Alne Materials Recycling Facility, Forest Lane, Alne, York, YO61 1TU

Flood Risk Assessment

For Allium Organics

KRS.0031.002.R.001.A

September 2019

www.krsenvironmental.com

CONTACT DETAILS

Registered Office:
KRS Environmental Ltd
3 Princes Square
Princes Street
Montgomery
Powys
SY15 6PZ

Tel: 01686 668957
Mob: 07857 264 376

Email: keelan@krsenvironmental.com
Web: www.krsenvironmental.com
LinkedIn: uk.linkedin.com/in/keelanserjeant/

Office also at:
KRS Environmental Ltd
The Media Centre
Northumberland Street
Huddersfield
West Yorkshire
HD1 1RL

Tel: 01484 437420
Mob: 07857 264 376

Alne Materials Recycling Facility, Forest Lane, Alne, York, YO61 1TU

Project	Flood Risk Assessment
Client	Allium Organics
Status	Final
Prepared by	Keelan Serjeant BSc (Hons), MSc
Date	September 2019

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EXECUTIVE SUMMARY

The proposed development would be expected to remain dry in all but the most extreme conditions. The consequences of flooding are acceptable, and the development would be in accordance with the requirements of the NPPF.

This FRA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of the NPPF. The development should not therefore be precluded on the grounds of flood risk.

1.0 INTRODUCTION

1.1 Background

This Flood Risk Assessment (FRA) has been prepared by KRS Environmental Limited at the request of Allium Organics to support a planning application for the proposed development at the former Landfill Site at Alne Materials Recycling Facility, Forest Lane, Alne, York, YO61 1TU.

This FRA has been carried out in accordance with guidance contained in the National Planning Policy Framework (NPPF)[1] and associated Planning Practice Guidance[2]. This FRA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

It is recognised that developments which are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. The development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues.

1.2 National Planning Policy Framework (NPPF)

One of the key aims of the NPPF is to ensure that flood risk is taken into account at all stages of the planning process; to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk.

It advises that where new development is exceptionally necessary in areas of higher risk, this should be safe, without increasing flood risk elsewhere, and where possible, reduce flood risk overall. A risk based approach is adopted at stages of the planning process, applying a source pathway receptor model to planning and flood risk. To demonstrate this, an FRA is required and should include:

- whether a proposed development is likely to be affected by current or future flooding from all source;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- if necessary, provide the evidence to the Local Planning Authority (LPA) that the Sequential Test can be applied; and
- whether the development will be safe and pass part c) of the Exception Test if this is appropriate.

1.3 Report Structure

This FRA has the following report structure:

- Section 2 describes the location area and the existing and proposed development;

[1] Ministry of Housing, Communities and Local Government (2019) National Planning Policy Framework.
[2] Communities and Local Government (2014) Planning Practice Guidance - Flood Risk and Coastal Change.

- Section 3 outlines the flood risk posed to the existing and proposed development;
- Section 4 details the proposed surface water drainage for the site and assesses the potential impacts of the proposed development on surface water drainage;
- Section 5 details the sequential and exception tests; and
- Section 6 presents a summary and conclusions.

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2.0 LOCATION & DEVELOPMENT DESCRIPTION

2.1 Site Location

The site is located at the Alne Materials Recycling Facility, Forest lane, Alne, York, YO61 1TU (see Figure 1). The National Grid Reference (NGR) of the site is 452001, 466251.

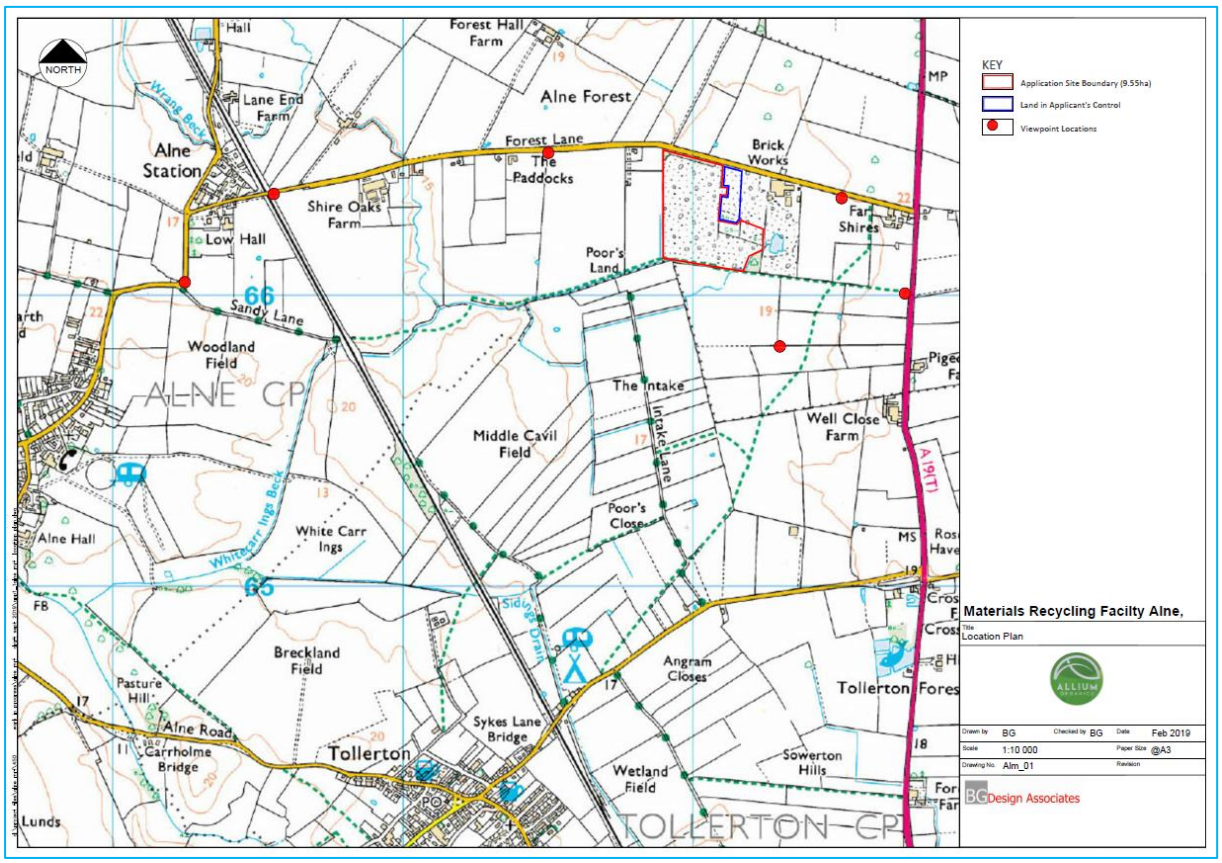


Figure 1 - Site Location

2.2 Existing Development

The site currently comprises a former landfill site with an area of approximately 9.88 hectares (ha). The site is surrounded by agricultural fields to the north and south. Immediately to the west of the site is Forest Lane Fisheries, a series of lakes and open water operating as a coarse fishing venue. Immediately to the east of the site is an existing brickworks. The top of the landfill mound lies approximately 12 to 15m above site levels and has been constructed with side slopes with gradients of approximately 1 in 3 which extend to the site boundary.

2.3 Proposed Development

The planning application is for engineering works to stabilise the former landfill site including the importation and blending of soil making material, erection of retaining wall and capping of the former landfill site to provide a growing medium for coppice. Appendix 1 shows the proposed restoration scheme.

The site would be progressively restored in 2 principal phases with each phase taking approximately 12 months to complete. Restoration would be carried out restoring the tip profile from north to south before continuing east systematically working out of the site. The land-take required for infilling purposes at any one time would be the minimum necessary to complete the works programme.

Further details with regard to the proposed development can be found in the accompanying information submitted with the planning application.

