ELTON 2 RESTORATION ENVIRONMENTAL PERMIT APPLICATION

Environmental Site Setting and Design

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1.0 INTRODUCTION

1.1 Report Context

Ingrebourne Valley Limited (IV) has retained SLR Consulting Limited (SLR) to prepare an Environmental Permit application for the restoration of Elton 2 (the Site), located near Warmington, Northants as a waste recovery operation.

The application seeks authorisation for the permanent deposit of inert waste for the restoration of the Site back to agricultural land following extraction of sand and gravel.

This Environment Setting and Site Design (ESSD) report defines the Site's conceptual model including the potential source, pathway and receptor linkages and provides details on the Site's environmental setting and proposed design. The ESSD is supported by the associated risk assessments submitted in this application.

1.2 Site Details

1.2.1 Site Location and Access

The Site lies to the north of the A605 and the village of Warmington, approximately 17 miles to the south-west of Peterborough at National Grid Reference TL 07175 91938 (based on the restoration area of the Site).

Access is from the A605 to the northeast of the Site, via a track which leads to the separately permitted mineral processing and waste storage area associated with the quarrying and restoration operations for the Elton 2 Site. The Site is accessed from the processing and waste storage area. A haul road and bailey bridge over the River Nene have been constructed within the Site in order to transport mineral and inert waste between the restoration area and the mineral processing and waste storage area.

1.2.2 Site Classification

The permit application is for the recovery of waste on land for the restoration of the Quarry. The permit will therefore be for the following activities:

- R5: Recycling /reclamation of organic materials.

1.2.3 Application Boundaries and Site Security

The Permit Boundary and Site Layout is illustrated in Drawing 02.

The Site will benefit from the following infrastructure to keep the Site secure, and prevent unauthorised access:

- Visitor Sign in/Sign out book located in the site office in the processing area;
- Perimeter fencing/hedging and lockable gates.

1.2.4 Adjacent Former Waste Management Activity Boundaries

A previous development, Elton 1, lies adjacent to the east of the site. Elton 1 has been restored to open water using inert waste under a recovery permit, Reference EPR/CB3201MY, also operated by IV.

1.2.5 Site Context

The Site, prior to development, consisted of agricultural pasture. The restoration area of the Site is surrounded on all sides by the River Nene and adjoining water courses and groundwater level is approximately 0.5 – 1m below the surface. A haul road area adjoins the restoration part of the Site, connected by a bailey bridge over

the river Nene, for the transportation of mineral and restoration materials between the separately permitted processing and waste storage area.

The A605 Peterborough Road lies to the south of the site with the village of Warmington beyond. To the west and north of the site lie areas of predominantly agricultural land. To the east of the site is the Elton 1 reservoir. There are numerous surface water features located within 500m of the Site boundary in all directions.

The nearest residential receptors are in the village of Warmington, located 165m to the south of the site. Water Mill House, located approximately 200m to the south of the site, is the nearest workplace receptor.

The site is crossed by the 'Nene Way' footpath and several other rights of way are located to the south of the site.

There are four local wildlife sites within 2km of the site boundary, the closest of these being Lady Margaret's wood 360m to the east and Eaglethorpe New Lake (the shallows of Elton 1 reservoir) 80m to the east. The River Nene is identified as a habitat for protected species: brown trout, European eel, Bullhead and water vole. In addition, the majority of the site, to the southeast and to the west has been identified as a protected habitat for deciduous woodland and floodplain grazing marsh. An Ecological Management, Restoration and Aftercare Plan for the site will be implemented under the requirements of the planning consent.

There are four scheduled monuments and multiple listed buildings within 2km of the Site, to the northeast, south, southwest and northwest, the nearest being a listed building 140m to the south of the site.

None of the following lie within 2km of the site boundary:

- Site of Scientific Interest (SSSI);
- Special Area of Conservation (SAC);
- RAMSAR;
- Special Protection Areas;
- Ancient woodland;
- Local Nature Reserve (LNR);
- Area of Outstanding Natural Beauty (AONB);
- National Nature Reserve (NNR);
- Registered Parks and Gardens;
- Registered Battlefields; or
- World Heritage Sites.

The site location in shown in Drawing 01 and the nearest receptors are shown on Drawing 03 Environmental Setting & Receptors.

Local Receptors within 500m of the Site are identified in Table 2, along with cultural and ecological receptors within 2km.

