9 RINGSEND WWTW

9.1 Introduction

The Ringsend WWTW is located on the Poolbeg peninsula close to the power stations and in the area of Dublin Port. The works currently provide preliminary and primary settlement of domestic and industrial flows emanating from Central and South Dublin for a population equivalent of 1,200,000. Flows from North Dublin will be introduced during the second half of 2002 and will increase the equivalent population treated to 1.7million by the year 2020. There are constraints on the flow to the works from the MainLift Pumping Station, Dodder Syphon, Dun Laoghaire PS and Sutton PS.

This upgrading of the WWTW is part of improvement in the treatment quality and capacity to ensure compliance with the following:

- The water quality standards of the Dublin Bay Water Quality Management Plan (DBWQMP);
- The Environmental Protection Agency Act, 1992 (Urban Wastewater Treatment) Regulation, 1994 (S1 419 of 1994) giving effect to Council Directive concerning urban wastewater treatment (91/271/EEC) (UWWT);
- Quality of Bathing Waters Regulation 1992 (S1 155 of 1992) giving effect to Council Directive concerning the quality of bathing waters (76/160/EEC).

For the purposes of this report, the existing works will be considered to be that related to the current design year of 2020 and the capacity for further upgrading will relate to a specified ultimate design horizon. Space (0.8 ha) has been allocated on the Site for future expansion and the Contractor is obliged to make provision in the design for increases in flow and load. These are explained further in the following text.

9.2 Existing Situation

9.2.1 Existing Works

The existing works are those which are comprised in Contract No. 2, Ringsend WWTW. Contract No. 2 includes the incorporation of Contract No. 1, Interim SludgeTreatment, which was implemented in 1998/99 to enable decommissioning of Dublin City Council's sludge ship and sludge disposal to sea to be abandoned.

The general principles and flow diagrams for Contract No. 2 can be found in Appendix A (Sk 3b – WWTW, Sk 5 Sludge Treatment). The works will comprise the following:

- 6mm inlet fine screening;
- Screenings handling;
- Fats, Oil, Grease and Grit (FOGG) removal for the flow to full treatment;
- Grit removal on stormwater flow;
- Stormwater settlement;
- Primary lamella settlement for treated flows;
- Intermediate pumping station;
- Secondary treatment in sequencing batch reactors (24 No.);

- Ultraviolet disinfection;
- Sludge screening;
- Thermal hydrolysis sludge treatment (Cambi);
- Anaerobic digestion;
- Thermal drying;
- Sludge gas storage;
- Sludge gas scrubbing;
- CHP, steam generation and boilers.

The WWTW receives sewage flows from four facilities:

a) Main Lift Pumping Station (via R&P, City Centre and Grand Canal Sewers);
b) Dodder Valley (gravity flow);
c) Dun Laoghaire Pumping Station;
d) New Sutton Pumping Station (for North Dublin)(in late 2002).

9.2.2 Existing Flows and Loads

The incoming flows for year 2020 are summarised in Table 9.1:

Table 9.1: Ringsend WWTW Existing Design Flows

Population Equivalent	1.7 million
DWF	4.6 m^3/s
Average flow	5.7 m^3/s
Full flow to Treatment	11.1 m^3/s
Stormwater Flow	11.5 m^3/s
Peak flow to Site	22.6 m^3/s

The specified design capacity assumes that between construction and 2020 the domestic population in Dublin will rise between 0.36% and 0.8% per annum. The design flows also assume a per capita wastewater discharge in 2020 of 180 l/hd/d. The domestic design average pollutant loads were estimated based on a per capita contribution of 60g BOD/hd/d, 75g TSS/hd/d., 8g AmmN/hd/d, 12g TN/hd/d and 3g TP/hd/d. The existing design loads are therefore as shown in Table 9.2:

Table 9.2: Ringsend WWTW Existing Design Loads for Raw Sewage (kg/d)

	Average	**75%ile**	**95%ile**
BOD_5	98,400	123,000	157,600
TSS	101,100	137,496	194,300
TKN	15,600	17,940	21,400
Ammonia as N	9,500	10,925	21,800
Total Phosphorus	3,700	4,225	5,600

The design capacity of the WwTW includes for return liquors within the processes. These are not shown in Table 9.2.

9.2.2 Industrial Loads

The current estimate of the industrial load contribution to the existing Ringsend WwTW is 27,700 kg/d of BOD and 25,000 kg/d of TSS. The industrial flow is estimated to be in the range of 0.2-0.25 m^3/s (averaged over a 24-hour, 7-day cycle).

Limited survey data are available for nitrogen and phosphorus loads deriving from industry. It is assumed that the trade nutrient contribution is the difference between the measured total N and P loads and the estimated domestic contribution.

Details of records provided by the Employer of imported wastes discharged at the existing Ringsend WwTW (for 1996) are given in Volume 6.

Flows from North Dublin will be introduced during the second half of 2002. The current estimate of the industrial load contribution from the North Dublin catchment is 2,800 kg/d of BOD and 2,300 kg/d of TSS. The industrial flow is estimated to be in the range of 0.1-0.15 m^3/s (averaged over a 24-hour, 7-day cycle).

9.3 Treatment Process

The treatment process and flow diagrams for the works are included in Appendix A. Following preliminary treatment, primary settlement is followed by biological treatment within SBRs and UV disinfection of treated effluent. UV is only required during the bathing season (May/September).

The secondary treatment is provided in 24 no. basins. The basins can only operate in sequence mode as sets of four. Normal operation employs a 4-phase cycle over 4.2 hours; as the flow increases, the cycle time can be reduced to 2.8 hours. A 3-phase cycle is used when one of the basins is out of service.

The Contractor's design was based on a blended effluent of 12 no. basins providing carbonaceous treatment, and 12 no. basins providing nitrified and denitrified effluent. This provides a treated flow of 11.1m^3/s and an effluent standard of 25 mg/l BOD, 35 mg/l TSS, 125 mg/l COD and with 18.75mg/l AmmN on a 95%ile basis.

Additional nitrification and denitrification equipment has been fitted under a variation to the Contract and this should result in a final effluent with a total nitrogen standard of less than 10mg/l total N (measured as an annual mean). Some process control modification may be needed for this to be guaranteed. However, experience of the influent and plant performance will be required before the process control can be optimised.

9.3.1 Inlet Screens

The inlet screens are required to intercept and remove solids larger than 6mm from the incoming sewage. Seven no. screens (six duty, one standby) are required for a future maximum peak incoming flow of 23.5m^3/s. Details are given in Table 9.3. One no. Rotating Bar Interceptor (RBI) is provided upstream of the inlet screens for the gravity flows received from Dodder Valley.

Table 9.3: Inlet screens

No. Screens	7 no. (6 duty, 1 standby)

Design flow per screen	3.917 m^3/s
Channel width	2.5 m
Channel Immersion	3.0 m
Screen Aperture	6.0 m

Screenings removed from the influent are passed to macerators via a launder system. Three no. handling streams are provided as duty/assist/assist each capable of dealing with $12m^3/h$ of wet screenings. The washer/dewaterers produce a final product with 35% dry solids content.

