



Dublin City Council
Comhairle Cathrach Bhaile Átha Cliath

THE DUBLIN BAY PROJECT



DUBLIN BAY WATER QUALITY MONITORING PROGRAMME

Fourth Annual Report

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DUBLIN CITY COUNCIL
Environment, Planning & Development

THE DUBLIN BAY PROJECT

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DUBLIN BAY WATER QUALITY MONITORING PROGRAMME

Fourth Annual Report

Waterways
Public Health & Environmental
Control Division

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Executive Summary

1. Introduction

This report represents the results of analysis carried out during the fourth year of the Dublin Bay monitoring programme. The first two years of the monitoring programme involved acquiring baseline data prior to the upgrading of the Ringsend Sewage Treatment Works. The third year was effectively a transition year. Up until late November/early December 2002 primary treatment was in operation at Ringsend Sewage Treatment Works. The sequential batch reactors (SBRs) were gradually brought on stream in December 2002. During the fourth year of the programme all of the SBRs were in operation. The five-year programme commenced in June 2000 and involves acquiring information on the Ringsend effluent, Liffey Estuary, offshore waters and bathing waters prior to, during and after the upgrading of the Sewage Treatment Works at Ringsend. Dublin Underwater Subaqua Club (DUSAC) carried out three diving surveys in 2000, 2002, 2003 and 2004 in order to assess the densities of the sand mason (*Lanice conchilega*) and Ectocarpus on the north side of the Bay parallel to Dollymount beach. These dives are to be repeated in 2005. The results of these dives in addition to results for sediment samples taken from the littoral and sublittoral zones of Dublin Bay will be presented in a Technical Report at the end of the five-year programme.

2. Liffey Estuary

There were twelve surveys of the Liffey estuary during the fourth year of the monitoring programme (July 2003 to June 2004). Since the upgrading of the Ringsend Treatment Works there has been a significant improvement in the Biochemical Oxygen Demand results for samples taken from the site 'off the NTW Works outfall' down to the Poolbeg Lighthouse. Only 2.7% of the BOD results in this zone of the Liffey exceeded 4mgO₂/l compared with 24.3% and 21.8% in the first and second years of the monitoring programme respectively. In terms of the levels of nutrients, there are indications that the levels of total oxidised nitrogen are increasing in the vicinity of the New Treatment Works outfall. This would be expected to happen as a consequence of nitrification of the sewage at Ringsend. The ammoniacal nitrogen values were generally lower than the values recorded during the first three years of the programme although it should be noted that there were a number of results in excess of 0.8mgN/l. These elevated results were most likely associated with discharges from Ringsend. During the bathing season months the majority of coliform results for samples taken from this zone of the Liffey complied with the EU mandatory limit values. However, outside of the bathing season there were a number of elevated bacteriological results, again probably associated with discharges from Ringsend. The reactive phosphate and total phosphorous values were similar to values recorded during the first three years of the programme. The indications are that the total nitrogen and particulate nitrogen plus dissolved organic nitrogen levels are decreasing in the vicinity of the Ringsend Treatment Works outfall. However there were discharges on a significant number of the survey dates and it is difficult to accurately assess the impact of the upgrading of the Works while these discharges were occurring. The discharges ceased in May 2004.

3. Offshore Waters

There were nine surveys of Dublin Bay (offshore waters) in 2003/4. It was not possible to carry out surveys in October 2003 March and April 2004 due to adverse

weather conditions. During the fourth year of the monitoring programme all of the total and faecal coliform results for samples taken during the bathing season months complied with the blue flag limit values. UV sterilisation of the Ringsend effluent occurs during the bathing season. Outside of the bathing season although there has been an improvement in the number of samples complying with the EU mandatory limits for coliforms, 5.9% of total coliform and 10% of faecal coliform results exceeded the mandatory limit values. The high coliform results were probably associated with the discharges from Ringsend. In terms of the levels of nutrients there are indications that the levels of ammoniacal nitrogen and total nitrogen are decreasing in the offshore waters and there is a slight increase in the TON values during the summer months. However, more surveys are required of both the Liffey estuary and the offshore waters to accurately assess the impact of the secondary treatment process on the levels of nutrients in both water bodies.