Table 1 Environmental Receptors

Receptor Name	Receptor Type	Direction from Site	Approximate Distance from Site Boundary (at nearest point) (m)
Local receptors within 500m of the Environmental Permit Boundary as shown on Drawing 03 Environmental Site Setting and within Appendix ERA1.			

Receptor Name	Receptor Type	Direction from Site	Approximate Distance from Site Boundary (at nearest point) (m)
Protected habitat	Coastal and floodplain grazing marsh	The site	-
River Nene	Surface water feature	All directions	Adjacent
River Nene Protected species (brown trout, eel, eel migratory route, Bullhead and Water Vole)	Protected species	All directions	Adjacent
Public footpaths & bridleways	Local network	North and south	Adjacent
Surface water drains	Surface water feature	North, south and west	20
Agricultural land	Agricultural land	North, south and west	25
Elton 1 reservoir	Surface water feature	East	80
Eaglethorpe New Lake (shallows of Elton 1 reservoir)	Local wildlife site	East	80
A605	Local transport network	South	110
Warmington	Residential	South	165
Water Mill House	Commercial	South	200
Playing field	Recreational	Southeast	275
Commercial properties	Commercial	South	370
Elton 2 processing and waste storage area	Industrial	East	380
Allotment	Allotments	South	490
Cultural and ecological receptors within 2km of the EP boundary as shown in Drawing 03 Environmental Site Setting			
Schedule II Listed Building	Listed Building	Northeast, south, southwest and northwest	140
Schedule II* Listed building	Listed Building	Northeast, south, southwest and northwest	600
Little Green Moated Site	Scheduled Monument	Southeast	600
Schedule I Listed Building	Listed Building	Northeast, south, southwest and northwest	850
Fotheringhay Motte and Bailey Castle	Scheduled Monument	North	1000

Receptor Name	Receptor Type	Direction from Site	Approximate Distance from Site Boundary (at nearest point) (m)
Site of Fotheringhay Priory	Scheduled Monument	North	1300
Earthworks of Abbot Ramsey's Manor	Scheduled Monument	Northeast	1700

2.0 SOURCE

2.1 Site Development

2.1.1 Historical Development

The Site is approximately 20 hectares in size and prior to development consisted mainly of agricultural pasture used for livestock grazing, with a commercial poplar plantation near the eastern boundary. Prior to mineral extraction activities, which commenced in December 2021, the Site has been undeveloped.

2.1.2 Proposed Development

A planning application, reference 19/00033/MINFUL was submitted to Northamptonshire County Council in April 2019 for the 'Phased mineral extraction, construction of a bailey bridge to cross a branch of the River Nene, importation of reclamation material including ancillary activities, with restoration to agricultural pasture and wet woodland'. Planning consent was granted on 31st March 2021.

The planning permission /Section 106 Notice requires that IV restore the Site to original levels post extraction of mineral, for use as agricultural pastureland and woodland. The approved restoration plan is illustrated in Drawing 05 Restoration Scheme.

Approximately 850 – 900,000 tonnes of sand and gravel will be extracted from the Site and the resulting void will be restored using a combination of site-won overburden, silt from the processing of the mineral and imported inert wastes, with a final layer comprising replacement of the site-derived topsoil.

The ground water level in the mineral extraction area is between 0.5 and 1m below the current ground levels. The Site will not be dewatered for mineral extraction or restoration because the hydrological setting would require large volumes of groundwater to be abstracted which would be impractical.

The restoration area of the Site is divided into Eastern, Central and Western areas as shown in Drawing 04 Sequence of Operations. The planning permission requires the phases to be worked sequentially from east to west. The mineral extraction phase commenced in December 2021 and it is anticipated that the Site will be restored by 2030.

The restoration approach is to place in-situ clay overburden to form a side-wall attenuation barrier against the basal clay before the rest of the void in each area is restored using imported inert waste. The barrier material will be end-tipped into water within the void as mineral extraction proceeds. An alternative construction scenario, of placement of a cut-off wall around each phase using specialist techniques such as slurry wall or deep spoil mixing, has also been considered if it should be the case that side slope stability issues are encountered. It is not possible to place a barrier around the entire site to manage groundwater as planning conditions require that only one phase can be worked at a time.

It is recognised that the EA's application determination timescales are currently very lengthy and therefore, should the permit not be issued in time, it is proposed that Phase 1 of the restoration will commence with non-

waste materials comprising in-situ overburden and silt only. This is to mitigate the risk of not meeting the required planning permission timescales.

