FICHTNER
Consulting Engineers Limited

Indaver Rivenhall Limited

Rivenhall IWMF

Review of Operating Techniques

The Operating Techniques for the Rivenhall IWMF are referenced within Table S1.2 of the Environmental Permit. Due to the changes to the arrangements for the emissions to water from the Facility (section 2.2 of the Supporting Information), a review of the associated Operating Techniques has been undertaken with the proposed changes set out within this document.

There are two aspects of the Operating Techniques which relate to the proposed arrangements for the emissions to water from the Rivenhall IWMF, as follows:

- Application - Supporting Information of the application document provided in response to section 3a – technical standards, Part B3 of the application form.
- Response to Schedule 5 Notice dated 26/04/17:
  - Response 7 (site surface water streams);
  - Response 8 (discharges to River Blackwater); and
  - Responses 9 and 10 (water use).

These Operating Techniques have been revised to identify where they need to be amended to allow for the discharge of uncontaminated surface water run-off from Upper Lagoon to the River Blackwater.

In undertaking this review, the relevant sections of the individual documents have been reviewed, and where appropriate the changes to the Operating Techniques have been highlighted or ~~strikethrough~~.

1 Supporting Information

1.1 Section 2.3.4 of the Supporting Information

Overview

The significant water consuming treatment processes within the Rivenhall IWMF when fully operational will be the Pulp plant and CHP plant (the CHP will have a mains water supply to provide make up boiler water). The following key points should be noted:

1. The Rivenhall IWMF water system will be designed to ensure that there are 'zero' discharges to water from the installation:

Water for use within the IWMF will be pumped from Upper Lagoon (which is recharged as required with water from New Field Lagoon) and fed into the Pulp Plant at a rate of 507.5 m^3 per day to support and supplement the IWMF's Zero Liquid Discharge (or Closed Loop) waste water treatment system.

1. The Pulp Plant requires a maximum of 1,750 m^3 of water per day to produce 85,500 tonnes of high grade recycled pulp per year.

2. Water from the Pulp Plant, will be cleaned and treated to an exceptionally high standard through the WWTP. Allowing for water losses associated with the waste paper recovery, recycling and treatment processes undertaken at the installation, the maximum waste water flow into the WWTP will be 1,506 m^3 per day.
3. Allowing for water losses through the WWTP reverse osmosis and evaporation processes 1,496 m^3 of cleaned and treated water will be recirculated and reused within the Pulp Plant or the nearby lagoon network to provide a Zero Liquid Discharge (or Closed Loop) waste water treatment system.

The facility will have separate process effluent and storm water systems (surface drainage).

However, due to the proposed phased construction of the Rivenhall IWMF, until the Pulp Plant and associated waste water treatment plant are commissioned, there will not be a significant demand for water.

1.2 Section 2.3.5 of the Supporting Information

Potable and Amenity Water

Water for supplies for the offices and mess facilities will come from the mains water supply. The quantity of this water is expected to be small compared to the other water uses on-site.

Waste water from showers, toilets and other mess facilities will be treated in on-site package treatment works.

1.3 Section 2.3.6 of the Supporting Information

Process Water

Where practicable, water supplied to the installation will be supplied from the Upper Lagoon.

All detailed design will be based upon maximising the use of rainwater falling on and around the facility and feeding into Upper Lagoon, and this includes from the adjacent New Field Lagoon formed by mineral extraction restoration and ~~that~~ is ~~also~~ within Indavers ~~GFC's~~ control. When there is not a sufficient supply of water available, the process water will be sourced from the mains supply. The water demand for each of the treatment processes is detailed as follows:

1.4 Section 2.3.6.1 to 2.6.3.8 of the Supporting Information

Water Abstracted from the River Blackwater

Under the terms of the Environment Agency Licence Serial No: AN/037/0031/001/R01 (issued on the 9 March 2016 to Gent Fairhead & Co Limited), the maximum quantity of water to be abstracted is 250,000 m^3 per annum. The abstraction licence is not within the control of Indaver. Therefore, reference it is proposed that reference to it is removed from the Operating Techniques listed within the EP.

