Augean SOUTH LTD

# PRELIMINARY ENVIRONMENTAL INFORMATION REPORT

## FOR THE PROPOSED DEVELOPMENT CONSENT ORDER APPLICATION FOR THE ALTERATION AND CONSTRUCTION OF HAZARDOUS WASTE AND LOW LEVEL RADIOACTIVE WASTE FACILITIES AT THE EAST NORTHANTS RESOURCE MANAGEMENT FACILITY, STAMFORD ROAD, NORTHAMPTONSHIRE

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## Executive Summary

**ES1**. Augean South Ltd (Augean) is the operator of the East Northants Resource Management Facility (ENRMF) in Northamptonshire. The ENRMF site is an established operational landfill site which accepts hazardous waste and low level radioactive waste (LLW). The site also includes an established waste treatment and recovery facility.

**ES2.** The facilities at ENRMF are an acknowledged part of the nationally significant infrastructure for the management of hazardous waste and LLW and as such it serves more than just a local need. The site receives wastes generated primarily in the centre and south of the UK. The need for specialist facilities to serve these areas of the country will continue beyond the duration of the current consent which extends to 2026.

**ES3.** In order to secure continuity of its operations beyond 2026, Augean is proposing to submit an application for a new Development Consent Order (DCO) for an extension in the area and timescales for the operation of the site including an extension to the west of the existing site and increasing the throughput of the waste treatment and recovery facility. This document is provided to inform a consultation process before the application is finalised and submitted. It is anticipated that the application for the DCO will be submitted in late Spring 2021.

**ES4.** Augean is a leader in the specialist waste management sector. The company delivers a broad range of services across many nationally critical areas for the safe and sustainable management of waste. The company specialises in the management of the UK's more difficult to manage wastes including hazardous waste and low level radioactive waste.

**ES5.** The proposed development comprises a western extension to the site. The proposal includes the construction of new landfill void to the west of the currently consented hazardous waste and low level radioactive waste landfill

area and the alteration of the restoration profile and the timescale for completion of the existing landfill site in order to integrate the final landscape of the existing site with the western extension. The application includes an increase in the consented throughput of waste to the waste treatment and recovery facility and an increase in the total waste input rate to the site. In order to construct the western extension void it will be necessary to win and work minerals including the extraction of soils, overburden and clay. The soils and some clay will be retained on site for use in site restoration and the construction of the low permeability engineered liner and capping layers. The remaining materials will be exported off site. The application includes the alteration of the operational period of the current site activities and the western extension to approximately 2046.

**ES6.** An Environmental Impact Assessment of the likely significant environmental effects associated with the proposed development will be undertaken and reported in an Environmental Statement. The application for a Development Consent Order will be accompanied by the Environmental Statement.

**ES7**. In this document the main elements of the proposed development are set out in general terms with accompanying plans, together with the details of the environmental information that is available for review at this stage in the development of the design and the environmental studies. This document provides a summary of the work undertaken to date with respect to the environmental baseline at and in the vicinity of the application boundary together with a preliminary assessment of impacts that may result from the proposed development. The opinions of the statutory consultees and the local community are sought on the information and assessments included within this report.

**ES8.** In the relevant sections of this report the options and alternatives that have been considered during the development of the current extension proposals are explained. This includes assessment of the suitability of the site location and

the identification of the constraints which affect and lead to the choices that have been made with respect to the design of the proposed operations, the containment engineering design, the restoration profile hence the void generated, the operational and management proposals and the design of the restored site. The design parameters which are fixed at this stage are identified in the relevant sections of the report as are those which are subject to further refinement and where options are still being considered.

**ES9.** The proposals for pre-application submission consultation on the proposed development and the environmental information available to date are set out in a Statement of Community Consultation. The statutory consultation will take place between 26 October and 14 December 2020.

# 1 Introduction and purpose of this report

**1.1** Augean South Ltd (Augean) operates the East Northants Resource Management Facility (ENRMF) in Northamptonshire (Figures 1.1 and 1.2). The ENRMF site has a long history of mineral and waste development and is an established hazardous waste and low level radioactive waste (LLW) landfill site together with an established waste treatment and recovery facility.

**1.2** Augean is a leader in the specialist waste management sector. The company delivers a broad range of services across many nationally critical areas for the safe and sustainable management of waste. The company specialises in the management of the UK's more difficult to manage wastes including low level radioactive waste. The company seeks to apply the waste hierarchy to enable recycling, recovery and reuse wherever possible for these more challenging waste types. Where waste must be disposed of Augean treats the waste where practicable to reduce the polluting potential before landfill disposal.

**1.3** The facilities at ENRMF are an acknowledged part of the nationally significant infrastructure for the management of hazardous waste and LLW and as such it serves more than just a local need. The site receives wastes generated primarily in the centre and south of the UK. The need for specialist facilities to serve these areas of the country will continue beyond the duration of the current consent which extends to 2026.

**1.4** In order to secure continuity of its operations beyond 2026, Augean is proposing to submit an application for a new Development Consent Order (DCO) for an extension in the area and timescales for the operation of the site including an extension to the west of the existing site and increasing the throughput of the waste treatment and recovery facility. This document is part of a number of documents which are being provided to inform a consultation process before the application is finalised and submitted. It is anticipated that the application for the DCO will be finalised and submitted in late Spring 2021.

**1.5** The overarching purpose of the DCO application and the proposed development is to continue to meet that established need beyond the consented life of the current site. It is important that the proposals satisfy all relevant legal, policy and regulatory considerations and that they make sure that people and the environment are properly protected in the short, medium and long term. The proposals also must be commercially viable and provide business security.

**1.6** Augean is carrying out an Environmental Impact Assessment of the proposal. As part of the pre-application consultation this Preliminary Environmental Information Report has been prepared to explain the potentially significant impacts and benefits of the proposed development. The purpose of this consultation is to seek views on this information from the local community as well as prescribed statutory consultees. The PEIR presents the environmental information collected to date and provides an initial assessment of the likely significant environmental effects. Once the assessment work is complete Augean will submit an Environmental Statement with the DCO application which will report on the likely significant environmental effects of the proposals identified in the Environmental Impact Assessment, the appropriate mitigation measures to be put in place where necessary and any residual effects.

**1.7** In the relevant sections of this Preliminary Environmental Information Report the options and alternatives that have been considered during the development of the current extension proposals are explained. This includes assessment of the suitability of the site location and the identification of the constraints which affect and lead to the choices that have been made with respect to the design of the proposed operations, the containment engineering design, the restoration profile hence the void generated, the operational and management proposals and the design of the restored site. The design parameters which are fixed at this stage are identified in the relevant sections of the report as are those which are subject to further refinement and where options are still being considered.

**The current consented activities**

**1.8** The ENRMF was granted a Development Consent Order SI 2013 No. 1752 (the ENRMF DCO) in July 2013. Works No.1 of the Authorised Project is defined in Schedule 1 of the ENRMF DCO and includes a hazardous waste landfill facility for the disposal at a direct input rate of up to 150,000 tonnes per annum of hazardous waste and low level radioactive waste. Works No. 2 of the Authorised Project is defined in Schedule 1 to the ENRMF DCO and includes a soil treatment facility with a consented capacity of 150,000 tonnes per annum (tpa) of contaminated materials comprising predominantly hazardous wastes. The ENRMF DCO specifies the completion and restoration of the site by 31 December 2026.

**1.9** The East Northamptonshire Resource Management Facility (Amendment) Order 2018 SI 2018 No. 742 was granted on 20 June 2018. The amendment order increased the consented capacity of the soil treatment facility to 200,000tpa. In March 2019 a non-material amendment was granted by Northamptonshire County Council to allow a change in the phasing of the landfill site and to allow the working of Phase 10 in advance of Phase 7. The landfill phases are shown on Figure 1.3.

**1.10** Hazardous waste is classified as such based on the concentrations of specified contaminants present in the waste material. The types of hazardous waste typically accepted by Augean at ENRMF include contaminated soils, contaminated dredging materials from the clearance of watercourses and harbours, treatment residues such as filter cakes, manufacturing residues and air pollution control residues used for scrubbing stack emissions at industrial facilities.

**1.11** LLW comprises generally low level radioactive waste which can have a radioactive content up to 4,000 becquerels per gram (Bq/g) of alpha activity or

12,000 Bq/g of beta or gamma activity[1]. The waste which is and will continue to be disposed of at ENRMF will be limited to that at the lower activity end of the range of wastes classified as LLW comprising waste which typically has a level of radioactivity of up to 200Bq/g. The LLW wastes typically comprise construction waste from decommissioning nuclear power stations, wastes from the oil industry, manufacturing, residues from treatment and wastes from research facilities and hospitals.

**The proposed development**

**1.12** The proposed development comprises the construction of new landfill void to the west of the currently consented hazardous waste and LLW landfill area (the western extension) and the alteration of the restoration profile and the timescale for completion of the existing landfill site in order to integrate the final landscape of the existing site with the western extension. The application includes an increase in the consented throughput of waste to the waste treatment and recovery facility and an increase in the total input rate to the site. In order to construct the western extension void it will be necessary to win and work minerals including the extraction of soils, overburden and clay. The soils and some clay will be retained on site for use in site restoration and the construction of the low permeability engineered liner and capping layers. The remaining materials will be exported off site. The application includes the alteration of the operational period of the current site activities and the western extension to approximately 2046. This is currently a preliminary estimate and will be confirmed following completion of the detailed site design work.

**1.13** The proposed development comprises the construction and alteration of a hazardous waste facility in accordance with Section 14 (1)(p) and Section 30 of The Planning Act 2008 (as amended) hence is a Nationally Significant Infrastructure Project. The proposed development comprises the construction of a new hazardous waste facility for the disposal of hazardous waste by landfill

[1] The activity concentration of a radionuclide (Bq/g) is called the specific activity.

with a capacity of more than 100,000 tonnes per year and the alteration of the existing waste treatment and recovery facility to increase the throughput from 200,000 tonnes per annum to 250,000 tonnes per annum. The application includes associated development such as the alteration of the restoration profile of the existing landfill area and will include an increase in the overall input rate to the site from 250,000 tonnes per annum to 300,000 tonnes per annum.

**1.14** The current operations at ENRMF are the subject of Environmental Permits issued and regulated by the Environment Agency. Any extension to the waste management operations at the site will continue to be the subject of Environmental Permits. It will be necessary to apply to vary the Environmental Permits in respect of the existing hazardous waste and LLW landfill site to include the western extension. The Environmental Permit for the treatment facility will be varied in order to increase the waste throughput rate and to include any changes to the processing activities. The process of preparing the applications to vary the Environmental Permits for the landfill site and treatment facility is taking place in parallel with the DCO application.

**Application process**

**1.15** As stated above the proposed development comprises the construction and alteration of a hazardous waste facility in accordance with Section 14 (1)(p) and Section 30 of The Planning Act 2008 (as amended) hence is a Nationally Significant Infrastructure Project. The application for a Development Consent Order (DCO) will be submitted to The Planning Inspectorate (PINS). The decision on whether or not to grant the DCO will be taken by the Secretary of State. Prior to the submission of the application to PINS extensive pre-application consultation is being carried out with both statutory and non-statutory consultees. This Preliminary Environmental Information Report has been prepared and issued as part of that pre-application consultation.

**1.16** The Environmental Statement which will be submitted with the DCO application must include the information referred to in regulation 14(2) of The Infrastructure

Planning (Environmental Impact Assessment) Regulations 2017[2] which is reasonably required for the consultation bodies to develop an informed view of the likely significant environmental effects of the development. In summary the information which must be provided includes a description of the development, an outline of the main alternatives studied, a description of the aspects of the environment which have the potential to be significantly affected by the development, a description of the likely significant effects of the development on the environment, a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment and a non-technical summary. This document together with the supporting and associated documentation referenced in it comprises the Preliminary Environmental Information Report which has been prepared for the purposes of pre-application consultation.

**1.17** Details of the consultation with local stakeholders and the local community for this application for a DCO are provided in the Statement of Community Consultation which sets out how Augean will consult with people living, visiting and working in the vicinity of the site that may be affected by the application and gives details of opportunities for engagement and discussion. This Preliminary Environmental Information Report is also being circulated to statutory consultees as specified in the legislation. The statutory consultation will take place between 26 October and 14 December 2020.

**1.18** During and following the period of consultation the feedback and comments received will be reviewed and assessed in accordance with Section 49 of The Planning Act 2008 (as amended) and the details of the proposed development and the Environmental Impact Assessment will be amended where appropriate and then finalised. It is anticipated that the application for the DCO will be finalised and submitted in late spring 2021 together with an Environmental Statement.

[2] The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

## 2 The site location and description

**2.1** The proposed application boundary lies approximately 1.1km east south east of Duddington village and approximately 2km north north west of Kings Cliffe village at its closest points. The proposed application boundary is centred on NGR TL 004 999 (Figure 2.1). The application boundary covers an area of approximately 57.5 hectares and includes the existing ENRMF site. The existing ENRMF site is approximately 31.2 hectares and the proposed western extension covers an area of approximately 26.3 hectares. The land within the application boundary is either owned by Augean or Augean have an option agreement in place for the land. The setting is generally rural with the majority of the land surrounding the site comprising open farmland or woodland as shown on the aerial photograph at Figure 2.2.

**2.2** As explained in Section 1, the existing ENRMF site comprises an active hazardous waste and low level radioactive waste (LLW) landfill site including restored and partially restored landfill areas together with the waste treatment and recovery facility and material stockpiles. A consented area for a gas management and surface water management compound including a flare stack is located in the north western corner of the current site. Site infrastructure including the site access, weighbridge and waste reception facilities, car parking areas, site offices, welfare facilities, storage areas, laboratories and wheel and vehicle body washing facilities are in place at the site (Figure 1.3). The site infrastructure will be retained and adapted as associated development and ancillary activities to the main site activities.

**2.3** The existing highway access to the ENRMF site is from Stamford Road which runs adjacent to the eastern boundary of the site from the A47 to the north. Waste delivery and collection vehicles using the site access are not permitted to travel to the south of the site access on Stamford Road towards the village of Kings Cliffe unless they are delivering wastes collected locally. The access road enters the reception area adjacent to and south east of the landfill.

Consented improvements to widen the site access are being implemented currently and will be in place by the end of 2020. The existing highway access to ENRMF will continue to be used for the proposed development.

**2.4** The current landfill comprises 11 phases of landfilling (Figure 1.3). Landfilling operations are complete in Phases 1 and 2 which are capped and partially restored. Landfilling operations are completed in Phases 3, 4, 5 and the southern part of Phase 6. Phases 3, the northern part of 4 and 5 and the southern part of 6 are capped with the remaining areas of Phases 4 and 5 covered with temporary capping. Currently landfilling operations are being carried out in the northern part of Phase 6 and in Phase 10. Phase 7 is currently being constructed.

**2.5** The waste treatment and recovery facility currently is located in the north western corner of the site in the area which ultimately will be landfilled as Phase 11 of the landfill site. Under the extant DCO the waste treatment and recovery facility is currently due to be removed from the site prior to the development of the final phases of landfilling. The waste treatment and recovery facility comprises a concrete pad and adjacent clay hardstanding area which currently includes storage areas for solid wastes and sludges, a soil washing plant, a stabilisation unit, an enclosed bag processing unit, a laboratory/office, a welfare facility, a surface water collection lagoon, a weighbridge and an area for bioremediation. The plant comprises modular units including silos, material feed hoppers, transfer conveyors and closed mixing vessels as well as storage areas for wastes awaiting treatment and treated wastes awaiting removal.

**2.6** The western extension currently comprises 2 areas of arable land with grassy margins. A hedgerow forms the boundary between the two areas. There is an area of young scrubby woodland in the south eastern corner of the northern area. The topography of the western extension generally is gently sloping towards the central boundary between the two areas. The ground elevation of the northern area ranges from 89m Above Ordnance Datum (AOD) in the north

to 80mAOD in the south. The ground elevation in the southern area ranges from 86mAOD in the south to 81mAOD in the north with a high point of 88mAOD in the centre of the southern area. The western extension is bordered by woodland and arable fields.

**2.7** The existing ENRMF site is bordered by a dense continuous thorn hedge and/or 1.8m high chain link fencing on all boundaries. There are gates at the site entrance which are locked outside operating hours. A farm access track runs outside and adjacent to the southern boundary of the existing ENRMF site and joins an access track running north to south along the eastern boundary of the southern section of the western extension area. The access track then turns to the west to the south of the southern section of the western extension area. An agricultural storage area with barns used by the farmer of the adjacent fields is located in the inset on the southern boundary of the existing site.

**2.8** There are scattered properties within 1km of the application area. The closest properties to the application area are the properties at Westhay Cottages located approximately 25m to the east of the application boundary and approximately 815m to the east of the proposed western extension area. Westhay Farm is located approximately 75m east of the application boundary and approximately 865m to the east of the proposed western extension area and is operated as a haulage yard and a farm with associated agricultural and commercial buildings. A cleared area in the centre of the woodlands located to the north of the existing site was used formerly by the Ministry of Defence for storage associated with the Wittering Airfield. This area has been granted planning permission for development as a transport facility but is unused currently. Westhay Lodge is located approximately 615m to the south of the application boundary. There are a number of properties between 750m and 955m to the north of the application boundary including an unnamed property approximately 750m north of the application boundary and Cuckoo Lodge which is approximately 875m to the north of the application boundary. The closest point of the boundary of the operational training airfield at RAF Wittering

and associated accommodation is located approximately 840m to the north north east of the application boundary. The closest settlement to the site is Duddington the outskirts of which are located approximately 1.1km to the west north west of the boundary of the northern section of the western extension area. Collyweston is located approximately 1.6km to the north north west of the northern section of the boundary of the western extension area. The village of Kings Cliffe is located approximately 2km to the south south east of the southern section of the boundary of the western extension area. The hamlet of Fineshade is located approximately 2.4km to the west south west of the southern part of the western extension area.

**2.9** There are two Grade II* listed buildings and twenty eight Grade II listed buildings within 2km of the site. The closest are located within Duddington Village where there are twenty seven listed buildings located within a conversation area at a distance of over 1.2km west of the site. There are no other designated heritage assets within 2km of the site.

**2.10** To the south of the application boundary is open agricultural land. The area of agricultural land to the south of the extension area is bordered to the south by woodland known as Little Wood (Figure 2.1). To the west of the majority of the application boundary is woodland known as Fineshade Wood part of which is known as The Assarts and which is a Local Wildlife Site (Figure 1.2). A short length of the western boundary of the northern section of the northern area abuts agricultural fields. The northern boundary of the western extension is formed of woodland with a field with a number of lagoons created in a fenced area beyond. The eastern boundary of the northern section of the extension area is adjacent to Collyweston Great Wood. To the east and north east of the application area beyond Collyweston Great Wood and east of Stamford Road is an area of woodland known as Easton Hornstocks. Parts of the Collyweston Great Wood and Easton Hornstocks comprise a Site of Special Scientific Interest (SSSI) and a National Nature Reserve (NNR) (Figure 1.2).

**2.11** The north eastern part of the existing ENRMF site and a section of the central area of the extension together with the woodland and pond area immediately to the north of the western extension area are designated as a Potential Wildlife Sites (PWS). Local Wildlife Sites (LWS) and PWS were reviewed by The Wildlife Trust for Northamptonshire in 2006[3]. PWS are sites that are either known or thought to be of higher biodiversity value than the average countryside but have not been confirmed to be of LWS standard. Category 1 PWS are sites that were never fully surveyed and assessed against LWS criteria. The area of the ENRMF site which comprises the PWS is species-poor seeded grassland habitat over a capped area of the landfill. No information is available on the reasons for its selection. The details of the PWS are provided at Appendix 2.1. The designated sites in the vicinity of the application boundary including the Regionally Important Geological Sites are shown on Figure 1.2. Details of the citations for each of the sites shown on Figure 1.2 are presented in Table 2.1 to this report. The closest European designated sites to the application boundary are Rutland Water and Barnack Hills and Holes which are shown on Figure 1.1. A full list of the designated European sites within 10km of the application boundary, the statutorily protected sites within 5km of the application boundary and the locally designated sites within 2km of the application boundary is provided at Appendix 2.1.

**2.12** The void for the existing landfill at ENRMF is formed from excavations extending through glacial till comprising predominantly clay (formerly referred to as boulder clay) and the Blisworth Limestone Formation where these formations are present and into the clay of the Rutland Formation. The Rutland Formation is underlain by the Lincolnshire Limestone Formation. The site geology is described in detail in Section 16 of this report. A swallow hole is located close to the north western corner of the current landfill area and further limestone solution features (known as dolines) may be present in the vicinity of the swallow hole. The Blisworth Limestone Formation and the Lincolnshire

[3] The Wildlife Trusts (2006) Wildlife Site Survey for North Northamptonshire https://www.east-northamptonshire.gov.uk/download/downloads/id/1054/north_northamptonshire_wildlife_site_survey.pdf Accessed 18/06/20

Limestone Formation are designated as principal aquifers by the Environment Agency. The glacial till is designated as a secondary undifferentiated aquifer and the Rutland Formation is designated as a secondary B aquifer. The application site is not located in a groundwater source protection zone (SPZ).

**2.13** Based on the Environment Agency Flood Map for Planning the application site is located in Flood Zone 1. Flood Zone 1 is defined as land having a less than 1 in 1,000 annual probability of river or sea flooding. The current site is located in the catchment of the River Nene which flows generally eastwards and is located approximately 6km east south east of the site at the closest point. The surface water management system for the restored landform for the current site is designed to lead to a drainage area at the south eastern corner of the ENRMF site and to discharge to a drainage ditch which flows generally to the south and after joining a stream outfalls to the Willow Brook approximately 2.5km south of the site. The Willow Brook joins the River Nene approximately 9km south east of the site.

**2.14** The proposed western extension to the landfill is located on a surface water divide with the majority within the catchment of the Willow Brook consistent with the current ENRMF site and part of the northern section of the extension area draining to the east to a drainage ditch which runs along the western and southern boundaries of Collyweston Great Wood. It is understood that the drainage ditch continues eastwards from the site joining a tributary of the Wittering Brook where it issues approximately 2.0km north east of the current ENRMF site and approximately 2.7km east north east of the proposed western extension. The Wittering Brook joins the River Nene approximately 7.5km east of the site.

**2.15** No public rights of way cross the application area (Figure 2.1). There are rights of way in proximity to the western extension area which run through The Assarts woodland (part of Fineshade Wood). The closest right of way is Footpath MX15 which is approximately 100m to the west of the boundary of the application area

at its closest point. Footpath MX15 runs in a north westerly and south westerly direction and connects into the wider public rights of way network. The Jurassic Way bridleway (NE12) is located approximately 845m to the west of the application area at its closest point (Figure 2.1).

**2.16** There are a number of services which cross the western extension area and which are in the vicinity of the site. The services at and in the vicinity of the site are shown on Figure 2.1. A mains gas pipeline runs parallel to the southern boundary of the existing ENRMF site and crosses the southern section of the western extension area in an east to west direction. Overhead power lines run along the eastern boundary of the southern section of the western extension area in a northerly direction before turning in a north westerly direction across the northern section of the western extension area. Two water pipelines cross the northern part of the southern section of the western extension area. A short section of redundant, closed out pipeline owned by the MOD is present at the northern point of the western extension area. An oil pipeline is located in the woodland to the east of the eastern boundary of the northern section of the western extension area.

**2.17** Northamptonshire County Council and East Northants District Council have been contacted regarding developments which should be included in the cumulative impact assessments. East Northants District Council will be providing a response shortly. Northamptonshire County Council have confirmed that the developments that should be considered include Collyweston Quarry, Wakerley Quarry, Cooks Hole Quarry and Thornhaugh Quarry. Further work will be undertaken with respect to cumulative impacts in the Environmental Statement which will accompany the DCO application.

## 3 Summary of the proposed development

**3.1** The detailed design for the proposed development is being progressed. The design development process is iterative and will continue throughout the consultation period up to the submission of the DCO application. The full details of the proposed development will be set out in the application documents. A summary of the main elements of the proposed development is presented below:

- The construction of new landfill void for the disposal of the same range of hazardous wastes and low level radioactive waste (LLW) disposed of at the site currently with a capacity of greater than 100,000 tonnes per annum (tpa) supported by the existing site infrastructure. The new landfill will comprise a number of phases and provide a landfill void of approximately 2million cubic metres.

- The continuation of filling of the existing ENRMF landfill with hazardous waste and LLW the subject of the current Development Consent Order and the amendment of the consented restoration profile to tie the existing landfill in to the proposed extension landform. The amendment to the restoration profile will result in the creation of new void at the existing site.

- The winning and working of minerals in order to create the landfill void and provide extracted materials for use on site as well as the exportation of clay and overburden for use in engineering, restoration and general fill at other sites.

- The stockpiling of clay, overburden and soils for use in the construction of the engineered containment system at the site and restoration of the site.

- The direct input of waste into the existing and new landfill will continue at a rate of up to 150,000tpa.

- An increase to the waste throughput of the waste treatment and recovery facility to 250,000tpa which comprises an increase of 50,000tpa compared with the rate consented in the 2018 DCO amendment.

- A combined waste importation rate limit to the waste treatment and recovery facility and landfill of 300,000tpa which is an increase of 50,000tpa compared with the currently consented total input rate.

- The LLW which is and will continue to be disposed of at the ENRMF will be limited to that which is at the lower end of the activity range and typically will have a level of radioactivity of up to 200 Bq/g.

- The diversion of some of the services that cross the western extension to alternative routes within the application area.

- The operational hours of the site will not change from those already permitted.

- Restoration to generally domed restoration landforms in the extension area and amendment to the approved restoration profile of the existing ENRMF site to create a coherent restored landform over the whole application site.

- Restoration of the site to nature conservation interest using the soils available at the site as well as suitable imported materials.

- Completion of the landfilling and restoration operations by December 2046. This is a provisional completion date that will be updated as part of the ongoing detailed design works and confirmed in the DCO application.

- Retention of infrastructure until 2046 and the retention of long term management infrastructure beyond this date.

- The site will be subject to a ten year aftercare and maintenance period following the completion of restoration. The Environmental Permits for the landfill site will continue for a longer period until the point at which the Environment Agency consider that the site no longer presents a potential risk to the environment and that the permits can be surrendered.

**3.2** The limit of extraction for the proposed western extension has been determined based on the boundaries of the land under the control of the applicant together with other constraints at the site such as the presence of boundary features, the need for ecological mitigation areas, the locations of services, the locations of geological features and the overall topography and surface water management needs.

**3.3** The additional void will allow site operations to continue to provide a facility for the disposal of hazardous waste and LLW and the treatment of waste including hazardous waste at the waste treatment and recovery facility for approximately 20 additional years. This is a provisional duration estimate and will be updated as part of the ongoing detailed design works and confirmed in the DCO application.

**3.4** The current Environmental Permits for the landfill operations specify the types of hazardous waste and LLW permitted for importation and deposition at the site. To ensure that only permitted wastes are deposited within the landfill Augean operates a rigorous set of waste acceptance criteria. The Environmental Permit for the waste treatment facility specifies the types of non-hazardous and hazardous wastes that can be treated at the facility. Treated waste from the facility are either recovered and transferred from the site for recovery or use, are transferred for landfill disposal at a non-hazardous waste landfill site such as the Augean Thornhaugh Landfill Site or are transferred to the ENRMF hazardous waste landfill site for disposal depending on the nature of the output from the treatment process.

# 4 The current landfill operations and the proposed landfill operations

## 4.1 Introduction

**4.1.1** The landfill currently accepts hazardous waste and low level radioactive waste (LLW). Hazardous waste is classified as such based on the concentrations of specified contaminants present in the waste material. As is the case currently, hazardous wastes will only be accepted for landfill disposal if they meet specified waste acceptance criteria for hazardous waste landfill sites. The types of hazardous waste typically accepted by Augean at ENRMF include contaminated soils, contaminated dredging materials from the clearance of watercourses and harbours, treatment residues such as filter cakes, manufacturing residues and air pollution control residues used for scrubbing stack emissions at industrial facilities. In accordance with legislation the hazardous wastes that are permitted for deposition at the landfill site are subject to a maximum total organic carbon content of 6% by weight. Hazardous wastes with leachable components above those specified in the legislation are not accepted for landfill disposal at the site. Wastes which are not accepted for landfill disposal include liquid wastes, corrosive wastes, flammable wastes and wastes that are classified as oxidising.

**4.1.2** As is the case currently, it is proposed that Augean will continue to accept LLW for disposal from sources such as the decommissioning of nuclear facilities, manufacturing activities and research facilities and hospitals where radioactive materials are used. The wastes will also include naturally occurring radioactive material (NORM) waste from the oil and gas and mineral processing industries notably supporting the decommissioning programme for the North Sea oil and gas extraction infrastructure. The LLW waste types principally will comprise construction and demolition waste such as rubble, soils, crushed concrete, bricks and metals from the decommissioning of nuclear power plant buildings and infrastructure, small amounts of lightly contaminated miscellaneous wastes from maintenance and monitoring at these facilities such as plastic and metal

and wastes from manufacturing activities, science and research facilities and hospitals where radioactive materials are used. LLW is only accepted at the site if it is compatible with other wastes, meets the site conditions for acceptance and it has been demonstrated that disposal at the site represents the Best Available Technique for the management of the waste.

**4.1.3** The landfill is operated on the principle of containment and the new landfill void will be operated as an extension of the current landfill area based on the same principle of containment. This existing and the new landfill void has been and will continue to be lined with an engineered low permeability barrier designed to retain contaminants within the engineered landfill. The landfill will continue to be operated in a series of phases which are filled and restored progressively. To complete the containment structure, to separate the restoration materials from the wastes and to minimise the infiltration of rainfall into the waste following achievement of final waste levels, the landfill is and will continue to be capped with a low permeability layer keyed in to the low permeability side liner system. The restoration materials will be placed above the low permeability cap.

**4.1.4** The existing landfill comprises 11 phases of landfilling (Figure 1.3). Landfilling operations are complete in Phases 1 and 2 which are capped and partially restored. Landfilling operations are completed in Phases 3, 4, 5 and the southern part of Phase 6. Phases 3, the northern part of 4 and 5 and the southern part of 6 are partially capped with the remaining areas of 4 and 5 covered with temporary capping. Currently landfilling operations are being carried out in the northern part of Phase 6 and in Phase 10. Phase 7 is currently being constructed.

## 4.2 The design of the extended landfill

**4.2.1** The design and the phasing for the western landfill area are currently being finalised but it is anticipated that the landfill will be operated in a number of phases, some of which will be separately constructed and contained landfill

areas depending on the final decisions regarding the diversion of the services which cross the site and further assessment of the geology and hydrogeology in the area in which there may be solution features present in the underlying limestone as described further in Section 16 of this report. The central landfill area will be contiguous with the landfill in the current area of the site and filling will be continuous across the current western boundary.

**4.2.2** It is not intended that the gas pipeline which crosses the site from east to west as shown on Figure 2.1 will be diverted and it will not be possible to landfill over the pipeline as access must be maintained. The area to the south of the gas pipeline will be developed as a separately constructed, fully contained landfill area with suitable stand off distances from the gas pipeline as agreed with the pipeline authority.

**4.2.3** It has not yet been determined whether the water pipes which cross the western landfill area will be diverted. If the pipes are diverted this would be within the area of land controlled by Augean. It will not be possible to landfill over the route of the water pipes as access must be maintained. If the water pipes are not diverted then the area to the south west of the water pipes will be developed as a separately constructed, fully contained landfill area with suitable stand off distances from the water pipes as agreed with the water authority.

**4.2.4** The overhead electricity power cables which cross the western landfill area currently as shown on Figure 2.1 will be diverted and run below ground. The cables will be diverted from the south western corner of the current site to follow a route to the west parallel with and adjacent to the gas pipeline and then to turn to the north at the western boundary of the site and follow the western site boundary and re-join the original cable route at the north western corner of the site. Alternatively, the electricity cable may be run along the route of the water pipes as this will mean a shorter diverted route.

**4.2.5** Prior to the finalisation of the design for all the original and diverted services routes, further detailed discussions will be held with the relevant authorities to

agree the appropriate, safe standoff distances from the location of the services to the excavation boundary and to agree the distances to be allowed between the locations of services where they are laid parallel to each other.

**4.2.6** An abandoned pipeline from the former Government Oil and Pipeline System may be present at the location shown in the northern area of the site. It has been confirmed by the Defence Infrastructure Organisation that the pipeline has been declared redundant by the MOD and that the necessary legal changes have been removed in accordance with the Land Powers (Defence) Act 1958. This length of pipeline will be removed with appropriate precautions in place when the northern area of the site is developed.

**4.2.7** As described further in Section 16 of this report, a site investigation was carried out in the proposed western landfill extension area to establish the geological and hydrogeological conditions. The scope of the site investigation was agreed with the Environment Agency before it commenced. Particular attention was paid to examining the geology in the vicinity of the swallow hole that is located close to the north western corner of the current landfill area and to the possible presence of further limestone solution features (known as dolines) in the vicinity of the swallow hole. It has been agreed with the Environment Agency that the final design of the proposed landfill extension in the vicinity of the swallow hole and potential other limestone solution features will be developed in detail following the issue of the Development Consent Order and Environmental Permit variation. Further targeted site investigations will be carried out in this central area prior to finalising the design in this area. To illustrate the potential scope of the development in this area and to ensure that all relevant impacts can be assessed, three options for the landfill design which may be included in the DCO and Environmental Permit variation applications and the potential impacts of each option will be assessed. The options for this area of the site comprise:

- Continuous landfill from north to south with a stand off from the known swallow hole.

- Retention of a 20m corridor linking the land to the west of the proposed extension to the swallow hole to provide a route for surface water drainage.

- Retention of a 150m corridor linking the land to the west of the potential extension to the swallow hole to provide a route for surface water drainage.

**4.2.8** Taking into account the various options for the landfill design set out above, the preliminary designs for the options for the completed landfill profiles comprise the following and are set out in Figures 4.1 to 4.3 and Figures 4.4 to 4.6:

***Options without diverting the water pipes:***

- Figure 4.1. The existing water pipelines are left in place. The area to the south of the gas pipeline is constructed as a separate landfill area. The area to the south west of the water pipelines is constructed as a separate landfill area. Extraction and landfilling of the whole area to the north of the gas pipeline with a stand off from the known swallow hole but no break or standoff from the potential doline area.

- Figure 4.2. The existing water pipelines are left in place. The area to the south of the gas pipeline is constructed as a separate landfill area. The area to the south west of the water pipelines is constructed as a separate landfill area. Extraction and landfilling of the area to the north of the water pipelines with a break at the potential doline area with a 20m corridor.

- Figure 4.3. The existing water pipelines are left in place. The area to the south of the gas pipeline is constructed as a separate landfill area. The area to the south west of the water pipelines is constructed as a

separate landfill area. Extraction and landfilling of the area to the north of the water pipelines with a break at the potential doline area with a 150m corridor.

***Options with diversion of the water pipes:***

- Figure 4.4. The existing water pipelines are diverted as shown. The area to the south of the gas pipeline is constructed as a separate landfill area. Extraction and landfilling of the whole area to the north of the water pipelines with a stand off from the known swallow hole but no break or standoff from the potential doline area.

- Figure 4.5. The existing water pipelines are diverted as shown. The area to the south of the gas pipeline is constructed as a separate landfill area. Extraction and landfilling of the area to the north of the water pipelines with a break at the potential doline area with a 20m corridor.

- Figure 4.6. The existing water pipelines are diverted as shown. The area to the south of the gas pipeline is constructed as a separate landfill area. Extraction and landfilling of the area to the north of the water pipelines with a break at the potential doline area with a 150m corridor.

**4.2.9** For all of the options being assessed, the landfilling in the western phases of the current landfill site (Phases 7, 8, 9 and 11) will be continuous with the landfill in the proposed adjacent phases of the western landfill area as shown in the schematic diagram on Figure 4.7. This continuous landfill will make the most efficient use of the area available for waste void and will result in the creation of an integrated and consistent restoration profile.

**4.2.10** The proposed western extension area will be developed in a number of phases. The phasing order for the proposed western landfill area has not yet been finalised but the preliminary proposals are to commence landfilling at the northern extent of the site first and to develop the landfill in a southerly direction to a mid-point in the northern area. Landfilling would then take place in the area

to the south of the gas pipeline with the central area filled last. This order would allow the earliest restoration of the northern area and provide for further investigations in the area of the swallow hole as well as the diversion of services before the final design of the central area is determined. The site including the western extension area will provide landfill void which will result in the operation of the landfill for a period of up to 20 years from commencement. It is anticipated that extraction and engineering operations will commence shortly after the DCO consent and Environmental Permit are granted.

## 4.3 Pre-construction works including mitigation measures

**4.3.1** A number of measures will be implemented before work starts on the construction of the landfill areas in the western extension. These works will be phased and will be carried out before the landfill development works in each individual phase. A detailed pre-construction mitigation scheme will be prepared and implemented through the DCO.

