11 SURFACE WATER

This chapter evaluates the impacts, if any, which the development will have on Surface Water as defined in the Environmental Protection Agency (EPA) 'Advice Notes on Current Practice (in the preparation of Environmental Impact Statements'), 2003.

This chapter has been prepared based on a number of previous assessments of the site, the most recent of which was completed as part of an EIS and planning application submitted in 2009. It is considered that the primary assessment undertaken at the site in 2005 addressed the primary impacts potentially affecting the surface water aspect. This chapter will assess the impact of proposed amendments to the existing planning permission as described in Chapter 1, on the surface water of the site and environs. The amendments will entail some additional construction in the form of conversion of two temporary office and maintenance structures respectively to permanent structures, the installation of an additional foul water treatment plant system and associated hardstanding surfaces and parking.

As the facility has now been constructed, a number of mitigation measures recommended in previous EIS's have now been implemented. This chapter therefore represents an update of the 2009 assessment to include the results of mitigation measures as implemented and identify any further mitigation measures now required. New legislative standards for surface water quality (SI 272 of 2009) have been considered in determining the impact on the local surface water environment.

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

11.1 DRAINAGE NETWORK

Regional

The development site lies in the River Nanny catchment (Figure 11.1). The River Nanny rises in the south-east of Co. Meath and flows through Duleek towards Laytown, where it discharges to the sea.

Data obtained from the EPA indicates an estimated dry weather flow of 0.009 m^3/s and a 95 percentile flow of 0.059 m^3/s on the nearest hydrological station located on the River Nanny at Duleek.

The River Nanny channel is located approximately 2 km south of the development site. Surface water in the vicinity of the site drains naturally towards the river.

Local

The site lies within the Nanny River Catchment which is part of the Eastern River Basin District (ERBD as defined under Irelands programme for the implementation of the Water Framework Directive (WFD) (2000/60/EC). Surface water on and in the vicinity of the site drains through land drains and ditches

EPA Export 25-04-2012:04:20:39

towards the local streams that flow to the River Nanny. The drainage ditches are mostly dry in the summer months.

11.2 SURFACE WATER QUALITY

In December 2011, KD Environmental completed an assessment of surface water discharges from the facility and their potential impact on the River Nanny. This study is presented in Appendix 11.1 The study found that the River Nanny is not impacted by surface water discharged from the site when discharged at the permitted flow rate of <130m3/hour.

A limited amount of chemical and biological quality data for the River Nanny is available from the EPA. Results generally indicate moderate quality surface water in the Nanny at the nearest monitoring stations to the site (approximately 2km away). An average Q-value of 3-4 was noted across the various stations on the Nanny from 2010 monitoring. This is consistent with data available for previous monitoring rounds since 2001.

The 2008 ERBD Characterisation Report stated that the River Nanny catchment is considered "At Risk". Agricultural runoff was identified as the dominant cause of poor water quality in the Nanny/Delvin Catchment. The available biological and water quality monitoring records indicated that 16% of monitoring stations are considered unpolluted, 23% of slightly polluted, 52% of moderately polluted and 8% seriously polluted. Overall some improvement in quality has been noted over the last 10 years but pollution levels are considered unacceptably high.

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

11.3 PROPOSED DRAINAGE NETWORK

11.3.1 Foul Water/Sanitary Management

Construction

During the construction phase, domestic effluent generated on the site will be managed through the existing domestic effluent treatment systems. It is not anticipated that there will be any need for temporary portaloos or other temporary sanitary facilities as there are already sufficient provisions in place at the site.

Operation

Domestic sewage from toilets, changing and kitchen areas currently discharges via the foul drainage system, depending on its location on site, to on site effluent treatment systems which pass through an engineered percolation area to ground. The existing percolation areas have been designed and constructed in accordance with the guidelines in the EPA's Wastewater Treatment Manual (Treatment Systems for Small Communities, Business, Leisure Centres and Hotels, 1999). It is proposed that an

EPA Export 25-04-2012:04:20:39

additional system will be installed for the proposed modular office block. The system will be designed and constructed in accordance with the requirements of the recently published EPA Guidance on the Authorisation of Discharges to Groundwater.

11.3.2 Industrial Effluent

Operation

Industrial effluent will be contained within the site and evaporated within the incineration process. There will be no discharge of process effluent to the drainage network. As the flue gas cleaning system is a combination of a semi wet and dry lime injection process, there will be no effluent at all from the flue gas treatment process. All water injected in the semi –wet stage is evaporated in the spray reactor. Some wash waters from cleaning operations will be directed to the spilled water storage tank and will be either evaporated in the spray reactor, or transported off-site for treatment or disposal to an appropriately permitted or licensed facility.

11.3.3 Storm Water Management

Construction

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

Storm water management during the required construction works will be controlled in accordance with the site Environmental Management Plan (currently being agreed with the Agency) and any planning conditions set down by the planning authority. The facility (ref W0167-02) licence provides for monitoring of such issues as dust generation, noise generation, traffic management and surface water run-off.

Run off generated during construction will be directed to the existing surface water drainage system (including interceptors, attenuation pond, monitoring stations etc) prior to its discharge to the local drainage network. A wheel wash will not be required for the construction phase due to the limited nature of the construction activities associated with the proposed development.

Operation

Process Building

All waters produced from wash down etc. within the waste processing building will be directed to a spill tank located to the east of the bunker building and underground. The spill tanks (2 tanks) have a capacity of 100m^3. As described above, water from this spill tank will be used to supplement process water requirements or will be transported off-site for treatment or disposal to an appropriately permitted or licensed facility. There will be no process effluent from the facility.

During shutdowns there may be a need to drain the boiler which is filled with approximately 130m^3 of clean de-mineralised water. Some of this water will be pumped to the spilled water tank for re-use in the process and the remainder to the stormwater network where it will pass through two sets of TOC monitoring equipment prior to discharge.

EPA Export 25-04-2012:04:20:39

Site Drainage

The site storm water drainage system has been designed in general accordance with Sustainable Drainage Systems (SuDS) principles and will collect rainwater from all roofs, hardstands, roads and grassed areas which fall naturally towards these areas. The proposed amendments will entail some alteration to the existing drainage system but in the main the existing infrastructure will remain. There will be no need for any additional stormwater attenuation capacity. The existing design has been agreed and is in accordance with the requirements of Meath County Council.

Sustainable drainage systems aim to mimic as closely as possible the natural drainage of a site in order to reduce the impact of flooding and water pollution. The subject site is essentially divided into two parts, firstly the northern 6.8 Ha. 'developed' part of the site, and secondly the southern 3.6 Ha. 'undeveloped part of the site. The southern 'undeveloped' part of the site, is drained naturally. Stormwater will continue to be collected by the existing system of field boundary ditches for ultimate outfall to the River Nanny. Similarly infiltration trenches have been installed to intercept overland stormwater flow from the undeveloped areas before reaching any of the proposed areas of roads and hardstanding. This intercepted flow will be directed to the original field ditch boundary drainage system. Due to the natural south to northslope of the ground, storm waters emanating from the development will not flow naturally to the undeveloped part of the site. Landscaping works have now been completed in this part of the site but will take some time to become fully established. Once established the trees and shrubs planted, will have the beneficial effect of increasing the "residence time" of the storm flows thereby reducing downstream effects.

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

The design principle for the northern portion of the site is to largely manage runoff flows and pollutants on the site rather than directing them to the nearest receiving waters. In addition good housekeeping practices, retention and regular monitoring (i.e. testing) will ensure the potential for contamination is minimised. Good housekeeping measures include reusing waste contaminated water in the process itself, as detailed above. Waste contaminated water that is not required in the process will be diverted to the spilled water tank and sent for disposal or treatment at an appropriately licensed facility. It is therefore highly unlikely for such waste contaminated water to pollute any receiving waters.

In accordance with SuDS, consideration was given to surfacing roads and hard standings with pervious paving. However given the risk of spillage onto these areas from attending refuse lorries, with subsequent possible contaminated runoff, the existing surface water drainage system routes the surface water from roads and hardstanding to a monitoring station and from there to the firewater retention tank if contaminated, or to the natural watercourse via a petrol interceptor if uncontaminated. The proposed amendments require the conversion of two temporary structures to permanent use; a 375sq m maintenance building and a 396sq m office block. The maintenance building is accompanied by a hardcored laydown area (to be used during annual maintenance shutdown). The office building requires

EPA Export 25-04-2012:04:20:39

the development of a paved access road and hardstand outside of the building. 22 Nr additional parking spaces are also to be provided at the main car park. In the case of the Buildings and the additional carparking it is proposed that the run-off from these areas will drain in to the site storm water drainage system.

In order to prevent flooding of the ditches downstream of the facility a discharge rate from the site based on the Dublin City Council Storm Water Management Policy and by agreement with Meath County Council of 59.8 litres/second has been incorporated into the existing drainage design. Attenuation for a 1 in 30 year storm will be provided by the storm water attenuation pond which discharges via a pump to an external drainage ditch. Attenuation of 1 in 100 year storm occurrences will also be contained within the attenuation pond (see Appendix 11.2 for calculations- revised to account for the new structures and additional surfaces). Based on these calculations it is confirmed that the system has the capacity to accommodate the discharges from the additional areas. In the event of a greater than 1:100 year storm occurrence, the paving has been designed sloping away from the building meaning any flooding that may occur will flow away from the building towards proposed and existing land drains. The provision of the above system allows the maintenance of the current discharge characteristics to the ditches serving the site i.e. flows similar to that generated from agricultural land. This will prevent downstream flooding due to "flash flooding" from the site.

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

See Figure 11.2 for a flow diagram of the proposed storm water management system.

11.4 POTENTIAL IMPACTS

Construction Phase

The construction phase will consist of construction of roads, hardstanding areas, car parks and other ancillary structures as specified earlier in this EIS and as detailed in Chapter 18, Construction.

The main potential impacts arising out of these works will consist of the following:

- Run-off from bare earth surfaces will contain silt and clay particles. Excessive amounts of silt entering the surface water system could clog the stream beds.
- Hydrocarbon contaminated water entering the drainage network has the potential to contaminate the surface water.
- Sewage or canteen effluent entering the surface water system has the potential to contaminate the surface waters.

Operational Phase

The main potential impacts associated with the operational phase will comprise the following:

EPA Export 25-04-2012:04:20:39

- Run-off from the site has the potential to impact on surface water quality.
- Fire water run-off generated by a fire occurring in any of the buildings causing uncontrolled flows to the storm water drainage system have the potential to impact on surface water quality.

11.5 MITIGATION MEASURES

Construction Phase

The following mitigation measures will be implemented during the construction phase:

It is anticipated that the existing storm water management system will be used to manage any potentially silt laden run off during construction works. In the event that temporary settlement tanks are required, written agreement will be sought from the planning authority for details of temporary settlement tanks/silt traps/oil interceptors to control discharges of site surface water run-off during the construction period. The concentration of suspended solids (SS) of the surface water run-off from the site construction works, for discharge to surface waters, will not exceed 30 mg/litre.

During the construction phase of the development, oil and fuel storage tanks, chemicals and all other materials that pose a risk to waters if spilled, will be stored in designated storage areas, which are bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s). The existing designated storage areas at the facility will be used to minimise risks of spillages during the construction period. Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and safe disposal. Bunded pallets will be used for storage of drums.

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

During the construction phase all domestic effluent generated on site will discharge to existing sewage treatment facilities. It is not proposed to provide portaloo or other additional sanitary facilities.

During the earthmoving/excavation phase of the proposed construction works site construction roads will be sprayed with water during dry periods to mitigate against the formation of dry dust particles and road sweepers will be operated as required to keep public roads clean.

Operational Phase

There will be no discharge of process effluent to the drainage network.

Fuels and oils used on site during the operational phase will be stored in tanks located in concrete containment bunds. Fuel oil and bulk ammonia tanks are located outside in double skinned tanks.

EPA Export 25-04-2012:04:20:39

Domestic effluent will be treated depending on its location at one of three foul water treatment systems and discharged to the relevant percolation area.

Chemicals or other potentially polluting substances will be stored in the designated storage areas within the main process building which is bunded.

Run-off from clean hard surfaces on site including the roofs of the buildings, site roads, car parks, hardstanding areas and ancillary buildings will be collected into the surface water drainage system as detailed in Section 11.3.3 above.

All drainage arrangements will comply with the requirements of the planning authority for such works and services.

All sludge from the drainage system, bunds, silt traps and oil interceptors will be regularly collected for safe disposal.

An adequate supply of containment booms and/or suitable absorbent material to control, contain and absorb any potential spillages will be maintained at the facility.

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

Firefighting and Firewater Retention

Fire suppression is provided by an on site dual purpose water storage tank. This tank has an overall capacity of 2,185m^3 with an effective fire-fighting storage volume of 1855m^3 and a process water storage capacity of 330m^3. The fire fighting effort is supported by 2 diesel fire pumps connected to a fire main and hydrant system throughout both the site and buildings. This will be further augmented by Local Fire Service capabilities. In the event of a fire, the process water requirement will not be needed and potentially all 2,185m^3 will be available for fire fighting. All staff are trained in Emergency Response techniques in order to deal with emergencies including fire fighting.

The facility has achieved compliance with the Building Regulations with particular reference to Part B (Fire), i.e. a Fire Safety Certificate has been obtained; and will continue insofar as practicable follow the recommendations in the Code of Practice for Fire Safety in Buildings – BS5588 which is referred to in Technical Guidance Document B (Fire) to the Building Regulations. The modular offices and the warehouse will be submitted to the Local Authority for certification purposes.

The greatest potential for fire at the facility arises within the waste bunker where localised heating can occur due to decomposition of organic material. As detailed in Section 5, localised fires within the waste bunker are lifted using the grab crane, into the hoppers which transfer the waste directly to the furnace. Up to the level of the tipping hall, the bunker has a capacity of 5,670m^3 approximately. If a 50% voidage ratio is assumed for the waste, then there would be a retention capacity of 2,835m^3

EPA Export 25-04-2012:04:20:40

within the waste bunker. With 2,185m^3 of water available for fire fighting, this demonstrates that all of the water will be retained within the bunker even in the most extreme fire event.

If a fire occurred in the turbine area, the fire fighting water would be collected in the cellar beneath the turbine which has a capacity of circa 1,000 m^3. As outlined in Chapter 9, the waste bunker has been designed conservatively with 1.1m thick walls and 800mm base and secondary containment system. It will therefore retain any fire water generated within the bunker.

With respect to fire occurring elsewhere in the process building or other buildings on site, the design philosophy as outlined in the 2009 EIS and as represented in Figure 11.2 remains unchanged.

The firewater retention tank volume of 300m^3 remains unchanged and has been calculated using the German LÖRÜRL Methodology for the calculation of retention volume.

A Fire Water Risk Management Programme was prepared in July 2011 to comply with Condition 3.7 of Indaver's Waste Licence W 0167-02 and has been attached in Appendix 11.3.

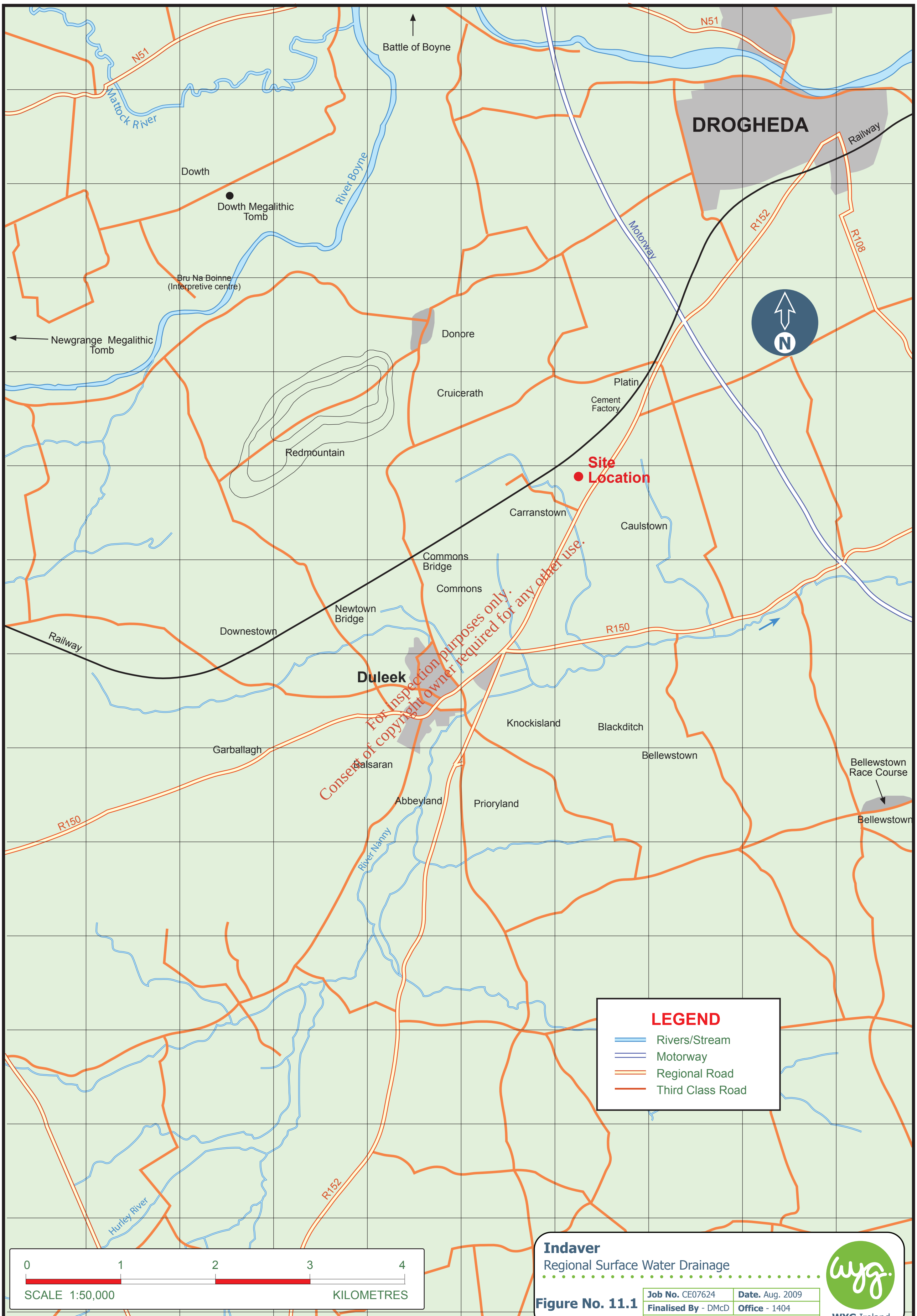
A schematic of the effluent streams and their management is presented in Figure 11.2.

