Article 12 (Part 1)
Section C: Management: Provide further details, including the number of staff on site, the hours the facility is to be manned, i.e. other than security, and details of any contingency arrangements

The operations management of the Waterford Waste water Treatment works at Gorteens will be structured to provide all the necessary technical, analytical, supervisory and administrative management necessary to enable the proper operation and maintenance of the works, safely and efficiently on a continuous basis throughout the contracts Operation and Maintenance Period.

The Plant will be manned Monday to Friday from 8am to 5:00pm during the week, by the following qualified personal:

1 Operations and Maintenance Manager, and reporting to him:
- 1 x Electrical Technician
- 1 x Mechanical Technician
- 2 x Plant Operatives

Outside of the normal day time operations of the works there will be a callout Rota system in place consisting of the Electrical Technician, Mechanical Technician and two Operatives. The on-call Rota period for each member of staff will be for one week (Friday to Friday) in four.The call-out rota for the facility is shown below.

The Waste water Treatment works will be fully automated and controlled by a SCADA system which monitors & logs all plant equipment and process flows & levels. All critical plant will have standby systems in the event of plant failure. The SCADA system will also be equipped to send priority alarm messages to the on-call personnel, via the mobile phone text messaging service, alerting them to a potential problem at the works. The on-call member of staff will be equipped with a Laptop capable of logging into the plant SCADA system remotely for interrogation purposes.

In order to provide adequate duty cover during the whole of the Operations and Maintenance Period, a personnel rosta will be arranged so that no more than one member of staff shall be absent from the Works at any one time on holidays, training or otherwise. Where Operation and Maintenance personal leave the employment during the Operation and Maintenance period, they will be replaced with staff of equivalent experience and qualifications.

Waterford WwTW Call out Rota

Week = Friday to Friday

CAW Staff	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9
Operator 1									
Operator 2									
Electrical									
Mechanical									

CAW Staff	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18
Operator 1									
Operator 2									
Electrical									
Mechanical									

CAW Staff	Week 19	Week 20	Week 21	Week 22	Week 23	Week 24	Week 25	Week 26	Week 27
Operator 1									
Operator 2									
Electrical									
Mechanical									

CAW Staff	Week 28	Week 29	Week 30	Week 31	Week 32	Week 33	Week 34	Week 35	Week 36
Operator 1									
Operator 2									
Electrical									
Mechanical									

CAW Staff	Week 37	Week 38	Week 39	Week 40	Week 41	Week 42	Week 43	Week 44	Week 45
Operator 1									
Operator 2									
Electrical									

Waterford WwTW Call out Rota

Week = Friday to Friday

Mechanical									

CAW Staff	Week 46	Week 47	Week 48	Week 49	Week 50	Week 51	Week 52
Operator 1							
Operator 2							
Electrical							
Mechanical							

Article 12 (Part 2)
Section D.1: Infrastructure

Provide further details on site infrastructure including appropriately scaled labelled drawings for:

(a) Overall site layout showing all process areas

The overall site area showing all process areas is shown in Drawing No. C1197-3014.

It should be noted that the sequence is not always in numerical order, e.g. there is no Item 4 on the drawing. However, all items of the WWTP are included.

(b) Primary and secondary treatment: plant and infrastructure

The inlet works, where the main primary treatment is carried out is shown in Drawing C1197-2000. The storm tanks, to which excess flow passes during storm conditions, is shown in Drawing No. C1197-1013. The overall flow diagram detailing the preliminary treatment is shown in Drawing C1197-1012.

The secondary works, excluding the sludge treatment area, which is shown in 2(d) are shown in Drawing No. C1197-1017 and C1197-2005, (Final Settlement Tanks), Drawing C1197-1027 (Wash water, i.e. settled effluent that passes to the Final Effluent sampling and wash water pumping station), Drawing C1197-1016 (Aeration Tanks) and Drawing C1197-2006 (Selector and Aeration Tanks).

(c) Works Inlet building internal layout details

The works inlet building internal layout details are provided as Drawing No. C1197-2000, which shows the plan view of the sludge building and Drawing No. C1197-2001 shows the section detail of the building. Here the incoming flow is screened by the automatic screens, prior to passing to grit traps. From the inlet works, the sewage passes on to a distribution chamber to the primary settlement tanks. The preliminary treatment for grease and grit details are shown in Attachment C1197-8402.

(d) Sludge building internal layout details

The sludge thickening and dewatering building internal layout details are shown in Drawing No. C1197-2011. Activated sludge is thickened here by the gravity belt thickeners. It is transferred to the sludge treatment building (See section (e)). Note - Also detailed on this drawing is the boiler room, where the two boilers are located. These plant items can also be seen in Drawing No. C1197-3006, where the buildings location in relation to the overall treatment area can be seen. The boiler specification is shown in Attachment C1197-8417.

(e) Sludge Treatment Area

Drawing No. C1197-3006 shows the layout details of the overall sludge treatment area, which includes the sludge thickening and dewatering area, and the sludge treatment area, where the following processes take place: Primary sludge is thickened by means of the picket fence thickener and added to the thickened secondary sludge by means of a blending tank. The blended sludge is pasteurised and then fed to the anaerobic digesters.

From the digesters, the digested sludge flows to a digested sludge tank, and from there to one of the two dewatering sludge belt presses, to produce the final sludge cake.

(f) Wastewater drainage infrastructure

The pipework showing all the drainage from the plant, including the wastewater infrastructure, is shown in Drawing C1197-3002. The drainage for the sludge area is shown in Drawing No. J300-SK-009-250808.

(g) Surface water site drainage including location of SW-01, sampling location, interceptors, trunk pipe

The surface water drainage is shown in Drawing No. J300-SK-007-220808 and also in Drawing No. C1197-3002. The surface water sampling chamber is shown in the overall drawing for the site, i.e. Drawing No. C1197-3014, as mentioned in Section 2(a). The surface water sampling location is Item 29 on the drawing.

(h) Odour Control Units, process and areas served, pipework and open tanks

There are two odour control units (OCUs), one to serve the inlet works (OCU-1) and one to serve the sludge building (OCU-2). The P&ID diagram for the odour units is included as Drawing No. C1197-1026. This shows the 2 no. odour units, and which items or areas of the plant that may produce odours that are directed to the odour units. These include:

<u>OCU 1 (Odour Control Unit 1) – Inlet Works</u>

- Inlet Works
- Grit Classifier
- Screenings Wash
- Inlet Works Building
- Screen/Grit Skips
- Primary Settlement Tank

The odours from the primary settlement tanks are directed through an odour unit biofilter before entering a droplet eliminator. Final effluent washwater is also added to the process at this point. All of the remaining areas/items listed above are directed straight to the droplet eliminator, then through two exhaust fans, through a carbon filter and the cleaned air is released to atmosphere via a stack.

<u>OCU 2 (Odour Control Unit 2) – Sludge Works</u>

- Picket Fence Thickener
- Gravity Belt Thickeners
- Sludge Blending Tanks
- Emergency Sludge Holding Tanks (Primary and Secondary)
- Sludge Building
- Sludge Dewaterers and Dewaterers Skip
- Liquor Returns

All items are directed into the odour unit biofilter, including final effluent washwater, then directed to the droplet eliminator, through two no, exhaust fans and a carbon filter before being the cleaned air is released to atmosphere via a stack.

OCU-1 and OCU-2 are shown in the overall drawing for the site, i.e. Drawing C1197-3014, and are labelled as items 20/1 and 20/2.

OCU-2 is shown in more detail within the sludge treatment building in Drawing No. C1197-3006. Both OCUs are the same make and model and so OCU-1 is the same as OCU-2 shown in this drawing.

The process design details for the odour control design for the WWTP is included as Attachment C1197-8419. This data sheet provides information for each of the sources identified above. The average and maximum odour concentrations for each source is given, with the average and peak H_2S (hydrogen sulphide) concentrations. The flow rate for the air from each source is also provided along with the dimensions and details of the vessels or tanks for each odour source are given.

The attached sheet also provides the calculations that were used to determine the ventilation rates and the resulting ventilation rates. Calculations for the Odour concentrations are also included, along with H_2S and airflow rates. This data was then used for the air dispersion model, to predict odours at sensitive receptors and boundaries.

There will be open tanks within the plant, these are the activated sludge areas, i.e. the final settlement tanks, the aeration tanks and selector tank. These tanks contain activated sludge, which would not be considered a common source of odour and are not typically covered. The OCUs do not treat air from these tanks, i.e. there is no odour control treatment, as it is not considered necessary given the nature of the material and the location of the plant.

(i) Biogas Storage, collection system and pipework; and waste burner

Biogas is produced as a product of digestion of the sludge in the digester tanks. This is utilised to provide the prime fuel source for the boilers, providing hot water for the pasteuriser system. Excess gas (or unused gas) is diverted to the waste gas flare for burning. Should there be insufficient gas available then the boiler system is designed to operate with gas oil. There is no provision for scrubbing.

The biogas collection system is located in the sludge treatment area, as shown in Drawing No. C1197-3006 (see attached). The pipework is shown, and the direction of flow of the biogas, from the 2 no. digesters to the biogas condensate holder, shown in Drawing No. C1197-2023 and Drawing No. C1197-1024.

Biogas from the Sludge Digesters flows to the flexible membrane gasholder. Water from the gas condenses in the gas pipework and gravitates forward to the condensate trap/chamber. See Attachment C1197-8418.

Gas is prevented from escaping from the condensate trap by means of a water trap, condensate discharges into a small pumping chamber for subsequent return to the liquors treatment plant. A system of valves in the condensate trap allows isolation of the gasholder if necessary. Low-pressure fans pressurising the space between the outer membrane of the gasholder and the internal membrane bag maintain gas pressure. Vacuum and pressure relief valves on the gasholder allow discharge under abnormal circumstances. The set pressures of the relief valves will be lower on top of the digesters than at the gas holder so that if there is a high gas pressure the relief will be at high level to make the best use of dispersion for safety and odour reasons.

The gas holder (Drawing No. C1197-1024) is a flexible membrane gas holder of 100m^3 capacity, which buffers the flow of biogas from the digesters and provides a reservoir of gas for semi-continuous operation of the boilers. The gas holder is constructed from two reinforced fabric membranes. The inner membrane is a hemispheric – cylindrical gas- holder, which is attached at its equator to the external, truncated spherical membrane, which is inflated by air pressure thus providing support to the inner membrane. The exterior membrane is inflated by two blowers, which maintain a constant air pressure in the outer membrane. The gas pressure is maintained by the exterior air pressure acting on the inner membrane.

The system operates at a working pressure of 200 mm wg. As the gas is utilised the inner membrane of the holder deflates under the constant pressure from the low-pressure fans. As the inner bag deflates an ultrasonic detector mounted in the top of the gasholder monitors the degree of deflation and computes a gas volume. Various set points will trigger various operations. As the inner membrane expands and fills with gas, the enclosed air volume between the inner and the outer membrane reduces, and to protect against this causing any excess air pressure, the air is automatically released through an air release valve mounted on the outer membrane. When gas consumption exceeds gas production the air blower provides air to replace the reducing gas volume whilst maintaining constant gas pressure.

Two air blowers configured as duty standby provide inflation air for the membrane Gasholder. These run continually in automatic and are rated for the maximum gas utilisation rate by the waste gas burner.

From the gas holder, the biogas is directed to the boilers, which are shown on Drawing No. C1197-3006. Gas is drawn from the gasholder via the condensate trap to the Boiler room for usage by the boilers (as the prime fuel source). The details of the gas use and flow rate for the boilers are shown in the P&ID for the boilers, included as Attachment C1197-8417.

A waste gas burner, located away from the gas holder, burns any excess Biogas, though as the hot water demand is high within the plant, use of this equipment will be limited and should be viewed as a standby route for the gas. This is shown in Drawing No. C1197-1024.

This low level waste gas burner operates under control of the SCADA (the operation control system). If the biogas level in the gasholder exceeds a set point the burner starts and biogas is drawn from the gasholder through a series of actuated valves and flame arrestors. In order that sufficient temperature is reached within the burner fresh air is added to the biogas at the burners to increase the oxygen/biogas mixture.

(j) Location of boiler emission points

The location of the boiler emission points A-01 (a&b) are shown in Drawing 07_4084E.1.2Rev.1 (Figure E.1.2 Emissions to Atmosphere).

The 2 no. boilers can be seen in detail on Drawing No. C1197-3006. A P&ID diagram of the boilers is shown in Drawing No. C1197-1028. This shows the loop system from the pasteurisers to the boilers and also where water is added from the service water pipe to the boilers.

The underground pipework for the boilers is also provided as Drawing No. C1197-2031. This shows the pipe work for the hot water/service water, the electrical ducts serving the boiler, the sump and drainage points and the gas/fuel oil pipework (as already mentioned, diesel will only be used to power the boilers in the rare event that sufficient biogas is not available.

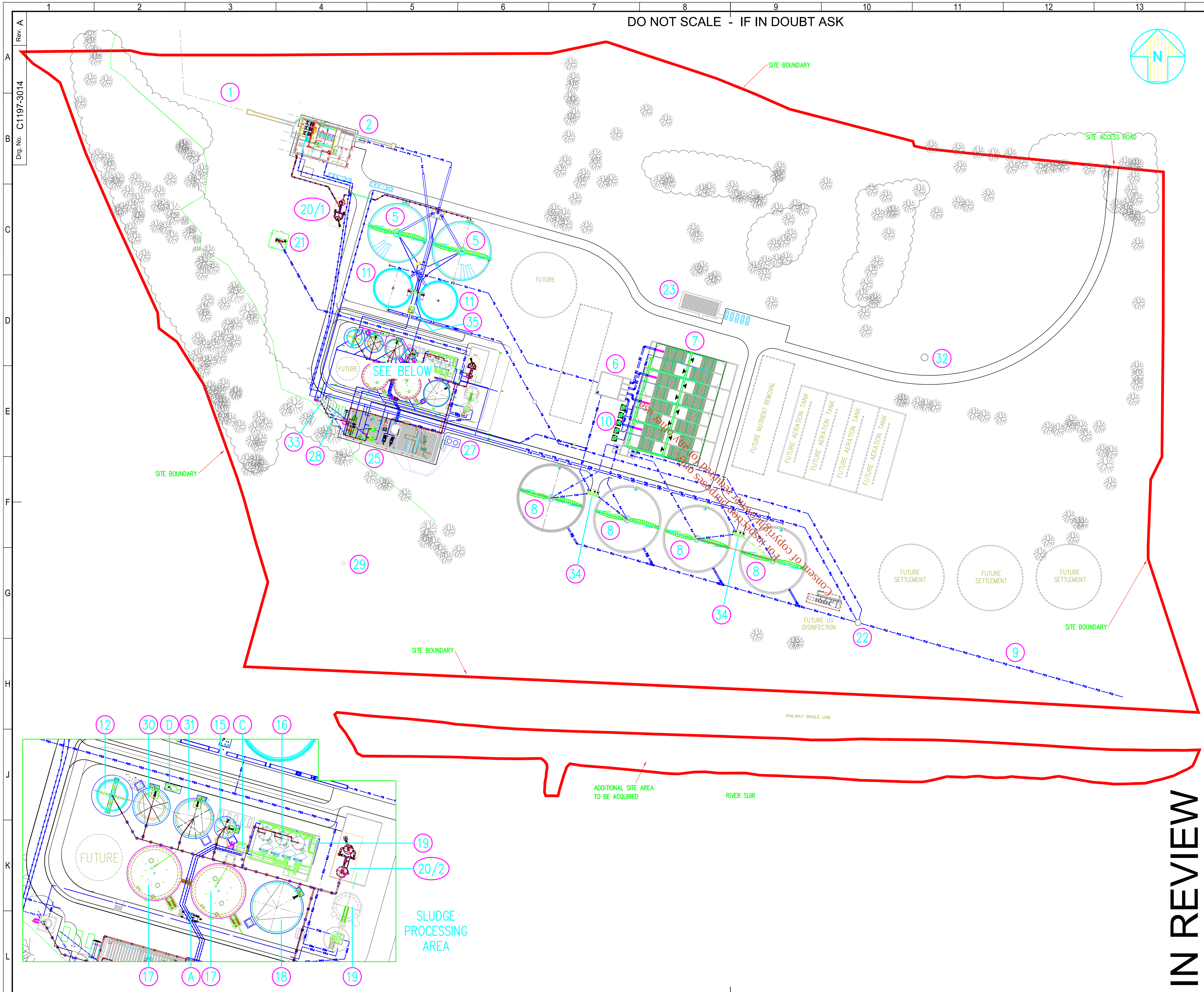
(k) Provide further details of bunded areas and tanks

The sludge treatment area will be bunded, as shown in Drawing No. C1197-3006. The hatched area is the bund that will surround the sludge treatment area.

The bund is an earth structure and is designed to contain sludge spillages should any of the structures within the bunded area rupture or if a pipe bursts. Its area is approximately 90m x 40 m x 1.5m deep giving a volume of approximately 5500 m^3. In particular the largest individual item within the sludge area is a digester tank, which has a design volume of 1,721m^3.

There is no installed provision for pumping out this sludge should there be a spill or leak. It will be done on an individual incident basis by external licensed contractors. An "Incident Response Plan" for dealing with this will be written as part of the O&M (Operations and Maintenance manual) manual for the operational phase of the Plant.

Also shown in Drawing No. C1197-3006 is the fuel tanks for the boilers and the generator, which will be diesel fuelled. These tanks are outlined in blue on the drawing. The tanks are double skinned and so no additional containment is provided.