9.3.2 Stormwater Treatment

Stormwater is separated downstream of the inlet screens via two weirs. Aerated grit lanes; 30m long, 4.5m wide and 4.5m sidewall depth, are provided downstream of the weirs.

Stormwater treatment is provided for 1.5 hours retention of $11.5m^3/s$ in six no. storm tanks, four of which are blind (see Tables 9.4 and 9.5). The blind tanks fill first. All six tanks are provided with submersible re-suspension pumps.

The effluent from the storm discharge must not exceed 3×10^6 FC/100ml on a 95%ile basis.

Table 9.4: Storm tank arrangement

No. Storm Tanks	6 no.
Configuration	4 blind, 2 overflow
Overflow Tanks	2 & 5
Blind Tanks	1, 3, 4 & 6

Table 9.5: Storm tank dimensions

Tank No.	Width (m)	Length (m)	Volume (m^3)
1	31	65	7,346
2	37	104	11,791
3	37	88	9,822
4	31	65	7,346
5	37	107	12,131
6	37	88	9,978

9.3.3 Preliminary Treatment

Screened effluent is elevated from the inlet screen outlet channel by archimedian screw pumps (see Table 9.6) to the inlet to the aerated grit and fats,oils and grease (FOGG) removal channels. The screw pumps pass forward the flow to full treatment (FFT) of $11.8m^3/s$.

Table 9.6: Archimedian screw pumps

No. Pumps	4 Duty, 1 Standby
Maximum Flow	2.775 m^3/s
Maximum Lift	2.1 m

The aerated grit and FOGG removal facility comprises horizontal flow tanks with grit screws in the hopper bottoms, baffles (recently modified) and surface scraping of grease. Details of the FOGG removal units are given in Table 9.7:

Table 9.7: FOGG removal units

No. Lanes	6
Retention Time	20 mins. @ av. Flow
Side wall depth	5.5 m
Length	30.0 m
Width	6.5 m

Grease removed from the flow is transferred to the sludge treatment, plant for mixing with sludge as it enters the Hydrolysis plant. Grit is removed and classified prior to disposal via skip.

9.3.4 Primary Treatment

Primary treatment is provided in two sets of six lamella settlement tanks. These are designed for the removal of 50% TSS and 24% BOD. The tanks are hydraulically designed for 13.8m^3/s to provide sufficient future treatment capacity, but the lamella packs are only rated for 11.1m^3/s at present.

Table 9.8: Primary settlement tanks

No. of primary tanks	12 no.
Design flow (12 tanks in service)	11.1 m^3/s
Design flow (10 tanks in service)	11.1 m^3/s
Lamella plate spacing	80 mm
Project plate area per tank	2,412 m^2
Total projected plate area	25,704 m^2
Design loading rate per tank (12)	1.55 m^3/m^2.h
Loading rate per tank (10)	1.90 m^3/m^2.h
Average TSS to sludge process	53,500 kgds @3%ds
75%ile TSS to sludge process	72,500 kgds @3%ds
Peak TSS to sludge process	100,800 kgds @3%ds
Dimensions:	
Length	36.6 m
Width	12.0 m
Side wall depth	4.5 m

The primary tanks are flat-floored with hydraulically operated scrapers which draw the sludge to two hoppers at the end of each tank. These hoppers provide sludge consolidation before transfer to the holding/mixing tanks. The lamellas are also provided with mobile cleaning bridges (1 no. per bank).

9.3.5 Secondary Treatment

Primary settled effluent combines in the inlet channel leading to the Intermediate Pumping Station (IPS) where the sewage is pumped to the lower and upper SBR basins. The IPS has been designed with 10 no. pump stalls, with 2 no. remaining vacant for future secondary treatment upgrading. Further details are given in Table 9.9:

Table 9.9: Intermediate pumping station

No. Low Lift Pumps Design Duty	4 (3 duty / 1 standby) 1,880 l/s @ 11.4 mhd
No. High Lift Pumps Design Duty	4 (3 duty / 1 standby) 1,880 l/s @ 20.9 mhd

The secondary treatment comprises 24 no. SBR basins which operate in groups of four. Four-phase cycles comprise fill, aerate, settle and decant overflow for flows arriving which are less than $6m^3/s$. As the flows increase, the cycles are decreased to 2.8 hours for $11.1m^3/s$. When one of the basins in a group is out of service, the remaining three operate on a three phase cycle; fill/aerate, settle and decant. Table 9.10 gives the dimensions of the SBR basins, as well as some of the main design criteria used:

Table 9.10: SBR basins and design values

No. Reactor Basins	24
Length Width TWL BWL Total Process Volume Aeration Devices	52.0m 39.0m 6.9m 4.9m $335,000m^3$ Fine bubble diffused air
Carbonaceous Operation	
Design Sludge Age Design MLSS	5 days (total) 4 days (aerobic) 2,500 mg/L @ TWL
Nitrification	
Design Sludge Age Design MLSS	15-25 days (total) 15 days (aerobic) 4,000 mg/L @ TWL
Design Flow Design Loads	$11.1 m^3/s$ 73,212 kg BOD/d 16,064 kg TKN/d 11,044 kg NH^3.N/d

Each of the basins includes a pre-react zone. Submersible mixers are now provided in all of these zones, although when the basin is initially operated in carbonaceous mode there is no need for mixing. In addition, return activated sludge (RAS) pumps are provided. Returning RAS and mixing the liquor with incoming settled effluent aids the creation of nitrates, essential to compensate for low alkalinity, when operating in nitrification-denitrification mode.

9.3.6 Disinfection

Disinfection is provided downstream of the SBRs in 5 no. channels of submersed low pressure Ultra Violet (UV) lamps (one bank per channel). Details are provided in Table 9.11.

UV disinfection is provided to guarantee final effluent Faecal Coliforms (FC) during the bathing season from May to September. The channels housing the UV plant are designed for a flow of $13.8m^3/s$ but have been reduced for the current FFT of $11.1m^3/s$. In addition, the channel length has been designed to accommodate a future upgrading of the coliform requirements from 100,000 FC/100ml to 10,000 FC/100ml (80%ile compliance).

Table 9.11: UV Disinfection channels

No. UV Channels	5
No. Banks per Channel No. Modules per Bank Each Module No. Lamps per Bank Total No. of Lamps	1 10 2 lamps wide x 10 lamps deep 200 1000
Design	
Flow Rate UV Dose Design Rate Effluent Quality UV Transmission UV Dose at end of Lamplife	11.1 m^3/s 5.7 m^3/s 100,000 FC/100ml 45% 16 mJ/cm^2

9.3.7 Sludge Treatment

Sludge is removed from the primary settlement tanks and the SBRs to the 2 no. sludge holding/mixing tanks (7,790m^3 total capacity) adjacent to each lamella bank. The average design sludge loads (assuming 50% removal of solids during primary settlement) are given in Table 9.12:

Table 9.12: Design sludge loads

Design Sludge Loads (2020)	
Primary Sludge	53,612 kg/d @ 3%ds 1,787 m^3/d
Secondary Sludge	52,000 kg/d @ 0.85%ds 6,118 m^3/d
Combined Sludge Load	105,612 kg/d @ 1.34%ds 7,905 m^3/d

Sludge is transferred from these tanks for treatment by thermal hydrolysis and mesophilic anaerobic digestion, followed by thermal drying. The final product is required to conform to USEPA Regulation 40 CFR Part 503 Class A, must have a bulk density of more than 600kg/m^3, and must not be less than 92%ds.