4. Bathing Waters

During the 2004 bathing season the bacteriological quality of the water at Seapoint, Killiney, Blackrock, Dollymount North and Dollymount South complied with the blue flag limit values. Samples taken from Dollymount Middle/Bathing Zone complied with the blue flag limit values for total and faecal coliforms but not faecal streptococci. Three faecal streptococci results out of 21 i.e. 14% exceeded the limit of 100cfu/100ml. Two of these samples were taken after very heavy rain which had a negative impact on the water quality due to combined sewer overflows discharging into the river Liffey, runoff from the land and overflows from Ringsend. As in 2003 there was a significant improvement in the bacteriological quality of samples taken from the Bull Wall and Dollymount South during the 2004 bathing season when compared with the bacteriological quality prior to the upgrading of the Ringsend Treatment Works. However during 2004 three of the eighteen samples taken from the Bull Wall exceeded the mandatory limit value for total coliforms. Two of these elevated results were recorded after heavy rainfall. The reasons for the third failure are not clear. Although there was an improvement in the water quality in the Liffey estuary at the Poolbeg lighthouse the results were not as good as those recorded during the 2003 bathing season even though the discharges from Ringsend ceased in May 2004. The bathing water at Merrion and Sandymount complied with the EU mandatory limit values but not the blue flag limit values. There are a number of potential sources of pollution in the Sandymount/Merrion area including the Saint Alban's overflow pipe, the Elm Park Stream which flows onto the beach at Merrion, gullies on the road in the Sandymount area discharge onto the beach after rain. There is also a problem with faecal matter from dogs on the beach at Sandymount. Investigations are still underway to try to identify and eliminate sources of pollution in the Sandymount/Merrion area.

5. Ringsend Effluent

The Sequential Batch Reactors were in operation during the fourth year of the monitoring programme. There has been a significant improvement in the effluent quality since the commencement of the secondary treatment process. However the effluent water quality is not yet consistently complying with limits specified in the Urban Waste Water Directive (UWWD). Between July 2003 and June 2004, 74%, 90% and 51% of the BOD, COD and Suspended Solids results respectively complied the UWWD limits.

1. Introduction

This report represents the results of the Dublin Bay monitoring programme for the period July 2003 to June 2004 - the fourth year of a five-year monitoring programme which commenced in June 2000. The First, Second and Third Annual Reports were issued in November 2001, October 2002 and October 2003 respectively. The programme, which is being carried out by the Central Laboratory based in Marrowbone Lane, involves acquiring information on the Ringsend effluent, Liffey Estuary, offshore waters and bathing waters prior to, during and after the upgrading of the Sewage Treatment Works at Ringsend. The first two years of the programme involved acquiring baseline data. The third year was effectively a transition year, as between July and November/December 2002 the treatment process at Ringsend was still primary treatment. In December 2002 the Sequential Batch Reactors (SBRs) were gradually phased into operation. During the fourth year all of the SBRs were in operation and uv sterilisation of the effluent occurred during the bathing season months (mid May to the end of August). The Ringsend Sewage Treatment Works has been upgraded in order to comply with the EU Urban Waste Water Directive (91/271/EEC) which specifies that waste water shall before discharge be subjected to secondary treatment or equivalent treatment. This treatment process must be upgraded to tertiary treatment by May 2008 in order to comply with the Urban Waste Water Treatment Regulations, 2001 (S.I. No 254 of 2001). This regulation designated the Liffey Estuary as a 'sensitive area' for the purposes of urban waste water treatment and requires the provision of nutrient removal. The existing sewage treatment plant at Ringsend is the main source of waste discharges to the Liffey Estuary and Dublin Bay. It is expected that there will be a significant positive impact on the receiving waters when the work is complete.