2.4 Ground Levels

The application site boundary ground levels range between approximately 17-18 metres Above Ordnance Datum (mAOD). The engineered landfill cell within the site rises to a maximum height of approximately 33.50mAOD.

2.5 Catchment Hydrology / Drainage

The site is located within an area of low rainfall. The average annual rainfall recorded by the Meteorological Office for a rain gauge at Easingwold (NGR SE 528 692) approximately 3km to the north of the site is 625mm.

A drainage ditch flows through the south eastern corner of the site, flowing from north east to south west. Surface waters within the ditch flow to the south west and combine with other drainage ditches which flow around the boundaries of the site. The ditches discharge off the site to the west and then continue westwards along field drainage ditches before discharging into the Whitecarr Ings Beck approximately 1.20km to the west of the site.

The ditches are bounded by steep sided well vegetated banks with a water level of approximately 1.00m below the surrounding ground level with water depths of less than 0.25m. Flow within the ditches is likely to be almost entirely derived from surface water runoff rather than groundwater.

Whitecarr Ings Beck flows to the south west combining with other watercourses to form the River Kyle which then flows south eventually discharging into the River Ouse approximately 6km to the south west of the site. The typology of the local watercourses is low (altitude <200m, small (catchment <10km^2) and calcareous geology in accordance with the Water Framework Directive (WFD).

2.6 Geology

The British Geological Survey (BGS) Map indicates that the site is underlain by superficial deposits across the site typically consisting of the Alne Glaciolacustrine Formation - clay, silty. Superficial deposits formed up to 2 million years ago in the Quaternary Period in a local environment previously dominated by ice age conditions

The BGS Map indicates that the bedrock deposits at the site are underlain by the Mercia Mudstone Group - mudstone. Sedimentary bedrock formed approximately 201 to 252 million years ago in the Triassic Period in a local environment previously dominated by hot deserts

2.7 Groundwater

The Environment Agency has designated the solid geology underlying the site as a Secondary B Aquifer – Predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

The superficial deposits are designated as Unproductive Strata - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow. The site is not located within an Environment Agency Source Protection Zone.

2.8 Soil

Information from the National Soil Resource Institute[3] details the site area as being situated on slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soil with impeded drainage. Impeded drainage refers to soils with a tight, compact deep subsoil that impedes downward water movement; after heavy rainfall, particularly during the winter, the subsoil becomes waterlogged.

The Flood Studies Report WRAP soil map classification is Type 2: i) Very permeable soils with shallow groundwater; ii) Permeable soils over rock or fragipan commonly on slopes in western Britain associated with smaller areas of less permeable wet soils; and iii) Moderately permeable soils, some with slowly permeable subsoils.

2.9 Permeability / Infiltration Rate

In determining the future surface runoff from the site, the potential of using infiltration devices has been considered. As no site geotechnical information on the permeability and infiltration rate at the site has been acquired at this stage it is not possible to comment definitively upon the suitability of infiltration based systems. However, an overview of the general ground conditions may be used to gauge if there is potential for their application.

The general ground conditions suggest that the permeability and infiltration rate of the site will be low. Whilst this should ideally be confirmed by a site investigation into the hydrogeology of the site, the ground conditions suggest infiltration techniques such as soakaways may not provide a suitable option at the site.

[3] https://www.landis.org.uk/soilscapes/

3.0 FLOOD RISK

3.1 Sources of Flooding

All sources of flooding have been considered, these are; fluvial (river) flooding, tidal (coastal) flooding, groundwater flooding, surface water (pluvial) flooding, sewer flooding and flooding from artificial drainage systems/infrastructure failure.

3.2 Environment Agency Data

The Environment Agency is responsible for the protection of the water environment. Information regarding the current flood risk at the site, local watercourses local flood defences, water levels and water quality has been obtained from the Environment Agency.

3.3 Hambleton District Council

Hambleton District Council is the Local Planning Authority (LPA). Planning guidance written by Hambleton District Council regarding flood risk was consulted to assess the mitigation policies in place. These documents included the Local Development Framework and the Local Plan. The Hambleton District Council Strategic Flood Risk Assessment (SFRA) which covers the site has been reviewed.

3.4 North Yorkshire County Council

North Yorkshire County Council is the Lead Local Flood Authority (LLFA) and has responsibilities for 'local flood risk', which includes surface runoff, groundwater and ordinary watercourses. The North Yorkshire County Council Preliminary Flood Risk Assessment (PFRA) which covers the site has been reviewed.

3.5 Swale and Ure Internal Drainage Boards (IDB)

It is understood that the Swale and Ure IDB maintains the complex network of pumped drainage channels within this area via the Shire Group of Internal Drainage Boards. Information on the flood risk posed by these drainage channels has been reviewed.

3.6 Yorkshire Water

Yorkshire Water is responsible for the disposal of wastewater and supply of clean for this area. Information with regards to sewer and water main flooding contained within the Hambleton District Council SFRA and the North Yorkshire County Council PFRA has been consulted as part of this FRA. All Water Companies have a statutory obligation to maintain a register of properties/areas which are at risk of flooding.

3.7 Historic Flooding

There are no records of anecdotal information of flooding at the site. The British Hydrological Society "Chronology of British Hydrological Event[4]" has no information on flooding within the vicinity of the site. No other historical records of flooding for the site have been recorded.

Data from the BGS indicates that the types of deposits in the locality of the site are of the type not associated with floodplains. Therefore, it has been concluded that the site has not flooded in the last thousand years.

[4] http://www.dundee.ac.uk/geography/cbhe/

3.8 Existing and Planned Flood Defence Measures

The Environment Agency flood map confirms that there are no flood defences measures which protect the site from flooding (see Figure 2).

3.9 Environment Agency Flood Zones

A review of the Environment Agency's Flood Zones indicates that the site is located within Flood Zone 1 and therefore has a 'low probability' of fluvial flooding as shown in Figure 2, with less than 1 in 1000 annual probability of river flooding in any year (<0.1%).

The Flood Zones are the current best information on the extent of the extremes of flooding from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development.

The Environment Agency Flood Zones and acceptable development types are explained in Table 1. Table 1 shows that all development types are generally acceptable in Flood Zone 1.

In the Planning Practice Guidance to the NPPF appropriate uses have been identified for the Flood Zones. Applying the Flood Risk Vulnerability Classification in the Planning Practice Guidance to the NPPF, the proposed development is classified as 'less vulnerable'. Table 2 of this report and the Planning Practice Guidance to the NPPF state that 'less vulnerable' uses are appropriate within Flood Zone 1 after the completion of a satisfactory FRA.

Figure 2 - Environment Agency Flood Zones

Table 1 Environment Agency Flood Zones and Appropriate Land Use

Flood Zone	Probability	Explanation	Appropriate Land Use
Zone 1	Low	Less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)	All development types generally acceptable
Zone 2	Medium	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% 0.1%) in any year	Most development type are generally acceptable
Zone 3a	High	A 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year	Some development types not acceptable
Zone 3b	'Functional Floodplain'	Land where water has to be flow or be stored in times of flood. SFRAs should identify this zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1% flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes)	Some development types not acceptable

Table 2 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	×	Exception test required	✓
Zone 3b 'Functional Floodplain'	Exception test required	✓	×	×	×

Key: *✓: Development is appropriate, ×: Development should not be permitted.*

3.10 Climate Change

Projections of future climate change, in the UK, indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within the NPPF recommends that the effects of climate change are incorporated into FRA's. Recommended precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the flood risk assessments: climate change allowances guidance[5]. As per Environment Agency guidance, the anticipated lifetime of the development is deemed to be 60 years.

Table 3 shows peak river flow allowances by river basin district. The flood risk assessments: climate change allowances guidance recommends that for 'less vulnerable' uses in Flood Zone 1 that the

[5] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#high-allowances.

central allowances are used. Therefore, the design flood level for the site is the 1 in 100 year (+20%) event water level.