The upstream processing of sludges comprise conventional screening (5mm), dewatering by belt thickeners and belt presses to present 101,388 kg/d of sludge (@ 20%ds) to the thermal hydrolysis plant.

The hydrolysis plant comprises two streams which begin with buffering and pre-heating of the sludge, with recycled steam, in two pulper vessels. Sludge is heated in the pulpers and also conditioned by a recirculating macerator pump. As the temperature rises, the dry solid concentration falls to about 12% ds. After transfer into the 4 no. reactors, which operate in sequence, the sludge temperature is elevated further to 165°C and pressurised to 12 bar with steam. The fill, pressurisation, depressurisation and emptying of the reactor takes approximately 1.5 hours.

The temperature of the sludge after depressurisation is approximately 100°C. This is further cooled by pre-heating boiler feed water to 40°C for feed into the digesters. Three anaerobic digesters are provided, details of which are given in Table 9.13.

Table 9.13: Anaerobic digesters

No. Digesters	3
Design Feed Rate	101,388 kg/d @ 12%ds
Sludge Flow	849 m^3/d
Sludge Feed VM	79%
VM Reduction	56%
Design Gas Production	1 m^3 biogas/kg VM destroyed
Dimensions	
Side Wall	16.0 m
Diameter	17.7 m
Hopper Depth	2.0 m
Volume	4,250 m^3

After digestion, the sludge is transferred to the thermal drying plant at 6%ds. The thermal drying plant comprises three streams (A & B from Contract No. 1 and C from Contract No. 2), as shown in Table 9.14. Prior to the dryers, centrifuges dewater the feed sludge to 25-30%ds.

Table 9.14: Thermal dryers

No. Dryers	3
Design Flow Rate	52,925 kg/d
Dryer Feed Rate	223 m^3/d @ 30%ds
Dryer Rating	4.2 te/h
Final Product	63m^3/d @ 92%ds

9.4 Discharge Consent Standard

The wastewater effluent guarantees are based on the Urban Wastewater and Bathing Water Directives. The discharge consent standard is shown in Table 9.15:

Table 9.15: Discharge consent standard

Guaranteed Effluent Quality	95%ile	Max.
BOD	25 mg/l	50 mg/l
SS	35 mg/l	87.5 mg/l
COD	125 mg/l	250 mg/l
Ammonia as N	18.75 mg/l	47 mg/l
Faecal Coliforms (FC/100ml)	100,000 (80%ile)	

The Contract has included the installation of nitrification and denitrification equipment comprising submersible mixers in the pre-react zone and RAS pumps. This is the first stage in upgrading the final effluent requirements to >10mg/l total N. However, alkalinity dosing and/or process control adjustments may also be necessary to provide these requirements.

The sludge quality standard required is shown in Table 9.16:

Table 9.16: Sludge quality standard

Final Product	Sludge
Micro Organisms	FC < 1000 MPN/g.ds *Or* Salmonellae < 3 MPN/4g.ds
Metals	Cr - 3 mg/kg ds

	Hg - 16 mg/kg ds Cu - 1000 mg/kg ds Ni - 300 mg/kg ds Zn - 2500 mg/kg ds Cd - 20 mg/kg ds Pb - 75 mg/kg ds
Dry Solids Concentration Bulk Density	92%ds 600 kg/m^3

9.5 Future Development

Provision has been made in the design of the plant for future upgrading. This includes the requirement for the preliminary treatment and primary treatment to be designed for an ultimate peak flow of 23.5m^3/s. FFT is specified as 11.1m^3/s for the remainder of the wastewater process; however, the primary settlement tanks, whilst hydraulically designed for 13.8m^3/s, will require additional lamella packs to be added. In addition, the sludge handling plant will also have to be upgraded.

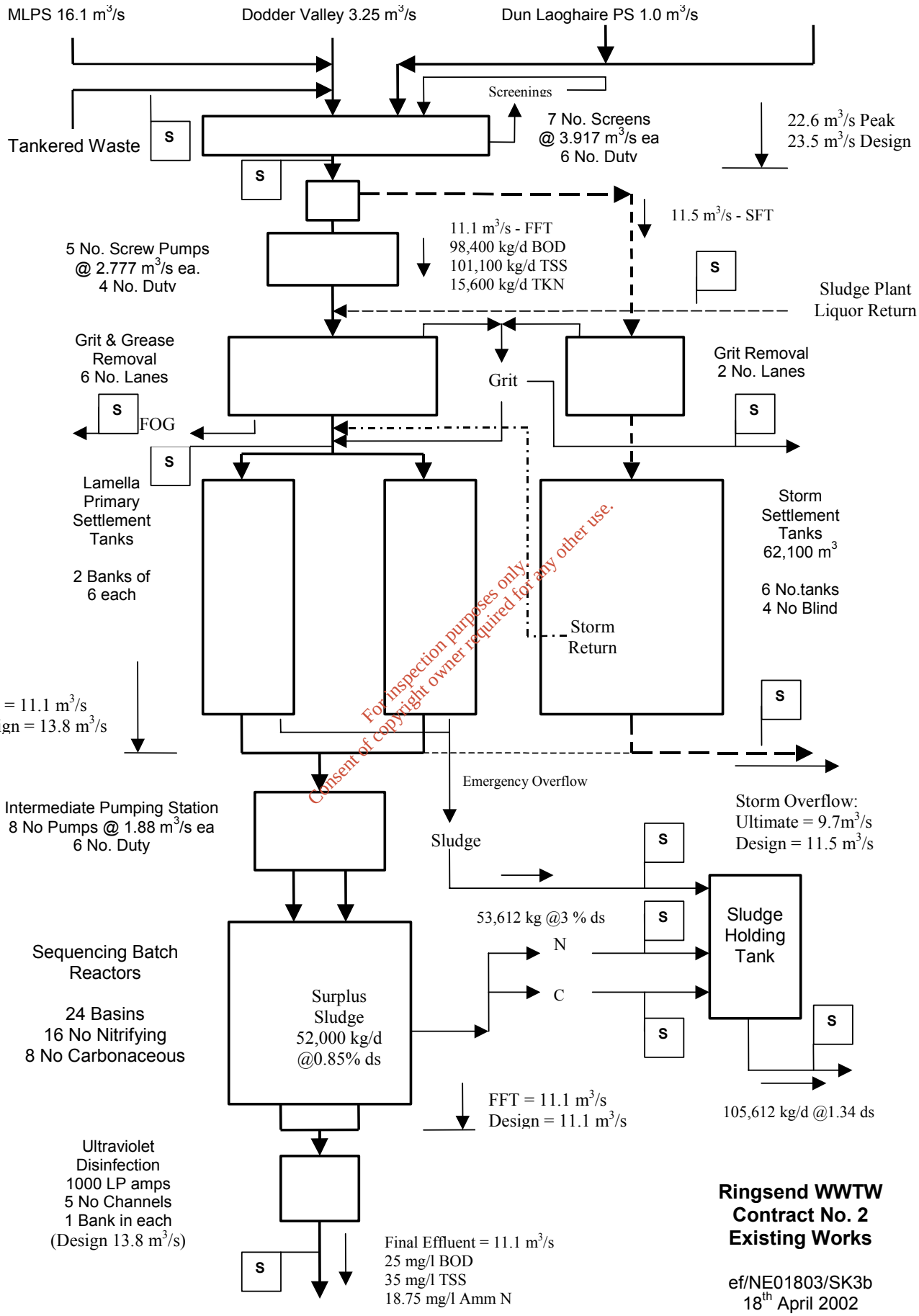
The IPS has provision for additional pumps to be added to enable secondary treatment of 13.8m^3/s however, additional biological basins will be required. To cater for this, 0.8ha is reserved on the site layout for additional secondary treatment.