It is anticipated that up to 550,000m^3 of imported inert waste in total, comprising carefully selected soil and stones from naturally occurring or low contamination sources, will be used for infill at a rate of approximately 75,000m^3 per annum. In addition, the restoration will incorporate approximately 284,340 tonnes of site-won overburden placed either as a side wall barrier or infill, and approximately 75,295 tonnes of silt recovered from the settlement lagoons in the processing area, following washing of the mineral.

Imported inert wastes for restoration will be initially tipped in the separately permitting processing and waste storage area adjacent to the Site. The waste will undergo rigorous waste acceptance checks to ensure that they are chemically and physically suitable for placement as restoration materials. If required, imported inert waste will be screened to separate oversize material which will then be reduced in size using a mobile crushing unit before being used for restoration.

Articulated dump trucks (ADT) will be used to transfer the imported inert wastes to the restoration area of the Site via the haul road and bailey bridge, where they will be placed into water against the natural basal clay and side wall attenuation barrier in each phase.

Once restoration with inert waste has been completed to the required levels, the reserved topsoils will be placed on the surface to return the Site to agricultural use. In addition, a new wet woodland area designed to enhance local biodiversity will be established near the eastern boundary of the Site to replace the poplar plantation which existed before the mineral extraction phase of the development commenced. The restoration and final contours are shown in Drawing 04 Restoration Scheme.

2.1.3 Sequence of Operations

The proposed sequence of operations is as follows:

- A haul road and bailey bridge over the southern arm of the River Nene have been constructed to connect the restoration area to the processing and waste storage site;
- Hydraulic excavators have commenced stripping topsoil and subsoil, which is transported by ADT for storage in the processing area;
- The working of the site will proceed in 3 phases from east to west as illustrated in Drawing 04;
- Dewatering of the site is not practical given the proximity to the River Nene and high groundwater level. Gravel will be extracted ‘wet’ from each area and be transported to the process area for washing;
- Mineral will be extracted down to the clay which underlies the sand and gravel seam. The underlying clay forms a natural geological barrier;
- During extraction of each phase, the clayey overburden will be used to construct an artificial side-wall attenuation barrier against the basal clay to restrict groundwater inflow;
- Imported inert waste will be transported from the processing and waste storage area and placed directly into water within the void;
- If the environmental permit determination is delayed, infilling of the first phase will commence with non-waste consisting of site-won overburden and silt from the mineral washing settlement lagoons;
- Once the imported restoration materials have been placed to the required level, site-derived subsoil and topsoil will be replaced. Subsoil and topsoil will be transported by ADT from stockpiles in the processing and waste storage area and a low ground pressure dozer will be used to spread the material loosely and avoid any compaction. The finished topsoil thickness will depend on the original amount removed but is expected to be 0.2m on average.

2.1.4 Waste Types

It is proposed that only inert waste material that is suitable for its intended use will be used in the restoration of the Site.

The waste categories which will be employed for general fill at the Site are detailed in Table 3 below. These waste types are all included within the list provided by EA's 'Check if your waste is suitable for deposit for recovery' guidance published on go.uk[1].

Strict waste acceptance procedures will be in place at the adjacent, separately permitted processing and waste storage site to ensure that non-conforming waste is not accepted, as described in the Operating Techniques in Section 11 of this application. All waste accepted at the Site will be inert, and no contaminated materials will be accepted. Documentation will accompany all waste material accepted, which will be reviewed in accordance with the Site's waste pre-acceptance and acceptance procedures to ensure any materials used are suitable for use in the restoration operations.

A description of the material acceptance procedures for the restoration of the Site, including basic characterisation and on-Site verification are included in the Operating Techniques in Section 11 of this environmental permit application. These procedures will ensure that only materials that are both chemically and physically suitable for use in the recovery activity will be accepted at the Site.

Table 2 Proposed Waste Types for Infill

European Waste Code	Description
01	WASTES RESULTING FROM EXPLORATION MINING, QUARRYING AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS
01 04	Wastes from physical and chemical processing of non-metalliferous minerals
01 04 08	Waste gravel and crushed rocks other than those containing dangerous substances
01 04 09	Waste sand and clays
17	CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)
17 01	Concrete, bricks, tiles and ceramics
17 01 01	Concrete
17 01 02	Bricks
17 01 03	Tiles and ceramics
17 01 07	Mixtures of concrete, bricks, tiles and ceramics
17 05	Soils Stones and Dredging Soil
17 05 04	Soil and Stones
19	WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE
19 12	Wastes from the mechanical treatment of waste
19 12 09	Minerals (excluding residual fines)

[1] https://www.gov.uk/government/publications/deposit-for-recovery-operators-environmental-permits/check-if-your-waste-is-suitable-for-deposit-for-recovery dated 21 April 2021

European Waste Code	Description
20	MUNICIPAL WASTE (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS
20 02	Garden and Park Wastes
20 02 02	Soil and Stones

The Site will use site-derived subsoils and topsoils for the final restoration to agricultural land.