Water Obtained from Public Mains Supply

The Sewerage Undertaker (Anglian Water) will provide a maximum instantaneous mains supply of either: 200 m^3/day at 7.5 l/s (reduced in peak periods of 7:30-9:30 and 16:00-18:00 to 5.5 l/s); or, 475 m3/day at a continual 5.5 l/s.

Site welfare facilities will be supplied with a Public Mains Supply. Klargester [Biotec-5 or BioFicient] or similar package treatment systems will be used to treat the effluent to a suitable standard to enable discharge to water. Treated effluent will be discharged to the storm sewer (subject to meeting appropriate discharge standards) ~~or to Bottom Ash Water basin~~. Domestic sewage sludge will be removed from treatment plant via road tanker and transported off-site for disposal at public sewage treatment works.

Water Collected from Rainfall

It is estimated that as an annual volume of water of 124,412 m^3 will be collected from direct rainfall and surface water run off: Direct Rainfall into New Field Lagoon 62,755 m^3; Surface Water Run-off into New Field Lagoon from the IWMF 61,657 m^3. A detailed water balance for New Field Lagoon has been developed, and can be provided if necessary.

Water demand for the mechanical biological treatment activity

The MBT is a biodrying process, and does not have a water demand. The MBT has been designed to treat pre-sorted and shredded wastes which will be fed into biodrying clamps. The biodrying process will produce around 15,000 m^3/year or 44 m^3/day of waste water. Wastewater produced through the biodrying process can be used either as a pre-seeded source of process water to support the AD operation, or tankered off-site to a suitably licensed wastewater treatment facility.

Water demand for the MRF

A small quantity of water (10 m^3/day approximately 3,500 m^3/annum) will be required within the MRF for general housekeeping purposes and dust & odour suppression purposes. Effluents from washdown and run-off from dust & odour suppression generated within the MRF will be collected in a sump and reused, or transferred off-site using a tanker to a suitably licenced waste management facility ~~cleaned and treated through the WWTP for reuse and recirculation within the IWMF~~.

Water demand for the AD Plant

The design and general arrangement of the AD offers a Closed Loop wastewater treatment process. Most of the water required by AD process will be supplied by recirculated process water, reducing the demand of fresh or industrial water to the AD.

Mains water will be supplied to the AD plant to support the pre-treatment, biological treatment and biogas clean up and air treatment processes at a rate of approximately 6,350 m^3/year.

Furthermore, it is estimated that 1,100 m^3/year of wash down water will be required for general housekeeping and maintenance of the AD area, which will be collected and reused as a pre-seeded source of process water to support the AD operation.

Whilst the AD process offers a closed loop water management system, the maximum fresh water demand for the AD will be approximately 7,450 m^3/year.

Water demand for the Pulp Plant

The Pulp Plant will have a water demand of approximately 609,000 m3 per annum. Some of this water will leave the process within the sludge or recovered and recycled pulp. The process will, produce 550,000 m3 of wastewater for treatment within the WWTP and treated for recirculation and reuse within the IWMF.

Water for use within the Pulp Plant will principally be sourced from the WWTP and supplemented with water from Upper Lagoon via New Field Lagoon which will require localised treatment (deionisation) prior to re-use within the installation. A small quantity of water will be condensed steam from the dispersers.

Water demand for the CHP plant

Boiler water and other process water consumers for the CHP plant will be sourced from the mains system. Following construction of the Pulp Plant and its associated Water treatment plant, the CHP Plant will consume approximately 96,000m^3 of water per annum.

Process effluents from the CHP Plant will be re-used within the bottom ash quench. There will be no discharges of process effluents from the CHP plant.

The wastewater treatment process in the Pulp Plant utilises steam from the CHP Plant. The cooled steam (condensate) will be returned to the CHP plant to be re-used within the water treatment plant which serves the installation.

Water demand from the wastewater treatment plant

The WWTP does not have a fresh water demand.