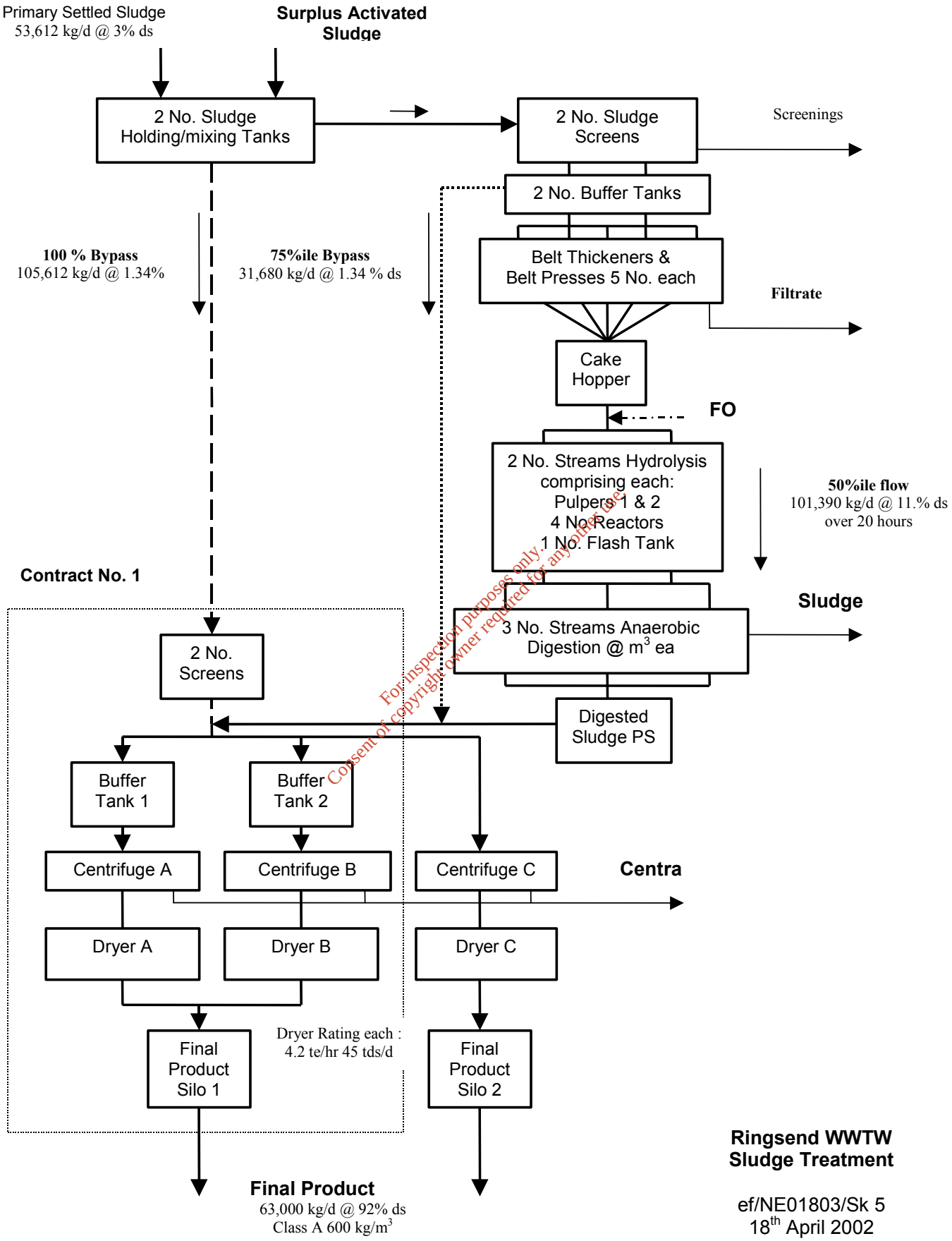
Provision is also made for increasing the hydraulic capacity of the UV disinfection plant to deal with 13.8m^3/s by removing the channel reducers. The channels can also accommodate larger equipment to enable the FC standard to increase to 10,000 FC/100ml.

With the increased flow there is likely to be a load increase which will manifest itself as sludge as a product of the process. Provision has been made for an additional reactor to be added to each of the hydrolysis process streams. Space has also been allowed for a fourth digester. Since the dryers are each 4.2 te/hr capacity, there is the potential for them to deal with 135 tds/d (with all operating).