11.6 RESIDUAL IMPACTS

The existing surface water management system is adequately designed to prevent uncontrolled discharges to the outfall ditch by the provision of two layers of monitoring and a controlled discharge system. As a result of the proposed amendments there will be no significant negative impacts on the existing surface water environment.

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

EPA Export 25-04-2012:04:20:40



NOTE: Drawing is for diagrammatic purposes only. No measurements to be taken.

Indaver
Regional Surface Water Drainage

Figure No. 11.1

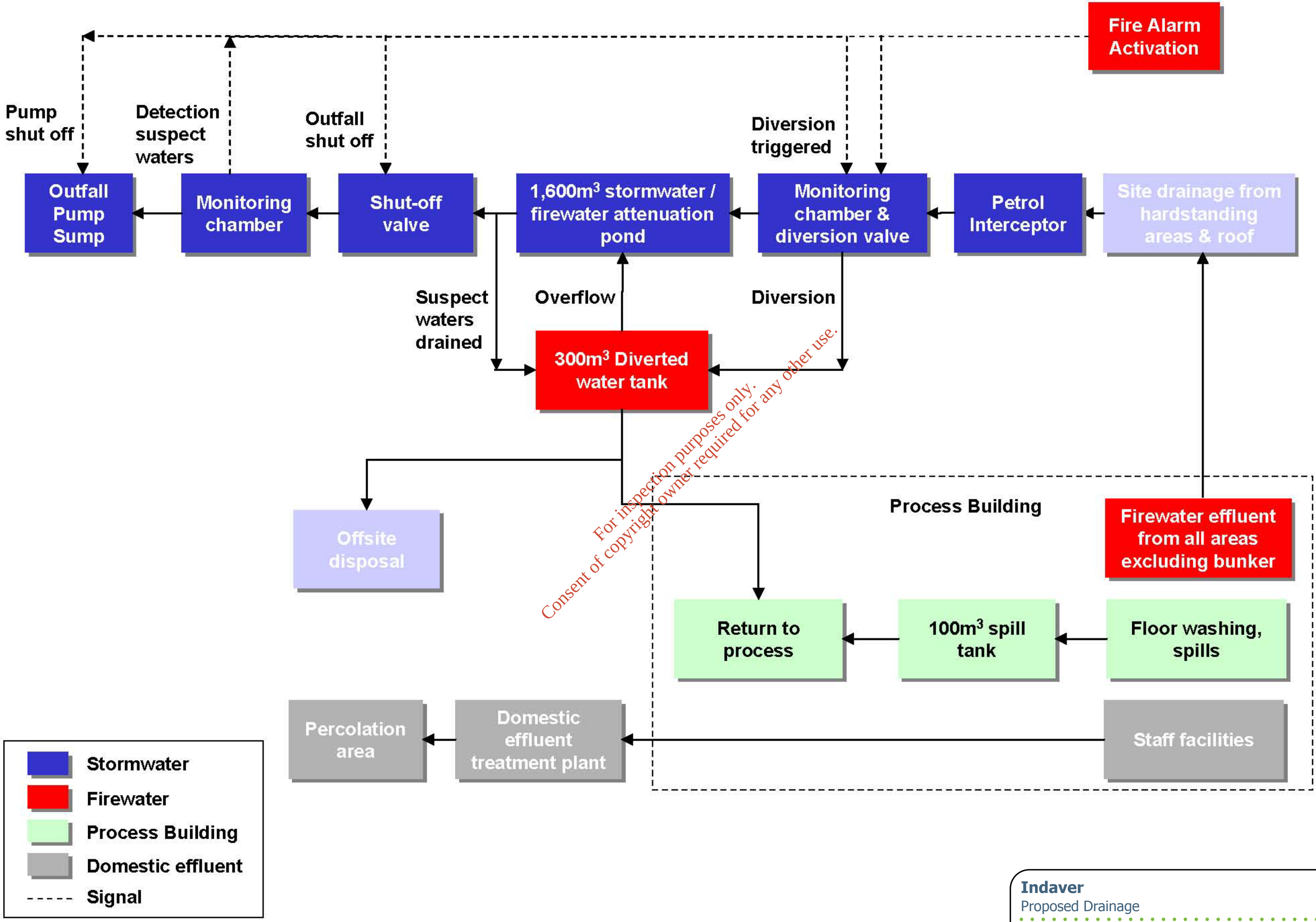
Job No. CE07624	Date. Aug. 2009
Finalised By - DMcD	Office - 1404
Drawn By: J Farrar - CS2,Illustrator	

WYG Ireland

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

© WYG

EPA Export 25-04-2012:04:20:40



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

Indaver

Proposed Drainage

Figure No. 11.2

Job No. CE07629	**Date.** Aug. 2009
Finalised By - DMcD	**Office** - 1404
Drawn By: J Farrar - CS2,Illustrator	

WYG Ireland

© WYG

JF(10)

EPA Export 25-04-2012:04:20:40

Appendix 11.1

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

EPA Export 25-04-2012:04:20:40

Indaver Ireland Ltd.

Carranstown, Duleek, Co. Meath

Surface Water Assimilation Capacity Study

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

Report Date:

5th January 2012

KD Environmental

17 Eastham Court, Bettystown, Co. Meath

Report No 2011/49/03

EPA Export 25-04-2012:04:20:40

1.0 Introduction

KD Environmental were commissioned by Grace McCormack of Indaver Ireland to perform an assimilation capacity study of surfacewater discharged from the Indaver waste facility to the River Nanny.

The Indaver Ireland waste facility is situated at Carranstown, Co. Meath approximately 1.5km from the town of Duleek. Surrounding land use is agricultural with some private residences in the immediate vicinity of the Indaver facility.

Surface water runoff from roofs, yards and hardstand areas is held on site within a surfacewater lagoon and is continually monitored for discharge parameters of conductivity, pH and Total Organic Carbon as per schedule C.6.2 of EPA waste license W0167-02. Surface water is only discharged if parametric trigger limits set for these parameters is met and should any parameter exceed these limits, the surface water is retained in the lagoon pending investigation and treatment if required. Parametric trigger limits were set by Indaver and are included in section 8 of this report.

In recent cold and icy weather, salt has been applied to some hardstand walkways to prevent slipping of employees on icy surfaces. This has resulted in the elevation of conductivity levels in site surface water and consequentially the surface water, SW1, has not been discharged.

This report performs an assimilation capacity to determine whether the River Nanny which receives the Indaver surface water, will experience a significant rise in conductivity level as a result of discharging the Indaver surface water with the increased conductivity. An assimilation capacity study to determine the capacity of the Nanny to receive Total Organic Carbon (TOC) in the Indaver SW1 is also made and compared to current TOC trigger limits set by Indaver for the SW1 discharge.

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

2.0 Receiving Water

The surface water, SW1, is pumped from the holding lagoon into a drainage ditch. This ditch crosses neighbouring farm land for approx. 1.5km. The drainage ditch forms part of the River Nanny catchment area and surface water will enter the Nanny in the vicinity of the town of Duleek along with other land drains in the area.
The River Nanny enters the sea at Laytown, Co. Meath approx. 13km from the Indaver site and the Nanny estuary and shoreline is a designated Special Protected Area (Site Code 004158). The monitoring location on the Nanny for the purposes of this report was approx. 10km upstream from the SPA.
The OPW have in the past performed flow monitoring on the River Nanny both upstream and downstream of Duleek. The OPW flow readings downstream of Duleek are used to calculate the assimilation capacity of the River Nanny to receive the surfacewater from the Indaver site. OPW flow data is included as Appendix 1 of this report.

EPA Export 25-04-2012:04:20:40

3.0 Methodology

Samples of both the River Nanny and the SW1 surface water were taken on 3 separate days and analysed in-situ for Conductivity. In-situ analysis of pH, Total Dissolved Solids, Dissolved Oxygen and Temperature was also performed. A 1L sample was also taken and sent to Fitz Scientific Laboratories in Drogheda, Co. Louth for analysis of Total Organic Carbon. Laboratory certificates of analysis are included as Appendix 3 of this report.
The sampling point on the river Nanny was approx. 1.5km downstream of Duleek and approx. 3km from the Indaver site.

In situ analysis was performed by KD Environmental. pH, TDS and Conductivity were measured using a Hanna HI 98129 'Combometer' which was calibrated using known buffers before use on each monitoring day. The meter was checked using a pH 4.01 buffer and a 500uS/cm buffer and all readings were within a 2% acceptance range. Dissolved oxygen and temperature were measured using a Hanna HI9146 DO meter. The DO meter was air calibrated before use.

The results for Conductivity, TOC and the OPW flow data were used to calculate the predicted changes in conductivity and TOC of the River Nanny water as a result of receiving the Indaver discharge. Predicted conductivity levels are compared to the 1989 Surface Water Regulations, SI 294 of 1989, limit for conductivity in Class A1 surface waters. Predicted TOC levels are compared to the 1989 Surface Water Regulations, SI 294 of 1989, limit for COD in Class A3 surface waters.

50%ile and 95%ile river flow data was used to illustrate effect of rainfall variations on the assimilation capacity of the River Nanny.

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

4.0 Analysis Results

Table 1: Indaver Surface water SW1

Date	Conductivity (uS/cm)	TOC (mg/L)	pH (pH units)	TDS (mg/L)	D.O (mg/L)	Temp (°C)
15/12/11	1268	4.10	8.20	634	9.56	4.2
16/12/11	1266	4.04	8.09	633	10.68	3.1
19/12/11	853	3.73	8.32	418	10.15	7.8
Average	**1129**	**3.96**	**8.20**	**562**	**10.13**	**5.0**

Table 2: River Nanny Water

Date	Conductivity (uS/cm)	TOC (mg/L)	pH (pH units)	TDS (mg/L)	D.O (mg/L)	Temp (°C)
15/12/11	684	6.02	8.09	342	10.76	4.6
16/12/11	690	5.32	8.24	350	11.20	3.9
19/12/11	710	4.85	8.21	359	10.77	7.4
Average	**695**	**5.39**	**8.18**	**350**	**10.91**	**5.3**

EPA Export 25-04-2012:04:20:40

5.0 Conductivity Assimilation Capacity Calculations

Formula:

C final = (C back * F river) + (C discharge * F discharge) / (F river + F discharge)

C final=Resultant concentration after discharge (uS/cm)
C back=Background Conductivity in river (uS/cm)
F river=Flow in river (m3/s)
C discharge =Average Conductivity in discharge (uS/cm)
F discharge=Flow of discharge (m3/s)

5.1 Using 50%ile flow data

C final = (C back * F river) + (C discharge * F discharge) / (F river + F discharge)

C final = 708 uS/cm

Change in River Nanny conductivity 13 uS/cm

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

5.2 Using 95%ile flow data

C final = (C back * F river) + (C discharge * F discharge) / (F river + F discharge)

C final = 810 uS/cm

Change in River Nanny conductivity 115 uS/cm

EPA Export 25-04-2012:04:20:40

6.0 TOC Assimilation Capacity Calculations

Formula:

C final = (C back * F river) + (C discharge * F discharge) / (F river + F discharge)

C final=Resultant concentration after discharge (mg/L)
C back=Background TOC in river (mg/L)
F river=Flow in river (m3/s)
C discharge =Average TOC in discharge (mg/L)
F discharge=Flow of discharge (m3/s)

6.1 Using 50%ile flow data

C final = (C back * F river) + (C discharge * F discharge) / (F river + F discharge)

C final = 5.35 mg/L

Change in River Nanny TOC: None, -0.04 mg/L

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

6.2 Using 95%ile flow data

C final = (C back * F river) + (C discharge * F discharge) / (F river + F discharge)

C final = 5.01 mg/L

Change in River Nanny TOC: None, - 0.38 mg/L

Note: The SW1 discharge applies a slight dilution factor to the Nanny TOC levels as the discharge has a lower TOC concentration than the analysed TOC levels in the River Nanny water. This results in a slight reduction in TOC levels in the Nanny.

EPA Export 25-04-2012:04:20:40

7.0 Assimilation Capacity Results

Table 3 below compares predicted conductivity levels in the River Nanny downstream to conductivity limits for Class A1 waters under the 1989 EC (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, SI No. 294 of 1989.
As there are no limits for TOC specified under the 1989 Surface Water Regulations, Table 4 compares the predicted TOC levels in the River Nanny downstream to COD limits for Class A3 waters under the 1989 EC (Quality of Surface Water Intended for the Abstraction of Drinking Water) Regulations, SI No. 294 of 1989. There is a direct relationship between COD and TOC levels in surface water.

Table 3: Conductivity Results vs. Class A1 water status

	Predicted Conductivity uS/cm	**1989 Surface Water Regulations Class A1 Water**
50%ile	708	1000
95%ile	810	1000

Table 4: TOC Results vs. COD Class A3 water status

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

	Predicted TOC mg/L	**1989 Surface Water Regulations Class A3 Water**
50%ile	5.35	40
95%ile	5.01	40

8.0 Trigger Limits

Trigger limits have been set by Indaver for conductivity and TOC levels in the SW1 to prevent pollution in the receiving water body being caused by the discharge.
A warning limit of 650 uS/cm and a control limit of 800 uS/cm have been set for Conductivity. A warning limit of 15 mg/L and a control limit of 20 mg/L have been set for TOC.
Assimilation capacity calculations in this report show that conductivity levels exceeding these trigger limits would not affect the quality of the River Nanny water following discharge of SW1.
It is suggested that a review of these trigger limits is made by Indaver as use of salt to prevent slipping on hardstand walkways will cause a breach of these conductivity trigger limits in the future.
TOC discharged at the warning limit of 15 mg/L or the control limit of 20 mg/L would not exceed the COD limit for class A3 waters under the 1989 Surface Water regulations. SW1 analysis results are significantly lower than the TOC warning limit. However, there may be scope to increase TOC warning and control limits if required and this is outlined in the conclusion section of this report.

EPA Export 25-04-2012:04:20:40

9.0 Conclusions

The discharge of the SW1 surface water to the River Nanny will not cause a significant increase in conductivity of the river when discharged at the concentrations averaged in table 1 of this report and at a rate of 130m^3/hour. The fact that the Nanny has a much larger flow than the discharge rate of the Indaver surface water and that the Nanny has relatively low conductivity levels, allows for the current surface water held in the lagoon to be assimilated into the river water without causing significantly high conductivity levels in the river water.

Using the assimilation calculations, the OPW flow data and the analysis on the River Nanny conductivity levels, a surface water discharge with higher conductivity levels or a discharge at a greater rate could be accommodated by the Nanny. The Indaver discharge is set at 130m^3/hour or 0.036m^3/sec. At this discharge rate it is predicted that a conductivity level in the discharge of 1800uS/cm would have no detrimental effects on the R. Nanny conductivity levels.

However, the Indaver surface water discharge travels to the River Nanny via land drainage ditches that cross private agricultural land and respect to this must be taken into account. There are also unaccounted for sources of conductivity and TOC that may enter the River Nanny such as agricultural discharges and surface waters from other premises in the area.
Electric Conductivity is directly dependent on total ion concentration or dissolved solids present. A conductivity measurement alone does not determine whether a discharge has polluting potential or not. A discharge with a low conductivity may still contain polluting substances that at low concentrations can be significantly detrimental to the water quality of the receiving waterbody.

