Permitting decisions

Variation including part refusal

We have decided to issue a variation for Milton Landfill Site operated by East Waste Limited.
The permit number is EPR/BV4584IU/V011.

We consider in reaching that decision we have taken into account all relevant considerations and legal requirements and that the permit will ensure that the appropriate level of environmental protection is provided.

Purpose of this document

This decision document provides a record of the decision making process. It:

- highlights key issues in the determination
- summarises the decision making process in the decision checklist to show how other relevant factors have been taken into account

Unless the decision document specifies otherwise, we have accepted the applicant's proposals.

Read the permitting decisions in conjunction with the environmental permit. The introductory note summarises what the permit covers.

Structure of this document

1. Background to this variation
2. Key issues of the decision
3. Aspects relating to the application process
4. Technical reasons for decision
5. Aspects relating to the variation

1. Background to this variation

Milton Landfill is located on Butt Lane to the west of Milton in northern Cambridgeshire, at National Grid Reference TL46506320. The site is L-shaped, broadly oriented northeast-southwest and is just under 1 Km in length and width at the widest points, with a total area of approximately 48 ha.

Milton is operated by East Waste Limited, a subsidiary of FCC, under permit number BV4584IU. The permit was originally issued in 2005 with the most recent major variation in 2016, primarily to address leachate trigger levels for recently installed wells (2014) and to vary the CO2 limits. The landfill is located within a quarry void within the Gault Clay Formation (classified as unproductive strata) below River Terrace Deposits (RTD) (classified as a Secondary A Aquifer) The thickness of the Gault beneath the site varies but at the thinnest in the eastern area of the site, where it is reported to be only 16 metres thick. This overlies the Lower Greensands Formation (classified as a Principal Aquifer)

The groundwater in the Lower Greensands aquifer is protected by the presence of the Gault Clay beneath the site, with the River Terrace Deposits considered to be the primary groundwater receptor.

Landfilling has been undertaken at the site since the 1980s. Operations have been split into three phases where Phase I (1 cell) and II (cells 1-11) are completed, and the final few cells of Phase III (cells12-24) are nearing completion. An update provided by the Schedule 5 response in June 2024 confirms the current and final operational cell is Cell 24, which is forecast to complete operational tipping by the end of 2024. Restoration is expected to continue into 2026.

Milton Landfill has taken a combination of hazardous and non-hazardous wastes since first opening in c.1980. Historic activity has included hazardous wastes, confirmed to have been tipped into Phase I, Phase II and Cells 12-15B of Phase III. No hazardous waste has been tipped since 2003.

1.1 Details of the variation

On 13/06/22 East Waste Limited submitted an application to vary the permit EPR/BV4584IU for Milton Landfill Site, which was duly made on 16/02/2024. The application sought to:

1. To revise the leachate compliance levels;
2. To increase the annual tonnages of waste and restoration materials;
3. To surrender small areas of land, which have not been landfilled;
4. To include new groundwater monitoring boreholes and associated compliance limits;
5. To reduce the number of leachate wells used for regular monitoring;
6. Revise the surface water management scheme.

Following a detailed technical review of the information submitted in support of the variation application, we are unable to approve requests 1 and 5; and in part request 4. Request 6 is subject to an improvement condition. We can accept the other changes listed and the variation is issued to include requests 2-3, and request 4 with amendments. These points are discussed further in the *Technical Reasons for Decision* section below.

2. Key issues dominating the decision

To revise the leachate compliance levels – refused

The Operator's proposals to amend the leachate limits in the permit have been assessed by the Environment Agency technical specialists in National Operations and Area teams. Our assessment concluded that the compliance limits proposed are not acceptable, as the operator has not demonstrated they would be able to comply with the varied limits and the proposal would also risk further loss of the operator's ability to effectively control leachate levels. The application is not supported by a conceptual model which is compatible with the management design of the site, which relies upon hydraulic containment to maintain the protection to groundwater obligation under Schedule 22 of the Environmental Permitting Regulations (EPR) 2016. Reasons for this decision are further explained below.

The site is in a hydrogeologically sensitive setting, where the superficial deposits of the River Terrace Deposits, a Secondary A aquifer is the primary receptor.

The Milton Landfill site was permitted to be operated on the principle of hydraulic containment, where the leachate level in the site is to be managed at a level lower than the base of the RTD, so that groundwater is at a higher level than the leachate head. Current leachate levels set in the permit would maintain hydraulic containment albeit they are not universal across the site, which reflects the undulating nature of the RTDs across the Site, and the base of cells. Figure 2:1 taken from the agreed 2015 Hydrogeological Risk Assessment for the site, is a schematic of the site design, showing the construction of the Site relative to the surrounding geology and how hydraulic containment could be achieved where a leachate head remained lower than that of the height of the water table.

Waste disposal at the site began prior to the Landfill Directive (2001), Phase I had a 3 m sidewall liner of clay installed retrospectively in 1996, with Phase II and III having basal and sidewall lining systems installed. Phase I and Phase II Cells 1 to 5a have no basal drainage system installed, with leachate sumps retrospectively drilled.

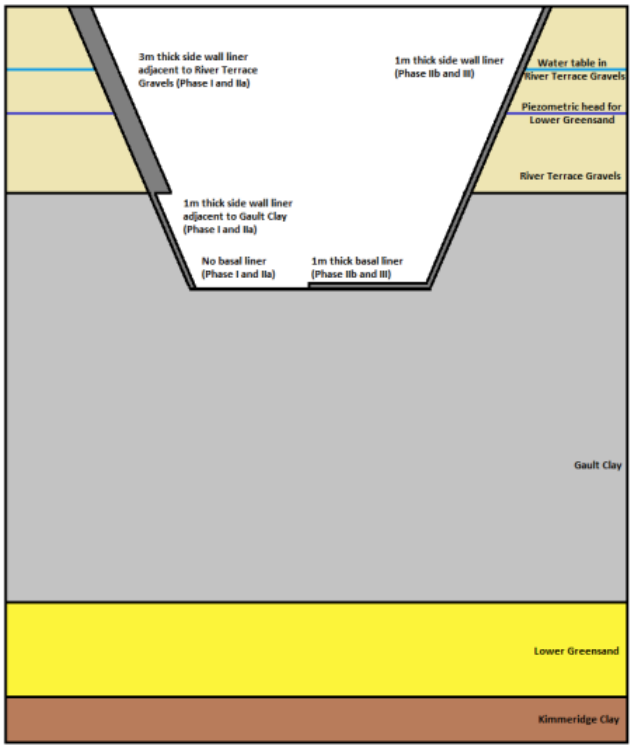


Figure 2.1: Schematic Showing Conceptual Hydrogeological Site Model

In most permitted hydraulically contained landfills a freeboard of 1 m is applied to allow for the impact of any failure of leachate extraction systems to be remedied and limit the environmental risk to groundwater. The current permitted levels provide Milton with only 0.2 m of freeboard in the most hydrogeologically vulnerable areas of Phase I (eastern area) and between 0.1-1.0 m freeboard in areas of Phase II and eastern areas of Phase III.