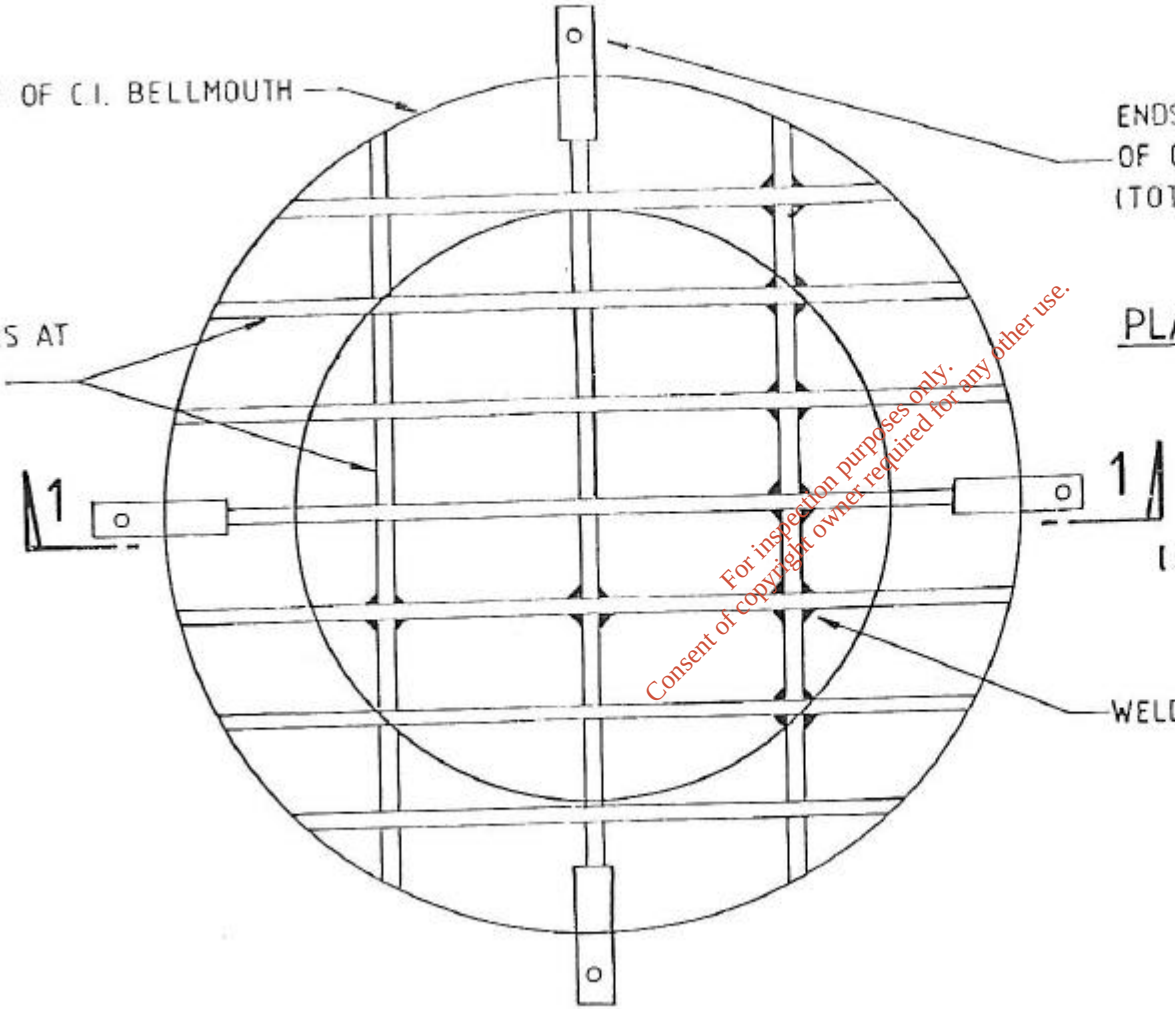
APPENDIX A

Flow Diagrams for Ringsend WwTW Contract No. 2





RECORD DRAWING

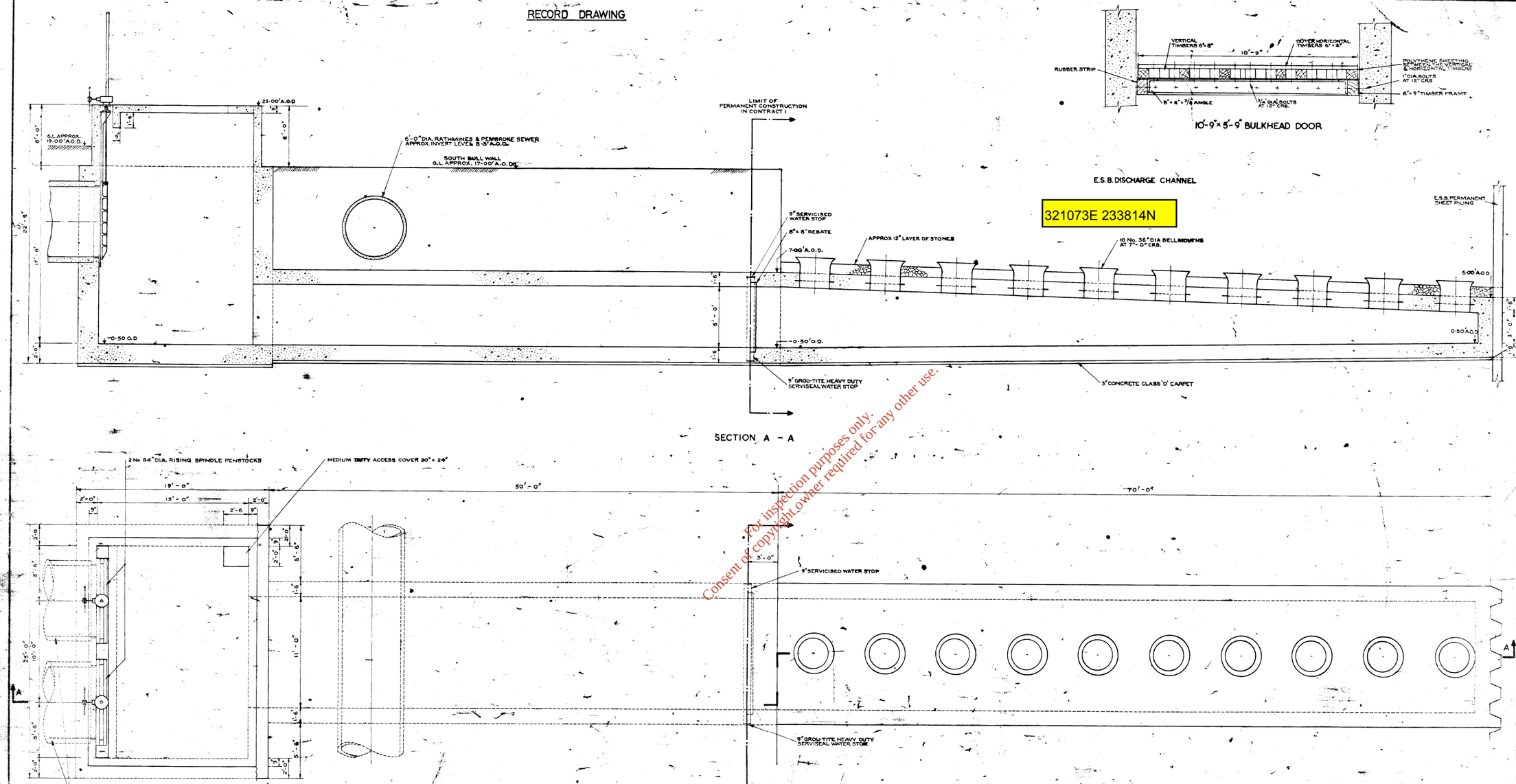


PLAN OF COVER GRATING TO BELLMOUTH

10 Nº THUS PROVIDED

(ALL STEELWORK HOT DIPPED GALVANISED)

