

CHAPTER 6.1

SURFACE WATER AND FLOOD RISK

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6.1 Chapter 6.1 Surface Water and Flood Risk

6.1.1 Introduction and Current Planning Situation

The geological setting, site boundary and planning application area remain unchanged from that originally assessed and approved. Quarrying operations within the footprint of the Integrated Waste Management Facility (IWMF) site has resulted in the phased and systematic excavation of overburden and sand and gravel reserves to the underlying London Clay; and the subsequent restoration operations has resulted in the placement of overburden materials within the IWMF site.

Within the Section 73 application and submission of details in July 2015, Appendix A "IWMF Process Overview" updated the proposed process description in the detailed design of the IWMF and clarified the supportive water flows from New Field Lagoon into Upper Lagoon to support the IWMF's waste recovery, recycling and treatment operations. This information, together with a wider description of the IWMF development, is presented within Appendix 3A of this Section 73 application.

Prior to the implementation of the IWMF development works (ESS/34/15/BTE), within the Section 73 application (2015), an up to date assessment was undertaken of all surface water baseline conditions and IWMF-related foreseeable developments within the detailed design of the IWMF required under Planning Condition 23.

The submission of details approved under ESS/34/15/BTE against Condition 23 are presented within Appendix 6-1A (for Condition 23 Surface Water).

6.1.2 Original Assessment Surface Water and Flood Risk Assessment

As part of the original planning application a detailed review of flood risk was undertaken and required mitigation measures were formulated to ensure the proposed development was neither at flood risk nor increased flood risk to third parties. This assessment was undertaken using best practice guidance and was reviewed, and approved, by the Environment Agency and Essex County Council.

6.1.3 Updated Surface Water and Flood Risk Assessment – 2017

An updated surface water risk assessment was completed by SLR Consulting in 2015 to support the approved modifications to the IWMF's building footprint and switch from vertical to soil nailed retaining walls. Based on the original surface water risk assessment completed by Golder Associates (UK) Ltd, the updated assessment 2015 confirmed that the minor modifications within the Section 73 application and submission of details in July 2015, were of negligible effect on the surface water and flood risk proposals in and around the Site. Indeed, the subsequently approved IWMF design and surface water control proposals approved and implemented under ESS/34/15/BTE enhanced surface water control.

The increase in stack height will neither change nor alter the findings of the surface water and flood risk assessment which is confirmed by SLR Consulting's 2017 Surface Water and Flood Risk Assessment review presented within Appendix 6-1B.

6.1.4 Sources of Flooding

The original Flood Risk Assessment¹ assessed all sources of flooding in accordance with best practice² at the time the assessment was completed and in accordance with current best practice guidance³.

¹ Ground and Surface Water Assessment: Rivenhall Airfield eRCF, Golder Associates, August 2008.

² Planning Policy Statement 25 (PPS25): Development and Flood Risk, Defra, 2006.

The original assessment confirmed that the proposed development was at 'low' risk of flooding from river, tidal and coastal sources. Given the site location, and following review of current published flood mapping⁴, the IWMF remains at 'low' flood risk from these sources.

6.1.5 Updated Surface Water Baseline - 2017

Within the original surface water assessment the Flood Estimation Handbook (FEH, 1999) reported annual rainfall of 566 mm per year in the area of the Site. It was noted that the principal surface water features in the vicinity of the Site are the River Blackwater and the River Brain.

The average annual rainfall for this region of England is 577 mm, which is similar and more conservative than the average rainfall currently presented on the met office website for the period 1971 to 2000 for the nearby meteorological station of Wattisham (573.8 mm).

Therefore, no adjustment of the annual rainfall data is required when considering the flood risk potential of the IWMF site from that originally assessed.

The on-going monitoring of groundwater levels in and around the Site confirm that the groundwater conditions are comparable to those reported in 2008 by Golder Associates (UK) Limited. Therefore, no adjustment is required to the 2008 or 2015 Flood Risk Assessment(s) to account for significant variations or changes to the underlying groundwater conditions.

6.1.6 Updated Surface Water Assessment - 2017

The 'allowable' off-site rate of surface water runoff from site was limited to 5 l/sec/hectare. This is a commonly accepted rate of Greenfield runoff and one which remains valid. The required volume of storm water attenuation on site was calculated and it was confirmed that 20,481 m³ of storm water storage would be required. The design storm event considered was a 24-hr duration storm with an annual probability of occurrence of 1% (e.g. the 100-yr event). A climate change allowance of 10% was included and added to the estimated rainfall in accordance with applicable guidance at that time (PPS25).

It is noted that current guidance (NPPF and PPG) also states that a 1% annual probability storm should be used for the design of drainage infrastructure. Current guidance also states that a 10% uplift in rainfall intensity should be applied for developments with a design life of up to 25 years e.g. the calculations presented in the original assessment remain valid and appropriate.

It is concluded, therefore, that drainage from the proposed IWMF area can be managed in accordance with the principles detailed in the original planning application, and without increasing flood risk to third parties.