See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
A		FIRST ISSUE	

NOTE
TREES INDICATED ARE TO BE RETAINED

THIS DRAWING TO BE READ IN CONJUNCTION WITH TEXT OF 3 a) (i) WATER LICENCE

PLANT LEGEND:

1. INLET CHANNEL
2. SCREENING & GRIT REMOVAL BUILDING
5. PRIMARY SETTLEMENT TANK
6. SELECTOR TANK
7. AERATION TANK
8. FINAL SETTLEMENT TANK
9. OUTFALL
10. AERATION BLOWERS (5 No.)
11. STORMWATER TANK
12. PICKET FENCE THICKENER
15. SLUDGE BLENDING TANK
16. SLUDGE PASTEURISATION
17. SLUDGE DIGESTER
18. DIGESTED SLUDGE TANK
19. GAS HOLDING TANK
20. ODOUR CONTROL UNIT
20/1. ODOUR CONTROL UNIT – INLET
20/2. ODOUR CONTROL UNIT – SLUDGE
21. WASTE GAS BURNER
22. DISCHARGE MONITORING CHAMBER
23. ADMINISTRATION BUILDING
25. SLUDGE THICKENING, DEWATERING & DIGESTION CONTROL BUILDING
27. FUEL TANK
28. SKIP HOLDING AREA
29. SURFACE WATER MONITORING CHAMBER
30. THICKENED PRIMARY SLUDGE TANK
31. THICKENED SECONDARY SLUDGE TANK
32. BELVIEW SEWER PUMPING STATION
33. RETURN LIQUORS PUMPING CHAMBER
34. RAS PUMPS (6 No TOTAL)
35. PRIMARY SLUDGE PUMPS (3 No)

A.W.I. CONTRACT No 1002

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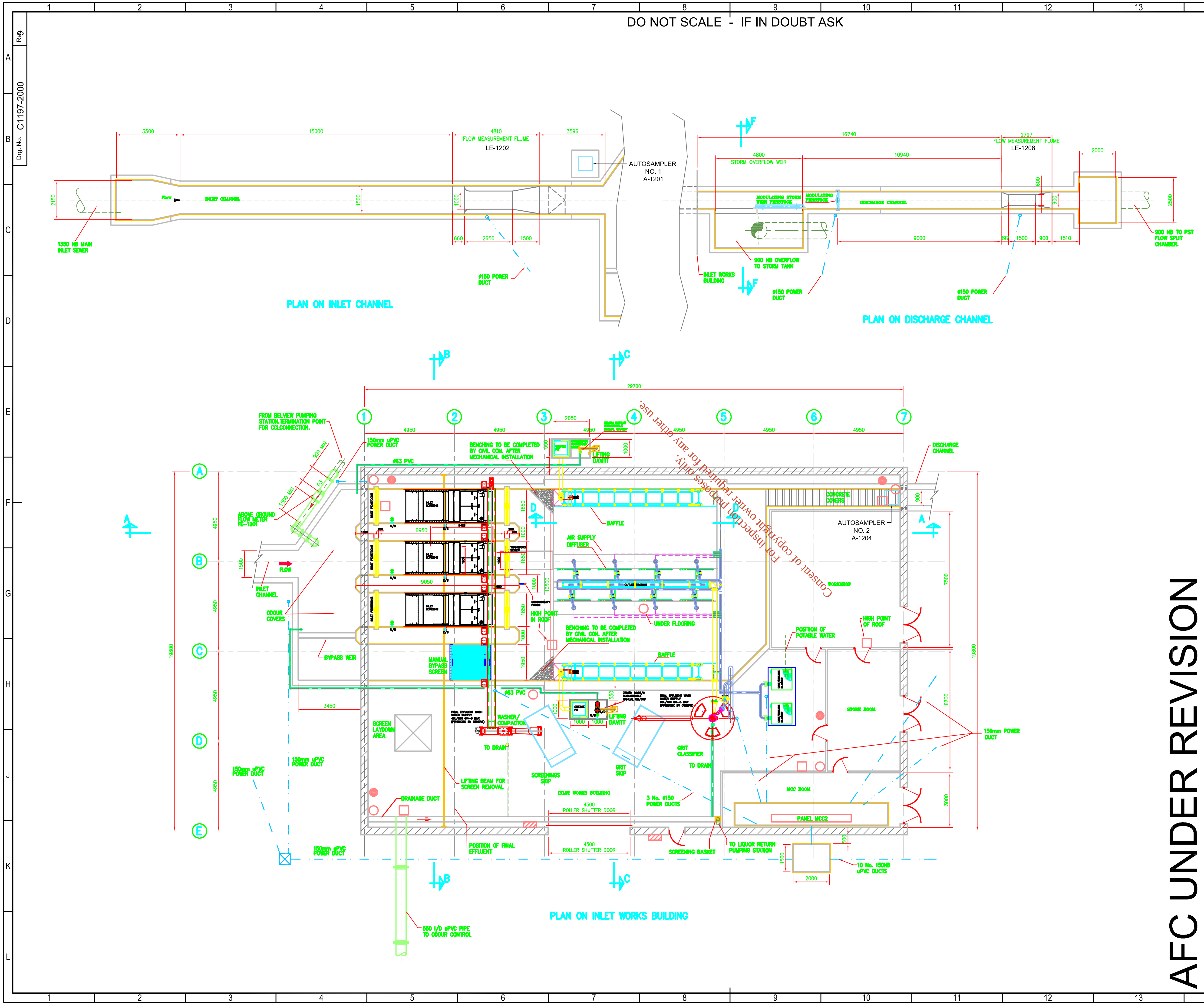
Customer: WATERFORD CITY COUNCIL

Title: SITE LAYOUT
MAIN FEATURES
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
PWhite			A1
Date 23/09/2008	Date	Date	Original Scale

Drg. No. C1197-3014 Rev. A



AFC UNDER REVISION

Rev.	Date	Description	Drawn
9		GAS DETECTION SYSTEM ADDED.	

See Previous Issues For Past Revision Details

NOTES

1. SEE DRAWING No C1197-9403 FOR DUCT SIZING AND ROUTING INFORMATION.

- ○ H_2S (LOW LEVEL)
- ● O_2 (1.5 – 1.8m)
- □ CH_4 (HIGH LEVEL)
- ▨ STATUS INDICATOR

APPROVED FOR CIVIL DESIGN
REV. 6 DATE 03/07/2007
SIGNATURE JMNORTON

ISSUED APPROVED for CONSTRUCTION / SHE 2 REVIEW COMPLETED
DATE: 08/03/2007 SIGNATURE: JMNorton

A.W.I. CONTRACT No 1002

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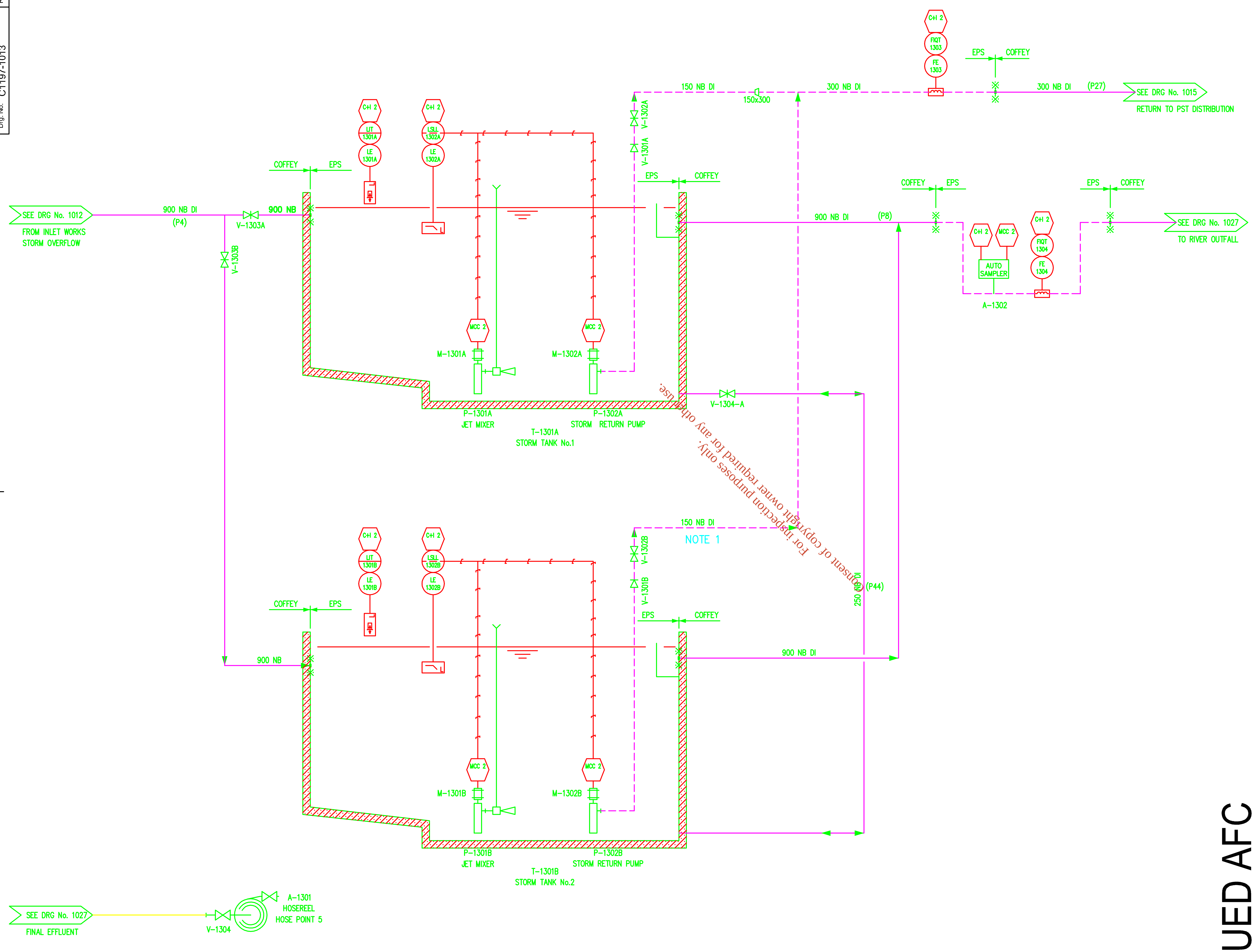
Customer: WATERFORD CITY COUNCIL

Title: INLET WORKS
GENERAL ARRANGEMENT - PLAN
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley			A1
Date 07/11/2006	Date	Date	Original Scale 1:100

Drg. No. C1197-2000 Rev. 9

DO NOT SCALE - IF IN DOUBT ASK



ISSUED AFC

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
2	27/06/2008	HOSE POINT 5 NOTE ADDED	

NOTES

1. ALL PUMPED HYDRAULIC PIPE SIZES TO BE CONFIRMED BY EPS.

LEGEND:

NEW PIPEWORK/CHANNEL BY CIVILS CONTRACTOR. (solid line)

NEW PIPEWORK BY M&E CONTRACTOR. (dashed line)

CHECKED		APPROVED	
PROCESS ENG.	DGH	PROCESS TECH SPECIALIST.	DGG
PROJECT ENG.	JMN	PROJECT MAN.	CGP
LEAD MECH ENG.		MECH ENG MAN.	BM
LEAD ELEC ENG.	AMT	ELEC ENG MAN.	JL

A.W.I. CONTRACT No 1002

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Customer
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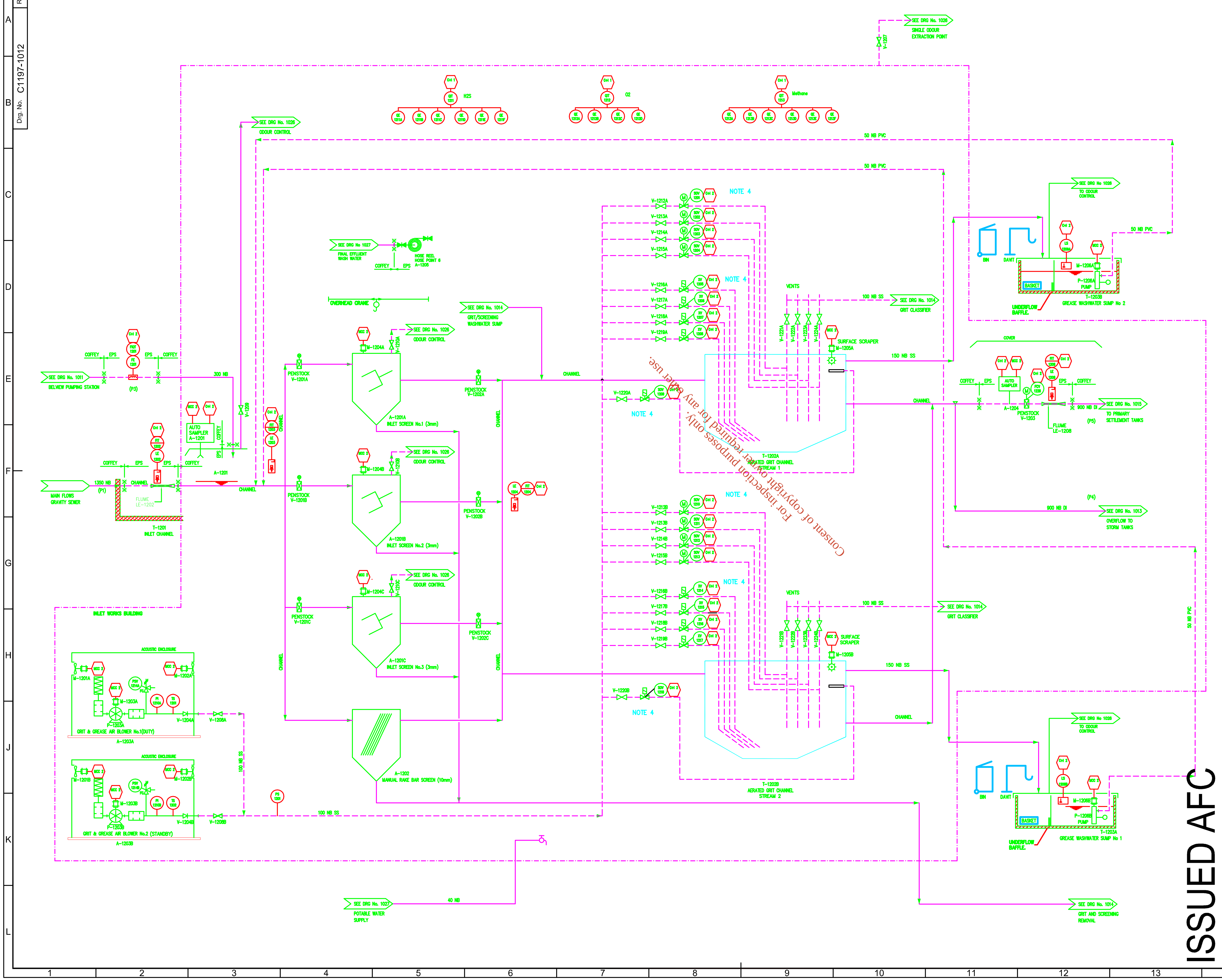
Title
STORM TANKS
P & I DIAGRAM
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMiller	RJMeakin	A1
Date 20/10/2006	Date 26/06/2008	Date 27/06/2008	Original Scale NTS

Drg. No. C1197-1013 Rev. 2

DO NOT SCALE - IF IN DOUBT ASK



ISSUED AFC

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
1	27/06/2008	GENERAL UPDATES	

NOTES
1. REMOVED
2. REMOVED
3. REMOVED
4. NO FEEDBACK

LEGEND:
NEW PIPEWORK/CHANNEL BY CIVILS CONTRACTOR.
NEW PIPEWORK BY M&E CONTRACTOR.

CHECKED		APPROVED	
PROCESS ENG.	DGH	PROCESS TECH SPECIALIST.	DGG
PROJECT ENG.	JMN	PROJECT MAN.	CGP
LEAD MECH ENG.	JAM	MECH ENG MAN.	BM
LEAD ELEC ENG.	AMT	ELEC ENG MAN.	JL

A.W.I. CONTRACT No 1002

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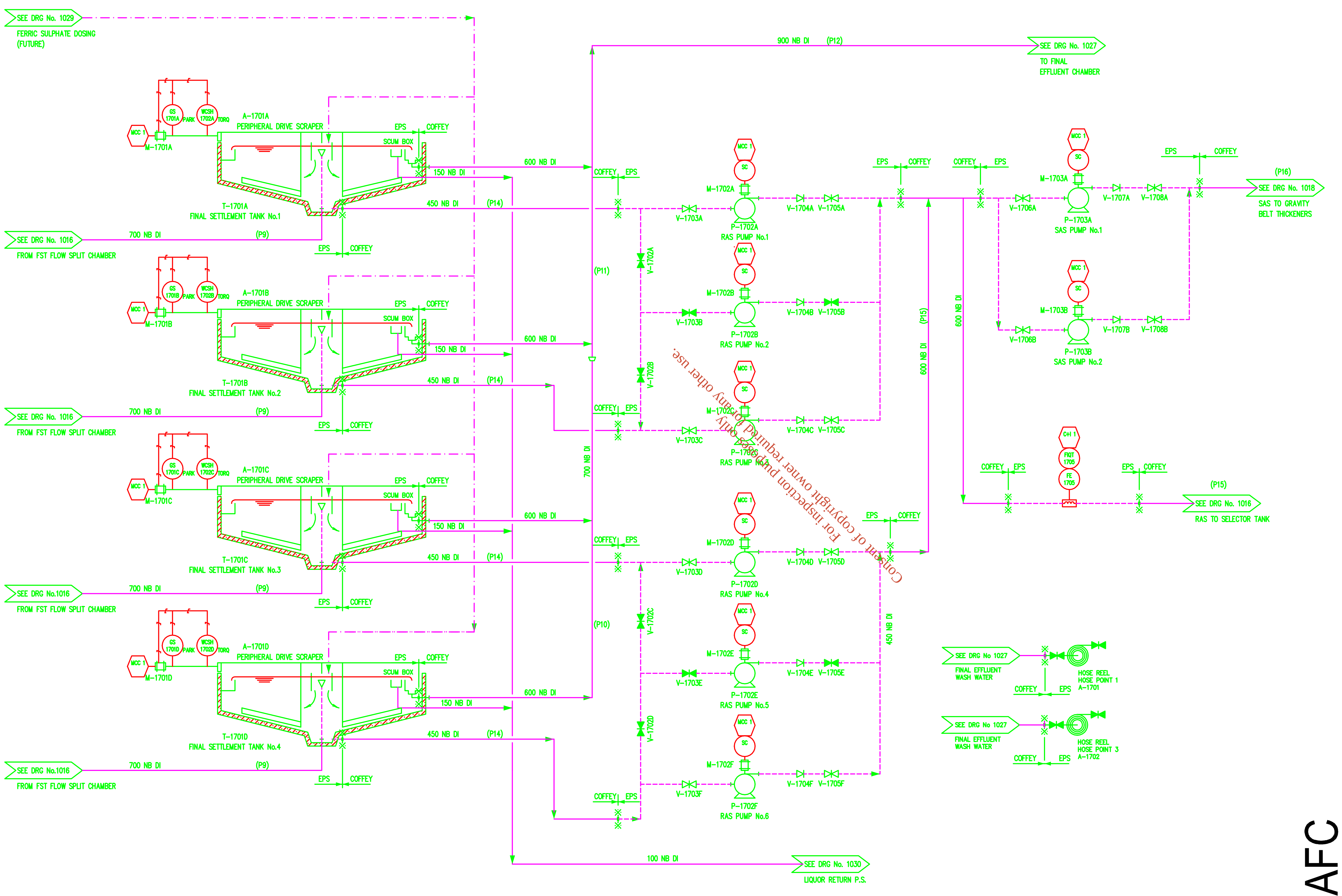
Title
PRELIMINARY TREATMENT
P & I DIAGRAM
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMiller	RJMeakin	A1
Date 20/10/2006	Date 26/06/2008	Date 27/06/2008	Original Scale NTS

Drg. No. C1197-1012 Rev 1

DO NOT SCALE - IF IN DOUBT ASK



ISSUED AFC

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
1	27/06/2008	LINE REMOVED FROM FIQT1705 ELEC TAG. YCSH1701A,B,C & D ARE NOW GS1701A,B,C & D (PARK).	