RECORD DRAWING



NOTE :-
PENSTOCK CHAMBER AND REMAINDER OF THE CONCRETE CULVERT CONSTRUCTED IN ANOTHER CONTRACT

JOHN TAYLOR & SONS
CHARTERED CIVIL ENGINEERS
ARTILLERY HOUSE
WESTMINSTER

CORPORATION OF DUBLIN
DUBLIN DRAINAGE
DETAILS OF PENSTOCK CHAMBER & CULVERT AT E.S.B. DISCHARGE CHANNEL

No.	DATE	AMENDMENTS

DRAWN BY	CHECKED BY
R.C.	I.W.
DATUM O.D.	
SCALE:- 1/2 INCH TO A FOOT	

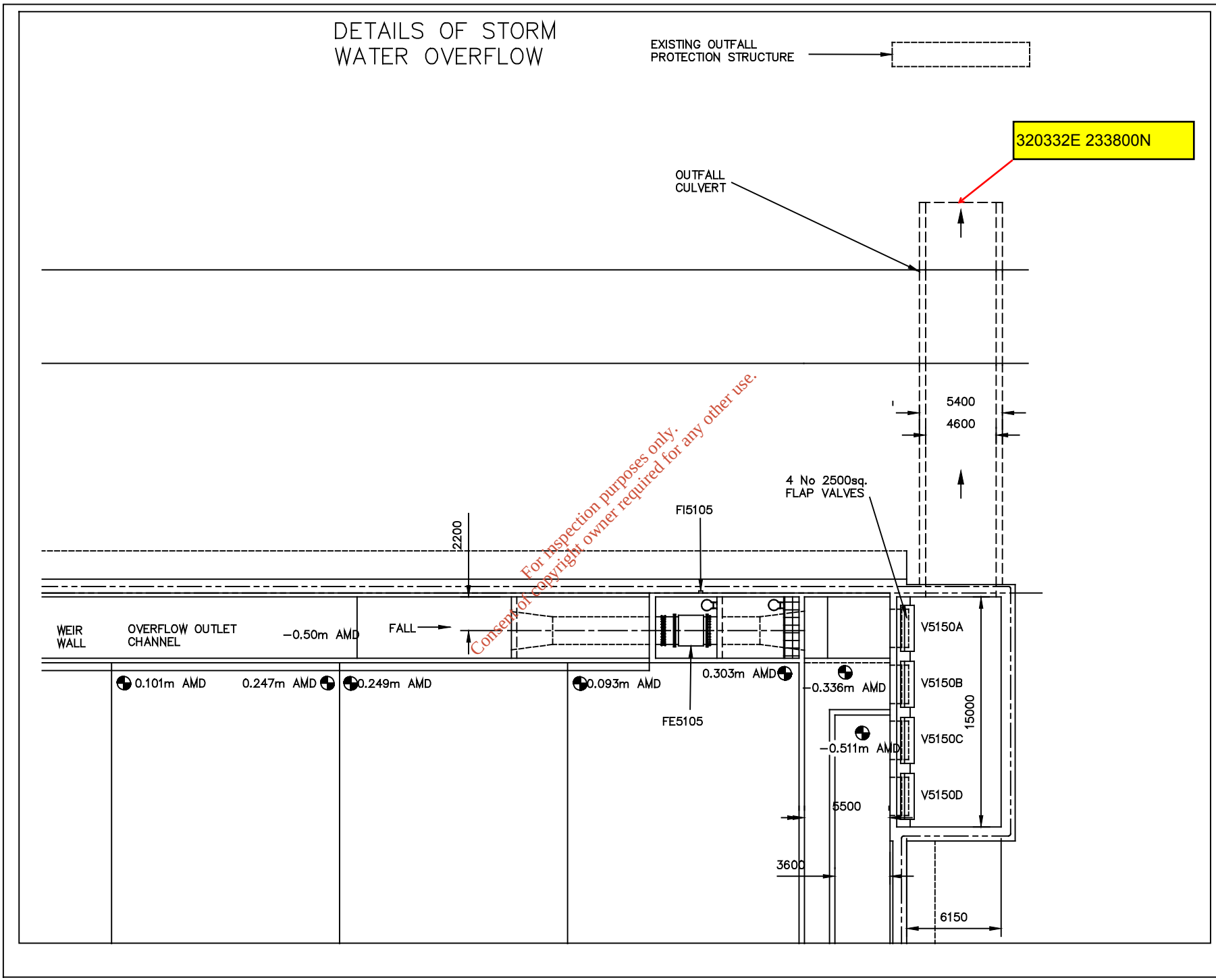
CONTRACT No. 1

DRAWING No. 2z

DATE NOVEMBER 1969

G 0102

DETAILS OF STORM WATER OVERFLOW



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SECTION C: INFRASTRUCTURE & OPERATION

Advice on completing this section is provided in the accompanying Guidance Note.

C.1 Operational Information Requirements

Provide a description of the plant, process and design capacity for the areas of the waste water works where discharges occur, to include a copy of such plans, drawings or maps, (site plans and location maps, process flow diagrams), and such other particulars, reports and supporting documentation as are necessary to describe all aspects of the area of the waste water works discharging to the aquatic environment. Maps and drawings must be no larger than A3 size.

Attachment C.1 should contain supporting documentation with regard to the plant and process capacity, systems, storm water overflows, emergency overflows, etc., including flow diagrams of each with any relevant additional information. These drawings / maps should also be provided as geo-referenced digital drawing files (e.g. ESRI Shapefile, MapInfo Tab, AutoCAD or other upon agreement) in Irish National Grid Projection. This data should be provided to the Agency on a separate CD-Rom containing sections B.1, B.2, B.3, B.4, B.5, D.2, E.3 and F.2.

Attachment included	Yes	No
	X	

C.2 Outfall Design and Construction

Provide details on the primary discharge point & secondary discharge points and storm overflows to include reference, location, design criteria and construction detail.

Attachment C.2 should contain any supporting documentation on the design and construction of any and all discharge outfalls, including stormwater overflows, from the waste water works.

Attachment included	Yes	No
	X	

Station	Single pump rating	No. of pumps(duty,assist standby)	Single Pump Flow	Max flow(no. of pumps)	Duty/Asssist start levels(m)	Sump depth(m)	Overflow level(m)	Head(m)	Inlet/Outlet Pipe size(mm)	Telemetry)	Other requirements
West Pier	185kW	3	740L/s	1000L/s(2)	3.1/4.1	7			2000/900	InTouch	
Bullock Harbour	25kW	3	130L/s	165L/s(2)	1.3/1.8	4		20	400/300	InTouch	
Blackrock	13.4kW	2	30L/s	52L/s(2)	/2.36		2.61		150/125	BroadWin	
Tobernea,	15kW	2	30L/s	47L/s(2)	1.51/1.6	1.56	2.43		200/150	BroadWin	
Brighton Vale	5.5kW				0.7/1.1	1.56				BroadWin	
Rocklands	1.3kW		7L/s	7L/s		6.75		14	130		GSM Alarm
Colliemore1		2	12L/s	12L/s						BroadWin	
Colliemore2			15L/s	15L/s						BroadWin	
St. Helens	22kW	2	30L/s	30L/s	1.21/1.21	5			150	BroadWin	

ATTACHMENT C1 PUMP DETAILS

THE FOLLOWING ARE EXCERPTS FROM THE GDSDS FINAL REPORT

The Dodder Valley Sewer Catchment

The Dodder Valley Foul Catchment generally follows the Dodder River Valley and includes the areas to the south of the river. In the eastern portion it includes Windy Arbour, Dundrum, Churchtown and Ballinteer, while the western section includes Tallaght, Firhouse, Greenhills and Ballyboden/Rathfarnham, draining to a trunk sewer laid generally parallel to the River Dodder and entering the Dublin City Council area at Belfield. This catchment is divided as follows, with two thirds in the South Dublin Co. Co. area and one third in the Dun Laoghaire Rathdown Co. Co. area. There are, however sewers that traverse this boundary making complete separation based on local authority administrative areas difficult.