Table 3 - Peak River Flow Allowances by River Basin District (use 1961 to 1990 baseline)

River basin district	Allowance category	2015 to 2039	2040 to 2059	2060 to 2119
Humber	Upper end	+20%	+30%	+50%
	High central	+15%	+20%	+30%
	Central	+10%	+15%	+20%

3.11 Fluvial (river) Flooding

The drainage ditches within the vicinity of the site may pose a fluvial flood risk. The ditches are bounded by steep sided well vegetated banks with a water level of approximately 1.00m below the surrounding ground level with water depths of less than 0.25m. Flow within the ditches is likely to be almost entirely derived from surface water runoff rather than groundwater.

Flood risk to the site from the ditches can be considered to be limited, since the majority of the ditches are located on the boundaries of the site. Any overbank flow would follow the contours of the surrounding area rather than flowing towards the site.

The flood risk can also be considered to be limited due to the difference in elevations. The ground levels of the site are located approximately 1.00m above the normal water level of the ditches. Modelled water levels for the ditches are not available. The site will not be inundated with floodwater for all events up to and including the 1 in 1000 year event. The site will be flood free during the 1 in 100 year (+20%) and 1 in 1000 year events. Given the scale and nature of the proposed development and the size and location of the ditches it has been concluded that the ditches pose a negligible flood risk to the site. Therefore, the risk of flooding from the ditches is considered to be of **low significance**.

3.12 Tidal (coastal) Flooding

The site is not located within the vicinity of tidal flooding sources and the risk of tidal flooding is considered to be **not significant**.

3.13 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers).

Site conditions suggest a low probability of groundwater flooding. There, are no BGS flooding susceptibility areas within the 50m of the boundary of the site. Groundwater was encountered in the existing boreholes as seepages at the interface between the Glacial Lake Clay and Glacial Till at depths between 6.00m and 9.00m deep however, groundwater monitoring has indicated a piezometric surface at a depth of 1.20 to 2.00m below ground level. The risk of flooding from fluvial flooding is considered to be of **low significance**.

3.14 Surface Water (pluvial) Flooding

The site is not situated near to large areas of poor permeability however; the soil conditions at the site and within the vicinity of the site indicate that the site may be at risk of surface water flooding.

Surface water flooding tends to occur sporadically in both location and time such surface water would tend to be confined to the streets around the development.

Site conditions suggest a low probability of surface water flooding with low runoff potential. The Environment Agency Surface Water flood map shows that the majority of the site has a very low risk of surface water flooding (see Figure 3) with a chance of flooding of less than 1 in 1000 years.

A small proportion of the site adjacent to the drainage ditches and where small depressions are situated have a low to high risk of surface water flooding with a chance of flooding of 1 in 1000 years to greater than 1 in 30 years. This may result in low water depths of 300 - 900mm and low water velocities of less than 0.25m/s. These areas cover a very small proportion of the site.

A surface water bund of approximately 500m in height will be constructed around the internal flank of the site to collect surface water and attenuate surface water runoff. Surface water will then be directed to the existing drainage ditch. The risk of flooding from surface water flooding is considered to be of **low significance**.

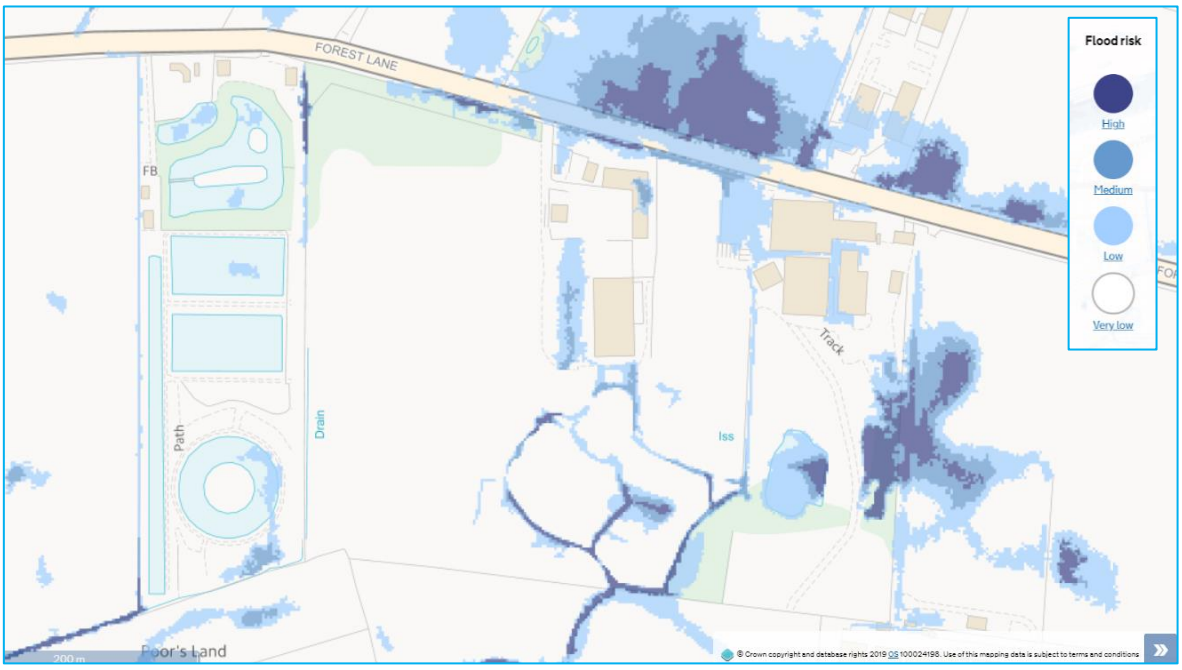


Figure 3 - Environment Agency Surface Water Flood Map

3.15 Sewer Flooding

Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system is too great to be handled. Sewer flooding tends to occur sporadically in both location and time such flood flows would tend to be confined to the streets around the development.

There are no existing sewers located within the vicinity of the site. Therefore, the risk of flooding from sewer flooding is considered to be **not significant**.

3.16 Flooding from Artificial Drainage Systems/Infrastructure Failure

There are no nearby artificial water bodies, water channels and artificial drainage systems that could be considered a flood risk to the site. The Environment Agency Reservoir flood map shows that the

site is not at risk of reservoir flooding (see Figure 4). The risk of flooding from artificial drainage systems/infrastructure failure is considered to be **not significant**.

Figure 4 - Environment Agency Reservoir Flood Map

3.17 Effect of the Development on Flood Risk

The site is located within Flood Zone 1, the proposed development will have no impact on the movement of floodwater across the site. The overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed. There will be no increase in the floodwater levels due to the proposed development.

3.18 Summary of Site Specific Flood Risk Assessment

A summary of the sources of flooding and a review of the risk posed by each source at the site is shown in Table 4.

The site is not at risk of flooding from a major source (e.g. fluvial and/or tidal), the site has a 'low probability' of fluvial flooding as the site is located within Flood Zone 1 with less than a 1 in 1000 annual probability of river or sea flooding in any year (<0.1%). The site will not be inundated with floodwater for all events up to and including the 1 in 1000 year event. The site will be flood free during the 1 in 100 year (+20%) and 1 in 1000 year events. Therefore, the risk of fluvial flooding is considered to be of **low significance**. A secondary flooding source has been identified which may pose a **low significant** risk to the site. This is:

- Surface Water Flooding

The flooding source will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the proposed development site.

There will no net loss in flood storage capacity or impact on movement of floodwater across the site. The overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed.

The proposed use of the site is 'less vulnerable', 'less vulnerable' uses are appropriate within Flood Zone 1 after the completion of a satisfactory FRA. In conclusion, the flood risk to the site can be considered to be limited; the site is situated in Flood Zone 1, with a low annual probability of flooding and from all sources. The site is unlikely to flood except in very extreme conditions.