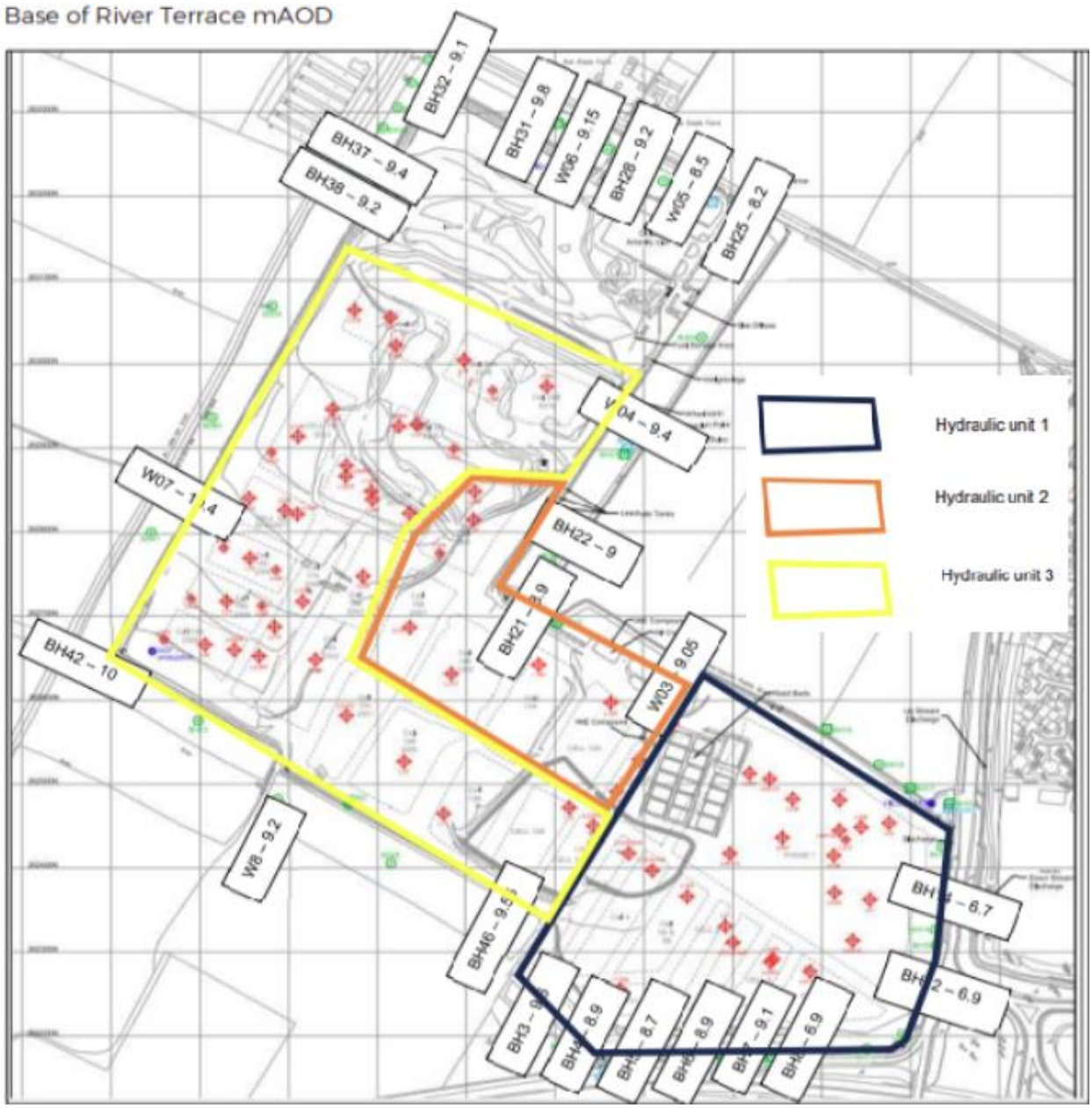
The site was designed and constructed to be managed under hydraulic containment in order to protect groundwater in both the RTD and Lower Greensand aquifers. The application has not applied to cease active control, which normally occurs when the waste has degraded to a point that the quality and quantity of the leachate will not pose a risk to people or the environment through an uncontrolled release. That has not yet occurred here. Instead, the application has been submitted to raise the height to which the permitted leachate levels are managed. The HRA states the intention behind the proposed increase to leachate compliance level will allow greater operational flexibility to target leachate extraction to priority areas. However, the proposed leachate levels are also currently out of compliance.

The application specifically applies to move Phase I and part of Phase II of the Site to an advective leakage scenario over the site design of hydraulic containment. Advective leakage is where the leachate head is higher than the surrounding groundwater giving rise to an outward hydraulic differential and thereafter allowing leachate to migrate from the landfill.

The proposal is to increase the level at which leachate is managed across the site to effectively generate three hydraulic phases (see map below provided with the Schedule 5 notice response and annotated with proposed compliance limits) where leachate would effectively lead to internal “channelling” of leachate towards the eastern area of the site (Phase I and part of Phase II). The levels proposed will lead to periods of time where there is advective leakage across the sidewall engineering into the RTD on the eastern boundary of the site. This is not an appropriate active control management proposal for cells designed to be hydraulically contained. It would be more appropriate to address leachate management proposals within an action plan designed to bring the site back into compliance with the hydraulic containment conceptual site model.

The variation application proposes three different leachate heads across three hydraulic units which are lowest in Hydraulic Unit 1 and highest in Hydraulic Unit 3. This will effectively create one large, connected phase that will cause leachate to flow towards cells that are the most vulnerable, hydrogeologically and for leachate management (Hydraulic Unit 1). No justification nor explanation of why this is appropriate has been provided, and no tailored leachate management plan has been proposed to explain how effective extraction will be achieved for Hydraulic Unit 1 where leachate will enter it from units 2 and 3.

Summary of proposals



Proposed Unit	Current leachate head level	Proposed leachate head level	Depth range of the base of RTD
Hydraulic Unit 1	6.5 mAOD	8.0 mAOD	6.7-9.6 mAOD
Hydraulic Unit 2 (contains cells from Phase II & III - Cells 12a, 13a, 14a, 15b and 20b)	6.5 mAOD (unless specified) Partly cell specific*	8.5 mAOD **	8.9-9.05 mAOD
Hydraulic Unit 3 (contains cells from Phase II & III - rest of Phase II & III, cell specific current leachate limits apply to Cells 2, 3, 6 and 12c)	6.5 mAOD (unless specified) Partly cell specific*	9.0 mAOD**	8.2-10.4 mAOD

* cell specific limits are in place in Phase II (Cell 2 at 8.0m AOD; Cell 3 at 8.1m AOD; Cell 6 at 8.4m AOD; Cell 12c at 9.5m AOD and Cell 12a at 8.0m AOD

** Intention to leave any current leachate limits in place, where they are higher than the variation proposes. E.g. Cell 12c only

Leachate is generated by water percolating through waste deposited in a landfill. At Milton, the leachate contains very high levels of contaminants such as chloride, ammoniacal nitrogen, heavy metals and organic compounds. If leachate is not correctly managed, it may cause harmful effects on the RTD groundwater and surface water. Increased leachate levels will also impact the site's ability to manage landfill gas effectively. This is a particular issue if a large proportion of the waste mass becomes saturated, as would be the case if the proposed leachate levels were permitted. The LFGRA cannot be fully assessed at this stage because the proposed leachate levels underpin the volume of waste saturated and therefore the assessment of the impact on gas production and management.

The application has not considered the cells within the landfill individually or reviewed the leachate level data collected historically to justify the proposed compliance limits. Data provided shows that many boreholes in Phase I and Cell 8 from Phase II (in hydraulic unit 1) and Cell 12D and Cell 19a from Phase III (which span both hydraulic units 1 and 2) are out of compliance for current leachate compliance limits. The following cells are currently out of compliance for the proposed leachate heads: Cell 2 from Phase II, (in hydraulic unit 1); and Cells 12A, 12B, 12D, 13B, 13D, 24A and 24B (which span both hydraulic units 2 and 3) from operational Phases II and III. Borehole specific compliance limits could be considered that would demonstrate compliance with the hydraulic containment model, and paragraph 6 of Schedule 22 of EPR 2016, where boreholes at the perimeter of the waste require a tighter compliance limit. A varied approach to compliance limits within cells/hydraulic units to maintain hydraulic containment could be permitted where a lower leachate compliance limit would apply to perimeter boreholes compared to more central boreholes where higher levels could be applied. This would support the statement made in the HRA which cites the reason for this variation applications being to allow greater operational flexibility to target leachate extraction to priority areas.