**4.3.2** The landfill areas and in particular the extraction boundaries have been determined based on detailed consideration of the standoff distances needed to protect the roots of the trees in adjacent areas in particular the woodland to the east (Collyweston Great Wood) and west (Fineshade Wood/The Assarts), the location of proposed amphibian/reptile exclusion fencing, suitable standoffs from the location of services and from the retained farm track which runs along the eastern boundary of the southern section of the site. The derivation and collation of these standoffs into a combined extraction limit and restoration boundary is set out at Appendix 4.1.

**4.3.3** Details on the ecological and habitat mitigation works are provided in Section 12 of this report and a summary only is provided here. At an early stage following the granting of the DCO an application will be made for a licence to erect an amphibian exclusion fence around the proposed active area(s) where protection is necessary. As the area that will be surrounded by the fence comprises agricultural land no significant great crested newt terrestrial habitat

will be lost. Grassland habitat will remain available outside the fenced area and connectivity between all ponds and feeding areas will be retained. The function of the fence will be to protect the amphibians and reptiles. Mitigation areas will be prepared for animals which are displaced. The potential areas which might be suitable are being assessed.

**4.3.4** It is currently proposed that early ecological mitigation will include the gapping-up of some existing hedgerows to improve growth and screening potential. Blackthorn planting is proposed in particular to enhance the habitat at locations where a colony of Black Hairstreak butterflies have been identified. Trees will be planted at an early stage along the eastern boundary of the southern part of the proposed western extension. Areas in which badgers are present will be fenced off as appropriate in accordance with the appropriate licensing regime. The mitigation proposals are being discussed with Natural England and the local Environmental Health Officers as well as local wildlife groups before they are finalised.

**4.3.5** Works for the diversion of services will be carried out following detailed discussions and planning with the relevant service providers and pipeline authorities in advance of excavation works in the adjacent areas.

**4.3.6** A surface water management and drainage scheme is being prepared and will form part of the detailed site design. The scheme will include the management of surface water in the catchment to the west of the proposed extension area which currently is conveyed to the swallow hole to the east of the proposed landfill area as well as runoff from the development site.

**4.3.7** Land will be retained under agricultural management until the site operations commence in each area unless the areas are needed for early ecological mitigation or material storage.

**4.3.8** Vegetation will be removed progressively as necessary in advance of each area being developed. Vegetation will be removed outside the breeding bird season

wherever possible. If it is necessary to remove vegetation during the breeding bird season (March to August) then all clearance will be preceded by a survey for nesting activity by a suitably qualified and experienced ecologist.

**4.3.9** As described in Section 15 of this report, trial trenches are being excavated at the site to establish the likelihood that artefacts of archaeological interest may be present in the proposed extension area. Following the completion of the trial trenching further discussions will be held with the Northamptonshire County Archaeologist regarding the archaeological potential of the western extension area and the proposed approach to the assessment.

**4.3.10** As is usual practice on large rural sites, soil stripping would be carried out under the direction of an archaeologist. If identified as appropriate this may be followed by archaeological excavation within areas defined by the geophysical survey and trenching as of archaeological interest, or as part of a Strip Map and Sample exercise. The results of any such exercises would be analysed and published.

### 4.4 The stripping, extraction and stockpiling of soils, overburden and clay

**4.4.1** There are no soils other than those in stockpiles on the existing ENRMF landfill area. As the remaining phases of the existing ENRMF landfill area are constructed it will be necessary to excavate clay and overburden. Clay will be extracted to a maximum depth of approximately 73m AOD which is approximately 11m below the boundary ground level.

**4.4.2** Soils and overburden will be stripped from the western extension area prior to mineral extraction and landfill construction operations in each area. Topsoil and subsoil will be stripped separately. All soil stripping, handling, storage and management operations will be carried out progressively in accordance with prepared phasing plans and an agreed soils management and handling scheme which will be prepared in accordance with the relevant guidance for the Good Practice Guide for Handling Soils as explained further in Section 14 of

this report. Part of the northern area of the proposed extension has an area of soil which is classified as Grade 3A Best and Most Versatile agricultural soil. This soil has been identified as having a high pH and calcium carbonate content and therefore will be husbanded for use in developing the areas of the site to be restored as calcareous grassland.

**4.4.3** It is proposed that clay and overburden will be excavated from the western extension area. Clay will be extracted to a maximum depth of approximately 72m AOD and approximately 16m below ground level. Clay suitable for use in constructing the clay lining for the landfill will be selected during excavation.

**4.4.4** Suitable clay from current stockpiles together with clay extracted during the preparation of the western extension area will be used in constructing the clay lining for the western extension area. Clay and other suitable materials will be exported from the site to the nearby Augean landfill site at Thornhaugh as there is a requirement for clay for use in the construction of the engineered lining system. Any remaining clay and overburden will be exported for general sale and reuse. Excavated materials that do not comprise engineering clay will be used as daily cover material and as protective cover and restoration material over the clay cap. A materials balance is being prepared and the need for and locations of materials stockpiles will be determined based on these calculations.

## 4.5 Landfill engineering and containment design

**4.5.1** The principles of the engineering and containment design of the landfill cells and the measures for the placement and containment of waste are described here. The general site operations and infrastructure are described in Section 6 of this report. Given the similar geology beneath the proposed extension area and the current landfill area it has been agreed in principle with the Environment Agency that the same approach to the landfill engineering can be applied in the proposed extension area. As implemented in the areas being constructed for landfilling at the current site, a minimum thickness of Rutland Formation and/or

glacial till of not less than 2m will be retained in situ beneath the engineered low permeability basal liner.

**4.5.2** As stated in Section 2.4 cell construction is currently being undertaken in Phase 7 of the current landfill. In discussion and agreement with the Environment Agency, during the preparation of future cells, particularly those close to the known and potential limestone solution features, geophysical surveying may be undertaken following excavation to the formation level but prior to the construction of the engineered liner to identify and locate the presence of potential solution features in the Lincolnshire Limestone. The approach taken for each cell including the need for geophysical surveys is agreed with the Environment Agency through the preparation of a CQA Plan. Any such features identified will be further investigated and appropriate action carried out for example infilling with suitable low permeability material. Cell construction in the existing landfill area comprises:

- at least a 1m thickness of engineered low permeability site derived clay,
- an artificial sealing liner comprising a 2mm thick HDPE geomembrane,
- a protection layer formed from geotextiles or sand,
- an overlying leachate drainage layer on the base of crushed aggregate or shredded tyres and/or tyre bales with drainage pipes,
- leachate monitoring and extraction wells,
- a concrete target pad for retrospective well drilling,
- a drainage geocomposite on the side slopes
- all constructed above the basal low permeability seal.

**4.5.3** The liner specification for the existing landfill is agreed with the Environment Agency in accordance with the Environmental Permit through Construction

Quality Assurance (CQA) Plans prepared and agreed for each area of engineering and these principles will continue for the proposed western extension area.

**4.5.4** The design of the low permeability capping layer at the existing site is agreed with the Environment Agency through CQA Plans prepared and agreed for each area of engineering and this principle will continue for the proposed western extension area. The specification for the low permeability capping currently comprises the following elements or alternative specification providing equivalent protection. A composite cap consisting of:

- a regulating layer of approximately 0.3m over the top of the waste,
- a 1m thick low permeability engineered clay liner formed from site derived clay,
- a geocomposite drainage layer,
- 1m to 1.5m of restoration materials.

**4.5.5** The nature of the site containment including the basal and side wall lining system and the capping layer will be specified through the Environmental Permit. The landfill cells and capping layers will be constructed in accordance with specifications prepared and agreed with the Environment Agency through the Environmental Permit and will be the subject of Construction Quality Assurance (CQA) Plans and protocols to ensure that the agreed specifications have been achieved. The final profile of the waste and capping layer is designed to form a stable slope which will encourage shedding of rainfall to minimise infiltration and as a consequence to minimise the generation of leachate which is the contaminated liquid formed when water infiltrates into the waste and which is collected in the base of the site.

**4.5.6** As explained above a leachate drainage blanket and collection sumps will be constructed at the base of the site above the low permeability basal liner. The

leachate levels will be controlled by pumping leachate from the leachate collection sumps or other extraction wells drilled as necessary. The level at which the leachate is maintained will be specified in the Environmental Permit. The leachate will continue to be used in the waste treatment and recovery facility with any excess leachate removed by tanker for disposal off site at a suitably authorised facility.

**4.5.7** The leachate generated at the site will not be recirculated above the ground. The excess leachate will be pumped into a leachate storage tank and used in the on-site waste treatment facility in place of mains water. If the leachate is not needed in the on-site waste treatment facility if will be removed from site by tanker for treatment at a suitably authorised waste water treatment plant.

**4.5.8** The waste types accepted in the initial cells at the current landfill site prior to July 2004, which is when the limitation on the organic content of landfilled hazardous wastes was implemented, have the potential to generate significant quantities of landfill gas. Even though the wastes that have been deposited since July 2004 and those that will be deposited in the future at the site will have a limited organic carbon content there is residual potential for the generation of small quantities of landfill gas and volatile organic compound vapours at the site. Landfill gas is generated as a result of the biodegradation of materials formed of organic carbon materials, typically food waste and vegetation. Materials such as paper, textiles and wood are also biodegradable but generally only at very slow rates. The LLW wastes that will continue to be disposed of at the site will exclude biodegradable materials as far as is reasonably practicable. The levels of radioactivity in the LLW which is accepted are too low to give rise to a risk from radiolytic hydrogen gas evolution. It is unlikely that significant quantities of landfill gas will be generated from the LLW that will be deposited at the site. If gas is generated by the hazardous waste and/or LLW, the gas will be collected in the gas management system and directed to the gas flare for combustion.

**4.5.9** A dual system of gas and vapour migration control is and will continue to be operated at the site in order to control any gas or vapour that might be generated. The engineered low permeability basal and sidewall liners impede lateral gas and vapour migration and the low permeability cap reduces the emissions to the atmosphere. A pumped landfill gas extraction system is and will continue to be operated which prevents the accumulation of gas under elevated pressures in the landfill minimising further the risk of the migration of gas and the emissions of gas to the atmosphere. The collected gas will continue to be directed to the gas flare located to the north west of the current landfill area and combusted in a high temperature flare. Combustion of the gas destroys potentially harmful and odorous components in the gas and minimises the release of methane which is a potent greenhouse gas. The location of the landfill gas pumping system and flare stack is shown on Figure 1.3. The landfill gas pumping system and flare stack is surrounded by 1.8m high fencing. The maximum height of the flare stack is 10m. The gas flare and pumping facility will be used also for any gas control and management needed for the proposed landfill extension area and will remain at the site beyond the completion of landfilling for as long as ongoing gas control is needed.

**4.5.10** Clean surface water that has not been in contact with waste will continue to be collected in a series of drainage ditches. The surface water management system for the current site will be extended to include the proposed extension area. The surface water management system will continue to be installed progressively as landfilling continues in the current and future landfill areas. Currently surface water is used in the waste treatment and recovery facility, for dust suppression and in the vehicle wheel wash. No surface water is currently discharged as it is all used on site. In the event that not all the surface water is used on site it will be discharged to a drainage ditch adjacent to Stamford Road in accordance with the conditions set by the Environment Agency in the current Environmental Permit. The Environmental Permit will specify that any discharges are monitored and subject to limits. The ditches and attenuation ponds at the restored site will be designed to provide sufficient capacity to

manage a 1 in 100 year rainfall event including an allowance for increases in rainfall as a result of climate change.

## 4.6 Disposal of hazardous waste

**4.6.1** Details on the controls in place for the acceptance of hazardous waste in the landfill site are presented in Section 7.3 of this report. Once the waste has been accepted at the site the delivery vehicle will travel along internal haul roads to the operational landfill area where wastes will be deposited at the working face. Hazardous waste will be placed and covered progressively throughout the day and at the end of the day with suitable cover material to ensure that deposited waste is not exposed. Dusty wastes and odorous wastes will be covered immediately with a minimum thickness of cover material as specified in the Operating Techniques that are controlled through the Environmental Permit. Wastes containing asbestos will be covered immediately with at least 300mm of material and with a further 700mm of material by the end of the day. The operational area is covered by a minimum thickness of 300mm of cover material at the end of each working day.

## 4.7 Disposal of LLW

**4.7.1** Details on the controls in place for the acceptance of LLW in the landfill site are provided at Section 7.8 of this report. Once the waste has been accepted the delivery vehicle will travel along the internal haul roads to an unloading point adjacent to the active landfill area. The waste packages will be lifted from the delivery vehicles using mechanical handling machines such as fork-lift trucks and placed in the landfill. Waste will not normally be tipped into the landfill but on a limited number of occasions if there are specific arisings of loose wastes that might be deposited by direct discharge from a vehicle (which would be covered or sheeted for transport) then this would be discussed and agreed with the EA based on specific risk assessments and with agreed additional measures in place. The waste will be disposed of in the operational working cell or cells and will be placed alongside hazardous waste. The disposal of

waste will take place only under the supervision of a trained operative who will be responsible for the operation of the plant at the disposal face.

**4.7.2** Immediately after placement the deposited wastes will be covered with a minimum thickness of 300mm of suitable cover material over all exposed surfaces. The radiation levels at 1m above the top of the cover material will be measured to check conformance with the specified dose rate of 2μSv/hr. If the radiation level exceeds the specified dose rate additional cover will be placed as necessary until the specified dose rate is achieved.

**4.7.3** As the predicted doses of radiation to which workers at the site will be exposed are below those specified under the Ionising Radiation Regulations 2017 no workers will be defined as Classified Persons in accordance with the regulations. Specific personal protective equipment will not be necessary during normal site operations additional to the standard equipment used and worn by workers at a hazardous waste landfill site. Passive dosimeters will be worn by staff working in the LLW reception and disposal areas as reassurance to confirm that the exposures received are in accordance with the predictions.

# 5 Description of the current operations and the proposed development at the waste treatment and recovery facility

## 5.1 The operation of the waste treatment and recovery facility

**5.1.1** The waste treatment and recovery facility located in the north west of the current site is the subject of an Environmental Permit for the operation of a soil washing plant, a stabilisation unit, a laboratory/office and an area for bioremediation (Figure 1.3). The plant comprises modular units including storage silos, material feed hoppers, transfer conveyors and closed mixing vessels. The plant is located on a concrete pad which has a self-contained surface water management system and collection sump. The concrete hardstanding covers a total area of approximately 1.5 hectares. The concrete pad and an adjacent area formed of engineered clay is used for the storage of wastes awaiting treatment as well as for outputs from the treatment processes awaiting transportation from the treatment facility. A lined lagoon is in place to the west of the treatment area which is used for the storage of wastes in sludge form prior to their treatment.

**5.1.2** The modular units including the storage silos currently have a maximum height of 15m**.** The maximum height of the soil washing plant is approximately 8m. The plant is painted or clad in ‘olive drab’.

**5.1.3** The current waste throughput of the waste treatment and recovery facility is 200,000 tonnes per annum. It is proposed that the throughput is increased to 250,000 tonnes per annum, an increase of 50,000 tonnes per annum.

**5.1.4** No substantial changes are proposed to the waste recovery and treatment facility other than an increase in the proposed throughput of the treatment plant and an extension in the area of the treatment and storage facility. The wastes will continue to be treated using modular plant which is adapted as needed depending on the waste types being received and the treatment processes being carried out. The details of the waste treatment processes and controls

are specified and regulated through the Environmental Permit for the treatment facility. It is important that the specification of the treatment plant remains modular and flexible so that the treatment processes can be adapted to respond to changes in waste types as well as to national policies and guidance regarding the appropriate treatment which should be applied in order to achieve the management of waste as high up the waste management hierarchy as possible. In order to accommodate the larger treatment and storage area which already is included in the boundary of the waste treatment permit, the waste treatment area will be extended as shown on Figure 2.1. The proposed extended area covers an area of 2.64ha.

## 5.2 Acceptance of wastes for treatment

**5.2.1** The wastes which are accepted at the treatment facility comprise hazardous waste and non-hazardous waste. LLW is not accepted at the treatment facility. The wastes typically are delivered in tankers, sheeted tipper trucks, intermediate bulk containers or bulk bags.

**5.2.2** Prior to entering into a contract for the delivery of wastes for treatment at the facility a pre-acceptance assessment will continue to be carried out using available analytical data or on analytical data for samples taken from the materials destined for treatment in order to confirm the technical feasibility of treating the wastes and to facilitate the selection of the most efficient treatment process. If after treatment materials will not meet acceptance criteria for recovery and use or disposal in the landfill they will not be accepted for treatment at the waste treatment and recovery facility.

**5.2.3** Wastes delivered to the site for treatment will continue to be inspected visually on arrival and analysis will be undertaken as necessary to confirm that the material is consistent with the pre-acceptance data provided. Only once it is confirmed that the material is consistent with the pre-acceptance data will materials be accepted for treatment at the facility.

**5.2.4** Following delivery of material and acceptance for treatment the site chemist will inspect the load visually and select a bay in the hardstanding area for stocking the material. The stocking bays are identified with clear signs and the location of each load delivered will be tracked in a register that is updated daily. Wastes in sludge form awaiting treatment are stored in the lined lagoon area. The lagoon area is constructed of low permeability clay and is subject to CQA.

**5.2.5** Based on the nature of the material, material from different locations or projects will be combined to form compatible batches for treatment. The stockpiles will be a maximum of 5m in height. Dusty wastes such as air pollution control residues (APCR) will not be stored in stockpiles but will be stored in large isopropylene or similar storage bags or will be delivered by powder tankers and transferred to the silos for storage. A schematic flow diagram showing the principles of the waste treatment processes is provided on Figure 5.1.

**5.2.6** Prior to some forms of treatment the waste material will be screened to remove oversize fractions. The removal of the oversized fractions is necessary to prevent obstructions in the plant during soil washing or stabilisation or to improve the soil condition for bioremediation. Oversize fractions will be stockpiled before being crushed using a mobile crushing plant if necessary. Crushing will be carried out on stockpiled material on a campaign basis over a period of approximately one week. It is likely that crushing will be carried out during only five or six campaigns per year. Samples of the crushed material will be analysed to assess the nature and composition of the material which will be treated in the soil washing plant if necessary. The main components of the soil washing, stabilisation and bioremediation processes are described below..

## 5.3 Soil washing

**5.3.1** The principal elements of the soil washing process are separation, washing, polymer addition, flocculation and dewatering. The soil washing process includes wet physico-chemical treatment to separate pollutants from the clean

aggregate materials. The removal efficiency depends on the form in which the contaminants are present and the structure of the soil.

**5.3.2** The contaminated soils comprising materials with a specified maximum particle size will be transferred by mobile plant from the stockpiles to the input hopper of the soil washing plant. The materials will be transported by conveyor to a wet screen where the materials are separated into a gravel fraction greater than 3mm and a fine fraction less than 3mm. Entrained pieces of metal will be removed by an overhead magnetic belt above the conveyor. The fraction greater than 3mm will be transported by conveyor to a sword washer in which the cohesive soil is broken up. Organic lighter materials in the feed material such as pieces of wood or paper will be removed. Any fine material adhering to the coarser fraction will be washed off.

**5.3.3** The coarse materials pass from the sword washer to a stockpile. The process water and fine material washed out during the process will pass through a dewatering screen to remove coarse organic material. From the screen the water and the fine fractions mixture will be collected in a buffer tank before being pumped to a series of cyclones.

**5.3.4** The cyclones process the wash water and fine fractions recovered from the sword washer. The cyclones separate by gravity the finer material into a sand fraction and a residual silt slurry. The sand fraction will be passed over a dewatering screen and be collected in a stockpile. The silt slurry will be removed from the cyclone to an upstream classifier to remove organic material from the slurry together with the fractions less than 3mm separated from the initial feed on the wet screen. The slurry will be transported to a moving belt where flocculating polymers are added to accelerate settlement in a sedimentation unit by breaking down the slurry to form a solid and a liquid phase. From the sedimentation unit the solid phase will be pumped to a sieve belt-press where it will be dewatered until a firm filter cake is generated. The water released from the belt press will be re-used in site processes.

**5.3.5** Provided that it meets the landfill acceptance criteria the filter cake comprising the residue from the soil washing process will be transported to the adjacent hazardous waste landfill for disposal. Where the treatment residue for disposal comprises a non-hazardous waste it will be exported from the site for disposal at an appropriately permitted facility which is likely to be the nearby Augean Thornhaugh Landfill Site or other suitable disposal facility. The treated sand and gravel fractions will be used as an engineering and restoration material at the site or may be exported for re-use elsewhere. Prior to re-use or landfilling of the products from the soil washing plant samples will be taken from the materials produced. Samples will be submitted to the site laboratory for appropriate chemical analyses. The final destination or use of the materials generated in the soil washing plant will be determined based on the nature of the material and the analytical results for the different fractions produced.

**5.3.6** The throughput of the soil washing plant will be 30 tonnes to 40 tonnes per hour of incoming material and the process will be controlled from a control room. A weighing belt on the conveyor located after the input hopper will record the quantity of material added to the process. A weighing belt located after the sword washer and the sieve belt press will record the quantity of material recovered from the process.

**5.3.7** The soil washing process necessitates approximately 300m³ of water at start-up. The process water will be stored in water buffer tanks housed in the plant. The water will be recycled and treated during the process. There may be water losses during operations through uptake by the solid fractions, spillage and evaporation. Water will be added to the system from the site drainage system. When due to contamination the process water becomes unsuitable for recirculation in the soil washing plant the process water will be used in the stabilisation process or elsewhere on site as appropriate. No changes are proposed to the soil washing process as a result of the proposed development.

**5.3.8** Polymers will be used to facilitate the dewatering of the sludge produced in the soil washing plant. The polymers will be stored in appropriate dry and secure containers.

**5.3.9** Some of the residues produced by the soil washing process may not meet the hazardous waste acceptance criteria for landfilling as contaminants in the residues may be too readily leachable. To render the residue suitable for disposal to landfill the residue subsequently can be treated by the stabilisation process.

## 5.4 Stabilisation process including immobilisation and neutralisation

**5.4.1** The processes of stabilisation, immobilisation and neutralisation are undertaken at the stabilisation plant. The processes are similar but vary in the objectives of treatment and inputs to the process. The purpose of stabilisation is to fix mobile contaminants in the matrix of the waste to reduce their polluting potential. The purpose of immobilisation is primarily to change the physical characteristics of the waste but the process can also encapsulate contaminants in the waste. The purpose of neutralisation is to moderate the pH of waste, usually to a neutral condition. Where the pH is a significant factor in the hazardousness of the waste it can be possible to generate a non-hazardous waste output. The outputs of all three processes commonly are managed by disposal in landfill but where the chemical nature of the material being treated and the treated outputs are suitable, the treated material can be recovered for a variety of uses.

**5.4.2** During the stabilisation process the potentially mobile contaminants in the waste are fixed through the introduction of reagents that reduce the potential for leaching from the waste. The reagents or mix of reagents used in the process are specific to the type and form of the contaminant present in the waste. The reagents that may be used in the process are subject to Environment Agency approval and currently include cement, flyash, air pollution control residues, landfill leachate, lime, clays, asphalt, iron powder or

a combination of binding polymers or other additives. Additional reagents such as waste acids or other waste materials may be added to the consented waste treatment processes in the Environmental Permit.

**5.4.3** The throughput of the stabilisation plant will be approximately 20 tonnes to 40 tonnes per hour of incoming material. The waste will be transferred by mobile plant from the stockpiles to the input hopper of the stabilisation plant. From the input hopper the material will be transferred to a mixer where a fixed amount of additive will be added and the contents mixed. The output from the mixer will be an immobilised material which is deposited in the landfill once samples have been collected and chemical analyses have been completed and assessed against the relevant landfill waste acceptance criteria or, where the material is suitable, it may be recovered for use elsewhere.

**5.4.4** The reagents for use in the stabilisation process will be stored in secure areas at the treatment facility. One of the reagents used in the stabilisation treatment process as a substitute for cement is air pollution control residues (APCR) from incinerators or biomass plants. Incinerators and biomass plants produce the APCR 24 hours a day, 7 days a week. The incinerator and biomass plants have facilities to store the APCR over weekends but not where the weekends are extended due to public holidays. To provide a continuing disposal outlet for the APCR these materials will continue to be accepted on public holidays and the treatment facility will be operated to use the material as a reagent to treat wastes already stocked at the site. No more than twenty tanker loads of APCR will be received at the site on public holidays. No significant changes are proposed to the stabilisation process as a result of the proposed development.

## 5.5 Bioremediation process

**5.5.1** The bioremediation process is based on enhancement of the rate and extent of natural biodegradation of organic pollutants in the wastes, commonly waste soils, into carbon dioxide and water. Wastes such as soils that are contaminated with light hydrocarbons for example petrol and diesel are suitable

for bioremediation. The natural bioremediation process is accelerated by the addition of nutrients.

**5.5.2** The contaminated wastes for the bioremediation process will be screened to reduce particle sizes and nutrients will be added to the screened waste. The material will be stored in a stockpile and covered with a canvas on the hardstanding area at the treatment facility in an area allocated for bioremediation.

**5.5.3** The material will be turned as necessary to facilitate aeration of the material. Approximately every two weeks during the bioremediation process and at the end of the process representative samples will be recovered from the stockpile and sent to the site laboratory for analysis of the organic compounds. When the concentrations of organic pollutants have been degraded to an acceptable concentration the material is suitable for re-use in engineering and restoration works at the landfill or for exportation from the site for re-use elsewhere. No changes are proposed to the bioremediation process as part of the proposed development.

**5.5.4** The potential for dust generation at the soil treatment plant is low as the processes for soil treatment are enclosed or will be undertaken on damp materials. The potential for dust blow from soils stored in stockpiles on the hardstanding before treatment will continue to be minimised by using a water bowser or sprays as necessary.

**5.5.5** The mixing of APCR for stabilisation, immobilisation and neutralisation is carried out in a closed vessel which will prevent dust emissions. On completion of the treatment the product from the stabilisation processes will be removed for re-use elsewhere or disposal in the landfill site. The bioremediation process will take place in covered stockpiles which prevents dust emissions from the soil during treatment. The remediated material product will be removed for re-use on completion of treatment. If there is any delay in removal the treated

material stockpiles will be kept damp by means of a water spray before being exported from the treatment area.

## 5.6 Additional processes

**5.6.1** The waste treatment and recovery facility is responsive to market conditions while operating to high environmental and safety standards. In order to respond to the market it is necessary for there to be flexibility to allow the movement of modular units within the footprint of the concrete pad and adjacent storage area to provide alternative arrangements. The assessments within the Environmental Impact Assessment will be undertaken based on the worst case scenario[4] ie the tallest modular unit in the most visible location. As the majority of the units on the concrete pad are modular there is not significant massing on the concrete pad.

**5.6.2** The operation of the waste treatment and recovery facility will be extended to 2046 at the latest to match the estimated lifetime of the extended landfill site. Prior to the commencement of the final phase of landfilling in the western extension area it is proposed that the waste treatment and recovery facility will be removed. If possible and practical all or elements of the treatment plant will be reused elsewhere or refurbished for use elsewhere. The hardstanding will be broken up and crushed for use as recycled secondary aggregate. Following removal of the treatment plant and associated infrastructure, landfilling of the north western section of the current landfill area (Phase 11) will be the final area landfilled and restored prior to the closure of the site.

[4] The Planning Inspectorate (2018) Advice Note Nice: Rochdale Envelope

## 6 General site operations and infrastructure

**6.1** The general layout of the site infrastructure is shown on Figure 1.3. The infrastructure includes site offices and welfare facilities, a laboratory, weighbridge, wheel washing facilities, lighting, security cameras, fencing together with fuel and leachate storage facilities and the gas flare.

**6.2** The landfill and treatment facility will continue to be accessed from the current site entrance on Stamford Road and using the site reception, weighbridge and wheelwash facilities shown on Figure 1.3. Temporary access routes through the western extension area to the operational phases will be constructed as needed. Where it is necessary to cross the routes of services, suitably supported temporary crossings will be constructed as agreed with the relevant services authority.

**6.3** It is proposed that the mineral extraction, construction and operation of the landfill, waste treatment and recovery facility will continue to be between 0700 and 1800 Monday to Friday and 0700 to 1300 on Saturday. There will be no waste management operations or importation of waste materials on Sundays or on public holidays with the exception of the receipt and use in the treatment facility of up to 20 loads of APC residues on public holidays.

**6.4** It is proposed that a chemical analytical laboratory will continue to be operated at the site. The laboratory at the site currently includes advanced analytical equipment and qualified chemists to provide an accurate and detailed testing capacity for wastes and environmental samples.

**6.5** To minimise the potential for dust generation as a result of site traffic during dry weather haul routes will continue to be kept damp with water delivered from a bowser or other spray. The running surface of roads formed of hardcore or similar materials will continue to be maintained to prevent the formation of ruts and potholes that may trap silt laden water which could cause dust when it dries. The movement of mobile plant and site traffic will be restricted to defined haul

routes which are treated. Vehicle speed limits will continue to be imposed to reduce the potential for dust to be raised. All site vehicle exhausts will be upward pointing to prevent dust being 'blown' up from the road surfaces. During landfill engineering works to ensure that the optimum moisture content is maintained clay is maintained in a damp condition hence landfill engineering does not result in the generation of dust.

**6.6** All vehicles associated with delivering waste to the site must make use of the wheelwash before exiting onto the road network. The wheel cleaning facilities present at the site comprise three stages*:*

- a wheel spinner
- a hurricane style power wash
- polishing stage with power wash

**6.7** All drainage from the wheelwash system is recycled. Silt from the system is disposed of in the landfill site. When the water is no longer suitable for recycling it is used for dust suppression in the landfill area or in place of mains water in the treatment and recovery facility. All waste delivery drivers are issued with site rules as part of their induction to the site. The rules include instructions on the use of the wheel cleaning facilities.

**6.8** The hard surfaced internal roads, site access and the section of Stamford Road close to the site entrance will continue to be swept regularly by a road sweeper to remove any debris and mud. A CCTV camera is installed at the site entrance and monitored from the weighbridge office to direct additional road cleaning when necessary.

**6.9** It is proposed that procedures will remain in place to direct site waste traffic, other than traffic making deliveries from a local source, to only enter and exit the site to and from the north along Stamford Road. Signs are in place to state that vehicles must turn left on leaving the site. It will be specified in the contract

with the consignors of LLW that other than Stamford Road delivery routes must use A roads only between the A47 and the site.

**6.10** Site security is the subject of the Environmental Permit and has been agreed with the Environment Agency on the basis of risk. The entire operational landfill, reception area and site entrance will continue to be covered by 24 hour CCTV. The CCTV system includes night vision and motion sensing. The CCTVs will continue to be manned remotely. In the event of intrusion the police and site management will be called.

**6.11** As stated in Section 2.7 the existing site has either a 1.8m high fence or a thorny hedge around the entire site boundary. Advice will be taken from Northamptonshire Police and the Environment Agency with respect to site security for the proposed western landfill area. It is considered likely that the site fencing or alternative barriers will be extended around the operational areas of the western landfill area. An Emergency Plan is in place as part of the Environmental Management System at the site which includes the actions which are necessary to inform the public in the highly unlikely event of an accident that has the potential for a significant effect beyond the site boundary. The Emergency Plan will be adapted and communicated as necessary based on the extended operations permitted at the site.

**6.12** The current site lighting comprises units fixed at a height of approximately 5m directed towards the ground. The units operate on dusk to dawn optic sensors and all lighting is set up to minimise glare but to provide suitable light to ensure the effectiveness of the CCTV camera system. The lighting is located in key areas at the main reception and office areas for both security and health and safety considerations. The key locations are the site entrance and visitors' car park, the main site office to provide light to the staff car park and weighbridge area and around the laboratory and vehicle inspection area. Mobile lighting is provided on the landfill and down-facing lighting units are fixed to appropriate points on the waste treatment plant. The site lighting at the site infrastructure

will not change as a result of these proposals. Mobile lighting will be used as necessary on the western landfill extension area.

**6.13** The following existing ancillary infrastructure will be retained for the development period to 2046:

- Weighbridge
- Wheel cleaning facilities
- Landfill gas flare and pumping station
- Laboratory
- Canteen
- Offices
- Cess pit
- Leachate storage tanks (mobile locations)
- Fuel storage tanks
- Monitoring boreholes
- Security cameras
- Boundary fencing

**6.14** Following the closure of the landfill to the receipt of waste, the leachate storage tanks, landfill gas management, surface water management and associated fuel storage and infrastructure will be retained at the site as necessary. All site infrastructure which no longer is necessary including offices, mess facilities, the weighbridge, wheelwash and security infrastructure will be removed.

# 7 Regulation and site monitoring

## 7.1 Site regulation

**7.1.1** The current site operations and management systems for the acceptance of waste and the operation of the hazardous waste and LLW landfill site and the waste treatment and recovery facility are developed based on guidance from the Environment Agency and the application of best practice. Environmental monitoring that is carried out in accordance with guidance and site specific schemes agreed by the Environment Agency confirm that the operations are not having a significant impact on the environment and do not represent an unacceptable risk to human health. It is proposed that these operating systems and schemes will be continued at the site including the western landfill extension area. The systems and schemes will be adapted as necessary in response to site specific experience and changes in guidance.

**7.1.2** As part of its PAS 99 fully integrated and externally certified Environment, Health and Safety and Quality Management System Augean has formal procedures in place to assess and check that only permitted wastes are received at the site for treatment or disposal. Procedures for the pre-acceptance assessment, waste acceptance criteria and the reception, inspection and verification of waste are formalised in the management system and are rigorously enforced. Any waste that arrives at the site that has not been subject to the pre-acceptance and booking procedure is rejected or quarantined and the Environment Agency is informed.

## 7.2 Acceptance of hazardous waste

**7.2.1** Approved procedures for the management of hazardous wastes which will continue to be used at the site include pre-acceptance procedures which are carried out prior to the delivery of waste to the site and site acceptance procedures that are carried out when waste is delivered to the site. In accordance with legislation the hazardous wastes that are permitted for

deposition at the landfill site will be subject to a maximum total organic carbon content of 6% by weight. Hazardous wastes with leachable components above those specified in the legislation will not be accepted for landfill disposal at the site. Wastes which will not be accepted for landfill disposal include liquid wastes, corrosive wastes, flammable wastes and wastes that are classified as oxidising.

**7.2.2** Hazardous waste will continue to be received only from contracted customers who must provide information and analytical data regarding the form and chemical nature of the waste and its leaching properties. An assessment will be carried out by the Augean team of specialist Technical Assessors to confirm that the waste is included in the Environmental Permit and that it meets the specified waste acceptance criteria for acceptance at the site.

**7.2.3** A waste consignment note will be prepared by the customer that describes the waste source and nature, the chemical components and concentrations, the hazards, the form and the quantity of the waste together with the type and number of containers and special handling requirements. The consignee must ensure that the waste is contained as necessary for transport in accordance with the relevant transportation legislation. All asbestos wastes will continue to be delivered to the site and deposited in double skinned bags or containers. Following implementation of Regulation 12 of The Waste (England and Wales) Regulations 2018 the producer of the waste must declare on the hazardous waste consignment note that they have fulfilled their duty to apply the waste hierarchy.

**7.2.4** On arrival at site the consignment note will be inspected and the accompanying paperwork will be checked together with comparison with the pre-acceptance details. The waste will be weighed and will be inspected and sampled as necessary to confirm consistency with the consignment note. The consignment note will be completed and logged. Any waste that arrives at the site that has not been subject to the pre-acceptance and booking procedure will be rejected

or quarantined and the Environment Agency informed. It is proposed that waste will remain in the quarantine area for a maximum of 10 days. The Quarantine Log will be updated and the Environment Agency notified when the waste is removed off site. Details on the disposal of hazardous waste are provided in Section 4.6 of this report.

**7.2.5** As explained in Section 1.11 of this report the radioactivity of the LLW that will continue to be accepted at the site is minimal. LLW comprises radioactive waste with a radioactive content not exceeding 4,000 becquerels per gram (Bq/g) of alpha activity or 12,000 Bq/g of beta or gamma activity however the waste which will be disposed of at the ENRMF will be limited to that which has a level of radioactivity at the lower end of the activity scale and typically will be up to 200 Bq/g. This means that only LLW with very low levels of radioactivity will be accepted at the site.

**7.2.6** Prior to agreement that each specific LLW consignment can be accepted at the site Augean will request amongst other information, detailed characterisation information regarding the physical nature, the chemistry and radioactive content of the waste together with information regarding the quantity, form and proposed packaging of the material. Augean will need to be provided with a copy of the relevant Environment Agency Authorisation or Environmental Permit for the disposal of the waste from the source site. The information will be assessed by Augean Technical Assessors and the site management to determine if the material is suitable for disposal at the site and is consistent with the conditions of the Development Consent Order and Environmental Permit. On approval by the Technical Assessor and site management the consignor will be permitted to make a booking to deliver the waste to the site. The consignor will be advised of the delivery requirements for the waste including an external exposure limit of 10 micro sieverts per hour (µSv/hr) at a 1m distance from each package.