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

Changes in TOC concentration are compared to 1989 Surface Water regulation Class A3 water COD limits. COD is not a direct comparison to TOC but levels are generally similar. Also Class A3 waters are not of good quality and would require intensive physical and chemical treatment to render them safe as drinking water. For these reasons the current TOC trigger limits could be increased but it is recommended that they are only increased to 25mg/L for warning limits and 30mg/L for control limits even though assimilation capacity calculations suggest that higher TOC discharge concentrations could be accommodated by the River Nanny.

EPA Export 25-04-2012:04:20:40

In summary, the discharge of surface water analysed from the holding lagoon at the Indaver site will not have a significant impact on the conductivity levels of the River Nanny water when discharged at 130 m^3/hour.
The increased conductivity levels in the surfacewater discharge are due to presence of sodium chloride or salt used to prevent slipping on icy hard stand areas. This will not pose significant environmental hazards to the River Nanny.
The River Nanny has the capacity to assimilate Indaver surface water discharges with higher conductivity and TOC levels than the current trigger limits set for the SW1 discharge.

David Kelly
Technical Manager
KD Environmental

5th January 2012

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

EPA Export 25-04-2012:04:20:41

Appendix 1

OPW River Nanny Flow Data

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

EPA Export 25-04-2012:04:20:41

• Hydro-Data Home • Contact Us • Search Query • Search Results • Map-Finder • Online Questionnaire

Summary Statistics Data

• *Daily Mean Flow Data* • *Daily Mean Level Data* • *Annual Maxima Data*

GENERAL STATION DETAILS			
Station Name: Duleek D/S	Station No: 08011	Watercourse: Nanny	NGR: O 053 685
Catchment Area (km²): 181	Catchment: Nanny	Gauge Type: L/AR	Datum: Poolbeg

SUMMARY HYDROMETRIC STATISTICS
Annual Average Rainfall (mm)[1]: 850
Est'd Annual Losses (mm)[1]: 456
Mean Annual Flow (m^3/s): 2.2713 (Data derived for the period 1979 to 2005)

STATION HISTORY
Period of Continuous Hardcopy Records: 1979 to 2005
Period of Digitised Record: 1979 to 2005

Note 1 : Data extracted from the Environmental Protection Agency publication 'Hydrological Data', July 1997

DURATION PERCENTILES

Flows equalled or exceeded for the given percentage of time (m^3/s)
(Data derived for the period 1979 to 2005)

1%	5%	10%	50%	80%	90%	95%	99%
16.0	7.56	5.56	1.17	0.33	0.17	0.10	0.04

Levels equalled or exceeded for the given percentage of time (mAOD Poolbeg)
(Data derived for the period 1979 to 2005)

1%	5%	10%	50%	80%	90%	95%	99%
21.06	20.45	20.28	19.96	19.84	19.80	19.75	19.46

COMMENTS / NOTES
Poor quality low flow data - to be used for indicative purposes only.

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

EPA Export 25-04-2012:04:20:41

Appendix 2

Assimilation Capacity Calculations

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

EPA Export 25-04-2012:04:20:41

Formula:

C final = (C back * F river) + (C discharge * F discharge) / (F river + F discharge)

C final=Resultant concentration after discharge (uS/cm)
C back=Background Conductivity in river(uS/cm)
F river=Flow in river (m3/s)
C discharge =Average Conductivity in discharge (uS/cm)
F discharge=Flow of discharge (m3/s)

	Units	Avr Nanny Result (uS/cm)	River Flow m3/s	Avr SW1 Result (uS/cm)	SW1 Flow	C Final (uS/cm)
50%ile	uS/cm	695	1.17	1129	0.036	707.95
95%ile	uS/cm	695	0.1	1129	0.036	809.85

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

EPA Export 25-04-2012:04:20:41

Formula:

C final = (C back * F river) + (C discharge * F discharge) / (F river + F discharge)

C final=Resultant concentration after discharge (mg/L)
C back=Background TOC in river (mg/L)
F river=Flow in river (m3/s)
C discharge =Average TOC in discharge (mg/L)
F discharge=Flow of discharge (m3/s)

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

	Units	Avr Nanny Result (mg/L)	River Flow (B) m3/s	Avr SW1 Result (mg/L)	SW1 Flow	C Final (mg/l)
50%ile	mg/L	5.39	1.17	3.96	0.036	5.35
95%ile	mg/L	5.39	0.1	3.96	0.036	5.01

EPA Export 25-04-2012:04:20:41

Appendix 3

Laboratory Certificates of Analysis

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

EPA Export 25-04-2012:04:20:41

Fitz scientific
Monitoring and Testing Services

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth
Ireland
Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
email info@fitzsci.ie

Customer	David Kelly KD Environmental Consultancy & Service 17 Eastham Court Bettystown Co. Meath	*Lab Report Ref. No.*	4315/007/02
		Date of Receipt	16/12/2011
		Sampled On	15/12/2011
		Date Testing Commenced	16/12/2011
		Received or Collected	Delivered by Customer
		Condition on Receipt	Acceptable
Customer PO		*Date of Report*	20/12/2011
Customer Ref	Indaver SW - 15/12/11	*Sample Type*	Surface Water

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Total Organic Carbon	316	TOC analyser (NPOC)	4.10	mg/L	

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

Signed : A Harmon **Date :** 20/12/11
Aoife Harmon - Technical Supervisor

Acc. : Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested
**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.

EPA Export 25-04-2012:04:20:42

Fitz scientific

Monitoring and Testing Services

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth
Ireland

Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
email info@fitzsci.ie

Customer	David Kelly KD Environmental Consultancy & Service 17 Eastham Court Bettystown Co. Meath	*Lab Report Ref. No.*	4315/007/04
		Date of Receipt	16/12/2011
		Sampled On	16/12/2011
		Date Testing Commenced	16/12/2011
		Received or Collected	Delivered by Customer
		Condition on Receipt	Acceptable
Customer PO		*Date of Report*	20/12/2011
Customer Ref	Indaver SW - 16/12/11	*Sample Type*	Surface Water

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Total Organic Carbon	316	TOC analyser (NPOC)	4.04	mg/L	

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

Signed : A Harmon **Date :** 20/12/11

Aoife Harmon - Technical Supervisor

Acc. : Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested
**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.

EPA Export 25-04-2012:04:20:42

Fitz scientific
Monitoring and Testing Services

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth
Ireland
Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
email info@fitzsci.ie

Customer	David Kelly KD Environmental Consultancy & Service 17 Eastham Court Bettystown Co. Meath	*Lab Report Ref. No.*	4315/008/02
		Date of Receipt	19/12/2011
		Sampled On	19/12/2011
		Date Testing Commenced	19/12/2011
		Received or Collected	Delivered by Customer
		Condition on Receipt	Acceptable
Customer PO		*Date of Report*	22/12/2011
Customer Ref	Indaver S.W - 19/12/11	*Sample Type*	Surface Water

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Total Organic Carbon	316	TOC analyser (NPOC)	3.73	mg/L	

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

Signed : A Harmon **Date :** 22/12/11

Aoife Harmon - Technical Supervisor

Acc. : Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested
**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.

EPA Export 25-04-2012:04:20:42

Fitz scientific

Monitoring and Testing Services

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth
Ireland

Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
email info@fitzsci.ie

Customer	David Kelly KD Environmental Consultancy & Service 17 Eastham Court Bettystown Co. Meath	*Lab Report Ref. No.*	4315/007/01
		Date of Receipt	16/12/2011
		Sampled On	15/12/2011
		Date Testing Commenced	16/12/2011
		Received or Collected	Delivered by Customer
		Condition on Receipt	Acceptable
Customer PO		*Date of Report*	20/12/2011
Customer Ref	Nanny - 15/12/11	*Sample Type*	Surface Water

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Total Organic Carbon	316	TOC analyser (NPOC)	6.02	mg/L	

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

Signed : A Harmon **Date :** 20/12/11

Aoife Harmon - Technical Supervisor

Acc. : Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested
**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.

EPA Export 25-04-2012:04:20:42

Fitz scientific

Monitoring and Testing Services

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth
Ireland

Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
email info@fitzsci.ie

Customer	David Kelly KD Environmental Consultancy & Service 17 Eastham Court Bettystown Co. Meath	*Lab Report Ref. No.*	4315/007/03
		Date of Receipt	16/12/2011
		Sampled On	16/12/2011
		Date Testing Commenced	16/12/2011
		Received or Collected	Delivered by Customer
		Condition on Receipt	Acceptable
Customer PO		*Date of Report*	20/12/2011
Customer Ref	Nanny - 16/12/11	*Sample Type*	Surface Water

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Total Organic Carbon	316	TOC analyser (NPOC)	5.32	mg/L	

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

Signed : A Harmon **Date :** 20/12/11

Aoife Harmon - Technical Supervisor

Acc. : Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested
**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.

EPA Export 25-04-2012:04:20:42

Fitz scientific
Monitoring and Testing Services

Unit 35,
Boyne Business Park,
Drogheda,
Co. Louth
Ireland
Tel: +353 41 9845440
Fax: +353 41 9846171
Web: www.fitzsci.ie
email info@fitzsci.ie

Customer	David Kelly KD Environmental Consultancy & Service 17 Eastham Court Bettystown Co. Meath	*Lab Report Ref. No.*	4315/008/01
		Date of Receipt	19/12/2011
		Sampled On	19/12/2011
		Date Testing Commenced	19/12/2011
		Received or Collected	Delivered by Customer
		Condition on Receipt	Acceptable
Customer PO		*Date of Report*	22/12/2011
Customer Ref	Nanny - 19/12/11	*Sample Type*	Surface Water

CERTIFICATE OF ANALYSIS

Test Parameter	SOP	Analytical Technique	Result	Units	Acc.
Total Organic Carbon	316	TOC analyser (NPOC)	4.85	mg/L	

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

Signed : A Harmon ***Date :*** 22/12/11

Aoife Harmon - Technical Supervisor

Acc. : Accredited Parameters by ISO 17025:2005

All organic results are analysed as received and all results are corrected for dry weight at 104 C
Results shall not be reproduced, except in full, without the approval of Fitz Scientific
Results contained in this report relate only to the samples tested
**The analytical result for this parameter may not be reflective of the concentration present at the time of sampling. The maximum recommended preservation time for this parameter has been exceeded.

EPA Export 25-04-2012:04:20:42

Appendix 11.2

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

EPA Export 25-04-2012:04:20:42

Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

Margin for Flood Risk warning (mm)	300	Inertia Status	OFF
DTS Status	ON	Analysis Time Step	Fine
DVD Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	30
Climate Change (%)	10

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Summer	30	10%	1				
1.001	15 Winter	30	10%	1				
1.002	15 Winter	30	10%	1	30/15 Summer			
2.000	15 Winter	30	10%	1	30/15 Summer			
1.003	15 Winter	30	10%	1	30/15 Summer			
1.004	15 Winter	30	10%	1	30/15 Summer			
1.005	15 Winter	30	10%	1				
1.006	15 Winter	30	10%	1	30/15 Summer			
1.007	15 Winter	30	10%	1	30/15 Summer			
3.000	15 Winter	30	10%	1	30/15 Winter			
3.001	15 Winter	30	10%	1	30/15 Summer			
3.002	15 Winter	30	10%	1	30/15 Summer			
4.000	15 Summer	30	10%	1				
3.003	15 Winter	30	10%	1	30/15 Summer			
3.004	15 Winter	30	10%	1	30/15 Summer			
5.000	15 Summer	30	10%	1				
3.005	15 Winter	30	10%	1	30/15 Summer			
6.000	15 Summer	30	10%	1				

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	31.839	-0.161	0.000	0.43	0.0	28.2	O K
	1.001	31.794	-0.066	0.000	0.61	0.0	53.7	O K
	1.002	31.718	0.148	0.000	0.80	0.0	52.9	SURCH'ED
	2.000	32.045	0.200	0.000	1.18	0.0	57.4	SURCH'ED
	1.003	31.654	0.184	0.000	1.46	0.0	111.9	SURCH'ED
	1.004	30.685	0.118	0.000	1.58	0.0	116.9	SURCH'ED
	1.005	30.381	-0.099	0.000	0.77	0.0	128.1	O K
	1.006	29.273	0.373	0.000	1.01	0.0	126.4	SURCH'ED
	1.007	29.064	0.364	0.000	1.12	0.0	126.2	SURCH'ED
	3.000	29.544	0.004	0.000	0.27	0.0	12.6	SURCH'ED
	3.001	29.533	0.193	0.000	0.88	0.0	30.4	SURCH'ED
	3.002	29.458	0.378	0.000	1.03	0.0	30.5	SURCH'ED
	4.000	29.474	-0.051	0.000	0.93	0.0	40.7	O K
	3.003	29.342	0.412	0.000	0.83	0.0	54.7	SURCH'ED
	3.004	29.298	0.438	0.000	1.03	0.0	67.9	SURCH'ED
	5.000	29.232	-0.168	0.000	0.15	0.0	8.1	O K
	3.005	29.021	0.446	0.000	0.72	0.0	74.7	SURCH'ED
	6.000	32.516	-0.084	0.000	0.71	0.0	24.2	O K

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

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:42

Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
6.001	15 Summer	30	10%	1				
7.000	15 Summer	30	10%	1				
6.002	15 Summer	30	10%	1				
8.000	15 Summer	30	10%	1				
3.006	15 Winter	30	10%	1	30/15 Summer			
1.008	15 Winter	30	10%	1	30/15 Summer			
9.000	15 Winter	30	10%	1	30/15 Summer			
9.001	15 Winter	30	10%	1	30/15 Summer			
10.000	15 Winter	30	10%	1	30/15 Summer			
9.002	15 Winter	30	10%	1	30/15 Summer			
9.003	15 Winter	30	10%	1	30/15 Summer			
11.000	15 Winter	30	10%	1	30/15 Summer			
9.004	15 Winter	30	10%	1	30/15 Summer			
9.005	15 Winter	30	10%	1	30/15 Summer			
12.000	15 Winter	30	10%	1	30/15 Winter			
9.006	15 Winter	30	10%	1	30/15 Summer			
13.000	15 Winter	30	10%	1				
13.001	15 Winter	30	10%	1	30/15 Summer			
9.007	15 Winter	30	10%	1	30/15 Summer			
14.000	15 Summer	30	10%	1				
9.008	15 Winter	30	10%	1	30/15 Summer			
1.009	15 Winter	30	10%	1	30/15 Summer			
1.010	15 Winter	30	10%	1	30/15 Summer			
1.011	15 Winter	30	10%	1	30/15 Summer			

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	6.001	32.450	-0.050	0.000	0.92	0.0	34.6	O K
	7.000	32.501	-0.099	0.000	0.61	0.0	24.3	O K
	6.002	32.116	-0.134	0.000	0.33	0.0	67.9	O K
	8.000	31.052	-0.148	0.000	0.26	0.0	21.1	O K
	3.006	28.932	0.522	0.000	1.07	0.0	139.8	SURCH'ED
	1.008	28.810	0.310	0.000	0.81	0.0	246.4	SURCH'ED
	9.000	29.662	0.177	0.000	0.36	0.0	16.8	SURCH'ED
	9.001	29.640	0.355	0.000	0.79	0.0	25.5	SURCH'ED
	10.000	29.610	0.325	0.000	0.28	0.0	8.7	SURCH'ED
	9.002	29.594	0.414	0.000	1.10	0.0	32.7	SURCH'ED
	9.003	29.484	0.394	0.000	1.16	0.0	37.5	SURCH'ED
	11.000	29.347	0.122	0.000	0.36	0.0	18.8	SURCH'ED
	9.004	29.336	0.356	0.000	1.65	0.0	51.8	SURCH'ED
	9.005	29.214	0.284	0.000	1.00	0.0	63.8	SURCH'ED
	12.000	29.153	0.053	0.000	0.69	0.0	30.7	SURCH'ED
	9.006	29.144	0.294	0.000	1.04	0.0	112.4	SURCH'ED
	13.000	29.084	-0.016	0.000	0.27	0.0	15.1	O K
	13.001	29.072	0.227	0.000	0.52	0.0	24.3	SURCH'ED
	9.007	29.058	0.323	0.000	1.39	0.0	152.8	SURCH'ED
	14.000	29.214	-0.186	0.000	0.07	0.0	4.1	O K
	9.008	28.825	0.270	0.000	0.97	0.0	151.1	SURCH'ED
	1.009	28.777	0.327	0.000	1.86	0.0	391.6	SURCH'ED
	1.010	28.628	0.298	0.000	1.69	0.0	388.9	SURCH'ED
	1.011	28.477	0.172	0.000	1.68	0.0	387.4	SURCH'ED