The wastewater treatment plant will receive up to 550,000 m3 of wastewater from the Pulp Plant which will be treated and discharged into the Upper or New Field Lagoon for re-use within the installation. For the purposes of calculating the water balance for the plant, it needs to be understood that some of the water which is used as feed water for the different processes will be 'lost' from the system through evaporation, steam and transported off-site in the outputs of the process (bottom ash, digestate, etc). Furthermore, as detailed above, the installation is an integrated waste management facility, and there are a number of processes which generate effluents which are transferred to other processes.

The information presented above, is summarised in Table 2-9:

Table 2-9 – Estimate of Water Supplied, Consumed and Wastewaters Generated by the IWMF

	Approximate Annual Water Consumption (m^3 per annum)
Water Supply	
Maximum quantity of water discharged from the Wastewater Treatment Plant into the Upper Lagoon (at a quality suitable for re-use)	550,000
Maximum abstracted from the River Blackwater	250,000
Supplied from public mains supply	173,000
Collected from rainfall	124,412

Table 2-9 – Estimate of Water Supplied, Consumed and Wastewaters Generated by the IWMF	
Total Available Supply	**1,097,412**
Water Demand	
Mechanical Biological Treatment Plant	-
Materials Recycling Facility	350
AD Plant	7,450
Pulp Plant	609,000
CHP Plant (including the boilers)	96,000
Wastewater Treatment Plant	-
Total (fresh) Water Demand	**691,800**
Effluent Generated	
Mechanical Biological Treatment Plant	15,000
Materials Recycling Facility	350
AD Plant	-
Pulp Plant	550,000
CHP facility (including the boilers)	-

As can be seen from Table 2-9, the total water supply available to the installation is approximately 1,097,412 m3 per annum, with an overall water demand of 691,800 m3 per annum. Taking this into consideration, and the ability to hold excess water in the New Field Lagoon topped up by rainfall and from the river water abstraction, the available water supply significantly exceeds the water demand for the waste treatment processes.

However, due to the proposed phased construction of the Rivenhall IWMF, until the Pulp Plant and associated water treatment plant are commissioned, the demand for harvested water will be minimal therefore it is proposed to discharge surface water run-off from Upper Lagoon to the River Blackwater.

2 Schedule 5 Notice dated 26/04/17:

2.1 Response 7 (site surface water streams)

EA Question 7:
Please provide clarification on section 2.3.4 – separate process effluent and storm water systems (surface drainage). What is the destination of storm waters? Where does storm waters collect and discharge to?

The following should be read in conjunction with the subsequent answers to Questions 8 to 10, all relating to water use at the IWMF.

Whilst the Rivenhall IWMF has been designed as a zero discharge installation, this assumes that all of the permitted waste treatment activities have been installed and are operational. Due to the proposed phased construction of the Rivenhall IWMF, until the Pulp Plant and associated water treatment plant are commissioned, there will not be a significant demand for water from the IWMF.

Taking this into consideration, it will be necessary to discharge uncontaminated surface water run-off from building roofs and areas of hardstanding, which is collected in Upper Lagoon to the River Backwater until these activities are installed and operational.

Following commissioning of the Pulp Plant and associated waste water treatment plant, it can be ~~is~~ confirmed that~~, the proposed 'zero discharge to water' referred to in section 2.3.4, means that~~ there will be no point emission to controlled waters (particularly the River Blackwater – direct or indirect), groundwater or public sewer from the IWMF.