Suitable in-situ clayey material will be used for engineering purposes.

3.0 PATHWAY AND RECEPTOR

3.1 Geology

Site investigation found top-soils with a thickness of 0.1- 0.2m. The Site is underlain by alluvial deposits, confirmed by site investigations which encountered superficial deposits comprising brown, sandy, silty clay up to approximately 3m thick.

The River Terrace Deposits to be worked underlie the alluvial deposits and also outcrop offsite to the immediate north and east of the site. The site investigations described these as very sandy gravels with infrequent, non-continuous clay bands. The deposits are present beneath the site at thicknesses varying from approximately 3 - 7m.

The regional bedrock geology comprises sandstone, mudstone and limestone strata of the Lias Group which have been exposed by the course of the River Nene. The Lower Lias strata underlying the site itself are overlain by Upper Lias Lincolnshire Limestone approximately 200m south-west of the site and by Upper Lias Rutland Formation mudstone approximately 20m north of the site.

Underlying the base of the eastern and southern parts of the Site, and oldest within the above geological sequence, is the Whitby Mudstone Formation. This stratum is described by the BGS as 'medium, dark-grey, fossiliferous mudstone and siltstone' and is present with thicknesses in excess of 120m.

The Grantham Formation, comprising 'mudstones, sandy mudstones and argillaceous siltstone-sandstone' overlies the Whitby Mudstone Formation and outcrops in the north-western area of the site only.

3.2 Hydrogeology

A detailed description of the hydrogeology of the area is presented in the HRA in Section 7 of the application. The following summary is based on the information presented in that report.

3.2.1 Aquifer Characteristics

The Environment Agency (EA) online mapping service[2] classifies the River Terrace Deposits as a Secondary A Aquifer, described as:

[2] Environment Agency website: What's In My Backyard? (Accessed 12/01/18) http://maps.environment-agency.gov.uk/wiyby/

> *"permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers"*

The Alluvium and Whitby Mudstone Formation are classified as Un-Productive Strata, described as:

> *"rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow"*

The Grantham Formation is classified as a Secondary (Undifferentiated) Aquifer, described as:

> *"rock layers where it has not been possible to attribute either category A or B. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type".*

However, as detailed in the July 2021 SLR memo[3] , site boreholes indicate Grantham Formation lithology immediately underlying the superficials to be clay, hence the Grantham Formation is not considered to be a receptor of concern at the site.

3.2.2 Groundwater Levels and Flow

Groundwater levels are between 0.5 and 1m below the Site surface and the River Terrace Deposits at the Site are fully saturated. Groundwater flow across the Site is broadly towards the east. There will be interaction between the River Nene and groundwater in the Terrace Gravels and potentially through any permeable bands in the alluvial deposits.

3.2.3 Groundwater Quality

Groundwater quality has been monitored at six boreholes around the Site since 2019, generally on a monthly basis. Test results are presented in Table 2-7 of the HRA in section 7 of this application.

Groundwater quality is generally within the relevant UK Drinking Water Standards (DWS), apart from:

- ammoniacal nitrogen concentrations have generally been slightly elevated above DWS at all boreholes, and particularly elevated (typically above 2 mg/l) at upgradient borehole BH01;
- pH values have occasionally fallen below the minimum DWS value of 6.5;
- concentrations of iron and manganese have often exceeded DWS; and
- the above trends may reflect varying redox conditions in the confined River Terrace Deposits.

3.3 Receptors

3.3.1 Abstractions & Source Protection Zone

Online mapping[4] confirms that the proposed development is not located within a groundwater Source Protection Zone (SPZ) and that the only licensed groundwater abstraction within a 2km radius is a catchpit for agricultural use 600m north-west (up-gradient) of the application site.

East Northampton District Council has indicated that there is one private water supply located 3km to the west of the site at NGR: 503792 292313. The private water supply abstracts from a borehole for single domestic use.