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

EPA Export 25-04-2012:04:20:42

Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.012	15 Winter	30	10%	1	30/15 Summer			
1.013	120 Winter	30	10%	1	30/30 Summer			
1.014	15 Summer	30	10%	1				

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.012	28.324	0.049	0.000	1.42	0.0	386.5	SURCH'ED
	1.013	28.077	0.177	0.000	2.34	0.0	60.0	SURCH'ED
	1.014	29.786	-0.064	0.000	0.98	0.0	60.0	O K

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

EPA Export 25-04-2012:04:20:42

Global Variables

Region	FSR - Scotland & Ireland
Return Period (yrs)	5
M5-60 (mm)	15.300
Ratio R	0.270
Volumetric Runoff Coef	0.750
Profile Type	Summer
PIMP (%)	100
Areal Reduction Factor	1.000
Storm Duration (mins)	15
Hot Start (mins)	0
Hot Start Level (mm)	0
Manhole Headloss Coefficient	0.500
MADD Factor * 10m³/ha Storage	2.000
Foul Sewage/Hectare (l/s)	0.00
Additional Flow - % of Total Flow	0
Number of Input Hydrographs	0
Number of Time/Area Diagrams	0
Number of Bifurcations	0
Number of Overflows	0
Number of Off-Line Controls	0
Number of On-Line Controls	1

Starting Storm file name

M:\011838\MICROD\PHASE 2\PHASE 2.SWS

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

Freely Discharging Outfalls

Outfall Pipe Number	Outfall MH/No	C.Level (m)	I.Level (m)	D,L (mm)	B (mm)
1.014	S1.13	30.200	29.500	1500	0

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:42

On-Line Controls (Pump)

US/PN	Volume (m³)	Ctrl MH Name	Invert (m)	Headloss (m)	Flow (l/s)
1.012	8.624	S1.11	27.600	0.2	60.0
				0.4	60.0
				0.6	60.0
				0.8	60.0
				1.0	60.0
				1.4	60.0
				1.8	60.0
				2.2	60.0
				2.6	60.0

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

EPA Export 25-04-2012:04:20:42

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	33.60	0.140	240.0	0.107	4.00	1	0.600	o	300
1.001	39.20	0.290	135.2	0.114	0.00	1	0.600	o	300
1.002	21.50	0.100	215.0	0.038	0.00	1	0.600	o	300
2.000	29.00	0.290	100.0	0.254	4.00	1	0.600	o	225
1.003	30.10	0.175	172.0	0.018	0.00	1	0.600	o	300
1.004	13.20	0.087	151.7	0.030	0.00	1	0.600	o	300
1.005	64.16	1.580	40.6	0.068	0.00	1	0.600	o	300
1.006	42.34	0.200	211.7	0.049	0.00	1	0.600	o	375
1.007	53.63	0.200	268.1	0.015	0.00	1	0.600	o	375
3.000	20.00	0.200	100.0	0.049	4.00	1	0.600	o	225
3.001	54.00	0.260	207.7	0.094	0.00	1	0.600	o	225
3.002	41.00	0.150	273.3	0.052	0.00	1	0.600	o	225
4.000	57.60	0.445	129.4	0.156	4.00	1	0.600	o	225
3.003	13.00	0.070	185.7	0.000	0.00	1	0.600	o	300
3.004	74.25	0.285	260.5	0.097	0.00	1	0.600	o	300
5.000	13.32	0.200	66.6	0.030	4.00	1	0.600	o	225
3.005	52.03	0.165	315.3	0.053	0.00	1	0.600	o	375

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

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
1.000	S1.00	32.700	31.700	0.700	32.360	31.560	0.500		1200
1.001	S1.01	32.360	31.560	0.500	32.450	31.270	0.880		1200
1.002	S1.02	32.450	31.270	0.880	32.200	31.170	0.730		1200
2.000	S8.00	32.500	31.620	0.655	32.200	31.330	0.645		1200
1.003	S1.03	32.200	31.170	0.730	31.915	30.995	0.620		1200
1.004	S1.03a	31.915	30.267	1.348	31.850	30.180	1.370		1200
1.005	S1.04	31.850	30.180	1.370	32.415	28.600	3.515		1200
1.006	S1.05	32.415	28.525	3.515	31.950	28.325	3.250		1200
1.007	S1.06	31.950	28.325	3.250	30.750	28.125	2.250		1200
3.000	S20.00	30.150	29.315	0.610	30.300	29.115	0.960		1200
3.001	S3.00	30.300	29.115	0.960	30.300	28.855	1.220		1200
3.002	S3.01	30.300	28.855	1.220	30.250	28.705	1.320		1200
4.000	S3.01A	30.090	29.300	0.565	30.250	28.855	1.170		1200
3.003	S3.02	30.250	28.630	1.320	30.370	28.560	1.510		1200
3.004	S3.03	30.370	28.560	1.510	31.000	28.275	2.425		1200
5.000	S4.00	31.320	29.175	1.920	31.000	28.975	1.800		1200
3.005	S3.04	31.000	28.200	2.425	31.200	28.035	2.790		1200

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:42

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
6.000	18.60	0.100	186.0	0.090	4.00	1	0.600	o	225
6.001	43.00	0.250	172.0	0.045	0.00	1	0.600	o	225
7.000	19.00	0.140	135.7	0.090	4.00	1	0.600	o	225
6.002	9.60	2.150	4.5	0.045	0.00	1	0.600	o	225
8.000	28.52	0.800	35.6	0.078	4.00	1	0.600	o	225
3.006	23.01	0.135	170.4	0.000	0.00	1	0.600	o	375
1.008	9.97	0.050	199.4	0.009	0.00	1	0.600	o	600
9.000	20.00	0.200	100.0	0.067	4.00	1	0.600	o	225
9.001	22.65	0.105	215.7	0.068	0.00	1	0.600	o	225
10.000	24.50	0.105	233.3	0.047	4.00	1	0.600	o	225
9.002	22.60	0.090	251.1	0.027	0.00	1	0.600	o	225
9.003	23.72	0.110	215.7	0.032	0.00	1	0.600	o	225
11.000	8.25	0.140	58.9	0.074	4.00	1	0.600	o	225
9.004	8.75	0.050	175.0	0.013	0.00	1	0.600	o	225

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
6.000	S5.00	33.800	32.375	1.200	33.800	32.275	1.300		1200
6.001	S5.01	33.800	32.275	1.300	33.800	32.025	1.550		1200
7.000	S6.00	33.800	32.375	1.200	33.800	32.235	1.340		1200
6.002	S5.02	33.800	32.025	1.550	31.200	29.875	1.100		1200
8.000	S3.05a	32.850	30.975	1.650	31.200	30.175	0.800		1200
3.006	S3.05	31.200	28.035	2.790	30.750	27.900	2.475		1200
1.008	S1.07	30.750	27.900	2.250	30.510	27.850	2.060		1500
9.000	S20.01	30.150	29.260	0.665	30.275	29.060	0.990		1200
9.001	S7.00	30.275	29.060	0.990	30.325	28.955	1.145		1200
10.000	S7.00a	30.320	29.060	1.035	30.325	28.955	1.145		1200
9.002	S7.00b	30.325	28.955	1.145	30.375	28.865	1.285		1200
9.003	S7.01	30.375	28.865	1.285	30.045	28.755	1.065		1200
11.000	S9.00	30.350	29.000	1.125	30.045	28.860	0.960		1200
9.004	S7.02	30.045	28.755	1.065	30.200	28.705	1.270		1200

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

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:42

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
9.005	17.57	0.080	219.6	0.070	0.00	1	0.600	o	300
12.000	3.50	0.100	35.0	0.119	4.00	1	0.600	o	225
9.006	30.70	0.115	267.0	0.116	0.00	1	0.600	o	375
13.000	17.39	0.255	68.2	0.058	4.00	1	0.600	o	225
13.001	7.43	0.110	67.5	0.059	0.00	1	0.600	o	225
9.007	50.79	0.180	282.2	0.111	0.00	1	0.600	o	375
14.000	12.30	0.200	61.5	0.015	4.00	1	0.600	o	225
9.008	14.93	0.060	248.8	0.066	0.00	1	0.600	o	450
1.009	6.00	0.020	300.0	0.000	0.00	1	0.600	o	600
1.010	7.00	0.025	280.0	0.000	0.00	1	0.600	o	600
1.011	9.60	0.030	320.0	0.000	0.00	1	0.600	o	600
1.012	32.00	0.075	426.7	0.000	0.00	1	0.600	o	600
1.013	12.00	-2.000	-6.0	0.080	0.00	1	0.600	o	300
1.014	7.00	0.050	140.0	0.000	0.00	1	0.600	o	300

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
9.005	S7.03	30.200	28.630	1.270	30.290	28.550	1.440		1200
12.000	S10.00	30.300	28.875	1.200	30.290	28.775	1.290		1200
9.006	S7.04	30.290	28.475	1.440	30.300	28.360	1.565		1200
13.000	S11.00	30.325	28.875	1.225	30.400	28.620	1.555		1200
13.001	S11.01	30.400	28.620	1.555	30.300	28.510	1.565		1200
9.007	S7.05	30.300	28.360	1.565	30.530	28.180	1.975		1200
14.000	S7.06a	30.600	29.175	1.200	30.530	28.975	1.330		1200
9.008	S7.06	30.530	28.105	1.975	30.510	28.045	2.015		1350
1.009	S1.08	30.510	27.850	2.060	29.500	27.830	1.070		1500
1.010	S1.09	29.500	27.730	1.170	29.500	27.705	1.195		1500
1.011	S1.10	29.500	27.705	1.195	29.500	27.675	1.225		1500
1.012	S1.10a	29.500	27.675	1.225	29.500	27.600	1.300		1500
1.013	S1.11	29.500	27.600	1.600	30.151	29.600	0.251	5	1500
1.014	S1.12	30.151	29.550	0.301	30.200	29.500	0.400		1500

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

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:42

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	o	300	S1.00	32.700	31.700	0.700	1200
1.001	o	300	S1.01	32.360	31.560	0.500	1200
1.002	o	300	S1.02	32.450	31.270	0.880	1200
2.000	o	225	S8.00	32.500	31.620	0.655	1200
1.003	o	300	S1.03	32.200	31.170	0.730	1200
1.004	o	300	S1.03a	31.915	30.267	1.348	1200
1.005	o	300	S1.04	31.850	30.180	1.370	1200
1.006	o	375	S1.05	32.415	28.525	3.515	1200
1.007	o	375	S1.06	31.950	28.325	3.250	1200
3.000	o	225	S20.00	30.150	29.315	0.610	1200
3.001	o	225	S3.00	30.300	29.115	0.960	1200
3.002	o	225	S3.01	30.300	28.855	1.220	1200
4.000	o	225	S3.01A	30.090	29.300	0.565	1200
3.003	o	300	S3.02	30.250	28.630	1.320	1200
3.004	o	300	S3.03	30.370	28.560	1.510	1200
5.000	o	225	S4.00	31.320	29.175	1.920	1200

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

Downstream Manhole

PN	Length (m)	Slope (1:x)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	33.60	240.0	S1.01	32.360	31.560	0.500	1200
1.001	39.20	135.2	S1.02	32.450	31.270	0.880	1200
1.002	21.50	215.0	S1.03	32.200	31.170	0.730	1200
2.000	29.00	100.0	S1.03	32.200	31.330	0.645	1200
1.003	30.10	172.0	S1.03a	31.915	30.995	0.620	1200
1.004	13.20	151.7	S1.04	31.850	30.180	1.370	1200
1.005	64.16	40.6	S1.05	32.415	28.600	3.515	1200
1.006	42.34	211.7	S1.06	31.950	28.325	3.250	1200
1.007	53.63	268.1	S1.07	30.750	28.125	2.250	1500
3.000	20.00	100.0	S3.00	30.300	29.115	0.960	1200
3.001	54.00	207.7	S3.01	30.300	28.855	1.220	1200
3.002	41.00	273.3	S3.02	30.250	28.705	1.320	1200
4.000	57.60	129.4	S3.02	30.250	28.855	1.170	1200
3.003	13.00	185.7	S3.03	30.370	28.560	1.510	1200
3.004	74.25	260.5	S3.04	31.000	28.275	2.425	1200
5.000	13.32	66.6	S3.04	31.000	28.975	1.800	1200

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:43

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
3.005	o	375	S3.04	31.000	28.200	2.425	1200
6.000	o	225	S5.00	33.800	32.375	1.200	1200
6.001	o	225	S5.01	33.800	32.275	1.300	1200
7.000	o	225	S6.00	33.800	32.375	1.200	1200
6.002	o	225	S5.02	33.800	32.025	1.550	1200
8.000	o	225	S3.05a	32.850	30.975	1.650	1200
3.006	o	375	S3.05	31.200	28.035	2.790	1200
1.008	o	600	S1.07	30.750	27.900	2.250	1500
9.000	o	225	S20.01	30.150	29.260	0.665	1200
9.001	o	225	S7.00	30.275	29.060	0.990	1200
10.000	o	225	S7.00a	30.320	29.060	1.035	1200
9.002	o	225	S7.00b	30.325	28.955	1.145	1200
9.003	o	225	S7.01	30.375	28.865	1.285	1200

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

Downstream Manhole

PN	Length (m)	Slope (1:x)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
3.005	52.03	315.3	S3.05	31.200	28.035	2.790	1200
6.000	18.60	186.0	S5.01	33.800	32.275	1.300	1200
6.001	43.00	172.0	S5.02	33.800	32.025	1.550	1200
7.000	19.00	135.7	S5.02	33.800	32.235	1.340	1200
6.002	9.60	4.5	S3.05	31.200	29.875	1.100	1200
8.000	28.52	35.6	S3.05	31.200	30.175	0.800	1200
3.006	23.01	170.4	S1.07	30.750	27.900	2.475	1500
1.008	9.97	199.4	S1.08	30.510	27.850	2.060	1500
9.000	20.00	100.0	S7.00	30.275	29.060	0.990	1200
9.001	22.65	215.7	S7.00b	30.325	28.955	1.145	1200
10.000	24.50	233.3	S7.00b	30.325	28.955	1.145	1200
9.002	22.60	251.1	S7.01	30.375	28.865	1.285	1200
9.003	23.72	215.7	S7.02	30.045	28.755	1.065	1200

EPA Export 25-04-2012:04:20:43

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
11.000	o	225	S9.00	30.350	29.000	1.125	1200
9.004	o	225	S7.02	30.045	28.755	1.065	1200
9.005	o	300	S7.03	30.200	28.630	1.270	1200
12.000	o	225	S10.00	30.300	28.875	1.200	1200
9.006	o	375	S7.04	30.290	28.475	1.440	1200
13.000	o	225	S11.00	30.325	28.875	1.225	1200
13.001	o	225	S11.01	30.400	28.620	1.555	1200
9.007	o	375	S7.05	30.300	28.360	1.565	1200
14.000	o	225	S7.06a	30.600	29.175	1.200	1200
9.008	o	450	S7.06	30.530	28.105	1.975	1350
1.009	o	600	S1.08	30.510	27.850	2.060	1500
1.010	o	600	S1.09	29.500	27.730	1.170	1500
1.011	o	600	S1.10	29.500	27.705	1.195	1500
1.012	o	600	S1.10a	29.500	27.675	1.225	1500
1.013	o	300	S1.11	29.500	27.600	1.600	1500

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

Downstream Manhole

PN	Length (m)	Slope (1:x)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
11.000	8.25	58.9	S7.02	30.045	28.860	0.960	1200
9.004	8.75	175.0	S7.03	30.200	28.705	1.270	1200
9.005	17.57	219.6	S7.04	30.290	28.550	1.440	1200
12.000	3.50	35.0	S7.04	30.290	28.775	1.290	1200
9.006	30.70	267.0	S7.05	30.300	28.360	1.565	1200
13.000	17.39	68.2	S11.01	30.400	28.620	1.555	1200
13.001	7.43	67.5	S7.05	30.300	28.510	1.565	1200
9.007	50.79	282.2	S7.06	30.530	28.180	1.975	1350
14.000	12.30	61.5	S7.06	30.530	28.975	1.330	1350
9.008	14.93	248.8	S1.08	30.510	28.045	2.015	1500
1.009	6.00	300.0	S1.09	29.500	27.830	1.070	1500
1.010	7.00	280.0	S1.10	29.500	27.705	1.195	1500
1.011	9.60	320.0	S1.10a	29.500	27.675	1.225	1500
1.012	32.00	426.7	S1.11	29.500	27.600	1.300	1500
1.013	12.00	-6.0	S1.12	30.151	29.600	0.251	1500

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:43

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.014	o	300	S1.12	30.151	29.550	0.301	1500

Downstream Manhole

PN	Length (m)	Slope (1:x)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.014	7.00	140.0	S1.13	30.200	29.500	0.400	1500