NOTES

1. ALL PUMPED HYDRAULIC PIPE SIZES TO BE CONFIRMED BY EPS.
2. DRAWING PREVIOUSLY E8374–1017

LEGEND:

NEW PIPEWORK/CHANNEL BY CIVILS CONTRACTOR.

NEW PIPEWORK BY M&E CONTRACTOR.

FUTURE PIPEWORK

CHECKED		APPROVED	
PROCESS ENG.	DGH	PROCESS TECH SPECIALIST.	DGG
PROJECT ENG.	JMN	PROJECT MAN.	CGP
LEAD MECH ENG.	JAM	MECH ENG MAN.	BM
LEAD ELEC ENG.	AMT	ELEC ENG MAN.	JL

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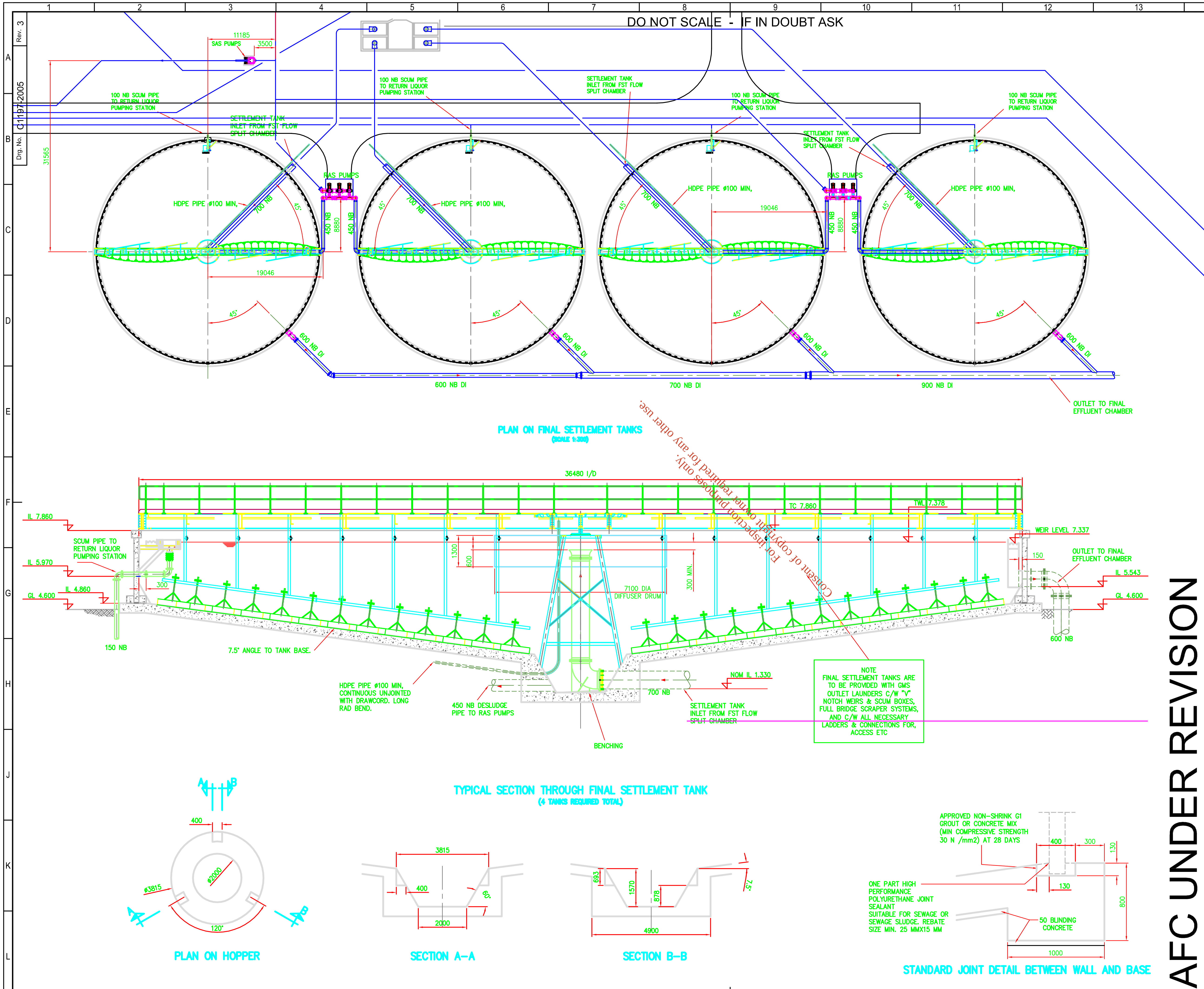
Title
FINAL SETTLEMENT TANKS
P & I DIAGRAM
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMiller	RJMeakin	A1
Date 20/10/2006	Date 26/06/2008	Date 27/06/2008	Original Scale NTS

Drg. No. C1197-1017 Rev. 1



AFC UNDER REVISION

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
3		TWL 7.378 WAS 7.172	

APPROVED FOR CIVIL DESIGN
REV. 3 DATE
SIGNATURE

ISSUED APPROVED for CONSTRUCTION / SHE 2 REVIEW
COMPLETED
A.W.I. CONTRACT No 1002
DATE: 05/11/2007 SIGNATURE: JMNorton

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Customer: WATERFORD CITY COUNCIL

Title: FINAL SETTLEMENT TANKS
GENERAL ARRANGEMENTS
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
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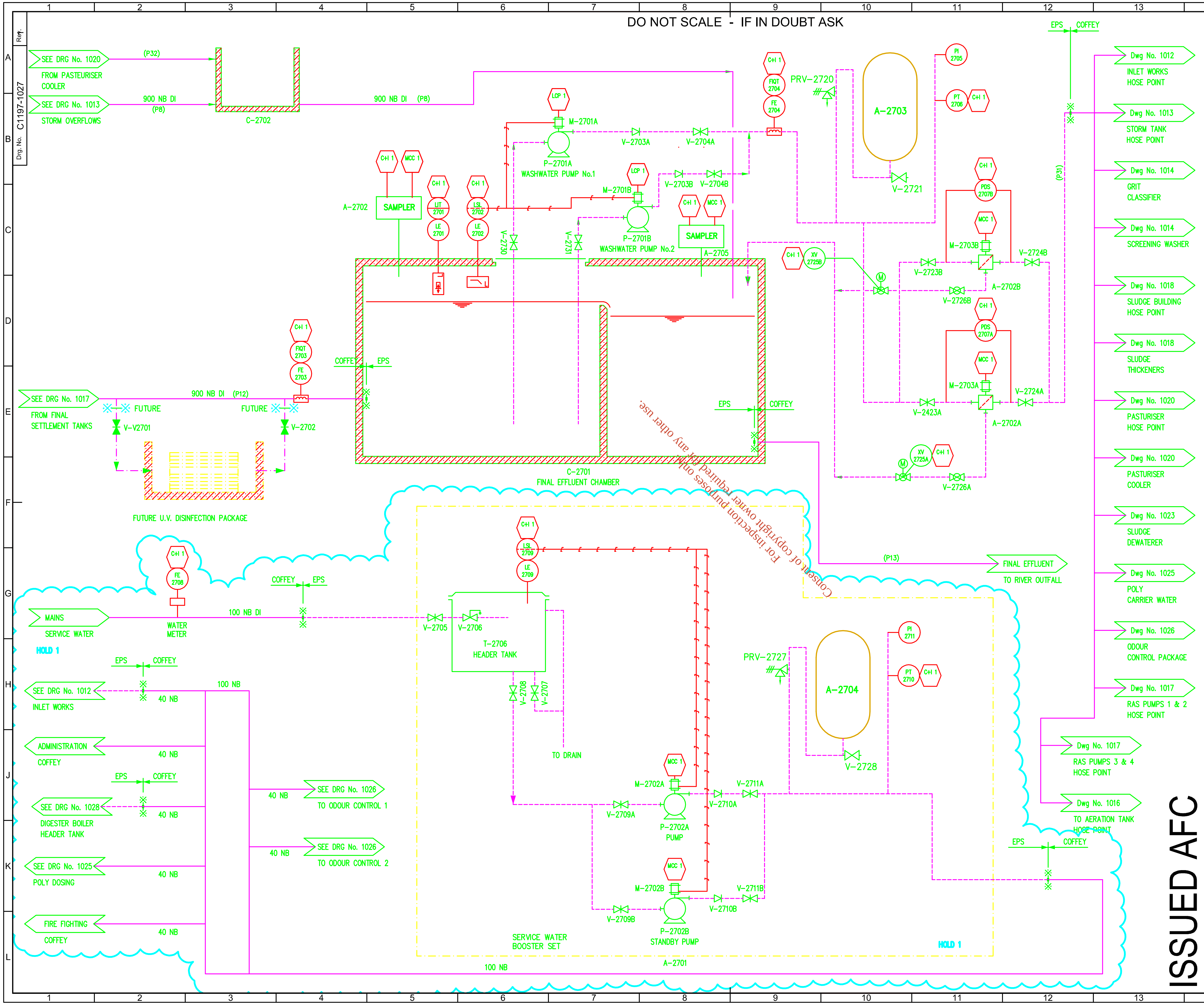
Date 07/11/2006	Date	Date	Original Scale 1:75

Drg. No. C1197-2005 Rev. 3



ISSUED AFC

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
1	27/06/2008	GENERAL MODS	

NOTES

1. DRAWING PREVIOUSLY E8374-1027

HOLDS

1. AWI TO CONFIRM SUPPLY SOURCE.

LEGEND:

- NEW PIPEWORK/CHANNEL BY CIVILS CONTRACTOR.
- NEW PIPEWORK BY M&E CONTRACTOR.
- FUTURE PIPEWORK.
- ENPURE PIPEWORK.

CHECKED		APPROVED	
PROCESS ENG.	DGH	PROCESS TECH SPECIALIST.	DGG
PROJECT ENG.	JMN	PROJECT MAN.	CGP
LEAD MECH ENG.	JAM	MECH ENG MAN.	BM
LEAD ELEC ENG.	AMT	ELEC ENG MAN.	JL

A.W.I. CONTRACT No 1002

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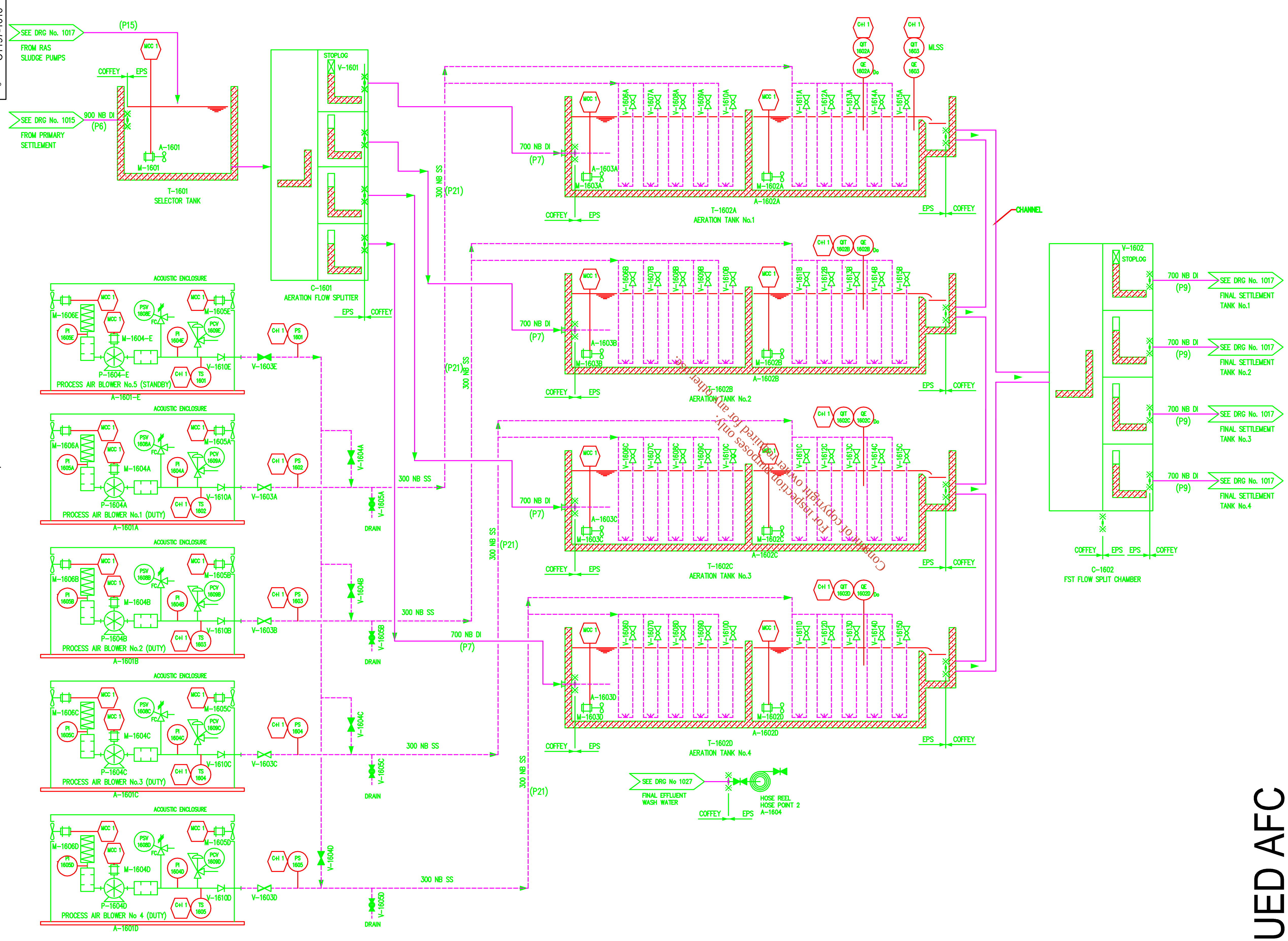
Customer: WATERFORD CITY COUNCIL

Title: WASHWATER & POTABLE WATER
P & I DIAGRAM
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMiller	RJMeakin	A1
Date 20/10/2006	Date 26/06/2008	Date 27/06/2008	Original Scale NTS

Drg. No. C1197-1027 Rev 1

DO NOT SCALE - IF IN DOUBT ASK



NOTES
1. REMOVED
2. REMOVED
3. REMOVED

LEGEND:
NEW PIPEWORK/CHANNEL BY CIVILS CONTRACTOR.
NEW PIPEWORK BY M&E CONTRACTOR.