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[3] '*Elton 2 – Requirement for Artificial Attenuation Barrier'*, July 2021, SLR Memo Ref: 210721_01526_00029
[4] https://magic.defra.gov.uk and https:/www.arcgis.com/home/webmap

A review of the River Nene catchment abstraction licensing strategy[5] indicates that groundwater in superficial sands and gravels in the area of the site, is available for licensing except where in continuity with surface water, where "Hands Off Level conditions" would apply.

3.3.2 Hydrology

Surface Water in the Vicinity of the Site

Surface water potential receptors at or immediately adjacent to the Site are:

- the River Nene immediately north with a standoff at the northern Site boundary;
- the River Nene Mill Stream immediately west with a standoff at the western Site boundary and tailrace;
- the River Nene Mill Stream overflow channel immediately south with a standoff the southern Site boundary;
- the River Nene Mill Stream tailrace immediately east with a standoff at the eastern Site boundary;
- the small field ditch (formerly connected to the River Nene) crossing the Site from north-west to south-east discharging to the Mill Stream overflow channel; and
- a lake and wetland at the former Elton 1 site, c. 100m to the east across the Mill Stream tailrace.

It is noted that these surface water receptors are likely to be perched on low permeability overburden restricting hydraulic continuity with groundwater in the River Terrace Deposits underlying the Site.

3.3.3 Ecological Sites

A review of MAGIC map confirms that there are no internationally or nationally designated sites within a 2km radius of the site EP boundary, and the only locally designated sites are:

- Tansor Gravel Pits West and East (former landfill) – approximately 1500m to the west of the Site;
- Lady Margaret's Wood – 360m to the east of the Site; and
- Eaglethorpe New Lake (referred to as Elton 1) – adjacent to the east of the Site.

3.3.4 Receptor Locations for Modelling

The primary receptors assumed for the HRA are in accordance with those required by Schedule 22 (Groundwater Activities) of the Environmental Permitting Regulations, 2016, these are as follows:

- for Hazardous Substance the receptor is assumed to be the groundwater within the River Terrace gravel aquifer beneath the Site taking account of immediate dilution in the aquifer[6] but without any dispersion or attenuation in the aquifer pathway; and
- for Non-Hazardous Pollutants the receptor has been assumed to be the groundwater within the River Terrace gravel aquifer at the down-gradient Site boundary (down-gradient boreholes in the gravel).

For the purposes of defining receptors, the compliance points are taken to be at the down-gradient Site boundaries. It is noted that there may be other, physical receptors further away from the down-gradient Site

[5] Environment Agency (March 2021) *Nene Catchment Abstraction Licensing Strategy*
[6] UK Government, *Groundwater Protection Technical Guidance*, Available at: https://www.gov.uk/government/publications/groundwater-protection-technical-guidance/groundwater-protection-technical-guidance (Accessed 22/07/2020)

boundary. Compliance with the Regulations at the points defined above will ensure that other receptors are adequately protected.

3.3.5 Other Relevant Receptors

The Environmental Risk Assessment provided in Section 6 of this application has identified the following potential risks relevant to the proposed operations:

- Odour;
- Noise and Vibration;
- Fugitive Emissions (including dust, mud, litter and pests); and
- Accidents.

The potential receptors that could be affected are identified in Drawing 003 and set out within Table 2 in Section 1.4 of this report. The mitigation measures and significance of these risks are considered in detail in the Environmental Risk Assessment (ERA) in Section 6 of this EP application, and the Dust Management Plan in Section 9 of this EP application.

4.0 POLLUTION CONTROL MEASURES

4.1 Site Engineering

4.1.1 Groundwater Management & Protection System

Groundwater lies between 0.5 – 1m below ground level and it is recognised that the Site setting poses particular challenges for dewatering, given that it is surrounded on all sides by the river Nene. Planning permission requires that the Site is worked sequentially, with the first phase substantially restored before the second is worked. This precludes an option to install an impermeable barrier around the whole Site ahead of operations. Therefore, because of the large volumes of pumping that would be required, dewatering is not proposed for the Site and materials will be placed directly into water.

To minimise disturbance to groundwater during operations, the backfill material will be carefully placed into water. The excavator will carry out this process until the excavation is 1m from the final level, prior to replacement of the final soil and topsoil layers. The daily operations will proceed with extraction in the mornings and infill in the afternoons, with the void water levels allowed to reach equilibrium overnight.