EPR Schedule 10 which incorporate the Landfill Directive requires modern landfills for biodegradable waste to have a 300mm thick granular aggregate leachate drainage blanket in combination with a robust well-engineered slotted/perforated pipework system along the base and to an appropriate height up the side wall. Each cell should have at least one extraction point and two remote monitoring points connected to the basal drainage system to extract leachate and monitor leachate levels.

The Environmental Monitoring Plan provided in Appendix A of LMP shows more recent cells to have at least 2 leachate monitoring wells. However, certain cells which have been highlighted within the LMP and throughout the supporting documents to be out of compliance with the current leachate level limit only have one leachate monitoring well. For example, Phase III Cells 12-16 (inclusive of all A and B counterparts) and much of Phase II only have one leachate monitoring well per cell. Given the consistent problems of leachate compliance, it is evident that the infrastructure across these cells at Milton is inadequate to maintain current leachate levels. Permitting an increase to leachate heads across the Site would only exacerbate this.

At Milton, many of the leachate wells have been retrofitted and it is not clear within the application if they are connected to the basal drainage pipework; adding further complication to leachate extraction management and monitoring at the site. Higher leachate levels inherently increase the risk of leachate leakage through the base and sidewalls or breaking out at surface. In order to increase leachate levels, the operator must be able to demonstrate that the existing leachate collection and monitoring infrastructure is fit for purpose and if necessary, include proposals to enhance or modify the current arrangements.

Whilst it is recognised that there may be scope to increase leachate level compliance limits within the site to maintain hydraulic containment beneath the groundwater in the RTD, the operator is not proposing to maintain hydraulic containment across the site and has not provided sufficient information to demonstrate that the levels proposed can be achieved and maintained in both the short and long term. In particular, we need confidence in:

- up to date leachate head data complete and inclusive of all recent leachate level monitoring data to provide information on leachate heads;
- the ability of the extraction system to effectively control leachate levels at greater depths;
- the ability to achieve compliance with the new agreed limits where levels are elevated;
- the quantitative risk assessment to demonstrate that increase leachate heads will not have an adverse impact on groundwater quality and remain hydraulically contained.

Further explanation of the key reasons why we are unable to accept the proposals outlined in the application is provided below.

2.1 The operator has not demonstrated they would be able to comply with the varied limits.

Even at proposed higher leachate levels, cells will still exist where significant leachate reduction is required as current levels exceed the proposals. Modelled predictions for leachate removal versus actual removal rates were provided as part of Schedule 5 Notice received in June 2024. It was stated that removal rates have been close to predicted. It is unclear how the predicted leachate rates have been derived and if any amendments have been made to focus on cells which remain consistently out of compliance. Since the response stated that removal rates have been close to predicted, this raises concerns about the derivation of these rates since there have been numerous leachate head compliance issues at the site indicating insufficient removal of leachate has occurred. It is not clear if the same prediction methodology is applied to increased leachate heads if the site will be able to achieve and remain compliant.

Previous efforts to reduce leachate levels have been unsuccessful and insufficient information has been provided within the Leachate Management Plan to demonstrate how compliance will be achieved in practice within a reasonable timeframe.

2.2 The proposal would risk further loss of the operator's ability to effectively control leachate levels.

It has not been demonstrated that the site has adequate leachate drainage and extraction systems in place to ensure that leachate can be effectively maintained at a higher level, and this increases the risk of loss of control. The site is already experiencing difficulties managing leachate levels across the site, particularly in the cells where leachate levels are recorded up to 10 or 11 m above the base.

Increasing leachate in the cells of Phases II and III has the potential to increase flow towards the eastern Phases and cells. This will make it more difficult to achieve the proposed leachate levels in Phases I and other parts of Phase II where the proposals would result in advective leakage into the RTD.

A robust conceptual model and risk assessment has not been provided to support the proposals.

The numerical modelling undertaken does not adequately characterise the landfill and environmental setting of the site to demonstrate that increased leachate heads will not have an unacceptable impact on groundwater. It has therefore not demonstrated compliance with EPR Schedule 22 paragraphs 6 and 7.

The Operator's proposal is not in accordance with Environment Agency guidance "How to comply with your environmental permit - Additional Guidance for: Landfill (EPR 5.02)" in regards to leachate management, which states: 'Leachate levels in landfills should be set and managed in order to provide a high level of environmental protection'. In this case we do not consider that the risks of increasing leachate levels have been adequately addressed. The guidance also states that: 'Sufficient information is required to provide a robust risk assessment and full understanding of your conceptual model.' The risk assessment for Milton does not adequately characterise the site and lacks the detailed level of justification required for such a proposal, further details are provided in Section 4.

To include new groundwater monitoring boreholes with revised compliance limits – partly refused

The applicant has applied to replace two boreholes that have become damaged during highway improvements. The application also seeks to update groundwater compliance limits for these replacement boreholes against the previous boreholes.

The Agency accepts the location of the replacement boreholes; W01R and BH12R but has refused the proposed revised Mecoprop groundwater compliance limit and provides alternative ammoniacal nitrogen limits as an update to Table S3.4 of the permit. Further details are provided in Section 4.

To reduce the number of leachate wells used for regular leachate quality monitoring – refused

The applicant has applied to reduce the number of leachate wells used for regular leachate quality monitoring. This reduction in monitoring is also refused from the information provided in the application. LFTGN02 (2003): Guidance on the monitoring of landfill leachate, groundwater and surface water is the guidance used to support the requirements of the Landfill Directive, which are incorporated into the Environmental Permitting Regulations. LTGN02 discusses that as a minimum there should be leachate monitoring wells and sampling from each hydraulically separated drainage cell. The proposals put forward in

the variation application do not cover this. An updated monitoring point map has not been provided which clearly shows the monitoring wells that would be appropriate in respect to the Phases and cell basal drainage systems across the Site. The application also bases support for this request on discontinued regulatory position statement (RPS 156) which was published in 2013 before the last major variation of the permit.

Improvement Condition for a revised surface water management scheme

Revisions to the surface water management plan (SWMP) are being included under an Improvement Condition to ensure that the proposals are fit for purpose, this is to cover the following points, discussed in more detail under the technical reasons for the decision:

- The SWMP is based on a different site acreage to that confirmed in the HRA, ESID and Environmental Monitoring Plan.
- Unjustified Catchment areas with no consideration of the change between temporary and permanent cell caps.
- Unjustified surface water flow directions.
- Concerns on the impact of the location of the attenuation pond on
    - existing infrastructure.
    - existing woodland area; and
    - Discharge points.
- Use of non-site-specific inputs.

3. Aspects relating to the Application Process

3.1 Application History

The original application submitted on 13/06/2022 was not Duly Made until 16/02/2024. Upon initial review, amongst other things, the application was missing supporting environmental data. This was requested on 25/01/2024 and the applicant requested an additional 4 week extension, citing the requirement for internal reviews before data could be provided; data was then provided on 16/02/2024. Up to date supporting environmental data is expected to be readily available and provided as standard, especially for an application focused on a request to increase leachate level compliance limits.

Following receipt of the additional information, a full technical assessment was undertaken which highlighted several issues with the application and a Schedule 5 Notice was issued on 09/05/2024. The Schedule 5 Notice requested further information in relation to geological and hydrogeological setting of the unconfined RTD aquifer, clarification into the hydraulic containment assessment for the Site, and clarification on both monitoring details and the Leachate Monitoring Plan. The response was received on 06/06/024.