This is achieved by two principal means:

1. controlled abstraction of water from the River Blackwater to supplement process water from the Upper Lagoon only when necessary; (the answer to Q9 below explains in more detail how excess river abstraction water is available above that which is actually required, so abstraction quantities can be controlled/reduced to suit IWMF process needs dependent upon available water in the Upper Lagoon);
2. in the event of potential storm-water rainfall exceeding the process use of water from the Upper Lagoon, the Lagoon has been designed with a freeboard capacity in excess of that needed to retain a 1 in 100 yr storm event (also explained in more detail in answer to Q9 below). As stated in section 2.4.4 of the Supporting Information:

   > The IWMF will give rise to surface water run-off from roads, vehicle parking areas, building roofs, hard-standings and hard landscaped areas. Surface water run-off from these areas will be discharged to the Upper Lagoon which is adjacent to the IWMF.
   >
   > The drainage plans, as approved by ECC, were presented in Annex 1 of the EP application (they are re-produced in Appendix B for reference). As can be seen from these drawings, surface water run-off (storm water) will be collected in the site drainage system and pumped from the surface water drainage collection sump (reference: SPS2) into Upper Lagoon, from where it is used in the IWMF processes. The treated process water from the WWTP is transferred from its holding tanks to the Upper Lagoon via a dedicated pumped main, for later recirculation back into the process.

2.2 Response 8 (discharges to River Blackwater)

EA Question 8:
The Application is for a "closed loop system" with respect to water use and handling at the IWMF. Please confirm that there will be no discharges of any "water streams" from the IWMF to the River Blackwater. Water streams mean uncontaminated rainwater from roofs, site surface run-off, treated and untreated process water /effluent).

Whilst the Rivenhall IWMF has been designed as a zero discharge installation, this assumes that all of the permitted waste treatment activities have been installed and are operational. Due to the proposed phased construction of the Rivenhall IWMF, until the Pulp Plant and associated water treatment plant are commissioned, there will not be a significant demand for water from the IWMF.

Taking this into consideration, it will be necessary to discharge uncontaminated surface water run-off from building roofs and areas of hardstanding, which is collected in Upper Lagoon, to the River Backwater until these activities are installed and operational.

Following commissioning of the Pulp Plant and associated water treatment plant, it can be ~~is~~ confirmed that, the proposed 'zero discharge to water' referred to in section 2.3.4, means that there will be no point emission to controlled waters (particularly the River Blackwater – direct or indirect), groundwater or public sewer from the IWMF.

As stated in section 2.3.4 of the Supporting information:

> *'The water system will be designed to ensure that there are 'zero' discharges to water from the installation.'*

Furthermore, the EP application also explains the arrangements within the facility for the treatment of process effluent generated by the facility, with the treated effluent from the wastewater treatment plant being discharged into the Upper Lagoon to enable it to be reused within the IWMF. There will be no discharge of treated effluents from the IWMF into the River Blackwater.

~~In response to some earlier planning queries GFC confirmed the zero discharge to controlled waters (as above) but explained that the option to apply for a discharge licence always exists. In the event an application for a discharge licence is submitted to the EA, it would be subject to a detailed assessment, and would require further planning approval in conjunction with any new EA licence. These are not the subject of the current applications. Any discharge application (for any UK site) has to comply with the European Water Framework Directive, whereby any discharge must not have a detrimental effect on the receiving bodies, i.e. it would need to be of an equivalent or better water quality standard than the water that already flows down the River Blackwater.~~

2.3 Responses 9 and 10 (water use)

EA Question 9:
Given that the total available supply of water exceeds the water demand, please explain your contingency plan in the event that there is continuous water surplus at the IWMF. How will excess water be managed at the facility?

Abstraction of water from the river will be demand led, and carefully managed to eliminate as far as possible the circumstances where there will be excess water at the IWMF. Water will be managed at the facility by controlling and limiting pumping operations between the River Blackwater to New Field Lagoon, and from New Field Lagoon to Upper Lagoon. The design of the Installation and the Upper Lagoon have taken full account of extreme weather rainfall events.

Water for use within the facility is sourced and supplied from the River Blackwater under Abstraction Licence Serial No: AN/037/0031/001/R01 and stored in New Field Lagoon.

The conditions of the abstraction licence are:

> Water abstraction at NGR TL 8343 2223 from a pumping sump with two pumps with a combined capacity of not more than 100l/sec, which will be used for filling reservoirs for the subsequent purpose of process water for waste treatment, processing and recycling;
>
> The maximum quantity of water to be abstracted up to:
>
> - 360m3/hr;
> - 8,640m3/d; and
> - 250,000m3/yr.
>   - No abstraction of water is permitted when the flow in the River Blackwater (as gauged by the Agency) at Appleford Bridge gauging station (NGR TL 845 158) is equal or less than 1,309l/sec (1.309m3/s).