4.1.2 Basal and Side Slope Attenuation Barriers

As the Site is a recovery operation, there is no mandatory requirement for basal and sidewall geological barriers. However, it is proposed that a side-wall attenuation barrier will be constructed around each phase by placing site-won clay overburden around the void as mineral extraction proceeds, prior to infill with imported inert materials. The Site is underlain by clays of the Grantham and Whitby Mudstone formations which according to British Geological Survey are over 100m thick and which will form a natural basal geological barrier.

Sufficient barrier material will be placed in order to achieve permeability equivalent to 1m at 1 x 10^{-7} m/s. The majority of the barrier material will be placed sub-aqueously. To ensure this occurs in a safe and controlled manner, IVL's excavations and tips rules shall be developed to accord with the design and site conditions and will be instigated on site. These rules will ensure that only essential earth moving plant operate in the vicinity of the active tipping point and that plant can enter and exit the active area in a safe manner for the duration of the works. The rules will include, but not be limited to, the following:

- Sands and gravel extraction shall extend the full depth to the underlying clay of the Grantham Formation;
- Site derived clay and silts will be transported and tipped from dump trucks at the edge of the excavated trench following aggregate extraction using a long reach excavator; and
- Materials will be pushed carefully into the water by tracked earth moving plant (dozer or long-reach excavator).

The construction of the sidewall attenuation barrier is conceptually illustrated on Drawing 06 – Site Design - Engineering.

A stability risk assessment (SRA) has been carried out for the Site and is presented in Section 10 of this application. The SRA concludes that the scheme satisfies the relevant factors of safety.

In case any concerns with stability are encountered as the development proceeds, an additional engineering scenario has also been considered. The alternative scenario is to construct a low permeability cut-off wall using geotechnical specialist techniques e.g. bentonite or deep soil mixing, prior to mineral extraction and infill.

The cut-off wall would be designed and installed by specialist contractors to meet the recommended performance criteria and would be keyed into the underlying clay of the Grantham Formation.

The slurry would have a maximum permeability of less than or equal to 1m thickness at 1 x 10^{-7}m/s, so that it meets the attenuation requirements. It may be possible to reduce the thickness if the permeability is decreased, provided equivalency with the above specification is achieved. Site batched grout will be introduced into the trench by pumping at a pre-determined flow rate. A schematic of the construction method is shown on Drawing 6.

Material Characterisation Testing

All material used in the geological barrier construction will be site-won and will not require testing.

Construction Quality Assurance

A Construction Quality Assurance (CQA) plan for the construction of the engineered attenuation layer will be prepared in advance of operations and will be submitted to the Environment Agency in advance of construction.

Capping

The Site will be brought to level with the imported inert fill and then finished with site-won sub-soils and top-soils. Given the inert nature of the materials employed, it is not considered that there is a requirement for an engineered cap.

4.2 Restoration

The Site will be restored back to its original levels and pre-development use as agricultural pastureland. The proposed restoration also includes an area of wet woodland in the eastern section of the site, which would replace the commercial poplar plantation which was felled for the development and create an enhanced environment compared with pre-development.

4.3 Water management

4.3.1 Groundwater Management

The HRA identified that in compliance with Schedule 22 (Groundwater Activities) of the Environmental Permitting Regulations 2016, the proposed development poses a potential hazard to ground and surface water quality. The proposed construction and installed technical precautions will prevent the discernible discharge of any Hazardous Substances and limit the introduction of any Non-Hazardous Substances to ground water during the

Site's lifecycle. The essential and technical precautions identified as part of the HRA to manage these risks are as follows;

- The wastes to be accepted to the Site will meet inert WAC limits;
- A risk-based programme of groundwater and surface water monitoring and the implementation of control levels and compliance limits have been outlined.

Groundwater monitoring data shows that the groundwater levels are between 0.5 and 1m below the Site surface and the River Terrace Deposits at the Site are fully saturated. Groundwater flow across the Site is broadly towards the east. There will be interaction between the River Nene and groundwater in the Terrace Gravels and potentially through any permeable bands in the alluvial deposits.

The Site will not be dewatered because of the volumes which would be involved, but it is proposed to construct an artificial attenuation barrier around each phase above the basal clay, by placing in-situ clayey overburden into the void as mineral extraction proceeds.

4.3.2 Surface Water Management

The risk of any impact from the Site on water quality in the River Nene is considered to be relatively low due to the intervening low permeability overburden on which the Rive Nene is likely to be perched, plus the relatively high flows in the Nene. Furthermore, the location of the groundwater monitoring wells means that these provide early identification of any release which could impact the surface water down-gradient of the Site.

