.1 µg/L	GC-MS 2

Note 1: Or other unit as appropriate – please specify.
Note 2: USEPA Method 604, AWWA Standard Method 6240, or equivalent.
^Note 3: Samples taken on 30/07/08

TABLE F.1(i)(b): SURFACE/GROUND WATER MONITORING (Dangerous Substances)
(Primary Discharge Point - one table per upstream and downstream location)

Discharge Point Code: ***SWO1 DUNMANWAY***

MONITORING POINT CODE: ***aSWO1uDUNMANWAY***

Parameter	Results (µg/l)				Sampling method (grab, drift etc.)	Limit of Quantitation	Analysis method / technique
	22/05/2008	04/06/2008	19/06/2008	02/07/2008			
Atrazine	Not available	Not available	Not available	Not available	Grab	0.96 µg/L	HPLC
Dichloromethane	Not available	Not available	Not available	Not available	Grab	1 µg/L	GC-MS 1
Simazine	Not available	Not available	Not available	Not available	Grab	0.01 µg/L	HPLC
Toluene	Not available	Not available	Not available	Not available	Grab	0.02 µg/L	GC-MS 1
Tributyltin	Not available	Not available	Not available	Not available	Not available	1 µg/L as Sn	GC-MS 1
Xylenes	Not available	Not available	Not available	Not available	Grab	0.96 µg/L	GC-MS 1
Arsenic	Not available	Not available	Not available	Not available	Grab	0.02 mg/L	ICP-MS
Chromium	<20	<20	<20	Not available	Grab	0.02 mg/L	ICP-OES
Copper	<20	<20	<20	Not available	Grab	5 mg/L	ICP-OES
Cyanide	Not available	Not available	Not available	Not available	Grab	0.01 µg/L	Colorimetric
Fluoride	Not available	Not available	Not available	50^	Grab	100 µg/L	ISE

Lead	<20	<20	<20	Not available	Grab	0.02 mg/L	ICP-OES
Nickel	<20	<20	<20	Not available	Grab	0.02 mg/L	ICP-OES
Zinc	<20	<20	<20	Not available	Grab	0.02 mg/L	ICP-OES
Boron	<20	<20	<20	Not available	Grab	0.02 mg/L	ICP-OES
Cadmium	<20	<20	<20	Not available	Grab	0.02 mg/L	ICP-OES
Mercury	Not available	Not available	Not available	Not available	Grab	0.02 µg/L	ICP-MS
Selenium	Not available	Not available	Not available	Not available	Grab	0.74 µg/L	ICP-MS
Barium	<20	<20	44	Not available	Grab	0.02 mg/L	ICP-OES

^Note 3: Samples taken on 30/07/08

TABLE F.1(i)(a): SURFACE/GROUND WATER MONITORING
(Primary Discharge Point – one table per upstream and downstream location)

Discharge Point Code: ***SWO1 DUNMANWAY***

MONITORING POINT CODE: ***aSWO1dDUNMANWAY***

Parameter	Results (mg/l[Note 1])				Sampling method (grab, drift etc.)	Limit of Quantitation	Analysis method / technique
	03/04/2008	22/05/2008	19/06/2008	02/07/2008			
pH	Not available	Not available	Not available	Not available	Grab	2	Electrochemical
Temperature	Not available	7.1	7.2	7.2	Grab	N/A	N/A
Electrical Conductivity (@20°C)	Not available	Not available	Not available	Not available	Grab	0.5 µmhos/cm	Electrochemical
Suspended Solids	132	94.6	Not available	101	Grab	0.5 mg/L	Gravimetric
Ammonia (as N)	<2.5	3	<2.5	<2.5	Grab	0.02 mg/L	Colorimetric
Biochemical Oxygen Demand	<0.1	<0.1	<0.1	<0.1	Grab	0.06 mg/L	Electrochemical
Chemical Oxygen Demand	<1.0	Not available	Not available	<0.1	Grab	8 mg/L	Digestion + Calorimetric
Dissolved Oxygen	Not available	Not available	Not available	Not available	Grab	N/A	N/A
Hardness (as $CaCo_3$)	Not available	Not available	Not available	Not available	Grab	N/A	N/A
Total Nitrogen (as N)	Not available	0.6	47	<0.5	Grab	0.5 mg/L	Digestion + Calorimetric
Nitrite (as N)	Not available	Not available	Not available	0.027^	Grab	0.004mg/L	Colorimetric
Nitrate (as N)	Not	Not	Not	3^	Grab	0.4 mg/L	Colorimetric

	available	available	available				
Total Phosphorus (as P)	<0.20	<0.2	<0.2	<0.2	Grab	0.2 mg/L	Digestion + Calorimetric
Orthophosphate (as P) - unfiltered	<0.05	<0.05	<0.05	<0.05	Grab	0.02 mg/L	Colorimetric
Sulphate (SO_4)	Not available	Not available	Not available	Not available	Grab	30 mg/L	Turbidimetric
Phenols (sum) [Note 2] (ug/l)	Not available	Not available	Not available	Not available	Grab	0.1 µg/L	GC-MS 2

Note 1: Or other unit as appropriate – please specify.
Note 2: USEPA Method 604, AWWA Standard Method 6240, or equivalent.
^Note 3: Samples taken on 30/07/08

TABLE F.1(i)(b): SURFACE/GROUND WATER MONITORING (Dangerous Substances)
(Primary Discharge Point - one table per upstream and downstream location)

Discharge Point Code: ***SWO1 DUNMANWAY***

MONITORING POINT CODE: ***aSWO1dDUNMANWAY***

Parameter	Results (µg/l)				Sampling method (grab, drift etc.)	Limit of Quantitation	Analysis method / technique
	03/04/2008	22/05/2008	19/06/2008	02/07/2008			
Atrazine	Not available	Not available	Not available	Not available	Grab	0.96 µg/L	HPLC
Dichloromethane	Not available	Not available	Not available	Not available	Grab	1 µg/L	GC-MS 1
Simazine	Not available	Not available	Not available	Not available	Grab	0.01 µg/L	HPLC
Toluene	Not available	Not available	Not available	Not available	Grab	0.02 µg/L	GC-MS 1
Tributyltin	Not available	Not available	Not available	Not available	Grab	1 µg/L as Sn	GC-MS 1
Xylenes	Not available	Not available	Not available	Not available	Grab	0.96 µg/L	GC-MS 1
Arsenic	Not available	Not available	Not available	Not available	Grab	0.02 mg/L	ICP-MS
Chromium	Not available	Not available	<20	<10^	Grab	0.02 mg/L	ICP-OES
Copper	Not available	Not available	<20	<30^	Grab	5 mg/L	ICP-OES
Cyanide	Not available	Not available	Not available	Not available	Grab	0.01 µg/L	Colorimetric
Fluoride	Not available	Not available	Not available	40^	Grab	100 µg/L	ISE
Lead	Not	Not	<20	<3^	Grab	0.02 mg/L	ICP-OES

	available	available					
Nickel	Not available	Not available	<20	<5^	Grab	0.02 mg/L	ICP-OES
Zinc	Not available	Not available	<20	<10^	Grab	0.02 mg/L	ICP-OES
Boron	Not available	Not available	<20	<200^	Grab	0.02 mg/L	ICP-OES
Cadmium	Not available	Not available	<20	<1^	Grab	0.02 mg/L	ICP-OES
Mercury	Not available	Not available	Not available	Not available	Grab	0.02 µg/L	ICP-MS
Selenium	Not available	Not available	Not available	Not available	Grab	0.74 µg/L	ICP-MS
Barium	Not available	Not available	45	66.5^	Grab	0.02 mg/L	ICP-OES

^Note 3: Samples taken on 30/07/08

Provide details of the extent and type of groundwater emissions at the works.

There are no emissions to groundwater from the existing wastewater treatment plant, nor are there any intended for the proposed new wastewater treatment plant at Dunmanway. There is an existing percolation area serving a development of 36 houses located approximately 500m north of the wastewater treatment plant. This percolation area receives treated effluent from a proprietary package treatment plant which was granted planning permission in 2006 (Reg Ref 061100). It is proposed that this proprietary plant and percolation area will be decommissioned on completion of the construction of the proposed wastewater treatment plant in Dunmanway.

Describe the existing environment in terms of water quality with particular reference to environmental quality standards or other legislative standards.

The water quality in the river Bandon is monitored by the EPA and Cork Co Co. The monitoring points in the vicinity of the wastewater treatment plant at Dunmanway are located 3km upstream of the outfall at Ardcahan Bridge and 2 km downstream at Ballabuidhe Bridge. The river Bandon in the vicinity of the outfall comprises a series of braided channels with densely wooded islands. This feature of the river continues for 2.5km from the Long Bridge to Ballabuidhe Bridge.

Results of biological monitoring in the Bandon River indicate that for much of its length water quality in the river is satisfactory. However the deterioration in water quality at site 0300 Br 3km SE of Dunmanway which was assigned a Q value of 3-4, may be due to the existing outflow from the wastewater treatment plant. Generally water quality has declined over the sampling period (1971-2003); however this is probably due to changes in farm practices and population changes. The sites of most relevance to the current proposal are those located upstream of the existing discharge (0200 Ardcahan Bridge) and downstream of the existing discharge (0300 Br 3km SE of Dunmanway). At the upstream site (0200) water quality has been consistently satisfactory since sampling commenced. At the downstream site water quality was satisfactory until 2000 when a Q value of 3-4 was assigned. This value which is indicative of water quality in transition was also assigned in 2003. Based on the available results it would appear that the existing discharge is having a negative impact on water quality. The overflow outfall from the Quarry Road Pumping Station discharges to the Dirty River. The two stations on the Dirty River are Station 050 at the bridge southwest of the Woodbrook Estate and Station 100 located at Quarry Bridge in Dunmanway. Overflows from the Quarry Road Pumping Station discharge to the Dirty between these two sites. A Q value of 4 was assigned to the upstream site (050) in 2000 whereas the downstream site (100) was assigned a Q value of 3-4.In 2003 the Q values for the two sites were reversed. However, based on these ratings and on flow and load survey

data collected in 2004, it would appear that the overflow is having a negative impact on water quality.

Provide a statement as to whether or not emissions of main polluting substances (as defined in the *Dangerous Substances Regulations S.I. No. 12 of 2001*) to water are likely to impair the environment.

The emissions from the wastewater treatment plant in Dunmanway in 2007 indicated that, for those substances which were monitored, none were likely to impair the environment. Chromium, copper, lead and nickel were not detected in final effluent samples in concentrations in excess of those listed in Table 2 of SI 12 of 2001. Zinc levels of 50 and 55µg/l were recorded in final effluent samples taken on the 9/8/2007 and 6/9/2007. The hardness of the effluent was not recorded but repeated samples of the receiving water in the river Bandon indicate that the hardness of the water is in the range 10 to 100mg/l $CaCO_3$. Zinc levels in the river Bandon have not been recorded in any sampling undertaken at any monitoring stations along the river by Cork Co Co. However it is considered unlikely that the emissions from the existing Dunmanway Wastewater Treatment Plant would be likely to impair the environment given the high level of dilution available in the river (95% flow of 520l/s versus existing discharge rates from the WWTP of 6.2l/s (DWF).

In circumstances where water abstraction points exist downstream of any discharge describe measures to be undertaken to ensure that discharges from the waste water works will not have a significant effect on faecal coliform, salmonella and protozoan pathogen numbers, e.g., Cryptosporidium and Giardia, in the receiving water environment.

Surface water abstractions along the river Bandon are recorded in the SWRBD Register of Protected Areas – SWRBD Drinking Water Abstractions (Surface) which is appended herewith. The nearest surface water abstraction for public water supply is located at Baxters Bridge near Bandon. Given the distance to this abstraction, (approximately 25km) it is not considered necessary to undertake any measures to ensure that discharges from the WWTP will not have a significant effect on faecal coliform, salmonella and protozoan pathogen numbers in the receiving environment.

Indicate whether or not emissions from the agglomeration or any plant, methods, processes, operating procedures or other factors which affect such emissions are likely to have a significant effect on Natural Heritage Areas or Special Areas of Conservation

The river Bandon between the Long Bridge and Ballabuidhe Bridges is designates as a Special Area of Conservation under the EC (Natural Habitats) Regulations, 1994 & 1997and the Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC). There are no Natural Heritage Areas or Special Protection Areas in the vicinity of the discharge location. The impact of discharges from the existing and proposed

wastewater treatment plants has been assessed in the sub threshold environmental assessment undertaken in conjunction with the Part 8 Planning process for the proposed wastewater treatment plant. The conclusions of this assessment were presented in the document entitled "Determination whether Dunmanway Sewerage Scheme would or would not be likely to have significant effects on the environment" (Cork Co Co August 2004) This document is included in this attachment. The assimilative capacity of the receiving waters (Bandon River) was examined from an ecological view point in the Dixon Brosnan report "Assessment of the ecological impacts of providing an upgraded Wastewater Treatment System at Dunmanway, Co. Cork". This report concluded that:

"Water quality in the Bandon River is generally satisfactory, however water quality deteriorates slightly downstream of the existing discharge point. It would appear therefore that the discharge is having a slight impact on water quality.

Notwithstanding the predicted increase in population over the next twenty years the improvement in treatment standards will result in significantly reduced discharge of nutrients to the Bandon River.

An examination of the existing discharge indicates that most of the effluent is being discharged into a side channel (Channel A). The distribution of silt, sewage fungus and algae indicates that water quality has seriously deteriorated in this side channel.

A survey determined that freshwater mussel is not present in channel A and given the levels of silt and algae the presence of other sensitive species such as brook lamprey and salmon is considered very likely. Given that freshwater mussel are present in other channels in this section of the Bandon River a discharge to channel A would create the least risk to this species.

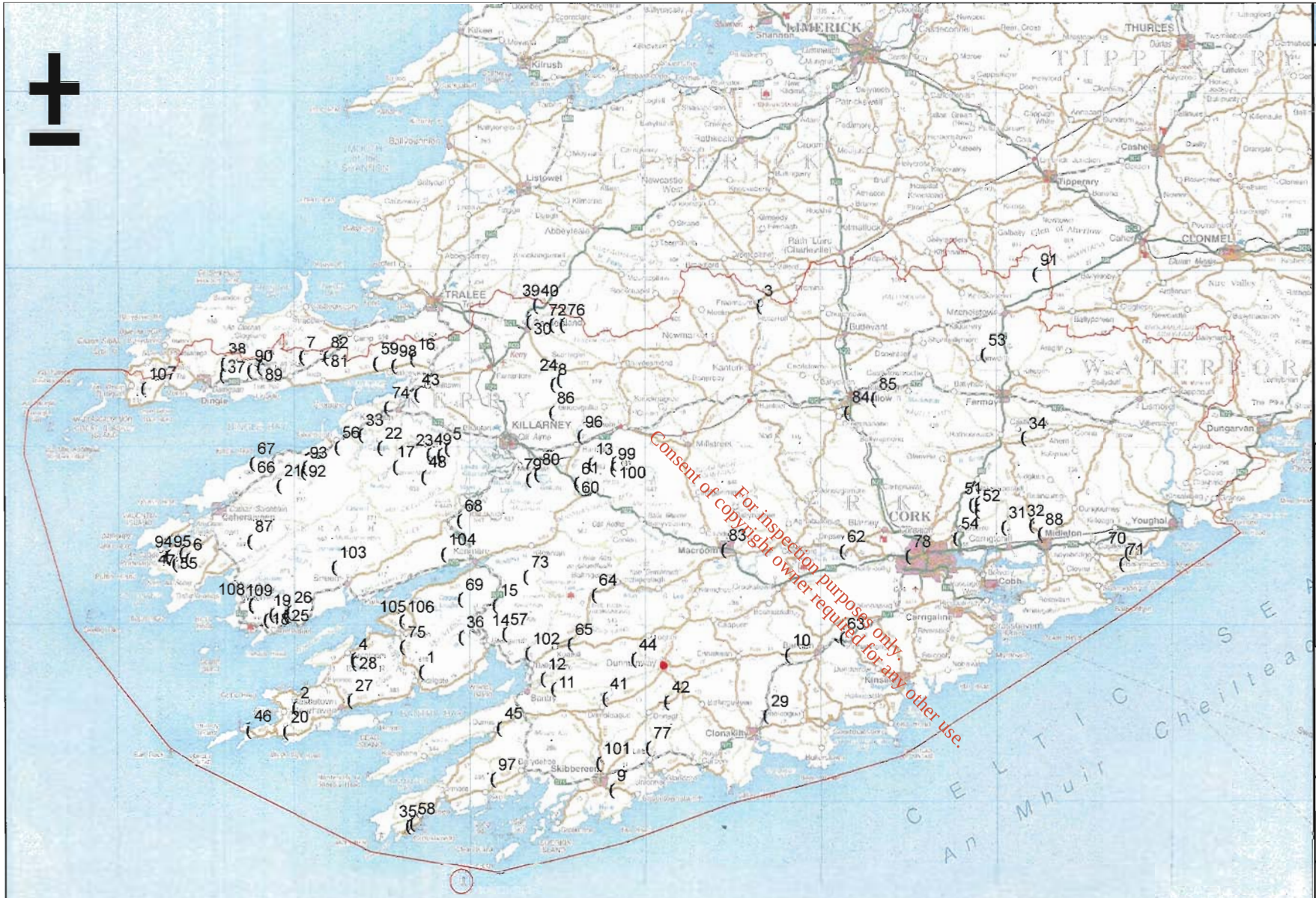
A survey of terrestrial habitats did not detect any rare species however the riparian habitats noted are part of a larger woodland habitat and disturbance should therefore be minimised."

Describe, where appropriate, measures for minimising pollution over long distances or in the territory of other states.

Not appropriate.

F.2 Tabular Data on Drinking Water Abstraction Point(s)

Catchment Area for water abstraction from Bandon River at Baxter's Bridge, Bandon



SWRBD Drinking Water Abstractions (Surface)

Legend

(Drinking Water Abstractions (Surface Waters)

SWRBD Boundary

south western River Basin District

SWRBD Office
Mott MacDonald Pettit
5 Eastgate Avenue
Little Island

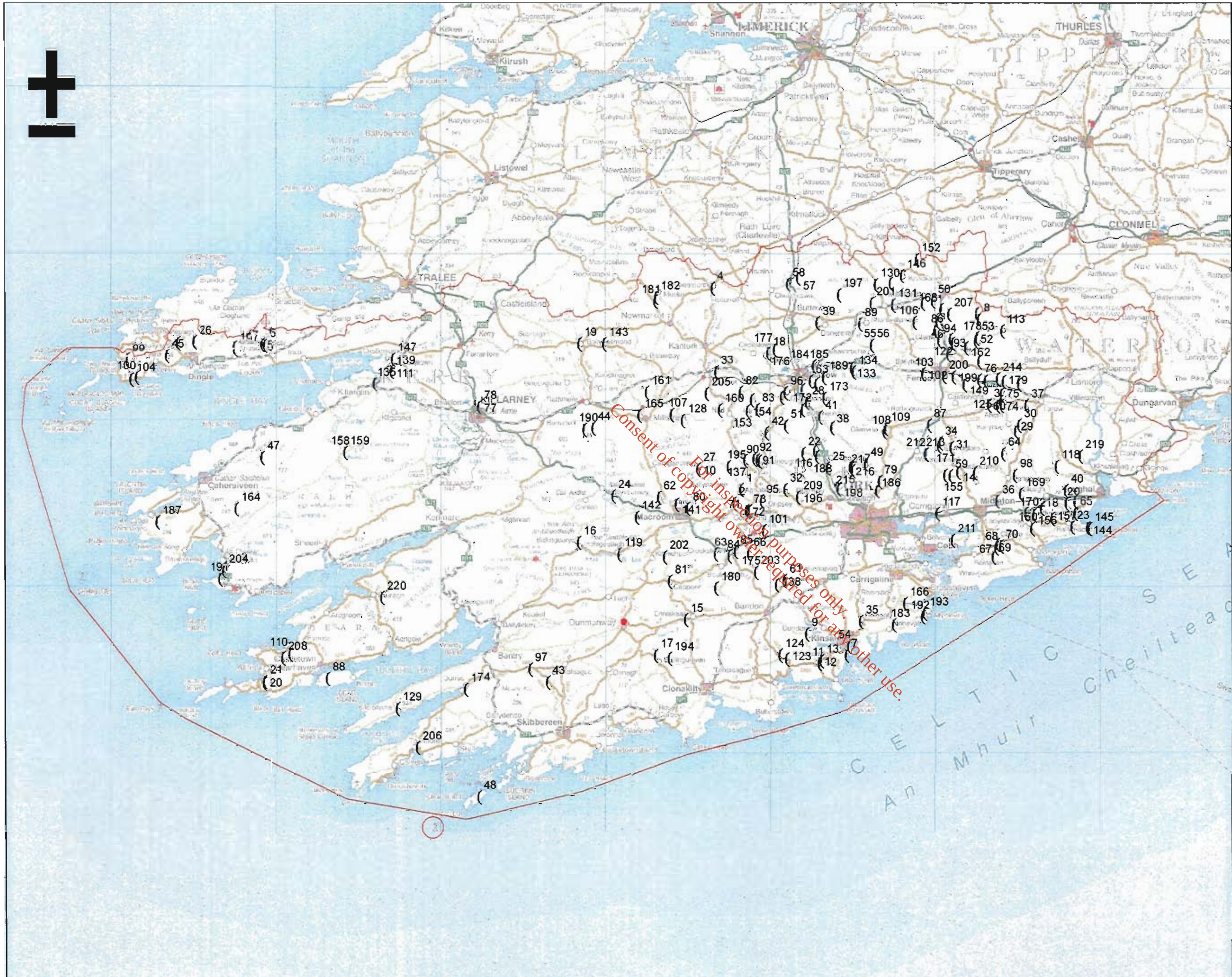
Project:
SWRBD Register of Protected Areas

Title: SWRBD Drinking Water Abstractions (Surface)

Issue Details

Drawn DT/JH	File Path Z/Initial Char/ Pro Habitats/Update
Scale: 1:1,000,000 @ A4	Map Name: Drnking Water (Surface)
Date. June 2007	Version: I

Notes
Ordnance Survey Ireland data, licensed for use by the SWRBD under the CCMA. Copyright Government of Ireland

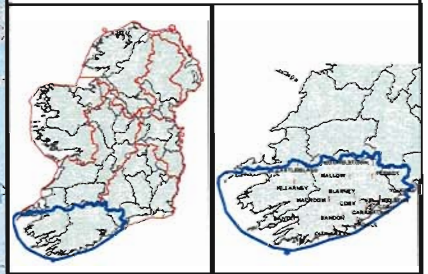


SWRBD Drinking Water Abstractions (Ground)

Legend

Drinking Water Abstractions (Ground)

SWRBD Boundary



south western river basin district

SWRBD Office
Mott MacDonald Pettit
5 Eastgate Avenue
Little Island

Project:
SWRBD Register of Protected Areas

Title: SWRBD Drinking Water Abstractions (Ground)

Issue Details

Drawn: DT/JH	File Path: Z/Initial Char/ Pro Habitats/Update
Scale 1 1,000,000 @ A4	Map Name: Dnnking Water (Ground)
Date: June 2007	Version I

Attachment G1 Programme of Improvements

A new wastewater treatment plant and 2 new pumping stations are proposed to be constructed in Dunmanway in conjunction with the West Cork Grouped Wastewater Treatment Plant DBO Contract which is due to go to tender in the near future. The following gives information on the improvements that these developments will bring.