Table 4 - Risk Posed by Flooding Sources

Sources of Flooding	Potential Flood Risk	Potential Source	Probability/Significance
Fluvial Flooding	Yes	Drainage Ditches	Low
Tidal Flooding	No	None Reported	None
Groundwater Flooding	No	None Reported	None
Surface Water Flooding	Yes	Depressions	Low
Sewer Flooding	No	None Reported	None
Flooding from Artificial Drainage Systems/Infrastructure Failure	No	None Reported	None

4.0 SURFACE WATER DRAINAGE

4.1 Surface Water Management Overview

It is recognised that consideration of flood issues should not be confined to the floodplain. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. For example, replacing vegetated areas with roofs, roads and other paved areas can increase both the total and the peak flow of surface water runoff from the development site. Changes of land use on previously developed land can also have significant downstream impacts where the existing drainage system may not have sufficient capacity for the additional drainage.

An assessment of the surface water runoff rates has been undertaken, in order to determine the surface water options and attenuation requirements for the site. The assessment considers the impact of the development compared to current conditions. Therefore, the surface water attenuation requirement for the developed site can be determined and reviewed against existing arrangements.

The requirement for managing surface water runoff from developments depends on the pre-developed nature of the site. If it is an undeveloped greenfield site, then the impact of the development will need to be mitigated so that the runoff from the site replicates the natural drainage characteristics of the pre-developed site. In the case of brownfield sites, drainage proposals will be measured against the existing performance of the site, although it is preferable for solutions to provide runoff characteristics that are similar to greenfield behaviour.

The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the proposed development, unless specific off-site arrangements are made and result in the same net effect.

It should be acknowledged that the satisfactory collection, control and discharge of surface water runoff are now a principle planning and design consideration. This is reflected in recently implemented guidance as well as the new Defra non-statutory technical standards for SuDS.

4.2 Climate Change

Projections of future climate change, in the UK, indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within the NPPF recommends that the effects of climate change are incorporated into Flood Risk Assessments. Recommended precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the associated Planning Practice Guidance to the NPPF[6].

The recommended national precautionary sensitivity range for peak rainfall intensity are summarised in Table 5.

Table 5 - Peak Rainfall Intensity Allowance in Small and Urban Catchment (use 1961 to 1990 baseline)

Parameter	2010 to 2039	2040 to 2059	2060 to 2115
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

[6] Communities and Local Government (2014) Planning Practice Guidance - Flood Risk and Coastal Change.

4.3 Opportunities for Discharge of Surface Water

There are three possible options to discharge the surface water runoff in accordance with requirement H3 of the Building Regulations, this hierarchy is also promoted within the NPPF. Rainwater shall discharge to one of the following, listed in order of priority:

- an adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable,
- a watercourse; or where that is not reasonably practicable,
- a sewer.

It is necessary to identify the most appropriate method of controlling and discharging surface water. The design should seek to improve the local runoff profile by using systems that can either attenuate runoff and reduce peak flow rates or positively impact on the existing surface water runoff.

4.3.1 Soakaway/Infiltration System

The general ground conditions suggest that the permeability and infiltration rate of the site will be low. Whilst this should ideally be confirmed by a site investigation into the hydrogeology of the site, the ground conditions suggest infiltration techniques such as soakaways may not provide a suitable option at the site.

If an infiltration system is proposed, it is recommended that a series of infiltration/soakaway tests are carried out on site to BRE Digest 365 Guidelines to confirm the assumptions made in the calculations. Such work is beyond the scope of this FRA, but should be undertaken to inform the detailed drainage strategy for the site.

4.3.2 Watercourse

Should infiltration be found to be unsuitable, the next option is discharge to a watercourse. A number of drainage ditches are located within the vicinity of the site. Therefore, discharge to a watercourse will be possible.

4.3.3 Sewer

In the event that discharge of surface water via infiltration or discharge to a watercourse is deemed unsuitable, then discharge to the public sewer may be possible. It should be confirmed with Yorkshire Water if they have the capacity to accept any discharge of surface water from the site. If so, it may be possible to discharge to the public sewers after attenuating the surface water on site.

4.4 Surface Water Runoff Rates

An estimation of surface water runoff is required to permit effective site surface water management and prevent any increase in flood risk to off-site receptors. In accordance with The SuDS Manual, the Greenfield runoff from the site has been calculated using the IoH124 method. Table 6 shows the IoH 124 method Greenfield runoff rates for the proposed impermeable area of 9.88ha (see Appendix 4). QBAR has been calculated to be 16.08 litres/second (l/s).

The method used for calculating the runoff complies with the NPPF, as well as the new Defra non-statutory technical standards for SuDS. No change to the existing impermeable areas are proposed. The proposed development will have the same impermeable areas as the existing development thus no increase in impermeable areas is anticipated. Therefore, surface water runoff will not increase

post-application compared to pre-application and there will be no increase in surface water flood risk to the site and off-site locations.

Table 6 - IoH124 method Greenfield Runoff Rates

Rainfall Event	Runoff Rate (l/s)
1	13.67
QBAR (rural)	16.08
30	27.02
100	33.77

4.5 Surface Water Drainage Strategy

Following placement, the soil would be cultivated and drilled. The early establishment of a grass sward is essential as it would stabilise the soils and encourage soil improvement through plant rooting.

As works progress, a surface water bund of approximately 500mm in height would be constructed around the internal flank of the site to collect surface water. Surface water would then be directed to the existing drainage ditch. The inclusion of this feature would ensure that surface water runoff is ameliorated, preventing the loss of soils and inundation of the adjacent concrete pad.

The requirement for the bund was outlined in a stability risk assessment prepared for the Environment Agency when they had control of the site. Details of the surface water bund are shown in Appendix 1. The bund will be used to prevent sediment laden runoff entering the groundwater/surface water, adjacent agricultural land and prevent an increase in flood risk due to surface water runoff. The amount of exposed ground surface will be kept to a minimum.

In adopting these principles it has been demonstrated that a scheme can be developed that does not increase the risk of flooding to adjacent properties and development further downstream.

5.0 SEQUENTIAL APPROACH

5.1 Sequential and Exception Tests

The risk-based Sequential Test in accordance with the NPPF aims to steer new development to areas at the lowest probability of flooding (i.e. Flood Zone 1). The site is located within Flood Zone 1 with a 'low probability' of flooding, with less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%). Therefore, the Sequential and Exception Tests will not need to be undertaken as part of this planning application.

6.0 SUMMARY AND CONCLUSIONS

6.1 Introduction

This report presents a Flood Risk Assessment for the proposed development at the former Landfill Site at Alne, Forest Lane, Alne, York, YO61 1TU.

6.2 Flood Risk

The site is not at risk of flooding from a major source (e.g. fluvial and/or tidal), the site has a 'low probability' of fluvial flooding as the site is located within Flood Zone 1 with less than a 1 in 1000 annual probability of river or sea flooding in any year (<0.1%). The site will not be inundated with floodwater for all events up to and including the 1 in 1000 year event. The site will be flood free during the 1 in 100 year (+20%) and 1 in 1000 year events. Therefore, the risk of fluvial flooding is considered to be of **low significance**. A secondary flooding source has been identified which may pose a **low significant** risk to the site. This is:

- Surface Water Flooding

The flooding source will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the proposed development site.

There will no net loss in flood storage capacity or impact on movement of floodwater across the site. The overall direction of the movement of water will be maintained within the developed site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed.

The proposed use of the site is 'less vulnerable', 'less vulnerable' uses are appropriate within Flood Zone 1 after the completion of a satisfactory FRA. In conclusion, the flood risk to the site can be considered to be limited; the site is situated in Flood Zone 1, with a low annual probability of flooding and from all sources. The site is unlikely to flood except in very extreme conditions.