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

EPA Export 25-04-2012:04:20:43

Summary Wizard of "CRITICAL"(Rank 1 by Max Level) Results for Design Storms

Margin for Flood Risk warning (mm)	300	Inertia Status	OFF
DTS Status	ON	Analysis Time Step	Fine
DVD Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	5
Climate Change (%)	10

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Summer	5	10%	1				
1.001	15 Winter	5	10%	1				
1.002	15 Winter	5	10%	1				
2.000	15 Summer	5	10%	1				
1.003	15 Winter	5	10%	1				
1.004	15 Winter	5	10%	1	5/15 Summer			
1.005	15 Winter	5	10%	1				
1.006	15 Winter	5	10%	1				
1.007	15 Winter	5	10%	1				
3.000	15 Summer	5	10%	1				
3.001	15 Winter	5	10%	1				
3.002	15 Winter	5	10%	1				
4.000	15 Summer	5	10%	1				
3.003	15 Winter	5	10%	1				
3.004	15 Winter	5	10%	1				
5.000	15 Summer	5	10%	1				
3.005	15 Winter	5	10%	1	5/15 Summer			
6.000	15 Summer	5	10%	1				

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	31.812	-0.188	0.000	0.29	0.0	19.2	O K
	1.001	31.693	-0.167	0.000	0.40	0.0	35.3	O K
	1.002	31.509	-0.061	0.000	0.61	0.0	40.6	O K
	2.000	31.795	-0.050	0.000	0.94	0.0	45.7	O K
	1.003	31.470	0.000	0.000	1.02	0.0	78.1	O K
	1.004	30.575	0.008	0.000	1.11	0.0	81.8	SURCH'ED
	1.005	30.339	-0.141	0.000	0.54	0.0	90.2	O K
	1.006	28.774	-0.126	0.000	0.77	0.0	96.0	O K
	1.007	28.618	-0.082	0.000	0.84	0.0	94.5	O K
	3.000	29.381	-0.159	0.000	0.19	0.0	9.0	O K
	3.001	29.249	-0.091	0.000	0.62	0.0	21.5	O K
	3.002	29.030	-0.050	0.000	0.93	0.0	27.5	O K
	4.000	29.433	-0.092	0.000	0.65	0.0	28.6	O K
	3.003	28.857	-0.073	0.000	0.78	0.0	51.5	O K
	3.004	28.820	-0.040	0.000	0.90	0.0	59.4	O K
	5.000	29.222	-0.178	0.000	0.10	0.0	5.5	O K
	3.005	28.607	0.032	0.000	0.61	0.0	64.0	SURCH'ED
	6.000	32.485	-0.115	0.000	0.48	0.0	16.5	O K

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

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:43

Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
6.001	15 Winter	5	10%	1				
7.000	15 Summer	5	10%	1				
6.002	15 Summer	5	10%	1				
8.000	15 Summer	5	10%	1				
3.006	30 Winter	5	10%	1	5/15 Summer			
1.008	15 Winter	5	10%	1				
9.000	15 Summer	5	10%	1				
9.001	15 Winter	5	10%	1				
10.000	15 Winter	5	10%	1				
9.002	15 Winter	5	10%	1	5/15 Winter			
9.003	15 Winter	5	10%	1	5/15 Summer			
11.000	15 Summer	5	10%	1				
9.004	15 Winter	5	10%	1	5/15 Summer			
9.005	15 Winter	5	10%	1				
12.000	15 Summer	5	10%	1				
9.006	15 Winter	5	10%	1				
13.000	15 Summer	5	10%	1				
13.001	15 Winter	5	10%	1				
9.007	15 Winter	5	10%	1				
14.000	15 Summer	5	10%	1				
9.008	15 Winter	5	10%	1				
1.009	15 Summer	5	10%	1				
1.010	15 Winter	5	10%	1	5/15 Summer			
1.011	15 Winter	5	10%	1	5/30 Summer			

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

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	6.001	32.403	-0.097	0.000	0.59	0.0	22.4	O K
	7.000	32.475	-0.125	0.000	0.41	0.0	16.6	O K
	6.002	32.096	-0.154	0.000	0.21	0.0	43.4	O K
	8.000	31.038	-0.162	0.000	0.18	0.0	14.4	O K
	3.006	28.544	0.134	0.000	0.71	0.0	93.5	SURCH'ED
	1.008	28.475	-0.025	0.000	0.61	0.0	185.8	O K
	9.000	29.338	-0.147	0.000	0.26	0.0	12.3	O K
	9.001	29.226	-0.059	0.000	0.66	0.0	21.1	O K
	10.000	29.201	-0.084	0.000	0.26	0.0	8.1	O K
	9.002	29.188	0.008	0.000	0.92	0.0	27.4	SURCH'ED
	9.003	29.112	0.022	0.000	0.98	0.0	31.6	SURCH'ED
	11.000	29.077	-0.148	0.000	0.26	0.0	13.6	O K
	9.004	29.010	0.030	0.000	1.34	0.0	42.2	SURCH'ED
	9.005	28.835	-0.095	0.000	0.80	0.0	51.4	O K
	12.000	28.987	-0.113	0.000	0.49	0.0	22.0	O K
	9.006	28.757	-0.093	0.000	0.76	0.0	81.7	O K
	13.000	28.941	-0.159	0.000	0.19	0.0	10.7	O K
	13.001	28.721	-0.124	0.000	0.41	0.0	19.3	O K
	9.007	28.693	-0.042	0.000	0.99	0.0	109.3	O K
	14.000	29.207	-0.193	0.000	0.05	0.0	2.8	O K
	9.008	28.494	-0.061	0.000	0.75	0.0	117.9	O K
	1.009	28.450	0.000	0.000	1.31	0.0	276.0	O K
	1.010	28.367	0.037	0.000	1.31	0.0	300.7	SURCH'ED
	1.011	28.323	0.018	0.000	1.30	0.0	299.4	SURCH'ED

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:43

Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.012	30 Summer	5	10%	1				
1.013	60 Winter	5	10%	1				
1.014	15 Summer	5	10%	1				

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.012	28.275	0.000	0.000	1.02	0.0	279.7	O K
	1.013	27.881	-0.019	0.000	2.34	0.0	60.0	O K
	1.014	29.786	-0.064	0.000	0.98	0.0	60.0	O K

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

EPA Export 25-04-2012:04:20:43

Network Details

* - Indicates pipe has been modified outside of WinDes's Storm/Foul & Schedules

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
1.000	33.60	0.140	240.0	0.107	4.00	1	0.600	o	300
1.001	39.20	0.290	135.2	0.114	0.00	1	0.600	o	300
1.002	21.50	0.100	215.0	0.038	0.00	1	0.600	o	300
2.000	29.00	0.290	100.0	0.254	4.00	1	0.600	o	225
1.003	30.10	0.175	172.0	0.018	0.00	1	0.600	o	300
1.004	13.20	0.087	151.7	0.030	0.00	1	0.600	o	300
1.005	64.16	1.580	40.6	0.068	0.00	1	0.600	o	300
1.006	42.34	0.200	211.7	0.049	0.00	1	0.600	o	375
1.007	53.63	0.200	268.1	0.015	0.00	1	0.600	o	375
3.000	20.00	0.200	100.0	0.049	4.00	1	0.600	o	225
3.001	54.00	0.260	207.7	0.094	0.00	1	0.600	o	225
3.002	41.00	0.150	273.3	0.052	0.00	1	0.600	o	225
4.000	57.60	0.445	129.4	0.156	4.00	1	0.600	o	225
3.003	13.00	0.070	185.7	0.000	0.00	1	0.600	o	300
3.004	74.25	0.285	260.5	0.097	0.00	1	0.600	o	300
5.000	13.32	0.200	66.6	0.030	4.00	1	0.600	o	225
3.005	52.03	0.165	315.3	0.053	0.00	1	0.600	o	375

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

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
1.000	S1.00	32.700	31.700	0.700	32.360	31.560	0.500		1200
1.001	S1.01	32.360	31.560	0.500	32.450	31.270	0.880		1200
1.002	S1.02	32.450	31.270	0.880	32.200	31.170	0.730		1200
2.000	S8.00	32.500	31.620	0.655	32.200	31.330	0.645		1200
1.003	S1.03	32.200	31.170	0.730	31.915	30.995	0.620		1200
1.004	S1.03a	31.915	30.267	1.348	31.850	30.180	1.370		1200
1.005	S1.04	31.850	30.180	1.370	32.415	28.600	3.515		1200
1.006	S1.05	32.415	28.525	3.515	31.950	28.325	3.250		1200
1.007	S1.06	31.950	28.325	3.250	30.750	28.125	2.250		1200
3.000	S20.00	30.150	29.315	0.610	30.300	29.115	0.960		1200
3.001	S3.00	30.300	29.115	0.960	30.300	28.855	1.220		1200
3.002	S3.01	30.300	28.855	1.220	30.250	28.705	1.320		1200
4.000	S3.01A	30.090	29.300	0.565	30.250	28.855	1.170		1200
3.003	S3.02	30.250	28.630	1.320	30.370	28.560	1.510		1200
3.004	S3.03	30.370	28.560	1.510	31.000	28.275	2.425		1200
5.000	S4.00	31.320	29.175	1.920	31.000	28.975	1.800		1200
3.005	S3.04	31.000	28.200	2.425	31.200	28.035	2.790		1200

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:43

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
6.000	18.60	0.100	186.0	0.090	4.00	1	0.600	o	225
6.001	43.00	0.250	172.0	0.045	0.00	1	0.600	o	225
7.000	19.00	0.140	135.7	0.090	4.00	1	0.600	o	225
6.002	9.60	2.150	4.5	0.045	0.00	1	0.600	o	225
8.000	28.52	0.800	35.6	0.078	4.00	1	0.600	o	225
3.006	23.01	0.135	170.4	0.000	0.00	1	0.600	o	375
1.008	9.97	0.050	199.4	0.009	0.00	1	0.600	o	600
9.000	20.00	0.200	100.0	0.067	4.00	1	0.600	o	225
9.001	22.65	0.105	215.7	0.068	0.00	1	0.600	o	225
10.000	24.50	0.105	233.3	0.047	4.00	1	0.600	o	225
9.002	22.60	0.090	251.1	0.027	0.00	1	0.600	o	225
9.003	23.72	0.110	215.7	0.032	0.00	1	0.600	o	225
11.000	8.25	0.140	58.9	0.074	4.00	1	0.600	o	225
9.004	8.75	0.050	175.0	0.013	0.00	1	0.600	o	225

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

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
6.000	S5.00	33.800	32.375	1.200	33.800	32.275	1.300		1200
6.001	S5.01	33.800	32.275	1.300	33.800	32.025	1.550		1200
7.000	S6.00	33.800	32.375	1.200	33.800	32.235	1.340		1200
6.002	S5.02	33.800	32.025	1.550	31.200	29.875	1.100		1200
8.000	S3.05a	32.850	30.975	1.650	31.200	30.175	0.800		1200
3.006	S3.05	31.200	28.035	2.790	30.750	27.900	2.475		1200
1.008	S1.07	30.750	27.900	2.250	30.510	27.850	2.060		1500
9.000	S20.01	30.150	29.260	0.665	30.275	29.060	0.990		1200
9.001	S7.00	30.275	29.060	0.990	30.325	28.955	1.145		1200
10.000	S7.00a	30.320	29.060	1.035	30.325	28.955	1.145		1200
9.002	S7.00b	30.325	28.955	1.145	30.375	28.865	1.285		1200
9.003	S7.01	30.375	28.865	1.285	30.045	28.755	1.065		1200
11.000	S9.00	30.350	29.000	1.125	30.045	28.860	0.960		1200
9.004	S7.02	30.045	28.755	1.065	30.200	28.705	1.270		1200

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:43

Network Details

PN	Length (m)	Fall (m)	Slope (1:x)	Area (ha)	T.E. (mins)	Rain Pro	k (mm)	Hyd Sect	Dia (mm)
9.005	17.57	0.080	219.6	0.070	0.00	1	0.600	o	300
12.000	3.50	0.100	35.0	0.119	4.00	1	0.600	o	225
9.006	30.70	0.115	267.0	0.116	0.00	1	0.600	o	375
13.000	17.39	0.255	68.2	0.058	4.00	1	0.600	o	225
13.001	7.43	0.110	67.5	0.059	0.00	1	0.600	o	225
9.007	50.79	0.180	282.2	0.111	0.00	1	0.600	o	375
14.000	12.30	0.200	61.5	0.015	4.00	1	0.600	o	225
9.008	14.93	0.060	248.8	0.066	0.00	1	0.600	o	450
1.009	6.00	0.020	300.0	0.000	0.00	1	0.600	o	600
1.010	7.00	0.025	280.0	0.000	0.00	1	0.600	o	600
1.011	9.60	0.030	320.0	0.000	0.00	1	0.600	o	600
1.012	32.00	0.075	426.7	0.000	0.00	1	0.600	o	600
1.013	12.00	-2.000	-6.0	0.080	0.00	1	0.600	o	300
1.014	7.00	0.050	140.0	0.000	0.00	1	0.600	o	300

PN	USMH No.	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl No.	US/MH (mm)
9.005	S7.03	30.200	28.630	1.270	30.290	28.550	1.440		1200
12.000	S10.00	30.300	28.875	1.200	30.290	28.775	1.290		1200
9.006	S7.04	30.290	28.475	1.440	30.300	28.360	1.565		1200
13.000	S11.00	30.325	28.875	1.225	30.400	28.620	1.555		1200
13.001	S11.01	30.400	28.620	1.555	30.300	28.510	1.565		1200
9.007	S7.05	30.300	28.360	1.565	30.530	28.180	1.975		1200
14.000	S7.06a	30.600	29.175	1.200	30.530	28.975	1.330		1200
9.008	S7.06	30.530	28.105	1.975	30.510	28.045	2.015		1350
1.009	S1.08	30.510	27.850	2.060	29.500	27.830	1.070		1500
1.010	S1.09	29.500	27.730	1.170	29.500	27.705	1.195		1500
1.011	S1.10	29.500	27.705	1.195	29.500	27.675	1.225		1500
1.012	S1.10a	29.500	27.675	1.225	29.500	27.600	1.300		1500
1.013	S1.11	29.500	27.600	1.600	30.151	29.600	0.251	5	1500
1.014	S1.12	30.151	29.550	0.301	30.200	29.500	0.400		1500

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

EPA Export 25-04-2012:04:20:43

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	o	300	S1.00	32.700	31.700	0.700	1200
1.001	o	300	S1.01	32.360	31.560	0.500	1200
1.002	o	300	S1.02	32.450	31.270	0.880	1200
2.000	o	225	S8.00	32.500	31.620	0.655	1200
1.003	o	300	S1.03	32.200	31.170	0.730	1200
1.004	o	300	S1.03a	31.915	30.267	1.348	1200
1.005	o	300	S1.04	31.850	30.180	1.370	1200
1.006	o	375	S1.05	32.415	28.525	3.515	1200
1.007	o	375	S1.06	31.950	28.325	3.250	1200
3.000	o	225	S20.00	30.150	29.315	0.610	1200
3.001	o	225	S3.00	30.300	29.115	0.960	1200
3.002	o	225	S3.01	30.300	28.855	1.220	1200
4.000	o	225	S3.01A	30.090	29.300	0.565	1200
3.003	o	300	S3.02	30.250	28.630	1.320	1200
3.004	o	300	S3.03	30.370	28.560	1.510	1200
5.000	o	225	S4.00	31.320	29.175	1.920	1200

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

Downstream Manhole

PN	Length (m)	Slope (1:x)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.000	33.60	240.0	S1.01	32.360	31.560	0.500	1200
1.001	39.20	135.2	S1.02	32.450	31.270	0.880	1200
1.002	21.50	215.0	S1.03	32.200	31.170	0.730	1200
2.000	29.00	100.0	S1.03	32.200	31.330	0.645	1200
1.003	30.10	172.0	S1.03a	31.915	30.995	0.620	1200
1.004	13.20	151.7	S1.04	31.850	30.180	1.370	1200
1.005	64.16	40.6	S1.05	32.415	28.600	3.515	1200
1.006	42.34	211.7	S1.06	31.950	28.325	3.250	1200
1.007	53.63	268.1	S1.07	30.750	28.125	2.250	1500
3.000	20.00	100.0	S3.00	30.300	29.115	0.960	1200
3.001	54.00	207.7	S3.01	30.300	28.855	1.220	1200
3.002	41.00	273.3	S3.02	30.250	28.705	1.320	1200
4.000	57.60	129.4	S3.02	30.250	28.855	1.170	1200
3.003	13.00	185.7	S3.03	30.370	28.560	1.510	1200
3.004	74.25	260.5	S3.04	31.000	28.275	2.425	1200
5.000	13.32	66.6	S3.04	31.000	28.975	1.800	1200