Due to the increasing load on the existing plant and the need to provide a satisfactory effluent quality, it is proposed to upgrade and expand the existing wastewater treatment plant to cater for the future increased loads. This proposal is in accordance with the County Cork Development Plan 2003, with the Preliminary Report on Dunmanway Sewerage Scheme prepared by RPS MCOS for Cork Co. Co. Water Services in 2001 and the Preliminary Report Amendment Report prepared by T.J. O'Connor & Associates in October 2004. This plant will be designed to serve a population equivalent of 3,500 persons.

The existing treatment plant site will be expanded since it is of limited area. The site will be screened using suitable hedging, bushes and trees to reduce its visual intrusion. It is intended that there will be green space between the boundaries of the works and the nearest dwelling or business premises to act as a buffer zone.

The treated effluent will discharge to the Bandon River by gravity via a new outfall. It is also intended that the overflow from the proposed works will operate by gravity to the river. The existing pumping stations at the Quarry Road and at the Long Bridge will be replaced and upgraded with submersible pumping stations incorporating stormwater holding tanks as part of this DBO Contract. The stormwater holding tank at the Quarry Road PS will overflow to the Dirty River. The stormwater holding tank at the Long Bridge PS will overflow to the Bandon River. Rising mains will also be constructed from the two upgraded pumping stations to the wastewater treatment plant as part of this DBO Contract.

Effluent Quality Requirements

The effluent quality requirements are determined with respect to:

- The EC Urban Wastewater Directive, given effect in Irish Law by SI No 254, 2001;
- The Phosphorus Regulations SI No 155 of 1992.

The effluent requirements for the treated wastewater from the proposed wastewater treatment plant are presented in Table G1.1 below

Table G1.1 Effluent Requirements

Parameters	Concentration (mg/l)	Maximum Concentration (mg/l)	Minimum Percentage Reduction
BOD	*25mgO_2/l	50 mgO_2/l	90
Suspended Solids	*35mg/l	70mg//l	90
COD	*125mgO_2/l	250mgO_2/l	75
Phosphorus	*1.5mg/l		80

* Standard to be achieved in 95% of samples or more

The effluent quality requirements shall be deemed to have been satisfied if not more than 5% of samples tested during the Tests on Completion for the DBO Contract fail to conform to the effluent requirements set out in Table G1.1 above.

Future Situation

The existing load on the wastewater treatment plant in Dunmanway was assessed as equating to 2404pe in 2004. The proposed wastewater treatment plant will have a design capacity of 3500pe and as such will be able to cater for the future development demands of the agglomeration for a considerable number of years.

The final effluent will be discharged to the River Bandon within an SAC. The location of the outfall has been assessed in the context of the River Mussels which are present in the main channel of the river. Sludges arising at Dunmanway Wastewater Treatment Plant will be dewatered prior to storage and transportation off site for disposal in accordance with the Cork Co Co Sludge Management Strategy.

Phasing

Provision for the future expansion of the plant to cater for increased loads over the lifetime of the works is an important element of the project. A modular approach in the design of the plant to allow for the expansion of the works without disrupting ongoing treatment of wastewaters will therefore be required in the event of any future expansion. However there is no expansion of the plant proposed other than that which is envisaged in the West Cork Grouped WWTP DBO Contract scheme.

Table G1.2 Breakdown if Domestic/Non Domestic Loads

	Existing	Proposed
Domestic Load	2024pe	2950pe
Non Domestic Load	380pe	550pe
	2404pe	3500pe

The Contractor shall design, construct, operate and maintain two new wastewater pumping stations including stormwater storage facilities at the sites indicated on drawing 1339-3(DY)-P03/1233. It is proposed to replace the existing pumping stations at the sites near the Long Bridge and on the Quarry Road.

Wastewater Characteristics

The characteristics of the influent to the treatment works are presented in Table G1.3.

Table G1.3: Flows, Population and Load

Parameter	**Unit**	**Dunmanway**
Eq.pop. Total	PE	3,500
Hydraulic Loads		
DWF	m^3/d	864
Maximum Flow to Works	m^3/h	100
Flow Full Treatment	m^3/h	100
Raw sewage load		
COD	kg/d	570
BOD	kg/d	210
Nkj	kg/d	42
TP	kg/d	9.1
SS	kg/d	266

The degree of septicity of the wastewater arriving at each of the treatment works is not known, but the DBO Contractor must allow for the fact that sewage will have passed through intermediate pumping stations and rising mains. The design of the treatment works and the guarantees offered by the Contractor shall take account of this factor.

The flow to the plant passes through at least one intermediate pumping station. Stormwater storage will be incorporated in each of these locations. Consequently, the maximum flow to the treatment plant will be limited by the maximum pumping rate which shall be set at three time's dry weather flow (3dwf).

Pumping Stations

The Long Bridge pumping station shall be designed and constructed to transfer flows up to the design flow of 15 m^3/hr to the treatment works. The design flow from the Quarry Road Pumping Station shall be 85 m^3/hr. During stormwater flow conditions, when the total flow exceeds the design flow of the WWTP, the first flush shall be stored in the stormwater holding tanks at the Pumping Stations. In the event that the stormwater holding tanks are filled and the stormwater event continues, the stormwater tank shall be operated as a pre-clarification tank without sludge withdrawal. Overflows from the stormwater holding tank at the Long Bridge Pumping Station shall be discharged via a new outfall pipe to the River Bandon after screening (see drawing 1339-3(DY)-P03/123). The overflow from the Quarry Road Pumping Station shall be discharged to the Dirty River after screening. The pumping stations shall be equipped with facilities to allow the standby power generator at the WwTP, or alternatively provision to connect a mobile generator, to power the pumps in the event of a power failure. Should the option of a mobile generator be chosen the Contractor shall provide for the supply of such a generator, of adequate size and capacity, within the scope of his tender. The Contractor shall provide telemetry ducts from the WwTP to the pumping stations. The invert level of the Quarry Road Pumping Station sump shall be reduced to lessen the incidence of surcharging of the main sewer.

Design criteria

	Quarry Road PS	**Long Bridge PS**	
Inlet Sewer Diameter	600	375/300	mm
Inlet Sewer Minimum Invert level	55.00	54.90	mOD
Max. pump capacity	85	15	m^3/h
Min. overflow capacity	338	33	m^3/h

On termination of storm conditions, and reduction of the total inflow to the plant below the design capacity, the contents of the stormwater holding tanks (water and sludge) shall be pumped to the WWTP but the rate of stormwater return shall be:

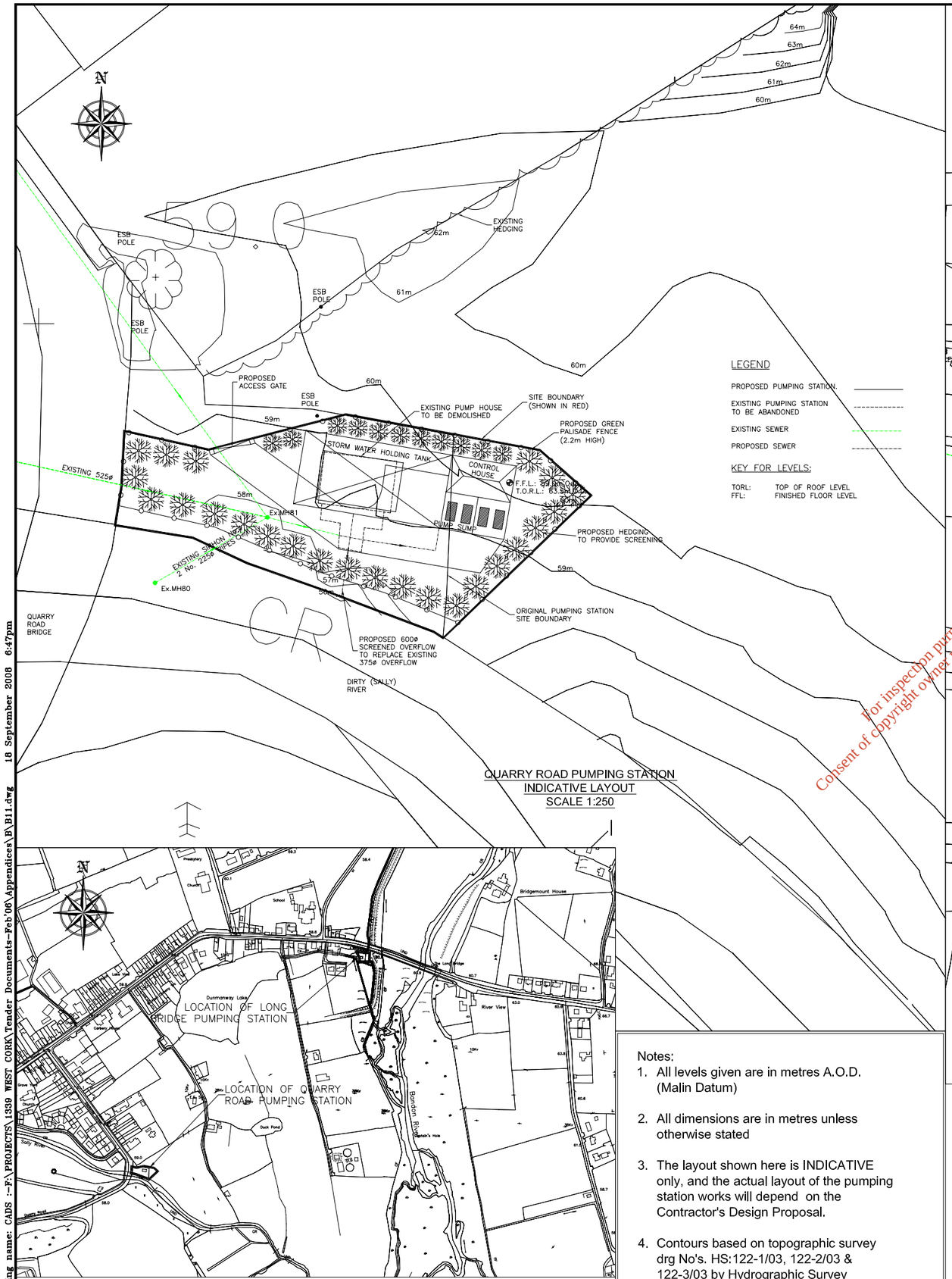
- not greater than 70% of DWF
- such that the total flow to the treatment works is not greater than the design capacity

The stormwater holding tanks shall be provided with an automatic proprietary storm tank cleaning system.

The design of the stormwater holding tanks shall be based on the storm flow below.

Design criteria

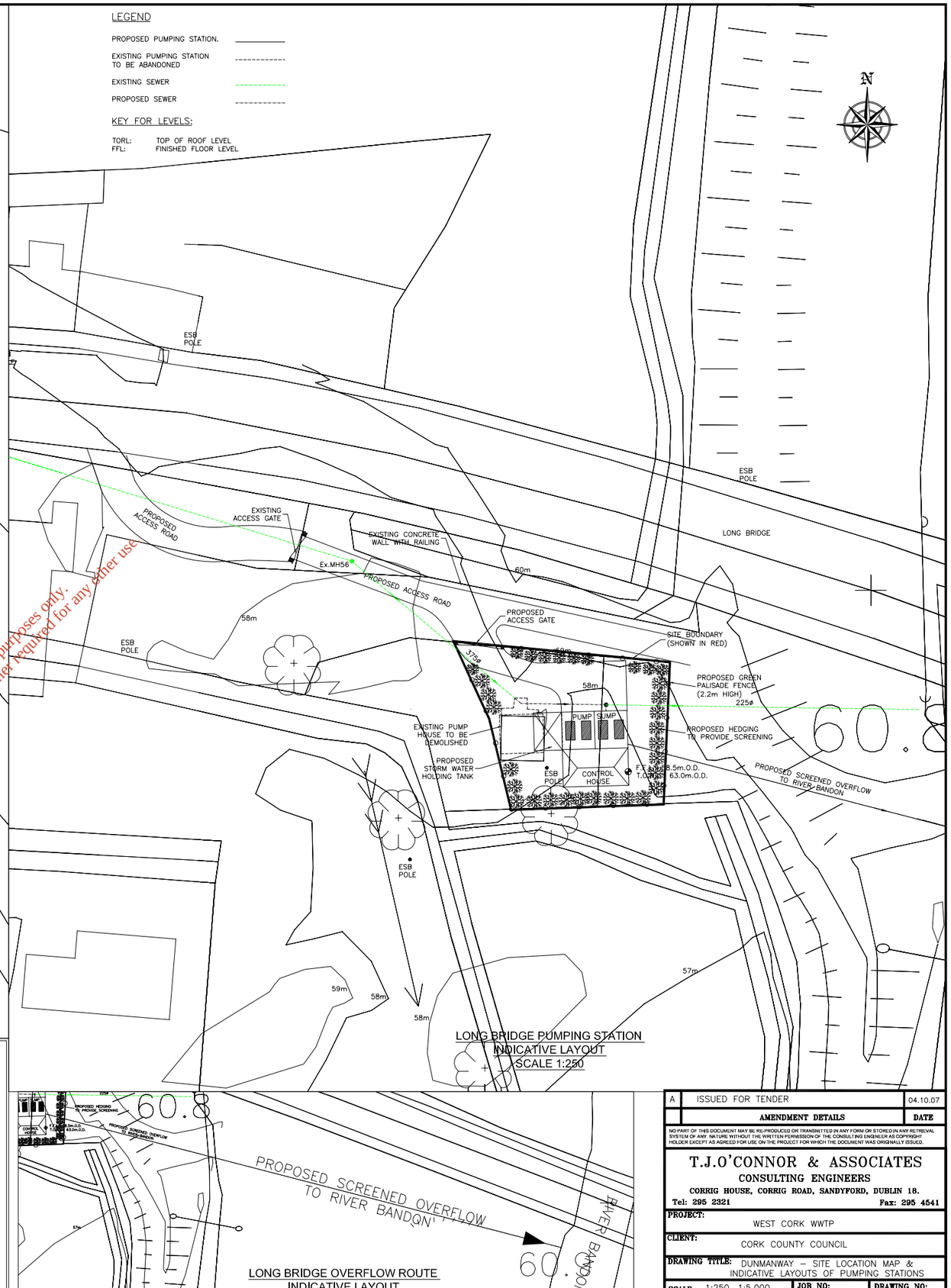
	Quarry Road PS	**Long Bridge PS**	
Max. storm flow to storage	258	15	m^3/h
Min. storage capacity at stormwater flow	2	2	hr
Min. volume stormwater holding tanks	515	30	m^3



QUARRY ROAD PUMPING STATION
INDICATIVE LAYOUT
SCALE 1:250

SITE LOCATION MAP
SCALE 1:5000

Notes:
1. All levels given are in metres A.O.D. (Malin Datum)
2. All dimensions are in metres unless otherwise stated
3. The layout shown here is INDICATIVE only, and the actual layout of the pumping station works will depend on the Contractor's Design Proposal.
4. Contours based on topographic survey drg No's. HS:122-1/03, 122-2/03 & 122-3/03 by Hydrographic Survey



LONG BRIDGE PUMPING STATION
INDICATIVE LAYOUT
SCALE 1:250

LONG BRIDGE OVERFLOW ROUTE
INDICATIVE LAYOUT
SCALE 1:500

A	ISSUED FOR TENDER	04.10.07
	AMENDMENT DETAILS	DATE

T.J.O'CONNOR & ASSOCIATES
CONSULTING ENGINEERS
CORRIG HOUSE, CORRIG ROAD, SANDYFORD, DUBLIN 18.
Tel: 295 2321 Fax: 295 4541

PROJECT: WEST CORK WWTP
CLIENT: CORK COUNTY COUNCIL
DRAWING TITLE: DUNMANWAY – SITE LOCATION MAP & INDICATIVE LAYOUTS OF PUMPING STATIONS
SCALE: 1:250, 1:5,000
JOB NO: 1339
DRAWING NO: A 2(DY)P03/123
DATE: JAN'04
DRAWN BY: F.T.

Attachment G2 Compliance with Water Quality Standards for Phosphorus Regulations (S.I. No. 258 of 1998).

These regulations provide for specified improvements in water quality conditions in rivers and lakes based on phosphorus concentrations or related water quality classifications.

The discharge from Dunmanway WWTP is to the river Bandon and as such is within the scope of these Regulations.

The results of the latest EPA assessment of the River Bandon are included in Attachment E. This assessment indicates a Q rating of 4, at the nearest monitoring station (0150) upstream of the treatment works and a corresponding Q rating of 3-4 at station (0300), just downstream of the works.

The existing treatment works is contributing to the deterioration in water quality in the river Bandon. In order to comply with the Phosphorus Regulations, as stated, the upgraded treatment plant discharge should be such as to ensure a minimum Q rating of 4, in the river downstream of the outfall. The corresponding level of molybdate reactive phosphate (MRP, which can be compared to ortho-phosphate) is 0.03 mg P/l. The current ortho-phosphate levels in the river are 0.01 mg P/l upstream of the outfall location. The maximum contribution by the effluent discharge is hence 0.02 mg P/l. With a $Q_{95\%}$ flow of the river of 1,872 m^3/h (= 0.52 m^3/s) and an average effluent flow from the WWTP of 33 m^3/h, the maximum concentration of ortho-phosphate in the effluent can be calculated at 1.13 mg/l. Therefore a final effluent standard of 1.5 mg/l. is required for the proposed 3,500pe WWTP at Dunmanway.

Attachment G3 Impact Mitigation

The programme of improvements will commence once the DBO Contract for the West Cork Grouped Wastewater Treatment Plant Scheme is awarded. Tender documents have been approved by the DoEHLG and a shortlist of tenderers has been prepared following a pre-qualification process. Approval to proceed to issue tender documents is anticipated in the near future with a contractor likely to be appointed with the next year. The works proposed will be completed within 18months of the appointment of a contractor.

In addition a sub-threshold environmental impact assessment was undertaken in conjunction with the Part 8 planning process and the determination in respect of this is included in Attachment G3.

Attachment G4 Storm Water Overflow

It is proposed that the combined storm overflows at the Brewery and Dirty Rivers will be eliminated once the pumping station at the Quarry Road has been upgraded.

The stormwater overflow at Dunmanway will be investigated and addressed in conjunction with the Dunmanway Sewerage Scheme Collection System Scheme, which is included in the DoEHLG's Water Services Investment Programme.

Comhairle Chontae Chorcai

CORK COUNTY COUNCIL (WESTERN DIVISION)

(Projects Section)

Dunmanway Sewerage Scheme

Determination whether Dunmanway Sewerage Scheme would or would not be likely to have significant effects on the environment

August 2004

Prepared By: Niall O'Mahony, Senior Engineer.