– No abstraction of water can take place until the Licence holder has provided a storage facility, capable of storing at least 250,000m3 of water which is constructed or lined so that it remains impermeable. (i.e. New Field Lagoon)

Water that is held in New Field Lagoon is pumped into Upper Lagoon as the IWMF process demands. Upper Lagoon will provide the day-to-day water required by the IWMF, and will have a storage capacity of approximately 25,000 m^3 at its operational maximum water level of 32m AOD.

The design of Upper Lagoon considered a storm event 24-hr in duration with an annual probability of occurrence of 1% (e.g. the 100-yr event) with an additional allowance of 40% for climate change. The design includes storm water attenuation (freeboard) in excess of the required 20,481m^3 of storm water storage above its maximum operating level of 32m AOD. This freeboard capacity will prevent flooding of the adjacent roads and floors of the IWMF.

In the event of a continuous storm, water is managed by stopping the abstraction and pumping operations from the River Blackwater and the New Field Lagoon, and storm water flood attenuation storage is provided within Upper Lagoon for the IWMF site.

Whilst the Rivenhall IWMF has been designed as a zero discharge installation, this assumes that all of the permitted waste treatment activities have been installed and are operational. Due to the proposed phased construction of the Rivenhall IWMF, until the Pulp Plant and associated water treatment plant are commissioned, there will not be a significant demand for water from the IWMF.

Taking this into consideration, it will be necessary to discharge uncontaminated surface water run-off from building roofs and areas of hardstanding, which is collected in Upper Lagoon, to the River Backwater until these activities are installed and operational.

Following commissioning of the Pulp Plant and associated water treatment plant, there will be no point source emission to controlled waters (particularly the River Blackwater – either direct or indirect), groundwater or public sewer from the IWMF.

There will be no gravity or pumped discharge from New Field Lagoon into the River Blackwater, nor any other local public surface water systems, as there is considerable freeboard available in New Field to attenuate 1 in 100 yr storms without flooding the adjacent access road, or the IWMF, the quarry processing area or any of the surrounding land.

Following a storm water event, no water will be pumped from the River Blackwater or New Field Lagoon into Upper Lagoon until water levels within Upper Lagoon have returned to normal operating level of 32 m AOD.

EA Question 10:
The water flow diagram indicates that 88.8 m3 per day will be used for the quenching of incinerator bottom ash (IBA). Please explain how the resultant water used to quench IBA is managed. What is the destination of this resultant water stream following quenching of IBA?

Water is supplied from the ash water basin to maintain a constant level in the IBA extractor/quench bath. This cools the IBA prior to it being conveyed to the ash bunker. The heat transferred from the IBA to the water will cause some of the water to evaporate. This will be fed into the furnace from where it is released at the stack with the combustion flue gases. The rest of the water will be absorbed into the IBA. Following additional design of the ash quench system, the ash quench system will consume approximately 96 m^3 per day of water.

Some residual moisture will evaporate within the bottom ash extractors within the CHP Plant as the IBA is conveyed to the ash storage hall~~bunker~~. The extraction system for the bottom ash extractors

is connected to the secondary combustion air system and is used as ~~is water vapour will be drawn into the secondary air intake at the top of boiler house as part of the~~ combustion air within ~~for~~ the boilers. If there is any free water which accumulates at the IBA storage hall~~bunker~~, this will drain into the IBA drainage system and be recirculated back into the ash water basin, as shown in the drainage drawings presented in **Error! Reference source not found.** [to the Schedule 5 Response].

Some of the moisture within the IBA will evaporate off from the IBA when it is within the IBA storage hall. This moisture will be released to atmosphere via the natural ventilation system.

During maintenance operation when quench water needs to be cleared, it will be tankered off site to a licensed facility.