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:43

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
3.005	o	375	S3.04	31.000	28.200	2.425	1200
6.000	o	225	S5.00	33.800	32.375	1.200	1200
6.001	o	225	S5.01	33.800	32.275	1.300	1200
7.000	o	225	S6.00	33.800	32.375	1.200	1200
6.002	o	225	S5.02	33.800	32.025	1.550	1200
8.000	o	225	S3.05a	32.850	30.975	1.650	1200
3.006	o	375	S3.05	31.200	28.035	2.790	1200
1.008	o	600	S1.07	30.750	27.900	2.250	1500
9.000	o	225	S20.01	30.150	29.260	0.665	1200
9.001	o	225	S7.00	30.275	29.060	0.990	1200
10.000	o	225	S7.00a	30.320	29.060	1.035	1200
9.002	o	225	S7.00b	30.325	28.955	1.145	1200
9.003	o	225	S7.01	30.375	28.865	1.285	1200

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

Downstream Manhole

PN	Length (m)	Slope (1:x)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
3.005	52.03	315.3	S3.05	31.200	28.035	2.790	1200
6.000	18.60	186.0	S5.01	33.800	32.275	1.300	1200
6.001	43.00	172.0	S5.02	33.800	32.025	1.550	1200
7.000	19.00	135.7	S5.02	33.800	32.235	1.340	1200
6.002	9.60	4.5	S3.05	31.200	29.875	1.100	1200
8.000	28.52	35.6	S3.05	31.200	30.175	0.800	1200
3.006	23.01	170.4	S1.07	30.750	27.900	2.475	1500
1.008	9.97	199.4	S1.08	30.510	27.850	2.060	1500
9.000	20.00	100.0	S7.00	30.275	29.060	0.990	1200
9.001	22.65	215.7	S7.00b	30.325	28.955	1.145	1200
10.000	24.50	233.3	S7.00b	30.325	28.955	1.145	1200
9.002	22.60	251.1	S7.01	30.375	28.865	1.285	1200
9.003	23.72	215.7	S7.02	30.045	28.755	1.065	1200

EPA Export 25-04-2012:04:20:43

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
11.000	o	225	S9.00	30.350	29.000	1.125	1200
9.004	o	225	S7.02	30.045	28.755	1.065	1200
9.005	o	300	S7.03	30.200	28.630	1.270	1200
12.000	o	225	S10.00	30.300	28.875	1.200	1200
9.006	o	375	S7.04	30.290	28.475	1.440	1200
13.000	o	225	S11.00	30.325	28.875	1.225	1200
13.001	o	225	S11.01	30.400	28.620	1.555	1200
9.007	o	375	S7.05	30.300	28.360	1.565	1200
14.000	o	225	S7.06a	30.600	29.175	1.200	1200
9.008	o	450	S7.06	30.530	28.105	1.975	1350
1.009	o	600	S1.08	30.510	27.850	2.060	1500
1.010	o	600	S1.09	29.500	27.730	1.170	1500
1.011	o	600	S1.10	29.500	27.705	1.195	1500
1.012	o	600	S1.10a	29.500	27.675	1.225	1500
1.013	o	300	S1.11	29.500	27.600	1.600	1500

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

Downstream Manhole

PN	Length (m)	Slope (1:x)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
11.000	8.25	58.9	S7.02	30.045	28.860	0.960	1200
9.004	8.75	175.0	S7.03	30.200	28.705	1.270	1200
9.005	17.57	219.6	S7.04	30.290	28.550	1.440	1200
12.000	3.50	35.0	S7.04	30.290	28.775	1.290	1200
9.006	30.70	267.0	S7.05	30.300	28.360	1.565	1200
13.000	17.39	68.2	S11.01	30.400	28.620	1.555	1200
13.001	7.43	67.5	S7.05	30.300	28.510	1.565	1200
9.007	50.79	282.2	S7.06	30.530	28.180	1.975	1350
14.000	12.30	61.5	S7.06	30.530	28.975	1.330	1350
9.008	14.93	248.8	S1.08	30.510	28.045	2.015	1500
1.009	6.00	300.0	S1.09	29.500	27.830	1.070	1500
1.010	7.00	280.0	S1.10	29.500	27.705	1.195	1500
1.011	9.60	320.0	S1.10a	29.500	27.675	1.225	1500
1.012	32.00	426.7	S1.11	29.500	27.600	1.300	1500
1.013	12.00	-6.0	S1.12	30.151	29.600	0.251	1500

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:43

PIPELINE SCHEDULES

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.014	o	300	S1.12	30.151	29.550	0.301	1500

Downstream Manhole

PN	Length (m)	Slope (1:x)	MH No.	C.Level (m)	I.Level (m)	C.Depth (m)	MH DIAM., L*W (mm)
1.014	7.00	140.0	S1.13	30.200	29.500	0.400	1500

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

EPA Export 25-04-2012:04:20:43

Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

```
Margin for Flood Risk warning (mm)   300      Inertia Status   OFF
DTS Status                            ON  Analysis Time Step  Fine
DVD Status                           OFF
```

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	5
Climate Change (%)	10

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.000	15 Summer	5	10%	1				
1.001	15 Winter	5	10%	1				
1.002	15 Winter	5	10%	1				
2.000	15 Summer	5	10%	1				
1.003	15 Winter	5	10%	1				
1.004	15 Winter	5	10%	1	5/15 Summer			
1.005	15 Winter	5	10%	1				
1.006	15 Winter	5	10%	1				
1.007	15 Winter	5	10%	1				
3.000	15 Summer	5	10%	1				
3.001	15 Winter	5	10%	1				
3.002	15 Winter	5	10%	1				
4.000	15 Summer	5	10%	1				
3.003	15 Winter	5	10%	1				
3.004	15 Winter	5	10%	1				
5.000	15 Summer	5	10%	1				
3.005	15 Winter	5	10%	1	5/15 Summer			
6.000	15 Summer	5	10%	1				

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.000	31.812	-0.188	0.000	0.29	0.0	19.2	O K
	1.001	31.693	-0.167	0.000	0.40	0.0	35.3	O K
	1.002	31.509	-0.061	0.000	0.61	0.0	40.6	O K
	2.000	31.795	-0.050	0.000	0.94	0.0	45.7	O K
	1.003	31.470	0.000	0.000	1.02	0.0	78.1	O K
	1.004	30.575	0.008	0.000	1.11	0.0	81.8	SURCH'ED
	1.005	30.339	-0.141	0.000	0.54	0.0	90.2	O K
	1.006	28.774	-0.126	0.000	0.77	0.0	96.0	O K
	1.007	28.618	-0.082	0.000	0.84	0.0	94.5	O K
	3.000	29.381	-0.159	0.000	0.19	0.0	9.0	O K
	3.001	29.249	-0.091	0.000	0.62	0.0	21.5	O K
	3.002	29.030	-0.050	0.000	0.93	0.0	27.5	O K
	4.000	29.433	-0.092	0.000	0.65	0.0	28.6	O K
	3.003	28.857	-0.073	0.000	0.78	0.0	51.5	O K
	3.004	28.820	-0.040	0.000	0.90	0.0	59.4	O K
	5.000	29.222	-0.178	0.000	0.10	0.0	5.5	O K
	3.005	28.607	0.032	0.000	0.61	0.0	64.0	SURCH'ED
	6.000	32.485	-0.115	0.000	0.48	0.0	16.5	O K

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

©1982-2008 Micro Drainage

EPA Export 25-04-2012:04:20:43

Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
6.001	15 Winter	5	10%	1				
7.000	15 Summer	5	10%	1				
6.002	15 Summer	5	10%	1				
8.000	15 Summer	5	10%	1				
3.006	30 Winter	5	10%	1	5/15 Summer			
1.008	15 Winter	5	10%	1				
9.000	15 Summer	5	10%	1				
9.001	15 Winter	5	10%	1				
10.000	15 Winter	5	10%	1				
9.002	15 Winter	5	10%	1	5/15 Winter			
9.003	15 Winter	5	10%	1	5/15 Summer			
11.000	15 Summer	5	10%	1				
9.004	15 Winter	5	10%	1	5/15 Summer			
9.005	15 Winter	5	10%	1				
12.000	15 Summer	5	10%	1				
9.006	15 Winter	5	10%	1				
13.000	15 Summer	5	10%	1				
13.001	15 Winter	5	10%	1				
9.007	15 Winter	5	10%	1				
14.000	15 Summer	5	10%	1				
9.008	15 Winter	5	10%	1				
1.009	15 Summer	5	10%	1				
1.010	15 Winter	5	10%	1	5/15 Summer			
1.011	15 Winter	5	10%	1	5/30 Summer			

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	6.001	32.403	-0.097	0.000	0.59	0.0	22.4	O K
	7.000	32.475	-0.125	0.000	0.41	0.0	16.6	O K
	6.002	32.096	-0.154	0.000	0.21	0.0	43.4	O K
	8.000	31.038	-0.162	0.000	0.18	0.0	14.4	O K
	3.006	28.544	0.134	0.000	0.71	0.0	93.5	SURCH'ED
	1.008	28.475	-0.025	0.000	0.61	0.0	185.8	O K
	9.000	29.338	-0.147	0.000	0.26	0.0	12.3	O K
	9.001	29.226	-0.059	0.000	0.66	0.0	21.1	O K
	10.000	29.201	-0.084	0.000	0.26	0.0	8.1	O K
	9.002	29.188	0.008	0.000	0.92	0.0	27.4	SURCH'ED
	9.003	29.112	0.022	0.000	0.98	0.0	31.6	SURCH'ED
	11.000	29.077	-0.148	0.000	0.26	0.0	13.6	O K
	9.004	29.010	0.030	0.000	1.34	0.0	42.2	SURCH'ED
	9.005	28.835	-0.095	0.000	0.80	0.0	51.4	O K
	12.000	28.987	-0.113	0.000	0.49	0.0	22.0	O K
	9.006	28.757	-0.093	0.000	0.76	0.0	81.7	O K
	13.000	28.941	-0.159	0.000	0.19	0.0	10.7	O K
	13.001	28.721	-0.124	0.000	0.41	0.0	19.3	O K
	9.007	28.693	-0.042	0.000	0.99	0.0	109.3	O K
	14.000	29.207	-0.193	0.000	0.05	0.0	2.8	O K
	9.008	28.494	-0.061	0.000	0.75	0.0	117.9	O K
	1.009	28.450	0.000	0.000	1.31	0.0	276.0	O K
	1.010	28.367	0.037	0.000	1.31	0.0	300.7	SURCH'ED
	1.011	28.323	0.018	0.000	1.30	0.0	299.4	SURCH'ED

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

EPA Export 25-04-2012:04:20:43

Summary Wizard of "CRITICAL"(Rank 1 by Max Level)
Results for Design Storms

PN	Storm	Return Period	Climate Change	Rank	First X Surcharge	First Y Flood	First Z Overflow	O/F Act
1.012	30 Summer	5	10%	1				
1.013	60 Winter	5	10%	1				
1.014	15 Summer	5	10%	1				

Lvl Ex.	PN	Water Lvl. (m)	Surcharged Depth (m)	Flooded Vol (m³)	Flow/ Capacity	Overflow (l/s)	Pipe Flow (l/s)	Status
	1.012	28.275	0.000	0.000	1.02	0.0	279.7	O K
	1.013	27.881	-0.019	0.000	2.34	0.0	60.0	O K
	1.014	29.786	-0.064	0.000	0.98	0.0	60.0	O K

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

EPA Export 25-04-2012:04:20:43

Appendix 11.3

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

EPA Export 25-04-2012:04:20:43

Indaver
Meath Waste-to-Energy Facility

FIRE WATER RISK MANAGEMENT PROGRAMME

(Prepared in Compliance with Condition 3.7 of Waste Licence Register No. W 0167-02)

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

Document No.: 462X003 Rev 1
FBS: 07.02.02
Date: July 2011

Byrne Ó Cléirigh Ltd., 30a Westland Square, Pearse Street, Dublin 2, Ireland.
Telephone: + **353 (0)1 6770733**. Facsimile: + **353 (0)1 6770729**. Web: **www.boc.ie**
Registered in Dublin, Ireland No. 237982.

Directors: LM Ó Cléirigh, BE, MIE, C Eng, FIEI, FI Mech E. AJ Clarke, BE, C Eng, FIEI. TV Cleary, BE, C Eng, FIEI, F I Chem E. JB Fitzpatrick, FCA.
LP Ó Cléirigh, BE, MEngSc, MBA, C Eng, MIEI.

EPA Export 25-04-2012:04:20:43

This report has been prepared by Byrne Ó Cléirigh Limited with all reasonable skill, care and diligence within the terms of the Contract with the Client, incorporating our Terms and Conditions and taking account of the resources devoted to it by agreement with the Client.

We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report is confidential to the Client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

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

EPA Export 25-04-2012:04:20:43

TABLE OF CONTENTS

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

EPA Export 25-04-2012:04:20:44

1 INTRODUCTION

At the request of Indaver Ireland, this report sets the Firewater Risk Management Programme for the Meath Waste-to-Energy (WtE) facility at Carranstown, Duleek, Co. Meath, which was prepared in accordance with Indaver's Waste Licence (Reg. No. W0167-02). Condition 3.7 of the Licence states the following:

> *3.7.1 - The licensee shall, to the satisfaction of the Agency, establish and maintain a suitable firewater risk management programme. The risk management programme shall be fully implemented in advance of acceptance of waste at the facility.*
>
> *3.7.2 - In the event of a fire or spillage to storm water, the site storm water shall be diverted to suitable containment. The licensee shall have regard to any guidelines issued by the Agency with regard to firewater retention.*

This report builds on Indaver's Fire Water Risk Assessment Report – Ref: PMG-MEATH-HSE-REP-000-1505 and the site's Emergency Response Procedure (ERP).

2 SITE DESCRIPTION

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

The Meath WtE Facility is situated on the R152 Drogheda to Duleek road and is located in the townland of Carranstown, approximately 3 km north east of Duleek in Co. Meath. The facility consists of a 70 Megawatt (MW) WtE plant for the acceptance of up to 200,000 tonnes per annum (tpa) of household, commercial and industrial non-hazardous waste.

On completion of the construction works, the facility will comprise of the following main elements:

- The main process building (comprising of tipping hall, waste bunker, furnace boiler, steam turbine, flue gas treatment and ash storage)
- An air cooled condensers building
- A contractors' compound / building with workshop
- A transformer compound and ESB substation with emergency generator
- A security building with weighbridge at facility entrance
- A water storage tank and pump house
- A surface water attenuation pond and fire water retention tank

When waste treatment operations commence, waste will be transported to the site on a daily basis by waste contractors. On entering the site, waste contractors will follow a two-way route to the tipping hall where inspections on the waste will be conducted by Indaver on a routine basis. In the tipping hall, waste will be deposited into the waste bunker where it will be mixed by the grab before being placed in the hopper that feeds the furnace. In the furnace, the waste will be incinerated at temperatures in excess of 850°C. The ash collected from the bottom of the furnace will pass through a wet bath before being stored for collection and removal from the site. The combustion gases from the incineration process will pass through a number of treatment stages. These

EPA Export 25-04-2012:04:20:44

include two stages of dosing (lime milk and lime) for acid removal and two stages of dosing (expanded clay and activated carbon) for dioxin removal, before passing through filter bags and being discharged to atmosphere via the stack. The emissions to air will be monitored continuously and the results will be fed back to the control room for the facility where the levels of dosing can be adjusted accordingly.

The fire scenarios that are included in this programme were identified on the basis of the potentially hazardous materials and/or operating conditions at the site.

2.1 Hazards

The facility will be used for the treatment of household, commercial and non-hazardous industrial waste, sewage sludges and industrial sludges. Although they are not classed as hazardous, there is a potential fire risk due to the combustible nature of the waste stream. However this risk is mitigated to some extent as the waste has a high moisture content and a slow natural burn rate. Further risk mitigation is provided by good operating practices and by the provision of fire fighting equipment at the site.

The wastes do not fit into any of the categories of potentially environmentally damaging materials identified in the EPA's guidance document on the storage and transfer of materials for scheduled activities[1].

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

- They are not included in the list of Priority Substances established under the Water Framework Directive (2000/60/EC);
- They are not classed as Dangerous for the Environment;
- They do not exhibit any of the toxicological properties identified in the guidance document;
- They are not classified under the German WGK system (water hazard classification system).

However, as the EPA's guidance document notes, substances may exhibit low toxicity or be non-hazardous to waters yet elicit a pollution response due to their Biological Oxygen Demand (BOD). As such, Indaver provided firewater retention facilities in order to protect against any potential damage from contaminated run-off.

Other hazards considered as part of this study include the potential sources of fires involving combustible materials stored on site and other materials which may adversely affect water quality if released in firewater run-off from the site.