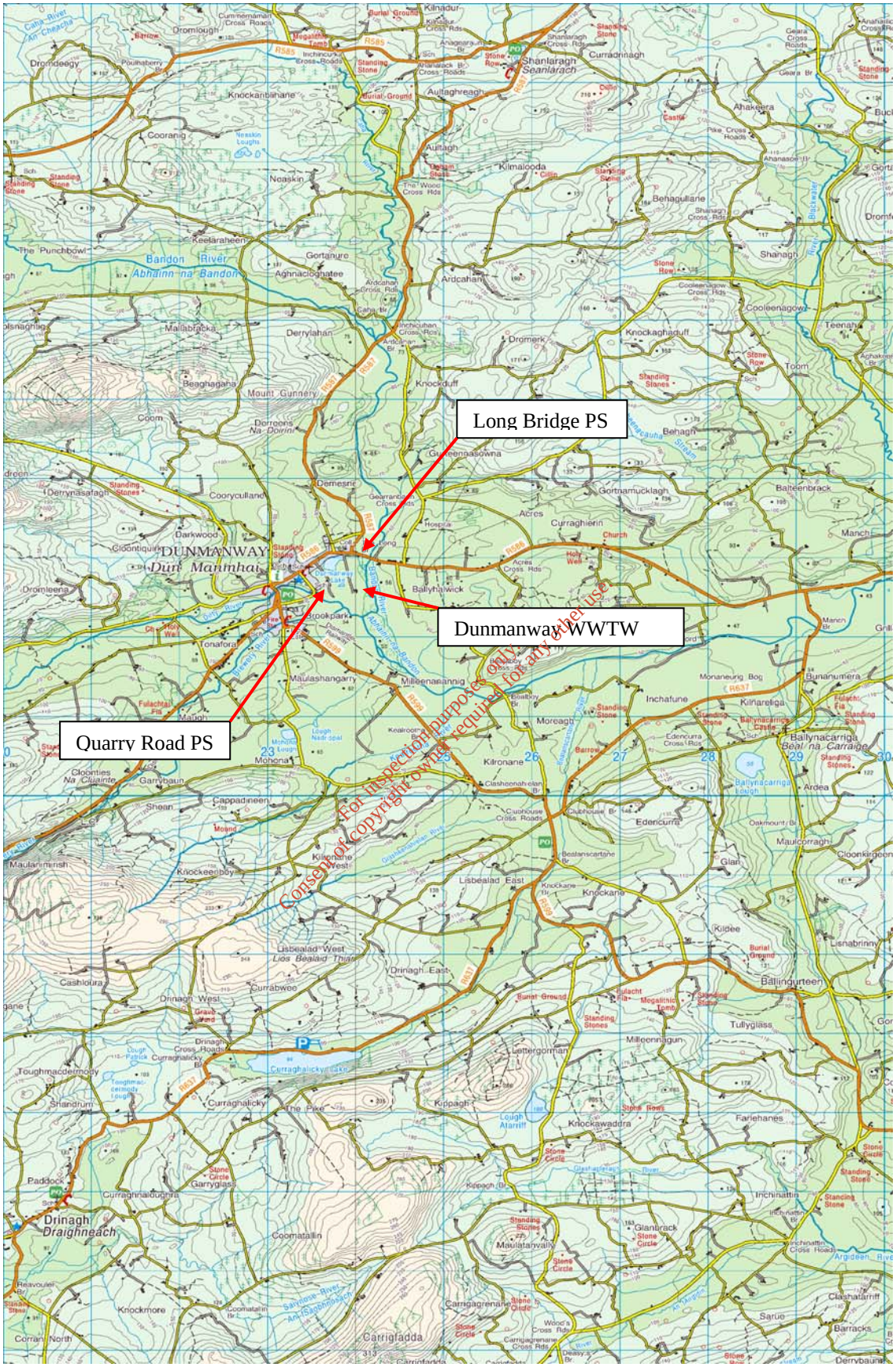


Figure 1 : Location Map.

Determination whether Dunmanway Sewerage Scheme would or would not be likely to have significant effects on the environment

Dunmanway Wastewater Treatment Plant

Description of the works

The existing collection system, including pumping stations at the Quarry Road and at Long Bridge, collects wastewater from Dunmanway and its environs. The pumping stations pump the collected wastewater to the treatment plant. An Imhoff tank provides primary treatment for the sewage followed by secondary treatment in two percolating filters.. The treated effluent discharges via a 225 mm outfall to the Bandon River. Excess flows are overflowed at the pumping stations to the adjacent rivers.

Due to the increasing load on the existing plant and the need to provide a satisfactory effluent quality, it is proposed to upgrade and expand the existing wastewater treatment plant to cater for the future increased loads. This proposal is in accordance with the County Cork Development Plan 2003 and with the Preliminary Report on the Dunmanway Sewerage Scheme prepared by M.C. O'Sullivan's in July 2001 and subsequent amendments to this report by T.J. O'Connor & Associates in 2004. This plant will be designed to serve a population equivalent of 3,500 persons. This will cater for population growth and development demand for the next twenty years. It is proposed to expand the existing treatment plant site since it is of limited area. The wastewater treatment plant will be screened to reduce its visual intrusion. It is intended that there will be green space between the boundaries of the works and the nearest dwellings or business premises in accordance with County Development Plan guidelines.

The Department of the Environment, Heritage and Local Government has directed that the wastewater treatment works be procured through a Design, Build and Operate form of contract in conjunction with a number of other schemes in West Cork. The scope of works for the scheme will include the construction of new pumping stations and stormwater holding tanks at Quarry Road and Long Bridge and replacement of the rising mains from these pumping stations to the wastewater treatment plant.. An **indicative** layout of the works is included in Dwg. No. 1339-3(DY)-P01 and sections through the proposed WWTP Site are shown on Dwg. No. 1339-3(DY)-. P02. Indicative layouts of the two pumping stations are shown on Dwg. No. 1339-3(DY)-. P03. The final layout of each of the sites will be governed by the contractor's proposals for the project.

It is proposed to discharge the treated effluent to the Bandon River by gravity via a new outfall situated approx 10m downstream of the existing outfall.

The new wastewater treatment plant will consist of preliminary and secondary treatment and nutrient removal or their equivalent, to achieve a final effluent of 25

mg/l BOD; 35 mg/l SS; 125 mg/l COD; 1.5 mg/l TP. Mitigation measures will be installed to maintain noise and odour emissions within recognised and acceptable limits at the site boundary. Standby power generation will be available on site in case of power failure. Thickened sludges will be transported by tanker or skip off site for further treatment or disposal in accordance with the County Sludge Management Plan. Screenings arising from the preliminary treatment stage will be disposed of to the Cork Co. Co. Landfill site.

The control house and any other building which may be located at the treatment works site will be constructed in blockwork with render finish, incorporating masonry panels using locally quarried stone, and slated pitched roofs. The appearance of the buildings will reflect the local traditional building styles. The paved areas will consist of concrete pavement and macadam. A 2.2 m high palisade fence will enclose the treatment works with stockproof fencing providing protection to the screen planting which will be provided to the external boundaries. The access road to the treatment works will be surfaced in macadam.

The layout for the wastewater treatment works shown on Dwg. No.1339-3(DY)-P01 is indicative of the layout type which will be proposed by the successful tenderer for the construction of the works. The Design Build Operate form of Contract provides for the Contractor to prepare the detailed design of the Works in order to achieve savings in construction costs and in order to obtain the most technologically advanced treatment processes. The final design and layout proposed by the successful tenderer may not resemble the indicative layout in every detail. However, the tenderers for the scheme will be obliged to ensure that the visual and other impacts of the final scheme layout and processes will not be any greater than those of the plant layout shown in the drawings.

The existing treatment works is served with a connection from the Dunmanway water supply scheme. This connection may have to be upgrade d to meet the requirements of the upgraded treatment facilities. Additional power supply, if required, will be brought to the site from the nearest available location in accordance with the requirements of the Electricity Supply Board.

Long Bridge Pumping Station, Dunmanway

Description of the works

It is proposed to replace the Long Bridge pumping station which is located to the west of the River Bandon south of the Long Bridge in Dunmanway. The new pumping station will have stormwater storage facilities to limit the likelihood of overflow of untreated effluent to the river. The pump control and metering equipment panels will be housed in a control house situated on top of the valve chamber of the pumping station. Mitigation measures will be taken to maintain noise and odour emissions within recognised and acceptable limits at the site boundaries. This pumping station will transfer the wastewater from the Dunmaway Sewerage Scheme collection system to the upgraded wastewater treatment plant situated 450m south of the Long Bridge.

The Department of the Environment, Heritage and Local Government has directed that the pumping station be procured through a Design, Build and Operate form of contract in conjunction with a number of other schemes in West Cork. The scope of works for the scheme will include the upgrading and expansion of the existing wastewater treatment works and construction of new pumping station at the Quarry Road and Long Bridge. An **indicative** layout of the pumping station is included in Dwg. No. 1339-3(DY)-P03. The final layout of the site will be governed by the contractor's proposals for the site.

The control house will be constructed in blockwork with render finish, incorporating masonry panels using locally quarried stone, and a slated pitched roof. The appearance of the buildings will reflect the local traditional building styles. The paved areas will consist of concrete pavement and macadam. A 2.2 m high palisade fence will enclose the pumping station site with stockproof fencing providing protection to the screen planting which will be provided to the external boundaries. The access road to the pumping station will be surfaced in macadam.

The layout for the pumping station shown on Dwg. No.1339-3(DY)-P03 is indicative of the layout type which will be proposed by the successful tenderer for the construction of the works. The Design Build Operate form of Contract provides for the Contractor to prepare the detailed design of the Works in order to achieve savings in construction costs and in order to obtain the most technologically advanced treatment processes. The final design and layout proposed by the successful tenderer may not resemble the indicative layout in every detail. However, the tenderers for the scheme will be obliged to ensure that the visual and other impacts of the final scheme layout and processes will not be any greater than those of the plant layout shown in the drawings.

The existing pumping station is served with a connection from the Dunmaway water supply scheme. This connection may have to be upgraded to meet the requirements of the upgraded pumping facilities. Additional power supply, if required, will be

brought to the site from the nearest available location in accordance with the requirements of the Electricity Supply Board.

Quarry Road pumping station, Dunmanway

Description of the works

It is proposed to replace the Quarry Road pumping station which is located on the north bank of the Dirty (Sally) River east of the Quarry Road Bridge in Dunmanway. The new pumping station will have stormwater storage facilities to limit the likelihood of overflow of untreated effluent to the river. The pump control and metering equipment panels will be housed in a control house situated on top of the valve chamber of the pumping station. Mitigation measures will be taken to maintain noise and odour emissions within recognised and acceptable limits at the site boundaries. This pumping station will transfer the wastewater from the Dunmaway Sewerage Scheme collection system to the upgraded wastewater treatment plant situated 450m south of the Long Bridge.

The Department of the Environment, Heritage and Local Government has directed that the pumping station be procured through a Design, Build and Operate form of contract in conjunction with a number of other schemes in West Cork. The scope of works for the scheme will include the upgrading and expansion of the existing wastewater treatment works and construction of new pumping station at the Long Bridge and Quarry Road. An **indicative** layout of the pumping station is included in Dwg. No. 1339-3(DY)-P03. The final layout of the site will be governed by the contractor's proposals for the site.

The control house will be constructed in blockwork with render finish, incorporating masonry panels using locally quarried stone, and a slated pitched roof. The appearance of the buildings will reflect the local traditional building styles. The paved areas will consist of concrete pavement and macadam. A 2.2 m high palisade fence will enclose the pumping station site with stockproof fencing providing protection to the screen planting which will be provided to the external boundaries. The access road to the pumping station will be surfaced in macadam.

The layout for the pumping station shown on Dwg. No.1339-3(DY)-P03 is indicative of the layout type which will be proposed by the successful tenderer for the construction of the works. The Design Build Operate form of Contract provides for the Contractor to prepare the detailed design of the Works in order to achieve savings in construction costs and in order to obtain the most technologically advanced treatment processes. The final design and layout proposed by the successful tenderer may not resemble the indicative layout in every detail. However, the tenderers for the scheme will be obliged to ensure that the visual and other impacts of the final scheme layout and processes will not be any greater than those of the plant layout shown in the drawings.

The existing pumping station is served with a connection from the Dunmaway water supply scheme. This connection may have to be upgraded to meet the requirements

of the upgraded pumping facilities. Additional power supply, if required, will be brought to the site from the nearest available location in accordance with the requirements of the Electricity Supply Board.

DETERMINATION

Schedule 7 attached to article 120 of the Planning & Development Regulations 2001 states that the Council should have regard to the following criteria:

1. **Characteristics of Dunmanway Sewerage Scheme** and in particular to:

   - **Size of the proposed scheme** – the scheme and hence the pumping stations, pipelines and Wastewater Treatment Plant (WWTP) is designed to cater for sewage and combined stormwater from the built up area of Dunmanway. Much of the sewer network, constructed in the early 1960's, is over 40 years old and so sections will require rehabilitation along with the construction of new foul, storm, combined sewers, and rising mains. The site for the WWTP is 1.812 acres. The ultimate population equivalent is 3,500, which is consistent with other agglomerations of this size and development. The P.E. is substantially below the threshold of 10,000 P.E. outlined in Part 2 (11) of Schedule 5 of the Planning & Development Regulations 2001 & Article 2, point (6), of Directive 91/271/EEC not included in Part 1 of this schedule.

   - **The cumulation with other proposed development** – the scheme is designed to cater for the sewage needs of the majority of the immediate area. The nearest other sewerage schemes or sources of discharge of effluent to the Bandon River are Ballineen WWTP (secondary treatment), 11 km to the East, and Carbery Milk Products WWTP (Secondary treatment), also 11km to the East. There is no evidence of any present or future cumulative problems arising from these schemes. The proposed works will cater for sewage flows from all development within the catchment area of the Dunmanway Sewerage Scheme.

   - **The use of natural resources** – the WwTP will be powered by mains electricity and the water supply will be from the existing public water supply. The demands for both electricity and public water supplies will not be significant in the context of the available supplies. The assimilative capacity of the Bandon River will be used to dilute and disperse the final effluent, see below for further details.

   - **The production of waste** – treated effluent from the WWTP will discharge to the Bandon River. Storm overflows from the stormwater holding tank at the Long Bridge pumping station will

occasionally discharge 6mm screened sewage to the Bandon River, also storm overflows from the stormwater holding tank at the Quarry Road pumping station will occasionally discharge 6mm screened sewage to the Dirty River (this is dealt with in more detail below). The only other waste products produced are screenings from the pumping stations and WWTP inlet works, and sewage sludge. The screenings will be bagged and collected for transportation to the nearest licenced landfill site. The ultimate predicted volume of sludge is 57 tonnes dry solids per annum and this will be transported off site for treatment according to the Sludge Management Plan for County Cork.

- **Pollution & nuisance** - the existing combined sewerage network has one main outfall at the existing WWTP and a number of emergency/combined stormwater outfalls, the outfall at the WWTP is discharging secondary treated sewage to the Bandon River, the other emergency/combined stormwater outfalls discharge dilute raw sewage to both the Bandon and Dirty Rivers during power outages and storm events. The proposed upgraded WWTP will provide secondary treatment to all sewage collected throughout the sewerage network. Stormwater holding tanks will be provided at the pumping station sites to minimise the frequency of sewage overflows to the Bandon and Dirty Rivers.
  Recent (May 2004) BOD/SS/COD analysis on the treated effluent discharge from the WWTP gave results of 53.5 mg/l BOD (average), 177 mg/l SS, and 217 mg/l COD (average). These figures are in excess of the limits stated in Urban Wastewater Treatment Regulations, 2001. They also breach the Royal Commission Standards under which the WWTP was originally designed. This has lead to some pollution of both rivers. The existing P.E. being treated at the WWTP is estimated to be 2,370. This figure is based on flow & load surveys undertaken in Nov/Dec 2003. The ultimate design P.E. (20 year) for the proposed upgraded WWTP is 3500. This is an increase of 48%.

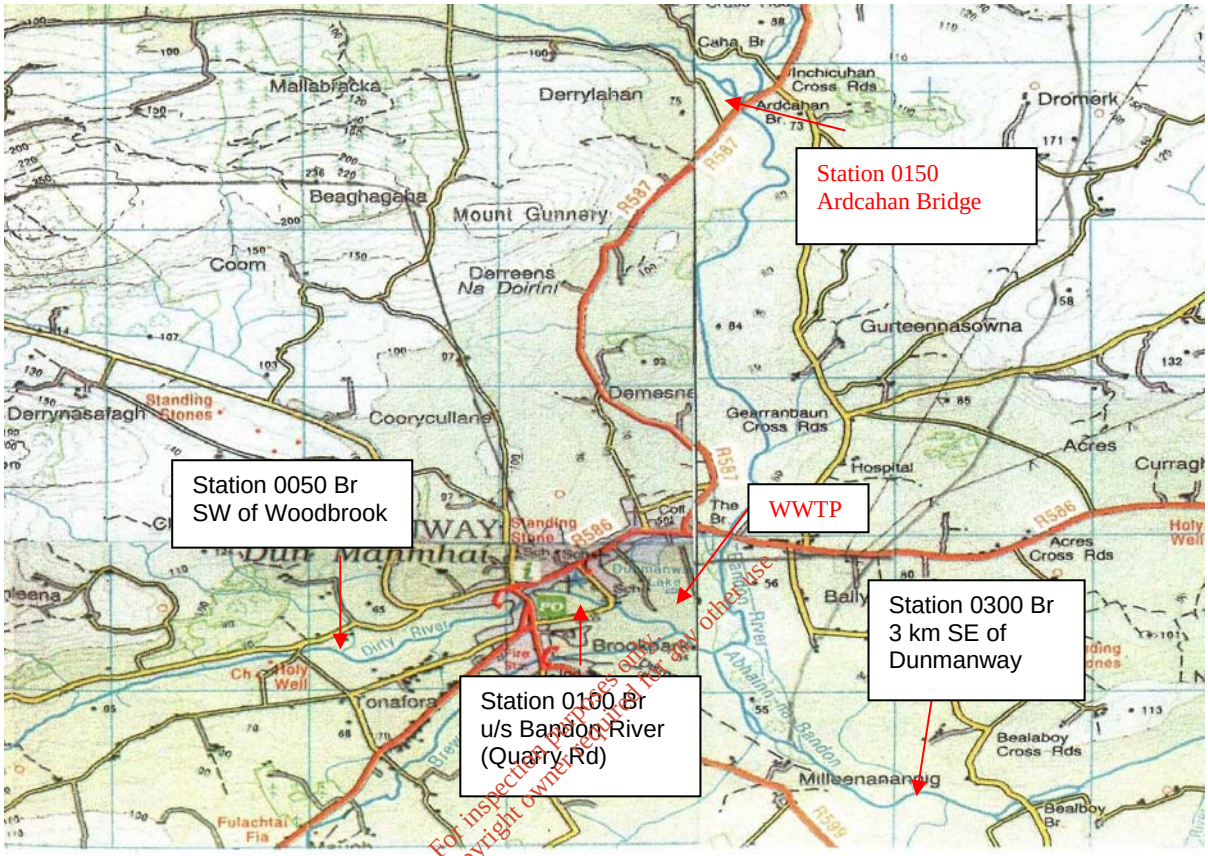
	Existing WWTP	**Upgraded WWTP**	**% Reduction in total discharge**
	P.E. 2370 180 l/h/d BOD 53.5mg/l (average) SS 177 mg/l	P.E. 3500 180 l/h/d BOD 25mg/l (average) SS 35 mg/l	
BOD kg/day	22.82	15.75	31.0
SS kg/day	75.51	22.05	70.80

Table 1. Comparison of treatment efficiencies for SS and BOD

Results of biological monitoring in the Bandon River indicate that for much of its length water quality in the river is satisfactory. However the deterioration in water quality at site 0300 Br 3km SE of Dunmanway which was assigned a Q value of 3-4, may be due to the existing outflow from the wastewater treatment plant. Generally water quality has declined over the sampling period (1971-2003); however this is probably due to changes in farm practices and population changes. The sites of most relevance to the current proposal are those located upstream of the existing discharge (0200 Ardcahan Bridge) and downstream of the existing discharge (0300 Br 3km SE of Dunmanway). At the upstream site (0200) water quality has been consistently satisfactory since sampling commenced. At the downstream site water quality was satisfactory until 2000 when a Q value of 3-4 was assigned. This value which is indicative of water quality in transition was also assigned in 2003. Based on the available results it would appear that the existing discharge is having a negative impact on water quality. The overflow outfall from the Quarry Road Pumping Station discharges to the Dirty River. The two stations on the Dirty River are Station 050 at the bridge southwest of the Woodbrook Estate and Station 100 located at Quarry Bridge in Dunmanway. Overflows from the Quarry Road Pumping Station discharge to the Dirty between these two sites. A Q value of 4 was assigned to the upstream site (050) in 2000 whereas the downstream site (100) was assigned a Q value of 3-4. Based on these ratings it would appear that the overflow is having a negative impact on water quality. However other influences associated with Dunmanway Town i.e. road run-off, small direct discharges etc. may also be impacting on water quality.