2. Dublin Bay Project

A total of £1R200 million is being spent on the Dublin Bay Project headed by Battie White. In brief the Project involves four separate elements:

1. Upgrading the existing Ringsend waste water treatment works from primary to secondary and subsequently tertiary treatment.
2. A sludge treatment works was built at Ringsend (completed in 1999) hence sludge is no longer being dumped at sea.
3. A new pumping station has been built at Sutton.
4. A submarine pipe has been laid under the Bay to bring the waste water from Sutton to Ringsend for treatment.

3. Sampling Locations

The zones in Dublin Bay have been described in detail in the Dublin Bay Water Quality Management Plan. The Dublin Bay monitoring programme focused on the Liffey Estuary, Dublin Bay offshore waters and the bathing waters as described below.

3.1 Liffey Estuary

The monitoring programme for the Estuary concentrated on the sites between Butt Bridge and the Poolbeg Lighthouse. Seventeen sites were chosen within this area of the estuary and both surface and near bottom (depth) samples were taken. All samples were taken in mid-channel. Twelve surveys were carried out during the period July 2002 to June 2003. It should be noted that there were only two surveys of the locations at Butt Bridge and the Custom House. The smaller boat that is required to reach these locations was unavailable for surveys. The sample stations for the Liffey Estuary are listed in Table 1 and displayed in Figure 1 below.

Table 1 –Sample Stations for Liffey Estuary

D/S Butt Bridge (BB)
Custom House (CH)
Matt Talbot Bridge (MTB)
Cardiff Lane (CL)
Dodder /Grand Canal Basin (D/GCB) to Liffey (D/GCB)
D/S Toll Bridge (TB)
Alexandra Basin (AB)
Ocean Pier (OP)
Old Treatment Works Outfall (OTW)
off Tanker Pier (TP)
off New Treatment (Ringsend) Works Outfall (NTW)
off Old Rathmines & Pembroke Outfall (R & P)
Half Moon Club Inside Wall (HM)
Poolbeg Inside Wall (PB)
X15 N 53.34469 W 6.16854 (Landfill Marker) (X15)
X16 N 53.34516 W 6.17561 (Green Lighthouse) (X16)
X17 N 53.34540 W 6.18295 (Round Pillar) (X17)

3.2 Dublin Bay – Offshore Waters

The sampling plan for the Bay waters entailed sampling twenty-four locations. Sampling from Points 8, 10, 16 and 19 was discontinued after the first two surveys mainly due to time constraints (see First Annual Report November 2001). An emphasis was placed on the sublittoral zone inside the 10 m depth contour. Samples were taken at two metres depth. In addition to the 2 m depth samples, surface and near

bottom (depth) samples were also taken at four locations. These additional samples were analysed for nutrients, salinity, temperature and dissolved oxygen.

The sampling points with their relevant source codes and co-ordinates are listed in Table 2 below and displayed in Figure 2.

Table 2 - Sample Stations for Dublin Bay-Offshore Waters

Source Code	Point	Latitude hddd.ddddd°	Longitude hddd.ddddd°
40270	Point 1	N 53.34435	W 6.13292
40271	Point 2	N 53.34666	W 6.14500
40272	Point 3	N 53.35000	W 6.13667
40273	Point 4	N 53.35500	W 6.13350
40274	Point 5	N 53.36000	W 6.13166
40275	Point 6	N 53.35500	W 6.11000
40276	Point 7	N 53.35000	W 6.11333
40278	Point 9	N 53.34433	W 6.10697
40280	Point 11	N 53.35082	W 6.09873
40281	Point 12	N 53.34933	W 6.07638
40282	Point 13	N 53.35491	W 6.05830
40283	Point 14	N 53.33996	W 6.07757
40284	Point 15	N 53.33892	W 6.09667
40286	Point 17	N 53.33975	W 6.11532
40287	Point 18	N 53.33360	W 6.11730
40289	Point 20	N 53.33265	W 6.10046
40290	Point 21	N 53.33345	W 6.09080
40291	Point 22	N 53.32635	W 6.12155
40292	Point 23	N 53.30818	W 6.10681
40293	Point 24	N 53.30445	W 6.13664
40294	Point 25	N 53.31095	W 6.15140
40295	Point 26	N 53.32379	W 6.14964
40296	Point 27	N 53.33330	W 6.13696
40297	Point 28	N 53.33667	W 6.16167