3.2 Application features related to the partial refusal

The operator has not demonstrated how the leachate compliance limits proposed have been derived for each drainage cell. Milton Landfill currently has permitted leachate heads for each operational cell. However, operational cells are different to drainage cells and Miltons current leachate heads are based on the site drainage/cells engineering. It is acknowledged that a larger 'hydraulic unit' could be feasible, but the operator has not demonstrated how leachate head compliance will be achieved and managed both in the short term and longer term to maintain hydraulic containment and to protect groundwater. The operator also has not provided explanation or justified argument for the move from non-hydraulic containment and how it will meet EPR Schedule 22 paragraphs 6 and 7.

We acknowledge the difficulties in managing leachate at landfill sites with old engineering and infrastructure and recognise the need to review leachate compliance limits to introduce more sustainable leachate management practices. In these cases, we seek to work with operators in an open manner to agree an acceptable way forward. We tried to do this here, through the issue of a schedule 5 request, which included a request to contour the groundwater levels across the site to better demonstrate the behaviour and interaction of the groundwater regime and the site. This was to understand the assessment made of the proposed change away from hydraulic containment management.

The proposal to vary leachate levels at the site is not straightforward for the following reasons:

- A substantial increase in leachate compliance limit is requested, taking certain areas of the site out of hydraulic containment,
- Leachate levels are significantly elevated in some cells and currently non-compliant with both existing and proposed compliance limits, and
- The site is in a hydrogeologically sensitive setting with unconfined RTD, a Secondary A aquifer, with recognised uncertainty in the impact of dewatering at the site.

The information provided in June 2024 response to the May 2024 Schedule 5 Notice reinforced our concerns regarding several aspects of the proposal and we do not consider that the operator would be able to provide sufficient information to support the proposed compliance limits in a timely manner as part of the current application. Further proactive interaction has not been sought with the operator because of fundamentally opposing views shown through the Schedule 5 responses which underpin the management of the Site under hydraulic containment.

Proposals to amend leachate compliance limits require confidence in the groundwater and leachate level data and the operator's ability to manage leachate to the proposed levels.

Further works are required to provide more reliable information on behaviour of groundwater to the north/northwestern area of the Site with respect to cessation of dewatering. The Schedule 5 response has shown that there is still uncertainty in this area following recharge after the winter of 2023-2024; and only limited understanding and information on the impact of the de-watering activities have been provided. We do not consider that this information can be provided within a reasonable timeframe as part of the application process. The outcome of the investigation may require substantial changes to the supporting information and risk assessment and if so, this would require a new application.

There are also issues with existing non-compliance where leachate heads are significantly elevated in some cells. It is not appropriate to allow further increases in leachate levels in other parts of the site until control can be demonstrated. This is likely to require a staged approach, whereby leachate heads are reduced to an acceptable level in these cells, before we can start to allow significant increases in leachate levels in other parts of the site.

The onus is on the Applicant to make a suitable application containing sufficient information. It is neither appropriate nor reasonable to expect to provide significant new information or make significant changes to the proposal during the application process except in exceptional circumstances. Duly made applications can only be revised with the Environment Agency's agreement. Our view is that the amount of information required to address the concerns identified in this document (if they can be addressed) would require a new application.

4. Technical Reasons for Decision

Technical Reasons for Refusal of Leachate Level Compliance Change

For the Environment Agency to consider an application to increase leachate head levels at a landfill, the operator needs to be able to clearly demonstrate that their proposals satisfy specific objectives. We are unable to agree to the proposed leachate compliance limit changes requested as a number of these objectives have not been met:

4.1 Leachate Drainage and Extraction Systems

The applicant has not explained the reason for prolonged non-compliance of leachate management at the Site; nor how they intend to bring levels down to within the proposed heads requested or outlined any timeframe for this to be achieved. This suggests that the operator has inadequate leachate drainage and extraction systems in place to maintain leachate at permitted levels. Allowing an increase in leachate heads across cells would add further risk to loss of control. The main issues from the application are summarised below:

- A proportion of leachate wells are retro drilled, and it is not clear if they intercept the basal drainage where this is present.
- Leachate levels are significantly elevated in some cells and the proposal does not adequately demonstrate that compliance can be achieved within a reasonable timeframe. Previous efforts to reduce leachate heads appear to have been unsuccessful.
- The operator has provided no explanation for the excess leachate seen in out of compliance cells, nor has any action plan been suggested to regain control of leachate heads.

4.2 Modelled leachate removal rates vs extraction rates

The initial application was not clear how modelled leachate removal volumes had been calculated, nor did it provide any future predicted removal rates for the proposed leachate levels, or explanation of the non-compliance issues currently observed at the site. The Schedule 5 from June 2024 provided a comparison of modelled removal volumes for 2022 and 2023 versus actual removed volumes, and these were stated as largely in line with each other. However, given the legacy leachate at Milton which the LMP discusses at length, no action plan has been proposed to incrementally reduce the leachate excess to meet current leachate level requirements or to meet the proposed levels which are currently exceeded in a number of cells. It remains unclear how the modelled removal rates were derived for current leachate heads and no rates were proposed for 2024 or the proposed leachate heads.

Information taken from the CAR form issued in June 2024, which looks at leachate head data from February-April 2024, shows that the site is currently out of compliance for proposed leachate levels for 12 of the 14 monitoring points sampled in February, 8 out of the 12 monitoring points sampled in March and 5 of 14 monitoring points sampled in April. Comparisons between the monthly sampling cannot be made because of inconsistencies between the holes sampled in each monitoring round. Whilst improvements might seem apparent from this statement it is not the case, and month-on-month progress is hard to establish. This means that even if the increased leachate heads requested were agreed the Site would be immediately out of compliance with Schedule 3, Table S3.1 of their permit which the Agency cannot permit.

4.3 Monitoring infrastructure

Each cell should have three wells; one leachate extraction well and two remotely located monitoring wells. Appendix A in the LMP provides location of the wells across the Site and demonstrates many of the cells experiencing problematic leachate heads have less than the required number of monitoring wells defined in LFTGN02. There is an ongoing failure to comply with leachate levels, it is the operators responsibility to ensure the number of wells installed meets the capacity required to extract leachate at rates needed to maintain compliance. This has not been the case at Milton.

We are only able to approve applications to increase leachate levels where we are satisfied that the leachate extraction and monitoring infrastructure is fit for purpose.

4.4 Hydraulic containment Conceptual Site Model and Freeboard to prevent leachate breakout

The initial application stated that the RTDs are not laterally continuous across the Site, which was reaffirmed in the Schedule 5 response where the applicant suggests it is not appropriate to contour groundwater of the RTDs across the Site on this basis. A supporting geological map from GroundSure is cited as evidence for this lateral discontinuity. Subsequent review of the site-specific borehole logs provided within the application, and Figure 2 of the Schedule 5's response disapproves this argument as they highlight the base of the RTDs at multiple locations across the site. Borehole logs refer to 'pockety drift' which is confirmed by the applicant in the Schedule 5 response as proxy to the RTD. The significance of greater presence of the RTD around the Site is importance because this is the vulnerable unit/aquifer that requires protection from any leakage of landfill leachate.

The current permit provides hydraulic containment by setting leachate compliance limits at 0.2 m below the lowest base of the RTD recorded in borehole 14, rather than any groundwater levels monitored. It is acknowledged that setting leachate levels against monitored groundwater levels as opposed to the lowest base of the RTDs is an option for Milton Landfill, but this would require acknowledgement of the continuous extent of the RTD across the site and in turn a revised approach to the variation and fundamental change to the conceptualisation of the site. We do not believe this can be achieved in a reasonable timeframe.