2.2 Fire Safety Management Systems

2.2.1 Fire Prevention

The facility has been designed in accordance with internationally recognised health and safety standards, design codes, legislation, good practice and experience. The

[1] EPA IPC Guidance Note on Storage and Transfer of Materials for Scheduled Activities (2004)

EPA Export 25-04-2012:04:20:44

facility is provided with manual and automatic controls, and there is a comprehensive interlock system in place which can automatically shut down the plant in a safe manner in the event of equipment failure or dangerous situations arising. In addition, the facility will operate a permit-to-work system (including hot work permits) for all maintenance work, which could give rise to the potential for fire and all contractors on site will undergo induction safety training.

2.2.2 Fire Detection

In addition to the controls to reduce the risk of a fire occurring in the first place, Indaver have also installed a fire detection / alarm system throughout the site. The devices on the system include:

- Optical smoke detectors, heat detectors and UV/IR flame detectors located throughout the plant;
- VESDA aspirating smoke detectors in MCC Room cabinets, VSD room, technical galleries and turbine hall;
- CCTV monitoring of key process operations (hopper /bunker);
- Fire alarm break glass units located throughout the plant;
- Local alarms in individual areas and site wide klaxon evacuation alarm;
- Master fire alarm panel located in MCC room and boiler area and a Repeater Panel located in the Control Room.

These systems would assist Indaver in developing a rapid response to any fire scenario, which can help to bring a fire under control more quickly, thereby reducing the quantities of fire fighting water required.

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

2.2.3 Fire Protection

The facility has been designed in accordance with internationally recognised health and safety standards, design codes, legislation, good practice and experience. Fire protection measures include fire doors with a minimum rating of one hour located through the facility and fire walls (locations shown in Figure 1) providing two hour fire protection with the exception of the viewing platform glazing between the Waste Bunker and the Administration Building control room, which will provide one hour protection.

2.2.4 Fire Suppression

Fire suppression is provided by an on-site water storage tank of 2,185 m^3 capacity. This water can be distributed around the site via a 250 mm diameter fire main and hydrant system. Of this capacity, 1,855 m^3 is set aside for fire fighting purposes, while the remaining volume is provided for process water requirements. However in the event of a fire, the process water requirement will not be needed and so potentially up to 2,185 m^3 could be available for fire-fighting purposes.

EPA Export 25-04-2012:04:20:44

The firewater pump house is equipped with three diesel pumps (two duty and one standby), and an electrical jockey pump to maintain the pressure in the line. These pumps can distribute water around the mains at a flow rate of 900 m^3 per hour. For fires inside the process building, the internal fire main has fixed hose reels, water cannons, sprinkler heads and foam deluge systems. For fires in outdoor areas, the external fire main has a network of hydrants.

The mains system delivers firewater to the following systems:

- Fire hydrants and fixed hose reels, located throughout the site;
- Automatic/manual dry and wet sprinkler systems (see Table 1 for more details);
- Automatic/manual foam deluge systems (see Table 1 for more details);
- Four water cannons in the Bunker Area.

A breakdown of the sprinkler systems at the site is provided in Table 1.

Table 1: Summary of Sprinkler Systems at Indaver

Area	Design Density	Design Area	System Type	Rate (l/min)
Shredder Unit	8 mm/min/m^2	45 m^2	Deluge system	360
Tipping Hall Waste Laydown Area	32 mm/min/m^2	165 m^2	Dry sprinkler	5,280
Sprinkler Pump House	8.1 mm/min/m^2	151 m^2	Wet sprinkler	1,223
Turbine Hall	8 mm/min/m^2	70 m^2	Deluge	560
Turbine Cellar	8 mm/min/m^2	123 m^2	Foam system	984
VSD Room*	n.a.	n.a.	Gaseous suppression	n.a.
Feeding Hopper	32 mm/min/m^2	60 m^2	Deluge	1,920
Crane Laydown Room	32 mm/min/m^2	330 m^2	Dry sprinkler	10,560
Burner x 2	8mm/min/m^2	6m^2	Wet	48
Cannons x 4	-	-	-	2,500

*The sprinkler system at the Variable Speed Drive (VSD) Room is a gaseous suppression system and so there is no firewater implications associated with its use.

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

Sprinkler systems provide the advantage that they allow water to be applied directly to the fire, allowing extinguishment to be achieved with lower flow rates than would be required using mobile systems, e.g. application from a fire tender. This means that smaller quantities of fire fighting water runoff would be generated for fires in these areas.

Indaver also maintain a stock of AFFF foam in a 1.5 m^3 foam tank, which feeds the foam deluge system.

For fires in the Bunker Area, there are four cannons in place, each capable of applying water at a rate of 2,500 l/min. In the event of a fire in this area, up to two cannons could be deployed.

For fires in outdoor areas, water would be applied by connecting to the network of hydrants on the external mains.

The layout of these facilities is illustrated in Figure 1.

EPA Export 25-04-2012:04:20:44

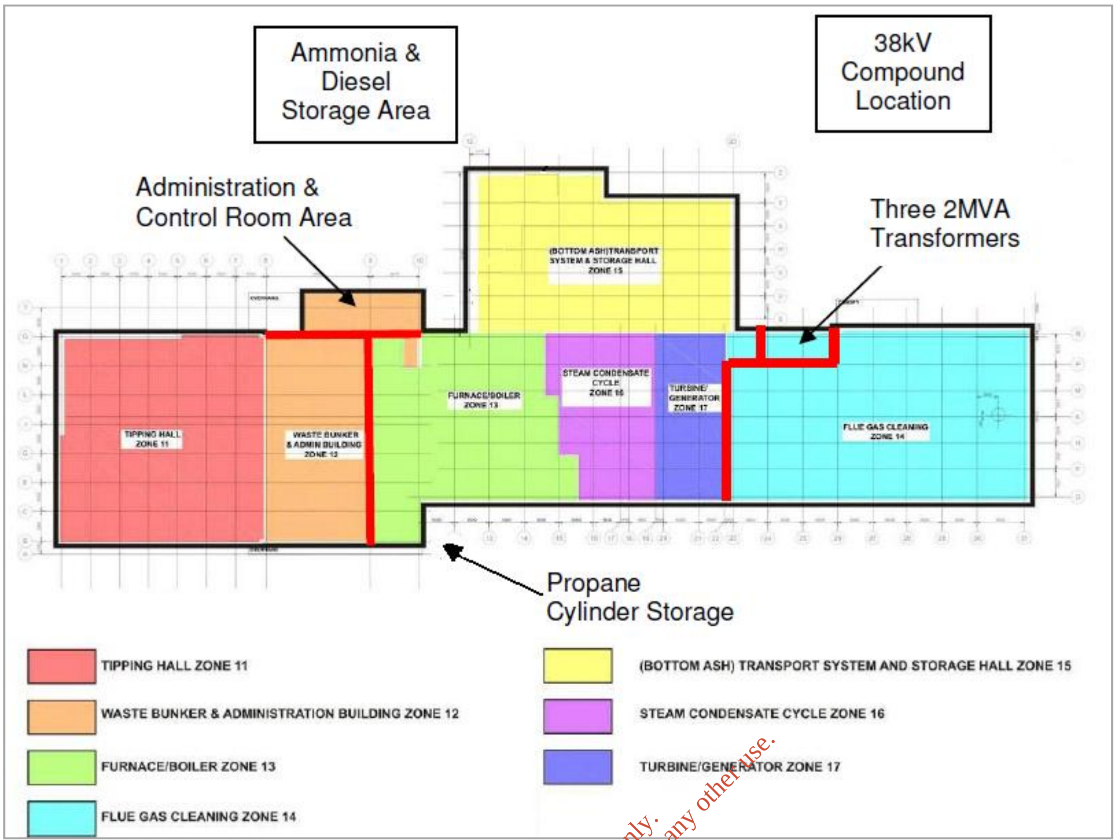


Figure 1: Indaver Ireland Facility Layout (Firewalls highlighted in red)

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

2.3 Drainage System

The site's outdoor surface drainage system has been designed in general accordance with Sustainable Drainage Systems (SuDS) principles. The system collects all rainwater from roofs, hardstanding areas, roads etc. and routes it to:

- A Class I bypass petrol interceptor, designed to retain oil/hydrocarbons present in the surface water runoff;
- A continuous online monitoring chamber (TOC, pH and conductivity) with diversion valve located between the interceptor and the surface water attenuation pond;
- A surface water attenuation pond with a capacity of 1,600 m^3;
- Another continuous online monitoring chamber (TOC, pH and conductivity), this one on the outfall from the attenuation pond;
- Local surface water drainage network and River Nanny.

The pre-attenuation pond monitoring chamber would divert any contaminated run-off to an underground diverted fire water retention tank with a capacity of 300 m^3. Should this tank be filled, the monitoring chamber would go into overflow mode, allowing runoff to pass into the attenuation pond.

The post-attenuation pond monitoring chamber would shut off the discharge pumps from the pond if contamination is detected in the outfall.

EPA Export 25-04-2012:04:20:44

In addition, the delivery area for the ammonia solution and diesel storage area drains to a 10,000 litre forecourt separator before joining the surface water drainage system upstream of the petrol interceptor. There is also a diversion valve located before the separator which leads to a 2.5m^3 holding tank to be used during filling operations in delivery area which will prevent small spills entering the surface water system. This will be included as part of the written procedure for these filling operations. After filling is successfully completed the diversion valve will remain open to the separator.

The internal surface drainage in the process building all drains to the 2 × 50 m^3 recovery tanks and is discussed in detail in Section 4.2.

3 DESCRIPTION OF METHODOLOGY

3.1 Review of Firewater Scenarios

The first step in the Fire Water Risk Management Programme is to identify the scenarios which can result in large quantities of fire fighting water being generated. The specific fire fighting scenarios are discussed in Section 4.1 of this report, but from a firewater retention viewpoint they can be broken down into the following categories:

- Fires in the Bunker Area
- Fires in Turbine Area
- Fires at the three 2MVA Transformers inside Process Building
- Fires in other locations inside Process Building
- Fires in outdoors location

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

In the first instances, any fire-fighting water would be collected in the Bunker itself, which is designed as a watertight structure, in accordance with BS8007, "Design of Aqueous Liquid Retaining Concrete Structures".

For fires in the Turbine area, any fire-fighting water would be retained within the cellar beneath the turbine which is also designed as a watertight structure, in accordance with BS8007.

For fires at the three 2MVA Transformers, fires would be either allowed to burn down or fought using CO2/powder extinguishers.

For any other fire scenarios inside the Process Building, the fire water run-off would be collected in dedicated Recovery tanks (designed as a watertight structure, in accordance with BS8007), with any overflow leading to the external surface water drainage network.

For fires in outdoor areas, the fire water run-off would be collected in the surface water drainage system.

EPA Export 25-04-2012:04:20:44

These drainage / catchment systems are described in more detail in the following section.

3.2 Firewater Catchment Systems

As discussed in Section 2.3, there are arrangements in place to prevent contaminated surface water run-off from being discharged off site. However, for fires inside the process building, there are separate provisions to retain the fire-fighting water, rather than allowing it to run-off to the surface water drains.

The greatest potential for fire at the facility arises within the waste bunker, where localised heating could occur due to decomposition of organic material in the waste. The bunker is water-tight (BS8007) and, up to the level of the tipping hall, it has a capacity of c.5,670 m^3. If a 50% voidage ratio is assumed for the waste, then there would be a retention capacity of 2,835 m^3 within the bunker. This is greater than the total quantity of fire-fighting water available on site, and so for a fire in this area all water would be retained within the bunker, even in the most extreme fire event. All firewater used in the Tipping Hall also drains to the waste bunker.

If a fire occurred in the Turbine area, the fire-fighting water would be collected in the cellar beneath the turbine. The cellar is of water-tight construction (BS8007 - Code of practice for design of concrete structures for retaining aqueous liquids), and has the capacity to retain c.1,000 m^3 of water.

If a fire occurred elsewhere in the process building, the firewater run-off would drain to the 2 × 50 m^3 recovery tanks.

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

For any scenarios outside of the process building, the fire-fighting water would be collected in the surface water drainage system, which incorporates a 300 m^3 diverted fire water retention tank (designed as a watertight structure, in accordance with BS8007) and a 1,600 m^3 surface water attenuation pond (described in Section 2.4). In addition, there is additional storage provided for runoff from the diesel delivery area with the forecourt separator providing up to 10 m^3 of additional storage.

3.3 Environmental Receptors

The main environmental receptor for firewater run-off from the site would be the River Nanny.

An ecological survey, carried out as part of the EIS, found that no parts of the site or in the immediate surroundings are covered by a scientific or conservation designation or proposed designation as recognised by the National Parks and Wildlife Service (NPWS). The survey identified that there were four such designated sites within approximately 5 km of the site and these are listed below:

- Duleek Commons (pNHA)
- Thomastown Bog
- Boyne River Island

EPA Export 25-04-2012:04:20:44

- Dowth Wetland

These are described in more detail in the EIS. None of these areas would be exposed to any risk due to firewater run-off from the site. However, the EIS also noted that the River Nanny reaches the Irish Sea at Laytown, where the estuary is a pNHA and a pSAC (site code: 000554, Laytown Dunes / Nanny Estuary). However, as the site is at a distance of c.10 km from the coast, if any firewater did enter the river, any contamination would be diluted to insignificant levels long before it reached the estuary.

Another potential receptor for contaminated firewater run-off would be groundwater. The limestones found beneath the site are part of the Platin Formation which has been classified by the GSI as a regionally important, diffuse karst aquifer with good development potential. The GSI/EPA/DoEHLG Groundwater Protection Scheme Classification ranks the site as having a moderate vulnerability due to the thickness and type of overburden cover present at the site. However there are no pathways by which contaminated firewater would enter the groundwater. Any fire-fighting water applied inside the process area would be retained there, while any fire-fighting water applied outdoors would be collected and retained in the surface water drainage system.

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

EPA Export 25-04-2012:04:20:44

4 Risk Management Programme

4.1 Fire Scenarios

The fire scenarios identified during the risk assessment conducted by Indaver are summarised in Table 2. For reference, we include details of the environmental fate of any firewater applied in these scenarios.

Table 2: Fire Scenarios at Indaver

Scenario	Corresponding Retention / Drainage System
Fire in Diesel Tank unloading area	Water applied in outdoor locations would be collected in the surface water drainage system
Ignition of Activated Carbon	Water applied in the Flue Gas Cleaning area would be collected in the Recovery Tanks
Fire in proposed Shredder Unit	Water applied in Tipping Hall area would be collected in the Waste Bunker
Waste truck fire in Tipping Hall	Water applied in Tipping Hall area would be collected in the Waste Bunker
Fire in Bunker	Water applied to the Bunker would also be retained within the Bunker
Fire in Feed Hopper	Water applied to the Bunker would also be retained within the Bunker
Fire in Furnace / Boiler Area	Water applied in this area would be collected in the Recovery Tanks
Fire in Turbine Area	Water applied in the Turbine area would be collected in the Cellar
Fire in Bag House Filter	Water applied in the Flue Gas Cleaning area would be collected in the Recovery Tanks
Fire in Variable Speed Drive (VSD) Room	Gaseous suppression system in this area – no firewater runoff implications
Fire in 2 MVA Transformers	CO2 and Powder fire extinguishers in areas – no firewater runoff implications
Fire in Office and/or Administration areas	Water applied in this area would be collected in the Recovery Tanks

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

4.2 Fire Fighting & Fire Water Retention Systems

4.2.1 Fire in Bunker Area (including Tipping Hall)

For a fire within the main bunker, water would be applied using 2 × 2,500 l/min water cannons. A typical fire-fighting scenario would involve application of water for 10 – 30 mins, however it is conservatively assumed that each scenario could potentially last for up to 2 hours. With a total available fire-fighting water stock of between 1,855 m^3 and 2,185 m^3, there is the capacity to continue fire-fighting beyond this time, and water could be applied to the bunker for c.6 hours in an extreme case. Even if the full inventory of water available on site was applied to combat a fire in this area, the bunker would have the capacity to store 2,835 m^3 of water even if it was full of

EPA Export 25-04-2012:04:20:44

waste, which means that it has more than sufficient capacity to retain the full volume of water that could be applied in any scenario.

Part of the bunker area is also protected by fixed sprinkler systems, as shown in Table 1. In these cases the water application rate would be comparable to or less than the amount of water that would be applied using the water cannons. Again, even if all the water on site was applied to the bunker as part of the emergency response, there would be sufficient capacity in the Bunker to retain it all.

4.2.2 Fire in Turbine Area

The fire-fighting measures in the Turbine Area are provided by fixed sprinkler systems, as described in Table 1. There are two such systems, one to apply water at the Turbine Hall (which covers the turbine bearing, valves, flanges etc.), and one to apply water to equipment in the Turbine Cellar (including the lube oil tank and pipe rack).

Based on the figures in Table 1, the Turbine Hall sprinkler system would apply water at a flow rate of 560 litres per minute, while the Turbine Cellar sprinkler system would apply foam at a flow rate of 984 litres per minute.