3.3 Shoreline (Bathing Waters)

The bathing waters were sampled at least weekly during both the 2002 and 2003 bathing season (mid-May to the end of August). Fourteen sampling stations were chosen and these are listed below. Bathing is regularly practised at all of these sites

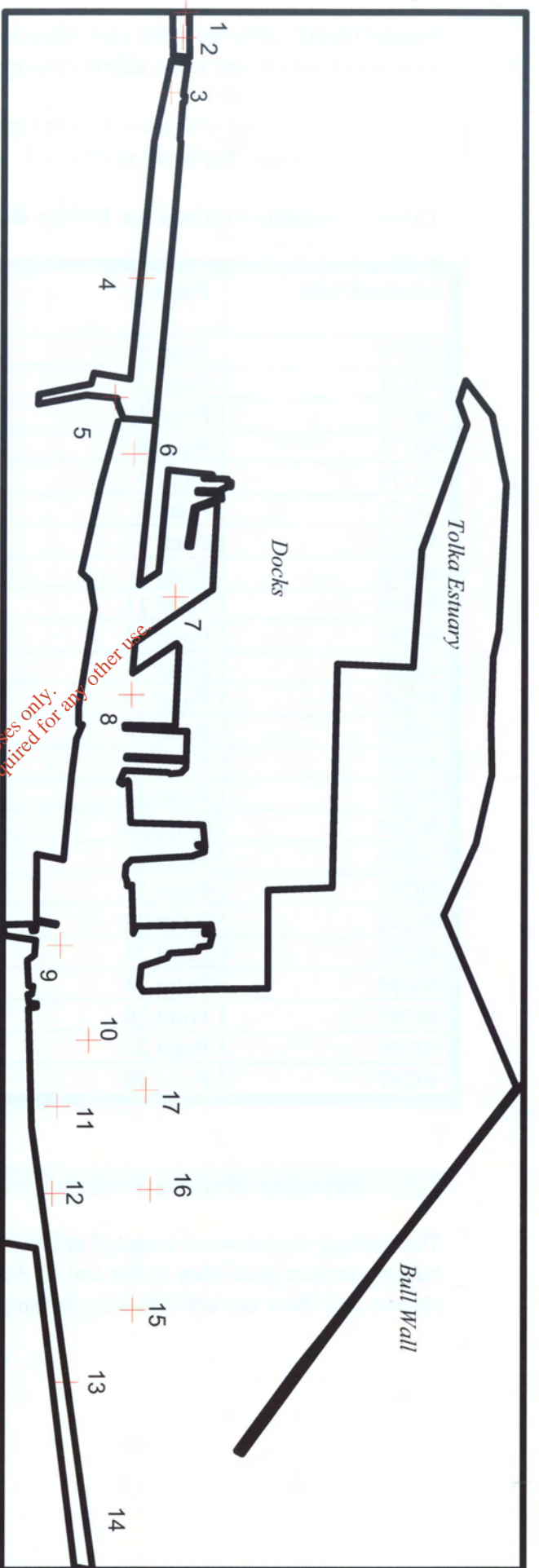


Figure 1. Liffey Estuary sampling stations

1. Butt Bridge
2. Custom house
3. Matt Talbot Bridge
4. Cardiff Lane
5. Dodder Outflow
6. Toll Bridge
7. Alexandra Basin
8. Ocean Pier
9. Off Tanker Pier

10. Old Treatment Works Outflow
11. New Treatment Works Outflow
12. Old Rathmines and Pembroke Outflow
13. Half Moon Club
14. Poolbeg Lighthouse
15. X15
16. X16
17. X17