ISSUED AFC

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
1	27/06/2008	TS-1601 to 5 & PS-1601 to 5 ADDED	

CHECKED		APPROVED	
PROCESS ENG.	DGH	PROCESS TECH SPECIALIST.	DGG
PROJECT ENG.	JMN	PROJECT MAN.	CGP
LEAD MECH ENG.	JAM	MECH ENG MAN.	BM
LEAD ELEC ENG.	AMT	ELEC ENG MAN.	JL

A.W.I. CONTRACT No 1002

coffey enpure

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Customer
WATERFORD CITY COUNCIL

Title
AERATION TANKS
P & I DIAGRAM
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMiller	RJMeakin	A1
Date 20/10/2006	Date 26/06/2008	Date 27/06/2008	Original Scale NTS

Drg. No. C1197-1016 Rev. 1

Drg. No. C1197-2006 Rev. 5

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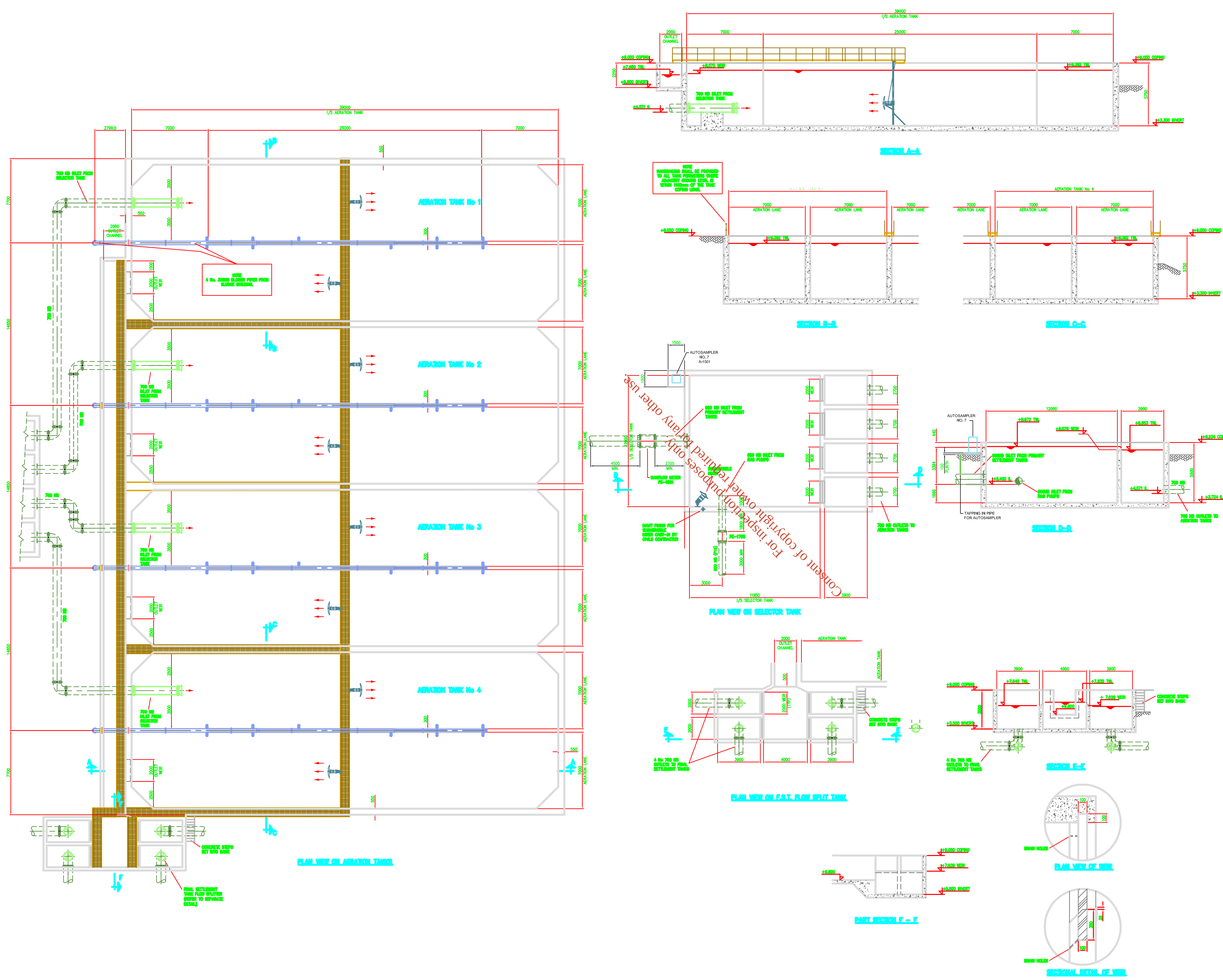

AFC UNDER REVISION

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
5		TWL 7.960 WAS 7.935, TWL 8.872 WAS 8.885, TWL 7.640 WAS 7.553	

APPROVED FOR CIVIL DESIGN
REV. 5 DATE
SIGNATURE

ISSUED APPROVED for CONSTRUCTION / SHE 2 REVIEW
COMPLETED
A.W.I. CONTRACT No 1002
DATE: 03/07/2007 SIGNATURE: DJTildesley

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Customer
WATERFORD CITY COUNCIL

Title
SELECTOR AND AERATION TANKS
GENERAL ARRANGEMENTS
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley			A1
Date 07/11/2006	Date	Date	Original Scale 1:175

Drg. No. C1197-2006 Rev. 5

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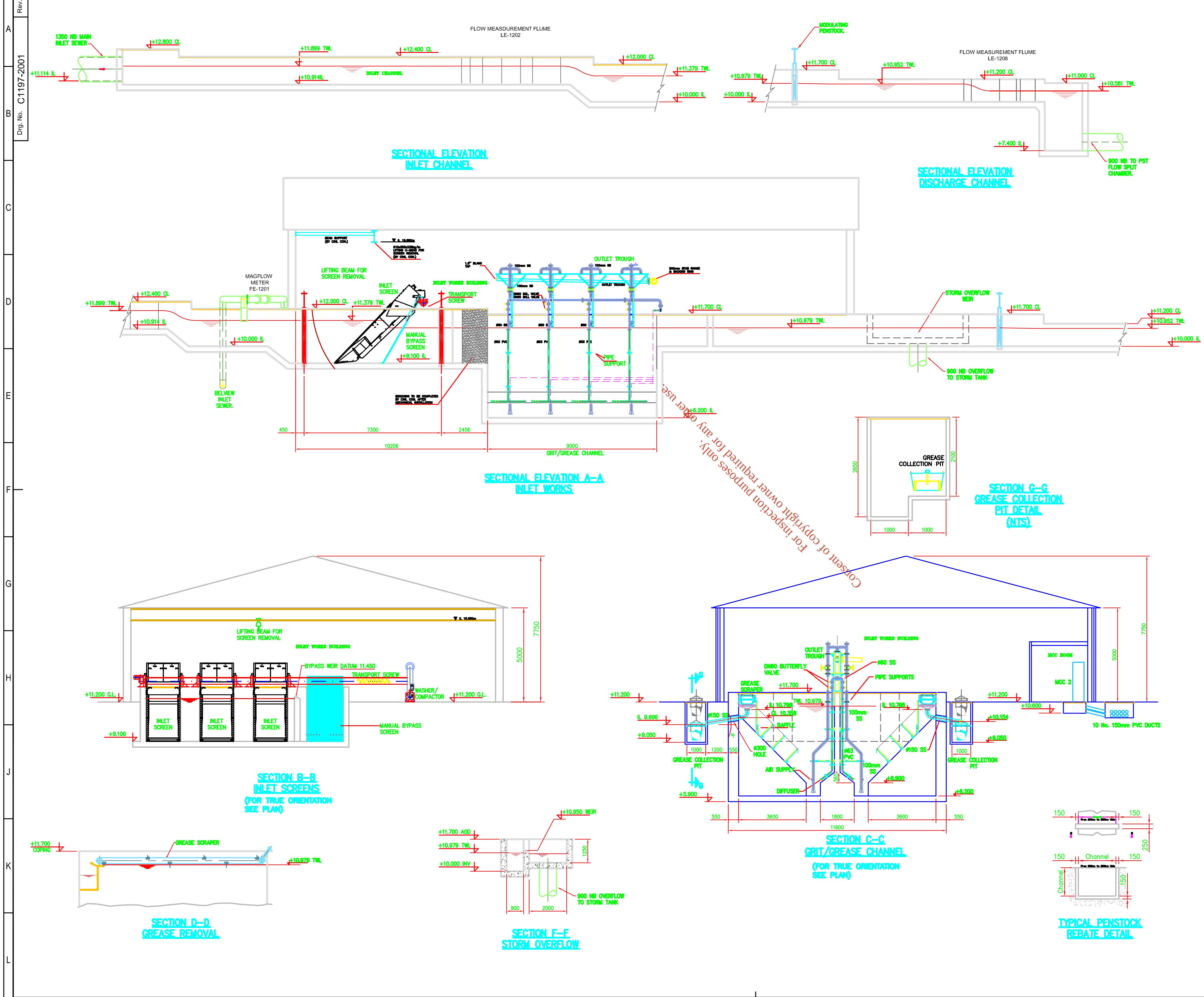

AFC UNDER REVISION

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
8		SECTION C–C REVISED TO EPS DRG.	

APPROVED FOR CIVIL DESIGN
REV. 8 DATE
SIGNATURE

ISSUED APPROVED for CONSTRUCTION / SHE 2 REVIEW COMPLETED
DATE: 08/03/2007 SIGNATURE: JMNorton

A.W.I. CONTRACT No 1002

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Customer: WATERFORD CITY COUNCIL

Title: INLET WORKS
GENERAL ARRANGEMENT - SECTIONS
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley			A1
Date 07/11/2006	Date	Date	Original Scale 1:100

Drg. No. C1197-2001 Rev. 8

PURAC

PROCESS DESIGN CALCULATION

Contract Name : Waterford **Contract No:** C1197

Document Reference: 8402 **Title :** Grit and Grease Removal

Revision	No. of Pages (Excluding Cover)	Date of Issue	Purpose of Issue	Originator	Checked	Approved
1	2		Contract Issue	DGH	[signature]	[signature]

PURAC Grit / Grease Removal				Project-Specific Data	
				Document Ref	8402
Standard Process Calculation: Project-specific data input is permitted to highlighted areas only.				Project No	C1197
				Project Name	Waterford
Calc Ref:	PCS001	Rev 1	Page 1	Process area code	
Author	D Garnett	Refer to PCS index for full details		Tag No(s)	
Calculation status:				Process Engineer	D. Hemmings
				Date	21-Nov-06

Description

Two longitudinal, spiral flow type aerated grit and grease removal tanks are to be utilised. A bypass channel capable of taking 50% of the flow is also included should one lane be out of service.

Plant Flows				
Peak flow		1.685	m3/s	
Mean flow		0.413	Cumecs	
Minimum flow		0.318	Cumecs	
Design parameters				
Detention time				
At maximum flow		3.0	Mins	Ref: Metcalf and Eddy 4th Edition page 389
Adopt maximum flow		1.685	Cumecs	
No. of channels	Select	2	No.	Ref: Vol 4 section 7.3.2
No. of channels as standby	Select	0	No.	
No. of operational channels		2	No.	
Total volume required		303	m3	
Volume per channel		152	m3	
Detention time				
At average flow		12.2	Mins	
Channel cross section - see also sketch				
D1 : Depth of channel	Select	4.00	m	Ref: Metcalf and Eddy 4th Edition page 389
W1 : Width of Grit channel		3.40	m	
W2 : Width of grease channel		1.70	m	
W1 approx 0.85*D				
W2 approx W1/2 and between 1 - 2m				
W4 Width : Wall to grit sump	Select	0.75	m	
W3 Width of grit sump	Select	0.75	m	
D2 Depth of grit sump	Select	0.85	m	
Angle A of benching	Select	60		
Angle B of channel floor	Select	45		
Area a		20.4	m2	
Area b		0.5	m2	
Area c		4.8	m2	
Cross sectional area of channel		15.1	m2	
Length of channel		10.01	m	
Actual Length	Rounded	10.00	m	
Actual W1	Rounded	3.40	m	
Actual W2	Rounded	1.70	m	
Total channel width		5.10	m	
Check hydraulic rate at maximum flow		59.5	m/h	Note: don't consider surface
		0.017	m/s	of grease removal normally.
Check hydraulic rate in non-aerated section		178.39	m/h	

Purac AB design notes:

Take cross section area around	10 and 15	m2
Take typical airflow as	40	m3/hr

The airflow will be set on site.

Use one Saunders valves per down comer and perforated stainless steel pipes DN40-50 as aerators.

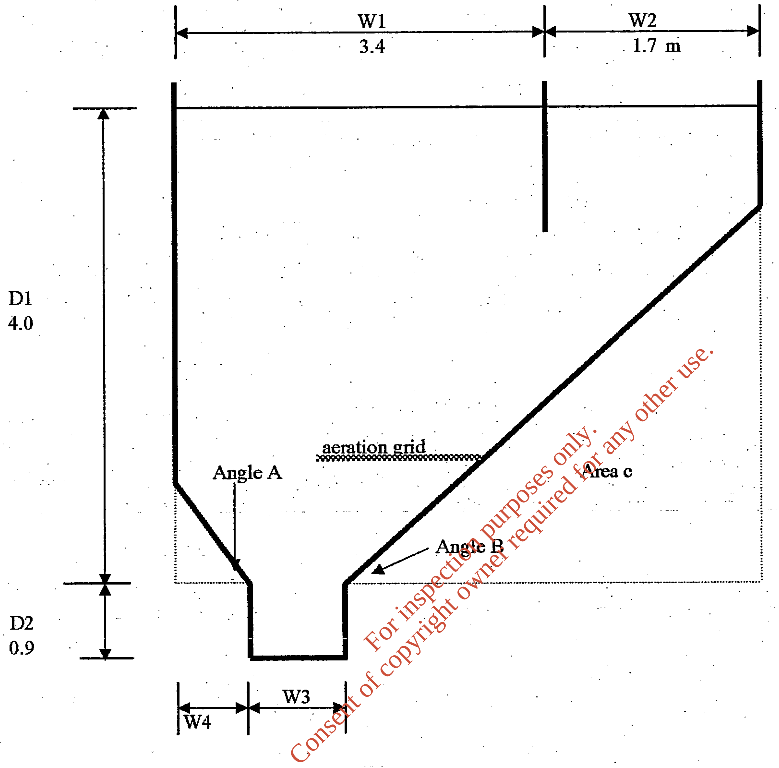
Fat removal zone width between	1 and 2	m
Retention time at maximum flow	3 to 5	min
Hydraulic load in non aerated zone	25	m/hr

Air Requirement

Metcalf and Eddy states that an airflow of between 12 and 30 m3/h per m length of tank is required.

Nm3/h of air per m length of tank	Nm3/h	20.0	
Air Requirement	Nm3/h	200.0	
Expected grit quantities	m3/1000 m3	0.0150	Ref: Metcalf and Eddy 4th Edition page 389
Grit quantities @ average flow	m3/d	0.54	

Cross Section - Grit and Grease Channel



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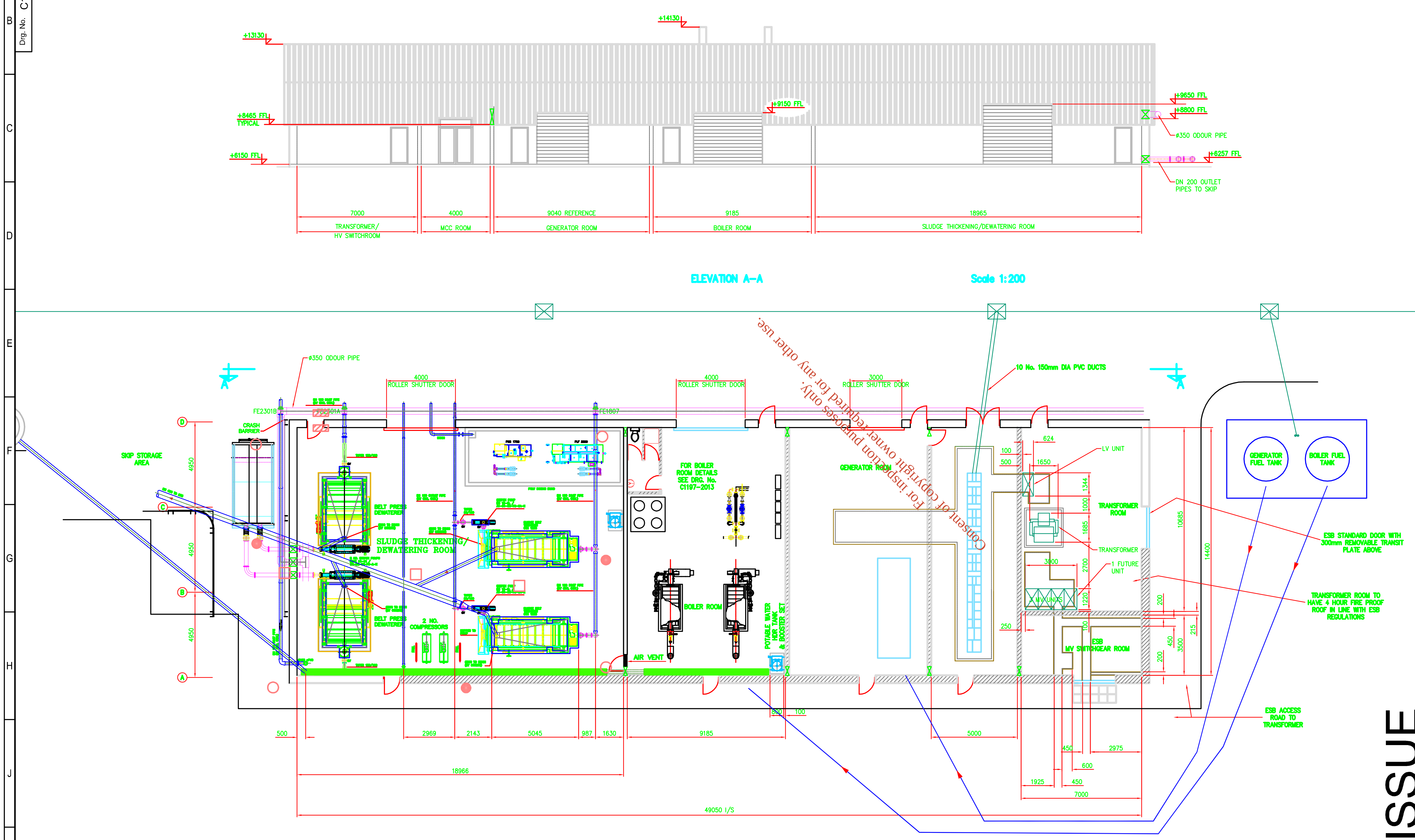
Drg. No. C1197-2011 Rev. P

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
P	01/09/2008	GENERATOR & BOILER FUEL TANKS ADDED.	



H2S (LOW LEVEL)

O2 (1.5 – 1.8m)

CH4 (HIGH LEVEL)

STATUS INDICATOR

SCHEDULE OF BUILDERSWORK OPES & LEVELS.

Centerline of Ope on plan equals centerline of corresponding pipe passing through unless noted otherwise.