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

For a conservative fire fighting scenario of 2 hours (a typical fire-fighting scenario is estimated to only last 30mins, as explained above), this means that a total volume of up to 67 m^3 of water would be applied using the Turbine Hall sprinkler system, which is significantly less than the capacity of the Cellar. Even if the fire was to continue beyond this duration, it would take c.30 hours of continuous water application using these sprinklers to fill the Cellar to capacity. As such it is not credible that these sprinklers would be deployed for this length of time. As such there is no run-off risk association with these scenarios.

The sprinkler system in the Turbine cellar is a foam-based system. AFFF foam is stored in a 1.5 m^3 tank to supply foam to the deluge system. This foam is mixed with water in a ratio of 97:3 to give a 3% foam solution. This means that a stock of 1.5 m^3 of foam can be used to generate up to 48.5 m^3 of foam/water solution. AFFF is categorised as a Low-Expansion foam and has an expansion ratio of less than 20:1. This means that the maximum volume of expanded foam solution that could be applied within the cellar is less than 970 m^3, assuming that the full inventory of foam was applied in this area. This volume is less than the capacity of the cellar and so there would be no firewater or foam run-off from this scenario.

4.2.3 Fire at the 2MVA Transformers

There are three 2MVA transformers located adjacent to the Flue Gas Cleaning area (as shown in Figure 1). These transformers are each partitioned from the Flue Gas Cleaning area and from each other by 2-hour fire walls. Each transformer contains 635 kg of transformer oil (PCB free) and is separately bunded. The transformer oil is combustible but is isolated from ignition sources by proven design. In the event of a fire in a transformer the Control Room will initiate electrical disconnection/isolation of transformer and a decision will be made on whether to tackle the fire or allow fire

EPA Export 25-04-2012:04:20:44

to burn out. CO2 and powder fire extinguishers in the area can be used to fight the fire so there would be no firewater or foam run-off from this scenario.

4.2.4 Fire in Flue Gas Cleaning Area and Other Process Areas

For fires in the flue gas cleaning area and other process areas, the fire-fighting water would be applied by the fixed sprinkler systems, described in Table 1. The water would then be collected in the 2 × 50 m^3 recovery tanks.

The two Recovery tanks have a total combined capacity of 100 m^3. Water from floor washing *etc.* will also drain to these tanks, but Indaver will ensure that the water level in these tanks is kept to a minimal level. At all times one tank will be empty, and the other will be filled to no more than 25% capacity. This means that in the event of a fire in this area the actual available capacity in these tanks will be at least 87.5 m^3. If a major scenario occurred which resulted in greater quantities of water being applied than could be retained in these tanks, then any overflow would be directed to the surface water drainage system where it can be contained.

4.2.5 Fire Outside the Main Process Building Area (including the Contractors Compound)

A fire in the contractors compound, 38kV compound & generator, diesel storage area or other outdoor areas, would be fought using hose reels and hydrants connected to the outdoor firewater ring main and, potentially, local fire brigade equipment. There will also be fire fighting equipment, such as hand held fire extinguishers, located in the contractors building.

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

All fire water generated from hardstanding areas on the site will be collected in the surface drainage system which passes through a Class 1 by-pass petrol interceptor (designed for a min. 1 in 100 year storm) before entering the surface water attenuation pond or, in the case of an emergency, the firewater retention tank. The monitoring points in the surface water drainage system are located after the petrol interceptor and at the outfall pump sump from the site where runoff is released to the hydrobrake leading to the drainage ditch beside the site. The monitoring points are automated and monitor Total Organic Carbon (TOC), conductivity and pH in the surface water.

If, after passing through the petrol interceptor, the surface water TOC is outside the set parameters, the diversion valve will close and redirect the surface water runoff to the firewater retention tank where it can be stored and tested for reuse in the flue gas cleaning process or removed from site for treatment or disposal by an appropriately licensed facility. The outfall pump for delivering the water from the surface water attenuation pond to the drainage ditch can also be de-activated remotely from the control room if the fire alarm is triggered.

The firewater retention tank has a capacity of 300 m^3. Should the capacity of this tank be reached, the system will automatically overflow to the surface water attenuation pond (capacity of 1,600 m^3) and can be contained there until testing on the water quality has been carried out. Meath County Council and the EPA were consulted on the proposed design of the continuous monitoring and discharge system as part of the planning and licensing process for the site.

EPA Export 25-04-2012:04:20:44

The drainage channel in the ammonia solution and diesel tank delivery area runs to a 10,000 litre forecourt separator where spills can be contained. When the capacity of the separator is reached, the flow will enter the surface water drainage system upstream of the petrol interceptor. As previously described, the 2.5m^3 holding tank will only be utilised during filling operations at the tanks.

Another potential fire scenario could arise in the event of a grassland fire in the surrounding area. In this case the response at Indaver would be to assess the scale of the fire and, if necessary, apply protective cooling water to items of plant or equipment judged to be in danger of overheating. In this case there is no contamination issue associated with the water used, as there is no loss of containment event on site. Even so any cooling water applied in this scenario would still be retained in the site drainage system.

4.3 Risk Assessment

4.3.1 Fires inside Process Buildings

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

Based on this analysis, many of the fire scenarios identified present no inherent environmental risk from firewater run-off. For any fires in the bunker area or in the turbine area, the capacity within the building would be more than sufficient to retain all fire-fighting water that could be applied. For scenarios in other locations inside the process building, any fire-fighting water would be collected in the Recovery tanks provided. If the Recovery tanks reach their capacity, the firewater will enter the surface water drainage network, where it will be contained (see section 4.3.2).

4.3.2 Fires at Outdoor Locations

For fires at outdoor locations, the capacity of the drainage system is more than sufficient to accommodate the volumes of water that would be applied and so there would be no environmental risk due to run-off from these fire scenarios under normal conditions.

However, the EPA guidance document on firewater retention advises that consideration should also be given to the amount of rainfall that could be collected in the retention system. This is not applicable for the scenarios in which the firewater would be retained within the building (in the Bunker, Cellar or Recovery Tanks), but it is relevant for those scenarios where the surface water drainage system is required to provide retention. The EPA's guidance on this matter is to allow for 50 mm rainfall or, if the figure is significantly different, to allow for the 20-year, 24-hour rainfall event.

We note that the surface water drainage and firewater retention system is not designed to the EPA's guidance but is instead designed using the German LÖRÜRL methodology. The methodology is based on the practical experience of German fire

EPA Export 25-04-2012:04:20:44

fighting authorities, technical universities, industry federations and the insurance industry. Under this methodology, the system is designed to retain water from a 2-hour fire event, plus rainwater from a 1-in-20 year storm for a total of four hours. The LÖRÜRL methodology considers that a large storm occurring simultaneously with a fire is an unrealistic scenario and so the approach used is that the storm could occur for the duration of the fire plus another two hours afterwards.

This means that in the highly unlikely event of a major fire scenario in an outdoor area, combined with a major rainfall event, a situation could arise in which the retention capacity of the site would not be sufficient for all of the water being collected in it. However, it should also be noted that in addition to the remote probability of such a combined event, this scenario would also have reduced environmental impact, due to the high level of dilution that would be provided by the high levels of rainfall to the site and to the surrounding catchment area.

There are no stormwater implications associated with the scenario involving a grassland fire off-site. The circumstances for grassland or forest fires to occur involve a period of dry weather so that the grass becomes dried out. It is not considered credible therefore that an external grassland fire could occur simultaneous with a major rainfall event.

4.4 Programme

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

According to the EPA guidelines, the risk management programme should outline actions to be taken to reduce the risk associated with contaminated firewater run-off (this may include the construction of a firewater retention facility, depending on the level of pollution risk).

Appendix C of the EPA's guidance includes a number of recommendations for a firewater risk management programme. Table 3 shows how these elements have been covered by the arrangements at Indaver.

Table 3: EPA Recommendations for Firewater Management Programmes

Recommendation	Status at Indaver
Construction of a fire retention facility	Retention facilities are in place, as discussed in this report
Alteration, where possible, to the process or the facility (cleaner technologies, waste minimisation, increased cleaning and maintenance)	Facility is new-build, incorporating best practice for the treatment of waste
Substitution of a potentially polluting raw material	Not applicable, the site is used for the treatment of waste. All transformer oil used onsite is PCB free.
Installation of pollution control equipment, structures or procedures	These are in place, as described in this report. These are described in greater detail in the EIS

EPA Export 25-04-2012:04:20:44

Recommendation	Status at Indaver
Alteration of storage arrangements for potential pollutants	Storage arrangements are in line with best practice (e.g. water impermeable bunker for wastes, recovery tanks for spills inside the process building, double skinned ammonia solution/diesel tank etc). Again, these are described in this report, and in more detail in the EIS
Implementation of a new or revised fire safety system	The facilities at the site are new-built and in accordance with best practice for fire safety
Implementation of emergency response procedures	There is an emergency response plan in place at the site
Establishment of emergency management structures, delegation of staff responsibilities and provision of fire awareness and response training	Roles and responsibilities are set out in detail in the emergency response plan
Development of a review/audit process to regularly monitor the implementation of risk management measures and ensure their continuing effectiveness	Indaver will draw up a programme to review and audit the firewater risk management programme

4.4.1 Indoor Scenarios

Indaver have provided firewater retention facilities at the site. For any fire inside the process area, water and/or foam would be applied as required, as set out in the Emergency Response Procedures for the facility. In addition, the valve on the effluent outfall from the site would be closed on activation of a fire alarm.

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

Any fire-fighting water applied in these areas would be retained on-site in the Bunker, the Turbine Cellar or the Recovery Tanks. As such the engineering controls are already in place to eliminate the potential pollution hazards associated with these scenarios.

In order to ensure the continued effectiveness of the retention facilities in these areas, Indaver will conduct periodic inspections of these systems. All maintenance will be performed in accordance with the recommendations of the manufacturer or supplier of the equipment. This will be recorded and documented in the SAP system that is in place at the site.

The only response measures after the event would be to assess the retained firewater for contamination to determine whether it could be disposed of as effluent or whether it should be collected for removal off site by a licensed undertaker. Any decision of this type would be made in consultation with the EPA.

4.4.2 Outdoor Scenarios

Indaver have also provided firewater retention facilities for fires at outdoor areas of the site. In this case the facilities have enough capacity to deal with any fire-fighting scenario. They do not have sufficient capacity to meet the EPA guidelines for storm water during a fire scenario, as they are designed using the German LÖRÜRL

EPA Export 25-04-2012:04:20:44

methodology. As such, the risk management programme includes a number of steps to further reduce the risk to the environment from a fire in these areas.

Fire in Contractors Compound

This scenario involves a fire in the contractors' compound. In this case any fire-fighting water applied would be collected in the general surface water drainage system, described earlier. The valve on the effluent discharge outlet from the site would be closed as part of the response procedure in order to ensure that any fire-fighting water would be retained on site.

The capacity of the retention systems would be sufficient to accommodate the fire-fighting water that would be applied in this scenario according to the German LÖRÜRL methodology, but it would not be sufficient to provide capacity for the 24-hour 20-year storm water event from the EPA's guidance document. This is because the fire-fighting water would enter the same drainage system as the surface water falling across the entire site.

However, this scenario does not present a significant environmental risk due to the lack of potential for contamination in the run-off and also the degree of additional dilution that would be provided if this quantity of rainfall occurred. Also, all surface runoff passes through the petrol interceptor before entering the surface water attenuation pond. The contractors' compound area is not used for storing any significant quantities of dangerous substances, and so the environmental hazards associated with a fire here are similar to those at any typical commercial or office building. Furthermore, the circumstances of any scenario which would result in the capacity of the retention facilities being exceeded (i.e. a fire in an outdoor area simultaneous with a major rainfall event), would also result in a large dilution factor as large volumes of rainwater run-off, from the site and from the greater catchment area surrounding it, would enter the river at the same time.

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

If a situation arose in which a fire occurred in an outdoor area at the same time as a major storm event, Indaver would monitor the water levels in the retention lagoon to ensure that it did not overflow. If the levels in the pond approach overflow levels, then some of the water would be required to be discharged off site in a controlled manner. As mentioned already, the system is designed to an internationally recognised standard and has more than sufficient capacity for fire-fighting water. If a scenario arose in which a fire in an outdoor area coincided with a major rainfall event, only the excess water volumes would be discharged off-site in this manner and so the bulk of the water would still be retained on-site. By its very nature, the large volumes of rainfall involved in this scenario would also provide a great deal of dilution to the firewater run-off. Furthermore, as discussed previously, the run-off from a fire of this type presents a low environmental hazard in the first place.

Fire at the ammonia solution/diesel tank unloading area

This scenario involves a release of Diesel fuel, which is classed as Dangerous for the Environment. This material is not classed as Flammable, and has a flash point of 66°C which is well above ambient temperatures, and so this scenario presents a very

EPA Export 25-04-2012:04:20:44

low fire risk. The ammonia solution used is non-flammable under ambient temperature and pressure conditions.

In the event of a fire in this area some ammonia gas fumes may be released due to an increase in ambient temperatures in the area and thermal radiation to the ammonia tank. Ammonia gas is only explosive over a very narrow concentration range (16-23% in air), and due to the fact that it is stored on site as a dilute solution (25% in water) it would not be credible that the necessary airborne concentrations could be reached. Furthermore as the ammonia solution tank is stored in an external area, any vapour formed would rapidly disperse to atmosphere, further reducing the potential for any build up of vapour, even if the tank were to be fully engulfed in a fire. The double-skinned ammonia and diesel tanks are also located in an external area away from facility processes and potential ignition sources.

During normal operations, storm water run-off from this area would be routed through the separator before joining the main surface water drainage system. However, when a delivery of fuel/ammonia solution is made, standard operating procedure is that the valve on the local drainage system will be closed and so that any spills would be routed to a 2.5 m^3 capacity underground holding tank. This tank is of sufficient capacity to retain a typical spill scenario in this area (e.g. leak from a transfer hose).

Fuel transfer operations will be continuously manned and monitored in order to allow a quick response to be put in place if a loss of containment did arise. In the event of a larger release scenario (e.g. damage to the road tanker resulting in a full compartment comprising c.6 m^3 of fuel leaking), any excess material will enter the local drainage system and be retained in the underground separator tank. These measures ensure that any spill scenario (and also any fire scenario) in this area would not impact the surface water drainage at the site.

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

Fire at the 38kV compound & generator

This scenario involves a fire at the 38 kV compound or the generator, leading to a release of transformer oil or diesel with firewater, which are both classed as Dangerous for the Environment. These materials are not classed as Flammable so this scenario presents a very low fire risk.

In this case any fire-fighting water applied would be collected and retained in the bunding and the general surface water drainage system, described above in 'Fire in Contractors Compound'.

4.4.3 Arrangements for Disposal of Firewater Run-off

After a fire event, the safe disposal of firewater from the site will include testing of water retained in the fire water retention tank and the surface water retention pond to see if it can be released safely, with the agreement of the Agency. If not, then arrangements are in place for it to be disposed of by other means (e.g. treatment in situ, if practicable, or arranging for a third-party to remove it).

EPA Export 25-04-2012:04:20:44

If water must be removed for treatment at an offsite facility the waste water will be classified by the technical department in accordance with operations procedure 4.2 Classification and Identification of Waste. Once the EWC has been assigned a suitable facility will be chosen to send the waste to and Indaver have a list of potential vendors who can accept these wastes. Only approved vendors under the internal vendor control procedure will be used.

5 CONCLUSIONS

Indaver's Meath Waste-to-Energy (WtE) facility at Carranstown, Duleek, Co. Meath, has been designed in accordance with internationally recognised health and safety standards, design codes, legislation, good practice and experience. The facility is provided with manual and automatic controls, and there is a comprehensive interlock system in place which can automatically shut down the plant in a safe manner in the event of equipment failure or dangerous situations arising. In addition, the facility will operate a permit-to-work system (including hot work permits) for all maintenance work, which could give rise to the potential for fire and all contractors on site will undergo induction safety training.

The firewater risk management programme for the site covers all the major fire scenarios identified for the site and the runoffs generated by the fire fighting responses including any releases of materials to the drainage systems that may be hazardous to the environment. The programme includes retention facilities, spill containment facilities and equipment, best practice process design, operational controls and procedures, fire fighting systems and other fire fighting equipment. These are described in details in each of the relevant sections.

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

The surface water drainage and firewater retention system is not designed to fully meet the EPA's guidance but is instead designed using the German LÖRÜRL methodology. This methodology is based on the practical experience of German fire fighting authorities, technical universities, industry federations and the insurance industry. The methodology does not meet the retention volumes required for the worst case 24 hour rainfall scenario given in the EPA's guidance. However, this does not present a significant environmental risk to offsite receptors due to the lack of potential for contamination in the run-off for the scenarios affected and also the degree of additional dilution that would be provided if this quantity of rainfall occurred.

This firewater risk management programme will be reviewed on a regular basis and, where necessary, updated as part of the Annual Environmental Report.

EPA Export 25-04-2012:04:20:44