**7.2.7** The LLW will be transported to the site in accordance with relevant transport regulations that apply to radioactive wastes. The regulations are established to control the risks to vehicle drivers and risks from for example transport accidents that could result in waste spillage. Due to the limited amount of radioactivity in the LLW that can be accepted at the site, most wastes which will be delivered to the site will not need any form of special packaging or shielding during handling or transport. However for ease of handling and in order to minimise the potential for spillage Augean will oblige waste producers to ensure that waste is transported in enclosed containers such as drums, bulk bags or other containers. Some large items of waste such as metal sheeting may not be transported in containers but will be wrapped.

**7.2.8** Prior to the delivery of wastes the timetable and details of the waste will be pre-notified to the site in accordance with the transportation regulations and pre-acceptance checks will be carried out to confirm the suitability of the waste for deposition at the site. Prior to the packing of each package or similar group of packages of LLW at the generating site a representative sample will be taken and retained by the source site for a year after the disposal of the package at the landfill. Augean will audit the consigning facilities routinely to confirm that the characterisation and packaging procedures are followed. The detailed procedures are set out in accordance with the Environmental Permit issued by the Environment Agency.

**7.2.9** On arrival at the site and prior to acceptance onto the landfill area the site chemist will confirm that the characterisation information which accompanies the waste load is adequate, conforms with the pre-acceptance information and that the load is acceptable for deposition at the site. Wastes arriving at the landfill will be subject to a physical check on the integrity of the packaging and monitoring to check that the external radiation dose is no more than 10 µSv/hr at a distance of 1m from the face of each package. The packages will not be opened or sampled at the site in order to minimise unnecessary exposure.

**7.2.10** As explained in Section 4.7 of this report additional precautions will be implemented after the waste is deposited in the landfill area and has been covered by suitable non-LLW material. Measurements will be made above the surface of the cover material to confirm that the activity measured at 1m above the surface of the covered LLW would result in an exposure of less than 2μSv/hr. The depth of cover will be increased if necessary to ensure that this limit is not exceeded. These precautions will provide additional confidence that no specific protective measures are needed for workers at the site who are closest to the LLW and will provide additional confidence that anyone off site also is suitably protected.

**7.2.11** In the unlikely event that unacceptable wastes are received at the site and the waste can be returned safely to the consignor the wastes will be refused entry to the site and returned to their source. In the unlikely event that a waste consignment is found on arrival to be unacceptable for receipt at the site and may not be safe to return to the sender quarantine measures will be implemented. The Environment Agency will be notified immediately. The detailed procedures for quarantine are specified in accordance with the radiation protection plan for the site which is established in accordance with the Environmental Permit in order to meet the requirements of the Ionising Radiation Regulations 2017.

## 7.3 Site and environmental monitoring

**7.3.1** The site operations and monitoring schemes all will continue to be carried out in accordance with the Augean Environmental Management System (EMS) which is externally certified and accredited to the ISO14001 standard. The EMS together with the health and safety and quality management systems are integrated in accordance with the PAS 99:2006 integrated management system standard. The EMS comprises a cycle of setting targets and objectives, planning, implementation, auditing and review together with undertaking where necessary corrective action and setting new targets and objectives. Through

the EMS and liaison with the local community in particular through the Kings Cliffe Liaison Group Augean will continue to seek to address potential environmental issues before they become a problem or nuisance.

**7.3.2** In order to monitor the nature of the leachate generated at the site and to confirm its suitability for use in the site treatment plant leachate monitoring will continue to be carried out routinely in accordance with schemes agreed with the Environment Agency. Site radiochemical monitoring of the leachate will continue be carried out based on a scheme prepared in accordance with the Environmental Permit.

**7.3.3** To confirm the effectiveness of the landfill containment system groundwater quality up and down hydraulic gradient of the landfill will continue to be monitored routinely in boreholes external to the waste based on a groundwater monitoring plan which is prepared in accordance with the Environmental Permit. Surface water quality at and around the landfill will continue to be monitored based on a surface water monitoring plan prepared in accordance with the Environmental Permit. The monitoring scheme includes radiochemical monitoring of groundwater and surface water samples.

**7.3.4** To confirm the effectiveness of the gas control systems landfill gas and volatile compounds are monitored in boreholes installed in the waste, in monitoring boreholes external to the waste located around the landfill and at the gas flare. The gas and vapour monitoring is carried out based on a gas monitoring plan which is prepared in accordance with the Environmental Permit. Site radiochemical monitoring will continue to be carried out of gas emissions in accordance with a scheme agreed with the Environment Agency as part of the Environmental Permit.

**7.3.5** Monitoring will continue to be undertaken at the site boundary for methane, hydrogen sulphide and volatile organic compounds (VOCs). Monitoring of deposited dust, suspended particulates (PM10) and asbestos fibres is undertaken at various locations on the site (Figure 7.1). Radiochemical

monitoring is carried out of particulate emissions in accordance with a scheme is agreed with the Environment Agency as part of the Environmental Permit.

**7.3.6** Monitoring of noise will continue to be carried out twice a year in accordance with the scheme approved through the current DCO.

**7.3.7** A site-wide radiochemical monitoring scheme approved by the Environment Agency and Public Health England is implemented at the site. Public Health England carry out independent assessment and monitoring of the LLW disposal activities at the site. The monitoring scheme includes regular reassurance monitoring of working areas for surface contamination such as the wheelwash, traffic routes, the site access and site offices. As part of the Environmental Permit for the deposition of LLW at the site emergency procedures have been prepared and agreed with the regulatory authorities.

**7.3.8** All the current monitoring schemes will be extended to include the western landfill area and will be subject to details and approvals in the Environmental Permits which will need to be varied to include the extension landfill area.

**7.3.9** The management and monitoring of the site will continue long after the site has ceased accepting waste. It is a requirement of the legislation that appropriate management remains in place for the duration of the Environmental Permits. The Environmental Permits do not cease on a specified date but continue in force until an application for its surrender is submitted to and accepted by the Environment Agency. The Environment Agency will not accept the surrender of an Environmental Permit until there is no longer any need for active management and monitoring in the opinion of the Environment Agency and until the Environment Agency are satisfied that the site does not present a potentially significant risk to the environment.

**7.3.10** As a requirement of the current Environmental Permits for the landfill site Augean make a Financial Provision which is available to the Environment Agency for the management of the site should Augean default on their site

management and aftercare obligations. The sum provided is agreed with the Environment Agency. This Financial Provision will be extended to apply also to the activities in the western landfill extension area as part of the variation of the Environmental Permit.

## 8 Restoration proposals

**8.1** The approved restoration scheme for the existing ENRMF landfill site is shown on the plan at Appendix 8.1. The preliminary proposed restoration scheme design for the proposed development is shown on Figure 8.1 and cross sections through the proposed restoration landform are shown on Figure 8.2. The proposed restoration landform for the current landfill area is a broad, curved ridge running from the east to the south west with slopes generally gentler on the southern side and steeper on the northern side. As explained further below, the proposed landform on the current site would extend up to a height of 99m AOD, which would be slightly below the height of the unrestored landform including the stockpiles on the site at present.

**8.2** The proposed restoration landform for the western extension area is a raised profile extending from north to south, rising up to a level of approximately 98m AOD at the northern end of the area and dropping down to 93m AOD where the adjoining landform also drops in elevation, meaning the adjoining woodland canopy is correspondingly lower. The central area then rises up to 97m AOD where it merges with the restored ENRMF site landform, and then towards the south the landform dips down to existing ground to take account of the two retained water pipelines.

**8.3** Two distinct areas of land, one to the south west of the un-diverted water pipelines and one from the south of the gas pipeline to the southern boundary of the site would also be worked and restored to form two small mounded landforms, rising up to 98.5m AOD.

**8.4** The design for the existing site takes into account various factors arising from best practice in terms of landfill restoration in order to maximise rainfall runoff and minimise rainfall infiltration. The current approved restoration scheme is for woodland, species rich neutral grassland, areas of scrubby planting and hedgerows with trees, along with the creation of a new footpath link from east to west.

**8.5** As explained in Section 4.2 of this report and shown on Figures 4.1 to 4.3 and 4.4 to 4.6 a number of preliminary options have been designed for the restored landform including integration with the current landfill area. The options reflect the extent of the constraints which may have to be accommodated in the design depending on the outcome of the ongoing investigations, risk assessments and discussions with the regulatory authorities and utility and pipeline companies. All of the design options follow the best practice principles for the design of restored landfill sites including in particular that the landform should be raised with slopes designed to shed water in order to minimise rainfall infiltration through the low permeability cap and into the waste. The gradients of the slopes across the western extension area in the preliminary restoration landform designs range between approximately 1:3.5 to 1:5 on the lower slopes to between approximately 1:7 and 1:12 on the middle and upper slopes. The gradients of the slopes across the existing ENRMF site in the preliminary restoration designs are in broad accordance with the approved slope gradients namely between approximately 1:3 (evident across the previously restored neutral/calcareous grassland area along the northern boundary) and 1:10 on the lower slopes to between approximately 1:12 and 1:40 on the middle and upper slopes. However, there are areas within the slopes that differ from this general pattern and that create local variations which are considered a desirable feature of the restored landforms.

**8.6** The preliminary restoration scheme design on Figure 8.1 is shown on the restored landform option shown on Figure 4.1 for illustrative purposes and the principles will be adapted to the finally selected restoration landform. The design generally incorporates neutral/calcareous wildflower grassland interspersed with areas of scrub and trees which in time will extend naturally to provide more extensive woodland cover with glades and rides. The scheme also incorporates an extensive network of hedgerows with occasional trees, which would link areas of vegetation and mark field boundaries as well as delineating the route of a maintenance track along which a new footpath would

extend. Other footpath routes would provide circular walks and would link with other public rights of way in the local area.

**8.7** Waterbodies will be incorporated into the design at locations at the base of the raised landfill areas once the site drainage scheme has been developed. The restoration scheme principles follow those agreed for the current site which were designed in discussion with the Northants Wildlife Trust in order to match their requirements for adoption as a Local Wildlife Site and to meet several of the Northamptonshire Biodiversity Action Plan habitat creation targets.

**Grassland Areas**

**8.8** Areas of seeded neutral/calcareous grassland will be developed, predominantly on the current landfill area and interspersed with the woodland areas in the western extension area. The type of grassland developed in each area will be based on the nature of the soils used for the restoration. The calcareous soils present in the northern part of the western extension area will be husbanded for use in the creation of calcareous grassland areas. The grassland/plant mixes will be selected to include plenty of pollen/nectar supplying flowers for the important invertebrates. These grassland areas will provide habitat particularly suitable for a wide range of invertebrates, particularly saproxylic species breeding in the adjacent Collyweston Great Wood, together with reptiles, feeding birds and ground-nesting birds such as skylark**.**

**8.9** The grassland areas will be managed primarily by seasonal mowing. In areas where there is a mix of scrub and grassland a band of taller grass will be left around the edges of the scrub patches which will provide over-wintering habitat for invertebrates, cover for reptiles and an area into which woody plants can spread, achieving the longer-term aim of developing a natural open woodland.

**Woodland/scrub/hedge planting**

**8.10** Discussions to date with Natural England, the Forestry Commission and Friends of Fineshade Wood have indicated that they would like to see the

development of woodland in the western extension area linking the woods on both sides. However, planting a new woodland provides relatively low biodiversity benefit whereas initial planting with a high quality grassland with some trees and patches of scrub (essentially a wood pasture) provides greater biodiversity and also allows for a more natural woodland form to emerge over time. These woodland/scrub/hedge planted areas will provide habitat particularly suitable for nesting birds, dormice, butterflies and other invertebrates, and commuting and feeding bats.

**8.11** The western extension area will be planted as a mosaic of habitat blocks in the order of three fifths grassland, one fifth trees edged with scrub and one fifth scrub with 1 to 3 trees in each block. This will be designed to provide a series of pleasing habitats and an assurance of future woodland. However, the final details of the design mix will be based on maximising the opportunities for biodiversity and continued discussions with interested local and national groups.

**Access**

**8.12** It is proposed that public access to the restored site is included in the restoration scheme. An illustrative access track route and footpaths are shown on the preliminary restoration scheme design (Figure 8.1). The paths shown link with Footpath MX15 to the west of the site at three locations in order to provide connectivity with the wider right of way network.

**Restoration soils**

**8.13** The proposed restoration scheme comprising largely neutral/calcareous grassland, tree and scrub planting and hedgerows with trees will require the use of soils with low nutrient richness typical of unimproved grasslands and natural habitats. Agricultural soils and typical top soils are inappropriate due to their relatively high nutrient status which would result in strong growth and competition by weed species to the detriment of the target species for the

specific habitats. Soils can be sourced from inert material received through the gate but are typically highly variable giving uneven establishment and often importation of undesirable species in the soil seed banks. Use of imported soils will require a reliable source with good characterisation to ensure that the restoration objectives are not compromised. It is proposed to use on site soils and overburden materials as a soil forming material for the restoration of the site.

**8.14** Part of the northern area of the proposed western extension area has soil which is classified as Grade 3A Best and Most Versatile agricultural land. This soil has been identified as having a high pH and calcium carbonate content and therefore will be husbanded for use in developing the areas of the site to be restored as calcareous grassland.

**8.15** The overburden present at the site generally is a clay rich material 76%-86% with 7%-15% sand. Examination in the field shows that the material is partly weathered and, at appropriate moisture content can be cultivated. The overburden material will have a very low nutrient content which if necessary can be adjusted by low doses of fertiliser. The need for fertilisation and the specification for handling and cultivation will be determined on a phase by phase basis by testing and examination of the overburden as dug. The restoration requirements will be set out in a scheme submitted for approval in accordance with the Requirements of the Development Consent Order.

**8.16** If a Development Consent Order is granted for the extended site area a detailed landscaping, restoration and aftercare scheme will be developed in agreement with the local planning authority. The scheme will be integrated with the proposed ecological management scheme for the site. The management and aftercare schemes will continue for a period of ten years following the cessation of landfilling at the site.

**8.17** The development and finalisation of the restoration scheme for the site will follow the objective of achieving Biodiversity Net Gain. Biodiversity Net Gain is

defined as development that leaves biodiversity at the development site in a better state than it was before the development took place. It is also an approach where developers work with local authorities, wildlife groups, land owners and other stakeholders in order to support their priorities for nature conservation. The approach being taken by Augean and their advisers for the development of this site is in accordance with good practice for achieving Biodiversity Net Gain.

# 9 The consideration of alternatives to the proposed development

## 9.1 Introduction

**9.1.1** In this section the options and alternatives considered to date during the development of the current extension proposals are explained. This includes the assessment of the suitability of the site location and the identification of the constraints which affect and lead to the choices that have been made to date with respect to the design of the proposed operations, the containment engineering design, the restoration profile hence the void generated and the operational and management proposals. The design parameters which are fixed at this stage are identified in the relevant sections of this report as are those which are subject to further refinement and where options are still being considered.

**9.1.2** One of the main objectives of the consultation exercise which is being carried out as part of the preparation of the development proposals and prior to the submission of the Development Consent Order (DCO) application is to explain to the consultees the alternative development and design options that have been considered, the constraints which affect the development of the proposals and to encourage comments and views particularly on the aspects of the proposals which are not fixed. The consultation proposals are set out in the Statement of Community Consultation which is circulated with this document and includes extensive circulation of the documentation for review and comment. The purpose of the consultation process is to engender improved understanding of the constraints and controls that are inherent in the design of the proposed development and to understand the concerns of the local residents and third parties with respect to the potential and perceived disadvantages or risks resulting from the proposed development. From this exercise solutions and amendments can be identified for the preparation and submission of the DCO application.

**9.1.3** The overarching purpose of the proposed development is to continue to meet the established need nationally and in particular in the centre and south of the UK for the safe disposal of hazardous waste and low level radioactive waste (LLW) and the treatment and recycling of wastes beyond the consented life of the current site. The proposals must satisfy all relevant International, European and National legal, policy and regulatory considerations to ensure that people and the environment are properly protected in the short, medium and long term and in order to proceed must be commercially viable and provide business security.

## 9.2 The continuing need for a facility in the central area of the country

**9.2.1** At the time that the application was made for the current DCO consent the limit of extraction for the creation of landfill void was determined based on land ownership boundaries. The designed landfill void took into account a number of factors including:

- the time needed to fill the remaining void in the previously consented landfill area in the east of the site (Phases 1 to 5);
- the need for additional landfill void for approximately a further 10 year period
- the proposed landfill input rate of 150,000tpa;
- constraints at the site such as the available clay, the presence of boundary features, the locations of proposed mitigation planting, existing facilities such as the gas flare, surface water management facility and the soil treatment facility.

**9.2.2** The additional void created through the proposed landfill extension the subject of the previous DCO application of approximately 1.2Mm$^3$ was designed to allow site operations to continue to provide a facility for the disposal of hazardous waste and LLW for approximately 10 additional years which

including completion of the previously consented void in the east of the site extended the life of the landfill site up to the end of December 2026.

**9.2.3** The site lies in the south eastern corner of the East Midlands region and is geographically close to the West Midlands, East of England, Greater London and South Eastern regions. As shown in Tables 9.1 and 9.2 over 80% of the waste accepted at the waste treatment plant and over 95% of the waste accepted at the site for landfill disposal over the last five years originates from these five regions. The majority of the waste deposited in the landfill comprises residues from the treatment plant. As shown in Table 9.3 the total quantity of hazardous waste produced in England has been rising steadily over the last 5 years and was almost 6 million tonnes in 2018. The data in Table 9.4 show that in the regions nearest to ENRMF the quantity of hazardous waste generated each year is rising over time and in 2018 was approximately 3.3 million tonnes. A total of approximately 750,000 tonnes of hazardous waste was landfilled in England in 2018 as shown on Table 9.5. No new hazardous waste landfill facilities have been developed in the south of the country since the proposals for the currently consented activities was submitted. Based on the data assessed there is a continuing need for the provision of a waste management facility for the treatment and disposal of hazardous waste able to serve the wastes arising in the West Midlands, East Midlands, East of England, South East and Greater London.

**9.2.4** The ENRMF is centrally located for the wastes arising at the locations of the major LLW waste producers in the south and east of the country. The location of the site is well placed to serve the producers of LLW from the nuclear and non-nuclear industries. ENRMF will continue to provide a closer and more convenient alternative for the disposal arisings than the more distant alternative facilities in the north west. The need for a fit-for-purpose site for the landfill disposal of LLW from both the nuclear and non-nuclear industries in a central location that will contribute to the national need for capacity to address the

identified shortfall and to conserve the capacity of the highly specialised facility at LLWR remains. The volumes of LLW deposited at the site to date is presented in Table 9.6 and Table 9.7 shows the predicted LLW arisings from the major producers of LLW although not all of this waste would be suitable for disposal at ENRMF.

**9.2.5** The remaining void capacity at the ENRMF landfill site at the end of 2019 was approximately 900,000m$^3$. At an input rate of 150,000m$^3$ to 200,000m$^3$ per annum this provides a remaining life of around 4.5 to 6 years. The treatment facility occupies the last phase of the landfill and must be removed before the area can be landfilled. Therefore, if it is intended to extend the site to the west to provide a continuous landform and to maintain the operation of the waste treatment facility while a western extension area is landfilled then the remaining void available is significantly less. This is because the landfilling will need to stand away from the western boundary while the new phases immediately adjacent and to the west are excavated and constructed to provide a continuous landfill void as illustrated in Figure 4.7.

**9.2.6** There is a clear need for the provision of continuity of waste treatment and recovery facilities as well as continuity of void capacity for hazardous waste landfill, as well as for suitable void for the landfill of LLW to serve primarily the West Midlands, East Midlands, East of England, South East and Greater London. A detailed review of the need for treatment and disposal capacity for hazardous waste and disposal capacity for LLW is being carried out and will form part of the application for the DCO.

**9.2.7** The development of new waste facilities involves a number of steps which must be planned well in advance in order to provide continuity for the Augean business as well as for its customers. These steps include:

- Identifying the options for alternative locations for the treatment facility.

- Identifying the options for alternative locations for the landfill facility.
- Assessing the feasibility of the alternative locations.
- Carrying out investigations and surveys to further assess suitability and constraints.
- Preparing and submitting the DCO and Environmental Permit applications.
- Timescales for determination of the DCO and Environmental Permit applications.
- The time to carry out pre-operational mitigation and to construct the infrastructure and engineered landfill containment.

To accommodate these steps Augean has conducted studies of options over several years.

**9.2.8** In this section the alternatives to the proposed development that have been considered and under each of the aspects listed below are explained:

- Alternative waste management methods
- Alternative options for the co-location of the treatment facility and the landfill site.
- The development of alternative locations for the future waste management activities.
- The consideration of alternatives for the design of the proposals at the ENRMF site.

## 9.3 Alternative waste management methods

**9.3.1** The government policy for the management of hazardous waste remains set out in the 2010 DEFRA document[5]. While reviews of this strategy have been carried out since 2010 the principles remain the same. The Resources and Waste Strategy for England[6] published in 2018 takes forward the same principles and enhances the emphasis on minimising the use of hazardous materials in product design and manufacture wherever possible. In the Resources and Waste Strategy it is stated (section 3.2.2) that based on data for 2016, waste infrastructure in England managed 203 million tonnes of waste, 5 million tonnes of which were hazardous. As noted in paragraph 9.6 above the total quantity of hazardous waste produced in England has been rising steadily and was almost 6 million tonnes in 2018.

**9.3.2** The Resources and Waste Strategy (section 3.2.6) states

> "*Therefore, we will work with producers and waste management companies to explore these issues and consider how we can encourage producers to implement the waste hierarchy in respect to hazardous waste alongside actions to implement the Best Overall Environmental Option for problematic wastes. This may include seeking views on requiring producers of hazardous waste to report annually on how much hazardous waste they produce, send for recycling or recovery, send for disposal and the steps they have taken to drive the management of hazardous waste up the waste hierarchy."*

**9.3.3** The National Policy Statement (NPS) on hazardous waste[7] was published by the Secretary of State in July 2013 and sets out Government policy for hazardous waste infrastructure. The NPS states that new, nationally significant

[5] DEFRA (2010) A Strategy for Hazardous Waste Management in England
[6] DEFRA (2018) Our waste, our resources: a Strategy for England
[7] DEFRA 2018. A framework document for planning decisions on nationally significant hazardous waste infrastructure.

infrastructure for the management of hazardous waste is needed to protect the environment and human health and to allow us to manage hazardous waste in a more sustainable way, recycling and recovering the waste where possible.

**9.3.4** The principle which underpins all the waste strategies is that of sustainability and that the quantities of hazardous waste that are generated for disposal should be managed by waste producers and waste managers in accordance with the waste hierarchy. It is stated that the waste hierarchy shall be applied in the following priority order:

- Prevention
- Preparing for re-use
- Recycling
- Other recovery e.g. energy recovery
- Disposal

**9.3.5** In accordance with the strategies and the waste hierarchy, before hazardous waste may be disposed of the producer of the waste must consider whether the generation of waste can be prevented in the first place and for the waste that is generated, to consider the alternative options for its re-use, recycling, use for the recovery of energy or treatment to reduce the hazardousness or volume of the waste. Only residues which remain after consideration and application of the alternatives are suitable for landfill disposal. The implementation of the hierarchy of waste management options means that the need for capacity for the treatment of hazardous waste will increase over time and the need for capacity for the direct landfill of waste is likely to decrease although the need for landfill of residues will remain. The waste hierarchy applies also to non-hazardous waste. One of the consequences of the increased treatment of non-hazardous waste is that the rate of generation of hazardous waste residues from the treatment of non-hazardous waste will increase with a resultant

increase in the need for hazardous waste landfill capacity. The 2010 Strategy for Hazardous Waste Management and the NPS for Hazardous Waste recognise that for waste where there is no better recovery or treatment option landfill is the final end point.

**9.3.6** The facilities operated by Augean at ENRMF manage wastes which cannot be managed appropriately in the upper levels of the waste hierarchy and remain to be managed safely for recovery or disposal using techniques which control environmental impacts. The majority of the wastes delivered to the ENRMF site are directed to the treatment facility where they are treated for recovery wherever possible or are treated to reduce their hazardous nature (particularly to reduce the leaching properties of these wastes) prior to their disposal in containment landfills. The proposals to increase the throughput of the waste treatment facility, to extend slightly the area of the facility and to incorporate flexibility in the precise design of the treatment plant and associated infrastructure reflects the continued development by Augean of opportunities to recover a greater range of waste types for re-use off site following treatment rather than disposal.

**9.3.7** The waste management hierarchy is applied to LLW in a similar way as it is applied to other wastes. Before LLW is directed for disposal to landfill the producer of the waste must first have considered alternative options for its minimisation, re-use or treatment. The UK Government policy[8] states that nuclear and non nuclear sites which produce LLW must prepare a LLW Management Plan. The strategy for the management of LLW[9] from the nuclear industry reiterates the commitment to the implementation of the waste hierarchy and the development of site specific LLW management plans. One of the principles of the management plans will be the minimisation of LLW in terms of

[8] Policy for the long term management of solid low level radioactive waste in the United Kingdom. March 2007. DEFRA and devolved administrations

[9] UK Strategy for the Management of Solid Low Level Waste from the Nuclear Industry. February 2016. Prepared by the Nuclear Decommissioning Authority on behalf of UK Government.

both activity and mass. LLW producers are obliged to manage their waste in accordance with the waste management hierarchy in the same way as producers of other types of waste.

**9.3.8** The LLW management strategies are based around three themes which are the application of the waste hierarchy, the best use of existing assets and the development of new fit-for-purpose waste management routes. The application of the waste hierarchy is seen by the Nuclear Decommissioning Authority (NDA) as critical in ensuring that wastes are consigned for disposal only where this is the best environmental option in order to safeguard the availability of safe, secure and environmentally appropriate disposal capacity for those residual wastes where landfill disposal is necessary.

**9.3.9** It is recognised in UK Government policy that some of the steps in the waste hierarchy applied to LLW require different considerations from those required for conventional (non-radiological) wastes. For instance, the avoidance of waste creation is less relevant in the case of materials which already are contaminated by historical activities at electricity generation sites that are awaiting decommissioning.

**9.3.10** Following the minimisation of waste generation in accordance with the waste hierarchy wastes should be re-used and recycled where possible followed by waste treatment. It has previously been considered by the NDA that opportunities to apply the principles of re-use and recycling to radioactive waste were limited however over recent years there has been more success in realising these opportunities within and outside the nuclear industry. Reuse and recycling of LLW may be limited to particular waste forms, for example metals, where recycling opportunities are most likely**.**

**9.3.11** Waste treatment activities for LLW include waste compaction and incineration. However even though compaction can substantially reduce the volume of the

waste the residual, compacted waste still will need to be disposed of. The NDA currently are driving the future implementation of thermal treatment technologies but only small volumes of combustible LLW are expected to be generated[10].

**9.3.12** The Government LLW policy recognises that for wastes that cannot be prevented, further minimised, diverted for recycling or re-used, final un-retrievable disposal is the end point for all LLW. The disposal of LLW is therefore considered the last option available to LLW producers. It is clear from the above that there will be a continuing need for LLW wastes which cannot be managed at a point higher in the waste hierarchy to be consigned for landfill disposal.

**9.3.13** It is considered that even with continued and improved application of the waste hierarchy by waste producers, there remains a need for the continued provision in the east and south of England for an environmentally secure landfill and treatment facility for hazardous wastes and LLW in order to support the economic structure of UK business and services.

## 9.4 Alternative options for the location of the treatment facility

**9.4.1** The particular advantage available at ENRMF is that the outputs from the waste treatment processes that necessitate disposal in a hazardous waste landfill can be deposited at the adjacent landfill site minimising the transportation associated with their final management. Similarly if the residues from the treatment process necessitate landfill in a non-hazardous waste landfill site they can be deposited at the Augean Thornhaugh Landfill Site which is only 5km by road from ENRMF. In addition the site infrastructure such as access, reception facilities, the site laboratory, offices and welfare facilities can be shared by the two integrated operations at the ENRMF site. There are therefore clear environmental and business benefits to co-locating the treatment and disposal

[10] Nuclear Decommissioning Authority Fourth Strategy. Consultation Draft August 2020.

facilities and the benefits of the co-location of waste management facilities are referred to in paragraph 4.13.3 of the NPS for hazardous waste.

**9.4.2** Notwithstanding these co-location benefits, Augean carried out a review of the option of removing the waste treatment facility from its current location to a separate location in order to maximise the use of the lifetime of the consented landfill void at the site including the void in the area in which the treatment facility is located currently (Phase 11 of the landfill site). As explained above the majority of the inputs to the landfill arise at the treatment plant therefore the two facilities are closely integrated. Therefore, even if the treatment plant was located elsewhere the limited remaining landfill void created by moving the treatment plant at ENRMF still would need to be replaced in order to continue to provide a secure nearby disposal facility for the outputs.

**9.4.3** Alternative locations for the treatment plant in the vicinity of the landfill which were considered included in particular:

- Thornhaugh Landfill Site.
- Land to the west of the ENRMF Landfill Site.
- The vacant former MOD land located in Collyweston Great Wood to the north.

**9.4.4** Consideration of these options was progressed in parallel with consideration of the options for the location for a new landfill area and the preference remained throughout for the identification of a location at which the two integrated facilities could be co-located.

**9.4.5** The transfer of the treatment facility to Thornhaugh Landfill site has the advantage that the land is owned by Augean however it has the significant disadvantage that the construction of a treatment facility at the site would substantially constrain the available consented landfill void as there are no

unused or suitable restored areas at the Thornhaugh site that could be used for the treatment plant.

**9.4.6** The land to the west of the current ENRMF facility is not owned by Augean and in the early stages of the review of alternatives Augean had no option agreement in place to purchase this land. When the option agreement became available to Augean to acquire land to the west of the current facility the preference remained to acquire sufficient land to co-locate the treatment plant with the landfill on an extended acquired area rather than solely to acquire a small area for the short term relocation of the treatment plant.

**9.4.7** For commercial reasons it was not practical to progress the option of the development of the former MoD site which has planning permission for development as a transport yard.

## 9.5 The development of alternative locations for the future waste management activities

**9.5.1** Since the current DCO consent for the site was issued, Augean have been maintaining a watching brief for alternative suitable facilities that might become available to them for future use and in 2017 a proactive programme was developed to carry out a structured geographical search for a potential future site to follow on from the current ENRMF.

**9.5.2** A set of search criteria was prepared against which potential sites would be assessed. The main criteria comprised:

- ***Site type***: Existing permitted facilities, mothballed sites and suitable mineral workings considered as well as undeveloped sites with the potential for development subject to planning permission and relevant other permissions.

- ***Ownership***: Freehold basis preferred as leasehold is unlikely to be acceptable due to long term liabilities associated with landfill developments.

- ***Location***: Ideally less than 50 but up to 100 miles from the M25. In an area generally north of the M4, west of the M11 and south of Birmingham.

- ***Size***: Potential for >2million $m^3$ of void. Approximately 40ha dependent on the geology (which will affect the depth of landfill void). Minimum of 5ha available for the treatment facility and ancillary infrastructure.

- ***Access***: Proximity to major A road or motorway access point. Good local access road suitable for HGV use without passing through villages/towns.

- ***Geology****:* Location with geology/hydrogeology that does not conflict with Environment Agency groundwater policy.

- ***Infrastructure****:* Water, electricity, telecoms to be in place. Gas not necessary. Potential location for discharge of effluent subject to consent.

- ***Planning policies****:* In an area where the planning authority has supportive policies for waste management development in the minerals and waste local plan.

**9.5.3** The first phase of the alternative site search commenced in August 2017 and was based on location criteria and the geological and hydrogeological setting together with a search of directories of mineral sites and excavations as well as large waste facilities including existing landfill sites. Plans were generated from geological and hydrogeological maps showing the overall areas of unsuitable and potentially suitable locations based on the area of search. The overall findings of Phase 1 of the work resulted in the identification of areas as being

identified as generally potentially suitable and unsuitable. Further work was carried out using GIS systems to exclude areas in groundwater source protection zones or in floodplains.

**9.5.4** In general the potentially suitable areas of unproductive groundwater strata are underlain by principal aquifers. For example, the Oxford Clay overlies Great Oolite strata which includes the Lincolnshire Limestone Formation principal aquifer, the Gault Clay Formation is underlain by the Lower Greensand principal aquifer and the London Clay Formation is underlain by the Chalk principal aquifer. For a site to be deemed potentially feasible it was identified that there would need to be a significant thickness of unproductive strata above the principal aquifer. In order to consider the site feasibility further it was necessary to check the thicknesses of unproductive strata in each of the areas and, where available, to check information on groundwater levels from the British Geological Survey online borehole records in order to further refine the potentially suitable and unsuitable locations.

**9.5.5** The second phase of the search commenced in January 2018 and comprised overlaying the locations of the following areas so that they could be excluded from the search areas.

- Flood Zone 2 or 3
- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Ramsar sites
- Areas of Outstanding Natural Beauty (AONB)
- Greenbelt

**9.5.6** The outputs from these two phases of work which included general areas of search as well as 85 specific sites identified from the databases were reviewed in further detail based on the further key criteria set out above and a shorter list of specific potential locations and specific search areas was provided in mid-2018 to a specialist land and estates surveyor for further review and assessment.

**9.5.7** A desk based review for each specific site and area identified was carried out and resulted in the generation of a first shortlist of 43 sites and areas in Cambridgeshire, Bedfordshire, Buckinghamshire, Northamptonshire and Oxfordshire. The development potential of these sites and areas was further reviewed and a second shortlist of 8 sites was assessed in further detail including assessment of their planning and permitting status. A number of these sites were excluded for reasons such as land access arrangements and proposals in place for the development of large numbers of houses on the land. Of the 8 sites in the second shortlist, 2 were discounted due to development constraints/existing development, 2 were identified as having limited potential for development and 4 were identified as potentially worth following up to obtain additional detailed information.

**9.5.8** In parallel to the wide ranging site search exercise, discussions were taking place with the owner of the land immediately adjacent to the current ENRMF site. These discussions had progressed to a sufficiently positive stage at the time that the site search exercise was narrowing that it was determined to hold initial discussions with the Environment Agency regarding the suitability in principle of the area adjacent to the site for an extension of the landfill. These discussions were held in late 2017 and, following the indication from the Environment Agency that the area was suitable in principle and on reaching an appropriate stage in discussions regarding future ownership of the site, the specification for a site investigation to examine the underlying geology and hydrogeology was agreed with the Environment Agency in December 2018.

Site investigations comprising the drilling of a number of boreholes and a series of ecological surveys were implemented during 2019 and early 2020.

**9.5.9** An extensive exercise was been implemented by Augean to identify potentially suitable alternative locations for the future waste management activities. This wide area of search identified a few sites which were regarded as potentially suitable with a recommendation that they should be investigated further. Neither of those sites were under the control of Augean and discussions had not commenced with the landowners. At approximately the same time discussions between Augean and the owners of the land adjacent to the current facility had progressed sufficiently to suggest that the land would become available.

**9.5.10** No new hazardous waste landfill or treatment facilities are allocated in the Northamptonshire County Council Minerals and Waste Local Plan. The national significance of the ENRMF facility is noted in the Northamptonshire Minerals and Waste Local Plan[11] (MWLP) at paragraph 5.23 which states:

> '*Hazardous treatment (soil treatment) and hazardous waste disposal capacity is* provided *at the nationally significant ENRMF; which is also used to dispose of LLW*'.

**9.5.11** The MWLP seeks to secure delivery of new waste capacity in two ways: (1) identification of specific industrial locations where waste management uses would be acceptable in principle along with sites for waste management facilities; and (2) identification of locally specific policies on which the acceptability of proposals for waste-related development that come forward on unallocated sites can be determined.

**9.5.12** Paragraph 5.48 of the MWLP states:

[11] Northamptonshire Minerals and Waste Local Plan. Adopted July 2017.

'*The development in Northamptonshire of facilities with a national or regional catchment area are only considered appropriate where these would be of a specialised nature, with a genuine specialist catchment area for the waste to be managed*'.

**9.5.13** As explained above and in earlier sections of this report, the facilities at ENRMF provide specialist waste management provision and comprise nationally significant infrastructure which serves a regional and national need rather than just a local need. Policy 15 of the MWLP states:

'***Policy 15: Development criteria for waste disposal (non-inert and hazardous)***

*Proposals* for *the disposal of non-inert or hazardous waste must demonstrate that:*

- *additional capacity is needed to deliver waste disposal capacity requirements,*
- *it clearly establishes a need for the facility identifying the intended functional role, intended catchment area for the waste to be disposed and where applicable the requirement for a specialist facility,*
- *it is in general conformity with the principles of sustainability (particularly regarding the catchment area),*
- *the waste to be disposed of has undergone prior-treatment to ensure that only residual waste is disposed of, and*
- *disposal forms the last available management option.*

*Where this can be demonstrated, preference will be given to extensions of existing sites unless it can be shown that a standalone site would be more sustainable and better*

*located to support the management of waste close to its source.'*

**9.5.14** Accordingly, where the regional and national need for the capacity can be demonstrated, where it can be demonstrated that the provision of the facility does not conflict with sustainability principles and the application of the waste hierarchy and where the site location is shown to be suitable and does not result in unacceptable environmental and health impacts, the policy preference is for extensions of existing sites rather than the development of new sites.