6.3 Surface Water Drainage Strategy

Following placement, the soil would be cultivated and drilled. The early establishment of a grass sward is essential as it would stabilise the soils and encourage soil improvement through plant rooting.

As works progress, a surface water bund of approximately 500mm in height would be constructed around the internal flank of the site to collect surface water. Surface water would then be directed to the existing drainage ditch. The inclusion of this feature would ensure that surface water runoff is ameliorated, preventing the loss of soils and inundation of the adjacent concrete pad.

The bund will be used to prevent sediment laden runoff entering the groundwater/surface water, adjacent agricultural land and prevent an increase in flood risk due to surface water runoff. The amount of exposed ground surface will be kept to a minimum.

In adopting these principles it has been demonstrated that a scheme can be developed that does not increase the risk of flooding to adjacent properties and development further downstream.

6.4 Sequential Approach

The site is located within Flood Zone 1 with a 'low probability' of flooding, with less than 1 in 1000 annual probability of river flooding in any year (<0.1%). Therefore, the Sequential and Exception Tests will not need to be undertaken as part of this planning application.

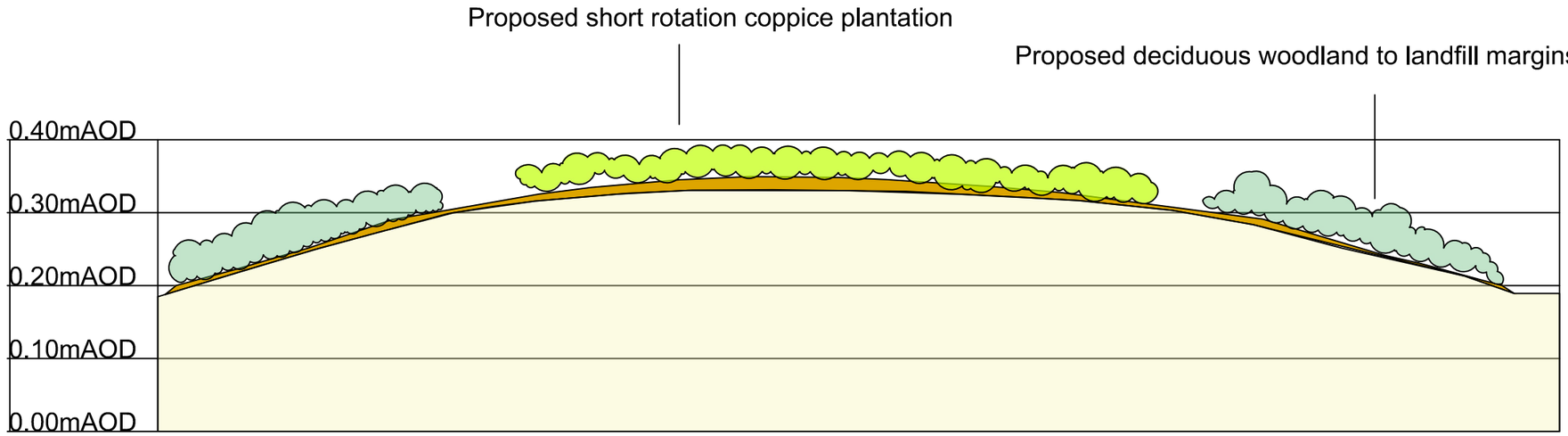
6.5 Conclusion

In conclusion, the proposed development would be expected to remain dry in all but the most extreme conditions. The consequences of flooding are acceptable, and the development would be in accordance with the requirements of the NPPF.

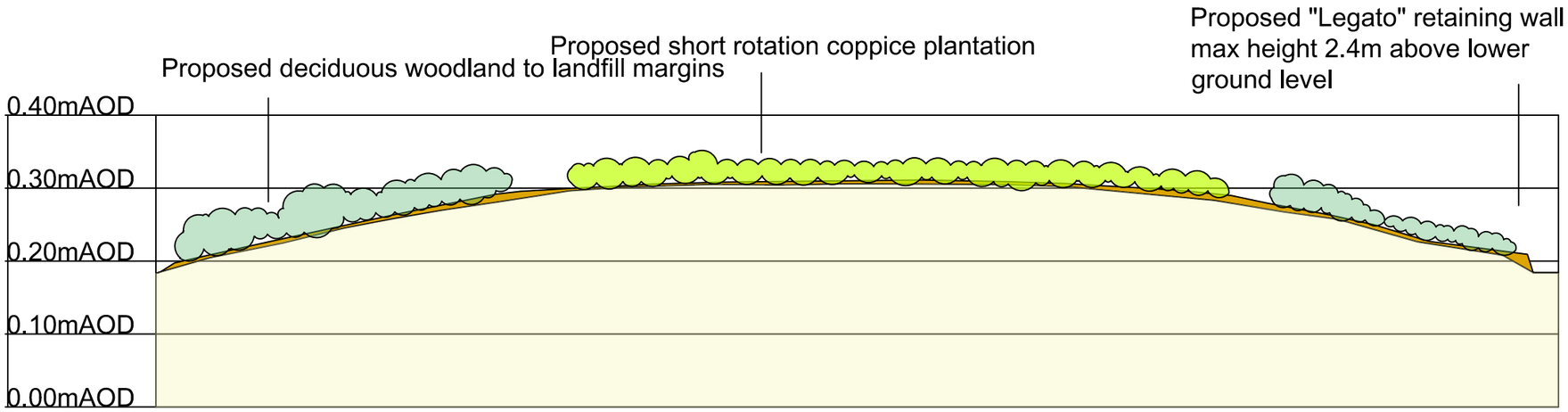
This FRA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of the NPPF. The development should not therefore be precluded on the grounds of flood risk.

APPENDICES

APPENDIX 1 – Planning Application Drawings



Section A-A



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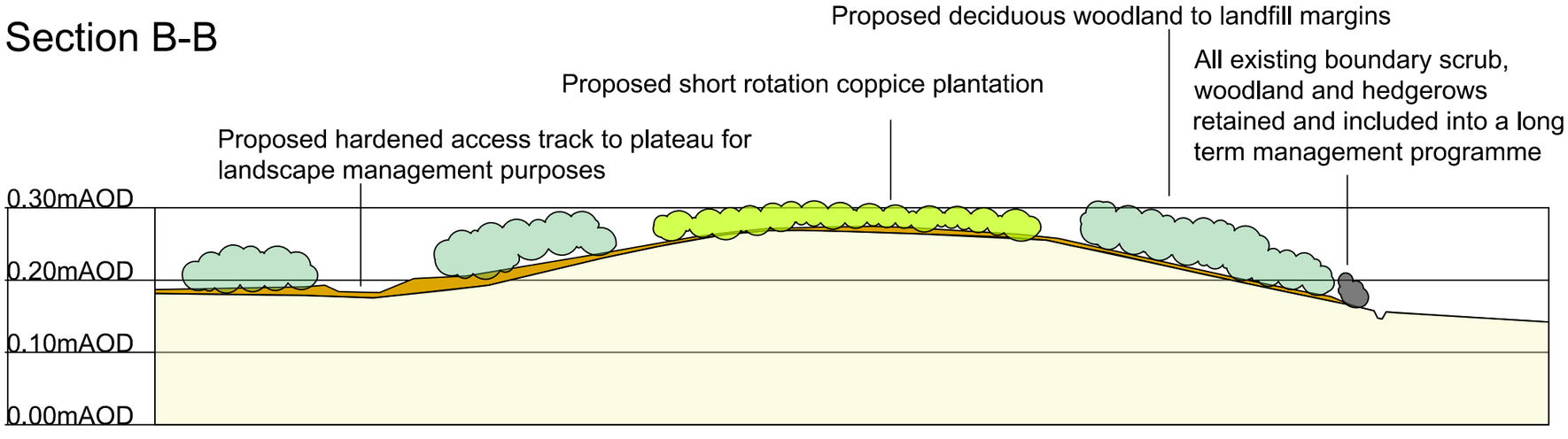