The new WWTP and Pumping Stations will comply with the Urban Wastewater Treatment Regulations, 2001 and will consist of preliminary treatment, secondary treatment, and nutrient removal or their equivalent, to achieve a final effluent of 25 mg/l BOD; 35 mg/l SS; 125 mg/l COD; 1.5 mg/l TP.
Mitigation measures will be installed at the WWTP and pumping stations so that odour concentrations should not exceed 2 o.u./m^3 at the site boundary at a 98 percentile probability of occurrence or it should not exceed this limit for more than 2 % of the year whichever is the lesser and odour concentration should not exceed 5 o.u./m^3 at the site boundary at a 99 percentile probability of occurrence or that it should not exceed this level for more than 1 % of the year, whichever is the lesser. The WWTW and PS's shall be designed to ensure that the maximum noise level of 45 dB(A) as the maximum allowable 15 minute Leq at the site boundary due to operations within the site during daytime (8 am to 8 pm) and 40 dB(A), 15 minute Leq at night (8 pm to 8 am) and at weekends, when all equipment installed is being operated, is complied with and there shall be no discrete tones or impulses. In addition, the noise level at a distance of 1 m of each sound producing mechanical item of

equipment shall not exceed 85 dB(A) except in the case of internal combustion engines in which case the noise level of 85 dB(A) shall apply to a distance of 1 m from the building in which they are housed.



The Pumping Stations will have dual pumping, emergency storage facilities and screened emergency overflow pipe to cater for power failure or extreme storm events. The provision of the new WWTP, pumping stations and sewers and the rehabilitation of the existing collection system will have a positive effect on both the Bandon & Dirty Rivers.

- **The risk of accidents,** having regard to substances or technologies used – any chemicals used will be stored in bunded areas. The site will be fenced all around by 2.2m high security fencing. Access to the site will be via a 2.2m high access gate that will be normally locked. The work practices will comply with the Safety, Health & Welfare at work (Construction) Regulations 1995 (S.I. No. 138 of 1995).

2. **Location of Dunmanway Sewerage Scheme** and in particular the environmental sensitivity of geographical areas likely to be affected by the proposed Sewerage Scheme, having regard in particular to:

- **The existing land use** – The existing WWTP is located on the flood plain 450m South of the Long Bridge. The surrounding land use here is agricultural. This area has not been given any specific zoning in the 2003 Cork County Development Plan. The upgraded WWTP is to be constructed around the existing WWTP, thus any change to the existing land use characteristics should be minimal. The site boundary of the upgraded WWTP will be 165 m from the nearest dwelling house.
  The new pumping station at the Long Bridge is on the dry side of the flood embankment. This area has not been given any specific zoning in the 2003 Cork County Development Plan. The new pumping station is to be constructed adjacent to the existing pumping station, thus any change to the existing land use characteristics should be minimal. The surrounding land use here is a mix of agricultural, commercial, and residential.
  The new pumping station at the Quarry Road is to be constructed adjacent to the existing pumping station, thus any change to the existing land use characteristics should be minimal. This area has been zoned for residential development in the 2003 Cork County Development Plan. The surrounding land use here is a mix of agricultural, municipal, and residential.

- **The relative abundance, quality and regenerative capacity of natural resources in the area** – the trees and shrubs within the existing WWTP and pumping stations and on the existing boundaries will be preserved as much as possible. New planting will also be provided to screen the treatment units. The assimilative capacity of the receiving waters (Bandon River) was examined in the " Assessment of the ecological impacts of providing an upgraded Wastewater Treatment System at Dunmanway, Co. Cork". The Following extract should be noted :
  "Based on the structure of the watercourse, the pattern of silt deposition and the distribution of invertebrates and macrophytes/algae it was determined that the discharge is already affecting channel A which obviously provides much lower dilution than the main channel. No impact was noted in the main channel. It is noted that although water quality in this smaller channel has obviously deteriorated this has helped to maintain suitable conditions for freshwater mussels elsewhere in the river. In particular this channel gives additional protection in the event of a catastrophic event such as complete failure of the treatment plant. Given the vulnerability and comparative rarity of freshwater mussel their protection is considered to be the highest priority. In these circumstances the negative effects on channel A are considered

less important than the potential impacts on mussel habitat in the main channel.

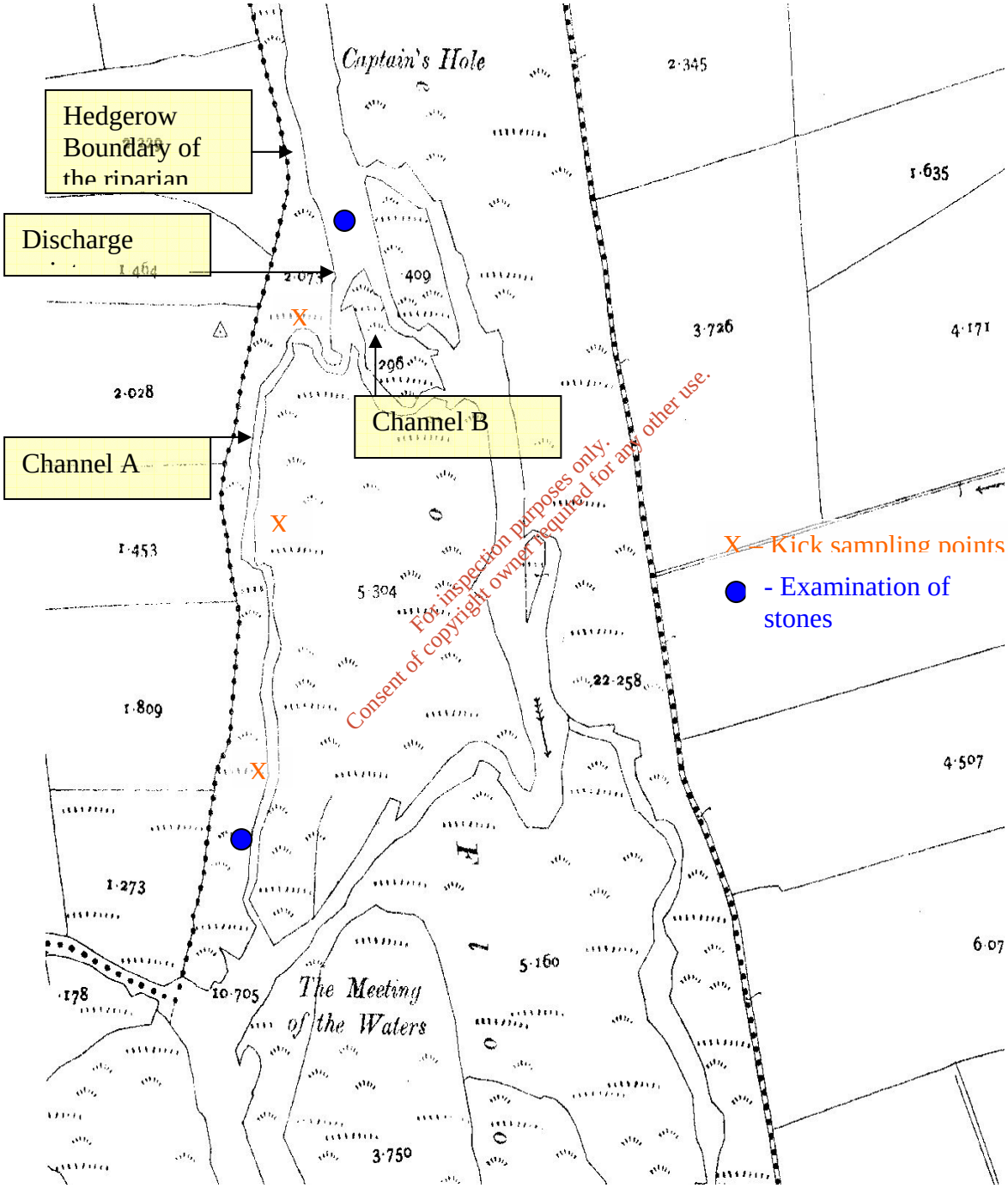
An examination of channel A indicates that high levels of silt have been deposited within this channel and thus was prevented from reaching the main channel where conditions are more suitable for mussels. Given the length of the channel (310m) and low velocity flows during dry periods it is estimated that only a small proportion of the suspended solids derived from the treatment plant may actually reach the main channel under these conditions. It is difficult to estimate how much of this deposited silt is remobilised during spate events. This is because of the braided and complex channel which makes it difficult to predict how much water will move down channel A in high flow conditions. A basic visual estimate of flows and depths at low water conditions suggests that approximately 10% of the total flow in the Bandon River moves through Channel A. However it is noted that if some of this silt is remobilised during spate events there will be a high level of dilution available which will minimise any impact.

It is noted that the reduction in nutrients reaching channel A will help to improve water quality and the diversity of macroinvertebrates may improve although heavy shading will naturally limit macrophyte development. However, even if all discharges into this channel were stopped it is uncertain that this channel would support significant mussel populations. In the short term the high levels of silt will preclude colonisation by this species and given the depth of this silt in some areas and the relatively low flows it is considered unlikely that this silt will clear within a short time frame.

In circumstances where a new pipe is required it would be preferable to move the discharge point downstream so that it discharges completely into channel A. The terrestrial and riparian habitats to be affected would not be significantly different to those existing at the discharge point and the exact route could be designed to avoid the more locally important habitats such as individual or groups of trees. Channel A flows in a south-westerly direction and by choosing a suitable location the distance from the external hedgerow to the channel can be minimised.

However the development of a new pipeline could lead to the deposition of high levels of silt and other substances if strict mitigation measures are not put in place".

Map showing structure of the channel at the discharge point



- **The absorption capacity of the natural environment**, paying particular attention to the following areas –
  (a) Wetlands – Although the areas to the East of the WWTP and the Long Bridge pumping station area in a flood plain, no significant wetland areas occur.
  (b) Coastal zones – Dunmanway is an inland town and is not significantly close to any coastal zone. The nearest coastline is some 18km away.
  (c) Mountain & forest areas – Geographically Dunmanway is situated in a basin and thus no mountain areas will be affected by this development.
  The discharge from the WWTP is to a cSAC (site code : 002171) and a pNHA (site code : 0101). This site contains a small though very important example of Alluvial Forest. Alluvial Forests are listed on annex 1 of the E.U. Habitats Directive. It is very unlikely that the treated effluent discharge will have any significant effects on the alluvial forests. However, there may be some disturbance to the riverbank and flood plain during construction of the outfall pipe. Every effort will be made to minimise disturbance.
  (d) Nature reserves & parks – No nature parks or reserves will be affected by Dunmanway sewerage scheme.
  (e) Areas classified or protected under legislation, including special protection areas designated pursuant to Directives 79/409/EEC and 92/43/EEC – The Bandon River into which the treatment plant will discharge is a pNHA (site code 0101) and a cSAC (site code 002171). The treatment works site boundary is to extend into the cSAC by approx 20m. As detailed in the site synopsis (attached to this report) two habitats listed in Annex 1 of the EU Habitats Directive, i.e. Alluvial Forests and Floating River Vegetation. Four Annex 2 species are also found in this cSAC - Otter, Salmon, Brook Lamprey, and Freshwater Pearl Mussel.
  The "Assessment of the ecological impacts of providing an upgraded wastewater treatment system at Dunmanway, Co. Cork" was completed by Dixon.Brosnan Environmental Consultants. This assessment considered the existing and proposed treatment arrangements, the conservation site designation, the topography, aquatic and terrestrial ecology, mammals, birds, possible impacts and mitigation measures.
  The Dixon.Brosnan report concludes:

"Water quality in the Bandon River is generally satisfactory, however water quality deteriorates slightly downstream of the discharge point. It would appear therefore that the discharge is having a slight impact on water quality.
Notwithstanding the predicted increase in population over the next twenty years the improvement in treatment standards will result in significantly reduced discharge of nutrients to the Bandon River.
An examination of the existing discharge indicates that most of the effluent is being discharged into a side channel (Channel A). The distribution of silt, sewage fungus and algae indicates that water quality has seriously deteriorated in this side channel.
A survey determined that freshwater mussel is not present in channel A and given the levels of silt and algae the presence of other sensitive species such as brook lamprey and salmon is considered very unlikely. Given that freshwater mussel are present in other channels in this section of the Bandon River a discharge to channel A would create the least risk to this species.
A survey of terrestrial habitats did not detect any rare species however the riparian habitats noted are part of a larger woodland habitat and disturbance should therefore be minimised.
Due to the predicted increase in population the flow from the treatment plant will increase. In addition the pool, which receives the current discharge, is inherently unstable. A new downstream discharge point on channel A is therefore recommended.
It is important that damage to habitats is minimised during construction and large machinery should therefore be excluded from the riparian zone. The specific route of the pipeline should be designed so as to minimise any possible impacts".

The South Western Regional Fisheries Board have been consulted and they have indicated that they are supportive of the proposals. The Heritage and Planning Division of the Department of the Environment, Heritage and Local Government were contacted in Sept 2003 and advised of the proposed development, requesting their recommendation in respect of conservation issues.
There are no Designated Areas under the Quality of Bathing Waters Regulations 1992 in the area. The area is not designated under the Quality of Salmonid Waters Regulations 1988.

(f) Areas in which the environmental quality standards laid down in legislation of the EU have already been exceeded – Discharges to the Bandon River from the existing WWTP and

pumping stations are in excess of the allowable standards in the EU Wastewater Directive. The upgrading of the sewerage scheme will bring these discharges in line with EU legislation.

(g) Densely populated areas – the area around the proposed outfall in the Bandon River is an area in the hinterland of Dunmanway and is not densely populated.
The location of the WWTP is on the South Eastern fringe of the town in an area that is surrounded agricultural land.
Both the Long Bridge pumping station and the Quarry Road pumping station are in areas of medium/low density residential/municipal areas. As there are existing treatment facilities at these locations the environmental sensitivity of the geographical areas will not be significantly impacted upon.

(h) Landscape of historical, cultural or archaeological significance – An archaeological assessment (attached) has been carried out by The Archaeological Services Unit of UCC. This Assessment concludes that there will be no impact on the recorded archaeological monuments within the vicinity of the development, however, as yet unknown archaeological monuments in the development zone may be impacted upon by ground disturbance and thus a number of mitigating strategies are recommended. These mitigation strategies will be considered during the preparation of the contract documents.
It is likely that during construction there will be some temporary disturbance to the natural landscape, however, when construction has been completed there should be little or no long-term significant effects to the natural landscapes.

3. **Characteristics of potential significant effects** of the proposed Sewerage Scheme and in particular to:

- **The extent of the impact** (geographical area and size of affected population) – the Dunmanway Sewerage Scheme is designed to cater for the existing and proposed population for the town of Dunmanway.

- **The transfrontier nature of the impact** – Dunmanway is not within a significant distance of any relevant frontier.

- **The magnitude and complexity of the impact** – the proposed Dunmanway Sewerage Scheme is a conventional scheme using proven technology dealing with wastewater from within its own catchment. Potential impacts have been identified in respect of some of the various environmental topics normally considered in the scoping and preparation of an environmental impact assessment (Schedule 6, section 2(b) Planning & Development Regulations 2001). These topics include human beings; flora; fauna; soils water; air; climatic factors; the landscape; material

assets, including architectural and archaeological heritage and cultural heritage; and the interaction of the above factors. In summary, the potential and actual impacts of the development include the following:

a) Emissions to air, soil and water could result in significant environmental impact but given the small scale of the development and the consequent small scale of emissions and the level of treatment and mitigation measures proposed it is not anticipated that there will be any significant impact from the proposed development.
b) Ecological assessments have established that aquatic habitats will be affected by the construction of the outfall pipeline. However, these studies further noted that none of the terrestrial habitats and species noted are of particular conservation value and no significant impact is expected to occur.
c) The Ecological assessment has recommended the optimum location for the outfall to be a location just down stream of its existing location at which point the effects to the River flora and fauna are minimised.
d) Odour and noise emission limits are proposed which will ensure that the potential impact of any noise or odour nuisance will be minimised.
e) The overflows from the pumping stations will be upgraded and will incorporate screening to eliminate discharge of visible sewage solids to the rivers. The use of storm water holding tanks at the pumping station sites will reduce the frequency of stormwater overflow events in line with the requirements of the Urban Wastewater Directive.
f) The proximity of treatment units to existing housing conforms to the recommendations of the draft EPA Wastewater Treatment Manual for Small Communities, Business, Leisure Centres and Hotels.

- **The probability of the impact** – the positive impact of effluent treatment on an area is well recorded and documented and no unpredicted impacts should arise.

- **The duration, frequency and reversibility of the impact** – the proposed Dunmanway Sewerage Scheme will operate continuously.

CONCLUSION

Taking account of the determination above and the guidance provided in "Environmental Impact Assessment (EIA) Guidance for Consent Authorities regarding Sub-threshold Development" issued by the DoEH&LG, dated August 2003 and the "EPA Advice Notes on Current Practice in the preparation of Environmental Impact Statements", I am satisfied that **the proposed Dunmanway Sewerage Scheme is unlikely to have significant effects on the environment.**

Signed:

_____

Niall O'Mahony
Senior Engineer
(Projects Section)

List of attachments:

Dwg. No. 1339-3(DY)-P01 – Dunmanway - Indicative Site Layout of the proposed Wastewater Treatment Works.

Dwg. No. 1339-3(DY)-. P02 –Sections through Proposed Dunmanway WWTP Site.

Dwg. No. 1339-3(DY)-. P03 – Pumping Station Indicative Layout Plans – Long Bridge and Quarry Road.

Preliminary Report on The Upgrading of Dunmanway Sewerage Scheme prepared by MCOS dated July 2001.

Review of the Preliminary Report on The Upgrading of Dunmanway Sewerage Scheme, prepared by TJOC dated September 2004.

Assessment of the Ecological impacts of providing an upgraded wastewater treatment system at Dunmanway, Co. Cork prepared by Dixon.Brosnan, Environmental Consultants.

Archaeological Assessment of Sewerage Scheme at Dunmanway, Co. Cork prepared by The Archaeological Services Unit of UCC dated March 2004.

Extracts from Cork County Development Plan 2003.

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

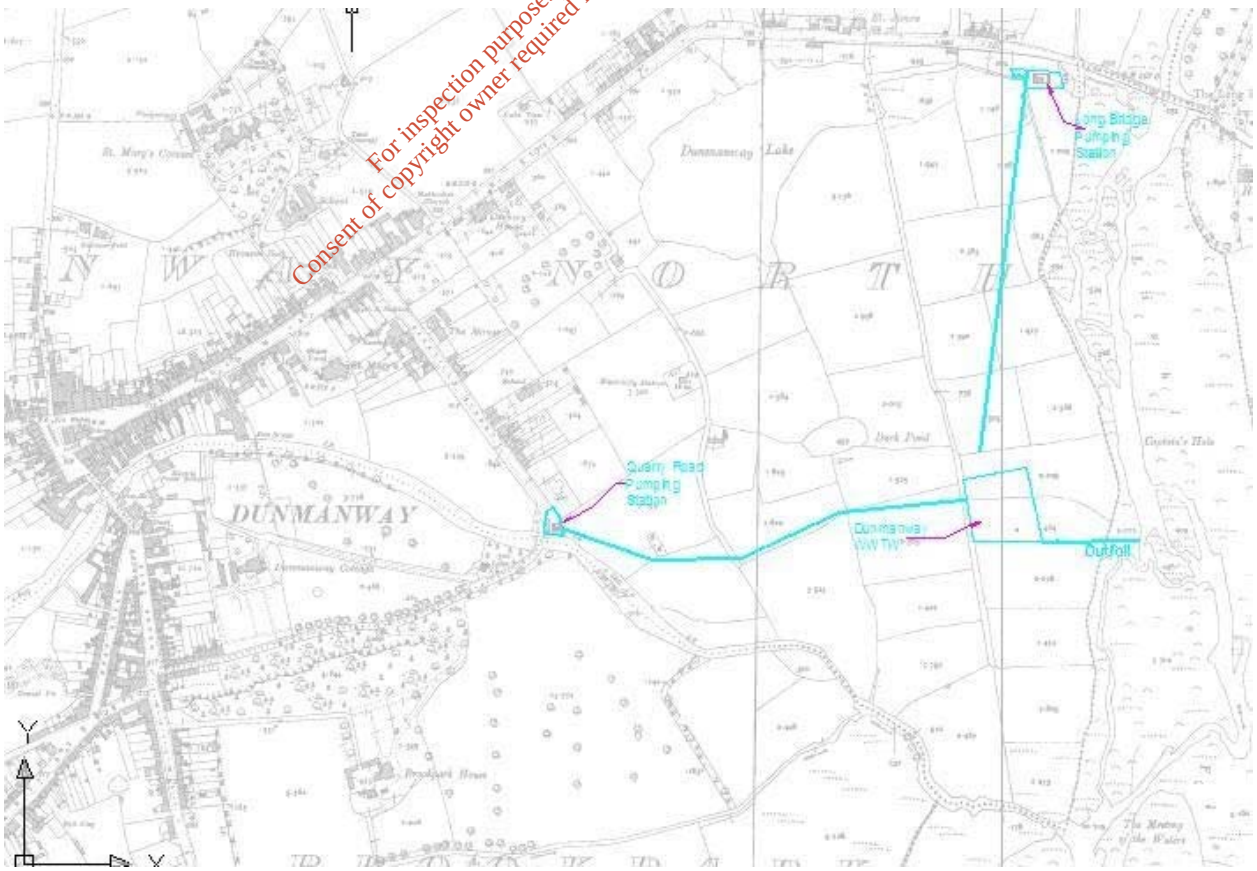
1. INTRODUCTION

Dixon.Brosnan environmental consultants were asked by T.J O'Connor & Associates to carry out an impact assessment in respect of an upgraded wastewater treatment plant to be constructed at Dunmanway, Co. Cork. An ecological assessment was requested by the Heritage section of the Department of Environment (Duchas).