**9.5.15** The extension of the existing site can be achieved using the existing site access and infrastructure including laboratory facilities as well as the existing suitably qualified and experienced workforce who are trained in the assessment and handling of hazardous waste and LLW. Remaining at or close to the current site location allows the specialised and experienced workforce to be retained. The necessary skill sets are not easily replicated in another location as most employees live locally. If the site moved to another location employees potentially would either have to relocate or find other employment or travel longer distances which is not a sustainable approach.

**9.5.16** The existing co-located treatment facilities and hazardous waste landfill and the nearby Augean Thornhaugh non-hazardous waste landfill provide substantial sustainability benefits as a result of the short distance for the transfer of treatment residues which cannot be reused for their final disposal. The current site setting has been demonstrated to be suitable and to provide for the safe disposal of hazardous waste and LLW. The impact assessment sections of this report demonstrate that the proposed extension area also can be developed and operated without resulting in unacceptable impacts on the environment or human health. Accordingly, given that the adjacent land is available to Augean, the development of an extension to the existing, established site rather than a site at a new location provides substantial sustainability, environmental, policy and cost benefits.

## 9.6 Design constraints and the consideration of alternatives for the proposals at the ENRMF site

**9.6.1** Careful consideration has been given to the selection of the area of adjacent land which is the subject of the proposed development. The option of the field adjacent to the southern boundary of the current site was considered as well as the proposed area to the west of the current site. Given the topography of the field to the south it was considered that development of the southern field had the potential for a greater visual and landscape impact than development of the western area which is generally more contained and likely to result in a lower potential visual and landscape impact.

**9.6.2** The option was considered of including the whole of the field to the south of the gas pipeline in the southern section of the proposed western extension. However, in order to provide continued easy access for the famer whose landholding extends to the south of the current site and west of the proposed extension, the southern boundary of the proposed development does not extend to the full extent of the southern field.

**9.6.3** The option of moving the waste treatment plant to the western extension area, particularly the self contained area to the south of the gas pipeline was considered. This would have the advantage that the final phase of the current landfill (Phase 11 and adjacent phases) could be landfilled at an earlier stage than if the treatment plant remains in its current location. It was determined that locating the treatment plant in the southern part of the southern field in the proposed extension area would result in a greater visual impact than the current location which is very well shielded from view by the natural topography and the surrounding landfilled areas. Moving the infrastructure and plant to this area would incur significant costs with no environmental or operational benefit.

**9.6.4** Consideration was given to the development of a new access to the site running northwards from the northern extend of the proposed extension area to join the

A47. It was determined that there were potentially significant ecological impacts associated with developing a route through the woodland area towards the A47 and that given the ecological constraints at the boundaries of the site there is limited space available at the northern end of the proposed extension area to develop new reception infrastructure. Furthermore it would result in greater distances for vehicles to travel over internal haul routes to reach the landfill area or treatment plant compared with the more centrally located existing access.

**9.6.5** In developing a suitable design for the void in the proposed landfill extension the physical and environmental constraints have been taken into account to develop the size of void which will provide appropriate environmental protection as well as the necessary capacity for the markets and bring certainty to Augean's business. The proposed design of the void extension is limited by the physical and environmental constraints at the site which are predominantly:

- The area of land controlled by Augean
- The current infrastructure for the site access and waste reception
- The need for a standoff from the site boundary to provide room for ecological mitigation, screening, planting, security and stable slopes
- The site geology and hydrogeology
- The visual impact and effect on landscape character

**9.6.6** The options considered with respect to the design of the landfill site for the proposed extension area taking into account the diversion of services, the standoff from boundaries in order to provide ecological mitigation, the design relative to the swallow hole and potential doline areas and the proposed restoration profile and scheme are set out in Sections 4 to 8 of this report. These aspects of the design will be fixed by the technical requirements identified through the assessments.

**9.6.7** The depth and horizontal extent of the excavation as well as the nature of the containment engineering including the capping at the consented landfill is specified in the current Environmental Permit and associated documents and will be specified in similar terms for the landfill extension area. The geology underlying the site determines the extent of the void depth and to some extent the engineering needed.

**9.6.8** A full description of the geology underlying the site is presented in Section 16 of this document. In summary the proposed extension area is formed predominantly of the silty mudstones of the Rutland Formation which overly the Lincolnshire Limestone. The materials which comprise the Rutland Formation are extracted to provide clays which are used to construct low permeability engineered containment seals to the current ENRMF landfill and at the nearby Augean Thornhaugh landfill site. Excess material is exported for use off site. It is the extraction of the Rutland Formation materials which creates the below ground void and the restoration landform which defines the above ground void.

**9.6.9** The depth of the void is constrained by the depth of the underlying limestone. A layer of low permeability Rutland Formation will be left in-situ above the limestone as discussed in Sections 4 and 16 of this report. The engineered containment layer and leachate drainage layer will be constructed over the base of the site as described in Sections 4 and 6 of this report. A default specification for the lining, leachate drainage and capping systems for hazardous waste landfill sites is set in the EU Landfill Directive and in national legislation together with the circumstances under which alternative engineering proposals are accepted as equally protective including the risk assessment design criteria which must be met. These aspects of the design will be fixed by the technical requirements identified through the legislation and the quantitative risk assessment.

**9.6.10** Extensive quantitative hydrogeological risk assessments have been carried out for hazardous wastes and for LLW for the current site to confirm that the proposed engineering containment designs are suitably protective of the environment and, as a consequence, protective also of human health. The risk assessments are based on conservative, worst case assumptions and are not based simply on the design criteria and performance expectations. For example the values for variable parameters which are included in the risk assessments usually are set as ranges of values ranging from the minimum likely through the most likely to the maximum likely. The model is then run through hundreds of iterations with randomly selected combinations of values to generate outputs that are probability based. The most likely outcomes generated by the models as well as the low probability outcomes are included in the assessment in order to determine the acceptability of each of the aspects of the design which are tested. Given the sensitivity analyses for key variables and the outputs from the models there is a high degree of confidence that the engineering containment design provides robust and long lasting protection to the environment. Similar models are being applied to the western extension area and the outcomes will be scrutinised by the Environment Agency who will only grant an Environmental Permit if they are satisfied that the assessments demonstrate that there would be no unacceptable environmental impacts.

**9.6.11** The void available together with the anticipated input rate and the likely size of each vehicle load delivered to the site determines the traffic numbers that will be associated with the delivery of wastes to the site. The impacts of the predicted traffic numbers associated with the proposed development are assessed taking into account the capacity and safety of the critical roads and junctions. The traffic impact assessment presented in Section 18 of this report explains that traffic impacts do not constrain the proposed development at the site and that the potential for increase over time of traffic numbers associated with other road users also is taken into account. Continued restrictions on the

routing of traffic are included in the proposals in order to avoid the impact of traffic associated with the site on rural roads and villages.

**9.6.12** A landscape baseline of the environment of the site and its surroundings was established including the landscape character and visual context of the local area. An assessment of the development options was undertaken to determine the constraints with respect to the visibility of the proposed extension and the degree to which the landscape can accommodate the development. It is also necessary to take into account the technical needs of the restoration profile which fix aspects of the overall design. In order to provide effective surface runoff from the site surface hence minimise infiltration and leachate generation it is necessary to design the restoration profile at suitable gradients. It is necessary to ensure that the designed gradients are stable for the proposed wastes and engineering components. It is necessary to take into account guidance on the design of minimum slopes for the restoration of landfill sites as well as maximum slopes for the maintenance of grassland areas and woodlands. It is necessary to ensure that there are no predicted residual significant adverse landscape and visual effects from the proposed scheme. The proposed height and shape of the final landform is designed taking into account the current site profile and the impact of the extended restoration profile on the landscape character and visual setting of the area.

**9.6.13** The preliminary proposed restoration profile shown on Figures 4.4 to 4.6 is derived from the criteria summarised above. Whilst refinements can be made to the final profile the overall shape has been developed taking into consideration the landscape character and visual setting as explained in Section 8 of this report and therefore is difficult to change without careful consideration of the consequent effects.

**9.6.14** The design of the restoration proposals for the site is the aspect which is most flexible as it is derived from a series of principles and objectives taking into account the landscape character and existing local habitats of the area and the

ecological objectives in developing site restoration and biodiversity proposals rather than technical or legislative requirements or practical constraints as are most of the other aspects of the site development design. The objectives and principles for the restoration of the site are set out in Section 8 of this document and a preliminary proposal for the restoration scheme is shown on Figure 8.1.

## 10 Introduction to the assessment of the environmental effects

**10.1** As explained in Section 3 of this report the proposed development is to extend the landfilling and treatment operations which are carried out currently at the ENRMF facility to an adjacent western area and to continue those activities over a longer period, potentially up to 2046. The nature of the activities and the wastes accepted at the site will not change significantly and, while they will take place over a larger area overall, the active area of operations at any one time will not be significantly different to the currently consented activities. The main changes to the currently consented activities are:

- An extension in the landfill area to the west of the current site. The current site area is approximately 31.2 hectares and the proposed western extension area is approximately 26.3 hectares. There will be no change to the annual rate of input of waste directly to the landfill of 150,000 tonnes per annum (tpa).

- The location of the waste treatment and recovery facility will not change but the area will be extended slightly from the current area of 2 hectares to 2.64 hectares. The rate of waste throughput to the treatment and recovery facility will increase from 200,000tpa to 250,000tpa.

- To accommodate the increase in the input to the waste treatment plant the combined consented waste input rate to the site for both the landfill and treatment facility will increase from 250,000tpa to 300,000tpa.

- There will be a need to divert some services in order to operate in the western landfill area.

- The site will continue to operate for a longer period with the completion date for the closure and restoration of the site changing from 2026 to 2046.

**10.2** In accordance with good practice the scope of the Environmental Impact Assessment is being determined by consultation with the local authority, statutory consultees and interested parties as well as the Secretary of State through the Planning Inspectorate (PINS). The proposed scope of the environmental impact assessments is set out in the Scoping Report[12] which was circulated in July 2020. The Scoping Report was circulated to a wide range of consultees and the responses received were collated into a Scoping Opinion[13] provided by PINS in August 2020.

**10.3** The issues raised in the Scoping Opinion and the responses from the consultees will be taken into account when undertaking and completing the environmental impact assessments. The specialists carrying out the technical assessments are liaising closely with the consultees and third parties where appropriate to make sure that the scope, methodology and results of the assessments are acceptable to the authorities. This work is continuing and the completed environmental impact assessments will be presented in an Environmental Statement and submitted with the DCO application.

**10.4** The Scoping Report, Scoping Opinion and consultee responses have identified that the following environmental impact assessments should be carried out: impacts on the health of people living and working in the area, ecology and biodiversity, landscape and visual resources, soil resources, cultural heritage, water resources, flood risk, transport and traffic, noise, air quality, amenity including dust, and socio-economic impacts as well as impacts associated with future climate change and potential accidents.

**10.5** Technical assessments are being carried out of the potential impacts of the proposed activities at the proposed locations and at the proposed rates and duration of operation. The assessments include the cumulative effects of

[12] EIA Scoping Report July 2020. https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/WS010005/WS010005-000010-WS010005%20-%20Scoping%20Report.pdf

[13] Scoping Opinion August 2020. https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/WS010005/WS010005-000003-WS010005%20%E2%80%93%20Scoping%20Opinion.pdf

activities at the site as well as the combined effects with any other relevant activities which currently take place or are known to be planned in the vicinity of the site.

**10.6** The preliminary technical impact assessment reports are presented as appendices to this report. Summaries of each of the preliminary impact assessments and their findings are presented in the following sections. Where the assessments have not yet been completed the extent of the remaining work is explained in the relevant sections. The final results of the Environmental Impact Assessments will be presented in the Environmental Statement which will accompany the DCO application.

**10.7** Current operations at the site are the subject of Environmental Permits for the landfill of hazardous waste and LLW and the operation of the waste treatment and recovery facility. The assessment of the impact of non-radiological and radiological effects on people and the environment have been assessed as part of the current DCO and Environmental Permit applications for the current hazardous waste and LLW landfill site and the waste treatment and recovery facility and associated site infrastructure. The acceptability of the impacts associated with the non-radiological and radiological effects of the current activities at the current locations has been confirmed by the granting of the extant DCO and Environmental Permits for the site. It will be necessary to review, extend and update the detailed risk assessments as part of the applications for variations to the Environmental Permits for the site to extend them to include the western extension area and the proposed changes to the activities if a DCO is granted for the proposed development.

**10.8** The disposal of hazardous waste and LLW and the treatment of waste must have both planning permission or Development Consent Order and an Environmental Permit in order to proceed. The Environment Agency is the regulator with responsibility for pollution control and for ensuring the safety of the public and the environment as a result of the proposed development, the

Health and Safety Executive is responsible for overseeing the safety of the site workers and the Department for Transport is responsible for safety during transportation.

**10.9** The nature of the hazardous wastes and LLW that will be accepted at the site will not change from that which is accepted currently. The LLW that will be accepted will be at the lower end of the range of LLW and typically will be below 200Bq/g. The principles of the design of the engineered containment and the leachate and gas management infrastructure of the landfill site will not change and will be extended to the proposed western extension area. The principles of the phasing of the landfilling and restoration activities will remain the same and will be extended to the western extension area. The methods of operation and control of the waste treatment and recovery facility will remain the same. The exposure pathways which are considered for the landfill disposal and treatment of non-radiological wastes are summarised in Table 10.1.

**10.10** As an integral part of the applications to extend the Environmental Permits to the proposed western extension area detailed risk assessments will be provided to the Environment Agency. The risk assessments relating to the treatment and disposal of hazardous waste will be assessed qualitatively except for emissions to water which will be assessed quantitatively. Quantitative risk assessments using mathematical models will be carried out to assess the effects of the disposal of LLW. The level of detail in the assessments presented in this document and the additional details which will be presented with the DCO application are intended to be appropriate to demonstrate the land use consequences of the proposals.

**10.11** The Environmental Permit application for the disposal of LLW will include a detailed quantitative Environmental Safety Case (ESC) which will be based on the ESC submitted in 2015 to support the Environmental Permit application for the disposal of LLW at the existing ENRMF landfill site. Many of the exposure assessments in the revised ESC will be the same as those in the current risk

assessment as they are for distinct situations or incidents, other exposure assessments will be updated and amended in order to reflect the potential presence of a greater quantity of LLW as a result of the proposals for the extension of the landfill to the west of the site. All activities and risk assessments associated with the deposition of LLW will be required to demonstrate that the design dose criteria set for the site will be met. The approach for setting the limit for the overall radiological capacity for the site will remain the same as that adopted for the current landfill area in the 2015 ESC. The 2015 ESC for the disposal of LLW at the current landfill site is provided for reference at Appendix 10.1.

**10.12** The full and detailed risk assessments that will be provided with the Environmental Permit applications will be scrutinised robustly by the Environment Agency. Risk assessments will be carried out for a number of scenarios which cover the operational and post operational period of the site together with the period in the long term when management of the site may no longer be in place. The exposure routes which are assessed include direct exposure of site workers and members of the public as well as indirect exposure through the ingestion and the water and air pathways.

**10.13** For the disposal of LLW the scenarios which will be assessed include expected events as well as events and accidents which it is considered are unlikely to occur. The exposure pathways which will be assessed for the landfill disposal of LLW are summarised in Table 10.2. The radiological activity of the LLW that will be accepted at the site will generally be below 200Bq/g. The dose criteria against which the potential exposure of site workers and members of the public are assessed are based on the legislation and guidance which specify limits for the protection of the public. The exposure pathways for the acceptance and landfilling of LLW considered for the proposed development will be the same as those considered for the current consented landfill. The risk assessment (set out in the Environmental Safety Case) will be required to demonstrate to the Environment Agency that based on the proposed operational and engineering

controls and the controls on the limits set for the overall radiological capacity for the material deposited at the site, the landfill disposal of LLW at the site will meet the dose criteria which are set by the regulatory authorities for the protection of human health and the environment.

**10.14** The assessments of potential risks from the disposal of LLW will be carried out based on the nuclides which represent the worst case in terms of activity levels and decay rates. The risk assessments take into account the emissions from daughter nuclides that are generated as a result of nuclide decay. The exact mixture of radionuclides that will be sent to the landfill for disposal will not be known until waste producers identify the specific loads of waste that will be sent to the site for disposal. As a consequence of the pre-acceptance procedures that are in place the exact mixture of radionuclides in any consignment will always be known prior to receipt at the site.

**10.15** As in the current Environmental Permit for the disposal of LLW, limits will be set for the quantities of specific radionuclides or group of radionuclides and a total radiological capacity for the LLW deposited at the site. The capacity limit will take into account the LLW that has been deposited in the site already and will apply to the receipt of LLW from the date of issue of the permit up to the date of closure of the permitted landfill including the current site and the extension area or the point at which the capacity limit is reached whichever is sooner. The landfill will not be permitted to receive any further LLW once the capacity limit is reached. The capacity limit cannot be expressed at the outset in terms of volume of material because it depends on the concentrations and exact mixture of nuclides received.

**10.16** The risk assessments submitted with the Environmental Permit applications must demonstrate to the satisfaction of the Environment Agency that using cautious assumptions the potential exposure concentrations of chemical contaminants or the dose of radioactivity that could be received by the public and workers does not exceed thresholds set out in regulation and guidance for

the protection of human health and the environment. Environmental Permits for the disposal of hazardous waste and LLW in the proposed extended landfill area and the proposed changes to the waste treatment plant will only be issued if the Environment Agency is satisfied that the site can be operated in the short, medium and long term without an unacceptable impact on human health and the environment.

**10.17** Summaries of the scenarios that are used in the risk assessments which will be prepared for submission to the Environment Agency with the Environmental Permit variation applications are presented in the relevant sections of this document to demonstrate how the potential health and environmental effects will be assessed and controlled through the Environmental Permits and the pollution control regime in order to support the conclusions reached with respect to the assessment of environmental effects that may result from the proposed development.

**10.18** Emissions to the environment of non-radiological contaminants associated with the wastes deposited in the landfill site and treated at the treatment facility will continue to be managed in accordance with best practice procedures using measures summarised in the relevant sections of this report and which will be specified and regulated through the Environmental Permits in order to control the potential for emissions. Monitoring will be carried out to confirm that the emissions to air and water remain below the levels which are set for the protection of human health and the environment. All waste management activities will be regulated through the pollution control regime set out in The Environmental Permitting (England and Wales) Regulations 2016.

**10.19** All the work at the operational landfill site with respect to radioactive waste will continue to be undertaken in accordance with the Ionising Radiation Regulations 2017 (IRR17)[14] and The Environmental Permitting (England and

[14] The Ionising Radiations Regulations 2017. SI 2017 No. 1075. Schedule 3.

Wales) Regulations 2016 (EPR2016)[15]. The amount of radiation a person is exposed to is known as the dose and is measured in millisieverts (mSv) or microsieverts (μSv) per year. 1,000μSv/yr is equivalent to 1mSv/yr. The dose limit for employees set in the legislation is 20 millisieverts (mSv) per calendar year. The dose limit set in the legislation for any person, such as members of the general public is 1mSv per calendar year.

**10.20** In addition to the IRR17 and EPR2016 regulations, there is specific Environment Agency guidance on requirements for authorisation of near-surface disposal facilities for solid radioactive wastes set out in The Near-surface Disposal Facilities on Land for Solid Radioactive Wastes - Guidance on Requirements for Authorisation (February 2009)[16] (NS-GRA). The NS-GRA specifies dose constraints that apply to doses that may arise to members of the public during the period of active management of the site; these are 0.3 mSv/yr from any single source from which radioactive discharges are made or 0.5 mSv/yr from the discharges from any single site.

**10.21** In Table 10.3 the dose criteria that will be applied at the site are set out in context with the exposure limits set in the legislation and guidance as well as other more familiar sources of radiation exposure. As shown in Table 10.3 a design dose criterion has been adopted by Augean for the activities involving the disposal of LLW at the landfill site. Design dose criteria are adopted for normal operational activities as well as for accidents. The adopted design dose criterion for each circumstance is either the legal dose limit, the relevant dose constraint specified in legislation or regulatory guidance or a dose level proposed by Augean which is lower (ie more protective) than the dose constraint specified in legislation or regulatory guidance and which is achievable based on the proposed activities and waste types to be accepted.

[15] Schedule 23 Part 4 Section 1 Paragraph 1b references the legal limits in the EU Basic Safety Standards (Article 13, Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom). The BSS Directive refers in turn to Section (Table) 2.3 of ICRP Publication 116

[16] UK Environment Agencies, 2009. Near-surface Disposal Facilities on Land for Solid Radioactive Wastes Guidance on Requirements (Environment Agency, Northern Ireland Environment Agency, and Scottish Environment Protection Agency), Bristol: Environment Agency

The radiation exposure risk assessments for the site which are described in the assessment sections of this report compare the calculated potential exposure doses for workers and members of the public to the design dose criteria which have been adopted for the acceptance of LLW at the site.

**10.22** As set out in Table 10.3 the design dose criterion which has been set for the acceptance of LLW for disposal at ENRMF is for a maximum potential annual exposure of members of the public as a result of routine operational activities during the management period of 0.3mSv/yr. The design dose criterion which has been set for the assessment of the acceptance of LLW for disposal at the ENRMF landfill is for a maximum potential exposure of workers a result of routine operational activities during the management period of 1mSv/yr. For the long term following the cessation of receipt of waste and after the cessation of management at the site, the design dose criterion set for the exposure of all persons is 0.02mSv/yr for a number of the different expected events (ie normal activities) and unexpected events (ie accidents) which are assessed. A further design dose criterion is set for inadvertent intrusion or excavation into the site at some point well into the future of 3mSv/yr. This dose criterion is at the lower end of the dose range of 3mSv/yr to 20mSv/yr allowed in the regulatory guidance for inadvertent intrusion events.

# 11 Population including impacts on human health

## 11.1 Introduction

**11.1.1** In this section of the PEIR the potential for direct and indirect effects on the health of people living and working around the site is assessed.

## 11.2 Methodology

**11.2.1** The assessment of risk including the identification and assessment of exposure pathways with the potential to affect the health of people is an integral part of the pollution control regulatory function and is carried out by the Environment Agency as part of the permit application process. The assessment of risk to the population in terms appropriate to the Development Control Order (DCO) process is presented in this document. The term risk is used widely in many contexts and circumstances often with differing definitions. In a government publication about the environment[17] which explains the approaches to and the assessments of risk for many types of activities the following definition of risk is provided:

> *'The potential consequence(s) of a hazard combined with their likelihoods/probabilities'*

It is explained that assessing a risk involves an analysis of the consequences and likelihood of a hazard being realised. In decision-making, low-consequence / low-probability risks are typically perceived as acceptable and therefore only require monitoring. In contrast, high-consequence / high-probability risks are perceived as unacceptable and a strategy is required to manage the risk. Other risks which fit in between the two extremes may require further structured risk assessment to better understand the features that contribute most to the risk and/or the implementation of further controls.

[17] DEFRA (2011) Guidelines for Environmental Risk Assessment and Management. Green Leaves III.

**11.2.2** There are three essential elements to assessing risk associated with emissions:

- a contaminant source which has the potential to cause harm to human health or the environment;
- a receptor which in general terms is something that could be affected adversely by the contaminant such as people, a water body or an ecological system; and
- a pathway or route by which a receptor can be exposed to and affected by the contaminant.

**11.2.3** Each of the elements can exist independently but a risk can be present only where they are linked together so that a contaminant can affect a receptor by a pathway. The identification of risk in this way is referred to as the source-pathway- receptor methodology and the linked combination of contaminant-pathway-receptor is referred to as a pollutant linkage or exposure pathway. On an individual site and at a single facility it is likely that there will be interrelated exposure pathways. In order to understand and assess the potential risks associated with a proposed development it is necessary to identify the potential exposure pathways associated with emissions from the facility and to assess the effects that may result from the identified exposures.

**11.2.4** The nature and level of risk are defined by the particular condition and circumstances of a facility or piece of land and its location. The design and operation of the facility, the use of the land and surrounding areas, the surrounding and underlying water environment and the site and nearby ecosystems determine the receptors and pathways present and the extent to which the receptors potentially may be affected by contamination. Because of the range of factors which contribute to the level of risk the same concentration of a contaminant can have widely differing effects. Risk assessment is the process of considering in a structured way the range of factors so that appropriate decisions are taken.

**11.2.5** Without an exposure pathway there is no risk even if a contaminant is present. Where there is an exposure pathway and there is some degree of risk an assessment must be carried out to determine whether the level of risk is acceptable. In this section of the document the risks to the population are assessed. Risks to other receptors some of which include indirect risks to the population (for example the transport of contaminants through water) are assessed in later sections.

## 11.3 Baseline

**11.3.1** The site is located in a generally rural area with the majority of the surrounding land comprising open farmland or woodland. The village of Duddington is located approximately 1.1km to the north north west of the site and the village of Kings Cliffe is located approximately 2km to the south of the site. The properties located closest to the site are shown on Figure 2.1. The surrounding area has a mixed urban-rural based economy with an adaptable industrial and commercial structure and a strong tourist base. A wide range of businesses are located in the surrounding area and small companies are predominant. Activities in the general vicinity of the site include mineral extraction, landfill and haulage yards as shown on Figure 1.2. Potentially sensitive receptors within 1km of the proposed development are described in Section 2 and shown on Figure 1.2.

**11.3.2** The ENRMF has a long history of extraction and landfill disposal. Clay extraction has taken place since 1957, landfill disposal commenced in 2000, the site has accepted only hazardous waste since 2004, the treatment plant was granted planning permission in January 2008 and LLW first was accepted at the site in December 2011. The site is the subject of a current DCO and Environmental Permits for the landfill of hazardous waste and LLW and for the treatment of waste. The issue of these consents demonstrates that the risks of carrying out these activities at the current site are considered acceptable. As

part of this application it is necessary to determine whether the risks remain acceptable if the activities are extended as proposed.

**11.3.3** The receptors for the assessment are the people who are nearby residents and members of the public who live and work in the vicinity of the site or may use the facilities close to the site such as footpaths together with surface water and groundwater receptors which may in turn be used by people. Site visitors and workers are protected in accordance with Occupational Health legislation and therefore they are not assessed as receptors in the impact assessment. Nevertheless the site is operated at all times to protect the health of those working at the site and closest to the waste on a day to day basis. As the health of the site workers is protected by the design and operation of the site it follows that the health of all those living and working beyond the site boundary will also be protected.

**11.3.4** The baseline for the assessment of impacts on human health is the current permitted operations at the site. The potential sources and pathways for each of the existing elements of the development have been identified.

**11.3.5** The site is located in an area of the country with natural background levels of radiation that are elevated compared with the average in the country due to the emission of radon from the underlying rocks. The average annual exposure in Northamptonshire from natural sources is 3.6 mSv/yr compared with an average annual exposure of the UK population from all significant sources of radiation of around 2.7 mSv/yr[18] The variability in the background levels of radioactivity across the country is significantly greater than the dose criterion of 0.3 mSv/year used as the design criterion for the operational period of the site as shown on Table 10.3.

[18] Ionising Radiation Exposure of the UK Population: 2010 review Public Health England (2016). (PHE-CRCE-026).

## 11.4 Preliminary assessment of effects

**11.4.1** At the design stage for all waste management facilities including landfill and treatment facilities such as those at the ENRMF potential exposure pathways are considered and operational methods are developed to eliminate or minimise exposure pathways hence to protect human health and the environment. These mitigation measures form an inherent part of the site design and operational controls. Monitoring schemes are designed and implemented to confirm that the design, construction and operating methods are effective in eliminating or controlling exposure pathways. The site construction and operational aspects that remove or minimise exposure pathways are described in Sections 4, 6 and 7 of this document. The main potential exposure pathways which are examined to assess the risks to human health from non-radiological and radiological emissions are presented in Tables 10.1 and 10.2 respectively. The assessments cover the operational and post operational period of the site together with the period in the long term when there is no further management of the site and the Environmental Permit has been surrendered. The situations assessed include normal operational circumstances together with unlikely events and accidents. The assessments are based on conservative assumptions.

**11.4.2** The risks relating to the treatment of waste and the potential for non-radiological emissions associated with the disposal of hazardous waste are assessed qualitatively except for the assessment of emissions to water which are assessed quantitatively. Quantitative risk assessments using mathematical models will be carried out to assess the effects of the disposal of LLW. The level of detail in the assessments presented in this document and the additional details which will be presented with the DCO application are intended to be appropriate to demonstrate the land use consequences of the proposals. The application for the Environmental Permits for the extension areas will be submitted with detailed risk assessments. The Environmental Permit application for the disposal of LLW will include a detailed quantitative

Environmental Safety Case (ESC) which will be based on the ESC submitted in 2015 to support the Environmental Permit application for the disposal of LLW at the current landfill site. Many of the exposure assessments in the revised ESC will be the same as those in the current risk assessment as they are for distinct situations or incidents, other exposure assessments will be updated and amended in order to reflect the potential presence of a greater quantity of LLW as a result of the proposals for the extension of the landfill to the west of the site. The approach to the use of design dose criteria set for the site and to setting a limit for the overall radiological capacity for the site will remain the same. The 2015 ESC for the disposal of LLW at the current landfill site is provided for reference at Appendix 10.1.

**11.4.3** The potential for indirect effects on health as a result of contaminant migration through the water pathway and effects on water resources are considered in Section 16 of this document. The groundwater risk assessments take into account all the waste that has been and could be disposed of at the site. The risk assessments are based on well-established models used nationwide and approved by the Environment Agency. They are based on highly conservative assumptions and consider the potential impacts of the site in the short and the very long term (thousands of years). They assume that the high density polyethylene liner (a heavy duty chemical resistant synthetic material) component of the engineered containment system degrades over time. The highly engineered clay component of the liner, being geological material, does not degrade and provides continued protection over geological time.

**11.4.4** The assessment methodologies that are used in the Environmental Safety Case which presents the assessment of the impacts associated with the deposition of LLW for the Environmental Permit application draw on methodologies developed by the International Atomic Energy Agency. Additional approaches developed by the Health Protection Agency (which is now Public Health England), the UK Environment Agencies (SNIFFER), the LLW Repository Environmental Safety Case and a screening methodology

developed by the Environment Agency for operational releases also are used where appropriate. The SNIFFER methodology was developed with regulators, operators and wider stakeholders to provide the regulators and stakeholders with a consistent approach to assessing the potential of landfill sites to accept LLW. Model parameter values used in the ESC take into account site specific aspects and National Dose Assessment Working Group (NDAWG) recommendations concerning representative persons.

**11.4.5** The LLW risk assessments are conservative in the assumptions made with respect to the long term management of the site. In the risk assessments it will be assumed conservatively that following closure of the landfill site management measures will be in place for a period of only 60 years. In practice the landfill will be the subject of an Environmental Permit and under management control and the subject of financial provision until the Environment Agency are satisfied that the site no longer represents a potentially significant risk of harm to human health or pollution of the environment. This period will almost certainly be considerably longer than 60 years. In the risk assessments it will be assumed that after 60 years people may excavate into the landfill in a way that results in continuous exposure to the LLW without realisation of the radiological hazards present. As shown on Table 10.3 dose criteria are set based on the likelihood of occurrence so that for situations or events which are expected to occur lower dose criteria (ie tighter standards) are set and for the assessment of accidents or events which are unlikely to occur the outcomes of the risk assessments are compared with higher dose criteria which take into account their low probability of occurrence.

**11.4.6** The results of the radiological assessments which will be presented in the Environmental Safety Case with the Environmental Permit application are compared with the design dose criteria explained above and summarised in Table 10.3 and will be used to derive a limit for the quantity of each radionuclide that can be disposed to the landfills such that the design dose constraints and risk guidance levels are not exceeded in any of the assessed scenarios. The

risk assessments take into account the emissions from daughter nuclides that are generated as a result of radioactive decay. The exact mixture of radionuclides that will be sent to the landfill for disposal will not be known until the site becomes operational and waste producers identify the specific loads of waste that will be sent to the site for disposal. As a consequence of the pre-acceptance procedures that will be in place the exact mixture of radionuclides in any consignment will always be known prior to receipt at the site.

**11.4.7** The total quantity of radionuclides in LLW that can be disposed of at the landfill site, including that which has been deposited already, will be controlled through a “sum of fractions” approach which will be specified in the Environmental Permit. This approach maintains the flexibility to respond to future mixtures of radionuclides in LLW whilst maintaining the overall dose within accepted levels and is an approach that is used at other sites receiving low activity radioactive waste. The permit will specify the total capacity for each radionuclide and that the sum of fractions shall be less than unity.

**11.4.8** The sum of fractions approach is implemented by calculating, for each radionuclide, the ratio of the activity of the radioactive waste disposed of at ENRMF to the relevant values specified in a disposal table which will be included in the Environmental Permit. This table will define the radiological capacity of the site. The table will include columns for the capacity limiting scenarios examined in the risk assessments with values in each column for each radionuclide that can be disposed. The sum of fractions approach applies to each risk assessment scenario. Hence, for each scenario, the ratios (fractions) are calculated for each radionuclide and then these are summed to obtain the total sum of fractions for the scenario. It will be a permit condition that for each of the scenarios listed the sum of these ratios shall be less than 1. The sum of fractions approach allows the operator greater flexibility in determining the final radioactive waste inventory without compromising environmental safety whilst ensuring that the design dose criteria are met. The

sum of fractions approach is used by the Environment Agency to regulate other LLW disposal permits.

**11.4.9** The radiological capacity limits will apply from the date of issue of the Environmental Permit up to the date of closure of the operational landfill or the point at which the capacity limit is reached whichever is sooner. The landfill will not be permitted to receive any further LLW once the sum of fractions equals 1. As explained above, the capacity limit cannot be expressed as a single number because it depends on the exact mixture of nuclides received at each landfill.

## 11.5 Extraction and stockpiling of clay

**11.5.1** The extraction and stockpiling of soil, overburden and clay will not have an impact on the health of workers or local residents due to the inert non-hazardous nature of the material. The potential air quality impacts from particulates generated as a result of the extraction and stockpiling of clay are assessed in Section 20 of this report.

## 11.6 Site operations as part of the time extension and void extension

**11.6.1** The potential impacts associated with the continuation of the operation of the consented and extended landfill and waste treatment and recovery facility to 2046 are similar to those for the current site operations but will be present over a longer time. There will be no additional cumulative effects other than those which are an intrinsic part of the assessments and which are therefore taken into account in the risk and impact assessments.

***Exposure to waste during waste handling***

**11.6.2** The potential for the exposure of workers at the site and the public beyond the site to hazardous waste is minimised through the implementation of specified waste handling and management procedures. Workers wear personal protective equipment when working in the vicinity of wastes to minimise the

potential for direct contact with hazardous waste. Members of the public are not allowed unaccompanied on the site.

**11.6.3** All asbestos waste is delivered to the site in double bags, is placed at the working face and is covered immediately. Any particularly dusty waste is delivered in containers or is subject to special procedures for the damping down of the material prior to and after placement in the operational cell. All waste placed in the landfill is covered throughout the day and when complete each landfill cell is capped with a low permeability capping system which is covered in turn by restoration materials which removes the pathway for direct exposure to hazardous waste. All waste handled at the waste treatment and recovery facility is controlled during storage and treatment in accordance with specified waste handling and management procedures. Dusty wastes are stored in silos or enclosed containers such as bags or drums.

**11.6.4** The exposure of site workers and members of the public to LLW while the waste is being accepted and deposited in the site has been assessed and is presented in Section E3.2.1 at Appendix E of the ESC provided at Appendix 10.1. The amount of exposure to site workers is based on the assumption that the waste is in a drum or in a bag and on conservative assumptions regarding the density of the waste and the type of isotope in the waste. It is assumed that the waste is dense and contains a greater mass of material than would be the case with less dense material and that the isotope present is that capable of having the greatest effect. No account is taken of any shielding that is afforded by the waste container that is the capacity of the container to absorb some of the radiation that is emitted. No account is taken in the assessment of the precautions that are a fundamental part of the routine operational procedures.

**11.6.5** Calculations have been carried out of the risks of direct exposure of members of the public for 8 hours a day every day at a distance of 50m from LLW containing the maximum level of radioactivity. No account is taken in the calculations of the significant shielding afforded by the visual screening bund

constructed from soil and the buildings present at the eastern boundary of the site that would absorb radioactive emissions where they are present between the waste and the member of the public and restrict opportunities for exposure. It is highly unlikely that waste will be located in a direct line of exposure 50m from a member of the public for any length of time and the probability that a member of the public would remain static for 8 hours each day 50m from and directly exposed to waste is negligible.