Section C-C

Materials Recycling Facility Forest Lane Alne York

Title
Restoration Cross sections

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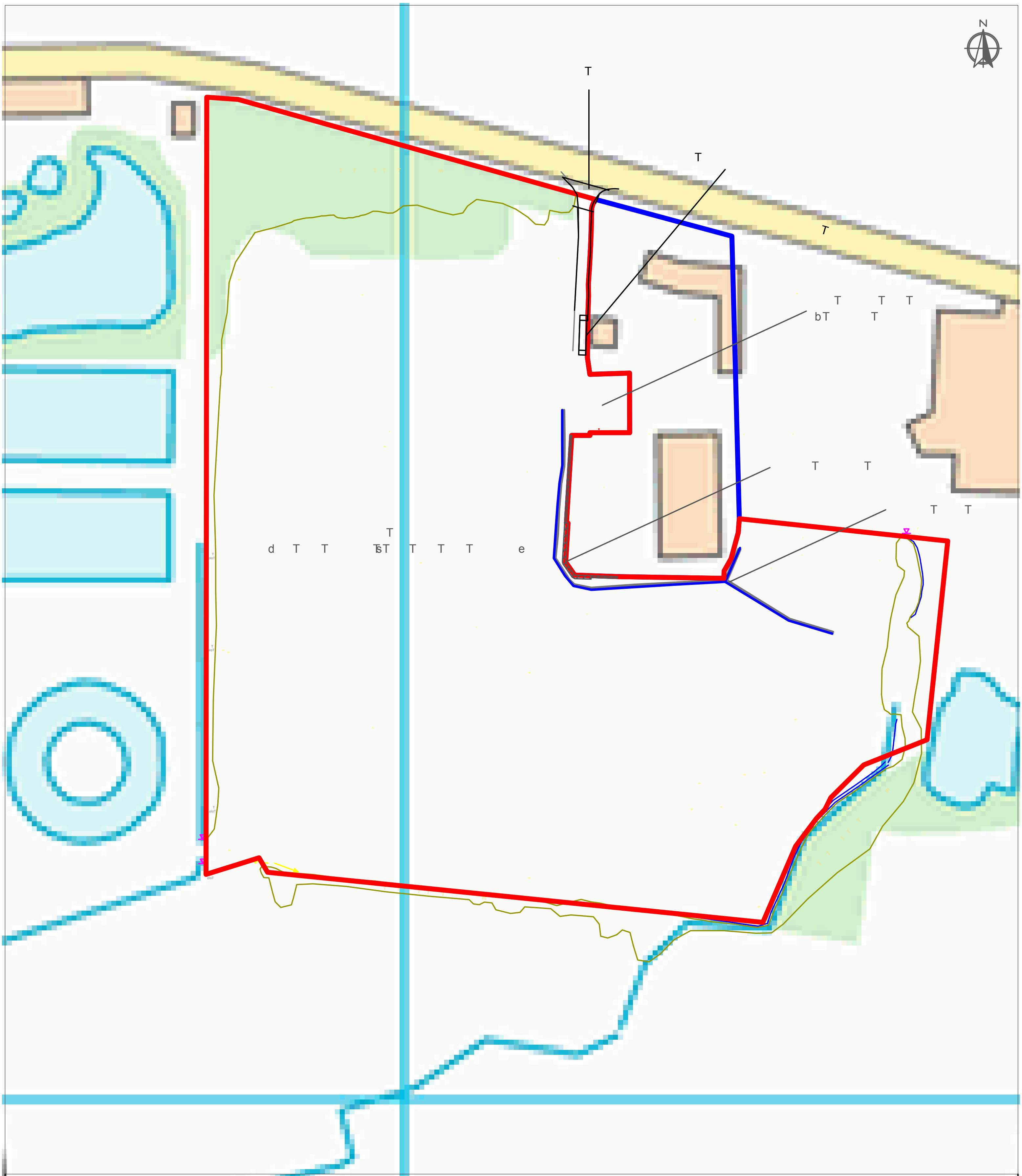

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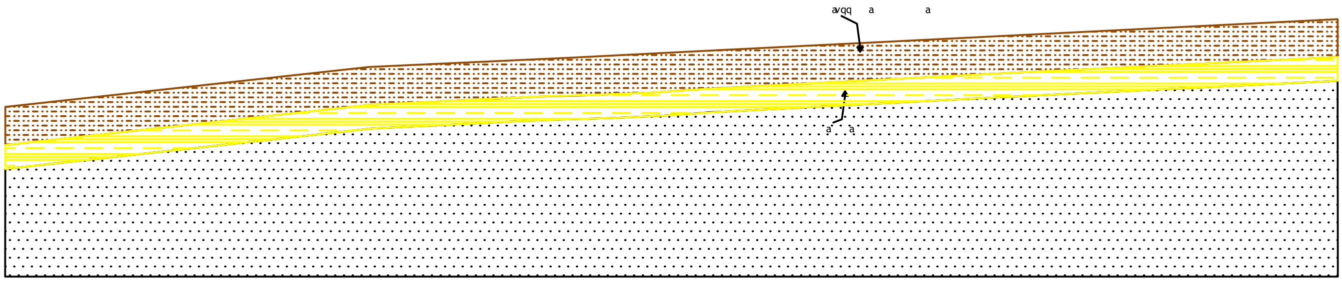

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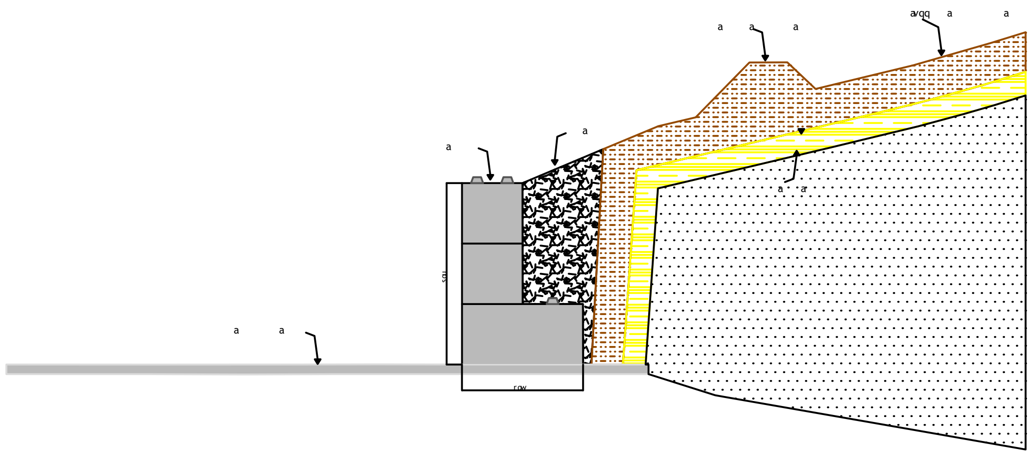