Ref.	Pipeø	Size (W x H)	Invert Level	Qty.
1	TRAY	500x900	8.465m	7
2	200	550x550	6.257m	2
3	ODOUR	500x500	8.800m	1

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REV. P DATE 01/09/2008
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A.W.I. CONTRACT No 1002

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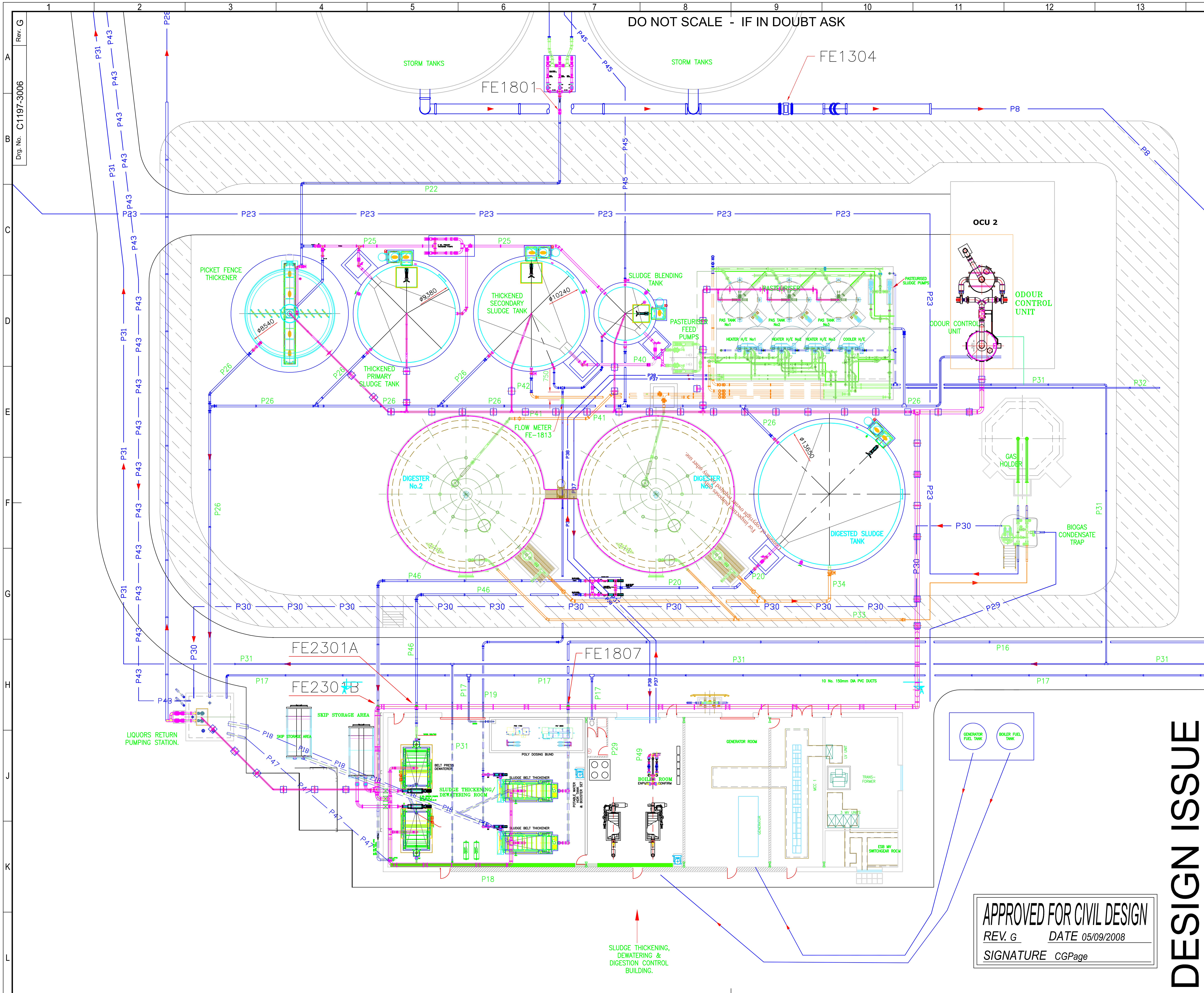
Customer: WATERFORD CITY COUNCIL

Title: SLUDGE THICKENING/DEWATERING BUILDING
GENERAL ARRANGEMENT
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMeakin	CGPage	A1
Date 15/11/2006	Date 21/08/2008	Date 01/09/2008	Original Scale 1:125

Drg. No. C1197-2011 Rev. P



Rev.	Date	Description	Drawn
G	05/09/2008	OIL PIPEWORK AND VALVES DELETED. GENERATOR & BOILER FUEL TANKS ADDED.	

See Previous Issues For Past Revision Details

UNDERGROUND PIPEWORK

PIPELINE No	DIA (NB)	DESCRIPTION
P8	900	STORM TANK OVERFLOW TO P13 (RIVER OUTFALL PIPE) (GRAVITY)
P16	150	SAS FROM RAS PUMPS (P15) TO GRAVITY BELT THICKENERS (PUMPED)
P17	100	SCUM FROM F.S.T.'s TO RETURN LIQUOR PUMPING STATION (GRAVITY)
P18	–	–
P19	100	FROM BELT THICKENERS TO SLUDGE BLENDING TANK (PUMPED)
P20	150	FROM DIGESTED SLUDGE TANK TO PUMP SET (GRAVITY)
P21	–	–
P22	150	SLUDGE FROM P.S.T TO PRIMARY SLUDGE PUMP (GRAVITY) AND ONTO PICKET FENCE THICKENER (PUMPED)
P23	150	EXCESS GAS FROM GAS HOLDING TANK TO WASTE GAS BURNER
P24	100	SCUM FROM PRIMARY SETTLEMENT TANKS TO SLUDGE BLENDING TANK (PUMPED)
P25	100	FROM PICKET FENCE THICKENER TO SLUDGE BLENDING TANK (PUMPED)
P26	100	OVERFLOW FROM PICKET FENCE THICKENER ETC TO RETURN LIQUOR PUMPING STATION (GRAVITY)
P28	200	RETURN LIQUORS FROM RETURN LIQUOR PUMPING STATION TO PRIMARY SETTLEMENT DISTRIBUTION (PUMPED)
P29	150	BIOGAS FROM GAS HOLDER TO BOILERS (PUMPED)
P30	–	–
P31	150 MAIN	FINAL EFFLUENT WASHWATER FROM DISCHARGE MONITORING CHAMBER TO SCREENING & GRIT REMOVAL BLDG, SLUDGE THICKENING DEWATERING & DIGESTION CONTROL BLDG & STORM TANK HOSE POINTS (PUMPED)
P32	80	FINAL EFFLUENT RETURN FROM PASTEURISER COOLER TO FINAL EFFLUENT CHAMBER (GRAVITY)
P33	150	GAS FROM DIGESTERS TO CONDENSATE TRAP (GRAVITY)
P34	200	FROM DIGESTERS TO DIGESTED SLUDGE TANK (GRAVITY)
P37	100	HOT WATER FROM BOILERS TO HEAT EXCHANGERS (PUMPED)
P38	100	WARM WATER FROM HEAT EXCHANGERS TO BOILERS (PUMPED)
P40	150	FROM SLUDGE BLENDING TANK TO PASTEURISER (PUMPED)
P41	150	FROM PASTEURISERS TO DIGESTER TANKS (PUMPED)
P42	150	RETURNED SLUDGE FROM PASTEURISERS TO THICKENED SECONDARY SLUDGE TANK (PUMPED)
P43	100	INLET WORKS AND ODOUR CONTROL UNIT No1 DRAIN TO RETURN LIQUORS SUMP (GRAVITY).
P44	250	CONNECTION BETWEEN STORM TANKS (GRAVITY).
P45	100	SCUM FROM PUMP STATION TO SLUDGE BLENDING TANK (GRAVITY).
P46 (2 No.)	150	DEWATER FEED PUMP TO DEWATERER (PUMPED).
P48	X	DEISEL FUEL TO GENERATOR (PUMPED).
P49	38	DEISEL FUEL TO BOILERS (GRAVITY).
P50	50	AIR LINE FROM COMPRESSOR TO PASTEURISER (PUMPED).

NOTE:–
1. PIPEWORK COLOURED MAGENTA IS EPS SUPPLY
2. PIPEWORK COLOURED BLUE IS COFFEY SUPPLY
3. PIPEWORK COLOURED GREEN IS ENPURE SUPPLY

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DATE: 31/07/2007 SIGNATURE: CGPage

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REV. G DATE 05/09/2008
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DESIGN ISSUE

A.W.I. CONTRACT No 1002

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Customer: WATERFORD CITY COUNCIL

Title: UPDATED SLUDGE AREA LAYOUT
PROPOSED CIVIL OUTLINE
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMeakin	CGPage	A1
Date 21/06/2007	Date 03/09/2008	Date 05/09/2008	Original Scale 1:175

Drg. No. C1197-3006 Rev. G

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PROCESS DESIGN CALCULATION

Contract Name : Waterford **Contract No:** C1197

Document Reference: 8417 **Title :** Bolier

Revision	No. of Pages (Excluding Cover)	Date of Issue	Purpose of Issue	Originator	Checked	Approved
1	1	04/06/2007	Contract Issue	DGH	[signature]	[signature]

BOILER SIZING						
		Case 1	Case 2	Case 3	Case 4	
Total Heat Required by all Digesters	kW	253	314	744	921	Ref: 8416 Heat Exchanger Design
Number of Duty Boilers Selected		1	1	2	2	
Output Required by Each Boiler	kW	253	314	372	461	
Boiler output required to be specified to suppliers. Suppliers to select actual boiler model to meet the required output and advise actual output, efficiency and fuel input requirements. Calculation given below is for preliminary assessment purposes only.						
Boiler Output Selected (Each)	kW	500	500	500	500	
Boiler Efficiency (Assumed)	%	80	80	80	80	
Estimated Fuel Input Required (Each)	kW	625	625	625	625	
Sludge Gas Usage						
Gas Net Calorific Value	MJ/Nm^3	22.5	22.5	22.5	22.5	
Approximate Gas Flowrate (Each)	Nm^3/h	100	100	100	100	
Approximate Gas Flowrate (Total)	Nm^3/h	100	100	200	200	
Minimum Gas Yield (Total)	m^3/d	2291	2291	3776	3776	8413 Gas Production
Proportion of Minimum Gas Yield Consumed by all Boilers	%	105	105	127	127	
Standby Fuels						
Fuel Oil Net Calorific Value	MJ/m^3	36900.00	36900.00	36900.00	36900.00	
Fuel Oil Flowrate (approx)	m^3/h	0.06	0.06	0.06	0.06	
	l/h	61	61	61	61	
LPG Net Calorific Value	MJ/m^3	93.90	93.90	93.90	93.90	
LPG Flowrate (approx)	Nm^3/h	23.96	23.96	23.96	23.96	
Natural Gas Net Calorific Value	MJ/Nm^3	38.62	38.62	38.62	38.62	
Natural Gas Flowrate (approx)	Nm^3/h	58.26	58.26	58.26	58.26	

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UNDERGROUND PIPEWORK

PIPELINE No	DIA (NB)	PIPELINE MAT'L	WORKING PRESSURE	DESCRIPTION
P1	1350	CONC	0.1	RAW SEWAGE FROM WATERFORD CITY TO INLET WORKS (GRAVITY)
P2	450	CONC	0.1	RAW SEWAGE FROM BELVIEW AREA TO NEW PUMPING STATION (GRAVITY)
P3	300	DI	11	RAW SEWAGE FROM BELVIEW PUMPING STATION TO WORKS INLET (PUMPED)
P4	900	DI	6	WORKS INLET STORM OVERFLOW TO STORM TANKS (GRAVITY)
P5	900	DI	7	SCREENED SEWAGE FROM PRELIMINARY TREATMENT TO PRIMARY SETTLEMENT TANKS (GRAVITY)
P6	900	DI	5	SCREENED SEWAGE FROM PRIMARY SETTLEMENT TANKS TO AERATION SELECTOR TANK (GRAVITY)
P7 (4No)	700	DI	4	SCREENED SEWAGE FROM SELECTOR TANK FLOW SPLIT CHAMBERS TO AERATION TANKS (4 No) (GRAVITY)
P8	900	DI	7	STORM TANK OVERFLOW TO P13 (RIVER OUTFALL PIPE) (GRAVITY)
P9 (4No)	700	DI	6	FROM F.S.T. FLOW SPLIT CHAMBER TO FINAL SETTLEMENT TANKS (4 No) (GRAVITY)
P10	600	DI	7	FINAL EFFLUENT FROM F.S.T.'s TO FINAL EFFLUENT CHAMBER (4 No) (GRAVITY)
P11	700	DI	7	FINAL EFFLUENT FROM F.S.T. OUTLETS (P10) TO FINAL EFFLUENT MAIN (P12) (GRAVITY)
P12	900	DI	7	F.E. MAIN TO FINAL EFFLUENT CHAMBER (GRAVITY)
P13	1200	CONC	13	FINAL EFFLUENT FROM FINAL EFFLUENT CHAMBER TO OUTFALL (GRAVITY)
P14	450	DI	6	RAS FROM F.S.T.'s TO RAS PUMPS (4 No) (GRAVITY)
P15	600	DI	5	RAS FROM RAS PUMPS TO SELECTOR TANK (PUMPED)
P16	150	DI	5	SAS FROM RAS PUMPS (P15) TO GRAVITY BELT THICKENERS (PUMPED)
P17	100	DI/HPPE	4	SCUM FROM F.S.T.'s TO RETURN LIQUOR PUMPING STATION (GRAVITY)
P18	400	PVC/DI	4	FILTRATE FROM GRAVITY BELT THICKENERS TO P17 (RETURN LIQUOR PUMPING STATION) (GRAVITY)
P19	100	DI	10	THICKENED SLUDGE FROM GRAVITY BELT THICKENER TO SLUDGE BUFFER/BLENDING TANK (PUMPED)
P20	150	DI	6	SLUDGE FROM DIGESTED SLUDGE TANK TO DEWATERER FEED PUMP (GRAVITY)
P21 (4No)	300	DI	6	AIR FROM PROCESS AIR BLOWERS TO AERATION TANKS (PUMPED)
P22	150	DI	10	SLUDGE FROM PRIMARY SETTLEMENT TANKS TO PRIMARY SLUDGE PUMP (GRAVITY) (2 No) AND ONTO PICKET FENCE THICKENER (PUMPED)
P23	150	HPPE	0.25	EXCESS GAS FROM GAS HOLDING TANK TO WASTE GAS BURNER
P24 (2No)	150	DI	5	SCUM FROM PRIMARY SETTLEMENT TANKS TO SCUM PUMPING STATION (GRAVITY).
P25	150	DI	5	FROM PICKET FENCE THICKENER TO P.C. PUMPS (GRAVITY)
P26	150	DI	7	FROM PICKET FENCE THICKENER TO RETURN LIQUOR PUMPING STATION (GRAVITY)
P27	300	DI	6	STORM RETURN TO PRIMARY SETTLEMENT TANK FLOW SPLIT CHAMBER (PUMPED)
P28	200	DI	12	RETURN LIQUORS FROM RETURN LIQUOR PUMPING STATION TO PRIMARY SETTLEMENT DISTRIBUTION (PUMPED)
P29	150	HPPE	0.25	BIOGAS FROM GAS HOLDER TO BOILERS
P30	50	HPPE	10	CONDENSATE DRAIN FROM BOILER PACKAGE CONDENSATE TRAP TO RETURN LIQUORS (P17) (PUMPED)
P31	–	–	–	–
P32	80	DI	60	FINAL EFFLUENT RETURN FROM PASTEURISER COOLER TO FINAL EFFLUENT CHAMBER (GRAVITY)
P33	150	HPPE	0.25	GAS FROM DIGESTERS TO CONDENSATE TRAP (GRAVITY)
P34 (2No)	200	DI	10	FROM DIGESTERS TO DIGESTED SLUDGE TANK (GRAVITY)
P35	–	–	–	NOT USED
P36	–	–	–	NOT USED
P37	100	DI	30	HOT WATER FROM BOILERS TO HEAT EXCHANGERS (PUMPED)
P38	100	DI	30	WARM WATER FROM HEAT EXCHANGERS TO BOILERS (PUMPED)
P39	–	–	–	NOT USED
P40	150	DI	6	FROM SLUDGE BLENDING TANK TO PASTEURISER FEED PUMPS (GRAVITY) FROM PUMPS TO PASTEURISER TANK
P41	150	DI	90	FROM PASTEURISERS TO DIGESTER TANKS (PUMPED)
P42	150	DI	90	RETURNED SLUDGE FROM PASTEURISERS TO THICKENED SECONDARY SLUDGE TANK (PUMPED)
P43	100	DI	8	INLET WORKS AND ODOUR CONTROL UNIT No1 DRAIN TO RETURN LIQUORS SUMP (GRAVITY).
P44	250	DI	5	CONNECTION BETWEEN STORM TANKS (GRAVITY).
P45	100	DI	7	SCUM FROM PUMP STATION TO SLUDGE BLENDING TANK (GRAVITY).
P46 (2No)	150	DI	10	DEWATER FEED PUMP TO DEWATERER (PUMPED).
P47	–	–	–	–
P48				DEISEL FUEL TO GENERATOR (PUMPED).
P49	38			DEISEL FUEL TO BOILERS (GRAVITY).
P50	50	GMS BS1387	69	AIR LINE FROM COMPRESSOR TO PASTEURISER (PUMPED).

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
J	22/08/2008	WEIGH BRIDGE ADDED.	

NOTES

#1. PRESSURE SHOWN AS M WATER HEAD.

#2. REFER TO DRAWING C1197–3006 FOR DETAILS OF SLUDGE AREA.

#3. FOR ELECTRICAL/CONTROL DUCTWORK LAYOUT SEE DRG C1197–3010.

#4. FOR SERVICE WATER AND FE WASHWATER (P31) SEE DRAWING C1197–3010.