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

2. EXISTING SEWERAGE SCHEME

Map 1 shows an outline of the current treatment system.



Following flow and load surveys it was determined that the average load to the plant is approximately 2,370 PE at present. The total existing load to the treatment plant based on the population figures and estimates of the loads from non-domestic dischargers is 2,214 PE. This correlates rather well with the loads determined by flow and load surveys. For the purposes of comparison in this report a figure of 2,214 PE will be used.

2.1 Influent and Effluent Monitoring

The influent and effluent flows of the Dunmanway WWTP were monitored for approximately 5-6 times per year in accordance with the Urban Wastewater Treatment Directives. The results of this monitoring up until the year 2000 are presented below.

ADD flow and load figures from 2003

Table 1 – Influent Concentrations

Year	COD (mg/l)	BOD (mg/l)	SS (mg/l)
1996	-	142	465
1998	-	-	-
2000	-	-	-

Table 2 – Effluent Concentrations

Year	COD (mg/l)	BOD (mg/l)	SS (mg/l)
1996	-	17	23
1998	27	17	-
2000	206	46	138

The limited amount of influent data restricts the determination of the influent loads. Furthermore, the available data show large differences between the BOD and SS concentrations, which are out of the regular ranges. The effluent data show satisfactory results for 1996 and 1998. The effluent met the discharge standards as set by the UWWTD. In 2000, the effluent concentrations showed a substantial deterioration. The discharge standards were not met in 60-75% of the samples. To determine the treatment levels occurring at present further tests were conduced in May 2004 the results of which are detailed in Table 3:

Table 3: Waste water treatment plant data 2004

	Raw Effluent		Treated effluent	
Date	**BOD (mg/l)**	**SS (mg/l)**	**BOD (mg/l)**	**SS (mg/l)**
13/5/04			33	-
14/5/04			74	177

Composite sample 13-14/5/04	74	228		

Although it is noted that the data is very limited the most recent results suggest that treatment is presently very poor. The results suggest that BOD reduction is minimal and that the levels of suspended solids in the final effluent are elevated. A comparison with results from 2000 suggests that treatment efficiency has deteriorated in the intervening years.

2.2 Future Population

Cork County Council has drafted a County Development Plan in 2003, in which, among others, the objectives for future development are described. This plan states that Dunmanway is considered to be a key support settlement in the heart of West Cork. The overall strategy aims to improve Dunmanway's important commercial, administrative and institutional functions serving a wide area and to promote its potential as a rural industrial/enterprise location.

The Development Plan has proposed a new development boundary. This has been set to include all the areas that are the subject of specific zoning objectives. In addition, it includes relatively large areas of either established or proposed open space that form part of the structure of the town. For the design of the wastewater treatment plan, a horizon of about 20 years is in general taken as starting point.

2.3 Future Non-Domestic Loads

In the Development Plan, several zones have been designated for the provision of industries or a post primary school. With common-used design rules for the estimation of the flows and loads (17.4 ha; 28 m^3/ha/day; 0.225 m^3/PE/day), the possible contribution of these zones might allow for more than 2,000 PE. In accordance with the assumptions for the population growth, this might also be considered as the long-term estimate. For the design of the wastewater treatment plant, a figure of 500 PE is assumed to be appropriate. The total non-domestic load will hence be 1,080 PE.

2.4 Total Future Load

Based on the figure noted above the design load of the wastewater treatment plant is calculated as follows.

Table 4 – Existing and Future Loads

	Current PE	Increase in PE	Design PE
Domestic	1,632	648	2,280
Non-Domestic	580	500	1,080
Total	2,212	1,148	3,360

It is proposed to design the extended and upgraded wastewater treatment to cater for a population equivalent of 3,500 PE.

2.5 Nutrient loadings

The current load is estimated to be 2,214 PE. A discharge volume per person of 180/l/day is usually considered appropriate when determining effluent flows. This will result in a total flow of 398.52 m3 per day. The most recent BOD results for the treated effluent in May 2004 were 33 and 74 mg/l; giving an average of 53.5 mg/l. This would result in a total BOD discharge to the river of 21.32 kg/day. The level of suspended solids was recorded in May 2004 was 177mg/l. This will result in a total discharge of 70.54 kg/day to the Bandon River

It is assumed that within the next 20 years a population equivalent of 3,500 will be reached in Dunmanway; an increase of 58.1%. In the absence of upgrade and increased treatment efficiency this would result in a total BOD discharge of 33.71 kg/day and a total suspended solid discharge of 111.53 kg/day.

Based on the above, the current discharge of sewage would be expected to cause deteriorations in water quality. In the absence of an appropriate upgrade the increased in population in Dunmanway will lead to greater discharge of nutrients to the Bandon River.

3. PROPOSED SEWERAGE SCHEME

3.1 Treatment plant

Due to the increasing load on the plant and the need to provide a satisfactory effluent quality, it is proposed to upgrade the treatment plant to cater for the future increased loads. This plant will be designed to serve a population equivalent of 3,500 persons. The proposed treatment standards are shown in Table 5 and a comparison of treatment from the existing and upgraded treatment plants is shown in Table 6:

Table 5: Proposed treatment standards.

Parameter	Value	Unit
Design Capacity	3,500	p.e.
BOD	25	mg/l
COD	125	mg/l
Suspended Solids	35	mg/l
Total Phosphorus	1.5	mg/l

Table 6 – A comparison of treatment efficiencies for SS and BOD

	Population equivalent 2214 180l/person/day BOD 53.5 mg/l SS 177 mg/l	**Upgraded treatment plant. Predicted 3,500 PE 180l/person/day BOD 25mg/l, SS 35 mg/l**	**% reduction in total discharge**
BOD kg/day	21.32	15.75	26.13
SS kg/day	70.54	22.05	68.74

As detailed above the upgrade will significantly reduce the amount of nutrients reaching the river, despite the increase in population. It is also noted that the population size will increase incrementally; thus in the short term the amount of nutrients being discharged will be considerably lower.

4. EXISTING WATER QUALITY

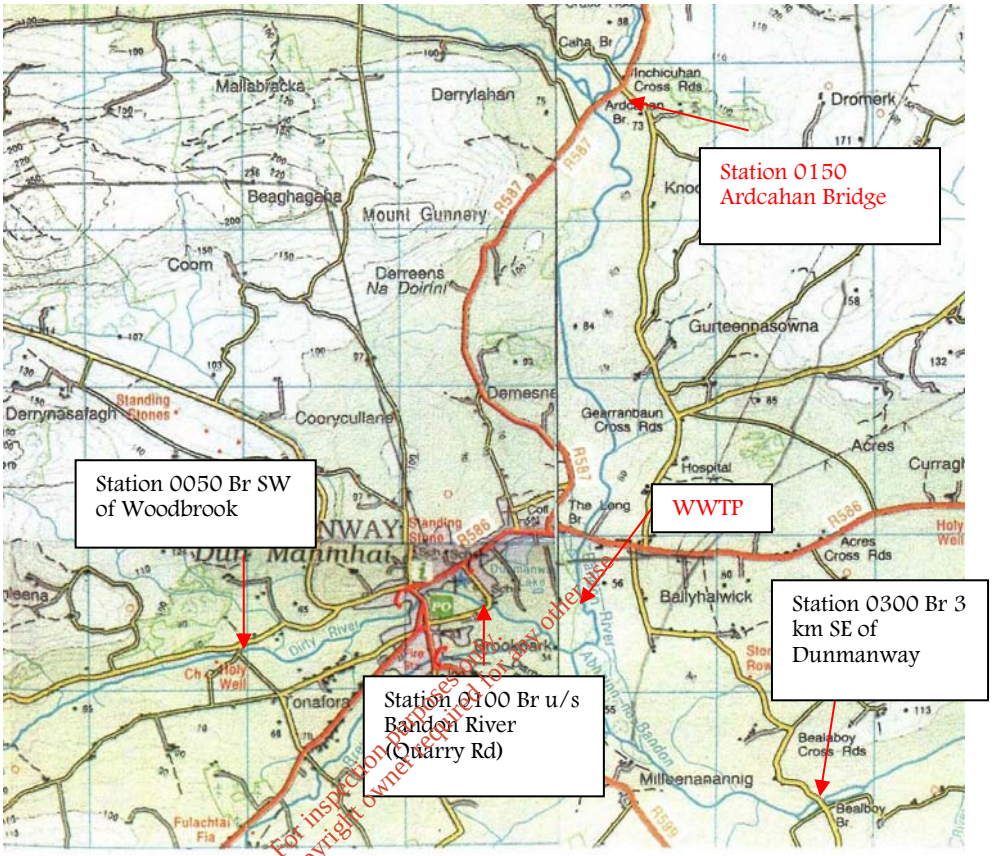
4.1 Biological monitoring

Results for the EPA biological monitoring programme on the Bandon River are detailed in Table 7 and the locations of the most relevant sampling points are shown on Map 1.

Table 7: Q values recorded at sampling stations on the Bandon river (1971-2003)

Sampling Stations		Biological Quality Ratings (Q Values)									
No.	Location	1971	1976	1978	1982	1986	1989	1994	1997	2000	2003
0050	Br E of Keenrath House	-	-	-	-	-	4-5	4-5	4	4-5	4-5
0100	Br u/s Ardcahan Bridge	5	4-5	4-5	4-5	4	3-4	-	-	-	-
0150	Ardcahan Bridge	-	-	-	-	4-5	4	4	4	4	4
0200	Br near River View	-	-	4-5	4-5	4-5	4	-	-	-	-
0300	Br 3km SE of Dunmanway	5	4-5	4-5	4	4	4	4	4	3-4	3-4
0400	Manch Bridge	5	4-5	4	4	4	3-4	4	3-4	3-4	3-4
0550	Bridge S of Enniskean	-	-	-	-	-	4	4-5	4	3-4	4
0600	Br nr Desert Station	5	5	5	3-4	3-4	4	4-5	4	4	4
0700	Carhoon Bridge	5	4-5	4	3-4	4	3-4	4-5	4	4	4
0780	Bandon Bridge	-	-	-	-	-	3-4	-	-	-	-
0800	1.5km d/s Bandon Bridge	5	3	2-3	3	4	3	3-4	3	3	3
0850	French's Wood	-	-	-	-	-	3-4	-	-	-	-
0900	Bridge u/s Inishannon	5	4-5	4	4	4	3-4	4	4	4	4

Map 2 showing the locations of the relevant EPA sampling points.



Results indicate that for much of its length water quality in the Bandon River is satisfactory. However the deterioration in water quality at site 0300 Br 3km SE of Dunmanway which was assigned a Q value of 3-4, may be due to the existing outflow from the wastewater treatment plant. Similarly the deterioration downstream of Bandon at site 0800 is probably related to the Bandon wastewater treatment plant.

Generally water quality has declined over the sampling period; however this is probably due to changes in farm practices and population changes. The sites of most relevance to the current proposal are those located upstream of the existing discharge (0200 Ardcahan Bridge) and downstream of the existing discharge (0300 Br 3km SE of Dunmanway). At the upstream site (0200) water quality has been consistently satisfactory since sampling commenced. At the downstream site water quality was satisfactory until 2000 when a Q value of 3-4 was assigned. This value which is indicative of water quality in transition was also assigned in 2003. Based on the available results it would appear that the existing discharge is having a negative impact on water quality.

One of the contributories to the River Bandon is the Dirty River, which confluences with the River Bandon approximately 1 km southeast of Dunmanway. The overflow outfall from the Quarry Road Pumping Station discharges to the Dirty River. The two stations on the Dirty River are Station 050 at the bridge southwest of the Woodbrook Estate and Station 100 located at Quarry Bridge in Dunmanway. Overflows from the Quarry Road Pumping Station discharge to the Dirty between these two sites. A Q value of 4assigned to the upstream site (050) 2000 whereas the downstream site (100) was assigned a Q value of 3-4. Based on these ratings it would appear that the overflow is having a negative impact on water quality.

4.2 Chemical Monitoring

The results obtained from Cork County Council for the period 1998-2000 is shown in Table 8:

Table 8: County Council Data 1998-2000

Station No.	Dissolved Oxygen % Saturation				Dissolved Oxygen mg $O_2 l^{-1}$				B.O.D mg $O_2 l^{-1}$			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0150	*16*	68	99	110	*16*	7.8	11.6	12.6	*22*	0.3	1.0	3.3
0300	*12*	67	94	112	*12*	7.3	11.0	12.6	*14*	0.7	1.0	1.6
0400	*17*	71	92	128	*17*	9.0	11.9	14.1	*23*	0.6	1.3	4.0
0500	*17*	64	94	122	*17*	8.3	11.2	13.9	*21*	0.7	1.2	5.9
0550	-	-	-	-	-	-	-	-	-	-	-	-
0600	*14*	63	91	103	*14*	8.4	10.8	12.3	*15*	0.7	1.1	1.9
0700	*18*	62	94	112	*18*	8.6	11.0	14.0	*23*	0.4	1.4	3.8
0770	*8*	91	99	110	*8*	9.1	11.0	12.6	*13*	0.3	1.2	2.2
0900	*18*	68	100	126	*18*	8.9	11.6	14.4	*23*	0.8	1.3	4.4

Station No.	Chloride mg Cl l^{-1}				Total Ammonia mg N l^{-1}				Un-Ionised Ammonia mg NH_3 l^{-1}			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0150	-	-	-	-	*24*	0.01	0.03	0.19	*17*	<0.001	<0.001	0.001
0300	-	-	-	-	*13*	0.02	0.03	0.15	*10*	<0.001	<0.001	<0.001
0400	-	-	-	-	*23*	0.02	0.03	0.11	*16*	<0.001	<0.001	<0.001
0500	-	-	-	-	*23*	0.02	0.06	0.19	*17*	<0.001	<0.001	0.001
0550	-	-	-	-	*4*	0.03	0.04	0.08	-	-	-	-
0600	-	-	-	-	*16*	0.02	0.04	0.13	*12*	<0.001	<0.001	0.001
0700	-	-	-	-	*25*	0.02	0.04	0.13	*18*	<0.001	<0.001	0.001
0770	-	-	-	-	*17*	0.01	0.03	0.14	*11*	<0.001	<0.001	0.001
0900	-	-	-	-	*24*	0.01	0.03	0.57	*17*	<0.001	<0.001	0.004

Station No.	Oxidised Nitrogen mg N l^{-1}				Ortho-Phosphate mg P l^{-1}				Colour Hazen			
	No.	Min	Med	Max	*No.*	Min	Med	Max	*No.*	Min	Med	Max
0150	*15*	0.4	0.8	1.6	*23*	<0.01	0.01	0.02	-	-	-	-
0300	*11*	0.6	1.6	2.7	*13*	0.01	0.01	0.03	-	-	-	-
0400	*16*	0.6	1.8	4.0	*24*	0.01	0.01	0.02	-	-	-	-
0500	*14*	0.9	2.3	3.6	*23*	0.01	0.02	0.06	-	-	-	-
0550	*4*	1.4	2.1	7.3	*4*	0.01	0.03	0.04	-	-	-	-
0600	*13*	1.1	2.7	4.1	*15*	0.01	0.03	0.06	-	-	-	-
0700	*15*	1.1	2.8	4.4	*25*	0.01	0.03	0.07	-	-	-	-
0770	*8*	1.0	2.8	3.1	*18*	<0.01	0.02	0.05	-	-	-	-
0900	*18*	1.7	3.7	5.5	*25*	0.01	0.03	0.09	-	-	-	-

The data available for the period 1998-2000 indicates that water quality is generally satisfactory in the Bandon River. The sites of most relevance to the current proposal are those located upstream of the existing discharge (0200 Ardcahan Bridge) and downstream of the existing discharge (0300 Br 3km SE of Dunmanway). No significant differences were noted in levels of total and un-ionised ammonia; however an increase in BOD, oxidised nitrogen and orthophosphate and a decrease in dissolved oxygen suggests that the existing discharge is causing a slight deterioration in water quality.

5. RIVER FLOWS

As there are no hydrometric gauging stations on this stretch of the River Bandon, there is no long-term historical record of flows available for this study. All analyses have therefore been based on river catchment characteristics, as described below.

For the purposes of estimating the required effluent discharge standards, low flows in the river are of particular importance. These are used for calculations of dilution, fully mixed contaminant concentrations and when combined with background water quality measurements, they provide an accepted basis for determining appropriate effluent discharge standards. For the purposes of the current study, a software package developed by the European Small Hydropower Association (*Hydra*) for use throughout Ireland, has been used to estimate low flows on the River Bandon. The package was developed by the Institute of Hydrology in the UK under a EU contract to provide the necessary hydrologic estimates for small scale hydropower projects in Ireland.

A widely accepted characterisation of low flows in rivers is the ninety-fifth percentile flow. This represents the value at which, statistically, flow in the river will be higher for 95% of the time. Table 8 below shows the output from the *Hydra* package, for the River Bandon at the outfall from the existing treatment works.

Table 9 – River Bandon catchment characteristics and flow regime results

Catchment Characteristics	
Total Area:	104.4 km^3
Rainfall (average annual):	1,843 mm
Potential Evaporation (average annual):	509 mm
Runoff (average annual):	1,366 mm
Flow Regime Results	
Mean flow estimate:	4.50 m^3/s
Q95 (% of mean):	11.6 %
Q95 (absolute):	0.52 m^3/s

6. ASSIMILATIVE CAPACITY

6.1 Waste assimilative capacity

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:

$WAC = (C_{max} – C_{back}) \times F_{95} \times 86.4$ *Equation 27.1*

where WAC = waste assimilative capacity (kg BOD/day)

C_{max} = maximum permissible BOD (mg/l)

C_{back} = background upstream BOD (mg/l)

F_{95} = 95^{th} percentile flow (= min. flow approx.) (m^3/s)

86.4 = units conversion factor

Under the European Communities (Quality of Salmonid Waters) Regulations, 1988 (S.I. No. 293 of 1988) the maximum BOD concentration in salmonid freshwaters should not exceed 5mg/l. This standard should be conformed to by 95% of samples over a period of 12 months. Although the Bandon River has not been designated as a salmonid river under these regulations this limit is considered appropriate given the importance of salmonid species within the river.

The median background BOD in the River Bandon upstream of the proposed outfall location at Station 0150 Ardcahan Bridge during the period 1998-2000 was 1mg/l. This figure was derived from the results of Cork County Council's monitoring programme during that period. Using the 95^{th} percentile flow of 0.52 m3/s determined by the Hydra package for the discharge point the

WAC at this point was estimated to be 179.71kg BOD/day. An upgraded treatment plant serving 3,500 p.e with a BOD discharge of 25mg/l would result in a daily discharge of 15.75 kg/day. Thus, the waste assimilative capacity available, based on the total flow in the Bandon River, is considerably higher than the predicted daily discharge.

6.2 BOD- mass balance equation

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:

$$T = (FC + fc) / (F + f)$$

where T = downstream pollutant concentration (mg/l)
F = upstream river flow (m^3/s)
C = background pollutant concentration (mg/l)
f = effluent flow (m^3/s)
c = effluent pollutant concentration (mg/l)

The Commission standards formed the basis for *Memorandum No. 1* (1978) issued by the Irish Department of the Environment Technical Committee on Effluent and Water Quality Standards. This notes that a discharge to a watercourse should not increase the BOD within the watercourse by more than 1mg/l. Using the mass balance equation and a final concentration of 25 mg/l BOD in the final wastewater discharge the downstream BOD concentration was calculated at 1.33mg/l. Thus the proposed treatment will not lead to excessively elevated levels of BOD downstream of the discharge.

6.3 Phosphorous – mass balance equation

Within the aquatic environment phosphorus 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 phosphorus. 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.

The target values specified in the Phosphorous 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. In practical terms Q values of 4 or more are taken to represent satisfactory water quality, where eutrophication is unlikely to be a problem.

Because annual median phosphate (P) values in such waters rarely exceed 30ug P/l, this concentration has been adopted as the target value to be achieved by 2007.

The median background BOD in the River Bandon upstream of the proposed outfall location at Station 0150 Ardcahan Bridge during the period 1998-2000 was 0.01mg/l. Using the mass balance equation and a final concentration of 1.13mg/l orthophosphate in the final wastewater discharge the downstream BOD concentration was calculated at 0.0156 mg/l. Thus the proposed treatment will not lead to excessively elevated levels of orthophosphate downstream of the discharge.