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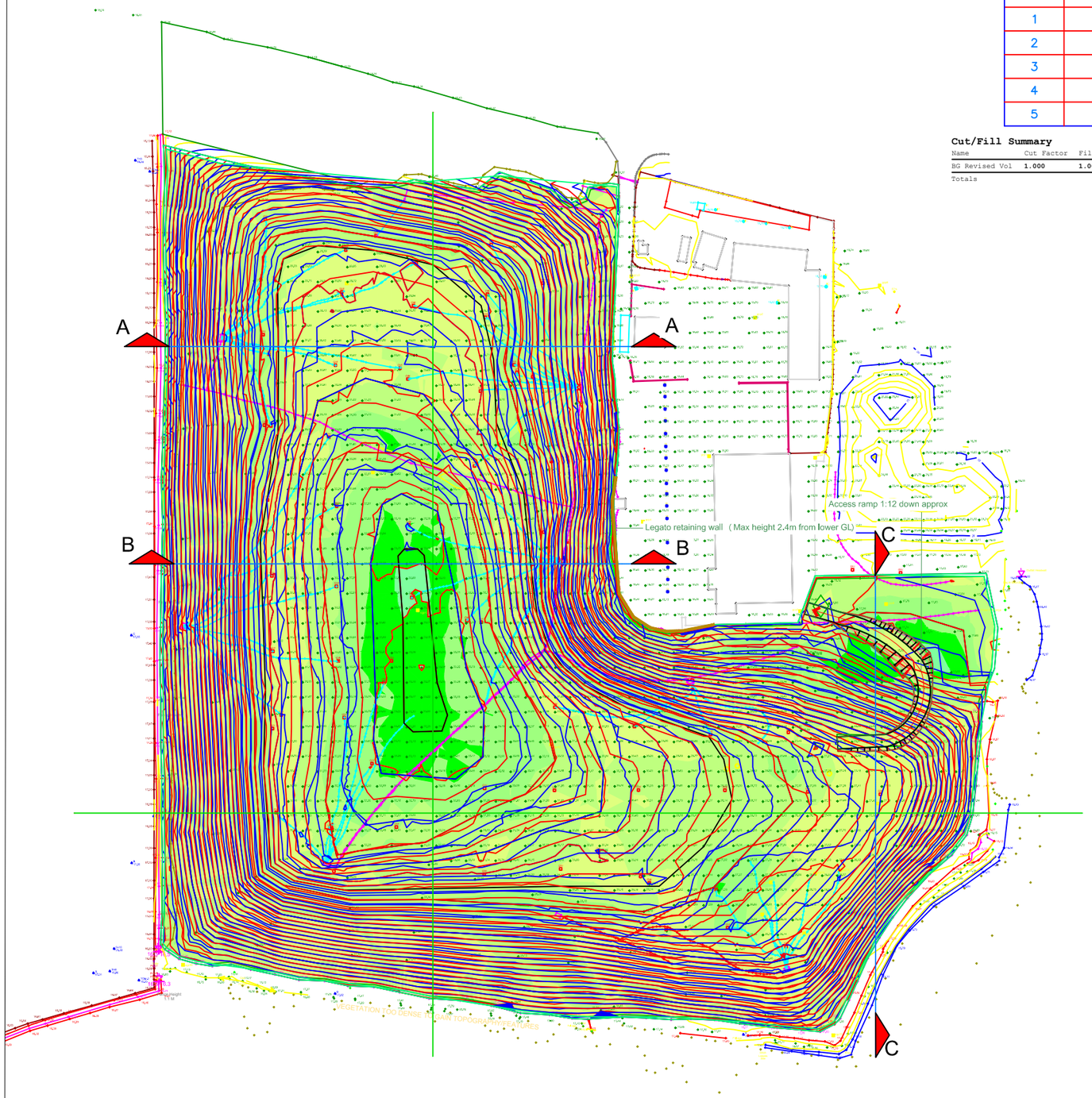

Elevations Table				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	0.00	0.50	34666.95	
2	0.50	1.00	34542.31	
3	1.00	1.50	11384.91	
4	1.50	2.00	3861.16	
5	2.00	2.50	327.00	

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
BG Revised Vol	1.000	1.000	84795.01sq.m	736.41 Cu. M.	56336.70 Cu. M.	55600.28 Cu. M.<Fill>
Totals			84795.01sq.m	736.41 Cu. M.	56336.70 Cu. M.	55600.28 Cu. M.<Fill>

SOILSVOLUMES SUMMARY

Final overall soil profile, to a depth of 0.5metres, would consist of 20% Compost-Like Output (CLO) amounting to 8.400 m3 with the remaining 33,600m3 consisting of subsoil materials.
Below 0.5m to a maximum depth of 2.0m would consist of subsoil infill amounting to 15,000m3
Overall volume of imported materials, including CLO, would therefore be circa 57,000m3

KEY

- Final profile grass seeded prior to deciduous woodland and coppice planting
- Proposed contours@1metre intervals
- Proposed contours @ 0.5 metre intervals
- Proposed cross sections

Note: The site will be progressively restored using imported topsoils and Compost Like Output (CLO) prior to seeding and planting with both permanent mixed deciduous woodland on the landfill site margins and short rotation coppice within the central plateau area.
Landfill site boundaries which include existing woodland, scrub and hedgerows will be assessed and incorporated into an overall Landscape and Environmental Management Programme (LEMP).

Materials Recycling Facility Alne

Final Restoration Profiles: Imported Soil Making Materials and Compost Like Output Volumes (CLO)

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Date : 11.09.2019	AL ###_##-#

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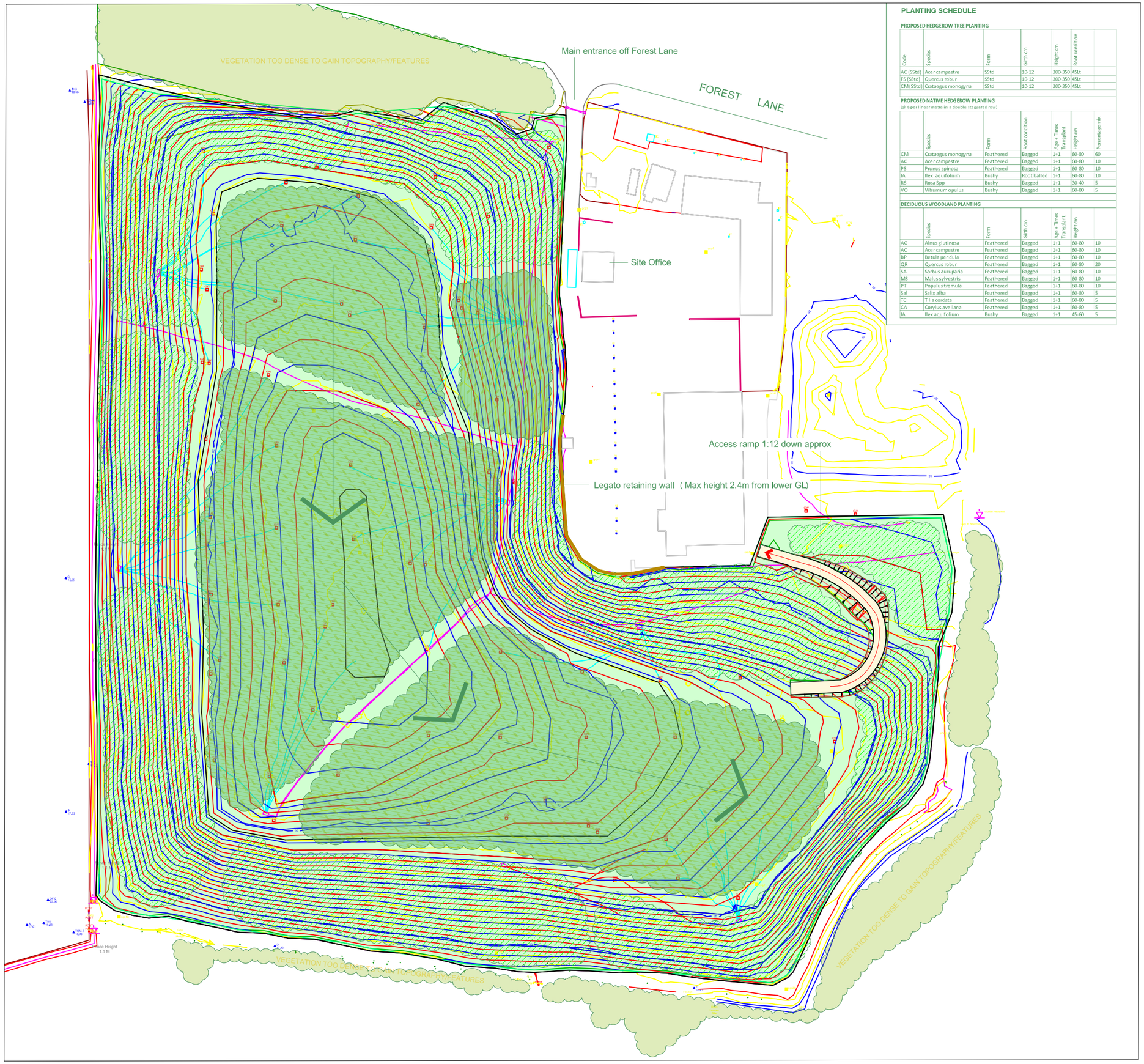