The application and Schedule 5 response in June 2024 have provided conflicting information regarding the freeboard capacity across the site offered from the proposed leachate heads, with uncertainty also present in the conceptual site model regarding dewatering activities in the northwestern area of the site. The application did not account for recharge to the RTD following cessation of dewatering, the duration of which was not outlined. The response received in June 2024 defined de-watering activities to have started in 2003 and ended in 2022, with limited additional de-watering in 2023. Recharge of the RTD was also confirmed to have been different than expected; being greater and more responsive to the winter of 2023-24. The response confirmed additional monitoring would be required to define the groundwater behaviour, showing that further work is required at the site to understand the groundwater regime and the risk posed by any proposed increases in leachate level.

There are discrepancies in the freeboard factor of safety offered across the site from the proposed leachate levels stated in the application HRA compared to those provided in the Schedule 5 response.

Hydraulic unit 1, presented in the Schedule 5 response rather than the original application, proposes a leachate head of 8.0 m in Phase I and eastern areas of Phase II (Cells 1 and 9-11). This would overtop the base of the RTD by 1.3 m along the eastern boundary but provide a hydraulic containment freeboard of between 0.7 and 1.6 m elsewhere. Cross-section figures in the HRA show the average groundwater level rather than the lowest groundwater level. The 5th percentile groundwater level provided in the HRA for BH12 is 7.42 m AOD suggesting that this area of the site would be hydraulically contained if a lower leachate compliance limit of 7 m AOD were applied.

Hydraulic unit 2 proposes a revised head of 8.5m, which would provide 0.4m of freeboard capacity, against the base of the RTD in BH21. The freeboard offered by groundwater levels in the area has not been quantified. No assessment of the appropriate freeboard under hydraulic containment management is provided in the HRA.

Hydraulic unit 3 applies for a revised head of 9.0m, which would give a 0.2m capacity to the southern boundary of the Site, increasing in places to up to 1.4m. This gives a wide discrepancy across the area in the freeboard capacity. The level of appropriate freeboard capacity has not been assessed against the standard requirement of 1 m nor how this will be appropriately monitored.

The proposed maximum allowable leachate head in some cells do not include a logical or consistent factor of safety against leachate breakout. In some cells, current leachate heads leave just 20cm capacity.
Additional ground investigation and comparison to measured groundwater levels of the RTD would be recommended to support proposals for leachate level management under hydraulic containment with suitable additional leachate monitoring infrastructure in critical areas at the perimeter of each cell to confirm compliance.

4.5 Leachate Action Plan

The LMP is based on Milton being managed by hydraulic containment, which is what the Schedule 5 response from June 2024 confirms the variation is to move away from. Given the proposed moved to a different style of management is applied for, the Agency would have expected a revised LMP to have been submitted to support the new style of management. This has not been done and the application invalidates the current LMP.

The operator has not adequately demonstrated how a reduction in leachate levels will be achieved where levels are significantly elevated against current permitted leachate limits. In many cells, proposed leachate limits are already exceeded and there has been no staged action plan put together to reduced leachate to the proposed leachate levels requested.

The LMP does discuss the legacy leachate volumes and provides data on this. The response to the Schedule 5 June 2024, provided predicted extraction rates for 2022 and 2023 against actual rates, showing that these were similar but there is no explanation provided to explain the excess leachate which remains at Site. This suggests that the model used for predictions is likely to be unrealistic. The model should represent what leachate removal volume is required to maintain the site at the current permitted leachate levels. In turn, a revised model should be in place to ensure that proposed leachate levels can also be met. The current model is suggested to be unrealistic because successful leachate management cannot be met, the site is out of compliance in several places and has been for some time. No update to the model extraction rates has been made, nor any explanation for the legacy leachate volumes.

The LMP suggests that calculated leachate generation is based on effective rainfall rates of 142mm per year, taken from the BGS effective rainfall maps. The non-restored areas use an effective rainfall value of 229 mm/yr, assuming half the evapotranspiration rate and a waste absorption rate of 35%. Capping types discussed in the LMP assumes 9.6% infiltration of effective rainfall through final capping and 80% through temporary capping. No justification is given for the capping values. The sensitivity in these figures is not addressed and given the predicted extraction rates are similar to actual rates of abstraction the lack of compliance with leachate levels suggests that they are not appropriate. The Agency has not requested an explanation into the derivation of the input values because it is considered a full review of the LMP is required given the non-compliance of leachate heads, and lack of action plan for reducing these. This was not included as part of and so is not within the scope of this variation application.

The LMP states the following Actions will be completed should a compliance limit be breached and to thereafter regain control of leachate for cells:

- The pump in the well will be checked to see if working efficiently
- Leachate removal volumes will be reviewed
- Investigate whether well requires desilting
- Increase the frequency of leachate level monitoring
- Consider installing additional leachate abstraction wells.
- The findings of the investigations and any proposed further action will be reported to the Agency for agreement.

Given the review of CAR forms over the last 10 years for Milton, which demonstrate multiple struggles with current compliances limits, it suggests that the proposed LMP is inappropriate, and a total review of leachate management is needed. An updated LMP is an essential part of a variation which seeks to update leachate heads and move to a different style of management. The absence of an updated LMP provides limited support to application variation.

The current volume leachate legacy at Milton is stated to be 6896 m^3 and the operator confirms in the LMP the most problematic areas are cells 12C and cell 24B. The operator also confirms the reason for this is mainly due to the infrastructure being not fit for purpose due to silt build up. These wells were desilted without success and so were redrilled November/December 2020. Whilst additional wells and pumps have been installed, levels should have decreased, but no reduction has been seen. The CAR form issued in June 2024, demonstrates specifically that Cell 12C remains out of compliance against the current leachate head permitted and out of compliance against the proposed limits of this variation. Given that the improved infrastructure was installed almost 4 years ago, we would expect the operator to demonstrate a systematic, staged reduction in leachate whereby they are now compliant for Cell 12C.

This also directly contradicts the Leachate Levels Review included in the HRA, Section 2.4.4, which states cells 12 to 14 are mostly compliant as some cells have consistently been and remain out of compliance.

4.6 Hydrogeological Risk Assessment Modelling

The risk assessment uses two tools to assess the risk posed to the RTD and the underlying Greensand aquifer. A seepage assessment is completed for the risk posed to the RTD where the operator has explicitly confirmed through the Schedule 5 response to move away from hydraulic containment of the proposed hydraulic unit 1. A LandSim assessment is provided for the risk posed to the underlying Greensand.

4.6.1 Seepage Assessment

A seepage assessment has been completed within the HRA, Section 2.4.6. This considers the impact that moving away from hydraulic containment of hydraulic unit 1 would have on the RTD. We are not satisfied that this assessment is sufficient to justify the risk posed to the RTD from the proposed change in active management technique, particularly where hydraulic containment could be achieved with a lower leachate level. Specifically, we are not satisfied with the following aspects:

a) A potential seepage surface of 600m to the RTD has been identified along the eastern boundary of the Site. This has been based on the base of the RTDs found in borehole 12 and a groundwater level at the 5th percentile. This does not extend to the full perimeter of hydraulic unit 1 as defined in the response to the Schedule 5 request. It is not therefore clear if a conservative length has been modelled.
b) Dilution is based on an aquifer thickness of 2 m, but this thickness has not been justified.
c) No sensitivity analysis of the permeability and hydraulic gradient applied in the assessment has been undertaken. These parameters have a significant impact on the amount of dilution.
d) The only hazardous substance that has been assessed is xylene, there has been no assessment of the leachate quality to consider if this is the most conservative hazardous substance to demonstrate compliance with paragraph 6 Schedule 22 of EPR 2016 and the need to prevent the input of hazardous substances.
e) The Environmental Assessment Levels (EALs) applied have referred to permitted compliance limits rather than the EALs applied in the 2015 HRA that were agreed as appropriate for the assessment of risk to groundwater. The level used for ammoniacal nitrogen is higher than that previously agreed of 0.39 mg/l. The EAL used to assess impact is the relevant environmental standard or natural background groundwater quality. It should be one value, not a range as applied. The groundwater compliance limits set within the permit recognise that there is some anthropogenic (non-natural) impact from agricultural activities.