7. IMPACT OF THE EXISTING DISCHARGE

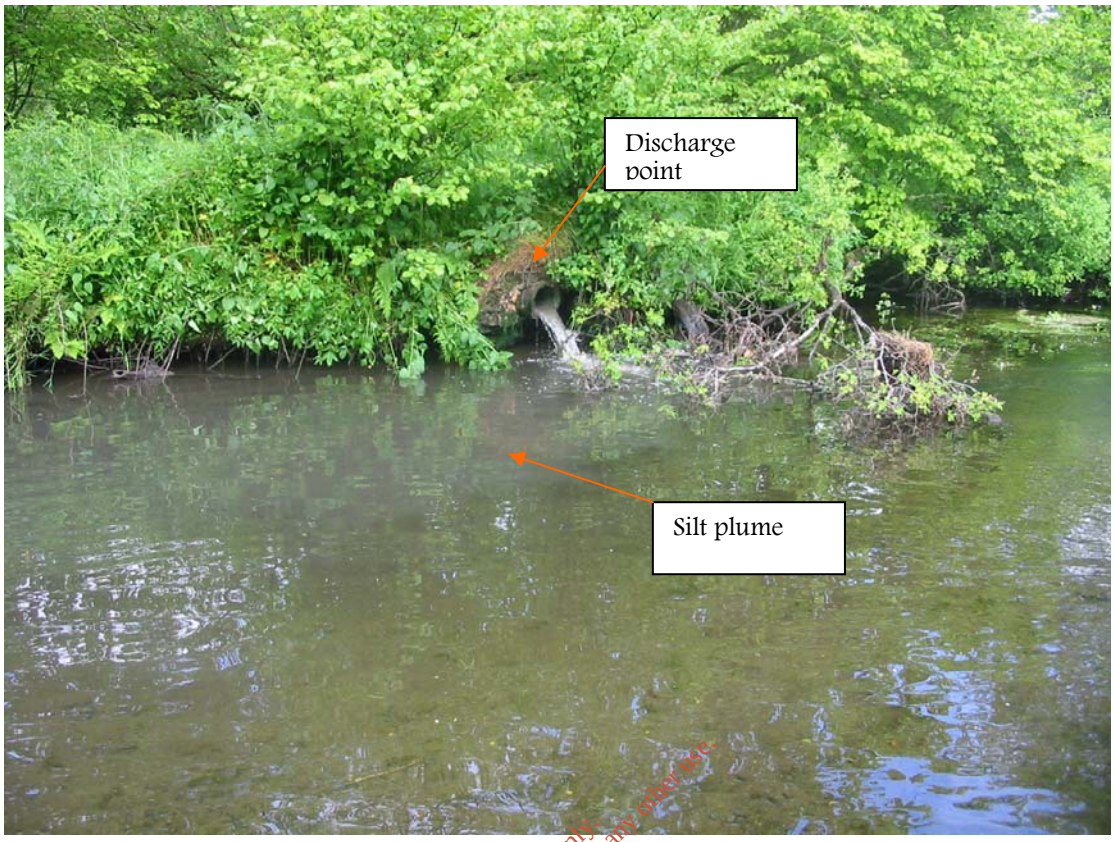
Currently the treatment plant discharges via a concrete pipe into a channel of the Bandon River. The river in this area is braided and forms a number of channels, which meander, through dense woodland. There are numerous backwaters and dead-end channels and the exact flow pattern will vary continuously depending on the volume of water flowing in the river. Upstream of the discharge point a large proportion of the available water is diverted into another channel, which is not affected by the discharge. The treated effluent discharges into a shallow pool, which is drained by two channels.

The river was visited during moderate flow conditions and during low flow conditions. The effect of the discharge can be determined by the silt deposition pattern. Based on this pattern it was determined that the discharge is diverted through the larger of the two channels (denoted channel “A” for the purposes of this report). Deep silt has built up along the bank for approximately 4m between the discharge point and the mouth of channel A. In places this layer of silt is up to 0.5m in depth. This pattern of silt deposition continues down channel, A which runs for 308m before rejoining the main channel. In the upper reaches of this channel there are obvious indications of the effect of the discharge with strong growth of sewage fungus on woody material in the stream. Sanitary products were also noted.

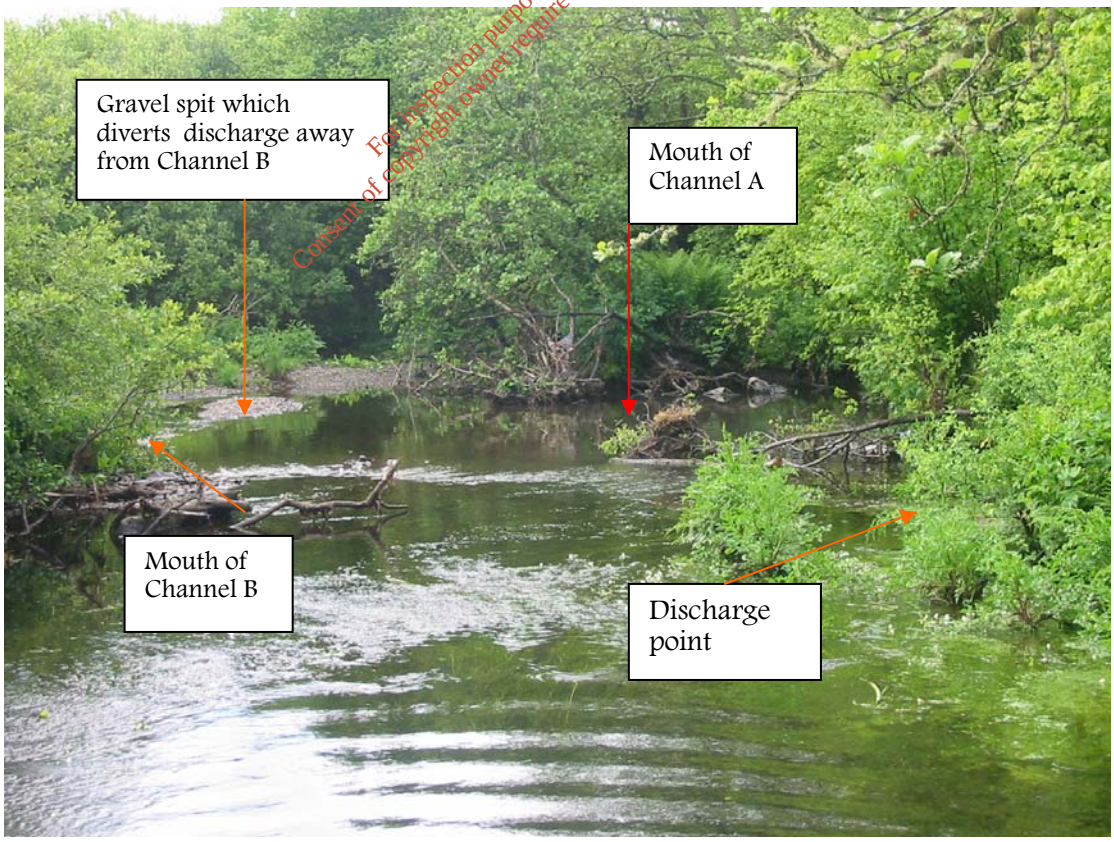
At moderate flows some of the water from this pond does discharge through a second smaller channel (denoted channel “B” for the purposes of this report). During low flows a spit of gravel is obvious which allows only minimal flow to channel B. The mouth of this channel is on the opposing bank of the pond from the discharge pipe. There is a short section of riffle with gravel giving way to deep slow-flowing pools with a soft substrate. None of the distinctive grey silt found in channel A is present within this channel and likewise no sewage fungus or sanitary products were noted in this channel.

Based on the physical structure of the channel, the pattern of silt deposition and sewage fungus it seems improbable that any more than minimal amounts of treated effluent reach channel B at present.

The structure of the channel and silt plume at the discharge point is shown in Photography (I) & (II) and Map 4.

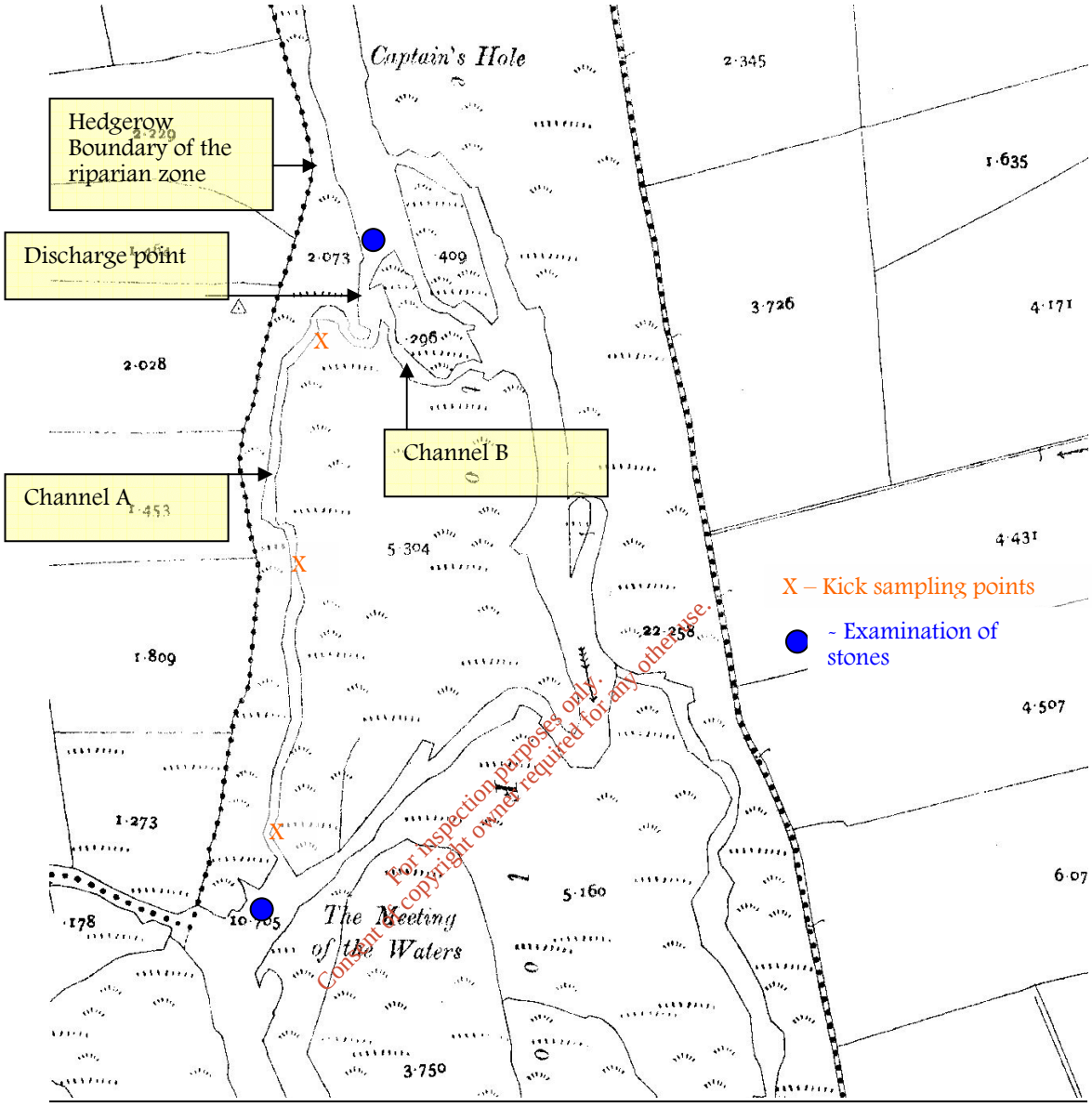


Photography (I) showing silt plume



Photography (II) showing structure of the channel at the discharge point.

Map 4: Structure of the channel at the discharge point



* The structure of the river is continually changing. This map is therefore given to provide an overview and may not coincide exactly with conditions on the ground.

8. ECOLOGY

8.1 Site Designation

The section of the Bandon River into which the treatment plant discharges is a candidate Special Area of Conservation (cSAC 2171).

8.2 Habitats

A number of different habitat types are located at or close to the site of the proposed discharge pipe. site visits were conducted April 23rd, May 25th, and June 10th 2004. The initial visits were walkover surveys using Phase 1 methodology (JNCC 93) to identify habitat types. Species lists were compiled during subsequent site visits. All habitats were classified to level 3 of the classification scheme outlined in *A Guide to Habitats in Ireland* (Fossit, 2000) and a list of the species on which the habitat classifications are based is included in Appendix 2. It should be noted that some of the habitats are transitional and where this occurs they are placed in the category they most resemble

8.3 Aquatic Habitats

Eroding River FW1/Depositing River FW2

The site synopsis notes that this section of the Bandon River *"contains a small though very important example of the Annex I priority habitat Alluvial Forest as well as good examples of another Annex I habitat - Floating River Vegetation"*

Floating vegetation of the type mentioned in the site synopsis occurs immediately upstream of the discharge point on the smaller channel and approximately 300m downstream in the main channel. This type of vegetation is generally absent from the smaller channel. Primarily this is due to heavy shading by riparian vegetation within the woodland area and it is noticeable that where the canopy opens up the growth of aquatic flora increases.

Immediately upstream of the discharge there are examples of the type of vegetation referred to by the site synopsis. Water crowfoot is common and also noted were starwort, water milfoil and the moss *Fontinalis* sp. A dense stand of bogbean also occurs upstream of the discharge point on the same bank. Sections of the riverbank and wetter areas close to the river also contain aquatic or semi aquatic species including hemlock water dropwort, valerian, mint and marsh marigold (*Caltha palustris*).

Several aquatic plant species which are considered important or uncommon are noted in the site synopsis namely; Shoreweed (*Littorella uniflora*) and Six-stamened Waterwort (*Elatine hexandra*), a moss species *Brachythecium rivulare,* a liverwort *Chiloscyphus polyanthos* var.

polyanthos, an algae species *Nostoc, a* liverwort *Riccardia chamaedryfolia* and a moss *Fissidens crassipes*. None of these species were noted in channel A and given the absence of a diverse aquatic flora and the heavy shade/siltation the presence of any of these species in channel A is considered very unlikely.

8.4 Macroinvertebrate Analysis

Due to the risks associated with disturbing juvenile mussels no kick sampling was carried out in the main channel where the survey was confined to examining larger stones. Due to absence of larger stones and following the determination by survey that freshwater mussels were absent kick-sampling was conducted at three sites on the side channel.

The distribution of macroinvertebrates shows a distinct pattern. Upstream of the discharge point heptageniid mayflies, which are highly sensitive to pollution, are common. Gravels in this area are clean with low silt levels and diversity appears good with species such as *Rhyacophila* sp., *Emphemerella* sp., and *Baetis* sp. also noted.

A kick sample taken 10m downstream of the discharge point indicates a sharp decline in water quality. The streambed at this location is heavily silted with dense growth of sewage fungus. Tubificid worms, which are highly tolerant of pollution, were the dominant taxa and *Chrionomous* sp., which are similarly tolerant, were also noted. Minimal numbers of the uncased caddis *Hydropsyche* sp. and the freshwater shrimp *Gammerus* sp. were also noted. A Q value of 1-2 was assigned.

A second kick sample was taken approximately 150m downstream of the discharge point. Although some recovery of the biota was evident, reappearance of *Baetis* sp. in small numbers and increased numbers *Gammerus* sp. However tolerant species are still common and the most pollution species such as hegtageniid mayflies are still completely absent. Although this sample was taken from a riffle area with lower shade than the previous site (60% approximately) high silt levels were again evident. A Q value of 2-3 was assigned.

A third kick sample was taken immediately upstream of the confluence of channel A and the main channel. Water movement was slow at this location with a soft substrate and high silt levels. The diversity and density of species at this location was broadly similar to those detected at the previous site. No hegtageniid mayflies were detected. A Q value of 2-3 was assigned.

Finally an examination of stones was made in the main channel downstream of its confluence with channel A. Kick sampling was not carried out to prevent incidental damage to mussels. Heptageniid mayflies were noted in high numbers on the underside of larger rocks and diversity

generally was found to be higher. Silt levels were low. Dense growths of aquatic macrophytes (water crowfoot) were evident in the main channel at this location.

Based on the pattern of invertebrate distribution it would appear that the current discharge is severely impacting on water quality in channel A. This effect is particularly evident close to the discharge point. However notwithstanding the excessive shading and slow-flows which would naturally depress the diversity and density of macroinvertebrates it would appear that this effect continues for the length of the channel. However the additional flow available in the main channel downstream of the confluence would appear to provide sufficient dilution and no impact on water quality was detected.

8.5 Terrestrial habitats

The field in which the treatment plant is located contains similar semi-intensive grassland best categorised as *Dry calcareous and neutral grassland GS1.* Grass species include sweet vernal grass, Yorkshire fog, ryegrass (*Lolium perenne*), timothy (*Phleum pratense*) and meadow foxtail (*Alopecurus pratensis*). Herbaceous species include creeping buttercup (*Rananculus repens*), plaintain (*Plantago lanceolata*), clover (*Trifolium* sp.) and nettle (*Urtica diocia*). This habitat is not of particular conservation value.

At the discharge point the terrestrial habitats consist of a mixture of habitats including *Riparian woodland WN5*, *Hedgerows WL1*, *Scrub WS1* and *Dry meadows and grassy verges GS2*. The grassland area consists of a mixture of common grass species and herbaceous species. Growth is luxuriant reflecting limited grazing and periodic influxes of nutrients via flooding of the river. The grass species noted include cocks foot (*Dactylis glomerata*), sweet vernal grass (*Anthoxanthum odoratum*), Yorkshire fog (*Holcus lanatus*), and meadow grass (*Poa* sp). Taller vegetation includes dock (*Rumex* sp.), hogweed (*Heracleum sphondylium*), nettle (*Urtica diocia*) and angelica (*Angelica archangelica*), sorrel (*Rumex acetosa*), mayflower (*Cardamine pratensis*).

The site synopsis refers to "*contains a small, though very important example of the Annex I priority habitat Alluvial Forest".* The bulk of this type of habitat is located to the south of the discharge point. At the discharge point the riverbank and adjacent field has a mixture of hazel (*Corylus avellana*), willow (*Salix* sp.) alder (*Alnus glutinosa*) and blackthorn (*Prunus spinosa*). The bankside trees are important in maintaining the stability of the riverbanks and some of the older willow and hazel support dense growths lichens. Also noted was guelder rose (*Viburnum opulus*), ransoms (*Allium ursinum*), bluebell (*Endymion non-scripus*), wood avens (*Geum urbanum*), figwort (*Scrophularia nodosa*) and golden saxifrage (*Chrsoplenium oppositifolium*).

A hedgerow separates the riparian area and the field in which the treatment plant is located. The hedge is contiguous with areas of scrub and contains native willow (*Salix* sp.), hawthorn (*Cratagus minogyna*), willow (*Salix* sp.), holly (*Ulex europeaus*) and oak (*Quercus* sp.) and blackthorn.

None of the species noted are protected under the Wildlife Act (1976) and the Flora (Protection) Order, 1999. Although none of the species noted are rare the habitats in the vicinity of the discharge point are part of a much larger mosaic of watercourses, riparian woodland and scrub. This total area is of high conservation value and disturbance to riparian habitats should be minimised.

9. FAUNA

The following Annex II animal species Otter (*Lutra lutra*), Salmon (*Salmo salar*), Brook Lamprey (*Lampetra planeri*) and Freshwater Pearl Mussel (*Margaritifera margaritifera*) occur within the site.

9.1. Freshwater mussel

The pearl mussel is one of three species of large Unionacean bivalves found in Irish freshwaters. The species may occur in fast-flowing, oligotrophic, calcium deficient streams and rivers. The species is on the IUCN Invertebrate Red Data List and is protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). *Margaritifera* is also listed in Annex II and Annex V of the Habitats Directive (92/43/EEC) and is protected by law in Ireland under the 1976 Wildlife Act (Statutory Instrument No. 112, 1990). As noted in the site synopsis the populations of freshwater mussel at this location are thought to be of national importance.

Given the conservation value of this species, it was considered necessary to conduct a survey to determine if this species was present within channel A. This survey was conducted by Dr. Eugene Ross and the results and conclusions drawn from this survey are given in Appendix 3. The survey did not detect freshwater mussel within channel A.

9.2 Otters

Otters are found throughout the Bandon catchment and also occur within this general area.

The following are considered to be indicators of otter activity:

1-Spraints and anal glands

2-Footprints and sign heaps

3-Runs or paths

4- Feeding sites and prey item remains

The treatment plant is situated a considerable distance back from the river and works here are unlikely to have any significant impact on otters. The most likely source of disturbance to otters could arise to due bankside works at the discharge point. No signs of otter activity were noted at the discharge point or in its immediate vicinity. Any works in this area will be of limited duration. The area is generally overgrown with large amounts of cover available and no significant disturbance of otters is considered likely.