As the detailed site design progresses further, the drainage principles would be agreed with the Environment Agency and Essex County Council in accordance with Condition 23 of the existing planning permission.

6.1.7 Surface Water Lagoons

The surface water lagoons proposed at site (namely: Upper Lagoon and New Field Lagoon) will be designed and constructed in accordance with CIRIA Guidance⁵ and where required the Reservoirs Act⁶ and the Flood and Water Management Act⁷.

³ National Planning Policy Framework, (NPPF), Department for Communities and Local Government, 2012 and the Planning Practice Guidance (PPG), Department for Communities and Local Government, 2014.

⁴ <http://watermaps.environment-agency.gov.uk>

⁵ Design of Flood Storage Reservoirs. CIRIA Report B14, 1993 and Small Embankment Reservoirs, CIRIA Report 161, 1996

⁶ Reservoirs Act 1975

⁷ Flood and Water Management Act 2010

Therefore, with appropriate mitigation and management, residual flood risks to the IWMF and off-site areas are expected to remain low as per the findings of the assessment.

A detailed water balance has been prepared for New Field Lagoon to assess potential variation in water levels in and the relative contribution / losses to the lagoon from rainfall, evaporation, groundwater inflow and outflow etc.

The water balance considered site specific or regional data where relevant.

The water balance takes into account all potential inflows and outflows from the lagoon including:

- Inflows: Direct Rainfall to lagoon, surface water run-off from surrounding catchment to the lagoon, groundwater inflows, River Blackwater Abstraction; and
- Outflows: open water evaporation, groundwater outflows, pumping to the IWMF

The water balance model assumed the water level and water storage in New Field lagoon at the start of the analysis was 40.0 mAOD and 666,794 m³ respectively. The water balance was run at a daily time-step for a two year period. It was assumed that no water abstraction from the River Blackwater occurred (e.g. the water level in New Field lagoon was not replenished / topped up by water abstraction from the River Blackwater) and no process water was returned to New Field lagoon from the IWMF e.g. a worst case condition.

A steady state water abstraction rate from New Field lagoon to the IWMF of 507 m³/day has been assumed.

As reported by SLR, under normal operation in one year there would be a net reduction in water storage in New Field lagoon of 140,000 m³. The water balance also showed, as result of the lagoon setting, loss of water from the lagoon to groundwater was negligible (as was groundwater inflow to the lagoon) and less than 4 m³/day.

The water balance also showed that the volume of surface water, from direct rainfall and from surface water runoff to the lagoon from surrounding ground, to New Field lagoon was more than the simulated evaporation loss of water from the surface of the lagoon.

A summary of the simulated inflows / outflows to New Field lagoon, taken from SLR's report, is shown below:

**Table 5-5
Water Balance for New Field Lagoon – Run 1**

Variable	Net Inflow / Outflow (m ³ /year)
Abstraction from R. Blackwater	0
Direct Rainfall	+62,755m ³
Surface Water Run-off	+61,657m ³
Evaporation	-78,513m ³
Groundwater Inflow / Outflow	-1,124.2m ³
Abstraction to IWMF	-185,745m ³
Total Inflow / Outflow	-140,970m³

The water balance has shown that the proposed New Field lagoon has capacity to easily sustain operation of the IWMF for more than 3 years without water abstraction from the River Blackwater.

To replenish the water taken from New Field lagoon approximately 950 m³/day of water would need to be abstracted from the River Blackwater between November and March e.g. approx. 50% of the existing daily permitted abstraction volume.

Notwithstanding the above, in the unlikely event that water stored within the lagoon system falls low, there are operational controls that can be implemented such as reducing the

throughput within the pulp plant to reduce water demands that can be implemented to maintain the IWMF's site operations.

6.1.8 Lagoon Lining

Upper Lagoon will have a storage capacity of approximately 25,000 m³ with a water level 32mAOD.

In accordance with the implemented IWMF planning permission ESS/34/15/BTE Upper Lagoon will be constructed below surrounding ground levels and within areas of previous quarry working. The side slopes of Upper Lagoon will be constructed largely within in-situ London Clay (Permeability <10⁻¹⁰ m/s) and backfilled Boulder Clay. The slopes will be shaped to a maximum gradient of 1V:3H. Upper Lagoon will be constructed wholly within in-situ London Clay, constructed at a gradient of 1V:3H.

Prior to filling the Upper Lagoon, the side slopes will be proof rolled to seal the clay subgrade.

The side slopes of New Field lagoon are to be constructed largely within in-situ London Clay and backfilled Boulder Clay. The slopes will be shaped to a maximum gradient of 1V:3H. Upper Lagoon will be constructed wholly within in-situ London Clay, constructed at a gradient of 1V:3H.

Prior to filling the lagoons, the side slopes will be proof rolled to seal the clay subgrade. Additional reference should be made to Drawing 007-3 New Field Lagoon Sections which indicates the profile and arrangement of New Field Lagoon.