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REV. J DATE 22/08/2008
SIGNATURE CGPage

DESIGN ISSUE

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DATE: 31/07/2007 SIGNATURE: CGPage

A.W.I. CONTRACT No 1002

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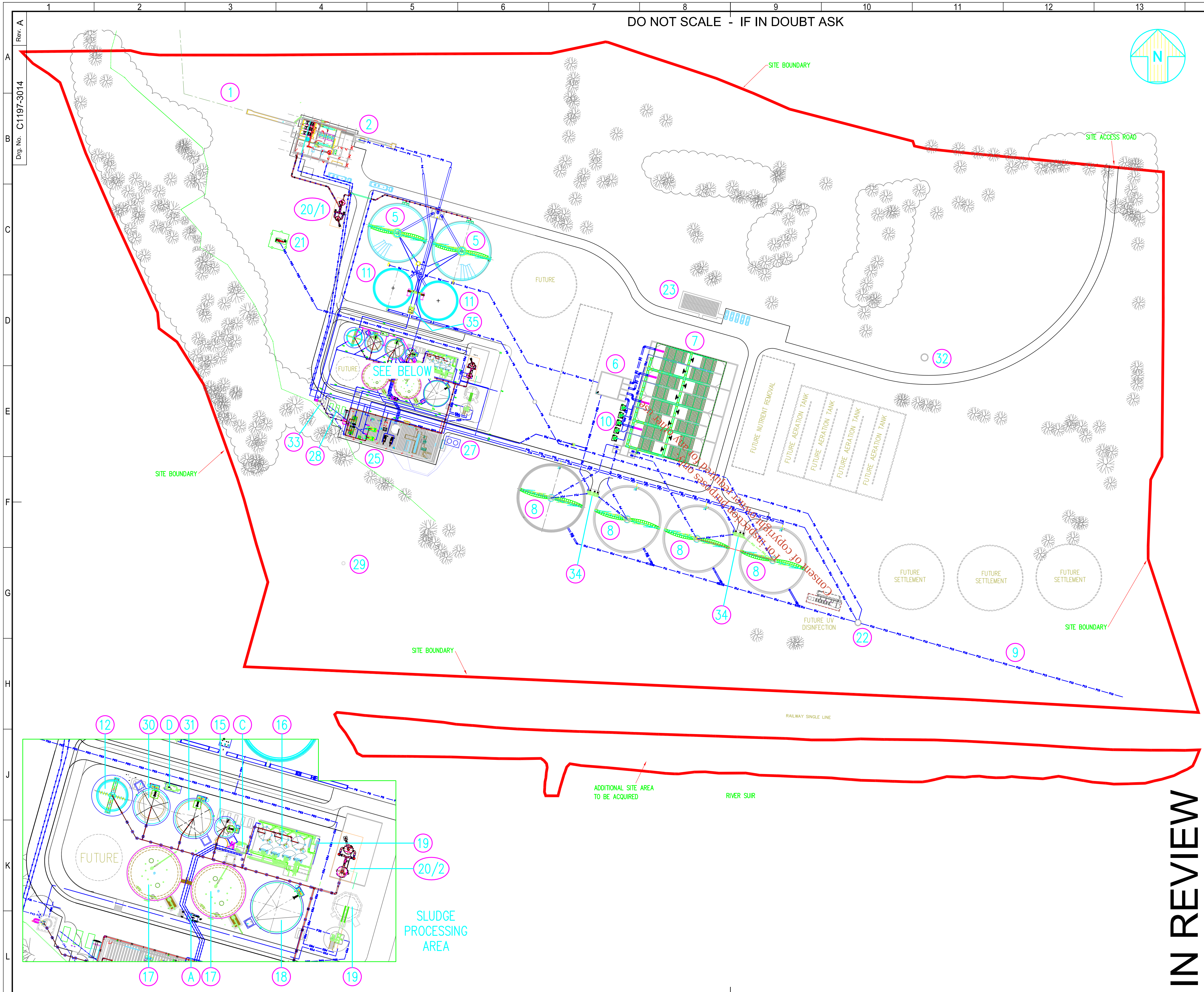
Customer: WATERFORD CITY COUNCIL

Title: PROPOSED PIPEWORK LAYOUT
CIVIL OUTLINE
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	AScott	CGPage	A0
Date 12/01/2007	Date 22/08/2008	Date 22/08/2008	Original Scale 1:500

Drg. No. C1197-3002 Rev. J



See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
A		FIRST ISSUE	

NOTE
TREES INDICATED ARE TO BE RETAINED

THIS DRAWING TO BE READ IN CONJUNCTION WITH TEXT OF 3 a) (i) WATER LICENCE

PLANT LEGEND:

1. INLET CHANNEL
2. SCREENING & GRIT REMOVAL BUILDING
5. PRIMARY SETTLEMENT TANK
6. SELECTOR TANK
7. AERATION TANK
8. FINAL SETTLEMENT TANK
9. OUTFALL
10. AERATION BLOWERS (5 No.)
11. STORMWATER TANK
12. PICKET FENCE THICKENER
15. SLUDGE BLENDING TANK
16. SLUDGE PASTEURISATION
17. SLUDGE DIGESTER
18. DIGESTED SLUDGE TANK
19. GAS HOLDING TANK
20. ODOUR CONTROL UNIT
20/1. ODOUR CONTROL UNIT – INLET
20/2. ODOUR CONTROL UNIT – SLUDGE
21. WASTE GAS BURNER
22. DISCHARGE MONITORING CHAMBER
23. ADMINISTRATION BUILDING
25. SLUDGE THICKENING, DEWATERING & DIGESTION CONTROL BUILDING
27. FUEL TANK
28. SKIP HOLDING AREA
29. SURFACE WATER MONITORING CHAMBER
30. THICKENED PRIMARY SLUDGE TANK
31. THICKENED SECONDARY SLUDGE TANK
32. BELVIEW SEWER PUMPING STATION
33. RETURN LIQUORS PUMPING CHAMBER
34. RAS PUMPS (6 No TOTAL)
35. PRIMARY SLUDGE PUMPS (3 No)

A.W.I. CONTRACT No 1002

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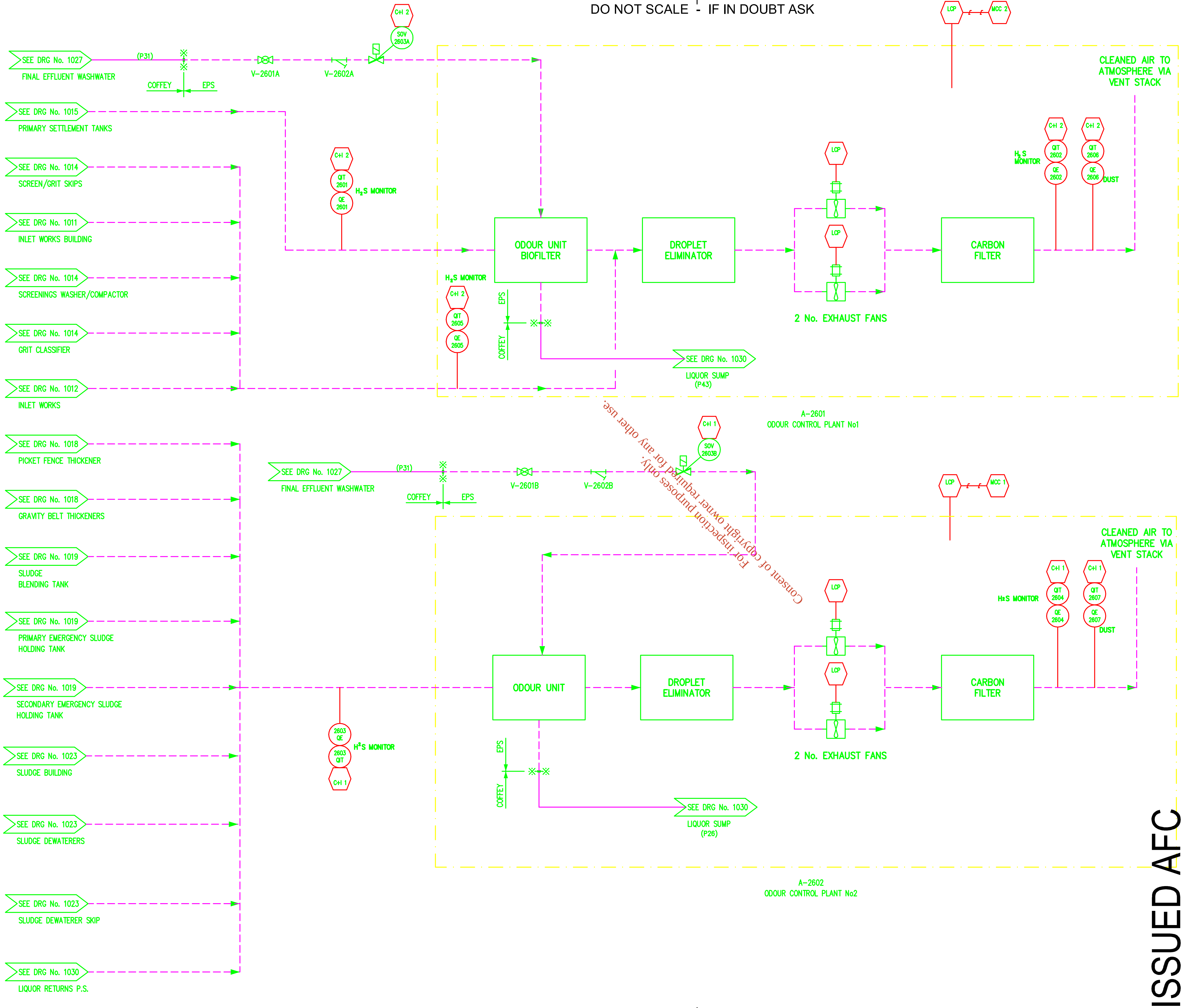
Customer: WATERFORD CITY COUNCIL

Title: SITE LAYOUT
MAIN FEATURES
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
PWhite			A1
Date 23/09/2008	Date	Date	Original Scale

Drg. No. C1197-3014 Rev. A

DO NOT SCALE - IF IN DOUBT ASK



See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
1	27/06/2008	UPDATED TO SUPPLIERS INFORMATION	

NOTES

1. REMOVED

LEGEND:

NEW PIPEWORK/CHANNEL BY CIVILS CONTRACTOR.

NEW PIPEWORK BY M&E CONTRACTOR.

CHECKED		APPROVED	
PROCESS ENG.	DGH	PROCESS TECH SPECIALIST.	DGG
PROJECT ENG.	JMN	PROJECT MAN.	CGP
LEAD MECH ENG.	JAM	MECH ENG MAN.	BM
LEAD ELEC ENG.	AMT	ELEC ENG MAN.	JL

A.W.I. CONTRACT No 1002

coffey enpure

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Customer: WATERFORD CITY COUNCIL

Title: ODOUR CONTROL
P & I DIAGRAM
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMiller	RJMeakin	A1
Date 20/10/2006	Date 26/06/2008	Date 27/06/2008	Original Scale NTS

Drg. No. C1197-1026 Rev 1

ISSUED AFC

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PROCESS DESIGN CALCULATION

Contract Name : Waterford **Contract No:** C1197

Document Reference: 8419 **Title :** Odour Control Design

Revision	No. of Pages (Excluding Cover)	Date of Issue	Purpose of Issue	Originator	Checked	Approved
1	4	23/01/2007	Draft Issue	DGH	PB	
2	4	09/02/2007	Contract Issue	DGH	[signature]	[signature]

PURAC Contract No.	**C1197**
Contract Title	**Waterford WwTW**
PURAC Document No.	**8419**
Date	**09/02/07**
Revision	**2**

List Odour Control Unit Names	P&ID no.	Tag No.	Ave Odour concentration (OU_E/m^3)	Max Odour concentration (OU_E/m^3)	Ave H_2S conc (ppm)	Peak H_2S conc (ppm)	Air flowrate (m^3/hr)
Combined Treatment OCU	C1197-1026	TBC	0	0	0.0	0.0	0
			0	0	0.0	0.0	0
			0	0	0.0	0.0	0
Inlet Treatment OCU	C1197-1026	TBC	63533	63533	19.2	19.2	13815
Sludge Treatment OCU	C1197-1026	TBC	97976	97976	49.0	49.0	5042
			0	0	0.0	0.0	0
Other discharges			0	0	0.0	0.0	0
			72743	72743	27.1	27.1	18857
Check calc integrity			OK	OK	OK	OK	OK

Areas to be odour controlled — Orange cells require input

Process Area	Process Fluid	P&ID no. & GA no.	No.	Tag No(s)	Air extracted to:	Ave Odour concentration (OU_E/m^3)	Max Odour concentration (OU_E/m^3)	Converted average H_2S conc. (ppm)	Converted peak H_2S conc. (ppm)	Air flowrate (m^3/hr)
Pre-screen and post-grit channels	Raw Sewage	C1197-1012 & 2000/1	1	T-1201	Inlet Treatment OCU	131243	131243	39	39	388
Fine Screens including bypass	Raw Sewage	C1197-1012 & 2000/1	4	A-1201A/B/C & A-1202	Inlet Treatment OCU	81000	81000	24	24	704
Screenings Compactors	Raw Sewage	C1197-1014 & 2000/1	1	A-1401	Inlet Treatment OCU	80000	80000	40	40	32
Grit Classifier	Grit	C1197-1014 & 2000/1	1	A-1402	Inlet Treatment OCU	160000	160000	80	80	32
Grit Channel	Raw Sewage	C1197-1012 & 2000/1	2	T-1202A/B	Inlet Treatment OCU	65833	65833	20	20	1004
Preliminary Treatment Building	N/A	C1197-1012 & 2000/1	1		Inlet Treatment OCU	150	150	0	0	7247
Primary Sedimentation Tank	Screened Sewage	C1197-1015 & 2004	2	T-1501A/B	Inlet Treatment OCU	157664	157664	47	47	4407
Pasteuriser	Sludge	C1197-1020	3	T-2001A/B/C	Sludge Treatment OCU	630000	630000	315	315	246
Picket Fence Thickener	Primary Sludge	C1197-1018	1	T-1801	Sludge Treatment OCU	420000	420000	210	210	178
Secondary Sludge Thickener	Secondary Sludge	C1197-1018 & 2011	2	A-1802A/B	Sludge Treatment OCU	280000	280000	140	140	60
Sludge Building	N/A	C1197-1018 & 2011	1		Sludge Treatment OCU	800	800	0	0	3580
Emergency Primary Sludge Tank	Primary Sludge	C1197-1019	1	T-1903	Sludge Treatment OCU	315000	315000	158	158	276
Emergency Secondary Sludge Tank	Secondary Sludge	C1197-1019	1	T-1902	Sludge Treatment OCU	315000	315000	158	158	329
Sludge Blending Tank	Sludge	C1197-1019	1	T-1901	Sludge Treatment OCU	630000	630000	315	315	41
Sludge Dewaterer	Sludge	C1197-1023 & 2011	2	A-2301A/B	Sludge Treatment OCU	96000	96000	48	48	90
						0	0	0	0	0
Liquor Return PS	Sludge Liquors	C1197-1030	1	C-3001	Sludge Treatment OCU	78750	78750	39	39	240

C1197 - Waterford WwTW

Ventilation, Odour Control and Declassification of Zoned Areas Calculations

PURAC Document No. **8419**

Date **09/02/2007**

Revision **2**

Orange cells require input

Process Area	Process fluid	No.	Vessel Shape	Working Dimensions / Details						Headspace / Gross Vessel Dimensions / Details						Process volume (per unit)	Headspace / Gross volume	Tank Perimeter (per unit)	Cover Perimeter	Actual Perimeter	Max fill rate or specified (per unit)
																m^3	m^3	m	m		m^3/hr
Pre-screen and post-grit channe	Raw Sewage	1	Rectangular	52.4	m length	1.8	m deep	1.5	m width	52.4	m length	0.5	m deep	1.5	m width	141.5	39.3	107.8		Perimeter	
Fine Screens including bypass	Raw Sewage	4	Rectangular	10	m length	2.2	m deep	2.2	m width	10	m length	1	m deep	2.2	m width	48.4	22.0	24.4		Perimeter	
Screenings Compactors	Raw Sewage	1	Other	4	m3 volume											4.0	4.0	N/A		N/A	
Grit Classifier	Grit	1	Other	4	m3 volume											4.0	4.0	N/A		N/A	
Grit Channel	Raw Sewage	2	Rectangular	10	m length	2.2	m deep	5.1	m width	10	m length	0.5	m deep	5.1	m width	112.2	25.5	30.2		Perimeter	400
Preliminary Treatment Building	N/A	1	Rectangular	29.3	m length	6.38	m deep	19.4	m width	29.3	m length	6.38	m deep	19.4	m width	3623.7	3623.7	97.4		N/A	
Primary Sedimentation Tank	Screened Sewage	2	Circular	32	m diam	3	m deep			32	m diam	1.37	m deep			2412.7	1101.8	100.5		Perimeter	
Pasteuriser	Sludge	3	Other	41	m3 volume											41.0	41.0	N/A		N/A	
Picket Fence Thickener	Primary Sludge	1	Circular	8.7	m diam	4.5	m deep			8.7	m diam	0.5	m deep			267.5	29.7	27.3		Perimeter	8
Secondary Sludge Thickener	Secondary Sludge	2	Rectangular	5.6	m length	0.75	m deep	1.2	m width	5.6	m length	0.75	m deep	1.2	m width	5.0	5.0	13.6		Cover	
Sludge Building	N/A	1	Rectangular	19.5	m length	6.38	m deep	14.4	m width	19.5	m length	6.38	m deep	14.4	m width	1790.1	1790.1	67.8		N/A	2
Emergency Primary Sludge Tan	Primary Sludge	1	Circular	9.38	m diam	5.6	m deep			9.38	m diam	2	m deep			387.0	138.2	29.5		Cover	
Emergency Secondary Sludge T	Secondary Sludge	1	Circular	10.2	m diam	5.6	m deep			10.2	m diam	2	m deep			461.2	164.7	32.2		Cover	
Sludge Blending Tank	Sludge	1	Circular	5.12	m diam	2.9	m deep			5.12	m diam	1	m deep			59.7	20.6	16.1		Cover	
Sludge Dewaterer	Sludge	2	Rectangular	5	m length	0.75	m deep	2	m width	5	m length	0.75	m deep	2	m width	7.5	7.5	14.0		Cover	
0	0	0	Rectangular		m length		m deep		m width		m length		m deep		m width	0.0	0.0	0.0		N/A	
Liquor Return PS	Sludge Liquors	1	Rectangular	3	m length	4	m deep	5	m width	3	m length	4	m deep	5	m width	60.0	60.0	16.0		Perimeter	240