***Dropped waste container resulting in spillage of hazardous waste or LLW***

**11.6.6** All asbestos waste is delivered to the site in double bags, any particularly dusty hazardous waste is delivered in containers or is subject to special procedures for damping down of the material prior to and after placement in the operational cell. All LLW will be delivered to the site in containers or wrapped and will be placed in the landfill in the container or wrapping. On a limited number of occasions if there are specific arisings of loose wastes that might be deposited by direct discharge from a vehicle (which would be covered or sheeted for transport) then this would be discussed and agreed with the EA based on specific risk assessments and with agreed additional measures in place including for dust control. Consequently the potential for the release of hazardous waste or LLW dust is low. There is a low probability that containers may be split or dropped at some point during the unloading and placement of the waste. Procedures are in place and will continue to be implemented at the site in the event that any waste is spilled from a container or a container is dropped. The unloading will only take place in the landfill operating cell or at the treatment facility. A bowser will be on standby in the cell and at the treatment facility. If waste is dropped or spilled the waste will be immediately doused to suppress dust and covered with suitable soil material in the location where the waste is spilled. In the unlikely event the waste is spilled outside the landfill or contained area of the treatment facility the procedure will include measures for rapid collection and safe disposal of the waste and verification monitoring of the

area at and around the spillage to confirm that all the spilled material has been retrieved.

**11.6.7** The potential exposure of site workers and members of the public through exposure to spilled LLW has been assessed in the quantitative risk assessments in Section E3.7 at Appendix E of the ESC provided at Appendix 10.1. The exposure assessment is based on the assumption that a one tonne load is dropped, breaks and dusty waste is dispersed. The waste containers are designed to withstand being dropped while being unloaded and handled therefore spillage is unlikely. It is assumed that the LLW in the container contains a single nuclide at an activity of 200Bq/g, that 10% of the container is released and that the spilled LLW is a loose dry material that disperses readily. Only a small proportion of the waste, if any, delivered to the site will meet these criteria. Most of the waste will not be at the maximum potential level of activity and the waste will be in lumps rather than dust. It is assumed in the assessment that the worker does not respond appropriately and remains very close to the dropped waste without taking any precautions or retreating for 30 minutes. In practice all staff will be trained to respond rapidly to events such as spillages and a water bowser is available at all times to spray and damp down dust. It is assumed in the assessment that a member of the public is located 50m from the waste, remains at that location for 30 minutes and that atmospheric conditions are still which represents the worst case as dilution in the air is minimised. No account is taken in the calculations of the significant shielding afforded by the visual screening bund constructed from soil or the buildings present at the eastern boundary of the site that would absorb radioactive emissions where they are present between the waste and the member of the public and restrict opportunities for exposure. In the conservative risk assessments it is concluded that the doses of radiation to which the workers and members of the public would be exposed as a result of a dropped or spilled container of LLW are below the relevant dose criterion.

***Contamination as a result of waste entering an open wound***

**11.6.8** No waste will be offloaded or handled in the vicinity of members of the public. There is no need for workers to touch waste or waste packages as they are being delivered and unloaded. Simple, standard personal protective equipment is worn by site workers including gloves to minimise the potential for wounds and for subsequent contamination of the wound. It is standard good practice that any open wounds are treated rapidly and covered. The implementation of standard good practice is considered acceptable to ensure that the risks to workers are minimised.

**11.6.9** The potential exposure of site workers to radioactivity through an open wound has been assessed in the quantitative risk assessments in Section E3.2.3 at Appendix E and in Appendix H of the ESC provided at Appendix 10.1. The risk assessment is based on the assumption that 0.1g of material at an activity level of 200 Bq/g becomes incorporated into a wound as a result of spillage from a dropped waste container. In the conservative risk assessment it is concluded that the dose of radiation to which the workers would be exposed as a result of contamination through an open wound is below the relevant dose criterion.

***Leachate treatment***

**11.6.10** As explained in Sections 4 and 6 of this document the generation of leachate at the site is limited by the placement of a low permeability cap over the completed site and the restoration of the site to a domed profile which encourages surface water runoff and minimises infiltration. Leachate levels at the site are maintained by pumping excess leachate from the site. During the operational period the leachate is used at the site as a substitute for water at the waste stabilisation facility. The stabilised waste and the incorporated leachate are returned to the landfill as hazardous waste. Following closure of the stabilisation plant leachate will be transported from the site by tanker to a suitable treatment plant.

**11.6.11** The concentrations of hazardous substances and the level of radioactivity in the leachate generated at the site will be determined by the nature of the wastes deposited. It is anticipated that the level of radioactivity in the leachate will be low and that the leachate will be exempt from regulatory control for the radioactivity content through exemption orders. The monitoring of leachate to date has confirmed that it does not contain radioactivity at a level which requires that it is subject to regulatory control due to its radioactivity. Exposure to hazardous substances in the leachate will be assessed and managed in accordance with the Environmental Permit which will be in place for the treatment facility.

**11.6.12** If the level of radioactivity in the leachate is sufficient that it is defined as a radioactive waste it will be necessary for Augean and the receiving treatment plant to obtain relevant Environmental Permits for discharge and treatment. As part of the applications specific exposure assessments would be carried out to confirm that there are no unacceptable exposures associated with the treatment of the leachate as proposed at the time.

***Fire at the site***

**11.6.13** Fires in landfill sites can result from the deposition of hot or burning loads of waste or can be associated with the collection and utilisation of methane in landfill gas at sites which accept significant quantities of biodegradable wastes. There will be insignificant amounts of biodegradable or combustible material in the hazardous waste and LLW deposited at the site and the waste treated at the treatment facility hence a fire starting in the site as a result of the ignition of combustible material is considered unlikely. The wastes in the landfill, the cover materials, the drainage materials which include shredded tyres, the hazardous waste including the wastes to be treated and LLW have an extremely low combustibility. The current waste acceptance criteria for the landfill excludes material with an organic carbon content greater than 6% and flammable wastes

are prohibited. It is considered that the potential for a fire in the hazardous wastes and LLW at the site is negligible.

***Impact from an aircraft crash***

**11.6.14** There is a very low probability of an accident such as an aircraft crash at the site that may result in the release of contaminated material into the air. This scenario is included due to the proximity of RAF Wittering which was an operational Harrier aircraft base until the fleet was withdrawn from service in December 2010. RAF Wittering remains an active air base supporting a wide range of military flying activities. The ENRMF site western extension area is located approximately 2.3km south west of the runway which runs approximately east-west. The frequency of military aircraft crashes in the UK is very low but it is noted by the IAEA[19] that most aircraft crashes occur within a semicircle of 7.5 km radius from the end of the runway. The scenario is included for this reason.

**11.6.15** Procedures are in place at the site for any form of waste spillage and procedures will be in place at RAF Wittering and with the emergency services in the event of an aircraft crash. These procedures would be implemented rapidly at the site. A bowser is always available on standby at the site and if waste is released as a result of an aircraft crash the bowser will be deployed immediately to douse the area and suppress dust. If necessary the area of exposed waste will be covered with suitable soil material. If waste is spread outside the landfill the procedure includes measures for rapid collection and safe disposal of the waste and verification monitoring of the area at and around the spillage to confirm that all the spilled material has been retrieved. It is considered that the impacts resulting from the unlikely event of an aircraft crash will be managed to minimise and reduce to an acceptable level the risks to people.

[19] IAEA, 2002. External human induced events in site evaluation for nuclear power plants. Vienna: International Atomic Energy Agency.

**11.6.16** A quantified risk assessment has been carried out for the release of LLW following an aircraft crash (Section E3.6 at Appendix E of the ESC provided at Appendix 10.1). In the risk assessment it is assumed that 300m$^3$ or 460 tonnes of LLW is displaced as a result of the impact from a crashed military plane. The presence of a covering or capping layer over the waste is ignored in the risk assessment. Emergency procedures including the evacuation of personnel and the public to a safe distance would be implemented immediately by the site and the nearby RAF base. It is assumed that the duration of the event in which the displaced material can be inhaled is 30 minutes and that the public will rapidly evacuate to a distance of at least 200m from the crash site. Worst case, still weather conditions are assumed in the risk assessment which minimises dilution from dispersion. The risk assessment demonstrates that as a result of this unlikely event the exposure of workers and members of the public will be below the relevant assessment criteria. Exposure to radioactivity as a result of fire is not assessed in this scenario as although an aircraft crash could lead to a fire, the fire would consume the aircraft fuel and wreckage and not the waste as the waste will contain little combustible material.

*Drilling through emplaced waste*

**11.6.17** During the operational life of the landfill site drilling works may be carried out for the purpose of installing new leachate monitoring or extraction wells or gas monitoring or extraction boreholes. As these works will be carried out only when the site is operated under the regulatory supervision imposed by the Environmental Permit drilling will be permitted only in accordance with appropriate and agreed controls with respect to exposure to hazardous waste and radiation. The controls will be determined by a process of risk assessment and based on conservative assumptions. It is highly unlikely that unacceptable risks will be presented by this activity.

## 11.7 Site restoration and closure

***Direct exposure to waste through cover materials***

**11.7.1** Where waste has been placed in the landfill site and covered with non-hazardous material and a low permeability capping system there is no pathway for direct exposure to hazardous wastes and therefore no risks from exposure to these wastes. There is the potential for emissions of radioactivity from LLW through the cover and capping layers. Exposure assessments have been carried out for members of the public walking on the site following placement of the cover layer and capping layer and closure of the site (Section E4.2.1 at Appendix E of the ESC provided at Appendix 10.1). It is assumed that the waste is covered by a 1.6m thick layer of non-LLW material and a further layer of cover material to a depth of 1m. The capping system will comprise a 300mm thick regulation layer, a 1m thick layer of clay, a drainage layer 300mm thick and at least 1m of restoration soils. In calculating the annual exposure it is assumed that members of the public spend the whole of each year on the site. The risk assessment demonstrates that the calculated exposures are below the relevant assessment criteria.

***Site remediation activities***

**11.7.2** Deliberate intervention to maintain, remediate or re-engineer the landfill site could lead to the creation of contaminated dust. Records will be maintained of the location of the hazardous waste and LLW at the site and any remediation work would be carried out with the knowledge that there was hazardous waste and radioactive material present at the site. Planning permission and possibly an Environmental Permit will be necessary for significant remedial works. Remedial works would be carried out under the regulatory supervision imposed by the Environmental Permit and works will only be permitted in accordance with appropriate and agreed controls on exposure to hazardous waste and radiation. The controls will be determined by a process of risk assessment. It is highly unlikely that unacceptable risks will result from this activity.

***Inadvertent activities***

**11.7.3** The exposure pathway which has been considered is the highly unlikely situation where it has been forgotten that hazardous waste and LLW have been deposited in the site and people may excavate into the landfill in a way that results in exposure to the waste without realisation of the hazards present. The situation is extremely unlikely given that any excavations into the site would encounter the cap placed over the waste and a range of visually obvious waste types and containers therefore it would be highly likely that the presence of waste would be recognised and excavations would cease at an early stage. It is considered that the risks resulting from this unlikely event are low.

**11.7.4** A quantitative risk assessment has been carried out of the exposure to radioactivity of a person who excavates LLW (Sections E5.6 and E5.7 at Appendix E of the ESC provided at Appendix 10.1). The calculations are based on the assumption that LLW is disposed of in all of the cells at the site and therefore is present in all the excavated material. In practice it is unlikely that all of the materials excavated would include radioactive substances. Calculations have been carried out for excavation after 60 years and 150 years following closure.

**11.7.5** It is assumed that following excavation of LLW the waste and cover materials are mixed together and re-deposited creating a soil layer contaminated with the radioactivity that was in the waste. It is assumed that contaminated material is incorporated into the surface soil in which crops are grown and on which animals are grazed. Exposure is assessed for the ingestion of contaminated soil attached to crops, the ingestion of crops that may have absorbed contaminants, the consumption of livestock raised on contaminated ground and associated products such as milk, external irradiation while living and working on contaminated soil and the inhalation of contaminated dust.

**11.7.6** Calculations have been carried out for residence on the excavated area after 60 years and 150 years following closure. Risk assessments have been carried

out for the unlikely event of exposure to radioactivity of a resident living in a house built on top of the landfill cap immediately after closure. Irradiation doses have been calculated for a resident spending 80% of the time indoors and 20% outdoors. Doses from gas inhalation have been calculated for indoor exposure of the house resident to gas accumulating in the dwelling. Controls under the planning process would prohibit development of domestic property on the site unless it can be demonstrated that there is no unacceptable risk to residents. The conservative risk assessments show that there would be no exposures above the relevant exposure criteria.

## 11.8 Routine monitoring and regulation

**11.8.1** The ENRMF will continue to be monitored and regulated to confirm that it is operating in compliance with all appropriate International, European and national health and safety standards. Environmental monitoring during the operational and aftercare phases while the site is managed will check that the levels of contaminants and radiation in a range of potential exposure pathways such as landfill gas, air emissions, leachate, surface water, groundwater and dust will not exceed the environmental thresholds and radiation dose criteria that are set for the site. Samples are taken to an agreed programme specified in the Environmental Permits and follow protocols set by the EA, with the resulting monitoring data reported to it. The EA currently undertakes its own independent sampling programme for radioactivity. The monitoring regime provides assurance that the site is performing as expected and that the design, construction and operating standards of the site are effective in eliminating or controlling any exposure risks.

## 11.9 Indirect impacts on health

**11.9.1** It is acknowledged that local residents and other third parties may have concerns regarding the proposals for the extension in the landfill area and the consequent extension in the time for the life of the landfill and treatment facilities at the site. There is no evidence that the day to day activities at the site currently

give rise to significant concerns regarding health or environmental impacts. Augean will continue to engage with the local community through the Kings Cliffe Liaison Group (KCLG) and through regular site open days including during engineering works to show how engineering of the site is undertaken, newsletters and maintenance of a register of stakeholders who are kept informed of new developments. The KCLG has been kept up to date with the programme for this application to extend the area of the site. In order to provide regular reassurance that the site is operating as anticipated, Augean will continue to make available through publicly accessible media such as the company website site monitoring data in a simplified form. Augean will also continue to make public data from passive dosimeters worn by site workers at the site to reassure the local community that the recorded radiation on site is within permitted levels

**11.9.2** Where the concerns of local residents or third parties are strongly felt they have the potential to give rise to mental anxiety which can result in physical symptoms such as headaches and nausea. In order to allay the concerns and to ensure that local residents and other interested third parties are able to understand fully the facts and potential impacts regarding the proposals Augean are carrying out extensive consultation prior to the finalisation of the proposals and submission of the application for the DCO. In some cases, mental anxiety may result from concerns arising from simple misunderstanding, misconceptions or misinterpretations of technical information. Misleading information presented in the media or circulated locally can in itself result in an increase in concerns without there being any factual basis for that concern. The purpose of the detailed consultation process is to understand the nature and source of the concerns of the public and to allay the concerns based on the facts available or, where possible and practical, to implement changes or adaptations to the development proposals to address the concerns. The commitments made by Augean as a result of the consultation process will be set out in a Consultation Report which will be submitted with the DCO application.

**11.9.3** The proposals will not be permitted unless they are fully compliant with official guidance and criteria and the risk assessments demonstrate to the satisfaction of all the statutory technical consultees including the Environment Agency and Public Health England that the proposals do not present any unacceptable risks to human health or the environment. The site will continue to be monitored and regulated to confirm that it is operating in compliance with appropriate International, European and national health and safety standards. The primary role of the Environment Agency at the site is to satisfy themselves before the proposals are granted Environmental Permits and on an ongoing basis thereafter that the operations satisfy all legal, policy and regulatory considerations to ensure that people and the environment are properly protected. On this basis it is concluded that there is no objective reason for significant indirect effects on health as a result of mental anxiety.

## 11.10 Mitigation and monitoring

**11.10.1** The mitigation measures comprise the construction and operation of the site in accordance with specifications and procedures set out through the Environmental Permit and prepared and implemented by Augean through their certified management systems. The mitigation measures include regular monitoring of emissions from the site.

# 12 Ecology and biodiversity

## 12.1 Mitigation and monitoring

**12.1.1** Extensive surveys have been carried out to establish the nature of the ecological environment at and around the application site including in particular the proposed western extension area. A number of these surveys have not yet been completed and are continuing. A preliminary assessment of the potential ecological impacts which may be associated with the proposed development and which need to be taken into account in the design of the site operations has been undertaken. A summary of the results of the surveys carried out to the end of June 2020 and the preliminary assessment is presented in the report at Appendix 12.1. The assessment describes the existing environment in the application site and includes baseline ecological surveys of the application site together with a sufficient surrounding area to place it in context. The preliminary assessment outlines the potential impacts and summarises the proposed avoidance, reduction and restoration measures to help mitigate these potential effects.

**12.1.2** As explained in Section 8 of this report the outputs from the ecological surveys and assessments are integral to the development of the detailed design of the proposed western landfill area including the identification and incorporation of appropriate and robust mitigation measures into the design as well as maximising the opportunities for biodiversity in the development of the restoration scheme for the site and its afteruse.

## 12.2 Methodology

**12.2.1** A desk study has been undertaken to identify statutory designated sites within 5km and non statutory designated sites within 2km of the site. The Northamptonshire Biological Records Centre, Northamptonshire Bat Group and Natural England's 'Nature on the Map' website were consulted to identify sites

designated for nature conservation together with records for protected or notable species.

**12.2.2** A preliminary ecological appraisal (PEA) was undertaken in 2018 including an extended Phase 1 habitat survey of the proposed western extension area (Appendix 1 of the report at Appendix 12.1). The PEA established that the zone of influence was considered to be no more than 1km beyond the site boundaries for any feature. Due to the lack of suitable habitat and the absence of any earlier records no further survey work will be undertaken for aquatic mammals and white-clawed crayfish. As a result of the Phase 1 habitat surveys it was identified that it was necessary to undertake botanical surveys including hedgerow assessments, great crested newt surveys, reptile surveys, breeding bird surveys, wintering bird surveys, bat surveys, badger surveys, dormice surveys, invertebrate surveys and tree surveys.

**12.2.3** The following ecological surveys were undertaken during 2019 and 2020:

- Botanical recording was carried out in each habitat including the adjacent woodlands in April to June in 2019 and 2020.
- A habitat update survey of the existing ENRMF site was undertaken in June 2020.
- Six surveys for great crested newts were carried out in evenings in spring 2020 of all suitable waterbodies located within 250m of the site boundaries using a combination of methods in accordance with established guidance[20],[21].
- 200 artificial cover objects (ACOs) have been in place for several years for reptiles around the margins of the existing ENRMF as part of on-going Environmental Management and Aftercare Plan (EMAP) monitoring. These

[20] Natural England, 2015. Great crested newts: surveys and mitigation for development projects.

[21] Oldham R S, Keeble J, Swan M J S & Jeffcote M (2000). Evaluating the suitability of habitat for the Great Crested Newt (Triturus cristatus). Herpetological Journal 10 (4), 143-155.

ACOs are checked monthly from March to September every year in weather conditions when any reptiles present could reasonably be expected to be active[22].

- 190 ACOs were placed around the margins of the proposed western extension in areas of suitable habitat for reptiles in March 2020. Between March and the end of June 2020, these ACOs were checked nine times. Whilst walking between the ACOs, reptiles were also searched for by watching and listening for movement in the undergrowth.

- Three early-season visits were made to the site and adjacent habitats to search specifically for basking adders in accordance with standard guidelines[23].

- From March to June 2019, six breeding bird survey visits were undertaken and a further three breeding bird survey visits were made to the existing ENRMF from April to June 2019 as part of the EMAP monitoring.

- Twelve wintering bird surveys of the western extension area were undertaken between October 2018 and March 2019, comprising a combination of dawn and dusk visits with walked transects and vantage point counts. Additional bird records were made during other fieldwork visits, particularly during evening newt and bat surveys when nocturnal species such as owls are active.

- Bat surveys were undertaken in accordance with the relevant guidance[24]. A preliminary roost assessment of all trees on the site was undertaken with each tree examined from the ground for Potential Roost Features (PRF) and categorised based on the features present. Dusk emergence watches were undertaken on trees with high bat-roost potential. Transects designed

[22] English Nature, 1994 (and as updated). Species Conservation Handbook. English Nature, Peterborough.

[23] ARG UK, 2018. Make the Adder Count 2018 Notes. Amphibian and Reptile Groups UK.

[24] Collins J. (ed.), 2016. Bat Surveys for Professional Ecologists: Good Practice Guidelines, 3rd edition. The Bat Conservation Trust, London.

to sample the range of available habitats within the site were undertaken. Two surveyors walked in parallel, one sampling the central, open arable area, the second covering the edge habitats (woodland and hedgerows) with better connectivity.

- To determine bat species assemblage, assess habitat use and bat activity, static bat detectors were run overnight for seven consecutive nights during April, May and June 2020.

- In February 2019 and February 2020 badger signs were searched for and recorded[25]. Records of new setts were collected during all other survey visits. A bait marking survey was also undertaken in February and March 2019 to determine the likely number of badger territories in the area potentially affected by the proposals.

- In March 2020, 50 dormouse tubes were placed in the limited suitable dormouse habitat available in the western extension area (scrub and hedgerows) potentially affected by the proposals to determine the presence/absences of dormice. The tubes were checked monthly between April and September 2020. 25 dormouse nest boxes have been present within woodland immediately north of the existing ENRMF since April 2016 as part of the EMAP monitoring and these are also checked monthly between April and September each year. A search for hazelnuts distinctively chewed by dormice was also undertaken within suitable woodland adjacent to the site during February 2020.

- A scoping visit for invertebrates was undertaken around the western extension area on 4 April 2019 followed by four monthly visits from May to August 2019. In 2020 four monthly visits were undertaken between May to August. The 2020 visits included sampling of the adjacent woodlands with specific permissions in place. A combination of methods was used targeting

[25] Harris S, Jefferies D, Cheeseman C and Booty C, 1994. Problems with Badgers? (3rd ed). RSPCA, Sussex.

six principal groups, as recommended in Natural England guidance[26] for assessing features and habitats for conservation assessment.

- In August 2019, a tree survey to BS 5837 was carried out over the whole site.

**12.2.4** Due to the seasonal nature of ecology surveys the following further fieldwork and assessments are still being carried and the results being collated but will be completed shortly:

- Reptiles - on-going artificial cover objects checks until September 2020.
- Bats - on-going monthly static and tree surveys until September 2020.
- Badgers - on-going monitoring during other site visits.
- Dormice - on-going monthly checks of dormice tubes and boxes until September 2020.
- Invertebrates - on-going monthly surveys until September 2020.
- Consideration of the opportunities for improvements in biodiversity to incorporate into the restoration scheme for the site.
- Identification of the protection and mitigation measures to be included in the design of the proposed development.

**12.2.5** On completion of the detailed design for the western extension a detailed ecological assessment will be undertaken in accordance with current guidance[27],[28]. Anticipated new British Standards such as those relating to Net Biodiversity Gain will be referenced if published at the time of the completion of the ecological impact assessment.

**12.2.6** The assessment of the impact of the disposal of LLW on non-human biota will be undertaken using the ERICA assessment tool using the version released in

[26] Drake, C.M. *et al*. (2007) NERR005. Surveying Terrestrial and Freshwater Invertebrates for Conservation Evaluation. Natural England, Peterborough.
[27] British Standard 42020.2013: "Biodiversity - Code of practice for planning and development"
[28] Chartered Institute of Ecology and Environmental Management Guidelines for Ecological Impact in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine published in September 2018

June 2019. The ERICA toolkit allows for consideration of three ecosystems: terrestrial, freshwater and marine. Each of these will be considered as appropriate for the ENRMF site. Within these ecosystems, the ERICA assessment tool considers a range of wildlife groups. As explained in Section 10 of this report the Environmental Safety Case carried out for the current landfill of LLW (Appendix 10.1) will be updated to reflect the proposals for the western landfill extension.

## 12.3 Baseline

**12.3.1** The closest European Natura 2000 sites are Rutland Water SPA/Ramsar which is approximately 8.8km to the north west of the application boundary and Barnack Hills and Holes Special Area of Conservation which is 7.5km north east of the application boundary as shown on Figure 1.1. Within 5 km of the site there are 10 statutory ecological sites with the closest being Collyweston Great Wood and Easton Hornstocks National Nature Reserve and Site of Special Scientific Interest located adjacent to the site to the north east as shown on Figure 1.2. There are two non statutory sites within 2km of the site boundary the closest being Fineshade Woods Local Wildlife Site located adjacent to the western boundary of the western extension area.

**12.3.2** A number of records for protected species in the vicinity of the proposed western landfill extension area were identified during the desk based study.

- Hazel dormouse records came from Fineshade Woods in 2017 when evidence of nests were found 750m to the west of the site.
- Occasional records were found from 2014 for badger in the surrounding landscape in Fineshade Woods 1.6km to the south west.
- There were abundant recent records of adder, common lizard and slow worm from Fineshade Woods and scattered records for grass snake.

- There have been abundant recent records for Great Crested Newts, smooth and palmate newts from Fineshade Woods.
- Two 2014 records for common toad roughly 2km southwest of the site.
- There have been records for 54 bird species including 10 on Schedule-1 of the Wildlife and Countryside Act 1981 with the majority from Fineshade Woods.
- There are many records of invertebrates, with the majority from Fineshade Woods especially butterflies and moths.

***Plant and species communities***

**12.3.3** The habitats present within the proposed western extension area comprise two arable fields, two hedgerows, strips of grassland, isolated trees and small areas of scrub and broadleaved woodland. The existing ENRMF site includes hedgerows, ditches, several waterbodies and restored species rich calcareous grassland on the restored areas with further pioneer 'wasteland' vegetation on parts of the landfill area. The only habitats currently considered to be priority habitats under Section 41 of the Natural Environment and Rural Communities (NERC) Act 2006 are managed waterbodies located to the north of the current landfill area and the hedgerows located on the western extension area as well as north of the current landfill area.

***Amphibians***

**12.3.4** All five common amphibian species were recorded during the 2020 surveys. Great crested newts originally translocated from the existing ENRMF have continued to be recorded in the original 'refuge' area created and now managed in an area immediately north of the existing active landfill site. This refuge area is within the DCO boundary. Great crested newts were also recorded in waterbodies outside the site during 2020, notably within the margins of Fineshade Woods. Smooth newts, palmate newts and common toads are also

recorded regularly in the refuge area and in waterbodies outside the site, with common frogs recorded less frequently.

**12.3.5** The original translocation of great crested newts and the location of the refuge pre-dated Augean's purchase of the ENRMF site. Following this, the EMAP was produced for the whole site and concurrently the refuge area was brought under management. This has involved replacement of the temporary amphibian fencing around the active ENRMF site with steel sheet for better protection. The refuge has never been fenced to the north, providing connectivity for the amphibians and reptiles with habitats, including Collyweston Great Wood, to the north and west. Management includes regular clearing of reedmace from the largest pond, the creation of two new breeding ponds, regularly cutting back encroaching scrub and birch from the rough grassland around the ponds and creation of new hibernacula from the arisings. The surveys are timed to record all five common amphibians, the populations of which have held steady or increased. The EMAP is intended to ensure the area provides suitably for the animals until the site is fully restored, the fences are removed and the animals are free to repopulate the new habitats created.

***Reptiles***

**12.3.6** All four common reptile species have been recorded at the site. Common lizards and slow-worms have been recorded annually in the refuge area with adder and grass snakes also found in some years. The 2020 reptile surveys have found particular concentrations of common lizards and slow worms around the grassy margins of the arable fields, particularly adjacent to the western edge of Collyweston Great Wood NNR and the refuge area on the northern edge of the existing ENRMF. No adders have been recorded to date in 2020 but there were adder records during 2019 along the hedgerow between the two arable fields in the proposed western extension area. Grass snakes have only been recorded twice in the western extension area during 2020, along the eastern edges of Fineshade Woods.

***Birds***

**12.3.7** Regular breeding bird surveys of the existing ENRMF site have recorded several pairs of skylark, linnet and yellowhammer with occasional little ringed plovers. Red kites visit the existing ENRMF site to forage. The 2019 breeding bird survey of the western extension area recorded 45 bird species including 1 to 2 pairs of breeding skylark with most other species, including red kite and peregrine, visiting from the surrounding habitats. The wintering bird survey recorded 37 species, mainly passerines feeding on the arable field and hedgerows. No flocks of wintering waders such as lapwings or golden plover were recorded as using the proposed western extension area.

***Bats***

**12.3.8** No evidence of a roost site was recorded in any of the trees in the western extension area with Potential Roost Features. Bat activity over the open arable fields in the western extension area away from the edge habitats was low. Seven species of bat were recorded during the surveys. There were peaks in activity in June at certain woodland and edge points. It is considered that maternity roosts are located in the adjacent woodlands to the east and west of the western extension area including for barbastelle. The location of Core Sustenance Zones surrounding a maternity roost will be taken into account when determining the potential to optimise biodiversity in association with bats[29].

***Badgers***

**12.3.9** Badgers were already known to use the area. In the 2020 survey 24 setts were located but only three were located within the site. All of the setts were located along boundaries in the north of the northern arable field in the western extension area. Badgers use much of the western extension area, especially the grassy margins of the arable fields, for foraging.

[29] Bat Conservation Trust (BCT) Guidance, Undated. Core Sustenance Zones and habitats of importance for designing Biodiversity Net Gain for bats.

***Dormice***

**12.3.10** No dormice (or their activity signs) have been found during any of the surveys to date for this application or as part of the many years of monitoring at the existing ENRMF. The desk study indicated that there are no known records of dormice in Collyweston Great Wood NNR but there are previous records from Fineshade Woods to the west, including one from 2020.

***Invertebrates***

**12.3.11** The proposed western extension area has a rich invertebrate fauna largely associated with the deadwood, woodland fringe and flower-rich habitats. 300 species from the target groups were recorded during the surveys to the end of June 2020 of which 22 species have a national status. Noteworthy species include the rare and threatened black hairstreak butterfly *Strymonidia pruni* found in woodland to the north and west and a colony of uncommon white-letter hairstreak butterfly *Strymonidia w-album*. The deadwood invertebrate resource represented by a strong suite of beetles and flies is a noted feature with these species all using the interface between the woodland and the site.

***Ecologically important features of the site***

**12.3.12** The following aspects of the proposed western extension area are considered ecologically important features:

- The habitats and plant communities that provide habitat for important species including amphibians, reptiles, badgers and invertebrates as described above.
- The amphibian and reptile assemblage.
- Bats particularly in respect of the adjacent woodlands.
- Badgers.
- The invertebrate assemblage particularly species using the interface between the site and the woodland at the site margins.

**12.3.13** The following aspects of the proposed western extension area are not considered to merit the need for significant consideration:

- Plants and plant communities as all species are common and widespread.
- The agricultural fields as they have a low biodiversity interest.
- Breeding and wintering birds, which are considered resilient to the impacts associated with disturbance of the site and are likely to benefit from the proposed restoration scheme.
- Dormice since the only habitat suitable for them within the proposed western extension area are the scrubby woodland area and two hedgerows (the internal one between the two arable fields and that forming the western boundary of the current ENRMF). Surveys have found no evidence of use here.

**12.3.14** It is necessary to outline the likely evolution of the baseline environment at the site without the implementation of the proposed development. If the proposed development was not implemented the existing ENRMF would continue to manage, treat and landfill hazardous wastes as well as provide a disposal facility for LLW. There would be no changes to the site operational practices and the operations at the site would be completed by 2026 to the currently consented restoration scheme. The aftercare and maintenance period for the site would continue to 2036. The land in the western extension area would remain as low biodiversity agricultural land would not be developed during restoration to habitats of nature conversation interest and there would be no opportunity to improve biodiversity.

## 12.4 Preliminary assessment of effects

**12.4.1** Based on the findings of the surveys carried out to date and initial consideration of the ecology of the habitats and species identified as well as the development proposals, the detailed design is being developed to take into account the following aspects and features.

- The measures necessary to protect notable species from killing, injury and disturbance. The disturbance of protected and notable species has the potential to cause stress to mammals and birds, reducing their resilience and breeding success, thereby affecting their conservation status locally.
- Avoidance of the severance of habitats which can disrupt regular migration, commuting and foraging routes used by mobile animals.
- Avoidance of loss of edge habitat, including flower-rich grassland bordering the neighbouring woods.
- Minimisation of the potential for the escape of dust to adjacent sensitive habitats, especially Collyweston Great Wood NNR
- Minimisation of the potential hydrological effects on adjacent trees, particularly in Collyweston Great Wood NNR.
- Maximising the opportunities offered through the proposed restoration scheme to improve biodiversity across the site and to improve connectivity between the woodlands to the west and the east of the western extension area.

**12.4.2** The incorporation of ecological protection and mitigation measures will be inherent to the design of the development proposals. The initial aspects that are being considered in order to provide the necessary protection and mitigation include the following:

- The clearing of vegetation outside the bird nesting season.

- Erecting a steel protection fence around the working area. This will prevent animals such as amphibians and reptiles from accessing the working area and minimise the potential for killing or injury of these animals. The fence would be erected outside the identified root protection area of the adjacent hedgerows and trees and no plant or vehicles would be allowed outside the protection fence. This fence will also protect and reduce the loss of grassland along the margins of the western extension area which are used for feeding including by invertebrates, or commuting and will help to maintain habitat connectivity so far as possible.

- Retaining all trees on site if possible and carrying out additional surveys and precautionary felling practices if trees with the potential for bat roosts must be removed.

- Avoiding/minimising illumination where possible and ensuring that any lighting that is necessary is localised and directed away from habitats used by nocturnal species such as bats, badgers and some birds reducing or preventing detrimental effects on them.

- Best practice measures will be used to prevent or reduce dust reaching sensitive habitats.

- Means to prevent adverse hydrological effects on adjacent trees will be set in place as part of the water management measures described in Section 16 and 17 of this report.

- Means to prevent adverse impacts on the adjacent ecological sites as a result of dust are and will continue to be implemented. The dust control measures implemented at the site are set out in Section 21.

**12.4.3** As explained in Section 4 of this report the landfill areas for the proposed western extension and in particular the extraction boundaries have been determined based on detailed consideration of the standoff distances needed to protect the roots of the trees in adjacent areas in particular the woodland to the east (Collyweston Great Wood) and west (Fineshade Wood/The Assarts), and the location of proposed amphibian/reptile exclusion fencing. The derivation and collation of these standoffs into a combined extraction limit and restoration boundary is set out at Appendix 4.1.

**12.4.4** At an early stage following the granting of the DCO an application will be made for a licence to erect the amphibian exclusion fence around the proposed active area(s) where protection is necessary. As the area that will be surrounded by the fence comprises agricultural land no significant great crested newt terrestrial habitat will be lost. Grassland habitat will remain available outside the fenced area and connectivity between all ponds and feeding areas will be retained. The function of the fence will be to protect the amphibians and reptiles. Mitigation areas will be prepared for animals which are displaced.

**12.4.5** It is currently proposed that early ecological mitigation will include the gapping-up of some existing hedgerows to improve growth and screening potential. Blackthorn planting is proposed in particular to enhance the habitat at locations where the colony of Black Hairstreak butterflies have been identified. Trees will be planted at an early stage along the eastern boundary of the southern proposed landfill area. Areas in which badgers are present will be fenced off as appropriate in accordance with the appropriate licensing regime. The mitigation proposals are being discussed with Natural England and the Local Authority as well as local wildlife groups before they are finalised.

**12.4.6** The final ecological mitigation necessary and the opportunities for long terms benefits will be determined when the outstanding baseline surveys have been completed and the design of the western extension area is completed. The

schemes will be included as necessary in the application for the Development Consent Order and will be implemented as part of the proposed development.

**12.4.7** If a Development Consent Order is granted for the extended site area a detailed landscaping, restoration and aftercare scheme will be developed in agreement with the Local Planning Authority. The scheme will be integrated with the ecological management scheme for the site. The management and aftercare schemes will continue for a period of ten years following the cessation of landfilling at the site.

**12.4.8** The development and finalisation of the restoration scheme for the site will follow the objective of achieving Biodiversity Net Gain. Biodiversity Net Gain is defined as development that leaves biodiversity at the development site in a better state than it was before the development took place. It is also an approach where developers work with local authorities, wildlife groups, land owners and other stakeholders in order to support their priorities for nature conservation. The approach being taken by Augean and their advisers for the development of this site is in accordance with good practice for achieving Biodiversity Net Gain.

## 12.5 Cumulative impacts

**12.5.1** The cumulative impacts are considered as an integral part of the assessment of potential ecological impacts. Based on the preliminary assessment work carried out to date on each of the elements of the proposed development it is considered that there will be no significant adverse cumulative effects and that there will be significant benefits to habitat development and biodiversity as a result of the proposed restoration scheme for the site.

**12.5.2** Significant biodiversity gain will be provided through the detailed landscaping aftercare and ecological management plan which will be prepared in consultation with the local authority for the phased and final restoration which will provide a variety of species-rich native habitats for a wide range of species.

Removal of the amphibian fence following final restoration will allow amphibians and reptiles as well as other species to expand into and use the site area.