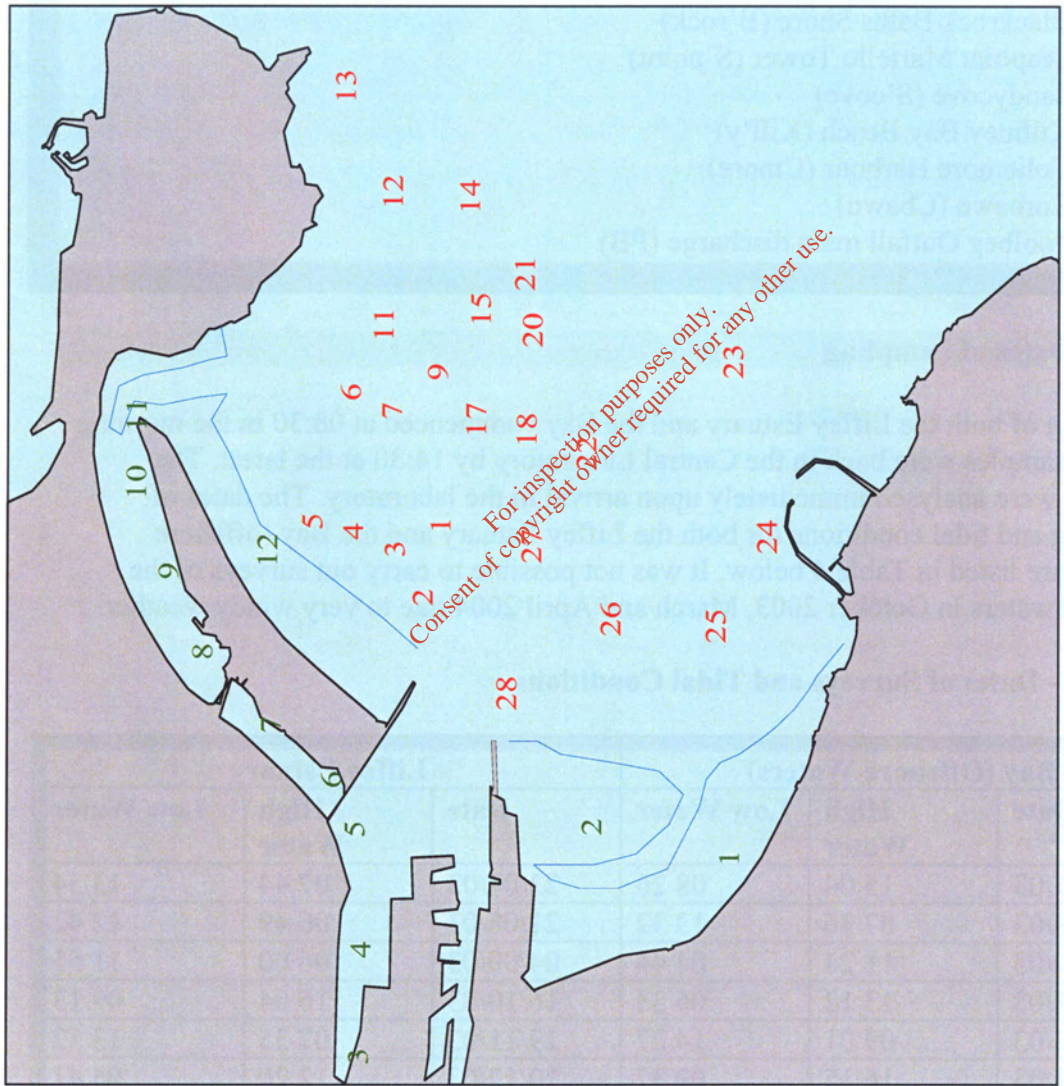


Figure 2 – Sampling Stations Dublin Bay Offshore Waters (red)

with the exception of Poolbeg, which is in the vicinity of the Ringsend treatment works outfall. This station has been included in order to gain information on the impact of the treatment works on the receiving waters. The bathing water sampling stations are listed in Table 3 below.