9.3 Other Mammals

Field mouse, brown rat and bank vole are extremely common in the Irish countryside and although no specialised survey was considered necessary there are almost certainly present with the vicinity of the discharge point. Rabbits are common in the general area and other species likely to be present include pigmy shrew, Irish hare and hedgehog. Evidence of both fox and badger was noted downstream of the discharge point but no evidence of either dens or setts were noted in the immediate vicinity of the discharge point. Bats are generally common in the types of habitat encountered and two bat species (Daubenton's Bat and Pipistrelle) are mentioned in the site synopsis. However the trees likely to be affected by the construction works are either of limited size and/or age and the likelihood of significant bat roosts being disturbed is considered very remote.

9.4 Brook Lamprey

The brook lamprey (*Lampetra planeri*) is non-migratory. It is found in sandy and gravely river and streams and breeds where the gradient of the river is shallow. (Whilde,1993). No specialised survey was carried out for this species however a lamprey was noted immediately downstream of the confluence of channel A and the main channel. Although it was not captured or conclusively identified it seems likely that this individual was a brook lamprey.

Given the high silt levels and poor water quality in channel A it is unlikely that brook lamprey will occur within this channel. Overall this side channel in its current condition is considered to be of minimal value for this species.

9.5 Salmonid Species

Salmon, sea-trout and brown trout all occur within the Bandon catchment. Channel A does not provide suitable breeding habitat for any salmonid species due to slow flows, absence of suitable gravels and heavy siltation. Based on analysis of macroinvertebrates water quality in channel A is poor and would not support salmonids. Salmonid species may occur downstream however albeit in very small numbers. No suitable holding pools for adult salmon were noted. Overall this side channel in its current condition is considered to be of minimal value for salmonid species.

9.6 Other fish species

Other fish species found in the Bandon river include eel, stickleback and minnow. All three species are likely to be common in the main channel. These species may occur in limited densities in certain sections of channel A; however this channel is not expected to be of particular significance for these species.

9.7 Birds

Rivers support a number of specialised bird species including dipper, kingfisher, heron, mallard, moorhen and swans. These species are all likely to occur within the overall catchment of the Bandon River although only heron, mallard and moorhen were noted in immediate proximity to the discharge point. A moorhen was nesting very close to the discharge point at the time of the survey. A number of other bird species will occur within the undisturbed woodland habitat, which exists on the banks of the river. These species are generally common in a mixed agricultural landscape and species noted included wren, robin, long-tailed tit, song thrush and pigeon Given that any impact will be of limited duration and a large area of similar habitat is located adjacent to the site no significant impacts on birds is considered likely.

10. POSSIBLE IMPACTS

10.1 Impacts on Fish

The Bandon supports important populations of salmonid fish and brook lamprey. These species are susceptible to deteriorations in water quality. Salmonid species breed in clean gravels and therefore breeding success can be affected by increased silt levels.

10.2 Impacts on invertebrates.

From conservation viewpoint the freshwater pearl mussel is the most important invertebrate species in the Bandon River. This species is susceptible to deteriorations in water quality and is particularly sensitive to large increases in suspended solids. The distribution of other macroinvertebrate species within the watercourse will be altered by changes in water quality however these impacts will be localised in extent.

10.3 *Impacts on aquatic vegetation*

Changes in nutrient levels will affect the distribution and density of aquatic plants. High levels may increase growth however the diversity of species may be significantly reduced. In these

circumstances water crowfoot may be dominant and where nutrients levels are extremely elevated algae and other fungal growths may be dominant.

10.4 Noise Impact

Noise impacts could occur during construction and from the everyday operation of the plant. The treatment plant itself is situated in an agricultural landscape where noises associated with farming are common and in this context works at the plant itself are unlikely to significantly impact on noise levels. The outfall laying works will be relatively short in duration and will take approximately 4 weeks to complete. Some impact on mammals and birds would be expected to occur due to noise generated by work on the pipeline. This impact will increase as the works get closer to the river. However given the limited duration of the works and the degree of cover available close to the discharge point this impact is expected to be of local significance only and no long-term impacts are expected. Following construction of the wastewater treatment plant it is recommended that noise levels do not exceed 55db during daylight hours and 45db at night. Under these circumstances no significant impacts are considered likely.

11. DISPOSAL OPTIONS

The following disposal options could conceivably be used:

1- Discharge on side channel A downstream of the current discharge point
2-Existing discharge point
3-Discharge to the main channel upstream or downstream of the current discharge point

11.1 Discharge to channel A downstream of the current discharge point

Based on the structure of the watercourse, the pattern of silt deposition and the distribution of invertebrates and macrophytes/algae it was determined that the discharge is already affecting channel A which obviously provides much lower dilution than the main channel. No impact was noted in the main channel. It is noted that although water quality in this smaller channel has obviously deteriorated this has helped to maintain suitable conditions for freshwater mussels elsewhere in the river. In particular this channel gives additional protection in the event of a catastrophic event such as complete failure of the treatment plant. Given the vulnerability and comparative rarity of freshwater mussel their protection is considered to be the highest priority. In these circumstances the negative effects on channel A are considered less important than the potential impacts on mussel habitat in the main channel.

An examination of channel A indicates that high levels of silt have been deposited within this channel and thus was prevented from reaching the main channel where conditions are more suitable for mussels. Given the length of the channel (310m) and low velocity flows during dry periods it is estimated that only a small proportion of the suspended solids derived from the

treatment plant may actually reach the main channel under these conditions. It is difficult to estimate how much of this deposited silt is remobilised during spate events. This is because of the braided and complex channel which makes it difficult to predict how much water will move down channel A in high flow conditions. A basic visual estimate of flows and depths at low water conditions suggests that approximately 10% of the total flow in the Bandon River moves through Channel A. However it is noted that if some of this silt is remobilised during spate events there will be a high level of dilution available which will minimise any impact.

It is noted that the reduction in nutrients reaching channel A will help to improve water quality and the diversity of macroinvertebrates may improve although heavy shading will naturally limit macrophyte development. However, even if all discharges into this channel were stopped it is uncertain that this channel would support significant mussel populations. In the short term the high levels of silt will preclude colonisation by this species and given the depth of this silt in some areas and the relatively low flows it is considered unlikely that this silt will clear within a short time frame.

In circumstances where a new pipe is required it would be preferable to move the discharge point downstream so that it discharges completely into channel A. The terrestrial and riparian habitats to be affected would not be significantly different to those existing at the discharge point and the exact route could be designed to avoid the more locally important habitats such as individual or groups of trees. Channel A flows in a south-westerly direction and by choosing a suitable location the distance from the external hedgerow to the channel can be minimised.

However the development of a new pipeline could lead to the deposition of high levels of silt and other substances if strict mitigation measures are not put in place.

11.2 Existing discharge point

The advantage of using the existing pipe and discharge point is that disturbance of the river and riparian habitats can be avoided. This would allow existing riparian habitats to be maintained. Also, under these circumstances, the deposition of additional high levels of silt from the construction process could be avoided. An examination of the pipe indicates that it may be possible to reuse it. If the pipe in its entirety cannot be used even the use of the last section of pipe could prevent damage to the river and the generation of silt. This is particularly important in respect of freshwater mussel populations.

However it is predicted that the flow from the treatment plant will increase by approximately 37% in line with the increase of population to 3,500 p.e. As noted earlier at low flows, a spit of gravel

diverts most of the effluent flow into channel A. However the higher predicted flows from the upgraded treatment plant and/or changes in the structure of what is an essentially unstable channel structure could result in the removal of this spit of gravel. This could conceivably cause some of the effluent to reach channel B and thereby constitute a risk to mussels known to exist downstream of this point.

11.3 Discharge to the main channel upstream or downstream of the current discharge point

Discharge to the main channel of the Bandon River would result in greater dilution being available at the discharge point and based on mass balance equations and waste assimilative capacity calculations the increases in phosphorous and BOD levels would not cause serious deteriorations in water quality.

However the movement of the discharge point onto the main channel would expose habitats, which previously were pristine or marginally affected to increased levels of nutrients and suspended solids. A breakdown in treatment or the introduction of dangerous chemicals could have a serious impact on the main channel. There would also be high risks associated with the construction of a new discharge point, which could lead to siltation. In addition to possible impacts on freshwater mussels high levels of suspended solids could also impact on salmonid spawning gravels and increased nutrients could affect the diversity of aquatic plants.

11.4 Preferred disposal option

Based on the information outlined above it is recommended that, provided certain mitigation measures are put in place, the preferred option is the provision of a new discharge pipe discharging to channel A downstream of the existing discharge point. The exact route of the pipe should be designed to as to provide minimum disturbance to riparian habitats and prevent any instability in the riverbank. The use of the existing discharge point is considered a secondary option and the use of a new discharge on the Bandon River should be considered as a last resort.

12. MITIGATION MEASURES

It is important that damage to the riparian zone is minimised and it is recommended therefore that large machinery is excluded from this area. Hand tools should be used in close proximity (within 10m) of the river. As a general guideline the hedge at the eastern end of the field in which the treatment plant is located should form a boundary beyond which heavy machinery should be excluded.

The new pipeline should be located as close as practically possible to the beginning of channel A. This maximises the length of channel A available downstream of the discharge point.

However the new discharge point must be located so as to minimise the risk of erosion of the riverbank. In particular the number of mature trees to be removed should be minimised and positioning of the pipe should give due regard to specific trees which are stabilising the riverbank.

Due to the risks of pollution associated with in-stream works, a precast concrete structure is preferable where stabilisation of the discharge point is required.

It is important that the land-take area is restricted to the minimum necessary to provide the new discharge pipe. Storage of materials and vehicles should only take place outside of the riparian zone.

Consultation with an ecologist is recommended both in the design of a suitable route and during the construction phase. This route should be carefully marked out and agreed with Duchas prior to commencement of works.

13. CONCLUSIONS

Water quality in the Bandon River is generally satisfactory, however water quality deteriorates slightly downstream of the discharge point. It would appear therefore that the discharge is having a slight impact on water quality.

Notwithstanding the predicted increase in population over the next twenty years the improvement in treatment standards will result in significantly reduced discharge of nutrients to the Bandon River.

An examination of the existing discharge indicates that most of the effluent is being discharged into a side channel (Channel A). The distribution of silt, sewage fungus and algae indicates that water quality has seriously deteriorated in this side channel.

A survey determined that freshwater mussel is not present in channel A and given the levels of silt and algae the presence of other sensitive species such as brook lamprey and salmon is considered very likely. Given that freshwater mussel are present in other channels in this section of the Bandon River a discharge to channel A would create the least risk to this species.

A survey of terrestrial habitats did not detect any rare species however the riparian habitats noted are part of a larger woodland habitat and disturbance should therefore be minimised.

Due to the predicted increase in population the flow from the treatment plant will increase. In addition the pool, which receives the current discharge, is inherently unstable. A new downstream discharge point on channel A is therefore recommended.

It is important that damage to habitats is minimised during construction and large machinery should therefore be excluded from the riparian zone. The specific route of the pipeline should be designed so as to minimise any possible impacts.

APPENDIX 1: SITE SYNOPSIS

SITE NAME: BANDON RIVER
SITE CODE: 002171

The site consists of relatively short adjoining stretches of the Bandon and Caha Rivers. These rivers flow in a southerly direction to the east of Dunmanway, Co. Cork. Towards the southern end of the site the Bandon takes an easterly course. The predominant rock formations are Old Red Sandstone to the north and Carboniferous Slate stretching south of Dunmanway. Soils in the northern section consist of peats, podzols and skeletal soils. The southern section consists of alluvial soils and Brown Podzolics.

The east-west exposure of Old Red Sandstone to the north of Dunmanway displays distinct ridgelines of bare rock with poor pasture and scrub. In this area around Lovers Leap the Bandon River cuts a narrow channel southwards, cascading over a series of rock steps through a narrow valley. Below this and above Long Bridge the river widens and meanders through a fertile floodplain. Immediately south of the Long Bridge the reduced flow gradient and broad, flat valley permit the main channel to split and extend into a network of braided streams forming islands.

The site is important for a number of reasons. It contains a small though very important example of the Annex I priority habitat Alluvial Forest as well as good examples of another Annex I habitat - Floating River Vegetation. The Annex II animal species Otter, Salmon (*Salmo salar*), Brook Lamprey (*Lampetra planeri*) and Freshwater Pearl Mussel (*Margaritifera margaritifera*) occur. The populations of the Mussel are thought to be nationally important. The Kingfisher, listed under Annex I of the E.U. Birds Directive, breeds along the river.

Wet broadleaved semi-natural woodland is found in an undisturbed area of braided river channels and islands below Dunmanway. The river channels are well defined and the islands appear solid. Canopy dominants are Hazel (*Corylus avellana*) (multi-stemmed) and Sessile Oak (*Quercus petraea*), with scattered Downy Birch (*Betula pubescens*), Ash (*Fraxinus excelsior*), Rusty Willow (*Salix cinerea* subsp. *oleifolia*) and Alder (*Alnus glutinosa*). There is a very sparse understorey composed of Whitethorn (*Crataegus monogyna*), Holly (*Ilex aquifolium*) and saplings of Hazel and Sessile Oak. Epiphytes are abundant on trees: Ivy (*Hedera helix*), Honeysuckle (*Lonicera periclymenum*) and bryophyte species such as *Isothecium myosuroides*. The ground flora is dominated by Ramsons (*Allium ursinum*), Wood Anemone (*Anemone nemorosa*), Ivy with abundant/scattered Lesser Celandine (*Ranunculus ficaria*), Wood Sedge (*Carex remota*) and Irish Spurge (*Euphorbia hyberna*). Goldilocks Buttercup (*Ranunculus auricomus*), a very rare plant in Co. Cork, has been recently recorded from this woodland.

Floating river vegetation is found along the length of the river and is dominated by Water-crowfoot (*Ranunculus* spp). Other aquatic plants found include Alternate Water-milfoil (*Myriophyllum alterniflorum*), Broad-leaved Pondweed (*Potamogeton natans*) and four Water-starwort species (*Callitriche* spp.). Mosses present on rocks and attached to tree roots include *Fontinalis antipyretica* in slack flow areas and *Fontinalis squamosa, Rhynchostegium riparioides* and *Amblystegium riparium* in

moderate flows. The landward fringe of deep pools supports Yellow Water-lily (*Nuphar lutea*), Bogbean (*Menyanthes trifoliata*), Marsh Marigold (*Caltha palustris*), Water Mint (*Mentha aquatica*) and Fool's Water-cress (*Apium nodiflorum*). Shoreweed (*Littorella uniflora*) and Six-stamened Waterwort (*Elatine hexandra*) are two species of local importance which are found in the river. In moderate current flow below the Long Bridge, the larger stones are covered by the moss *Brachythecium rivulare* and the Liverwort *Chiloscyphus polyanthos* var. *polyanthos.* Boulders covered in *Nostoc* algae are probably of local occurrence in Ireland. The liverwort *Riccardia chamaedryfolia* and the moss *Fissidens crassipes* found under the Long Bridge are considered to be rare in Ireland.

Heath in mosaic with wet grassland, exposed rock, scrub and improved grassland covers up to 30% of the site north of Long Bridge. Typical heath plants growing in association with the rocks are abundant Western Gorse (*Ulex gallii*), Ling Heather (*Calluna vulgaris*), Bell Heather (*Erica cinerea*), Cross-leaved Heath (*E. tetralix*), Tormentil (*Potentilla erecta*), Heath Grass (*Danthonia decumbens*), Stonecrops (*Sedum* spp.), small amounts of St Patrick's Cabbage (*Saxifraga spathularis*) and many lichen species.

Some small areas of woodland occur within the site north of Long Bridge. Tree species such as Sessile Oak, Beech (*Fagus sylvatica*), Scots Pine (*Pinus sylvestris*) and Downy Birch are found with an understorey of Holly, Hazel, Rowan and Rusty Willow.

Two Red Data Book plant species have been recorded in the past from within or close to the site - Greater Broomrape (*Orobanche rapum-genistae*), a species that grows on the roots of legumes, and Small White Orchid (*Pseudorchis albida*), a species of upland pastures and heaths that is protected under the Flora Protection Order 1999.

The river below Long Bridge is an important inland site in Cork for Mute Swan and approximately 20 individuals are present throughout the year along this stretch. Several hundred Snipe use the site during the winter. Other birds seen regularly within the site are Grey Heron, Cormorant and Mallard, while low numbers of Lapwing and Teal visit during the winter.

The site supports many of the mammal species occurring in Ireland. Those which are listed in the Irish Red Data Book include Badger, Irish Hare, Daubenton's Bat and Pipistrelle. The two bat species can be seen feeding along the river and roosting under the old bridges.

Landuse at the site consists mainly of sheep grazing in the northern section and cattle grazing on improved grasslands below Lovers Leap and further south. In the area between Milleenanannig and Bealaboy Bridge land reclamation and drainage is taking place. In the area of exposed rock on the higher terrain above Ardcahan Bridge some land reclamation and forestry is carried out.

This site contains good examples of two habitats listed on Annex I of the E.U. Habitats Directive - alluvial forest and floating river vegetation - and supports populations of four Annex II species - Otter, Salmon, Brook Lamprey and Freshwater Pearl Mussel. The presence of a number of Red Data Book plant and animal species adds further interest to the site.

APPENDIX 2: SPECIES LIST PLANTS

Alnus glutinosa	Alder
Agrostis spp.	Bent grass
Ajuga repans	Bugle
Alisma plantago-aquatica	Water plaintain
Alopecurus geniculatus	Marsh Foxtail
Alopecurus pratensis	Meadow foxtail
Angelica archangelica	Angelica
Anthoxanthum odoratum	Sweet vernal grass
Anthriscus sylvestris	Cow parsley
Apium nodiflorum	Fools watercress
Asplenium scolopedrium	Hartstongue Fern
Athyrium filix-femina	Ladies Fern
Bellis perennis	Ribwort Plantain
Betula pubescens	Downy Birch
Blechnum spicant	Hard Fern
Callitriche sp.	Starwort
Calstegia sepium	Hedge Bindweed
Caltha palustris	Marsh Marigold
Capsella bursa-pastoris	Shepards Purse
Cardamine pratensis	Mayflower
Carex flacca	Carnation Sedge
Carex remota	Remote sedge
Carex rostrata	Bottle Sedge
Carex spp.	Sedge
Centuarea nigra	Lesser Knapweed
Chrysplenium oppositifolium	Golden Saxifrage
Cirsium arvenesis	Creeping thistle
Cirsium palustre	Marsh Thistle
Cirsium spp.	Thistle
Conopodium majus	Pignut
Corylus avellana	Hazel
Crataegus monogyna	Hawthorn
Cynosuros cristatus	Crested dogs tail
Dactylis glmerata	Cocksfoot
Digitalis purpurea	Foxglove
Dryopteris afffinis	Scaly Male Fern
Dryopteris filix-mas	Male Fern
Eleocharis palustris	Common spike rush
Endymion non-scriptus	Bluebell
Eymus repens	Couch Grass
Filiendula ulmaria	Meadow sweet
Fontinalis sp.	Moss
Fraxinus excelsior	Ash
Galium aparine	Goose grass
Geraium robertianum	Herb Robert
Geran ium dissectum	Cut leaved cranesbill
Geum urbanum	Wood avens

Helix hedera	Ivy
Heracleum sphondylium	Hogweed
Ilex aquifolium	Holly

APPENDIX 2: SPECIES LIST PLANTS CONTINUED

Iris psuedocorus	Yellow Flag

APPENDIX 4: FRESHWATER MUSSEL SURVEY

An investigation of the status of *Margaritifera margaritifera* (L.) in the side channel of the Bandon River receiving effluent from the Dunmanway Sewage Treatment Plant.

Carried out on behalf of:

Dixon. Brosnan

Environmental consultants

Report by:

Dr. Eugene Ross,

Freshwater Bivalve Investigations.

Chestnut Drive, Oakpark, Tralee, Co. Kerry.

Submitted: June, 2004.

Contents

Introduction

The sewage treatment plant in Dunmanway, Co. Cork is to be upgraded. The existing treatment plant is located east of the town within 100m of the Bandon River. Effluent from the treatment plant is discharged by pipe (Photograph 1) into the Bandon River at a point where a small side channel diverges from the western side of the river (Photograph 2). This part of the Bandon River and adjacent lands have been designated as a Special Area of Conservation. The area contains good examples of two habitats listed on Annex I of the E.U. Habitats Directive - alluvial forest and floating river vegetation - and supports populations of four Annex II species - Otter, Salmon, Brook Lamprey and Freshwater Pearl Mussel.

The pearl mussel is one of three species of large Unionacean bivalves found in Irish freshwaters. The species may occur in fast-flowing, oligotrophic, calcium deficient streams and rivers, where it can grow to lengths of 159mm (Jackson 1925) and live to ages well in excess of 100 years (Ross 1984). *Margaritifera* has been recorded in most parts of Ireland with the exception of the central limestone plain but several studies have confirmed that a significant decline has occurred in some Irish populations, notably in northern and eastern areas (Ross 1988, Moorkens and Costello 1994, Beasley and Roberts 1996). Such declining populations are usually characterised by a predominance of older mussels and an absence of juvenile recruitment (Bauer 1983).