The Dodder Valley foul sewerage catchment covers an area of approximately 3,580 hectares and serves a total population of approximately 153,000. (This is split as follows: 1,600ha and 51,000 population in DLRCC; 1,980ha and 102,000 population in the SDCC area). A separate foul and storm drainage network exists throughout the whole catchment although, as this study progressed, it became clear that it is in fact a 'partially separate' drainage network.
Dodder Valley DLRCC Catchment

The boundary of the eastern side of the catchment runs south from Belfield through Kilmacud to Sandyford. The southern part of the catchment is marked out by Blackglen Road, Sandyford and Marley Park. The western boundary of the DLRCC study areas is the county boundary between Dún Laoghaire-Rathdown and South County Dublin while to the north the catchment is bounded by the River Dodder. Within this area, two small areas drain to other catchments, as follows.

A small area of approximately 22 hectares around Braemor Park is served by the Rathmines and Pembroke catchment (Ref F005). Another nearby area of the county at Clonskeagh Road still contributes to the City Centre catchment (Ref. F001) via the 'old county' or 'old Dodder Valley' sewer. This is a far older sewer than the current Dodder Valley trunk sewer and while many of the areas that originally contributed to this sewer were intercepted on completion of the current Dodder trunk sewer in 1972 there are still some areas serviced by the older sewer. These include housing developments adjoining Clonskeagh Road. From a meeting with DLRCC it emerged that a section of network which currently contributes to the old county sewer from Clonskeagh Road is to be intercepted on Clonskeagh Rd at the point of crossing by the main Dodder Valley trunk sewer. It was said that this diversion will occur within the next few months. Once this diversion occurs it will leave a small area on Clonskeagh Road within Dún Laoghaire-Rathdown County still connected to the City Centre Catchment.

An area around Churchtown also still flows to the Old Dodder Valley sewer and into the City Centre catchment. According to DLRCC it is also intended for this sewer to be diverted into the newer Dodder Valley sewer. This diversion will occur at the downstream section of this area at Patrick Doyle Road. At the time of the Phase 1 report on this catchment it was thought that this diversion had already occurred. Due to the fact that there is some uncertainty over the exact time both the Clonskeagh and Churchtown catchment diversions would occur, flow monitors were installed near the proposed diversion points during this study.

The Dodder Valley trunk sewer generally follows the line of the Dodder River beginning in the western portion of the catchment within the SDCC administrative area. It crosses into DLRCC administrative area at Mount Carmel - as a 1500mm pipe - and flows by gravity as a 1500mm or 1650mm pipe to the Belfield siphon house. The Belfield siphon house is in the DCC administrative area at the border with Dún Laoghaire-Rathdown. The trunk sewer continues downstream from here as a twin siphon, travelling to the Sandymount foreshore and continuing

ATTACHMENT C1 CATCHMENT DESCRIPTION

as a twin siphon with a sub-marine portion from the foreshore until it enters the inlet chamber to Ringsend WwTW.

The Dodder Valley DLRCC catchment includes:-
?R a grit removal chamber with emergency overflow - Milltown Diverter Station
?ù a boulder trap - Belfield Siphon House
?ž 4060m approx. of twin siphon sewers in the DCC area

Catchment Geography

The catchment area does not include contributing flows from coastal areas or areas of a large tourist potential and therefore would not be influenced by any significant annual variation in population. It is unlikely that there are many buildings with basements within the catchment as it is not within the older development areas of Dublin.
Dodder Valley DLRCC

The Dún Laoghaire-Rathdown section of the Dodder Valley Foul Catchment is a suburban catchment lying in the Dodder River Valley Catchment, with the southern portion rising into the Dublin Mountains. The catchment consists mostly of medium density residential housing estates interspersed with industrial, institutional, community and recreational areas and includes the suburbs of Windy Arbour, Dundrum, Sandyford, Churchtown and Ballinteer. The catchment has become almost fully developed and apart from some development that can still occur to the south of the catchment, future development will mainly consist of infill housing estates.
Dodder Valley SDCC

The South Dublin County Council section of the Dodder Valley Foul Catchment lying generally in the Dodder River Valley is a suburban catchment, consisting of high density housing estates around Jobstown and West Tallaght, with medium density housing generally prevalent in the rest of the Catchment. There are large industrial estates particularly in the Tallaght area as well as hospitals, institutional and commercial areas around the Catchment. This portion of the Dodder Valley Catchment drains the suburbs of Jobstown, Tallaght, Kilnamanagh, Firhouse, Greenhills, Knocklyon, Rathfarnham and Ballyboden. Development lands exist to the west and south of the Catchment around Kiltipper, Oldcourt areas.

The West Pier East Catchment

The Dún Laoghaire West Pier Drainage Areas are located some 10 kilometers south-east of Dublin City Centre, and comprises some 2,300 ha of urban and suburban area including Blackrock, Monkstown, Stillorgan, Sandyford, Dun Laoghaire, Glasthule, Dalkey and Sallynoggin. The drainage system discharges by gravity and pumped systems to the West Pier Pumping Station. Flows arriving at West Pier Pumping Station are pumped across Dublin Bay for treatment at Dublin City Council's WWTW at Ringsend.

All of the sub-catchments in the study area are highly developed with limited green field sites available for further development. The sewers are essentially combined, with limited provision of separate storm systems.

Under normal flow conditions the West Pier West catchment, West Pier East and Bullock West sub-catchments flow directly to the West Pier Pumping Station by gravity. Flows from the Bullock East sub-catchment discharge to the pumping station at Bullock Harbour, from where they are pumped into the West Pier East interceptor sewers. Under certain storm conditions an element of the Bullock West sub-catchment overflows to the Bullock East sub-catchment via

overflow chambers in Adelaide Road and Castlepark Road then ultimately to Bullock Harbour Pumping Station.

Catchment Geography

The catchment is relatively flat around the coastal area but rises to heights of 80m AOD some 2km inland. The underlying rock strata is granite overlaid with varying thicknesses of boulder clay/glacial till. In some areas rock is at or close to the surface.

The southern area of Dublin Bay is a high amenity area governed by the Dublin Bay Water Quality Management Plan with designated bathing beaches subject to the Bathing Water Regulations 1996. The beaches at Seapoint and nearby Killiney have in the past attained Blue Flag status.

Both West Pier West and West Pier East catchments contribute to the West Pier Pumping Station. 41,329 people are resident in the West Pier East catchment and the balance of 49,890 people are resident in the West Pier West catchment which is the subject of a separate study under the GDSDS.

The area is not a major residential tourist location. However, the beaches, harbours and amenities do attract both local residents and visitors from Dublin and the surrounding suburbs, especially over the summer months.

The catchment is highly developed and therefore details of future devlopment within the catchment are not relevant.