6.1.9 Cumulative Surface Water Assessment

The planning application boundaries of the former Site A2 and existing Site A3 and A4 quarrying operations included the IWMF site to ensure that the 'Site Specific Issues to be Addressed' set out within Essex County Council's emerging Replacement Minerals Local Plan and adopted 2014 Minerals Local Plan were addressed, namely:

"Careful consideration must be given to the final low-level restoration contours to ensure the final landform blends with the surrounding topography and could blend with the levels and planting of the strategic waste management development (Ref ESS/37/08/BTE) if implemented."

Furthermore, the 'preferred' Site A5 and 'reserve' Site A6 and A7 within the 2014 Minerals Local Plan are adjacent to or near the IWMF site. Therefore, there is a need to consider the cumulative impacts associated with the coincidental development of these schemes on the Site's surface water setting.

The plan for all minerals excavation is for work to be phased with rolling restoration, resulting in the delivery of low level restoration proposals.

The restoration proposals associated with Site A2 and Site A3 and A4 have resulted in an increase in the size of New Field Lagoon. The former overflow arrangements to Bradwell Pond (in the original application) are therefore no longer proposed; however, this will have a negligible effect on the overall catchment areas, surface water runoff and water quality. Consequently the cumulative surface water impact of/to any subsequent development will also be negligible.

Further consideration has been given to the surface water impacts associated with the installation of the proposed electricity cable and water abstraction and discharge pipelines within a shallow trench. Given the transient nature of the works and the limited influence that they will have on surface water and flood risk potential, the services installation works will have a negligible effect on surface water resources or the potential for flood risk.

Any abstraction point in the River Blackwater, would comprise an underground structure that would be constructed in accordance with any future Flood Defence Consent application which would have to be approved by the Environment Agency before any abstraction occurred.

The Environmental Impact Assessment (EIA), which accompanied the original IWMF planning application and subsequent variation ESS/34/15/BTE, considered abstraction of water from the River Blackwater on the basis that the efficient operations at the proposed Wastewater Treatment Plant (WWTP) within the IWMF would not require discharge of return effluent to the River. It continues to be the case that the River Blackwater will be used as the primary water source of non-potable water for industrial use at the IWMF site. At present, there is no discharge licence or permission to pump treated effluent into the river.

Abstraction and discharge licences are issued and regulated by the EA. GFC holds an existing licence from the EA (Serial No. AN/037/0031/001/R01) to abstract 250,000 m³ of water per year from the River Blackwater during the months November to March inclusive. The licence was originally issued in 2009 and renewed in 2016; it states the following conditions:

- *“water abstraction at NGR TL 8343 2223 from a pumping sump with two pumps with a combined capacity of not more than 100l/sec (NOTE: this point is on the River Blackwater where the old access road to the former Blackwater Aggregates Coggeshall Pit quarry crosses the River Blackwater ie in GFC's land ownership/control);*
- *for the purpose of filling reservoirs for the subsequent purpose of process water for waste treatment, processing and recycling;*
- *the maximum quantity of water to be abstracted is not to exceed:*
 - *360 m³/hr;*
 - *8,640 m³/day; and*
 - *250,000 m³/yr.*
- *no abstraction 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 (1.309 m³s⁻¹); and*
- *no abstraction shall take place until the Licence holder has provided a storage facility, capable of storing at least 250,000 m³ of water which is constructed or lined so that it remains impermeable.”*

New Field Lagoon has a capacity in excess of 250,000 m³; allowing for fluctuation in water level it would offer the following storage capacity:

- Water Level 40.5 mAOD - 726,000 m³
- Water Level 39.0 mAOD - 547,800 m³
- Water Level 37.0 mAOD - 369,800 m³

Upper Lagoon will have a storage capacity of approximately 25,000 m³ with a water level 32mAOD.

In accordance with the site planning permission both lagoons would be constructed below surrounding ground levels and within areas of previous sand and gravel working. On the 23 December 2016, Gent Fairhead & Co Limited received planning permission ESS/44/16/BTE for the Installation of an abstraction point, pumping equipment and water main from the River Blackwater to the IWMF site (ESS/34/15/BTE) using the existing abstraction licence

(Environment Agency ref AN/037/0031/001/R01) at land between River Blackwater and IWMF site.

The cumulative impact associated with the above abstraction only arrangement was fully considered within the Updated Environmental Statement 2015.

The option to apply for a revised abstraction and discharge licence always exists. In the event an abstraction and discharge licence application is made, it would be subject to a detailed assessment by the Environment Agency. 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.

It is concluded that from a surface water and flood risk perspective, the cumulative EIA for the IWMF proposal and the wider foreseeable developments in and around the site has been considered and assessed, and no significant negative cumulative impacts have been identified.

The proposed increase in stack height has neither changed nor altered the findings of the surface water and flood risk assessment.

DRAWINGS

Drawing 007-3 New Field Lagoon Sections

APPENDIX 6-1A

Condition 23 Surface Water approved under ESS/34/15/BTE

APPENDIX 6-1B

SLR Consulting's 2017 Surface Water and Flood Risk Assessment