Given these issues the HRA has not shown that a move away from hydraulic containment for the site would not cause an impact to groundwater quality. It has not been demonstrated that all necessary measures will be taken to prevent the input of hazardous substances into groundwater and to limit the input of non-hazardous substances into groundwater so as to ensure such pollutants do not cause pollution. The requirements of Schedule 22, paragraph 6 and 7 of EPR 2016 have not been satisfied.

4.6.2 LandSim assessment

A LandSim assessment has been completed and discussed HRA section 2.5. LandSim has been used to justify the risk posed to the Lower Greensands but a number of inappropriate input values have been applied to the models that were previously presented in the 2015 HRA for the site agreed for the 2016 variation. The conceptual model used in the risk assessment is not fully justified and does not adequately characterise the landfill and environmental setting.

Specifically, we are not satisfied with the following aspects of the LandSim model:

a) Leachate head level

The variation application has applied a single value of 3 m as the leachate head which is stated to model the head difference between the leachate level and the piezometric surface of the Greensand (which is above the base of the landfill). This is not appropriate for conservatively assessing the risks from basal leakage to the confined lower aquifer, where the leachate head on the base should be applied. The in-built LandSim conceptual model is for situations where the landfill base is above the water table and therefore only models leakage through the base. The original model produced for the 2016 variation recognised the limitations and provided a conservative model applying the leachate level in metres above the base of the cell as a range of leachate head values between 1.8 and 12.4 m.

b) Cap infiltration

The LandSim model provided has only used a single value of 10 mm/yr infiltration through the cap. The model provided for the 2016 variation applied a more appropriate normal distribution with a mean of 40 mm/yr. This change stated to be a fraction of effective rainfall after capping is not appropriate. The leachate management plan uses an effective rainfall value of 142 mm/yr.

c) Unsaturated pathway

The LandSim model provided introduces an unsaturated pathway thickness of 0.5 m which does not exist at the site. This is linked to the inappropriate use of the tool discussed under the leachate levels applied. While it is recognised that the in-built LandSim conceptual model requires an unsaturated pathway this should be set at a minimum of 0.01m. As this pathway does not exist retardation and biodegradation should not be applied.

d) Vertical Pathway

The vertical pathway utilised in the LandSim model is set at 16 m, which is greater than the conservative 12.7 m applied in the previous model for the 2016 variation which was justified in relation to borehole logs. A conservative range of 12.7 m to 16 m could be applied as the depth of Gault clay present beneath the base of the landfill cells, if 16 m can be justified.

e) Gault Clay and liner hydraulic conductivity.

The HRA notes that there were “error messages” in the model and therefore the hydraulic conductivity values were altered iteratively to reduce the magnitude of the errors. This is not appropriate as the model should represent the known uncertainty in these values. The “error messages” referred to are warning messages designed to instruct the user to think about the appropriateness of the tool and whether a conservative assessment is provided. These “errors” are also due to the management control periods applied in the model of between 38 and 52 years (from the start of operations).

During the LandSim management control period, leachate heads are fixed at the input value specified in the model. Once management control has ceased the leachate level varies according to the balance between the inflow (infiltration) and outflow (leakage through basal liner, and surface breakout) to the site. Under this scenario the input values of the waste thickness and the height of surface breakout strongly influence the hydraulics of the landfill.

The primary way to understand the impact of an increase in leachate levels is to fix the leachate head at the specified level, by running the model with long term management control (e.g. 20,000 years). This scenario has not been modelled. A range of other scenarios should then also be carried out to provide a better understanding of the various aspects of the model and resulting implications on groundwater quality.

It is emphasised that LandSim is a risk assessment tool and should only form part of the overall assessment when establishing suitable leachate compliance limits, particularly when a substantial increase in leachate levels is proposed.

Given the issues discussed that have resulted in the presentation of an inappropriate model scenario for the site it is not shown that the application of higher leachate levels where the site is to remain hydraulically contained would not cause an increased impact on groundwater quality.

4.7 Review of increased leachate head on stability

Insufficient discussion has been provided within the Stability Risk Assessment (SRA) to show how the modelling undertaken relates to the stability analysis related to the risk of increasing leachate heads and the impact on both the integrity of the waste and the engineering of both liner and cap. The discussion of results is superficial and no evaluation of metrics is presented in the SRA; and no description of modelling outputs have been presented to support why the waste, and any engineering features are stable. This makes it hard to directly determine a Factor of Safety. There is insufficient discussion relating graphical modelling outputs presented in Appendix SRA3 with Section 3.1 and Table SRA8. Cross referencing should be provided between tabulated/written descriptions of results and graphical outputs. Detail should be provided with respect to the Factors of Safety reported and the incremental displacements shown It is accepted that the risk of basal heave is unlikely given the thickness of the Gault Clay.

Refusal of replacement borehole groundwater compliance limits

The Agency accepts the location of replacement boreholes W01R and BH12R but partly refuses some of the proposed revised groundwater compliance limits.

The proposed compliance limit change for mecoprop in borehole BH12R is not justified. The compliance limit for mecoprop was changed to the drinking water standard in the 2016 variation from the minimum reporting value. The groundwater quality data submitted for BH12R shows that the limit was only exceeded in the first three monitoring rounds after the borehole was constructed and the levels are likely due to the drilling and installation of the borehole. Concentrations are below the current compliance limit in all remaining submitted data (33 monitoring rounds).

The proposed compliance limits for ammoniacal nitrogen and zinc are based on a calculation of the mean plus 3 standard deviations from data collected from the replacement boreholes only rather than including data from the original boreholes. This statistical approach is appropriate for zinc where the concentrations are below the relevant water quality standard, but it is not appropriate for ammoniacal nitrogen where the concentrations are above the relevant water quality standard. To comply with EPR Schedule 22 paragraph 6 any input from landfill leakage must not further pollute a groundwater body where there is already input from anthropogenic activity. While there is non-compliance of leachate levels across the site the chloride concentrations measured in the replacement boreholes do not show the same increase in ammoniacal nitrogen concentrations and therefore the quality is agreed to be from agricultural activity rather than impact from leachate, therefore a maximum concentration excluding outliers of 0.7 mg/l will be sent for borehole W01R and the highest EAL agreed within the 2015 HRA of 4.63 mg/l will be set for borehole BH12R slightly above the maximum concentration excluding outliers in the quality data provided in the application of 4.2 mg/l.

The next HRA produced for the site should review all the leachate quality data collected and assess if other contaminants would be more appropriate as priority and compliance contaminants – for example, chloride, sulphate, arsenic or lead.

Refusal of changes to leachate management/monitoring

The additional request to reduce the number of leachate wells used for regular monitoring is also refused. Robust monitoring underpins successful compliance. With this in mind, given the discussion around the consistent leachate compliance issues across the Site, the Agency does not feel it is appropriate to reduce the monitoring schedule in the permit. Once compliance can be consistently demonstrated and the applicant is able to show they are compliant with Schedule 22 of EPR 2016, then a separate variation to address this could be sought.