PLANTING SCHEDULE

PROPOSED HEDGEROW TREE PLANTING

Code	Species	Form	Girth cm	Height cm	Root condition	
AC (SStd)	Acer campestre	SStd	10-12	300-350	45Lt	
FS (SStd)	Quercus robur	SStd	10-12	300-350	45Lt	
CM (SStd)	Crataegus monogyna	SStd	10-12	300-350	45Lt	

PROPOSED NATIVE HEDGEROW PLANTING
(@ 6 per linear metre in a double staggered row)

	Species	Form	Root condition	Age + Times Transplant	Height cm	Percentage mix
CM	Crataegus monogyna	Feathered	Bagged	1+1	60-80	60
AC	Acer campestre	Feathered	Bagged	1+1	60-80	10
PS	Prunus spinosa	Feathered	Bagged	1+1	60-80	10
IA	Ilex aquifolium	Bushy	Root balled	1+1	60-80	10
RS	Rosa Spp	Bushy	Bagged	1+1	30-40	5
VO	Viburnum opulus	Bushy	Bagged	1+1	60-80	5

DECIDUOUS WOODLAND PLANTING

	Species	Form	Girth cm	Age + Times Transplant	Height cm	
AG	Alnus glutinosa	Feathered	Bagged	1+1	60-80	10
AC	Acer campestre	Feathered	Bagged	1+1	60-80	10
BP	Betula pendula	Feathered	Bagged	1+1	60-80	10
QR	Quercus robur	Feathered	Bagged	1+1	60-80	20
SA	Sorbus aucuparia	Feathered	Bagged	1+1	60-80	10
MS	Malus sylvestris	Feathered	Bagged	1+1	60-80	10
PT	Populus tremula	Feathered	Bagged	1+1	60-80	10
Sal	Salix alba	Feathered	Bagged	1+1	60-80	5
TC	Tilia cordata	Feathered	Bagged	1+1	60-80	5
CA	Corylus avellana	Feathered	Bagged	1+1	60-80	5
IA	Ilex aquifolium	Bushy	Bagged	1+1	45-60	5

KEY

- Existing Woodland and hedgerows
- Proposed deciduous woodland
- Proposed short rotation coppice
- Christmas tree plantation
- Grassed woodland glades
- Proposed contours@1metre intervals
- Proposed contours @ 0.5 metre intervals
- General direction of topsoil/ CLO infilling/restoration

Note: The site will be progressively restored using imported topsoils and Compost Like Output prior to seeding and planting with both permanent mixed deciduous woodland on the landfill site margins and short rotation coppice within the central plateau area.
Landfill site boundaries which include existing woodland, scrub and hedgerows will be assessed and incorporated into an overall Landscape and Environmental Management Programme (LEMP).

Materials Recycling Facility Alne

Proposed Restoration and Direction of Working

Drawn by : BG	Checked by : ##
Date : 11.09.2019	AL ###_##-#

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APPENDIX 2 – IoH 124 Method Calculations

KRS Environmental Limited.
www.krsenvironmental.com

3 Princes Square, Princes Street,
Montgomery
Powys, SY15 6PZ
Tel: 01686 668957 Mob: 07857 264 376
email: keelan@krsenvironmental.com

MasterDrain
HY 11.0

Job No.			
Sheet no.	1		
Date	01/10/19		
Project	Alne Materials Recycling Facility	By	Checked / Reviewed
Title	IoH 124 Method Calculations		

Hydrological Data:-

FSR Hydrology:-

Location = EASINGWOLD
M5-60 (mm) = 18.7
Soil runoff = 0.30
WRAP = 2
Hydrological area = 3

Grid reference = SE5269
r = 0.38
SAAR (mm/yr) = 640
Area = England & Wales
Hydrological zone = 8

Soil classification for WRAP type 2
i) Very permeable soils with shallow ground water;
ii) Permeable soils over rock or fragipan, commonly on slopes in western Britain associated with smaller areas of less permeable wet soils; (fragipan - a natural subsurface horizon having a higher bulk density than the solum above. Seemingly cemented when dry but showing moderate to weak brittleness when moist. The layer is low in organic matter, mottled and slowly or very slowly permeable to water. It is found in profiles of either cultivated or virgin soils but not in calcareous material).
iii) Moderately permeable soils, some with slowly permeable subsoils.

Design data:-

Area = 0.098 Km^2 - 9.8 Ha - 98000 m^2

Calculation method:-

Runoff is calculated from:-

$$Q_{BAR(rural)} = 0.00108\ AREA^{0.89}\ .\ SAAR^{1.17}\ .\ SOIL^{2.17}$$

where

AREA = Site area in Km^2
SAAR = Standard Average Annual Rainfall (mm/yr)
SOIL = Soil value derived from Winter Rainfall Acceptance Potential
$Q_{BAR(rural)}$ = Runoff (cumecs)

$Q_{BAR(rural)}$ is then multiplied by a growth factor - GC(T) - for different storm return periods derived from EA publication W5-074/A.

Calculated data:-

For areas less than 50Ha, a modified calculation which multiplies the 50Ha runoff value by the ratio of the site area to 50Ha is used
Reducing factor used for these calculations is 0.196

Mean Annual Peak Flow $Q_{BAR(rural)}$ = 16.08 l/s

KRS Environmental Limited.
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3 Princes Square, Princes Street,
Montgomery
Powys, SY15 6PZ
Tel: 01686 668957 Mob: 07857 264 376
email: keelan@krsenvironmental.com

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Job No.	
Sheet no.	2
Date	01/10/19
Project	Alne Materials Recycling Facility
Title	IoH 124 Method Calculations

By	Checked	Reviewed

Values for $Q_{BAR(rural)}$

Ret. per.	m³/hr	l/s	l/s/ha	Ret. per.	m³/hr	l/s	l/s/ha
1yr	49.212	13.670	1.395	100yr+20%	145.898	40.527	4.135
2yr	54.422	15.117	1.543	100yr+30%	158.056	43.905	4.480
5yr	70.054	19.460	1.986	100yr+40%	170.214	47.282	4.825
10yr	83.949	23.319	2.380	200yr	138.951	38.597	3.939
30yr	97.265	27.018	2.757	200yr + 30%	180.636	50.177	5.120
50yr	110.003	30.556	3.118	500yr	158.056	43.905	4.480
100yr	121.582	33.773	3.446	1000yr	176.004	48.890	4.989

Growth factors -

1yr	2yr	5yr	10yr	30yr	50yr	100yr	200yr	500yr	1000yr
0.85	0.94	1.21	1.45	1.68	1.90	2.10	2.40	2.73	3.04

The above is based on the Institute of Hydrology Report 124
to which you are referred for further details (see Sect 7).
Note that the 200 and above year growth curves were taken from W5-074.

KRS Environmental Ltd

Mob: 07857 264 376

Tel: 01484 684565

Email: keelan@krsenvironmental.com

Web: www.krsenvironmental.com