Prepared by DGHemmings 09/02/2007

C1197 - Waterford WwTW

Ventilation, Odour Control and Declassification of Zoned Areas Calculations

PURAC Document No. 8419

Date 09/02/2007

Revision 2

Process Area	Calculations for zoning declassification ventilation rate										Ventilation rates per unit m^3/hr				Safety Factor	Final rate per unit (Max X SF)	Choose flowrate per unit	Actual flowrate per unit	Actual air changes per hour (based on headspace)
	CH_4 rate of emission $m^3m^{-3}sec^{-1} \times 10^{-8}$	Air changes per hour	Temp °C	LEL %	Density kg / m^3	Grade of release	BS safety factor k	Gas production rate kg/s	Temperature corrected rate kg/s	Actual gas production rate kg/s	Rate 1	Rate 2	Rate 3	Rate 4		m^3/hr		m^3/hr	
Pre-screen and post-grit channel	6.9	8.0	20	5.3	0.72	Secondary	0.5	7.03E-06	5.35E-06	Corrected	388.1	1.1	N/A	314.4	0%	388.1	Max xSF	388.1	9.9
Fine Screens including bypass	6.9	8.0	20	5.3	0.72	Secondary	0.5	2.40E-06	1.83E-06	Corrected	87.8	0.4	N/A	176.0	0%	176.0	Max xSF	176.0	8.0
Screenings Compactors	0.0	8.0	20	5.3	0.72	Secondary	0.5	0.00E+00	0.00E+00	Corrected	N/A	0.0	N/A	32.0	0%	32.0	Max xSF	32.0	8.0
Grit Classifier	0.0	8.0	20	5.3	0.72	Secondary	0.5	0.00E+00	0.00E+00	Corrected	N/A	0.0	N/A	32.0	0%	32.0	Max xSF	32.0	8.0
Grit Channel	6.9	4.0	20	5.3	0.72	Secondary	0.5	5.57E-06	4.25E-06	Corrected	108.7	0.9	400.0	102.0	26%	502.0	Max xSF	502.0	19.7
Preliminary Treatment Building	0.0	2.0	20	5.3	0.72	Secondary	0.5	0.00E+00	0.00E+00	Corrected	N/A	0.0	N/A	7247.4	0%	7247.4	Max xSF	7247.4	2.0
Primary Sedimentation Tank	6.9	2.0	20	5.3	0.72	Secondary	0.5	1.20E-04	9.13E-05	Corrected	361.9	18.6	N/A	2203.6	0%	2203.6	Max xSF	2203.6	2.0
Pasteuriser	163.0	2.0	55	5.3	0.72	Secondary	0.5	4.81E-05	6.07E-05	Corrected	N/A	13.9	N/A	82.0	0%	82.0	Max xSF	82.0	2.0
Picket Fence Thickener	289.0	6.0	20	5.3	0.72	Secondary	0.5	5.57E-04	4.24E-04	Corrected	98.4	86.5	8.0	178.3	0%	178.3	Max xSF	178.3	6.0
Secondary Sludge Thickener	163.0	6.0	20	5.3	0.72	Secondary	0.5	5.91E-06	4.50E-06	Corrected	0.0	0.9	N/A	30.2	0%	30.2	Max xSF	30.2	6.0
Sludge Building	0.0	2.0	20	5.3	0.72	Secondary	0.5	0.00E+00	0.00E+00	Corrected	N/A	0.0	2.0	3580.2	0%	3580.2	Max xSF	3580.2	2.0
Emergency Primary Sludge Tank	289.0	2.0	20	5.3	0.72	Secondary	0.5	8.05E-04	6.13E-04	Corrected	0.0	125.2	N/A	276.4	0%	276.4	Max xSF	276.4	2.0
Emergency Secondary Sludge T	163.0	2.0	20	5.3	0.72	Secondary	0.5	5.41E-04	4.12E-04	Corrected	0.0	84.1	N/A	329.4	0%	329.4	Max xSF	329.4	2.0
Sludge Blending Tank	289.0	2.0	20	5.3	0.72	Secondary	0.5	1.24E-04	9.46E-05	Corrected	0.0	19.3	N/A	41.2	0%	41.2	Max xSF	41.2	2.0
Sludge Dewaterer	110.0	6.0	20	5.3	0.72	Secondary	0.5	5.94E-06	4.52E-06	Corrected	0.0	0.9	N/A	45.0	0%	45.0	Max xSF	45.0	6.0
0	0.0	2.0	20	5.3	0.72	Secondary	0.5	0.00E+00	0.00E+00	Corrected	N/A	0.0	N/A	0.0	0%	0.0	Max xSF	0.0	#DIV/0!
Liquor Return PS	110.0	2.0	20	5.3	0.72	Secondary	0.5	4.75E-05	3.62E-05	Corrected	57.6	7.4	240.0	120.0	0%	240.0	Max xSF	240.0	4.0

Prepared by DGHemmings 09/02/2007

C1197 - Waterford WwTW

Ventilation, Odour Control and Declassification of Zoned Areas Calculations

PURAC Document No. 8419

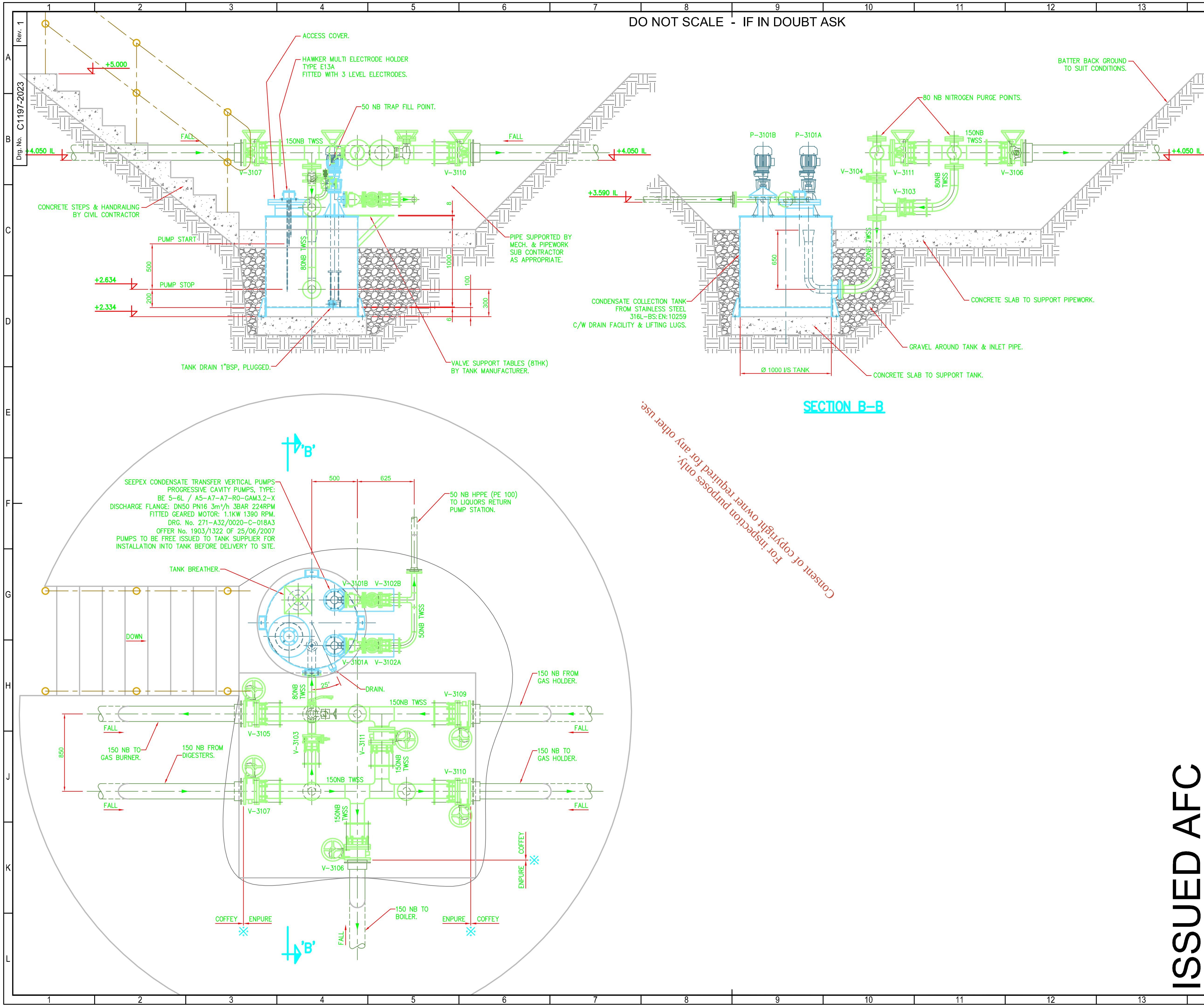
Date 09/02/2007

Revision 2

Process Area	OU concentration calculation						Final Calculated Odour, H_2S and airflow rates							
	Frechen data E_f (OU / s /m^2)	North data E_n (OU / s /m^2)	UKWIR value $OU_E.s^{-1}.m^{-2}$	Surface area per tank A (m^2)	Superficial air velocity V (m / s)	Emission rate E_{out} (OU / s)	Specified Odour concentration (OU_E / m^3)	Odour concentration (OU_E / m^3)	Chosen H_2S correlation factor ppb H_2S/OU_E	Direct H_2S correlation (ppm)	Factor of safety (peaking factor)	Odour concentration using SF (OU_E / m^3)	Estimated H_2S conc. using SF (ppm)	Total flow m^3/hr
Pre-screen and post-grit channels			180	78.6	0.001	14148		131243	0.3	39.4	1.0	131243	39.4	388
Fine Screens including bypass			180	22.0	0.002	3960		81000	0.3	24.3	1.0	81000	24.3	704
Screenings Compactors			180	N/A	N/A	N/A	80000	80000	0.5	40.0	1.0	80000	40.0	32
Grit Classifier			360	N/A	N/A	N/A	160000	160000	0.5	80.0	1.0	160000	80.0	32
Grit Channel			180	51.0	0.003	9180		65833	0.3	19.7	1.0	65833	19.7	1004
Preliminary Treatment Building				568.4	0.004	0	150	150	0.3	0.05	1.0	150	0.05	7247
Primary Sedimentation Tank			120	804.2	0.001	96510		157664	0.3	47.3	1.0	157664	47.3	4407
Pasteuriser			480	N/A	N/A	N/A	630000	630000	0.5	315.0	1.0	630000	315.0	246
Picket Fence Thickener			350	59.4	0.001	20806		420000	0.5	210.0	1.0	420000	210.0	178
Secondary Sludge Thickener			350	6.7	0.001	2352		280000	0.5	140.0	1.0	280000	140.0	60
Sludge Building				280.8	0.004	0	800	800	0.5	0.4	1.0	800	0.4	3580
Emergency Primary Sludge Tank			350	69.1	0.001	24186		315000	0.5	157.5	1.0	315000	157.5	276
Emergency Secondary Sludge Tank			350	82.4	0.001	28824		315000	0.5	157.5	1.0	315000	157.5	329
Sludge Blending Tank			350	20.6	0.001	7206		630000	0.5	315.0	1.0	630000	315.0	41
Sludge Dewaterer			120	10.0	0.001	1200		96000	0.5	48.0	1.0	96000	48.0	90
0.0				0.0	0.000	0		0	0.2	0.0	1.0	0	0.0	0
Liquor Return PS			350	15.0	0.004	5250		78750	0.5	39.4	1.0	78750	39.4	240
								72742.7		27.1		72742.7	27.1	18857

Prepared by DGHemmings 09/02/2007

DO NOT SCALE - IF IN DOUBT ASK



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See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
1	24/09/2007	REDRAWN, WAS IN ROUND CHAMBER.	

NOTE : THE DIGESTER BIOGAS IS AT A PRESSURE OF 200mm Wg (20 mBAR) ABOVE ATMOSPHERIC CONDITIONS AND THE DIGESTER PRESSURE RELIEF VALVES WILL BE SET TO DISCHARGE AT 275mm Wg.

NOTE : IT IS OF PARAMOUNT IMPORTANCE THAT THE BIOGAS PIPEWORK BETWEEN DIGESTERS AND CONDENSATE TRAP (CT); GROUND FLARE AND CT; GAS HOLDER AND CT AND HOT WATER BOILERS AND CT; ALL SLOPE, WITH CONSTANT GRADIENT "DOWN", TOWARDS THE PIPEWORK ABOVE THE CONDENSATE TRAP. TYPICAL CONSTANT GRADIENT 1:100.
DIGESTER BIOGAS AT 36°C IS SATURATED WITH WATER VAPOUR AND ANY COOLING OF THE GAS WILL RESULT IN CONDENSATE CONTAINING SULPHUR. THIS LIQUOR MUST FLOW DOWNHILL TO THE CONDENSATE TRAP, ANY DIP IN THE GRADIENT MAY RESULT IN THE GAS FLOWRATES BEING THROTTLED OR COMPLETELY STOPPED, DUE TO THE LIQUOR FORMING IN THE PIPELINE DEPRESSION. THE PURPOSE OF THE CT IS TO FULLY REMOVE THE LIQUOR FROM THE SYSTEM AND THEREBY ALLOW THE UNRESTRICTED FLOW OF BIOGAS THROUGH THE SYSTEM.

ISSUED APPROVED for CONSTRUCTION / SHE 2 REVIEW COMPLETED
DATE: 02/11/2007 SIGNATURE: JMNorton

A.W.I. CONTRACT No 1002

..\03 Title Blocks\Coffey Logo.JPG

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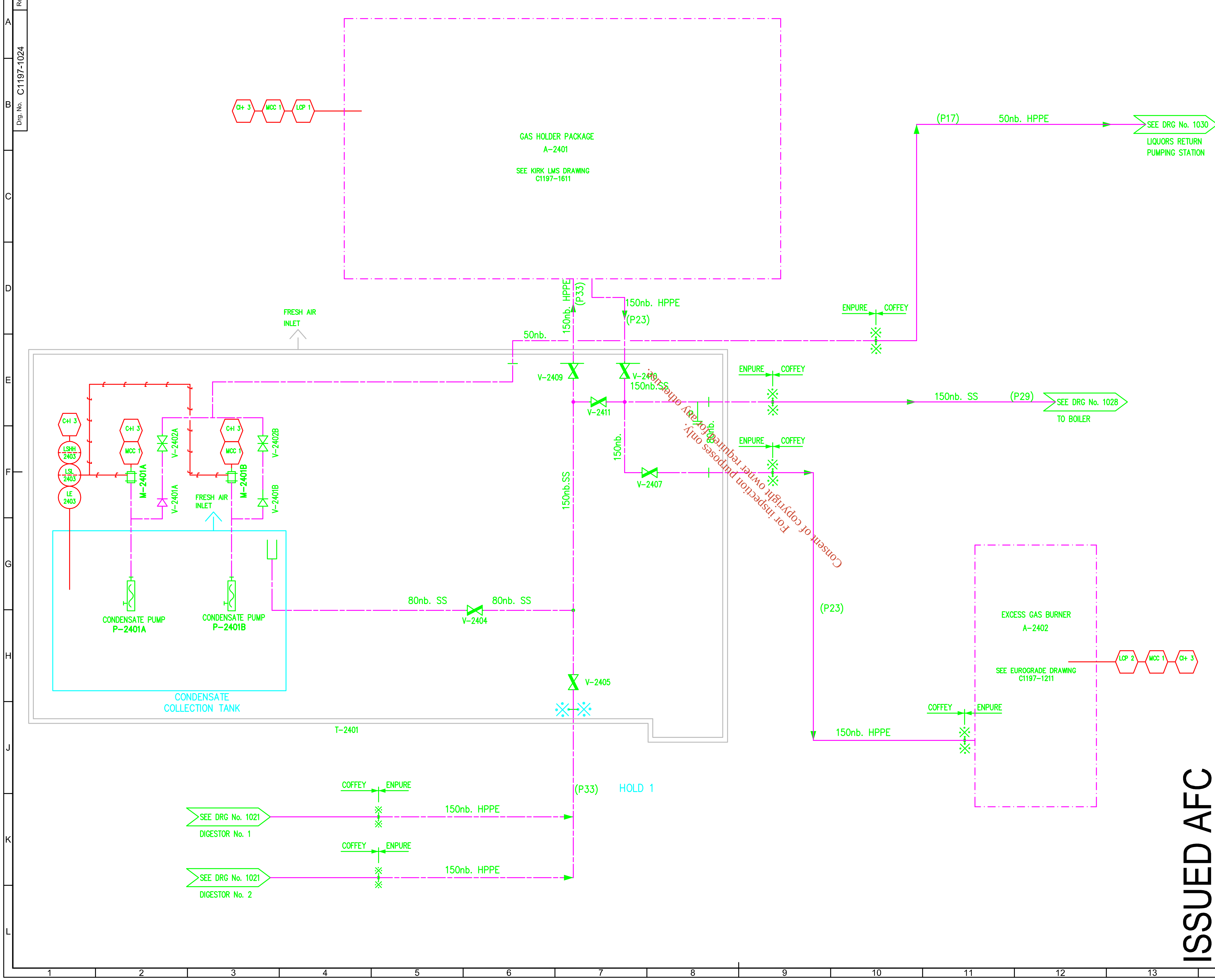
Title: CONDENSATE TRAP
GENERAL ARRANGEMENTS
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
CWThomas	RJMeakin	CGPage	A1
Date 12/02/2007	Date 19/09/2007	Date 24/09/2007	Original Scale 1:20

Drg. No. C1197-2023 Rev. 1

ISSUED AFC

DO NOT SCALE - IF IN DOUBT ASK



ISSUED AFC

Drg. No. C1197-1024 Rev. 1

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
1	27/06/2008	ELEC TAGS UPDATED AND GAS HOLDER REVISED.	