The proposals for leachate quality sampling reference a discontinued regulatory position statement (RPS 156) published in 2013 before the last major variation of the permit, this has been replaced by published guidance under Landfill operators: environmental permits - Monitor and report your performance - Guidance - GOV.UK (www.gov.uk), which also references LTGN02 (2003): Guidance on the monitoring of landfill leachate, groundwater and surface water

The Landfill Directive requires samples of leachate quality to be collected from representative points, this is described in LFTGN02 as being where leachate can be shown to drain freely through the waste and removed via a basal drainage system. The Regulatory Position Statement quoted does not contradict this. Therefore, a sample of quality should be taken from each cell that has a hydraulically separate basal drainage system to

obtain representative samples. The proposals put forward in the variation application do not cover this requirement.

Improvement Condition requiring revision to the surface water management scheme

Revisions to the surface water management plan (SWMP) are being implemented through an improvement condition within the permit. The improvement condition is applied to allow confirmation of the appropriateness of the plan where fundamentally different metrics have been used between the SWMP and HRA, namely the differing acreage of the Site considered in the SWMP to the rest of the variation support documents.

The HRA, ESID and Environmental Monitoring Plan all confirm the Site to be 48ha whereas the SWMP and subsequent calculations for run off are based on the site being 37ha; a difference of nearly 30% in surface area and in turn, surface water run-off. This reduced surface area has not been justified. Microdrainage calculations are based on a surface area of 37ha and therefore the appropriateness of the capacity of the attenuation lagoon needs to be clarified.

Other areas of concern relating to the revision of the surface water management scheme are summarised below and discussed further in subsequent sections:

1. Catchment area justifications.
2. Surface water flow directions.
3. Location of the attenuation pond.
    a. Impact on existing infrastructure.
    b. Impact on existing woodland area; and
    c. Discharge points.
4. Metric justifications.

4.8 Catchment area justifications

The catchment areas shown on Drawing WR7544/01/02 are not well defined or explained. In some areas, logical topographic highs where divergence of surface water run off would be expected can be seen, but other boundaries appear arbitrary. For example, the boundary defined between catchment areas 1 and 2 has consistent contours and no reason for runoff divergence is given. The onus is on the Applicant to make a suitable application containing sufficient information, which should ensure comprehensive understanding of the surface water environment and expected site behaviours.

Temporary capping is currently in place in cell 20b, cell 19b, cell 22 and cell 23, which impacts catchment areas 1 and 3. The SWMP does not discuss the impact of future permanent capping in these areas on infiltration rates and thereafter the surface water runoff behaviour.

4.9 Surface water flow direction

Drawing number WR7544/01/01 shows a flow direction for surface water around the perimeter of the site. Given that the topography appears to be at a steady 11.3 mAOD for most of the area in question, it is unclear what feature or process will encourage surface water flow as described.

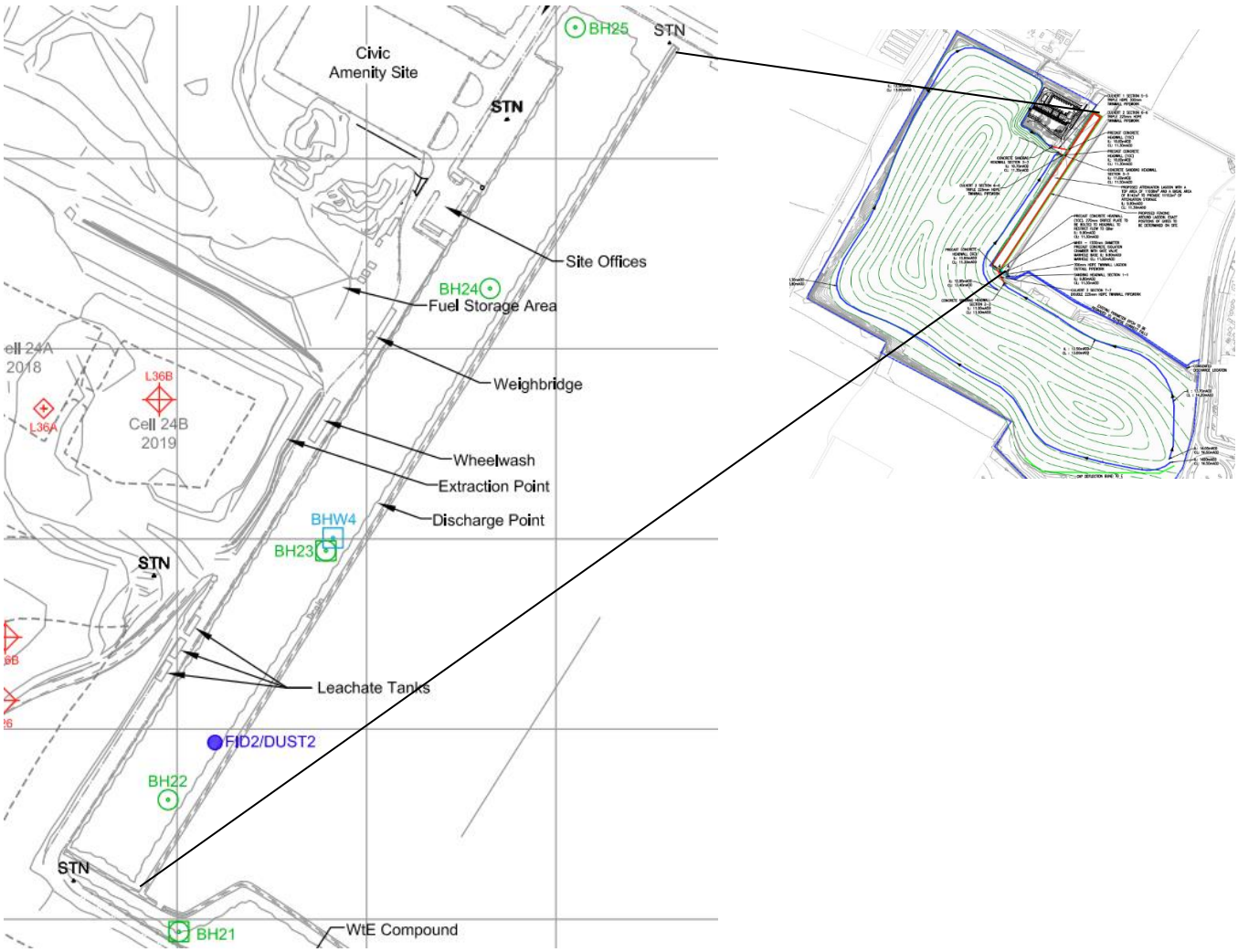
4.10 Location of the proposed attenuation pond

The location of the proposed attenuation pond has raised several areas of question. They relate to:

- Impact on existing infrastructure.
- Impact on existing woodland area; and
- Discharge points.