4.3.3 Leachate Generation, Management & Monitoring

Waste accepted on Site will only be inert in nature and will not pose a leachate risk to surrounding groundwater. Therefore, the Site does not require a management system for leachate prevention including artificial sealing liner, leachate management or any other engineering/management structures.

4.4 Gas Generation and Management

As the waste proposed to be accepted on Site is inert, there will be little to no significant quantity of landfill gas generated. In addition, groundwater lies between 0.5 and 1m below ground level; therefore the majority of the waste mass will be saturated and present no pathway for gas generation to occur. Accordingly, it is considered that landfill gas management is not necessary for the restoration.

4.5 Post Closure Controls

The land will be restored to pre-development levels for use as agricultural pastureland. Following the restoration, the land will be subject to a 5-year aftercare plan under the planning consent to achieve the required ecological and agricultural objectives.

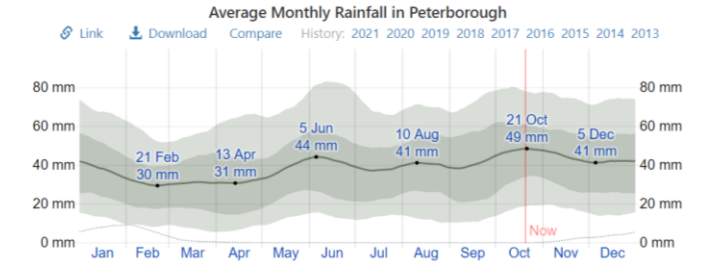
The Site will continue to be monitored in accordance with the conditions of the EP following restoration. The permit will be surrendered once conditions are completed and the Site monitoring confirms there is no longer potential to cause damage to or deterioration of the environment and risk to human health.

5.0 Monitoring

5.1 Weather

Precipitation data was taken from an online source[7] which uses data from NASA's MERRA-2 Modern-Era Retrospective Analysis. Average rainfall is displayed below, centred on Peterborough, calculated over a sliding 31-day period centred around each day of the year. Additionally, the 25th & 75th and 10th and 90th percentile bands are displayed.

Highest average rainfall is in October, while lowest average rainfall is in February.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	38.4mm	30.3mm	31.2mm	30.8mm	38.6mm	43.0mm	37.5mm	40.9mm	40.0mm	48.2mm	44.6mm	42.4mm

Wind speed and direction data from the meteorological observation station at Wittering meteorological station located 12km to the north of the Site, is considered to be broadly representative of the local Site conditions. A wind rose for Wittering is presented in Figure 1.

Figure 1 indicates that the prevailing wind direction is from the west and southwest. Winds from the north and east are relatively infrequent. On this basis, the locations in the east and northeast have the highest potential for impacts from any dust emissions originating from the Site.

[7] Weatherspark.com – accessed October 2021

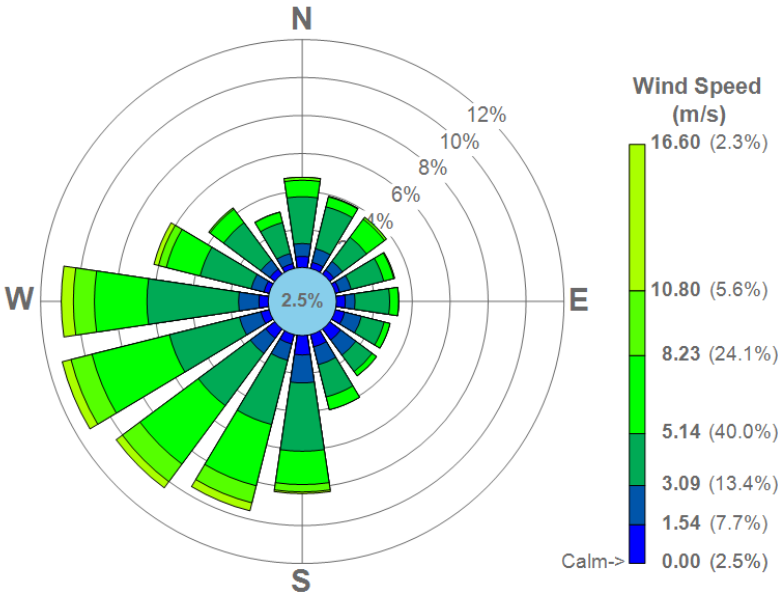


Figure 1 Windrose from Wittering Meteorological Station (2019)

5.2 Gas Monitoring

Monthly methane and carbon dioxide concentrations have been measured in 6 perimeter boreholes since May 2019. The data confirm that the background concentrations of methane and carbon dioxide are not significant. Methane concentration has been measured as zero at all locations during this period. The maximum concentration of carbon dioxide measured in this period is 1%. A summary of the gas monitoring data is provided in Table 4 below.