# 13 Landscape and visual effects

## 13.1 Introduction

**13.1.1** In this section the preliminary assessment of the effects of the construction, operation and restoration proposals on landscape and visual receptors is presented. The preliminary Landscape and Visual Impact Assessment (LVIA) report is presented at Appendix 13.1.

## 13.2 Methodology

**13.2.1** The preliminary LVIA has been undertaken in accordance with the Guidelines for Landscape and Visual Impact Assessment[30]. The viewpoint photographs to support the preliminary LVIA have been taken in accordance with the latest Landscape Institute and Institute of Environmental Management and Assessment guidance[31]. Further detail on the methodology is provided at Section 3 of the report at Appendix 13.1. The preliminary LVIA was carried out using combined site and desk based survey and assessment. The assessment is focussed on a study area with a 3km radius centred on the site.

**13.2.2** The Zone of Theoretical Visibility (ZTV) for the proposed development was created using Digital Surface Model data and used to determine the possible extent of the visual envelope for the proposed development. In combination with fieldwork this information was used to identify a series of eleven viewpoint locations representative of the view for a range of receptors including residents, users of public rights of way and roads. The viewpoints included in the assessment were agreed with Northamptonshire County Council in February 2020. A field survey was carried out in February 2020 and photographs were taken from each of the representative viewpoints. The study area, ZTV map and the viewpoint locations are shown on Figure 13.1.

[30] Landscape Institute and IEMA (2013) Guidelines for Landscape and Visual Impact Assessment 3rd Edition (GLVIA3)

[31] Landscape Institute and Institute of Environmental Management and Assessment (2019) Visual Representation of Development Proposals Technical Guidance Note 06/19

## 13.3 Baseline

**13.3.1** The baseline for the LVIA comprises the approved restoration profile and scheme for the existing ENRMF site and the current situation at the western extension area.

***Landscape features***

**13.3.2** Landscape features are elements of the environment which contribute to the local character and setting of a site. The key landscape features across the western extension area that are likely to be directly affected by the proposed development are the topography of the area, which will be permanently affected by soil stripping and bund construction, mineral working and subsequent restoration using waste, land classified as grade 3a Best and Most Versatile agricultural land, other grade 3b agricultural land, the hedgerow separating the northern area from the southern area in the western extension area and the small scrubby area in the centre of the western extension area. These features are all considered to have low sensitivity to the proposed development except for the topography (low – medium sensitivity) and the grade 3a soil (medium sensitivity).

**13.3.3** The site does not lie within an area designated at a statutory/national or non statutory/local level for its landscape value or quality. At a national level the site lies within National Character Area (NCA) 92: Rockingham Forest as defined by Natural England which consists of an undulating landform rising to a prominent northern scarp with large woodlands forming a prominent feature on the skyline and remnants of unimproved grassland and large arable fields with low hedges. The settlement pattern is small villages with isolated farmsteads. The area is largely rural and tranquil in character.

**13.3.4** The site lies within Landscape Character Type (LCT) 11: Wooded Limestone Hills and Valleys. Within that LCT the site is located in Landscape Character Area (LCA) 11a: King's Cliffe Hills and Valleys. Relevant key characteristics of

this LCA include a series of broad valleys and broad low hills dipping gradually to the east with a generally enclosed character, a predominance of arable land with areas of improved pasture and calcareous grassland frequent along watercourses, limited limestone walls evident across the landscape, significant woodland cover of varying composition with large areas of designated ancient woodland. Communication routes are principally confined to minor roads connecting small settlements and individual dwellings.

**13.3.5** The site comprises two adjoining areas which are fundamentally different in terms of their existing character. The existing ENRMF is a typically disturbed and degraded landscape with built development such as offices and other infrastructure combined with various operations in progress such as engineering works, partly filled landfill cells and stockpiles. This area is not consistent with the character of the wider agricultural landscape, except for a narrow, previously restored grassland area along part of the northern side of the site. Sensitivity of the current ENRMF to the proposed development is rated as low.

**13.3.6** The western extension area is broadly rural and agricultural with open fields flanked by mature woodland. The western extension area is generally typical of the key characteristics identified in the national and local character assessments relevant to the locality, although it does not contribute in a special or irreplaceable way to local landscape character. The site is located within a predominantly arable landscape with well managed hedgerows with infrequent hedgerow trees and also significant woodland cover providing a strong sense of enclosure, mainly relating to the northern part of the area. The southern part of the western extension area is more noticeably influenced by the adjacent ENRMF. Sensitivity of the area to the proposed development is considered to be low – medium (southern part, adjacent to the ENRMF) and then medium for the northern part, between Collyweston Great Wood and The Assarts.

***Existing visibility***

**13.3.7** The baseline visibility assessment addresses the extent and quality of views towards the site available to a range of visual receptors including settlements/residents, amenity/recreation users (including people using Public Rights of Way), road users and people at work. The site is visually well contained so there are limited viewpoints from which the site can be seen. Eleven viewpoints were selected to represent views for residents, amenity/recreation users and road users. The viewpoint locations have been agreed with Northamptonshire County Council. The photographs from each viewpoint are presented at Appendix A to the report at Appendix 13.1.

**13.3.8** There are no views towards the site from the north due to a combination of extensive mature woodland (Collyweston Great Wood) and an absence of any residential properties or publicly accessible locations within the land to the north.

**13.3.9** The eastern boundary of the existing ENRMF is marked by an approximately 2m to 3m high, well established hedgerow which effectively screens the site all year round from Stamford Road, Westhay Cottages and Westhay Farm. The landform of the existing ENRMF prevents any views of the western extension area from Westhay Cottages and Stamford Road adjacent to the site. Between Westhay Lodge and Westhay Farm views from Stamford Road towards the site including the existing ENRMF operations are severely restricted due to the low elevation of the road combined with the roadside hedgerow. Further to the east and southeast there is a lack of residential properties or public rights of way with views towards the site. Views from Cross Leys Farm and St John's Wood Farm are restricted by distance and/or intervening landform and vegetation.

**13.3.10** From the south there are partial views towards the existing ENRMF operations from a section of Stamford Road in the vicinity of Westhay Lodge, approximately 770m from the site boundary. It is considered that partial views of the operations at the existing ENRMF are available from Westhay Lodge and

the garden. A triangular shaped block of conifer trees approximately 90m to the northwest of Westhay Lodge combined with agricultural buildings between the conifers and Westhay Lodge act as visual screens to severely restrict views from both the road and the property towards the proposed extension area. There are no views of the site from any properties within Kings Cliffe due to a combination of rising landform to the north of the village and a belt of woodland vegetation extending in an almost unbroken strip along the northern edge of the settlement.

**13.3.11** From the west there are only very limited views of the site due to a combination of mature woodland flanking the site along most of its western boundary and landform, which slopes downwards towards Duddington, entirely screening the site from views from this settlement. There are glimpses of the site from Footpath MX15 which runs through Fineshade Wood where there is a break in the trees in the north western corner of the southern field. Views towards the site from public rights of way to the west of Collyweston Quarry are very restricted due to distance and intervening vegetation as well as soil bunds located around the quarry in places.

**13.3.12** It is necessary to outline the likely evolution of the baseline environment at the site without the implementation of the proposed development. If the proposed development was not implemented the existing ENRMF would continue to manage, treat and landfill hazardous wastes as well as provide a disposal facility for LLW. There would be no changes to the site operational practices and the operations at the site would be completed by 2026 based on the consented restoration scheme. The aftercare and maintenance period for the site would continue to 2036. The agricultural fields in the proposed western extension area would not change. The landscape character of the site and the surrounding environs would not change. It is considered that the views of the site would remain generally consistent with the current baseline until the restoration of the existing ENRMF is completed.

## 13.4 Preliminary assessment of effects

**13.4.1** The preliminary assessment of the landscape effects of the proposed development has been undertaken with respect to the existing landscape features on and around the site and the character of the local and wider landscape. Effects on visual receptors are also considered. The preliminary assessment addresses the effects on landscape features, character and visual receptors at three stages of the proposed development mineral extraction and landfill cell construction, progressive infilling and 10 years post restoration.

***Effects on landscape features***

*Mineral extraction, landfill cell construction and progressive infilling*

**13.4.2** During the initial operational stages of the proposed development comprising mineral extraction, landfill cell construction and progressive infilling), effects of moderate – major adverse significance (considered significant in accordance with the LVIA Methodology) would occur to the topography of the western extension area as a result of mineral extraction and subsequent infilling works. Effects on the ENRMF site topography would be minor due to its existing height and appearance.

**13.4.3** All other effects on landscape features would be noticeable during these stages but would be of reduced significance, with none of these considered significant. Grade 3a and 3b soils would be stripped and retained on site for use in restoration.

**13.4.4** The overall effect on landscape features would be medium-large adverse due to landfilling operations being undertaken on previously undeveloped land and the significance is moderate adverse.

*10 years post restoration*

**13.4.5** The restored ENRMF landform would be approximately 6m higher than the current design for the restoration landform although the large scale of the area and the vegetation to be planted would mean that the effects of this increase would be limited in terms of landscape features. Topography in the western extension would be very different from existing but it would integrate well with the restored ENRMF site to form a united, higher level landform.

**13.4.6** There would be a very small net benefit to landscape features in terms of proposed woodland and scrubby areas when compared to the baseline (i.e. restoration of the ENRMF site on its own). However, there would be a significant net benefit in terms of the length of hedgerows with trees and of footpath routes as these landscape features would more than double the currently proposed lengths relevant to the existing ENRMF restoration scheme. There would also be a significant net gain in neutral/calcareous grassland which is considered beneficial to biodiversity.

***Effects on landscape character***

*Mineral extraction, landfill cell construction and progressive infilling*

**13.4.7** There would be adverse effects of moderate – major significance (i.e Significant) on the landscape character of the northern part of the western extension area, although this would be temporary and generally restricted to a local scale due to the very good boundary screening. Effects on the southern part of the extension area would be reduced due to the influence of the existing ENRMF site to the immediate east, but effects would still be immediately noticeable and of an adverse nature. Effects on the ENRMF site would be negligible, although the duration of works would be extended to take into account works within the western extension area.

**13.4.8** Effects on the wider LCA11a: Kings Cliffe Hills and Valleys character area would be of minor adverse significance.

*10 years post restoration*

**13.4.9** The character of the restored ENRMF site would be broadly similar to the character that would be evident if the approved restoration scheme were to be completed, although the woodland and scrubby vegetation would not be as concentrated and would be separated into smaller, more diverse and randomly positioned blocks. Beneficial effects would be of minor significance. The character of the restored western extension area, with the altered landform and addition of grasslands, woodland and scrubby blocks together with hedges and footpath routes, would be very different from the existing situation. Effects are considered to be of minor – moderate significance, of a beneficial nature.

**13.4.10** Effects on the wider LCA11a: Kings Cliffe Hills and Valleys character area would be of minor beneficial significance.

***Effects on visual receptors***

*Mineral extraction, landfill cell construction and progressive infilling*

**13.4.11** The visibility of the site is limited due to screening provided by surrounding vegetation on both the northern and western boundaries of the site. Of the eleven viewpoints there are no views of the site from VP1 (to the west north west of the site), VP6 (to the south east of the site), VP7 (to the south of the site), VP8 (to the south south east of the site) and VP10 (to the south east of the site) due to distance, landform and intervening elements.

**13.4.12** During the operational stages, there would be adverse effects of moderate – major significance (i.e. significant) on residents at Westhay Lodge (represented by VP5), who are considered as having high sensitivity. However, this would only apply when the infilling works are occurring in the southern part of the extension area, as the majority of works in the northern part would be screened and all the mineral extraction works would also be partially out of sight, screened by landform and/or the intervening hedge and advance planting along the eastern side of the extension area.

**13.4.13** There would be no other effects on visual receptors of a moderate – major or major significance (i.e. significant) during the operational stages.

**13.4.14** For public rights of way in closer proximity to the site, existing views of the western end of the ENRMF site, including parts of the waste treatment and recovery plant, are available through a gap in The Assarts woodland, from an approximately 52m long stretch of Footpath MX15 (VP3), approximately 120m to the west of the site. The proposed development would be visible, and would bring works closer to the Footpath users, though the existing view of the ENRMF reduces sensitivity to similar views and therefore limits significance of effects to a moderate level.

**13.4.15** Views from Footpath MX18 (VP2) are very limited due to distance and intervening elements. However, glimpses in winter through woody vegetation of plant in the distance would be possible, mainly as the restoration landform is being constructed. These effects would be limited at all stages of the development and are of minor significance.

**13.4.16** Partial views from an approximately 90m long stretch of Footpath MX13 (VP4) are limited to a small part of the southern section of the western extension area through a gap between Fineshade Wood and Little Wood. The views would be glimpsed by transient users heading northwards for a very short duration and are of minor significance.

**13.4.17** While the works would likely be glimpsed from a number of other locations, these would be from public rights of way or roads and would generally be in excess of 700m from the site (VPs 2, 9 and 11).

*10 years post restoration*

**13.4.18** At the 10 year post restoration stage effects on visual amenity would generally be of a negligible – moderate significance for receptors with partial or glimpsed views of the final landform and of a beneficial nature, due to the site restoration scheme. Views towards the ENRMF site would be similar to what they would

be if the approved restoration were to be carried out, with woodland, scrubby planting and grassland covering the restoration landform, although the layout of the vegetation would feature a number of smaller patches of planting amongst the grassland instead of one large block, and there would be more hedgerow lengths, including randomly placed trees.

**13.4.19** The western extension area would appear markedly different to the baseline, most clearly due to the raised landform, although due to the design, this would integrate well with the adjoining ENRMF landform. The good woodland and scrub cover would help to physically and visually link the woodland flanking all sides of the northern part of the extension area. The vegetation on the slopes of the restoration landforms evident within the southern part of the extension area would visually tie in with the established woodland to the west, for views from the east and southeast.

## 13.5 Mitigation and monitoring

**13.5.1** The mitigation measures proposed to minimise potential effects on landscape and visibility comprise:

- A hedgerow with trees would be advance planted along the south eastern boundary of the western extension area to provide visual screening;
- The current ENRMF site would be infilled and graded to formation levels, then soil/restoration material placed to final restoration levels (except for the operational areas that will remain active) at the earliest opportunity;
- The western extension area would be established, the mineral extracted, the void infilled and the restoration landforms created including final seeding and planting works in a progressive manner in order to minimise the adverse effects on landscape receptors and visual amenity. The intended timescales for extraction, infilling and final restoration works for the site is a period of up to 20 years;

- Soils will be stripped to full depths and stored in separate bunds no higher than 3m (topsoil) or 5m (subsoil) on site for use in restoration, in accordance with best practice. Soils would be replaced loosely, with any compaction remedied by ripping to a minimum depth of 500mm using winged tines pulled by tractor or dozer; and

- The restoration will provide a small net benefit in woodland and scrub planting with a large net benefit in hedgerows with trees and also footpath routes, as well as neutral/calcareous grassland areas. In addition, new ponds will be incorporated into the restored landform to provide an alternative habitat. Overall, there would be a net biodiversity gain when compared to the baseline.

## 13.6 Cumulative impacts

**13.6.1** Based upon current information, and subject to further review, it is considered that there will be no significant adverse cumulative effects on landscape features or character during the mineral extraction, cell construction and infilling stages of the proposed development. It is considered that there will be a significant beneficial cumulative effect on landscape features and character as a result of the overall net gain in neutral/calcareous grassland, woodland/scrubby areas, hedgerows with trees, individual ponds and footpath routes/links.

**13.6.2** Based upon current information, and subject to further review, it is considered that there will be no significant adverse cumulative effects on visual amenity during the mineral extraction and infill stages of the proposed development. It is considered that the cumulative visual effects of the proposed development when fully restored and when vegetation has matured will be beneficial but is not likely to be of major significance. This is mainly due to the well screened nature of the site from residential properties and publicly accessible locations within the study area (3.0km radius).

# 14 Soil resources and agricultural land classification

## Introduction

**14.1** In this section the assessment of the effects on soil resources and agriculture is presented. The agricultural land classification report is presented at Appendix 14.1.

## Methodology

**14.2** There are no areas of undisturbed soils in the current ENRMF site. A desk based review and an investigation of the soils in the study area (Figures 1 and 2 of the report at Appendix 14.1) which includes the western extension area was undertaken in December 2018 and January 2019 to determine the agricultural land quality within the study area. The soil survey was conducted at 28 locations using a hand auger and by examining one excavated soil profile pit. The locations of the auger sampling and soil pit are shown on Figure 1 of the report at Appendix 14.1. Further information was obtained from information published by the Soil Survey of England and Wales (SSEW)[32,33].

**14.3** The soil survey details have been interpreted to grade the land in the study area in accordance with the Ministry of Agriculture, Fisheries and Food (MAFF) Agricultural Land Classification of England and Wales[34]. The main factors which are considered in order to establish the Agricultural Land Classification (ALC) in accordance with the MAFF guidelines are climate, geology and the soil. The climatic criteria are considered first when classifying land as climate can be overriding irrespective of soil and site conditions.

**14.4** The ALC system provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The ALC system divides agricultural land into five

[32] Soil Survey of England and Wales (1984) Soil map of Midland and Western England (Sheet 3).
[33] J. M. Ragg et al, Harpenden (1984) Soils and their Use in Midland and Western England. Bulletin No10
[34] MAFF (1988) Revised Guidelines and Criteria for Grading the Quality of Agricultural Land.

grades (Grade 1 'Excellent' to Grade 5 'Very Poor'), with Grade 3 subdivided into Subgrade 3a 'Good' and Subgrade 3b 'Moderate'. Agricultural land classified as Grade 1, 2 and Subgrade 3a falls in the category defined as 'best and most versatile'.

**14.5** A preliminary assessment on soils has been undertaken. There are no standard criteria for assessing the significance of the effects of the proposed development on soil resources or agricultural land quality. A bespoke impact assessment matrix and criteria will be used to determine the impacts associated with the proposed development. Details on the assessment methodology is presented at Appendix 14.2.

**Baseline**

**14.6** The western extension currently comprises 2 areas of arable land with grassy margins. A hedgerow forms the boundary between the two areas. There is an area of young scrubby woodland in the south eastern corner of the northern area. The western extension is bordered by woodland and arable fields. The fields are under agricultural production.

**14.7** A soil survey of agricultural land surrounding Duddington was undertaken by MAFF after 1988 when the ALC guidelines were introduced. The MAFF survey established that in the wider area including areas to the east and to the west of the site soils in ALC Grade 3a and 3b[35] are extensive. There is a high proportion of Grade 3 land in Northamptonshire generally.

**14.8** Based on maps of the area the solid geology of the site is mainly underlain by Rutland Formation (argillaceous rocks with subordinate sandstone and limestone) with a small area in the north underlain by Blisworth Limestone Formation and a small area in the south underlain by Lower Lincolnshire Limestone Member. The majority of the study area is not covered by superficial

[35] Multi Agency Geographic Information for the Countryside. Post 1988 Agricultural Land Classification. Available online www.MAGIC.gov.uk

deposits. The southern part of the study area is covered by Mid Pleistocene Till. The soils in the study area are described in the Soil Survey of England and Wales Bulletin No 10. The report states that the soils within the study area are in the Ragdale Association. The eastern part of the study area is bordered by soils in the Evesham 1 Association. The Ragdale Association is described as clayey pelostagnogley soils. The Ragdale Association is developed in till which has grey clayey matrix containing chalk stones and some lenses of fine loamy material. Ragdale soils are seasonally waterlogged. The Evesham 1 Association consists of calcareous clays of variable depth and water regime and are formed on Jurassic clays. The soils are seasonally waterlogged when undrained.

**14.9** Based on maps of the area the solid geology of the site is mainly underlain by Rutland Formation (argillaceous rocks with subordinate sandstone and limestone) with a small area in the north underlain by Blisworth Limestone Formation and a small area in the south underlain by Lower Lincolnshire Limestone Member. The majority of the study area is not covered by superficial deposits. The southern part of the study area is covered by Mid Pleistocene Till. The soils in the study area are described in the Soil Survey of England and Wales Bulletin No 10. The report states that the soils within the study area are in the Ragdale Association. The eastern part of the study area is bordered by soils in the Evesham 1 Association. The Ragdale Association is described as clayey pelostagnogley soils. The Ragdale Association is developed in till which has grey clayey matrix containing chalk stones and some lenses of fine loamy material. Ragdale soils are seasonally waterlogged. The Evesham 1 Association consists of calcareous clays of variable depth and water regime and are formed on Jurassic clays. The soils are seasonally waterlogged when undrained.

**14.10** The classification of soil in agricultural land can be limited by one or more of three main site factors: gradient, micro relief (complex change in slope angle over short distances) and risk of flooding. The quality of the agricultural land in

the study area is not limited by gradient or micro relief. The study area is located in Flood Zone 1 which means it is at low risk of flooding by rivers or the sea. There is insufficient data to determine if the duration and frequency of flooding is limiting to the quality of the agricultural land in accordance with the ALC guidelines.

**14.11** It has been determined from the published information together with the findings of the soil survey that the quality of the agricultural land in the northern part of the study area is limited by soil droughtiness where the soil profiles are developed over limestone. The clayey soil profiles over the remainder of the study area are limited by soil wetness. The majority of the study area comprises clayey soils and is limited by soil wetness to Grade 3b. The area in the north of the study area where there are shallow soils over limestone is limited by soil droughtiness to Grade 3a.

**14.12** Based on maps of the area the solid geology of the site is mainly underlain by Rutland Formation (argillaceous rocks with subordinate sandstone and limestone) with a small area in the north underlain by Blisworth Limestone Formation and a small area in the south underlain by Lower Lincolnshire Limestone Member. The majority of the study area is not covered by superficial deposits. The southern part of the study area is covered by Mid Pleistocene Till. The soils in the study area are described in the Soil Survey of England and Wales Bulletin No 10. The report states that the soils within the study area are in the Ragdale Association. The eastern part of the study area is bordered by soils in the Evesham 1 Association. The Ragdale Association is described as clayey pelostagnogley soils. The Ragdale Association is developed in till which has grey clayey matrix containing chalk stones and some lenses of fine loamy material. Ragdale soils are seasonally waterlogged. The Evesham 1 Association consists of calcareous clays of variable depth and water regime and are formed on Jurassic clays. The soils are seasonally waterlogged when undrained.

**14.13** The climatic criteria have been reviewed for the site and it is considered that on the basis of a review of data on rainfall and accumulated temperature there is no overall climatic limitation at the site. The agricultural land within the study area is predicted to be near saturation point for 123 days per year mainly over late autumn, winter and early spring. In combination with topsoil texture this will cause limitations to agricultural land quality in the study area.

**14.14** The depth of topsoil (calcareous heavy clay loam) in the Subgrade 3a area is approximately 30cm below ground level. Below the layer of topsoil, the depth of recoverable subsoil (calcareous clay) above the limestone rock is approximately 25cm, i.e. the layer 30cm-55cm below ground level. The depth of topsoil in the Subgrade 3b area is approximately 25cm below ground level. Below the layer of topsoil (clay), the depth of recoverable upper subsoil (clay) is approximately 30cm, i.e. the layer 25cm-50cm below ground level. Where required, the lower subsoil (clay), i.e. 50cm-120cm below ground level, could be recovered and stored on site for restoration purposes.

**14.15** It is concluded that the majority of the study area is Grade 3b (comprising 77.3% of the study area) whilst the northern half of the northern field of the study area is Grade 3a (comprising 20.9% of the study area). There is a small area of land in the central eastern part of the study area that is classed as non-agricultural (comprising 1.8% of the study area). The agricultural land classification of the study area is shown on Figure 14.1. The land in the existing ENRMF site is classed as non-agricultural. The soil study area extended over a greater area than that which is included in the western extension area the subject of the DCO application. Within the proposed western extension area there is 5.93ha of Grade 3a soils and 19.8ha of Grade 3b soils and approximately 0.5ha that is non agricultural (Figure 14.1).

**14.16** It is necessary to outline the likely evolution of the baseline environment at the site without the implementation of the proposed development. If the proposed development was not implemented the existing ENRMF would continue to

manage, treat and landfill hazardous wastes as well as provide a disposal facility for LLW. There would be no changes to the site operational practices and the operations at the site would be completed by 2026. The aftercare and maintenance period for the site would continue to 2036. The agricultural land would be retained in the western extension area and the soils would remain in situ. The land would not be restored to habitats of nature conversation interest and there would be no net biodiversity gain.

**Preliminary assessment of effects**

**14.17** The details of the restoration of the site and the optimum use of the soils on western extension area are still being determined. A detailed soil resource impact assessment will be undertaken and included in the Environmental Statement that will be submitted with the DCO application. The methodology used is presented in Appendix 14.2.

***Construction of the landfill phases***

**14.18** As the phases of the western extension area are constructed it will be necessary to strip the soils. The soils will be handled, moved and stored in accordance with the MAFF Good Practice Guide for Handling Soils. A soil handling and management scheme will be prepared and submitted with the DCO application.

***Restoration***

**14.19** The site will be restored to nature conservation habitats. As it is not proposed to reinstate the agricultural land there would be a potential permanent loss of approximately 6 hectares of best and most versatile agricultural land and a loss of approximately 20 hectares of lower quality agricultural land. The primary objective of the restoration scheme for the site is ecological biodiversity. Agricultural land generally has a limited ecological biodiversity. The loss of agricultural land in the western extension area, of which there is no shortage in

Northamptonshire, is offset by the biodiversity benefits which will result from the proposed restoration scheme at the site.

**14.20** All soils will be retained on site and reused in the site restoration. The Subgrade 3a soils are calcareous and will be retained specifically for use in the areas being restored as calcareous grassland or for other calcareous habitats. As the site is progressively restored the handling of the soils during replacement will be in accordance with the guidance in the MAFF Good Practice Guide for Handling Soils. Soils will be replaced to at least a depth of 1m depending on the end use. In areas where tree planting is proposed the soil depth will be at least 1.5m.

**Mitigation and monitoring**

**14.21** All soil handling, movement and storage will be undertaken in accordance with schemes based on the MAFF Good Practice Guide for Handling Soils and a soil handling scheme will be submitted with the DCO application.

**Cumulative impacts**

**14.22** Consideration will be given to cumulative impacts once the detailed restoration design for the development is determined.

# 15 Archaeology and cultural heritage

## Introduction

**15.1** A desk based study including an initial assessment of archaeological potential and the potential impacts on the setting of cultural heritage assets has been undertaken and is presented at Appendix 15.1. The preliminary assessment is further informed by the results of a geophysical survey that has been undertaken of the proposed western extension area. The assessment considers both the direct and indirect effects of the development proposals on cultural heritage.

## Methodology

**15.2** The desk based study has been prepared in accordance with The Chartered Institute for Archaeologists guidance[36] and Historic England Guidance[37,38,39] and aims to provide an initial assessment of the potential effects upon archaeological and heritage resources within the site and the surrounding area that would result from the proposed development. The desk based study:

- Identifies and defines the extent of known heritage assets within the study area including the extent of the setting of the heritage asset;
- Establishes, from existing evidence, the likely archaeological potential of the site;
- Provides a preliminary assessment of the importance of the known archaeological resource;

[36] The Chartered Institute for Archaeologists' (1994 updated in 2014) Standard and Guidance for historic environment desk-based assessment

[37] •Historic England (2008) Conservation Principles: Policies and Guidance for the Sustainable Management of the Historic Environment.

[38] •Historic England (2017) The Setting of Heritage Assets (GPA3)

[39] •Historic England (2020) Mineral Extraction and Archaeology (HE Advice Note 13)

- Makes a preliminary assessment of the potential for indirect effects on offsite designated heritage assets;
- Assesses the potential impact of the proposed development on known or potential heritage assets and resources; and
- As necessary, makes recommendations on the need for (and scope of) further evaluation and mitigation.

**15.3** A search has been undertaken of the Historic England Archive, the Northamptonshire Historic Environment Record and DEFRA Magic Database to obtain information on designated heritage assets such as World Heritage Sites, listed buildings and other buildings of architectural or historic importance, scheduled monuments, Conservation Areas, archaeological sites, battlefields, historic parks and gardens and historic landscapes.

**15.4** The details of the assessment methodology are presented in Appendix 15.2.

**Baseline**

***Desk Based Assessment***

**15.5** There is no surviving archaeology within the existing ENRMF site as all areas of the site have been disturbed and were subject to previous investigation and recording. The western extension area has no upstanding heritage assets. It has been under arable cultivation for at least 150 years and prior to that it was partially located within Rockingham Forest. Ploughing has removed the surface evidence of any archaeology such as earthwork remains.

**15.6** An initial search for designated heritage assets within 2km of the site was undertaken. There are no designated heritage assets within the application boundary. The nearest Scheduled Monument is Duddington Bridge which is situated to the west of the village approximately 1.6km west north west of the site. One other Scheduled Monument sits on the limit of the 2km search area

north north west of the site in Collyweston and is the site of a manor house and gardens. Based on the Zone of Theoretical Visual Influence (ZTVI) and the assessment of views from designated assets or groups of assets (such as within Conservation Areas) there would be no visual effects from the proposed development nor effects upon their historical context. Both Scheduled Monuments are separated from the site by distance, topography, woodland and a lack of visual connection. Their settings cannot be affected by the proposed development and therefore the impact on them is not assessed further.

**15.7** There are two locations of Grade II* listed buildings and structures and twenty eight Grade II listed buildings within 2km of the site. The closest are located within Duddington Village where there are twenty seven listed buildings located within a conversation area at a distance of over 1.2km west of the site. There are no views of the application site from the locations of the buildings. The buildings and structures are separated from the application site by distance and there is a lack of intervisibility due to topography and woodland. Their settings cannot be affected by the proposed development and therefore the impact on them is not assessed further. There are no other designated heritage assets within 2km of the site.

**15.8** The Northamptonshire Historic Environment Record (HER) was consulted as part of the desk based study and the entries located within the western extension area or within 1500m of its boundary are presented in Table 12.4 of the preliminary cultural heritage assessment presented at Appendix 15.1. Within the western extension area of the site three entries have been recorded (references 9152/0/2, 9173/0/1 and 9173/0/7 on Table 12.4 in the report at Appendix 15.1). They comprise an area on the enclosure award map that was probably lawn, a fieldname and a crop mark of a field boundary that appears on the 1950s Ordnance Survey mapping.

**15.9** The vicinity of the site has been examined during an extensive fieldwalking programme between 1960 and 1999. Numerous archaeological sites have

been located including many of Roman date. The sites comprise possible settlements, buildings and ironworking locations. The National Aerial Photographic Mapping Programme has covered the area.

**15.10** A large number of landscape features were identified from the Rockingham Forest Project. One excavation was recorded in Collyweston Great Wood 900m north north east of the western extension area. During 1953-4 a Romano-British temple of several periods of construction was identified including hexagonal and octagonal stone buildings and associated finds.

**15.11** Prehistoric sites are rare. A possible cooking site identified during fieldwalking 340m north of the western extension area is marked by burnt and cracked pebbles. Two possible Bronze Age ring ditches lie towards the northwest limit of the study area lie 1km north west of the site. In this same area there is evidence for an Iron Age smelting site (7181/1/1).

**15.12** A further possible prehistoric barrow (9395/0/1) was identified in Westhay Wood to the south of the western extension area comprising a low mound about 15m in diameter. Two linear crop marks on the southern margin of the search area (9402/0/1 and 9402/0/2) were also interpreted as potential prehistoric boundaries.

**15.13** Despite extensive fieldwalking and aerial photographic assessment, there are no known Roman sites nearer than 500m from the Site (9389), where a significant find scatter of Roman date including building stone and pottery was located.

**15.14** A further probable settlement and ironworking site (2846) lies 1200m south-east of the western extension area. A similar Roman settlement including evidence of a building from aerial photographs and ironworking lies to the north-east of 2846 (2486 and 9400) and may be a continuation of 2846. Both sites lie to the east of Westhay Lodge. A Romano-British iron smelting furnace (2886/1) and a possible section of a Roman road (3010/1) are also recorded.

**15.15** A walkover survey has been undertaken within Fineshade Wood that lies to the west and south west of the western extension area. The survey identified ponds, ditches and banks, veteran trees and quarry pits.

**15.16** The Peterborough HER (PHER) was also consulted and two records were found within 1500m of the western extension area.

- Knocker's Temple 900m east of the site. Approximate position of stone foundations of possible Roman temple found in 1953-54 by Captain Knocker. The description is the same as the Northants HER entry 2868/1/1 - MNN22442

- Pipeline watching brief (PHER 51109) 700m east of the western extension area. No features were observed.

***Field Based Assessment***

*Geophysical survey*

**15.17** No archaeological investigations are known to have taken place within the western extension area prior to the current project. A geophysical survey of the western extension area was undertaken in November 2019 and May 2020. The geophysical survey found little that can described as of archaeological interest with any certainty. Most of the suitable anomalies are non-connected linear examples with weak magnetic enhancement and no coherent layout. Some may be ditch fills, others could be drains or former paths and some contrast so weakly with their surroundings as to be only tentatively identified. The main feature identified is the western part of a small rectilinear enclosure which due to the strength of magnetic enhancement associated with the fills may suggest the presence of materials commonly associated with intensive use such as cultural debris and heated soils. The geophysical survey data is included in the report at Appendix 15.1.

*Trial trenching*

**15.18** Excavation of a series of trial trenches will take place across the western extension area to verify the findings of the geophysical survey and identify any features of archaeological interest which may be present below ground. Discussions have been held with the Northamptonshire County Archaeologist and a Written Scheme of Investigation for the trial trenching has been approved. The work which is being undertaken by MOLA Northampton commenced in mid October 2020.

**15.19** It is necessary to outline the likely evolution of the baseline environment at the site without the implementation of the proposed development. If the proposed development was not implemented the existing ENRMF would continue to manage, treat and landfill hazardous wastes as well as provide a disposal facility for LLW. There would be no changes to the site operational practices and the operations at the site would be completed by 2026. The aftercare and maintenance period for the site would continue to 2036. The agricultural land would be retained in the western extension area and any below ground archaeology present in the western extension area would remain in situ. The western area of land would not be restored to habitats of nature conversation interest and there would be no net biodiversity gain. There would be no further contribution to the local archaeological knowledge of the area or potential further discovery of artefacts of archaeological interest.

**Preliminary assessment of effects**

**15.20** Many of the activities associated with the construction of the western extension area such as topsoil stripping, the creation of stockpiles, pre construction infrastructure works, movement of heavy machinery and mineral extraction could impact on known or potential archaeological or cultural features.

**15.21** The preliminary review of heritage information indicates that there are no adverse effects upon designated assets due to a combination of topography, distance, intervening woodland and built development.

**15.22** No significant archaeological finds have been made on the western extension area itself and the geophysical survey, whilst identifying a few anomalies, positively identified only one potential enclosure as being of archaeological interest.

**15.23** The preliminary conclusion of this review of archaeology and cultural heritage is that the proposed development will have neutral, negligible or not significant effects.

**Mitigation and monitoring**

**15.24** Following the completion of the trial trenching further discussions will be held with the Northamptonshire County Archaeologist regarding the archaeological potential of the western extension area and the proposed approach to the assessment. As is usual practice on large rural sites, soil stripping would be carried out under the direction of an archaeologist. If identified as appropriate this may be followed by archaeological excavation within areas defined by the geophysical survey and trenching as of archaeological interest, or as part of a Strip Map and Sample exercise. The results of any such exercises would be analysed and published.

**15.25** Based upon current information and subject to further review it is considered that there would be no significant residual effects as a result of the proposed development.

**Cumulative impacts**

**15.26** From the preliminary information available it is considered that there would be no cumulative effect on the setting of cultural heritage as a result of the proposed development.

# 16 Water resources

## 16.1 Introduction

**16.1.1** In this section of the report the potential for indirect effects on human health as a result of contaminant migration through the water pathway and potential impacts on water resources associated with the proposed development are considered. The baseline geology, hydrology (surface water) and hydrogeology (groundwater) has been established at the site as part of the assessments carried out for the current and proposed waste management activities at the site. A Flood Risk Assessment for the site is presented in Section 17 of this report.

## 16.2 Methodology

**16.2.1** A quantitative hydrogeological risk assessment has been carried out for the disposal of hazardous waste at the existing ENRMF in support of the Environmental Permit application for the existing ENRMF landfill site. In addition a quantitative hydrogeological risk assessment was carried out of the radiological risks to the aqueous environment as part of the Environmental Permit application for the deposition of LLW in the remaining cells of the existing ENRMF. These hydrogeological impact assessments are currently being reviewed and updated and the scope of the assessments in respect of the proposed western extension to the landfill are being agreed with the Environment Agency.

**16.2.2** The hydrogeological risk assessments take into account the cumulative impact from all the waste that has been and could be disposed of at the site. The risk assessments are based on well-established models used nationwide and approved by the Environment Agency. They are based on highly conservative assumptions and consider the potential impacts of the site in the short and the very long term (thousands of years). They assume that the high density polyethylene liner (a heavy duty chemical resistant synthetic material)

component of the engineered containment system degrades over time. The highly engineered clay component of the liner, being geological material, does not degrade and provides continued protection over geological time.