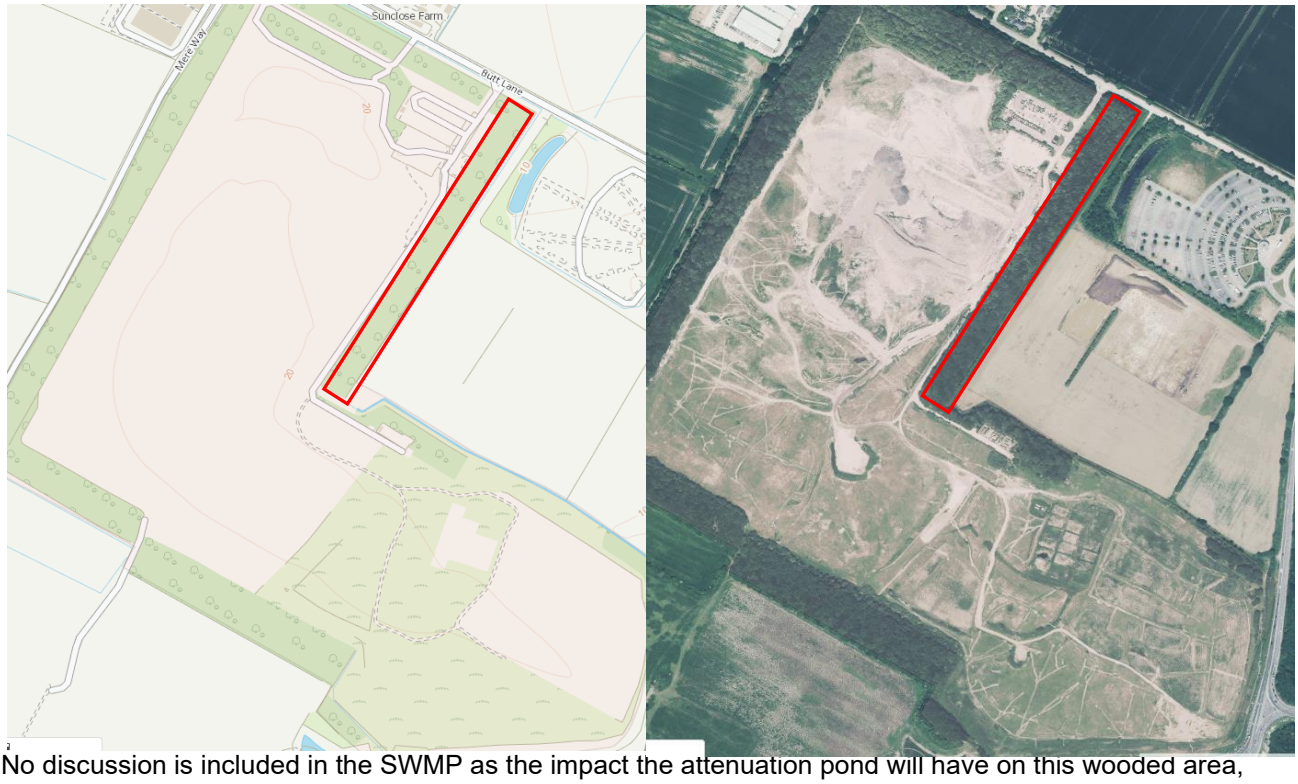
4.10.1 Existing infrastructure

It is unclear whether the proposed location of the new attenuation pond will engulf several existing monitoring points. Any proposed variation should clarify this and if necessary, provide alternative monitoring points. The potential impact to the potential monitoring points should be discussed within the SWMP. Potentially impacted monitoring points which appear to be affected are shown on the map below which is taken from Appendix A of the Leachate Management Plan, image 653M282T, Environment Monitoring Plan and referenced to drawing number WR7544/01/01 in the SWMP.


BH25
STN
Civic
Amenity Site
STN
Site Offices
BH24
Fuel Storage Area
Weighbridge
Wheelwash
Extraction Point
Discharge Point
BHW4
BH23
STN
Leachate Tanks
FID2/DUST2
BH22
STN
BH21
WtE Compound
L36B
L36A
Cell 24B
2019

4.10.2 Impact on existing woodland

The proposed location of the new attenuation pond appears to also engulf a small, linear woodland area parallel to the haul road. Images taken from Agency mapping tools show this concern, highlighted red:



No discussion is included in the SWMP as the impact the attenuation pond will have on this wooded area, nor any proposals for alternative replacement woodland to offset the environmental impact of removal of the woodland to maintain habitat diversity.

4.10.3 Discharge points

Opposing locations of discharge points exist between the SWMP, drawing no. WR7544/01/01 and the LMP, drawing no. 653M282. These have not been discussed within the SWMP which adds to uncertainty around the application to revise the surface water management scheme.

Drawing number WR7544/01/01 cites one consented discharge location to the north-eastern point of Phase I. This appears to be more proximal to site than the upstream discharge location cited on drawing no. 653M282. Furthermore, drawing no. 653M282 has an additional discharge point almost exactly halfway up the proposed attenuation ponds southeastern boundary, which the SWMP does not acknowledge. Therefore it is not clear where the discharges would occur and if they are acceptable locations.

4.11 Metric justifications

Aside from the opposing acreage of the Site different from other application documents, a Standard Percentage Runoff (SPR) value of 47 has been chosen which correlates to a SOIL class of 0.45 (soil type classification). The applicant has referenced this against Wallingford/Flood Studies Report, but not provided any empirical evidence that this soil class is appropriate for Milton. Only an informal comment has been made suggesting that this value is akin to the worse case conditions *of clayey material over an impermeable layer.*

Guidance to support future applications which has a SWMP element to the variation can be found at Surface water management plan technical guidance - GOV.UK (www.gov.uk).

Remaining Accepted Aspects of the Variation Application

The following section details our assessment of the other parts of the application that are not subject to refusal or improvement conditions and have been accepted:

1. To increase the annual tonnages of waste and restoration materials.
2. To surrender small areas of land, which have not been landfilled.

4.12 Increase annual tonnage

The operator requested as part of their application to increase annual waste tonnage from 150,000 of non-hazardous waste per annum to 200,000 tonnes per annum. The increase is requested to allow for earlier completion of operational filling and to meet demand of waste supply in the area. There is no change to the final levels. Completion of earlier operational filling is also cited to have secondary positive effects related to the leachate management following capping.

We can agree that the Restoration Plan submitted, and recent topographic surveys are appropriate for this request to be accepted. This will be updated accordingly in Table S1.4 of the permit. The operator may need to review their gas management plan to ensure any increase in gas volumes can be managed with the current infrastructure.

4.13 Partial surrenders

The operator has requested to surrender two small parcels of part of land. One is to the eastern perimeter of the landfill and the other is to the northern boundary of the landfill.

The partial surrender to the eastern perimeter of the landfill is required to enable improvement works to the adjacent highways (both A10 and A14). Trial pitting has confirmed the area for surrender as not previously subject to waste disposal and we are satisfied the surrender test has been met for surrender.

The area to the north of the landfill, adjacent to the household waste site has also been identified to be partially surrendered. This is sought to allow for extension of the household waste facilities. This area has previously been used to store material over a concrete surface, a low risk surrender has also been confirmed by Compliance Officers.

5.0 Aspects relating to the variation process

The table below explains how we have considered how this application addresses a number of matters that are standard considerations across all applications.

Aspect considered	Decision
Receipt of application	
Confidential information	A claim for commercial or industrial confidentiality has not been made.
Identifying confidential information	We have not identified information provided as part of the application that we consider to be confidential. The decision was taken in accordance with our guidance on confidentiality.
Financial provision	The financial provision arrangements remain in place and continue to satisfy the financial provisions criteria.
Growth Duty	
Section 108 Deregulation Act 2015 – Growth duty	We have considered our duty to have regard to the desirability of promoting economic growth set out in section 108(1) of the Deregulation Act 2015 and the guidance issued under section 110 of that Act in deciding whether to grant this permit. Paragraph 1.3 of the guidance says: “The primary role of regulators, in delivering regulation, is to achieve the regulatory outcomes for which they are responsible. For a number of regulators, these regulatory outcomes include an explicit reference to development or growth. The growth duty establishes economic growth as a factor that all specified regulators should have regard to, alongside the delivery of the protections set out in the relevant legislation.” We have addressed the legislative requirements and environmental standards to be set for this operation in the body of the decision document above. The guidance is clear at paragraph 1.5 that the growth duty does not legitimise non-compliance and its purpose is not to achieve or pursue economic growth at the expense of necessary protections.

Aspect considered	Decision
	We consider the requirements and standards we have set in this permit are reasonable and necessary to avoid a risk of an unacceptable level of pollution. This also promotes growth amongst legitimate operators because the standards applied to the operator are consistent across businesses in this sector and have been set to achieve the required legislative standards.