Table 4

Gas Monitoring Data Summary (May 2019 – July 2021)

Borehole Ref.	Unit	Count	Methane (CH4)			Carbon Dioxide (CO2)		
			Min.	Average	Max.	Min.	Average	Max.
AIR[1]	%	18	0	0	0	0	0.09	0.1
BH01[2]	%	16	0	0	0	0.3	0.47	1
BH02[3]	%	17	0	0	0	0.1	0.29	0.6
BH03[3]	%	17	0	0	0	0.5	0.78	1
BH04B[3]	%	17	0	0	0	0.1	0.34	0.6
BH05[4]	%	15	0	0	0	0.1	0.33	0.6
BH06[3]	%	17	0	0	0	0.1	0.41	0.9

[1] No borehole was sampled from November 2020 to March 2021 due to COVID-19

[2] No borehole was sample in November 2019 to April 2020 or from November 2020 to March 2021

[3] No borehole data was sampled in November 2019, January 2020 to April 2020 or November 2020 to March 2021

[4] No borehole data was sampled from November 2019 to April 2020 or between October 2020 and March 2021

The waste types which will be deposited at the Elton 2 Site are inert and non-reactive and will therefore not generate significant quantities of gas. In addition, groundwater lies between 0.5 and 1m below ground level; therefore, the majority of the waste mass will be saturated and present no pathway for gas generation to occur.

Given the foregoing, it is considered that the Site poses little risk of gas emissions. It is therefore proposed to carry out perimeter gas monitoring at quarterly intervals during operation of the site. As there will be no, or minimal, unsaturated zone within the waste infill, it is considered that in-waste gas monitoring boreholes would not provide meaningful data and therefore none are proposed for the Site.

5.3 Surface water

The risk of any impact from the Site on water quality in the River Nene is considered to be relatively low due to the intervening low permeability overburden on which the Rive Nene is likely to be perched, plus the relatively high flows in the Nene. Furthermore, the location of the groundwater monitoring wells means that these provide early identification of any release which could impact the surface water down-gradient of the Site. However, as an additional precaution it is also considered to monitor surface water at quarterly intervals at the upstream and downstream ends of the Mill Stream at locations SWA and SWB shown on Drawing HRA1.

5.4 Groundwater

The monitoring of groundwater quality around the perimeter of the Site will be carried out using the existing network of monitoring boreholes.

In keeping with inert landfill guidance, it is proposed that ongoing groundwater level and quality monitoring is undertaken from at least one up-gradient and two down-gradient boreholes within the River Terrace Deposits sand and gravel aquifer.

Groundwater level monitoring indicates that groundwater flow broadly towards the east across the Site. It is therefore proposed that the following Site boreholes are used for groundwater quality monitoring purposes going forward:

- Up-Gradient: BH1
- Cross-Gradient: BH5
- Down-Gradient: BH3 and BH4

The proposed monitoring schedule is outlined in Table 6 below, and monitoring locations are shown on Drawing HRA1.

Table 6 Proposed Groundwater Monitoring Schedule

Groundwater Monitoring Locations	Monitoring Frequency	Measurement and Analytical Suite
Up-gradient: BH1 Cross-gradient: BH5 Down-gradient: BH3, BH4	Quarterly	Groundwater level (mAOD), electrical conductivity, chloride, ammoniacal nitrogen, pH, fluoride, nickel, sulphate, lead, arsenic, zinc.
	Annual	Total alkalinity, magnesium, potassium, calcium, sodium, chromium, copper, iron, selenium, manganese, cyanide, mercury, BTEX (benzene, toluene, ethylbenzene & xylene), acenaphthene, benzo(a)pyrene, total PAHs, Aromatic C10-C12, well base (mAOD).
Note: all metals to be analysed as filtered/dissolved		

6.0 Site condition report

A Site Condition Report (SCR) is only necessary for a site/area of a site where waste is not being permanently deposited. Therefore, a SCR has been completed for the land which lies between the processing area and the bailey bridge connecting the haul road to the restoration area. The SCR is included in section 8 of the EP application.

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