NOTES
1. DRAWING PREVIOUSLY E8374-1024

LEGEND:
NEW PIPEWORK/CHANNEL BY CIVILS CONTRACTOR.
NEW PIPEWORK BY M&E CONTRACTOR.
ENPURE PIPEWORK

CHECKED		APPROVED	
PROCESS ENG.	DGH	PROCESS TECH SPECIALIST.	DGG
PROJECT ENG.	JMN	PROJECT MAN.	CGP
LEAD MECH ENG.	JAM	MECH ENG MAN.	BM
LEAD ELEC ENG.	AMT	ELEC ENG MAN.	JL

A.W.I. CONTRACT No 1002

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Customer: WATERFORD CITY COUNCIL

Title: GAS HOLDING SYSTEM
P & I DIAGRAM
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMiller	RJMeakin	A1
Date 20/10/2006	Date 26/06/2008	Date 27/06/2008	Original Scale NTS

Drg. No. C1197-1024 Rev 1

enpure

PROCESS DESIGN CALCULATION

Contract Name : Waterford **Contract No:** C1197

Document Reference: 8418 **Title :** Gas System Equipment

Revision	No. of Pages (Excluding Cover)	Date of Issue	Purpose of Issue	Originator	Checked	Approved
1	1	20/11/2006	Contract Issue	DGH	DG	DG
2	1	16/04/2007	Whessoe valve information changed	DGH	[signature]	[signature]

GAS HOLDER, EXCESS GAS BURNER AND DIGESTER PRESSURE/VACUUM RELIEF VALVES SIZING

	Unit	Case 1	Case 2	Case 3	Case 4
Gas Holder					
Number of Gas Holders		1	1	1	1
Average Gas Production Rate	m^3/h	193	164	157	95
Retention Time in each Gas Holder	min	20	20	20	20
Capacity of each Gas Holder	m^3	64	55	52	32
Selected Capacity of each Gas Holder	m^3	65	65	65	65
Retention Time at Minimum Production Rate	min	23	27	28	46
Retention Time at Average Production Rate	min	20	24	25	41
Retention Time at Maximum Production Rate	min	18	21	22	37

Excess Gas Burner

	Unit	Case 1	Case 2	Case 3	Case 4
Maximum Gas Production Rate	m^3/h	215	182	175	106
Gas Burner Oversizing Margin	%	25	25	25	25
Gas Burner Capacity Required	m^3/h	268	228	219	133

Digester Pressure/Vacuum Relief Valve - Pressure Relief Condition

	Unit	Case 1	Case 2	Case 3	Case 4	
Maximum Gas Production Rate	m^3/h	107	91	87	53	
Mixing Compressor Flowrate	m^3/h	0	0	0	0	Mechanical Mixing
Digester Feed Volume	m^3/h	15	15	15	15	Ref: Pasteurisation design sheets 8420
Pressure Relief Rate Required	m^3/h	122	106	102	68	

Digester Pressure/Vacuum Relief Valve - Vacuum Relief Condition

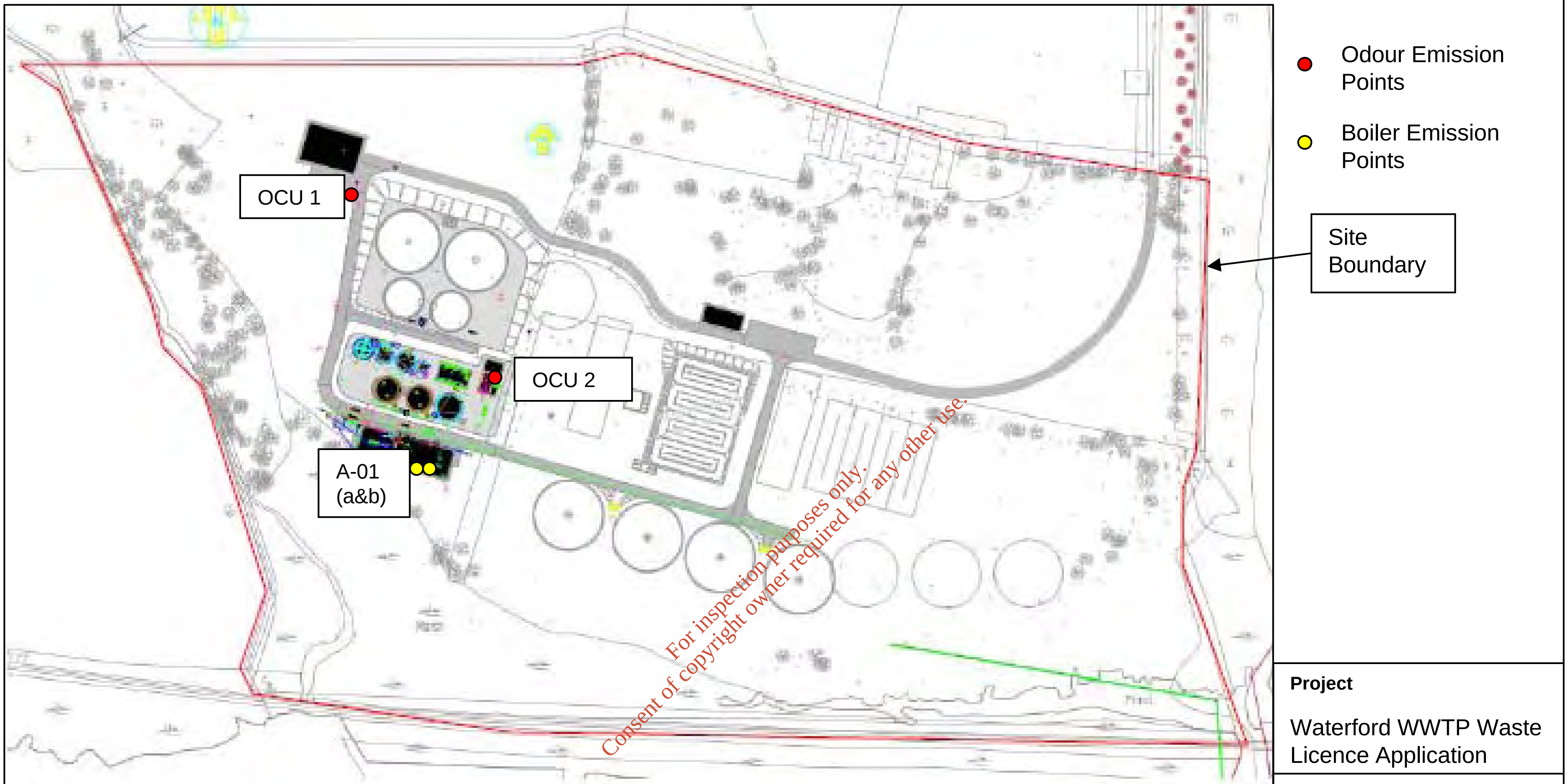
	Unit	Case 1	Case 2	Case 3	Case 4
Digester Height (Centre of Cone to TWL)	m	13.173	13.173	13.173	13.173
Drain Pipe Diameter (ID)	m	0.20	0.20	0.20	0.20
Drain Pipe Length	m	10.0	15.0	18.0	20.0
Roughness	mm	0.5	0.5	0.5	0.5
Fittings K_T		2	2	2	2

Maximum vacuum relief rate will occur when the friction loss in the outlet line is equal to the static head above the outlet. To evaluate this, the flowrate at which the static head is equal to the friction loss must be determined. Note that the friction factor and hence the friction loss is dependent on the flowrate so the equations must be solved by iteration.

To solve, use the following procedure :

From "Tools" menu choose "Goal Seek"
In "Set cell" box enter "C64", "D64", "E64", "F64"
In "To value" box enter number contained in cell C39, D39, E39, F39
In "By changing cell" box enter "C56", "D56", "E56", "F56"

	Unit	Case 1	Case 2	Case 3	Case 4
Maximum Flowrate	m^3/h	882	824	794	776
Water Temperature for Design	°C	35.0	35.0	35.0	35.0
Water Density	kg/m^3	994	994	994	994
Water Viscosity	mNs/m^2	0.7204	0.7204	0.7204	0.7204
Velocity	m/s	7.80	7.28	7.02	6.86
Reynolds Number		2152745	2010124	1937033	1892508
Friction Factor	f us	0.02495	0.02495	0.02496	0.02496
Dynamic Head Loss	m H_2O	13.17	13.17	13.17	13.17
Vacuum Relief Flowrate Required	m^3/h	882	824	794	776



Scale 1:2500

Project

Waterford WWTP Waste Licence Application

Reference

07/4084E.1.2

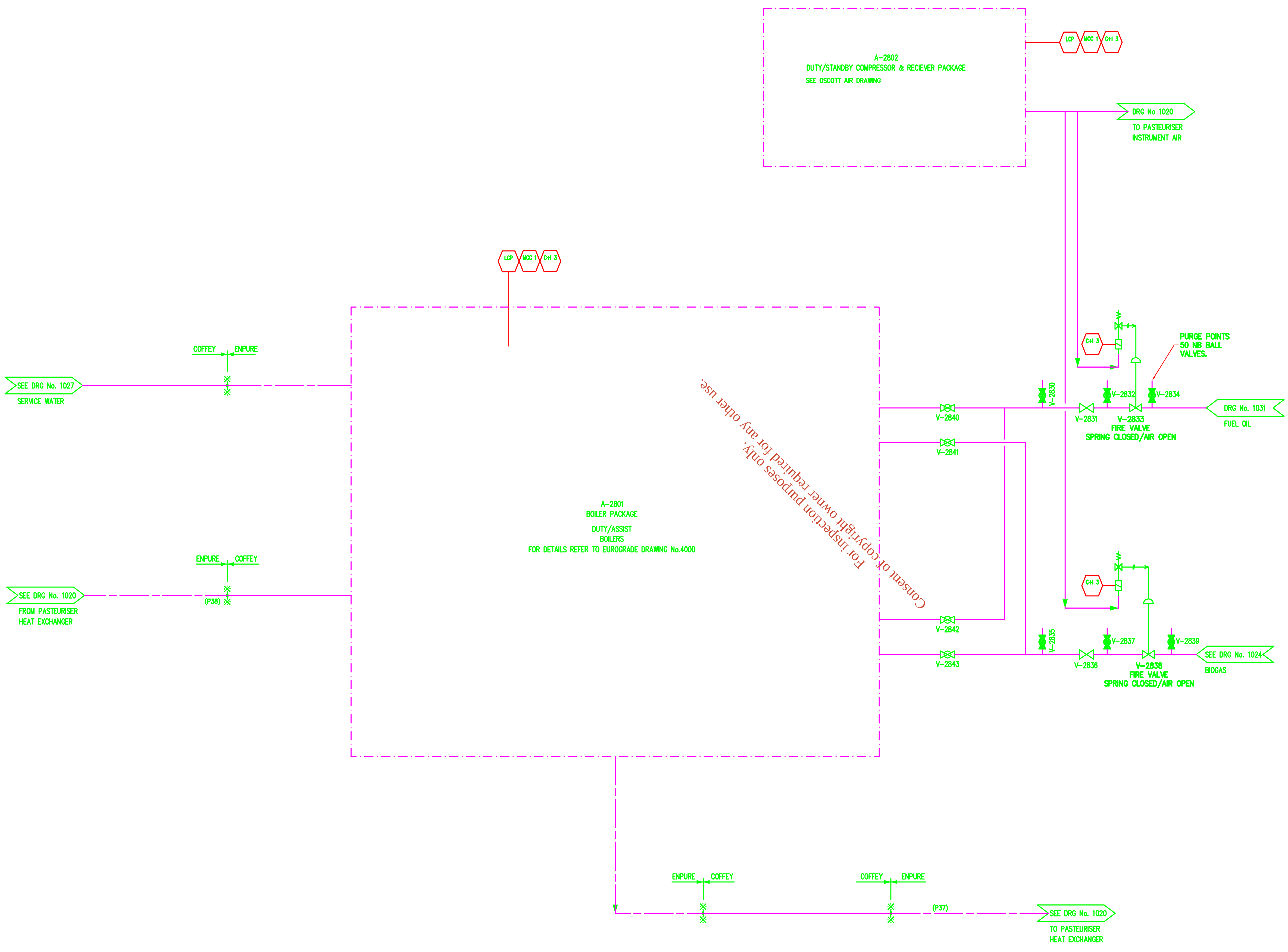
Figure E.1.2Rev.1

Location of Points of Emissions to Atmosphere (2)

awnconsulting

Unit 5, ATS Building, Carrigaline Industrial Park, Carrigaline, Co. Cork
T: +353 21 438 7400 F: +353 21 483 4617

DO NOT SCALE - IF IN DOUBT ASK



ISSUED AFC

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
1	27/06/2008	GENERAL MODS	

NOTES
1. REMOVED
2. REMOVED

LEGEND:
NEW PIPEWORK/CHANNEL BY CIVILS CONTRACTOR.
NEW PIPEWORK BY M&E CONTRACTOR.
ENPURE PIPEWORK.

CHECKED		APPROVED	
PROCESS ENG.	DGH	PROCESS TECH SPECIALIST.	DGG
PROJECT ENG.		PROJECT MAN.	CGP
LEAD MECH ENG.	JAM	MECH ENG MAN.	BM
LEAD ELEC ENG.	AMT	ELEC ENG MAN.	JL

A.W.I. CONTRACT No 1002

coffey enpure

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Kidderminster, DY10 2SH.
Tel: +44 (0)1562 820 010
Fax: +44 (0)1562 820 008
Internet : www.enpure.co.uk

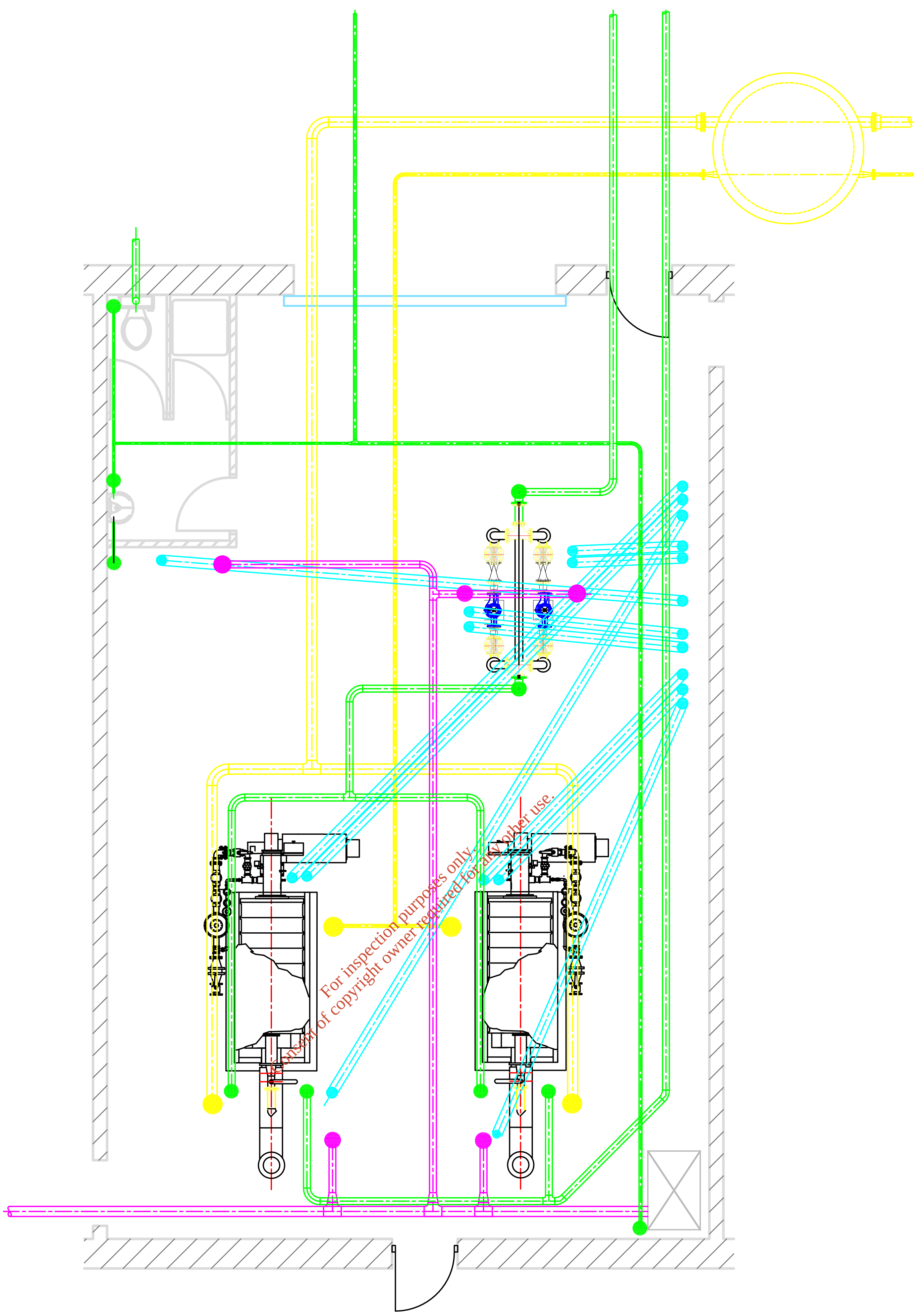
Customer
WATERFORD CITY COUNCIL

Title
BOILER SYSTEM
P & I DIAGRAM
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DJTildesley	RJMiller	RJMeakin	A1
Date 20/10/2006	Date 26/06/2008	Date 27/06/2008	Original Scale NTS

Drg. No. C1197-1028 Rev. 1

Drg. No. C1197-2031 | Rev. A



DO NOT SCALE - IF IN DOUBT ASK

DESIGN ISSUE

See Previous Issues For Past Revision Details

Rev.	Date	Description	Drawn
A	04/09/2007	FIRST ISSUE	DDF

NOTE:-
THIS DRAWING TO BE READ IN CONJUNCTION WITH DRAWING C1197-2013 FOR ALL DIMENSIONS ETC.

A.W.I. CONTRACT No 1002

.\Coffey Logo.JPG

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Customer
WATERFORD CITY COUNCIL

Title
BOILER ROOM COMBINED UNDERGROUND PIPEWORK
GENERAL ARRANGEMENT
WATERFORD WWTW

Drawn	Checked	Approved	Original Sheet Size
DDFudger	RJMeakin	JMNorton	A1
Date 31/08/2007	Date 04/09/2007	Date 04/09/2007	Original Scale

Drg. No. C1197-2031 | Rev. A