**16.2.3** The groundwater pathways for the migration of radioactive contaminants will be assessed using a model implemented specifically for the ENRMF site and surrounding area. The model is developed using the GoldSim software, which provides a flexible modelling framework that allows the effects of decay and ingrowth of radioactive isotopes to be accounted for. The hydrogeological risk assessments (HRAs) are reviewed regularly to determine whether the values used and assumptions made in the models remain valid and the results of the reviews are submitted to the Environment Agency.

**16.2.4** A survey of the surface water drainage at and around the site has been carried out and a qualitative assessment is presented of the potential for contaminant migration to the surface water and of the potential for adverse effects on surface water quality as a result of the proposed development.

**16.2.5** A qualitative assessment is presented of the potential impacts on groundwater levels, groundwater flows, groundwater resources and flows in nearby watercourses. The potential impacts on water dependant features of ecological importance and archaeological features of importance which may be affected by changes in the hydrogeological or hydrological regime of the site are included in the qualitative assessment. Mitigation measures are proposed as necessary to ameliorate any significant impacts identified.

**16.2.6** The level of detail in the assessments presented in this document and the additional details which will be presented with the DCO application are intended to be appropriate to demonstrate the land use consequences of the proposals.

**16.2.7** An extensive site investigation has been undertaken in the proposed western extension area the scope of which was agreed with the Environment Agency. Between 18 November 2019 and 17 March 2020 twenty seven boreholes were

drilled in the proposed western extension area to investigate the ground conditions in accordance with the scope of the site investigation agreed with the Environment Agency. The locations of the site investigation boreholes drilled at the site in order to obtain details of the underlying geology and hydrogeology are shown on Figure 7.1.

## 16.3 Baseline

### *Geology*

**16.3.1** Based on the 1:50,000 British Geological Survey (BGS) map (Sheet 157, Stamford), the geology at the site comprises glacial till (formerly boulder clay) drift deposits where present, overlying Jurassic bedrock. The bedrock comprises the Blisworth Limestone Formation in the south eastern corner of the currently permitted site and northern part of the proposed western extension area with the remainder of the site underlain by the Rutland Formation which comprises mainly clays and silty clays. The Rutland Formation stratigraphically underlies the Blisworth Limestone Formation and is underlain in turn by the Lincolnshire Limestone Formation, Grantham Formation, Northampton Sand Formation and the Whitby Mudstone Formation. In part of the southern section of the proposed western extension area the glacial clays directly overlie the Lincolnshire Limestone Formation with the Rutland Formation being absent. The Lincolnshire Limestone Formation comprises mainly limestones, sandy limestones and sandstones. The Grantham Formation and Northampton Sand Formation are not easily differentiated at the site and comprise mainly silt, clay, sand and sandstones. The Whitby Mudstone Formation comprises mudstone and clay.

**16.3.2** There is a Regionally Important Geological Site (RIGS) in the vicinity of the site. The RIGS is located approximately 1.3km to the east north east of the current site as shown on Figure 1.2. There is a Local Geological Site approximately 0.5km to the north west of the proposed western extension. The sites comprise quarries within the Lincolnshire Limestone Formation with the designations

relating to the geological exposures in the quarries. There will be no impact on the RIGS or the Local Geological Site as a result of the proposed development.

***Hydrology***

**16.3.3** Information regarding the local hydrology is taken from the Ordnance Survey 1:50,000 scale Landranger Map 141 Kettering and Corby and Landranger Map 142 Peterborough (Figure 1.1) and from information provided by the Environment Agency, East Northamptonshire Council, Rutland County Council and Peterborough City Council. The site is located in the catchment of the River Nene which flows generally eastwards and is located approximately 6km east south east of the site at the closest point.

**16.3.4** The current operational surface water management system is designed to retain all surface water on site where it is stored in ponds and used for dust suppression, in the wheel wash and in place of mains water in the treatment facility. As the site develops the surface water management system at the site is progressing towards the approved post restoration surface water management plan for the site which allows for the drainage of surface water from the restored phases to a drainage point at the south eastern corner of the existing ENRMF site which is the subject of consent under the Environmental Permit for the landfill. The discharge point has not yet been connected to the surface water management system. The ditch to which site runoff eventually will be discharged flows generally to the south and after joining a stream outfalls to the Willow Brook approximately 2.5km south of the site. The Willow Brook joins the River Nene approximately 9km south east of the site.

**16.3.5** The proposed western extension to the landfill is located on a surface water divide with the majority within the catchment of the Willow Brook consistent with the current ENRMF site. Part of the northern section of the proposed western extension area drains to the east to a drainage ditch which runs along the western and southern boundaries of Collyweston Great Wood. It is understood that the drainage ditch continues eastwards from the site joining a tributary of

the Wittering Brook where it issues approximately 2.0km north east of the current ENRMF site and approximately 2.7km east north east of the proposed western extension. The Wittering Brook joins the River Nene approximately 7.5km east of the site.

**16.3.6** Information on the surface water catchments at the site on the Environment Agency catchment data explorer website indicates that the majority of the proposed western extension is within the catchment of the Wittering Brook consistent with the majority of the current ENRMF site with the southern part of the proposed western extension and the southern part of the current ENRMF site only within the catchment of Willow Brook. It is known from site observations that runoff from the southern part of the northern section of the extension area and the central area of the proposed western extension to the landfill drains via field drains and drainage ditches to the swallow hole located approximately 10m to the north of the north western corner of the current site boundary. A number of drainage ditches from the west of the site drain into the perimeter drainage ditches round the extension area with a drainage ditch from the south culverted under the central part of the extension area towards the swallow hole. As it is likely that groundwater at the site feeds tributaries of the Willow Brook and the Willow Brook (see hydrogeology section below), for the purpose of this report it is considered that the majority of the proposed western extension to the landfill and the current ENRMF site are within the catchment of the Willow Brook.

**16.3.7** The southern section of the proposed western extension area drains to the south and south east to a drainage ditch that runs from west to east along the northern boundary of Little Wood approximately 50m south of the site. The drainage ditch continues eastwards to the east of Stamford Road and then south eastwards to where it is understood it joins a tributary of Willow Brook.

**16.3.8** In addition to the water bodies at the current site, there are a number of water bodies in the area of the proposed western extension. A pond is located

adjacent to the south west corner of the proposed western extension area. Three constructed ponds are located north of the proposed western extension area with the closest pond approximately 80m from the northern boundary. A number of small ponds are located between approximately 200m and 400m east of the proposed extension area in the former MOD site within Collyweston Great Wood. A small pond is located approximately 450m south of the proposed extension area to the south of Little Wood. A number of waterbodies associated with the Lincolnshire Limestone Formation workings at Collyweston Quarry are located approximately 500m west of the proposed extension area. Based on the 1:50,000 BGS map (Sheet 157, Stamford), with the exception of the Lincolnshire Limestone Formation workings at Collyweston Quarry, the waterbodies in the vicinity of the site are underlain by the glacial till (formerly boulder clay) or the Rutland Formation comprising mainly clays and silty clays. Surface water features in the vicinity of the site are shown on Figure 2.1.

**16.3.9** The existing surface water management system for the site includes containment of the surface water from the waste treatment facility on the area of hardstanding which has an elevated kerbed edge. Surface water collecting in this area drains to a sump which is designed to have sufficient capacity to hold surface runoff from the treatment area. Fuel, lubricant and chemical reagents are stored in bunded areas to contain spillage. Vehicles are refuelled on areas of hardstanding with surface water drainage directed to a collection point or in the engineered and contained landfill area. Surface water quality monitoring is carried out in the surface water management system at the site. The monitoring data are provided to the Environment Agency and are reviewed regularly by Augean.

**16.3.10** Based on information provided by the Environment Agency and the relevant Local Authorities there is one licensed and one deregulated surface water abstraction within a 3km radius of the site including the proposed western extension area. The licensed abstraction is located approximately 1.4km west north west of the site and is from the River Welland for hydroelectric power

generation. The deregulated abstraction is located approximately 2.7km north west of the site and is from the River Welland for general farming and domestic use. The River Welland is in a separate surface water catchment from the site hence the abstraction is not located downstream of the site. An abstraction from the River Nene is located approximately 7km east of the site where water is pumped to Rutland Water for public water supply. The abstraction is located approximately 8km downstream of the confluence between the River Nene and Willow Brook and approximately 0.7km upstream of the confluence between the River Nene and Wittering Brook.

**16.3.11** The quality of the surface water at and in the vicinity of the site is classified by the Environment Agency under the Water Framework Directive (WFD). The WFD classifications and objectives are presented in the River Basin Management Plans (RBMP). The RBMP relevant to the site comprises the Anglian River Basin District. The Willow Brook (Nene) catchment which includes the tributary of the Willow Brook to the south of the site was classified by the Environment Agency in 2019 as "Moderate" for ecological quality and "Fail" for chemical quality with an overall classification of "Moderate". It is understood that the failure of chemical quality is in respect of Macrophytes and Phytobenthos combined and phosphate from a continuous sewage discharge by the Water Industry. It is predicted in the RBMP that the ecological quality remains "Moderate" up to 2027 having achieved this objective in 2013 and that the predicted chemical quality objective of "Good" will be reached by 2027 having been "Good" up to 2016.

**16.3.12** The Wittering Brook catchment which includes the tributary of the Wittering Brook to the east of the site was classified by the Environment Agency in 2019 as "Moderate" for ecological quality and "Fail" for chemical quality with an overall classification of "Moderate". It is understood that the failure of chemical quality is in respect of phosphate from point source and diffuse emissions due to poor agricultural and rural land management, transport drainage and continuous sewage discharge. It is predicted in the RBMP that the ecological

quality remains “Moderate” up to 2027 having achieved this objective in 2009 and that the predicted chemical quality objective of “Good” will be reached by 2027 having been “Good” up to 2016.

**16.3.13** There are no permitted water discharges within 500m of the site. There is one water discharge exemption within 500m of the site, which is located approximately 250m to the east of the site. The exemption was previously the subject of a discharge consent for the discharge of treated sewage effluent to an unnamed ditch.

***Hydrogeology***

**16.3.14** The Blisworth Limestone Formation at the site was recorded as not water bearing during drilling of the boreholes at the site. The glacial till and the mudstones of the Rutland Formation have a low hydraulic conductivity and were recorded as not water bearing during drilling of boreholes at the site. The underlying limestones and sandstones of the Lincolnshire Limestone Formation and the Northampton Sand Formation are water bearing. It is likely that the Lincolnshire Limestone Formation and Northampton Sand Formation are in hydraulic continuity. The Lincolnshire Limestone Formation has a low to moderate primary permeability and a moderate to high secondary hydraulic conductivity due to the presence of fissures and fractures. Karst features such as swallow holes and doline depressions have been recorded in the vicinity of the site. A swallow hole is located approximately 10m to the north of the north western corner of the current site boundary. Other doline features comprising depressions have been identified in the vicinity of the swallow hole and are being investigated and assessed as part of the site investigation works.

**16.3.15** The Blisworth Limestone Formation and Lincolnshire Limestone Formation are designated as Principal aquifers by the Environment Agency. The glacial till is designated as a Secondary undifferentiated aquifer and the Rutland Formation is designated a Secondary B aquifer. The Grantham Formation is designated

a Secondary undifferentiated aquifer and the Northampton Sand Formation is designated a Secondary A Aquifer.

**16.3.16** Based on the groundwater level information provided by the Environment Agency together with groundwater levels recorded at the boreholes at and around the site including the proposed western extension area the direction of groundwater flow in the Lincolnshire Limestone Formation and Northampton Sand Formation is towards the south and south east generally in the vicinity of the site.

**16.3.17** The Lincolnshire Limestone Formation and Northampton Sand Formation to the east and south east of the site are cut by several valley features which are coincident with the River Nene and its tributaries. Based on the direction of the regional and local groundwater flow and the valley features in the Lincolnshire Limestone Formation and Northampton Sand Formation to the east and south east of the site it is likely that groundwater beneath the site discharges to the River Nene directly or via tributaries.

**16.3.18** On the 1:25,000 Ordnance Survey map (Sheet 234, Rutland Water) there are a number of springs identified within a 3km radius of the site. In general the springs coincide with valley features. A spring is shown at approximately 850m south east of the site located approximately 400m east of Westhay Lodge, springs are located to the immediate south east of King's Cliffe village approximately 2.6km south of the site, a spring is located approximately 2.8km south south east of the site, a spring is adjacent to Tixover Grange approximately 2.3km north west of the proposed western extension and there are springs to the west and south west of Collyweston between approximately 2.0km and 2.7km north north west of the proposed western extension.

**16.3.19** On the 1:10,000 Ordnance Survey base data there are a number of issues identified in addition to the springs within a 3km radius of the site. In general the issues coincide with valley features. Issues are shown at approximately 90m south of the proposed western extension in Little Wood as shown on

Figure 2.1, issues are located to the south of the site where the tributary of Willow Brook emerges and along the tributary at between 0.8km and 1.6km south of the site, issues are located between approximately 1.6km and 2.0km to the north east, east and south east of the site where tributaries of the Wittering Brook emerge, issues are located where a tributary of the River Nene emerges approximately 2.4km south east of the site, issues are located adjacent to Tixover Grange approximately 2.1km north west of the proposed western extension and along the Willow Brook approximately 2.9km south west of the proposed western extension.

**16.3.20** Based on the general direction of groundwater flow in the vicinity of the site it is considered that the springs and issues to the north west and north north west of the site are located up hydraulic gradient of the site and the springs and issues to the south, south south east and south east of the site are down hydraulic gradient of the site. All other springs and issues are neither up nor down hydraulic gradient of the site in respect of groundwater flow. Based on the 1:50,000 BGS map (Sheet 157, Stamford) of the springs and issues down hydraulic gradient of the site it is considered that the issue in Little Wood near the southern boundary is from the glacial till. It is considered that the northern most issue to the south where the tributary of the Willow Brook emerges and the issue along the tributary together with the springs to the south of the site near King's Cliffe village issue from the Lincolnshire Limestone Formation and feed into Willow Brook. It is considered that the southern most of the issues to the south where the tributary of the Willow Brook emerges is from the Blisworth Limestone Formation. It is considered that the spring to the south east of the site near Westhay Lodge issues either from glacial sand and gravel deposits or from the Blisworth Limestone Formation and feeds the tributary of Willow Brook. It is considered that the spring to the south south east of the site issues from the Blisworth Limestone Formation and feeds another tributary of Willow Brook. The remaining issues to the south east are from the Blisworth Limestone Formation.

**16.3.21** It is considered that the springs and issues from the glacial deposits and from the Blisworth Limestone Formation are hydraulically separate from the site as where these deposits are recorded at the site they are laterally discontinuous and were recorded as not water bearing during the site investigations. On this basis the issue to the south where the tributary of the Willow Brook emerges and the issue along the tributary together with the springs to the south of the site near King's Cliffe village issue from the Lincolnshire Limestone Formation are considered to comprise down hydraulic gradient receptors for the site.

**16.3.22** Groundwater has been sampled routinely from boreholes across the site for the purpose of groundwater quality monitoring. The groundwater monitoring scheme is the subject of the Environmental Permits for the site and is designed to confirm that the landfill is not having an unacceptable impact on groundwater quality. The monitoring data are provided to the Environment Agency and are reviewed regularly by Augean to identify spatial and temporal patters and to provide assurance that there are no adverse trends in groundwater quality. The monitoring locations are shown on Figure 7.1.

**16.3.23** The quality of the groundwater at and in the vicinity of the site is classified by the Environment Agency under the Water Framework Directive (WFD). The WFD classifications and objectives are presented in the River Basin Management Plans (RBMP). The RBMP relevant to the site comprises the Anglian River Basin District. The groundwater in the Northampton Sands in the Nene Catchment in which the site is located was classified by the Environment Agency in 2019 under the WFD as "Good" with respect to quantitative status and "Poor" with respect to chemical quality with an overall classification of "Poor". It is specified that the reason for not achieving good status with respect chemical quality is due to poor nutrient management under the agricultural and land management category. The quantitative status and chemical quality objectives are consistent with the current classifications with the current classifications predicted in the RBMP to remain up to 2027.

**16.3.24** There is one licensed groundwater abstraction which abstracts from two borehole locations, sixteen deregulated groundwater abstractions at fifteen locations and six private water supply groundwater abstractions within a 3 km radius of the site including the proposed western extension area. The licensed groundwater abstraction is from a borehole approximately 1.6km east and a borehole approximately 2.5km south east of the site for general farming and domestic use with the borehole to the south east potentially down hydraulic gradient of the site in respect of groundwater flow. Of the deregulated abstractions three are located to the south and south east hence potentially down hydraulic gradient of the site in respect of groundwater flow. The closest deregulated abstraction to the site is located approximately 1.1km south east of the site at Law's Lawn and is for general farming and domestic use. It is assumed that the deregulated abstraction at Law's Lawn is the private water supply for domestic use now registered with East Northamptonshire Council at a similar location coordinates. Two of the remaining five private water supplies are located to the south east hence potentially down hydraulic gradient of the site at distances of approximately 2.5km and 2.8km.

**16.3.25** It is necessary to outline the likely evolution of the baseline environment at the site without the implementation of the proposed development. If the proposed development was not implemented the existing ENRMF would continue to manage, treat and landfill hazardous wastes as well as provide a disposal facility for LLW. There would be no changes to the site operational practices and the operations at the site would be completed by 2026. The aftercare and maintenance period for the site would continue to 2036. The agricultural land would be retained in the western extension area and the drainage of the site would be retained as existing. It is considered that in terms of water resources the baseline at the site would not alter significantly. The topography of the western extension area and surrounding environs would not change.

## 16.4 Preliminary assessment of effects

**16.4.1** Pre-application discussions were held at an early stage with the Environment Agency regarding their Groundwater Protection Position Statements[40] particularly with respect to the proposed western extension of the landfill site. The proposed western landfill area is not located in a source protection zone and site investigation data demonstrate that the naturally low permeability strata of the glacial till and Rutland Formation are present above the Lincolnshire Limestone Formation and the proposed development will be above the water table. The Environment Agency have confirmed that, consistent with the status of the current ENRMF landfill site, the development of the proposed western extension landfill area in a manner which is similar to that adopted for the current landfill site would comply with the Environment Agency Groundwater Protection Position Statement in respect of the location of landfills.

**16.4.2** It is proposed that in the western extension landfill area a 2m or greater depth of the glacial till or Rutland Formation will be retained in-situ above the Lincolnshire Limestone Formation. The proposed site containment engineering and operations are described in Sections 4, 6 and 7 of this report. Consistent with the current landfill it is anticipated that the western extension area will be above rest groundwater levels at the site hence there will be no need for groundwater management during or post development. Consistent with the current landfill the proposed western landfill will have no significant impacts on groundwater levels or flows at and in the vicinity of the site. Leachate, surface water and groundwater will all continue to be monitored in accordance with the Environmental Permits. A leachate management system will continue to be operated in order to maintain leachate at permitted levels. Site operations are and will continue to be conducted in accordance with the Environmental Permits and under Environment Agency regulation.

[40] https://www.gov.uk/government/publications/groundwater-protection-position-statements

**16.4.3** The potential effect on groundwater quality of the proposed western landfill area has been considered as part of the preliminary HRA of the impacts associated with the deposition of hazardous waste. In the preliminary HRA it is concluded that there will be no significant impact on groundwater quality beneath the site or at receptors down hydraulic gradient of the site as a consequence of the proposed void extension. It is concluded in the preliminary assessment that operation of the western landfill area will not affect the current or predicted groundwater quality status relevant to the River Basin Management Plan. The preliminary HRA is being reviewed and will be discussed with the Environment Agency and the final HRA will be submitted to support the Environmental Permit application for the landfill of hazardous waste in the western extension area. The Environment Agency will review the HRA and will not issue an Environmental Permit for the area unless they are satisfied that the site can be operated without a significant impact on water resources.

**16.4.4** As explained in Sections 10 and 11 of this report if a DCO is granted for the disposal of LLW in the western landfill extension area the detailed quantitative radiological HRA prepared as part of the Environmental Safety Case for the current landfill area (provided at Appendix 10.1) will be updated to reflect the extended disposal area. The exposure pathways and risks that will be assessed together with the exposure limits will be similar to those assessed in the report presented at Appendix 10.1. The limits on the total radioactivity capacity for the LLW that will be included in the Environmental Permit will be set based on the conservative risk assessments to maintain the dose to people using or exposed to groundwater or surface water below the design criteria which are set for the protection of human health as set out in Table 10.3. The capacity limit will apply from the date of issue of the permit up to the date of closure of the landfill to the receipt of LLW waste or the point at which the capacity limit is reached whichever is sooner and will take into account the LLW that has been deposited in the current landfill. Any change in the consented capacity compared with the current Environmental Permit for the disposal of LLW will only be allowed on the basis that the increase in capacity will not result

in a dose which exceeds the protection criteria set in the legislation. The Environment Agency will not issue an Environmental Permit unless it is satisfied that the proposed disposal of LLW will not result in significant harm to human health or the environment including water resources.

**16.4.5** There is a potential risk to the quality of surface water and groundwater from the continuing use and storage of fuel, lubricants and chemical reagents together with the refuelling of vehicles at the site therefore containment measures and other precautions are in place as explained above to minimise the risks of and consequences resulting from spillages. It is considered that there will be no significant impact on the surface water and groundwater resources from the continued use and storage of fuel, lubricants and chemical reagents at the site and the refuelling of vehicles at the site provided that the procedures for the storage of fuel, lubricants and chemical reagents and refuelling continue to be followed.

**16.4.6** The surface water management plans for the site are being reviewed. The existing controls regarding the quality of surface water from the waste treatment area, the operational landfill area and the restored landfill areas will continue to be included in the surface water management system for the operational period and the principles of control will be extended to the landfill extension area. The surface water management plan for the proposed western extension area will address the drainage across the site to the swallow hole with the overall principle to maintain the pre-development drainage routes following restoration such that the majority of surface water drains to the Willow Brook catchment including via the swallow hole. Surface water and groundwater quality will continue to be monitored in accordance with schemes agreed with the Environment Agency through the Environmental Permits.

**16.4.7** It is considered that based on the controls which will be implemented the proposed development and restoration of the site will not have a significant impact on water quality or flow in the Willow Brook, Wittering Brook or River

Nene or on the surface water quality status as designated under the Water Framework Directive in the River Basin Management Plan. It is considered that the proposed development and restoration of the site will have no significant adverse impact on groundwater quality or flow beneath the site or at receptors down hydraulic gradient of the site.

## 16.5 Mitigation and monitoring

**16.5.1** The mitigation measures for the controls on emissions to the water environment are an integral part of the design and operation of the waste treatment facility and landfill site as well as the associated processes of waste assessment, acceptance, delivery, treatment and deposit at the site. The mitigation measures for the landfill site comprise in particular the construction of the site containment engineering as well as the operation of the site in accordance with specifications and procedures set out through the Environmental Permits. The mitigation measures for the surface water comprise the design and implementation of surface water management systems. Additional procedures are prepared and implemented by Augean through their certified management systems.

**16.5.2** Monitoring programmes that are agreed with the Environment Agency and regulated through the Environmental Permits will be extended to include the proposed development and will be implemented. Monitoring data will continue to be provided to the Environment Agency and presented for review by the public on the Augean web site. The regular monitoring provides confirmation that the mitigation measures are effective.

**16.5.3** The routine monitoring of leachate, groundwater and surface water also provides an early warning system in that if any monitoring results exceed the control or action limits specified in the permit this is recognised at an early stage and measures can be implemented to identify and rectify the source or cause of the contaminants. If exceedances are observed these may be due to external factors which are not under the control of Augean, for example

fertilisers applied to agricultural land or road salt used on the adjacent highway in the winter. Where site activities may be or are the source of the exceedances investigations and improvement actions are implemented and reported to the Environment Agency. These improvement actions may comprise changes to the systems for the management of wastes being treated at the site, improvements in the surface water management system, improvements in leachate management and control or improvements in the containment systems.

## 16.6 Cumulative impacts

**16.6.1** The cumulative effects of the proposed extensions to the development and the currently consented activities are integral to the risk assessments that are carried out. The upgradient quality of groundwater and surface water is taken into account in the risk assessments and in determining water quality monitoring threshold criteria. It is concluded that there will be no significant impact on groundwater quality beneath the site or at receptors down hydraulic gradient of the site as a result of the combined operations. It is considered that there will be no significant impact on surface water quality including at springs and issues, in the Willow Brook, the Wittering Brook or the River Nene as a result of the combined effects of these activities. It is considered that there will be no adverse effect on the groundwater or surface water quality status in the vicinity of the site as designated under the Water Framework Directive in the River Basin Management Plan.

**16.6.2** It is considered that due to the controls and mitigation measures in place as part of the existing management systems at ENRMF that will continue to be implemented and will be extended to the western area, the proposed development can be undertaken without significant individual or cumulative adverse impacts on surface water or groundwater flow or quality.

## 17 Flood risk assessment

### Introduction

**17.1** A preliminary assessment of the potential impacts of the proposed development on surface water flow and flood risk in the vicinity of the site has been carried out.

### Methodology

**17.2** The potential impacts of the proposed development as a result of flood risk have been assessed in accordance with the NPPF and the Planning Practice Guidance (PPG) to the NPPF. Consistent with NPPF and the PPG on flood risk it is necessary to undertake a site specific flood risk assessment for all developments over 1ha in Flood Zone 1 to demonstrate that the proposed development will be safe from flooding and will not increase the risk of flooding elsewhere.

### Baseline

**17.3** The hydrology of the site is described in Section 16 of this report. The site is located in the catchment of the River Nene which flows generally eastwards and is located approximately 6km east south east of the site at the closest point. The current operational surface water management system is designed to retain all surface water on site where it is stored in ponds and used on site including in the treatment plant to replace mains water, in the wheel wash and for dust suppression. As the site develops the surface water management system at the site is progressing towards the approved post restoration surface water management plan for the site which allows for the drainage of surface water from the restored phases to a drainage point at the south eastern corner of the existing ENRMF site which is the subject of consent under the Environmental Permit for the landfill. The discharge point has not yet been connected to the surface water management system. The ditch to which site runoff eventually will be discharged flows generally to the south and after joining

a stream outfalls to the Willow Brook approximately 2.5km south of the site. The Willow Brook joins the River Nene approximately 9km south east of the site.

**17.4** The proposed western extension to the landfill is located on a surface water divide with the majority within the catchment of the Willow Brook consistent with the current ENRMF site and part of the northern section of the extension area draining to the east to a drainage ditch which runs along the western and southern boundaries of Collyweston Great Wood. It is understood that the drainage ditch continues eastwards from the site joining a tributary of the Wittering Brook where it issues approximately 2.0km north east of the current ENRMF site and approximately 2.7km east north east of the proposed western extension. The Wittering Brook joins the River Nene approximately 7.5km east of the site.

**17.5** Based on the Flood Map for Planning[41] the site is located in Flood Zone 1 which is defined as land having less than a 1 in 1,000 annual probability of river or sea flooding which is confirmed in the East Northamptonshire Council Strategic Flood Risk Assessment (SFRA)[42].

**17.6** The surface water body closest to the site with the exception of on-site drainage, lagoons and the pond adjacent to the south west corner of the proposed western extension is more than 500m away and the only potential cause of flooding is from surface water run-off.

**17.7** It is necessary to outline the likely evolution of the baseline environment at the site without the implementation of the proposed development. If the proposed development is not implemented the existing ENRMF would continue to manage, treat and landfill hazardous wastes as well as provide a disposal facility for LLW. There would be no changes to the site operational practices and the operations at the site would be completed by 2026. The aftercare and

[41] HM Government (2020) Flood Map for Planning https://flood-map-for-planning.service.gov.uk/
[42] East Northamptonshire Council (2020) Strategic Flood Risk Assessment (SFRA) Level 1

maintenance period for the site would continue to 2036. The agricultural land would be retained in the western extension area and the drainage of the site would be retained as existing. It is considered that the baseline for flood risk at the site would not alter significantly. The topography of the proposed western extension area would not change.

**Preliminary assessment of effects**

**17.8** The revised surface water management scheme for the site including the extension area will be prepared once the final design for the proposed development is determined. The stockpiling of extracted clay may reduce infiltration and increase surface runoff. The capping of filled cells at the site will reduce infiltration into the waste and increase surface runoff due to the cap design and the restoration topography until the surface is restored and vegetation is established. These factors will be taken into account in the design of the management scheme. Surface runoff will be collected in and channelled via a series of ditches and ponds in accordance with the existing surface water management plan (SWMP) which has been agreed with the Environment Agency.

**17.9** The design of the surface water management scheme will include the necessary provisions for climate change in particular the predicted increase in frequency and intensity of rainfall storm events. The site is located approximately 55km south west of the nearest coast at the Wash and is approximately 80m above mean sea level and therefore is highly unlikely to be affected significantly by the predicted sea level rise of up to 1.6m by 2125 assuming an upper end allowance based on the 95th percentile scenario for the Anglian river basin district[43]. The site is not located in an area which is identified as sensitive to flooding from rivers or the sea hence it is considered that based on the implementation of an effective surface water management plan the

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

proposed development can be undertaken without increasing the risk of flooding at or in the vicinity of the site.

**Mitigation and monitoring**

**17.10** As the site is not located in an area which is identified as sensitive to flooding from rivers or the sea it is considered that no other mitigation with respect to flood risk will be necessary other than the measures that will be specified in the revised surface water management plan and in the design of the surface water scheme for the restored site.

**Cumulative impacts**

**17.11** It is considered that due to the location of the site in Flood Zone 1 the proposed development can be undertaken without significant individual or cumulative adverse impacts on flood risk.

# 18 Transport and traffic

## Introduction and methodology

**18.1** The traffic numbers associated with the currently consented activities at the site are being reviewed to determine whether there will be any significant changes as a result of the proposed development. In the assessment for the current site activities which was carried out to support the application for the current DCO, vehicle numbers were estimated for the maximum potential combination of vehicles including waste inputs to the landfill and the treatment facilities as well as vehicles removing treated waste for recovery or disposal elsewhere and vehicles removing excavated clay and overburden for use in engineering at Thornhaugh landfill as well as for sale. The probable average number of HGV vehicle movements associated with the combined activities that was assessed was 196 per day (98 movements in and 98 movements out). This assumed probable average number of movements is unlikely to change significantly as a result of this application.

**18.2** The COVID-19 pandemic has presented new challenges in obtaining representative baseline current traffic data because typical road, air and rail transport usage have been reduced by travel restrictions and social distancing measures. Accordingly no recent background traffic data have been recorded yet as part of the current assessment. It is proposed that background traffic surveys will be conducted at a time when it is likely that traffic levels are returned to near typical levels. This approach has been discussed and agreed with Northamptonshire County Council. This preliminary assessment of the potential impacts associated with traffic and highways has been prepared based on the work undertaken as part of the application for the existing ENRMF DCO. The transport assessment dated February 2012 is provided at Appendix 18.1.

**18.3** A full Transport Statement will be prepared to accompany the DCO application. A transport statement for the proposed development will be carried out generally in accordance with the Travel Plans, Transport Assessments and

Statements Guidance[44]. It is not anticipated that it will be necessary to undertake capacity assessments for the junction of Stamford Road with the A47. Discussions are currently being undertaken with Northamptonshire County Council to agree the scope of the transport assessment including the approach to determining the appropriate baseline data and traffic growth factors (Appendix 18.2).

**Baseline**

**18.4** ENRMF is situated immediately west of the minor road Stamford Road and has a single access by a priority junction. Approximately 40 metres to the south of the site access on the opposite side of the road is an access to the premises of P.C. Howard Ltd, a haulage and warehousing firm. To the north of the site Stamford Road continues another 1.25km to a priority junction with the A47. This junction is known as Collyweston Cross Roads but the north eastern arm is a private and gated access to RAF Wittering Airfield. Waste delivery and collection vehicles using the site access are not permitted to travel to the south of the site access on Stamford Road towards the village of Kings Cliffe unless they are delivering wastes collected locally.

**18.5** Approximately 500 metres south of Collyweston Cross Roads there is an access road off Stamford Road which leads to a former RAF storage area for Wittering Airfield and a developer was granted planning permission in 2009 to develop the site as a general storage and distribution facility and it is understood that the planning permission has been implemented although the land has not been used as a storage and distribution facility over at least the last 10 years. Works associated with this permission have however been carried out to straighten a section of Stamford Road in the vicinity of the entrance and to widen the access.

[44] Ministry of Housing, Communities and Local Government (2014) Travel Plans, Transport Assessments and Statements

**18.6** To the east the A47 links with the A1(T) via a grade-separated interchange at Wansford, giving the shortest access route to the trunk road network. To the west the A47 continues towards Leicester. At a roundabout near Duddington the A47 intersects with the A43 Northampton – Stamford Road giving a possible but longer alternative route to the A1 at Stamford.

**18.7** As part of the current Section 106 Agreement for the site operations, since 2013 Augean have had a commitment and have paid an agreed annual contribution which will continue to 2026. To date no substantial maintenance works have been carried out to the highway by Northamptonshire County Council. Over recent years Augean have regularly notified Northamptonshire County Council that the road surfacing on Stamford Road in the vicinity of the site and the nearby haulage yard is poor. Northamptonshire County Council recently have committed to carrying out resurfacing works on Stamford Road and a programme for these works is awaited. Augean propose that widening of the access to the site will be undertaken in conjunction with the resurfacing works on Stamford Road. It is proposed that the weighbridge and reception location for HGVs entering the site will be moved further within the site to allow a longer queuing area on the site and the easier circulation of vehicles within ENRMF if the DCO is granted.

**18.8** It will be necessary to undertake traffic surveys as part of the transport assessment. The traffic survey work will not be possible until the resurfacing works have been undertaken on Stamford Road in the vicinity of the site access and traffic levels have returned to near normal levels. Personal injury accident data for the vicinity will be obtained from Northamptonshire County Council and Peterborough City Council.

**18.9** The currently permitted total waste importation rate to the existing ENRMF is 250,000tpa. There is no limit on the volume of material that can be exported from the site. As explained above, in the 2012 DCO application for the existing ENRMF operations it was anticipated that the combined HGV traffic levels

generated by the site operations would be an average of 196 HGV movements per day. For the purposes of this preliminary assessment it is assumed that the probable average number of movements is unlikely to change significantly as a result of the proposed development the subject of this application.

**18.10** The transportation of wastes including hazardous waste and LLW is controlled by a range of legislation and guidance. The transportation of dangerous goods including products with potentially hazardous properties as well as hazardous waste and LLW is controlled under The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended) which implements the requirements of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR). The Department for Transport is the UK Competent Authority under these regulations. The emphasis of the regulations is to identify the types of materials where specific packaging is necessary for transportation and for the appropriate package design to provide the main element of safety in normal and accident conditions. The regulations for the transportation of potentially hazardous materials, including hazardous wastes and LLW, specify that all drivers need to have appropriate training and an appropriate class of licence.

**18.11** The packaging necessary for the hazardous wastes delivered to the site typically is limited to that which will minimise uncontrolled emissions which ranges from sheeting on lorries transporting contaminated soils or filter cakes to double bagged packages for wastes containing asbestos. Wastes in fine powder form such as air pollution control residues are delivered by tanker or in enclosed bags.

**18.12** Due to the limited amount of radioactivity in the LLW that it is proposed will continue to be accepted at the site, most LLW which will be delivered to the site will not need any form of special packaging or shielding during handling or transport. However, for ease of handling and in order to minimise the potential for spillage Augean will in most circumstances request that waste producers

transport LLW in enclosed containers such as bulk bags, drums or other containers. Some large items of waste such as metal sheeting may not be transported in containers but will be wrapped. Some materials may be unpackaged if the activity levels are low enough and it is proposed that the waste will be loose tipped subject to specific risk assessments agreed with the EA but all waste will be transported in covered containers. Appropriate packaging will be used based on the hazards presented by the wastes being transported and, in accordance with the legislation, the specified packaging will include appropriate protection of the wastes in the event of an accident.

**Preliminary assessment of effects**

**18.13** The waste importation rate to the site will increase to 300,000tpa which is an increase of 50,000tpa as a result of the proposed development. Notwithstanding this overall increase in waste input, the traffic numbers associated with the proposed development are not likely to increase significantly compared with the traffic levels associated with the current operations at the existing ENRMF as the overall HGV vehicle numbers include those associated with the quantities of overburden and clay exported from the site which can exceed the numbers of vehicles transporting waste when new areas are being excavated. There are fluctuations in the exportation of clays and excavated materials hence it is considered that the increase in the waste input to the site will be no greater than the fluctuations in the exportation of the exported materials. Work is ongoing to design the phasing of the site works including excavation works which will establish the traffic numbers associated with the proposed development for use in the final assessment.

**18.14** It was concluded in the 2012 DCO application that there would be no adverse impact on highway safety or capacity as a result of the extension of the operating period for the landfill and treatment. It is considered that this conclusion remains valid.