Table 3 - Bathing Water Sampling Stations

Dollymount – north (DN)
Dollymount – middle (DM)
Dollymount – south (DS)
Bull Wall Bridge (harbour side) (BW)
Half-Moon – south side of wall (HM)
Sandymount (SM)
Merrion (Mer)
Blackrock Baths Shore (B'rock)
Seapoint Martello Tower (S'point)
Sandycove (S'cove)
Killiney Bay Beach (Kill'y)
Coliemore Harbour (Cmore)
Corbawn (Cbawn)
Poolbeg Outfall main discharge (PB)

3.4 Dates of Sampling

Sampling of both the Liffey Estuary and the Bay commenced at 08:30 in the morning and the samples were back in the Central Laboratory by 14:30 at the latest. The samples were analysed immediately upon arrival in the laboratory. The dates of sampling and tidal conditions for both the Liffey Estuary and the Bay (offshore waters) are listed in Table 4 below. It was not possible to carry out surveys of the offshore waters in October 2003, March and April 2004 due to very windy weather.

Table 4 - Dates of Surveys and Tidal Conditions

Bay (Offshore Waters)			Liffey Estuary		
Date	High Water	Low Water	Date	High Water	Low Water
03/07/03	15 04	08 26	23/07/03	07 44	13 34
07/08/03	07 36	13 32	21/08/03	06 49	12 42
24/09/03	11 24	04 44	04/09/03	06 00	11 55
12/11/03	13 12	06 33	16/10/03	16 04	09 13
04/12/03	09 01	14 27	19/11/03	07 35	13 12
28/01/03	16 15	09 37	10/12/03	12 20	05 41
12/02/03	15 41	08 54	21/01/04	10 55	04 22
12/05/04	06 41	12 47	18/02/04	09 58	15 57
30/06/04	10 19	16 09	11/03/04	14 27	07 39
			01/04/04	09 52	15 48
			27/05/04	05 56	12 13
			10/06/04	06 17	12 19

Sections 4 to 6 inclusive are taken directly from the First Annual Report (November 2001). They are included in this Report for ease of reference.

4. EC Directives and Dublin Bay

There are two EC Directives to reduce nutrient inputs to the aquatic environment. These are as follows:

1. The Urban Waste Water Treatment Directive (91/271/EEC) sets minimum standards for sewage treatment across EC Member States. The dates for compliance with the Directive range from the end of 1998 (cessation of sewage sludge at sea) to 2005. The Directive allows for receiving waters to be identified as sensitive to eutrophication which then requires nutrient removal at sewage treatment works or industries discharging to the sensitive area. The limiting nutrient for algal growth in the freshwater environment is usually phosphorus and conversely the limiting nutrient in the marine environment is nitrogen.

2. The Nitrates Directive (91/676/EEC) is primarily concerned with pollution caused by nitrates from agricultural sources. It is intended to ensure that agricultural policy takes greater account of environmental policy and its objective is to reduce water pollution caused or induced by nitrates from agricultural pollution. Since nitrates from agriculture are diffuse sources of pollution to water courses, the primary mechanism for dealing with polluted areas or nitrate vulnerable zones is through good agricultural practice.

In Ireland Statutory Instrument No. 105 (1992) gave effect to the EU Bathing Water Directive (76/160/EEC) on the quality of bathing waters and applies to samples taken during the bathing season which in Ireland is defined as extending from mid-May until the end of August. Table 5 below lists the microbiological parameters as well as limits for dissolved oxygen, transparency and pH as specified in both the Regulations and the Directive.

It should be noted that the European Commission has presented a proposal for a revised Directive of the European Parliament and of the Council concerning the Quality of Bathing waters. This new proposal requires only two parameters to be monitored as both are regarded as excellent indicators of faecal contamination (Intestinal Enterococci and Escherichia Coli). The aim is that this will allow resources to be focused on the monitoring of those parameters that constitute a real threat to human health.