Basements are prevalent throughout the study area due to the age of the properties and the predominance in certain areas of period housing. However there are no known recent reports of basement flooding. The Council promoted the construction of the recently completed Newtownsmith sub-catchment drainage scheme to protect basements in this low lying area from the risks of sewer surcharge during storm events.

Catchment Sewerage System

The sewerage system drains to two main pumping stations; the West Pier and Bullock Harbour pumping stations.

The West Pier Pumping Station incorporates rotating bar interceptors (RBIs) to protect the pumps and the pumps (2 duty and 1 standby) are capable of discharging between 0.7 and 1.0m³/s across Dublin Bay to the Ringsend WWTP. The station incorporates some 7,400m³ of off-line storage and two CSOs. The lower level CSO discharges to a long sea outfall while the high level CSO discharges to the foreshore.

The Bullock Pumping station incorporates rotating bar interceptors (RBIs) to protect the pumps and the pumps (2 duty and 1 standby) are capable of discharging 180 l/s via a 400 mm diameter rising main to the interceptor sewers at Newtownsmith. The culvert feeding the pumping station provides some 3,100m³ of on-line storage. The station has one CSO discharging to a twin short sea outfall.

The interceptor sewers between Newtownsmith and West Pier consist of 1.4km of 2.1m and 1.8m diameter sewer in open cut and tunnel. This sewer is designed to surcharge under storm events and provide some 4757m³ of on-line storage for the West Pier Pumping Station.

The total sewer assets in the catchment are summarised in Table 2.2 below:

Current Sewerage and Waste Water Treatment Projects in Progress

A scheme to eliminate raw sewage discharges from the Coliemore catchment has DoELG approval. Design work is in progress with construction scheduled to commence in Spring 2004. The scheme will intercept all major discharges and transfer these to Bullock Harbour Pumping Station. Overflows at Coliemore Harbour will be limited to seven spills per season to meet non-contact recreational water quality standards. 6mm diameter aperture screens will be installed on the overflow.

(Note: the above scheme was completed in 2007)

West Pier West Catchment

CATCHMENT DESCRIPTION

The Dún Laoghaire West Pier Drainage catchments are located some 10 kilometres south-east of Dublin City Centre, and comprises some 2,300 hectares of urban and suburban areas including Blackrock, Monkstown, Stillorgan, Sandyford, Dun Laoghaire, Glasthule, Dalkey and Sallynoggin. The drainage system discharges by gravity and pumped systems to the West Pier Pumping Station. Flows arriving at West Pier Pumping Station are pumped across Dublin Bay for treatment at Dublin City Council's WwTW at Ringsend. The Ringsend plant has been extended and upgraded to provide sewage treatment to meet the requirements of the Urban Wastewater Treatment Directive, the Bathing Water Regulations and the Dublin Bay Water Quality Management Plan. The Dun Laoghaire West Pier Drainage Area divides into two distinct catchments, the West Pier West and the West Pier East catchment.

The West Pier West catchment is highly developed with limited green field sites available for further development. The system has been designed as a separate foul system in Sandyford, Stillorgan and Sallynoggin and combined in Booterstown, Blackrock, Monkstown and Dun Laoghaire. However, the catchment does have a limited separate storm catchment which is the subject of a separate report (Ref. S2014). The drainage system can be described as partially combined.

Catchment Geography

The Dun Laoghaire West Pier West (WPW) Catchment is situated in Dun Laoghaire Rathdown County Council (DLRCC). The catchment extends to the south and west of Dun Laoghaire town, covering an area of approximately 1,500 hectares, including the areas of Sandyford, Kilmacud, Stillorgan, Monkstown, Booterstown, Blackrock, Sallynoggin. The catchment extends from Sandyford Industrial Estate in the Southwest, Booterstown in the West to Sallynoggin in the South. The catchment is relatively flat around the coastal area, but rises to heights of 160m AOD at Sandyford Industrial Estate, some 6.5km inland. The underlying rock strata is granite overlaid with varying thickness of boulder clay/glacial till.

The catchment is a highly developed urban and suburban catchment with limited green field sites available for further development. The predominant land use in the catchment is residential, and there are two major towns, Blackrock and Dun Laoghaire. The Sandyford Industrial Estate, covering almost 120 hectares, is the only major industrial estate in the catchment.

The southern area of Dublin Bay is a high amenity area governed by the Dublin Bay Water Quality Management Plan and the Bathing Water Regulations 1996. The beach at Seapoint has

in the past attained Blue Flag status. There is a bird sanctuary in Booterstown adjacent to the DART station which is designated as a Natural Heritage Area (NHA). This is an area of high national and international significance.

The area is not a major residential tourist location. However, the beaches and amenities do attract both local residents and visitors from Dublin and the surrounding suburbs, especially over the summer months.

Basements are prevalent throughout the study area due to the age of many of the properties and the predominance in certain areas of period housing. There are no recent reports of basement flooding in the area.

Catchment Sewerage System

The West Pier West catchment consists of a foul/combined network which discharges to West Pier Pumping Station. The majority of the critical sewers (sewers necessary for operation of the system) are combined, although there is a number of critical separate foul sewers in the catchment. While the flow is predominantly by gravity, there are five pumping stations within the catchment. Blackrock Pumping Station and Tobernea Pumping Station are the main pumping stations, while St. Helen's and Brighton Vale Pump Stations are smaller stations, serving localised areas. There are emergency overflows at the St. Helen's and Blackrock pumping stations discharging to the Trimelston and Priory streams respectively and thence into Dublin Bay.

Flows from the system discharge to the West Pier Pumping Station, where they meet with flows from the adjacent West Pier East catchment. The wastewater is then pumped to Ringsend WwTW for treatment prior to discharge. There are two overflows at West Pier pumping station: one discharges to a long sea outfall, approximately 150 metres in length, while the other, set at a higher overflow level discharges to the foreshore adjacent to the pumping station. There is an off line storage tank at West Pier pumping station.

A number of sewer lines are reported to be close to capacity under storm conditions with high velocities being observed in some locations. There is an embargo by Council on new connections to the Albany sewer. The Council also report that the Carysfort Avenue sewer operates close to capacity, with high velocities being observed.
The overall structural condition of the existing sewers is unknown due to the limited availability of CCTV Survey information. Critical sewers in the catchment are located in highly developed and trafficked area and would prove difficult to upgrade.

Historical Development of the Sewerage System or Urban Development

The sewerage system as originally designed, consisted of a several small networks which discharged directly to Dublin Bay. In the 1970's the Blackrock Interceptor Sewer was constructed. This sewer picked up these smaller networks and carried the flows to Dun Laoghaire, where they discharged untreated via a storage tank and tidal valve to the sea.

In the early 1990's, the West Pier Pumping Station and cross bay pipeline was constructed. This station collected all the flows discharged to the sea and pumped them across Dublin Bay to the Ringsend Wastewater Treatment Works.

Dun Laoghaire-Rathdown County Council do not have written formalised stormwater management requirements. However, they have in the past promoted separate systems where

practical and are currently embracing a SuDS approach to stormwater management for new developments.