Although very widely distributed across northern Europe, Eurasia and North America, *Margaritifera* is declining throughout its range and is extinct or seriously threatened in many parts of Europe (Wells et al. 1983). The main cause of this decline is deteriorating river water quality although a variety of other factors are also implicated (Moorkens 1999). The species is on the IUCN Invertebrate Red Data List and is protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention). *Margaritifera* is also listed in Annex II and Annex V of the Habitats Directive (92/43/EEC) and is protected by law in Ireland under the 1976 Wildlife Act (Statutory Instrument No. 112, 1990).

The objectives of this investigation were to determine if *Margaritifera* was present in the side channel receiving the effluent from the Dunmanway sewage treatment plant, and if so, to quantify the number of mussels present, and to advise on the best means of minimising the impact of the proposed work on the *Margaritifera* population in that part of the Bandon River.

Study area and methods

The existing sewage effluent discharge point is located on the western bank of the Bandon River, at the downstream end of “The Captains Hole”. Eight metres downstream from the discharge point a small side channel, hereafter referred to as “Channel A”, diverges from the main channel (Figure 1, Photograph 2) having received the sewage effluent. “Channel A” then flows in a southerly direction before rejoining the main river channel at “The Meeting of the Waters”(Photograph 3). The site was visited on three occasions (April 23rd, May 18th and May 25th, 2004) and observed under normal and low water flow conditions. The entire length of “Channel A” was carefully searched for *Margaritifera margaritifera* by visual examination, and by examining the stream substrate using a viewing device while wading. Due to significant health and safety considerations relating to the highly contaminated nature of the effluent present, no attempt was made to search “Channel A” for mussels by

snorkelling. Representative photographs of “Channel A” habitat were taken and its length was measured using a surveying tape. The work was carried out under licence issued by the National Parks and Wildlife Service.

Results

On each of the three days that the site was examined, weather conditions were ideal, with generally bright sunlight and excellent underwater visibility in the main river channel. All the sewage effluent emanating from the discharge pipe appeared to be flowing into “Channel A”, which diverged from the main channel just below the effluent discharge point. “Channel A” was 310m in length and generally 3-5m in width, reaching a maximum of 8m. Water depth in “Channel A” was generally shallow and varied from a few centimetres in riffle areas to a maximum observed depth of 54cm.

The substrate of the upstream section of “Channel A” was covered in a layer of sewage fungus (Photograph 4), and in non-riffle areas a deep layer of foul smelling sediment had accumulated. In the downstream half of “Channel A” the non-riffle areas of substrate also had a deep layer of sediment, which was often covered with a layer of filamentous green algae (Photographs 5 and 9). A pronounced smell of sewage was evident all along “Channel A” and this increased as one approached the effluent discharge point.

On April 23rd, the water level was normal, and underwater visibility was poor in “Channel A” close to the sewage outfall, with pronounced turbidity and very high levels of suspended solids due to the sewage effluent (Photograph 6). However, conditions were adequate for searching the substrate for *Margaritifera* along most of the length of “Channel A”. No mussels were observed.

On May 18th the water level had dropped significantly after a prolonged dry spell and visibility was very poor in the 50-80m stretch of “Channel A” immediately downstream of the effluent discharge point. No mussels were observed in “Channel A”, although mussels were observed in the main river channel within 30m of the effluent discharge point and within 30m of the point where “Channel A” rejoined the main river channel at “The Meeting of the Waters”. It was noted that due to the low water levels, a low bank of gravel extended several metres upstream of the effluent discharge point, completely separating “Channel A” and the sewage effluent from adjacent channels (Photograph 7)

On May 25th the water level had risen slightly after overnight rain and visibility was again poor in the upper part of “Channel A”, which seemed to be receiving an increased volume of sewage effluent than that observed on the previous two visits. Once again no mussels were observed in “Channel A”.

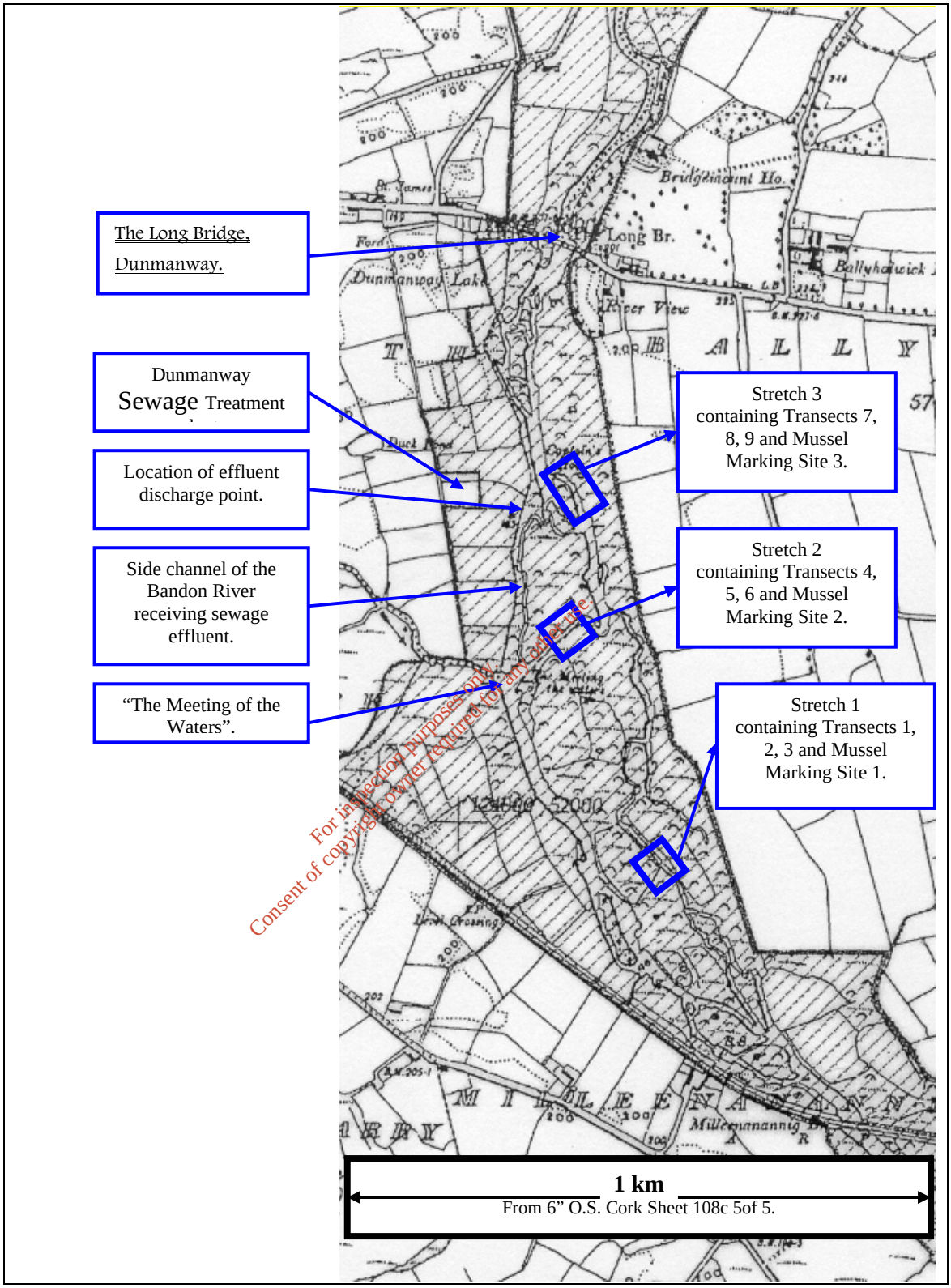


Figure 1. Map of the Bandon River in the area of alluvial woodland downstream of the Long Bridge (Dunmanway, Co. Cork). The locations of the Dunmanway Sewage Treatment Plant, the sewage effluent discharge point, "Channel A" receiving the effluent, and the three river stretches where a long term monitoring program of the Bandon River population of *Margaritifera margaritifera* is ongoing, are also indicated.

Discussion

The habitat conditions observed in "Channel A", which receives the effluent from the Dunmanway sewage treatment plant were absolutely inimical to the presence of *Margaritifera margaritifera*.

The species normally occurs in a narrow range of habitat types, with the main prerequisites being clean, oligotrophic, well-oxygenated waters with little sedimentation and a firm substrate of gravels and sand. Unfortunately none of these conditions were present in "Channel A" during the current investigation. The species is abundant in other side channels and in parts of the main channel of the Bandon River adjacent to "Channel A", where suitable conditions do exist (Ross 2001).

Margaritifera uses its gills for respiration and filter feeding. The very high levels of suspended organic solids observed (Photograph 6) downstream of the effluent discharge pipe would very quickly clog up the gills of any mussels present, greatly reducing their ability to respire and feed. Prolonged exposure to such high levels of suspended solids would result in starvation of the mussels or respiratory stress leading to asphyxiation. During the warm summer months these problems would be further exacerbated because *Margaritifera* uses its outer gills as brood pouches for the developing Glochidia larvae, thereby further reducing their respiratory and feeding efficiency, at a time when oxygen levels can be at their lowest.

Recolonisation of the habitat by juvenile mussels, that normally spend several years buried in coarse sand and gravel substrates, would also be prevented by the conditions observed in "Channel A". The juveniles require a constant flow of oxygen down into the substrate interstices, and the observed accumulation of sediment (particularly organic sediment) and layers of filamentous algae on top of the substrate would prevent oxygen reaching the juveniles below, and result in their death.

The habitat conditions in "Channel A" render it impossible for pearl mussels to survive there for any significant period of time. The upgrading of the sewage treatment plant should result in an improvement in the habitat quality, both in "Channel A", and further downstream in the main Bandon River channel where *Margaritifera* also occurs (F. McMahon, pers. comm.).

On the three occasions when the site was visited, all the sewage effluent appeared to be entering "Channel A", with no apparent entry of effluent into the other channels. During the very low flow conditions observed on May 18th, 2004, the low bank of gravel (Photograph 7) exposed by the falling water levels acted as a physical barrier, preventing any possibility of effluent entering other adjacent channels. However, it is likely that this gravel bank is not a permanent feature and may change in height or extent, or even disappear after periods of high flow/spate. The site was observed only under normal and low flow conditions, and it is possible that under conditions of higher flow, some effluent

could be carried into other channels adjacent to “Channel A” which do contain mussels. This possibility could be prevented by moving the discharge point downstream so that the effluent discharged directly into “Channel A” after it had diverged from the main channel, thus removing any risk to mussels in the adjacent channels. However this option should only be considered if the necessary works could be carried out without significant negative impact to the streambed, the bank or the adjacent riparian areas.

Recommendations

In order to minimise or avoid any negative impacts associated with the proposed upgrading of the Sewage Treatment Plant, the following measures should be adopted:

1. The discharge point could be moved downstream to ensure that all effluent enters directly into “Channel A”, thereby preventing the possibility of effluent entering other channels containing mussels, during high water flow conditions. This course of action should only be considered if the required works can be carried out without disturbance of the streambed, or significant negative impact on the bank or the adjacent riparian areas.
2. If the works required to complete option 1. above cannot be undertaken without significant negative impact, then the existing effluent discharge point should be retained.
3. Works involving any disturbance to the streambed or bank of “Channel A” should be avoided if possible, but if absolutely necessary, they should be carried out by hand in order to reduce disturbance or damage to “Channel A” and the riparian area.
4. Entry of machines into the riparian area or any river channel should be prevented.
5. Any activity resulting in the introduction of soil, sediment, fuel, hydraulic fluid, or other pollutants into the river as a result of the proposed works should be prevented.
6. Any disturbance of the riparian area should be minimised and made good immediately by removal of loose soil and replanting with suitable species.

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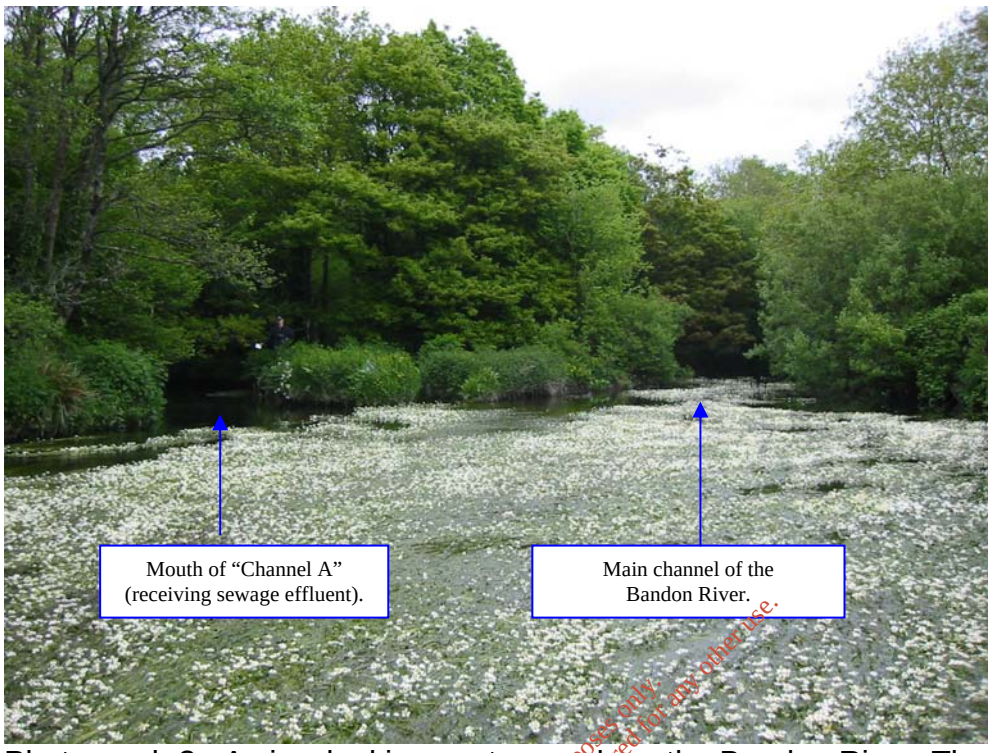
Photographs.

Photograph 1. The site of the sewage effluent discharge pipe into “Channel A” of the Bandon River at Dunmanway, Co. Cork.

Photograph 2. A view upstream from the point where “Channel A” diverges from the main channel of the Bandon River. The sewage effluent discharge pipe is visible on the western bank.

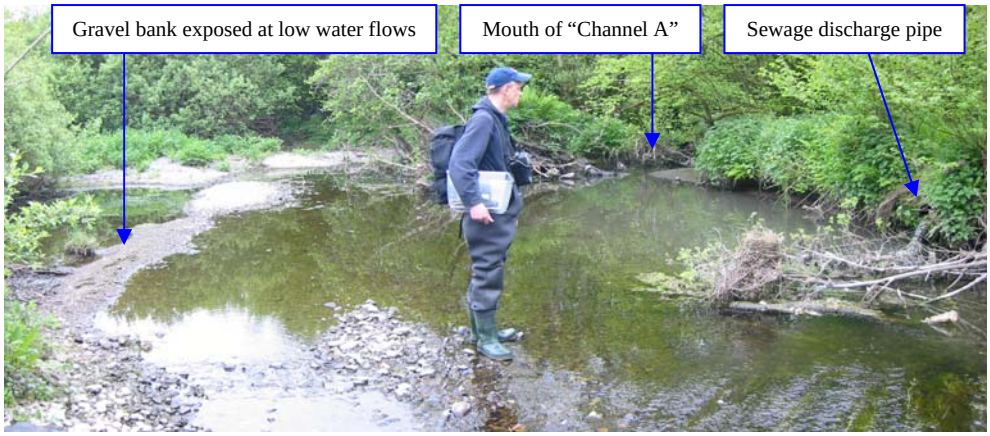


Photograph 3. A view looking upstream along the Bandon River. The point where “Channel A” rejoins the main river channel is visible on the left hand side of the picture.

Photograph 4. Sewage fungus present on the substrate in the upstream section of “Channel A”.

Photograph 5. A view of the substrate in the downstream half of “Channel A”, showing the accumulation of sediment and a layer of filamentous green algae.

Photograph 6. High levels of suspended solids in the water and a layer of sewage fungus coating the substrate close to the sewage effluent discharge point.



Photograph 7. A view downstream showing the location of the sewage discharge point, the mouth of “Channel A”, and the low bank of gravel exposed during low water conditions, separating “Channel A” from adjacent channels.

Photograph 8. A view of “Channel A” habitat approximately 100m downstream of the sewage effluent discharge point. Note the high turbidity of the water.

Photograph 9. A view of “Channel A” habitat approximately 190m downstream of the sewage effluent discharge point. Note the substrate consisting of soft sediment and the developing layer of filamentous green algae.

ANNEX 2: Check List For Regulation 16 Compliance

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

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

Regulation 16(1) In the case of an application for a waste water discharge licence, the application shall -		**Attachment Number**	**Checked by Applicant ✓**
(a)	give the name, address, telefax number (if any) and telephone number of the applicant (and, if different, of the operator of any treatment plant concerned) and the address to which correspondence relating to the application should be sent and, if the operator is a body corporate, the address of its registered office or principal office,	**Section B**	✓
(b)	give the name of the water services authority in whose functional area the relevant waste water discharge takes place or is to take place, if different from that of the applicant,	**Section B**	✓
(c)	give the location or postal address (including where appropriate, the name of the townland or townlands) and the National Grid reference of the location of the waste water treatment plant and/or the waste water discharge point or points to which the application relates,	**Section B**	✓
(d)	state the population equivalent of the agglomeration to which the application relates,	**Section B**	✓
(e)	specify the content and extent of the waste water discharge, the level of treatment provided, if any, and the flow and type of discharge,	**Section C**	✓
(f)	give details of the receiving water body, including its protected area status, if any, and details of any sensitive areas or protected areas or both in the vicinity of the discharge point or points likely to be affected by the discharge concerned, and for discharges to ground provide details of groundwater protection schemes in place for the receiving water body and all associated hydrogeological and geological assessments related to the receiving water environment in the vicinity of the discharge.	**F1**	✓

Regulation 16(1) continued…/		Attachment Number	Checked by Applicant ✓
(g)	identify monitoring and sampling points and indicate proposed arrangements for the monitoring of discharges and, if Regulation 17 does not apply, provide details of the likely environmental consequences of any such discharges,	**E2**	✓
(h)	in the case of an existing waste water treatment plant, specify the sampling data pertaining to the discharge based on the samples taken in the 12 months preceding the making of the application,	**E4**	✓
(i)	describe the existing or proposed measures, including emergency procedures, to prevent unintended waste water discharges and to minimise the impact on the environment of any such discharges,	**F1**	✓
(j)	give particulars of the nearest downstream drinking water abstraction point or points to the discharge point or points,	**F2**	✓
(k)	give details, and an assessment of the effects, of any existing or proposed emissions on the environment, including any environmental medium other than those into which the emissions are, or are to be made, and of proposed measures to prevent or eliminate or, where that is not practicable, to limit any pollution caused in such discharges,	**F1**	✓
(l)	give detail of compliance with relevant monitoring requirements and treatment standards contained in any applicable Council Directives of Regulations,	**G1**	✓
(m)	give details of any work necessary to meet relevant effluent discharge standards and a timeframe and schedule for such work.	**G1**	✓
(n)	Any other information as may be stipulated by the Agency.		✓

Regulation 16(3) Without prejudice to Regulation 16 (1) and (2), an application for a licence shall be accompanied by -		**Attachment Number**	**Checked by the applicant ✓**
(a)	a copy of the notice of intention to make an application given pursuant to Regulation 9,	**B8**	✓
(b)	where appropriate, a copy of the notice given to a relevant water services authority under Regulation 13,	**Not Applicable**	✓
(c)	Such other particulars, drawings, maps, reports and supporting documentation as are necessary to identify and describe, as appropriate -		
	(i) the point or points, including storm water overflows, from which a discharge or discharges take place or are to take place, and	**B8 & E2**	✓
	(ii) the point or points at which monitoring and sampling are undertaken or are to be undertaken,	**D2**	✓
(d)	such fee as is appropriate having regard to the provisions of Regulations 38 and 39.	**B9 (iii)**	✓
Regulation 16(4) An original application shall be accompanied by 2 copies of it and of all accompanying documents and particulars as required under Regulation 16(3) in hardcopy or in an electronic or other format as specified by the Agency.			
Regulation 16(5) For the purpose of paragraph (4), all or part of the 2 copies of the said application and associated documents and particulars may, with the agreement of the Agency, be submitted in an electronic format specified by the Agency.			
	Signed original.		✓
	2 hardcopies of application provided or 2 CD versions of application (PDF files) provided.		✓
	1 CD of geo-referenced digital files provided.		✓
Regulation 17 Where a treatment plant associated with the relevant waste water works is or has been subject to the European Communities (Environmental Impact Assessment) Regulations 1989 to 2001, in addition to compliance with the requirements of Regulation 16, an application in respect of the relevant discharge shall be accompanied by a copy of an environmental impact statement and approval in accordance with the Act of 2000 in respect of the said development and may be submitted in an electronic or other format specified by the Agency			
	EIA provided if applicable	Not Applicable	
	2 hardcopies of EIS provided if applicable.		
	2 CD versions of EIS, as PDF files, provided.		