**Mitigation and monitoring**

**18.15** The mitigation measures comprise the routing agreement for traffic travelling to and from the site together with an annual contribution for highway maintenance from Augean to the Highways Authority for the maintenance of the roads in accordance with a Section 106 Agreement. Augean are willing to continue this contribution for the proposed development.

**18.16** The routing agreement specifies that all HGVs entering and leaving the site travel directly to and from the A47 via Stamford Road north of the access to the site and do not travel south along Stamford Road towards Kings Cliffe. Signs informing drivers of these requirements are located near the site entrance and CCTV cameras are located so that site staff can observe the direction of vehicle entry and exit. Any reports of vehicles travelling south are followed up using the recorded CCTV data and drivers and their operating companies are contacted directly if they do not observe the instructions. This routing requirement will be continued for the extended operations at the site.

**Cumulative impacts**

**18.17** As part of the traffic assessment other developments in the vicinity of the site and the predicted growth in traffic from other sources over time will be considered. Enquiries are continuing to identify any planned developments in the area. Enquiries to date have not identified any significant developments of a type and at locations which would affect the conclusions regarding the impacts of site traffic on highway capacity or safety. It is considered that the proposals will have a negligible effect on the operation of Stamford Road or the A47 during the lifetime of the proposed development.

# 19 Noise and vibration

## Introduction

**19.1** A preliminary noise and vibration impact assessment has been undertaken and is presented at Appendix 19.1. In the report the results of the preliminary assessment of the noise and vibration impact of the proposed operations at the nearest sensitive receptors are presented.

## Methodology

**19.2** The approach to the assessment has been discussed with the Environmental Health Officer at East Northamptonshire District Council. Northamptonshire County Council and the Environment Agency have also had the opportunity to review the assessment approach and provide comment. Copies of the correspondence are presented at Appendix 1 of the report at Appendix 19.1.

**19.3** The COVID-19 pandemic has presented new challenges in obtaining representative baseline sound levels because typical road, air and rail transport usage have been reduced by travel restrictions and social distancing measures. For the purposes of the PEIR the background noise data measured during a survey in 2011 carried out as part of the assessment of effects associated with the proposals for the currently consented activities at the site has been temporarily adopted as a suitable baseline against which to make a preliminary assessment of noise impact for the potential western extension. This phased approach has been agreed with East Northamptonshire District Council, Northamptonshire County Council and the Environment Agency.

**19.4** Noise from the proposed development has been assessed with reference to current noise policy in England including the Noise Policy Statement for England, the NPPF and associated planning practice guidance along with any relevant local policies. In terms of technical guidance on the assessment of noise and vibration impacts, emissions from operations associated with the proposed development have been assessed primarily with reference to BS

4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' along with other relevant guidance and criteria as appropriate. Noise predictions have been carried out using the methods in BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites'.

**19.5** In order to assist in the calculation of noise levels from the construction and operation of the proposed development, CadnaA noise modelling software has been used. The prediction method used is that outlined within Annex F of BS 5228-1[45]. This guidance details methods to estimate noise from 'open sites' which can include quarries, waste sites and long-term construction projects. Screening has been calculated in accordance with Figure F.3 of BS 5228-1. For all noise prediction calculations, the ground absorption coefficient has been estimated according to the combination of soft and hard ground conditions present between the source and receiver position.

**19.6** Predictions have been made for locations representing private external amenity areas at a height of 1.5 metres above ground level and at least 3.5 metres from any reflecting surface other than the ground. The predictions made are 'free-field' sound levels to allow for an appropriate comparison with the measured free-field background sound levels. The inputs used within the modelling software are presented at Section 2.4.3 of the report at Appendix 19.1.

**19.7** The preliminary calculations are based simply on the proposed DCO application boundary without the use of detailed phasing plans. The design development process is iterative and will continue throughout the consultation period up to the submission of the DCO application. As a result it is likely that the noise emission calculations will need to be revised as the scheme develops. These initial calculations should be seen only as indicative at this stage.

[45] BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 1: Noise. British Standards Institution 2014.

**19.8** In order to consider the worst case scenario in the noise impact assessment the noise level predictions have been calculated with the combinations of plant working at the closest point to the receptor location. The predictions are worst case scenarios which may be of relatively short duration. The predictions indicate the potential highest $L_{Aeq,1h}$ (free-field) noise level to which a particular property or group of properties may be exposed during the operations at the site. The worst-case situation may occur intermittently over the lifetime of the site, but longer term noise levels perceived outside of the site boundary will be significantly less under normal situations than the calculated predicted levels.

**Baseline**

**19.9** As stated in Paragraph 19.3 the COVID-19 pandemic has presented challenges in obtaining representative baseline sound levels because typical road, air and rail transport usage have been reduced by travel restrictions and social distancing measures. As agreed with East Northamptonshire District Council, Northamptonshire County Council and the Environment Agency, for the purposes of the PEIR the background noise data measured during the 2011 survey has been temporarily adopted as a suitable baseline.

**19.10** Background noise monitoring was undertaken by Vibrock Ltd in March 2011[46] as part of an application for a previous extension to the ENRMF site. Monitoring was conducted at 4 locations selected to represent noise sensitive premises in the vicinity of the site. The locations are shown on Figure 2.1 and the approach was agreed at the time with Environmental Protection at East Northamptonshire Council. Noise levels were measured by Vibrock Ltd during a 24 hour period from 1200 hrs on Monday 7 March 2011 to 1300 hrs on 8 March 2011. Weather conditions during the survey were dry and settled with a light east-south-easterly breeze. A summary of the measured sound levels is presented in Table 19.1.

[46] Vibrock report ref. R11.6219/5/LD Assessment of Environmental Noise. Westerly Extension of East Northants Resource Management Facility, Kings Cliffe, Northamptonshire. 8 September 2011.

**19.11** A site inspection and acoustic survey of the existing site was performed on 16 July 2020 during which the site was operating normally. The purpose of this monitoring was to obtain site specific sample measurements for use within this assessment to estimate noise from the proposed development. The main noise generating activities observed during the survey included: the tipping of materials; the loading and unloading of materials by mobile plant such as tele-handlers, excavators and loading shovels; HGV and dumptruck movements, the operation of the waste treatment and recovery facility and engineering works including cell construction and capping.

**19.12** Site activities occurring during the on-site sample measurements were considered to be representative of typical operating conditions and the measurement durations were considered to be representative of any longer term fluctuations in the specific sound. The influence of sound from other sources was minimised by measuring at times when the residual sound had subsided to a relatively low level. Sample measurements of the sound pressure level obtained at known distances from plant and activities at the site have been used to calculate the sound power level of each noise source or noise-generating activity at the site with reference to the method outlined in BS 5228-1. The results of the noise survey are presented at Table 19.2.

**19.13** Once the acoustic environment in the vicinity of the ENRMF site is considered to be suitably representative a new baseline noise survey will be undertaken to establish the current background noise levels at the identified assessment locations. It is anticipated that this could be undertaken in late 2020 or early 2021. The survey will be undertaken with reference to the guidance provided with BS 4142[47], BS 7445[48] and the ANC Environmental Noise Measurement

[47] BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound, British Standards Institution 2019.
[48] BS 7445-1:2003 Description and measurement of environmental noise – Part 1 Guide to quantities and procedures. British Standards Institution 2003.

Guide[49]. The 2020/1 noise survey will be used to revise the impact assessment that will be submitted as part of the DCO application.

**19.14** A review of current noise sensitive receptor locations in the vicinity of the proposed development suggests that the receptors identified for the 2011 assessment remain appropriate for inclusion within any future noise impact assessment and it is understood that no new noise-sensitive development has occurred in closer proximity to the site during the intervening period.

**19.15** It is necessary to outline the likely evolution of the baseline environment at the site without the implementation of the proposed development. If the proposed development was not implemented the existing ENRMF would continue to manage, treat and landfill hazardous wastes as well as provide a disposal facility for LLW. There would be no changes to the site operational practices and the operations at the site would be completed by 2026. The aftercare and maintenance period for the site would continue to 2036. Following completion of the restoration of the existing ENRMF site, in the absence of any significant development in the vicinity of the site it is considered that the background noise levels would not be expected to increase significantly and is assumed the adjacent areas including the western extension area would remain as farmed agricultural land.

**Preliminary assessment of effects**

**19.16** The preliminary noise impacts associated with the proposed development have been assessed in accordance with BS 4142. In accordance with this standard the background sound level, the specific sound level and the rating levels have been established. At the site visit in July 2020 it was determined that there were no acoustically distinguishing characteristics associated with the site activities and plant at the closest properties such as impulsive sounds that were significant enough to warrant the application of a correction.

[49] ANC Guidelines: Environmental Noise Measurement Guide. 2013.

**19.17** Table 19.3 presents an initial estimate of the potential impact of the proposals during the daytime in accordance with BS 4142[50] and table 19.4 presents an initial estimate of potential night time noise emissions. The assessment is based on the gas abstraction plant and a generator used for security lighting at the waste treatment facility and a generator associated with the engineering contractor's compound operating at night.

**19.18** The initial worst case assessment demonstrates that the rating level is estimated to be up to 6dB above the daytime background sound level depending on the assessment location. Night-time rating levels are estimated to be at least 3dB below the background sound level.

**19.19** BS 4142[51] states that where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact. A difference of around +5 dB is likely to be an indication of an adverse impact. A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context. It should be noted that the initial estimate is not to be considered in isolation and due regard to the following sections on context and uncertainty should also be made.

***Context***

**19.20** Despite the initial estimate of noise impact which has determined the excess of rating level over the background sound level it is necessary to take the following points into account in the noise assessment:

- The most significant noise sources associated with the site operate during the daytime period only when there is a lower likelihood of

[50] BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound, British Standards Institution 2019.
[51] Section 11. BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound, British Standards Institution 2019.

adverse impact compared to operations during more sensitive periods such as the night-time.

- Absolute noise levels from site operations are expected to remain within the noise limits specified within the approved noise management and monitoring scheme currently in operation at the site. Site noise levels are also well below the measured background noise levels at each assessment location.

- Despite the excess of rating over background sound level suggesting a potential adverse impact at Westhay Farm and Westhay Lodge it should be noted that potential worst-case external noise levels from the facility of 44dB and 39dB respectively during the daytime are low. Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. Noise emissions from the site are considered likely to have little impact on residents using private external amenity areas during the daytime.

- As part of the assessment the character of the proposed sound has been assessed and it is not considered that any acoustic features will increase the significance of noise impact.

- All noise level predictions have been calculated with the combinations of plant working at the closest point to the receptor location. The calculations are therefore worst case scenarios which may be of relatively short duration.

- The western extension of the site will move some operations further away from the nearest noise-sensitive receptor locations which are to the east of the existing site.

**19.21** Whilst it is accepted that uncertainty can occur throughout all aspects of the noise measurement and assessment process, the approach undertaken at all stages has been adopted with the aim of reducing uncertainty via the implementation of good practice. Details of the measures to minimise uncertainty are presented in Section 4 of Appendix 19.1.

**19.22** Following an initial estimate of noise impact along with consideration of the context and any potential effects of uncertainty it is considered that the implementation of the proposed scheme is not likely to result in 'adverse' or 'significant adverse' impacts in accordance with BS 4142[52].

**19.23** Planning authorities often take account of the Government guidance relating to noise emissions from mineral sites[53] when evaluating the noise impact of waste development as the activities have many similarities. The potential noise levels associated with the proposed development are not expected to exceed the daytime background level by more than 10dB nor exceed the recommended maximum daytime limit of 55dB. Night-time noise levels during night-time periods are expected to remain well within the recommended 42dB limit. When noise associated with the proposed development is considered against this guidance, it is demonstrated that the potential noise impacts are not likely to be significant.

**19.24** Noise associated with the construction phase of the development has also been considered with reference to Annex E.3.2 of BS 5228-1[54] . When the indicative worst-case site noise levels are compared to the noise threshold level of 65 dB(A) it is suggested that the potential noise levels associated with the construction phase of the application are likely to remain within the recommended threshold values and are therefore not considered to be significant.

[52] BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound, British Standards Institution 2019.
[53] Planning Practice Guidance: Minerals – Ministry of Housing, Communities and Local Government. October 2014.
[54] BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 1: Noise. British Standards Institution 2014

**19.25** The potential impact of additional HGV movements which might be associated with the proposals on the wider road network will be considered with reference to the guidance presented within DMRB[55]. The percentage of any potential increase in HGV movements to and from the site that are associated with the proposed development are understood to be significantly less than 25% and any potential increase in road traffic noise levels due to the proposed scheme is therefore considered to result in a 'negligible' impact. The potential impacts of vibration generated by HGV movements to and from the site will also be considered if any significant traffic flow changes associated with the DCO application are identified.

**19.26** The results of the preliminary assessment suggest that there are unlikely to be any significant or unacceptable adverse impacts at sensitive premises in the vicinity of the proposed operations. At this stage, the assessment indicates that the overall potential impact of the development is likely to be in accordance with national and local planning policy which seeks to prevent and avoid any significant or unacceptable adverse impacts and, where necessary, mitigate and reduce to a minimum other adverse impacts.

**19.27** Further assessment work will be undertaken once the phasing of the operations is determined. The impact of simultaneous mineral extraction and landfilling and any cumulative impact associated with the continuation of operations at the existing ENRMF site and the creation of the amended restoration profile will be considered as part of the final noise impact assessment in combination with any concurrent operations within the proposed western extension area.

**19.28** It is intended that the following working scenarios will be assessed in the final noise assessment either individually or in combination as appropriate:

[55] Design Manual for Road and Bridges. Sustainability and Environment. LA111 Noise and Vibration Revision 2. Highways England May 2020.

- Construction of the new void including extraction of minerals, stockpiling of materials and formation of the landfill containment system;
- Operation of the landfill to 2046;
- Operation of the waste treatment and recovery facility up to 2046 including the operation of a mobile crusher on a campaign basis;
- Removal of the waste treatment and recovery facility by 2046;
- Restoration;
- The period following cessation of waste management activities at the site.

**Mitigation and monitoring**

***Noise Management and Monitoring***

**19.29** Noise emissions from the site are currently controlled via a Noise Management and Monitoring Scheme (MJCA Report Ref: AU/KCE/SPS/1604/01 dated March 2012). A copy of the current scheme is presented at Appendix 2 of the report at Appendix 19.1. This scheme will be reviewed and amended to include the extension area and will be submitted in support of the DCO application.

***Noise and Vibration Minimisation and Control***

**19.30** The following noise and vibration control measures will continue to be implemented at the site to minimise any potential noise impacts:

- The permitted operating hours of the site are strictly adhered to and effectively communicated to all site staff and subcontractors;

- Machinery is regularly well maintained and where appropriate fitted with exhaust silencers;
- Vehicle routes through the site are well maintained and free from defects such as pot-holes.
- Unnecessary horn usage and revving of engines is avoided;
- Equipment is switched off or throttled-down when not required;
- Drop heights of materials are minimised where possible;
- Covers, panels or enclosure doors are kept closed when the equipment is in use;
- Where reasonably practicable, noisy equipment is located as far from sensitive premises as possible;
- Plant and vehicles are started up sequentially rather than all together. Any period of idling required to warm up mobile plant at the start of the working day is undertaken in locations away from residential premises where practicable.

**Cumulative impacts**

**19.31** Collyweston Quarry lies approximately 500m to the west of the proposed western extension area.

**19.32** Noise-sensitive premises potentially affected by the cumulative effects of noise from the proposed development and the operation of Collyweston Quarry are restricted to residential dwellings in the village of Duddington. As part of the preliminary assessment the worst-case external noise level associated with the activities the subject of the proposed DCO application are estimated to be around 31 dB LAeq,1h (free-field) at residential premises on the east side of the village which are those in closest proximity to the ENRMF site and Collyweston

Quarry. Noise levels are estimated to be at least 15 dB below the daytime background sound level and will make no perceptible contribution to cumulative noise levels associated with the operation of both Collyweston Quarry and the ENRMF site.

# 20 Air quality

## Introduction

**20.1** In this section the preliminary assessment of the potential impacts of the proposed development on local air quality which have the potential to affect human health is presented. The potential impacts as a result of odour associated with the proposed development are also addressed. The potential impacts associated with nuisance dust are addressed in Section 21.

## Methodology

**20.2** Air quality data for the site has been obtained from the UK Air Quality Archive in respect of the most common atmospheric pollutants particulate matter ($PM_{2.5}$, $PM_{10}$) and nitrogen oxides ($NO_x$). Particulate matter (PM) is a term used to describe the mixture of solid particles and liquid droplets in the air. Particulate matter varies in size (i.e. the diameter or width of the particle). $PM_{2.5}$ and $PM_{10}$ means the mass per cubic metre of air of particles with a size (diameter) generally less than 2.5 micrometres (µm) and 10 µm respectively. $NO_x$ is the combined total of nitrogen oxides which includes nitric oxide (NO) and nitrogen dioxide ($NO_2$).

**20.3** The Environmental Permit for the existing ENRMF site specifies routine monitoring of ambient air quality at the site boundary for the gases which have the potential to be emitted from the site activities including the landfill site and treatment plant. The monitoring includes methane, hydrogen sulphide, oxides of nitrogen, carbon dioxide, carbon monoxide, suspended particulates ($PM_{10}$), asbestos fibres and volatile organic compounds (VOCs). The emissions from the landfill gas flare stack are controlled and monitored and gas concentrations in the ground are recorded in the monitoring boreholes surrounding the site are monitored based on schemes prepared in accordance with the Environmental Permit. Radon and tritium in the landfill gas are monitored at the flare stack in accordance with the Environmental Permit. The concentrations of the

parameters that are monitored are compared with emission or compliance limits and assessment limits which are specified by the Environment Agency and are protective of human health and the environment.

**Baseline**

**20.4** Each local authority in the UK monitors, reviews and assesses the air quality in their area. The aim of the review is to make sure that the national air quality objectives are achieved throughout the UK. These objectives have been put in place to protect people's health and the environment. If a local authority finds any places where the objectives are not likely to be achieved, it must declare an Air Quality Management Area there. The local authority must then put together a plan to improve the air quality (a Local Air Quality Action Plan). The site is not located in an air quality management area[56]. Air quality data for the site area from the UK Air Quality Archive is presented in Table 20.1. The data show that the air quality at the site location for $PM_{2.5}$, $PM_{10}$, $NO_2$ and $NO_x$ is better than the national air quality objective annual mean concentrations.

**20.5** The monitoring of air quality and gas in the ground at the site is undertaken in accordance with the Environmental Permit. The monitoring results are collated by Augean and submitted to the Environment Agency. Monitoring results for key parameters also are provided on the Augean web site.

**20.6** During the construction, operational and post-operational phases the site including the extended areas will continue to be monitored in accordance with the Environmental Permits to ensure that the process control, landfill containment and gas extraction measures are effective. Monitoring of gaseous emissions will continue following completion and restoration of the site until such time as in the opinion of the Environment Agency the site no longer represents a potential risk to the environment.

[56] DEFRA (2020) UK Air: Air Information Resource https://uk-air.defra.gov.uk/aqma/maps/

**20.7** Odour emissions may be generated from the importation and landfilling of odorous wastes. The hazardous wastes, LLW and wastes for treatment which are received at the site contain minimal quantities of putrescible material which mean it is unlikely that significant odorous emissions will be generated by the biodegradation of organic matter in the imported wastes. Some industrial wastes may contain odorous chemical contaminants and Augean implement an odour assessment as part of their pre-acceptance waste checks and waste with significant odour potential will not be accepted for delivery to the site.

**Preliminary assessment of environmental effects**

**20.8** The hazardous wastes and LLW disposed of at the site have a negligible potential to generate landfill gas or volatile compounds. It is unlikely that significant quantities of landfill gas or vapours will be generated. Any significant gas that is generated at the site will be contained by the low permeability perimeter seals and the low permeability capping layer, collected by the gas extraction and management system and directed to the gas flare for combustion. The monitoring of gaseous emissions and particulate matter that will continue at the site in accordance with the current and future Environmental Permits in order to confirm that the control measures in place remain effective. The site will still be managed and limited to control emissions such that they remain below the environmental concentrations that are determined by the Environment Agency to protect human health and the environment.

**20.9** As explained in Section 10, risk assessments of the emissions of radioactive isotopes in the gas generated at the site are carried out and the capacity of the LLW accepted at the site is and will continue to be controlled in order that the doses that result from radioactivity in gaseous emissions from the site do not exceed the design criteria as explained in Section 10 of this report. While a limited quantity carbon based gases such as methane and carbon dioxide may be generated by the biodegradation of the negligible proportion of biodegradable wastes deposited with the hazardous wastes at the site it is

highly unlikely that carbon based gases will be generated from the LLW deposited at the site.

**20.10** It is not anticipated that traffic numbers will increase significantly as a result of the proposed development hence it is not necessary to undertake a traffic air quality assessment as a result of the proposed development.

**20.11** The effect on air quality of the stripping and stockpiling of soil as well as the extraction and stockpiling of clay and overburden for the purpose of creation of void space and provision of engineering material has been considered. The movement of soil, clay and overburden has the potential to generate nuisance dust but also a proportion of fine particulates. The control measures to minimise the generation of dust and fine particulates are described in Section 21 and will continue to be implemented. Monitoring of particulate matter at the site in accordance with the Environmental Permit and the site Particulate Monitoring Action Plan will be carried out to confirm that the control measures in place at the site remain effective. Based on the control measures which will continue to be implemented it is considered that the extraction and stockpiling of soils, clay and overburden will have no significant impact on air quality in the locality.

**20.12** The impacts on air quality of the proposed increase in throughput and extension of time for the operation of the waste treatment and recovery facility and the associated storage area have been considered. The controls on the emissions of gases and vapours as well as particulates from the treatment processes will continue to be implemented and regulated through the Environmental Permit. The operating techniques used at the site will be regularly reviewed through the permit to confirm that they meet the Best Available Techniques as set out in European and national guidance. The monitoring of ambient air undertaken at the site in accordance with the Environmental Permit for the soil treatment facility and the site Particulate Monitoring Action Plan will provide assurance that the control measures in place at the site remain effective. It is considered

that the proposed development will have negligible impact on air quality in the locality.

**20.13** During restoration of the site the monitoring of gaseous emissions and particulate matter will continue in accordance with the Environmental Permit to confirm that the control measures in place remain effective. It is considered that the restoration of the site will have a negligible impact on air quality at the site.

**20.14** Based on the proposed continuation of the current controls including those that will be specified and implemented through the Environmental Permits, and based on the nature of the current and proposed wastes accepted at the site it is considered that there will be no significant impacts associated with odour generated as a result of the site activities.

**Mitigation and monitoring**

**20.15** The mitigation measures for the controls on emissions to the atmosphere are an integral part of the design and operation of the waste treatment facility and landfill site as well as the associated processes of waste assessment, acceptance, delivery, treatment and deposit at the site. Monitoring programmes that are agreed with the Environment Agency and regulated through the Environmental Permits will be extended to include the proposed development and will be implemented. Monitoring data will continue to be provided to the Environment Agency and presented for review by the public on the Augean web site. The regular monitoring provides confirmation that the mitigation measures are effective.

**20.16** The routine monitoring also provides an early warning system in that if any monitoring results exceed the control or action limits specified in the permit this is recognised at an early stage and measures can be implemented to identify and rectify the source or cause of the emissions. If exceedances of control limits are observed these may be due to external factors which are not under the control of Augean, for example high concentrations of suspended

particulates as a result of nearby agricultural activity or storms which deposit dust transferred over great distances. Where site activities may be or are the source of the exceedances investigations and improvement actions are implemented and reported to the Environment Agency. These improvement actions may comprise changes to the systems for the review and checking of wastes being accepted at the site or for managing the wastes delivered to the site, improvements in the gas management system, improvements in dust and particulate control or improvements in the capping system.

**Cumulative impacts**

**20.17** The background air quality in the area of the site meets the national Air Quality Objectives. There are no activities in the area that have the potential for a significant cumulative effect on air quality at or in the vicinity of the site.

**20.18** The combined effect of the individual elements of the proposed development has been considered. Emissions from the site as a whole will be controlled to levels which are below the relevant exposure criteria which are protective of human health. The management and monitoring of emissions to atmosphere will be implemented in accordance with the Environmental Permits and regulated by the Environment Agency. It is concluded that the proposed development will have a negligible impact on air quality.

# 21 Amenity

## Introduction

**21.1** In this section an assessment of the potential effects on amenity of dust, mud on the road and lighting are presented. A noise assessment is presented in Section 19 of this report. The assessment of impacts on air quality including odour is presented in Section 20 of this report. The potential for impacts on amenity associated with the proposed development generally is present only in the immediate vicinity of the site.

**21.2** The activities associated with the proposed development with the potential to generate dust are soil stripping, mineral extraction operations, landfill cell construction, materials handling, on site transportation, waste processing at the waste treatment and recovery facility, stockpiles and off-site transportation. HGVs leaving the site have the potential to result in the deposition of mud on the road.

**21.3** The need for and locations of lighting at the site are described in Section 6 of this report. The lighting is located in key areas at the main reception and office areas for both security and health and safety considerations. The key locations are the site entrance and visitors' car park, the main site office to provide light to the staff car park and weighbridge area and around the laboratory and vehicle inspection area. Mobile lighting is provided on the landfill and down-facing lighting units are fixed to appropriate points on the waste treatment plant. The site lighting at the site infrastructure will not change as a result of these proposals. Mobile lighting will be used as necessary on the western landfill extension area.

## Methodology

**21.4** The methodology used for the assessment of impacts from dust is summarised below and presented in detail at Appendix 21.1. A qualitative assessment is carried out of the impacts associated with mud on the road and lighting.

**21.5** The dust assessment has been undertaken generally in accordance with the Planning Practice Guidance Note for Minerals[57] and the Institute of Air Quality Management (IAQM) Guidance on the Assessment of Mineral Dust Impacts for Planning[58] together with MJCA experience of undertaking dust assessments for extraction operations, landfill sites and waste processing facilities. The details of the methodology for the dust assessment are presented at Appendix 21.1.

**Baseline**

***Dust***

**21.6** The annual mean air quality objective for $PM_{10}$ is 40µg/m³. The estimated annual mean $PM_{10}$ background concentration obtained from DEFRA for 2019 at the site is between 14.90µg/m³ and 16.19µg/m³ with a mean value of 15.45µg/m³[59] as summarised in Table 20.1. The background concentrations of $PM_{10}$ at the site are considerably below (ie better than) the annual mean air quality objective of 40µg/m³.

**21.7** An all hours wind rose and a dry hours wind rose prepared by ADM Limited based on data from the Meteorological Office for Wittering weather station located approximately 3.3km north east of the site for the period 2000 to 2019 are presented at Appendix 21.2 and 21.3 respectively.

**21.8** The wind roses show that the prevailing wind is from the west. Based on the all hours wind rose data wind speeds for approximately 54.06% of the year are between 0.5m/s and 5m/s which is classed as calm through to gentle breeze on the Beaufort Scale. Wind speeds between 5m/s and 9m/s occur for approximately 36.02% of the year which is classed as gentle breeze through to fresh breeze on the Beaufort Scale. Wind speeds greater than 9m/s occur for approximately 7.19% of the year. During the remaining 2.73% of the year the

[57] HM Government (2014) Planning Practice Guidance Note for Minerals https://www.gov.uk/guidance/minerals
[58] Institute of Air Quality Management (2016) Guidance on the Assessment of Mineral Dust Impacts for Planning v1.1
[59] DEFRA (2020) UK Ambient Air Quality Interactive Map https://uk-air.defra.gov.uk/data/gis-mapping Accessed May 2020

weather was either calm when no wind was observed or data was not collected at the Wittering weather station.

**21.9** Based on the dry hours wind rose data (as a percentage of the total dry hours) wind speeds for approximately 54.72% of the dry hours are between 0.5m/s and 5m/s. Wind speeds between 5m/s and 9m/s occur for approximately 35.5% of the dry hours. Wind speeds greater than 9m/s occur for approximately 6.94% of the dry hours. During the remaining 2.84% of the dry hours the weather was either calm when no wind was observed or data was not collected at the Wittering weather station. The dry hours wind data for the site is summarised in Table 21.1. A copy of the Beaufort Scale is presented at Appendix 21.4.

**21.10** The locations of the receptors considered in the assessment are shown on Figure 21.1 and presented in Table 21.2.

***Mud on the road***

**21.11** The access to the site will be via the access to the existing ENRMF from Stamford Road. The access is surfaced with tarmac along the length to the wheelwash in the site reception area. The operation and restoration of the site including the proposed western extension area has the potential to result in mud being tracked onto the public highway if appropriate controls are not implemented. The controls applied routinely are described below

***Lighting***

**21.12** There is external lighting at the existing ENRMF at the site reception facilities and waste treatment and recovery facility. All lighting is directed downwards and other than security lighting is switched off at the end of the working day. There is no evidence of adverse impact on amenity as a result of existing lighting at the site.

**21.13** The site lighting at the site infrastructure including at the site reception area and the waste treatment facility will not change as a result of these proposals.

Mobile lighting is used currently on the operational area of the landfill site during operational hours only will be used as necessary during operational hours only and only in the operational areas and haul roads on the western landfill extension area.

**21.14** It is necessary to outline the likely evolution of the baseline environment at the site without the implementation of the proposed development. If the proposed development was not implemented the existing ENRMF would continue to manage, treat and landfill hazardous wastes as well as provide a disposal facility for LLW. There would be no changes to the site operational practices and the operations at the site would be completed by 2026. The aftercare and maintenance period for the site would continue to 2036. Following the completion of the operations there would be no potential for mud on the road or dust as a result of the operations and all lighting would be removed from the site.

**Preliminary assessment of effects**

***Dust***

**21.15** To result in an impact dust must be generated by the proposed development and carried in sufficient quantities from the source to a sensitive receptor which is dependent on site activities and meteorological conditions including wind speed, wind direction and rainfall. As stated above dust impacts have the potential to occur mainly within 400m of the operation, even at the dustiest of sites.

**21.16** For the purpose of this assessment and in accordance with the guidance it is assumed that significant dust blow will not occur below wind speeds of 5m/s or in the hours with rainfall on average greater than 0.2mm. Based on the dry hours wind rose data presented in Table 21.1, during approximately 42.44% of the dry hours wind speeds are above 5m/s.

**21.17** The generation of dust at the site is associated with cell excavation and engineering, soil stripping and restoration, mineral extraction operations, materials handling, on site transportation, waste processing, stockpiles and exposed surfaces together with off-site transportation. The residual source emissions for each of the site activities have been determined based on the IAQM Guidance including Table A3-1. As explained above the residual source emissions are the potential emissions without any operational controls in place. ENRMF has and will continue to implement operational controls in order to minimise the emissions of dust.

| Activity | Residual Source Emissions with no controls in place |
|---|---|
| Site Preparation/Restoration | Medium |
| Mineral Extraction | Medium |
| Materials Handling | Large |
| On site transportation | Medium |
| Waste processing | Medium |
| Stockpiles and Exposed Surfaces | Large |
| Off site transportation | Medium |

**21.18** Site preparation and restoration operations comprising the stripping of soils and the placement of soils during restoration operations will be undertaken throughout the life of the development due to the phased nature of the operations. Simultaneous soil stripping and restoration operations may be undertaken for short periods during the development with the development of new areas and areas under restoration moving through the site during the development. The eastern area of the existing site has been capped and partially restored. An overburden and clay stockpile in the eastern area of the site will be in place for several years. The stockpile will be hydroseeded in winter 2020/21 in order to minimise the potential for dust generation from the stockpile. The areas closest to the eastern boundary of the site and the most

sensitive receptors will be fully restored approximately at the time of the implementation of the development proposals in the western extension area which are the subject of this application . Based on the categories provided in the IAQM Guidance there will be a medium working area (around 7ha at any one time) associated with the extraction and restoration operations at the site, a high volume of material movements (over 100,000$m^3$) and a medium number of mobile plant. Soil stockpiles will be seeded as soon as possible following placement. The soils that will be placed during restoration have the potential to generate dust. On the basis of these factors the residual source emissions from the site during preparation/restoration (ie extraction and restoration operations) without any operational controls are categorised as medium.

**21.19** Mineral will be extracted in phases from a total area of approximately 30ha over the life of the western extension area with each phase approximately 4ha which is classed as a small working area in the IAQM Guidance. Mineral will be extracted using an excavator at a rate of greater than 200,000 tonnes per annum but less than 1,000,000 tonnes per annum. The clay that will be extracted from the site has a low potential for dust as the moisture content is high. The mineral will be loaded directly to HGVs to travel along haul roads where it will then either be direct tipped to form stockpiles or exported off site. The mineral extraction operations will take place within 50m of western site boundary of the western extension area in some phases of the site in close proximity to low sensitivity receptors such as footpaths. The residual source emission category for mineral extraction for these areas is medium, the residual source emission category for materials handling is large and the residual source emission category for on site transportation is medium.

**21.20** The length of the access road from the wheelwash to the site access point is greater than 200m and there is a high total length of haul roads on site. Both the access road and haul roads are hard surfaced. The number of HGV movements associated with activities on site are categorised as high (in the order of 200 HGV movements per day). There are wheel wash facilities at the

site and a speed restriction of 15mph is enforced on site. The residual source emissions for on and off site transportation are categorised as medium.

**21.21** The waste processing operations will involve a combination of processes and will process waste at a rate of up to 250,000 tonnes per annum. The waste being processed has an overall dust potential categorised as medium. The end product of the waste processing is of low dust potential. The residual source emissions for waste processing are categorised as medium.

**21.22** Stockpiles on site will not exceed 5m in height, will predominately consist of material of low dust potential and will be sprayed with a water bowser where necessary. The stockpiles may be located close to the site boundary and it is anticipated that there could be frequent material transfer to and from the stockpiles during mineral extraction and cell construction operations. The area of exposed surfaces is categorised as medium as the ground surface is hardstanding at the waste treatment and recovery plant and site reception area however the ground surface at the landfill is categorised as exposed. The exposed surfaces at the site are categorised as having a medium dust threshold however the wind speeds at site are predominately low (less than 5mph). The residual source emissions from exposed surfaces are categorised as large.

**21.23** The magnitude of the potential dust impact at each of the receptors within 400m of the site boundary without the application of any dust control measures has been assessed and the results of the assessment are presented in Table 21.2. The locations of the receptors are shown on Figure 21.1. Based on the assessment and the information presented in Table 21.2 it is concluded in the assessment that based on the wind direction during dry hours together with the location of sensitive receptors, without the implementation of specific mitigation or dust controls there is the potential for a negligible to moderate adverse effect of dust impact on receptors within 400m of the site boundary. As a standard operating measure at ENRMF, good practice, effective dust management controls will be implemented at the site to minimise the potential for impacts

associated with dust. The dust management controls that are and will continue be implemented at the site together with an assessment of their effectiveness are presented in Table 21.3.

**21.24** Based on the qualitative assessment of the proposed activities it is concluded that without appropriate management there is the potential for a negligible to moderate adverse effects associated with impacts from dust on receptors within 400m of the site boundary. It is concluded that dust emissions have been and will continue to be controlled effectively using well tried and tested methods to a standard such that it is unlikely that there will be significant dust emissions from the site. In government guidance it is stated that dust generation from these activities can be controlled effectively and the effectiveness of the dust control measures are dependent on good site management.

***Mud on the road***

**21.25** The wheel cleaning facilities will continue to be used for all HGVs visiting the site before leaving the site onto the public highway. The access road from the wheel wash to the highway is hard surfaced which minimises the potential for mud and debris to be tracked onto the road network. The drain installed across the site access will minimise the potential for silt laden runoff to run onto the highway. The access road will be cleaned regularly by a road sweeper and maintained in good condition and the surface of Stamford Road will continue to be cleaned regularly using a road sweeper. Based on the wheel cleaning facilities and the proposed cleaning and maintenance regime the risk of nuisance from the proposed development associated with mud and debris on the local road network is low.

***Lighting***

**21.26** It is considered that there will not be an unacceptable impact on amenity as a result of the continued use of lighting as part of the proposed development. With

the exception of security lighting the lighting will only be used when the site is operational and will be directed downwards to minimise the visibility of light.

**Mitigation and monitoring**

**21.27** The mitigation measures proposed to minimise the impacts of dust, mud on the road and lighting are described in this section of the report and will continue to be implemented for the proposed development. The mitigation measures proposed to minimise the impacts of dust and mud on the road are summarised in Table 21.3.

**21.28** A dust management and monitoring plan is currently in use at the site and will be extended to include the proposed development. Boundary dust monitoring is carried out in accordance with the Environmental Permit to confirm that dust and particulates are being adequately controlled and this monitoring will continue for the proposed development.

**Cumulative impacts**

**21.29** There is the potential for cumulative effects with respect to dust from the continued operations at the existing ENRMF. It has been demonstrated in this assessment that dust emissions from the operations at the existing ENRMF and western extension area can be controlled hence it is considered that it is unlikely that there will be an unacceptable cumulative impact with respect to dust emissions.

# 22 Socio-economic impacts

## 22.1 Introduction

**22.1.1** The potential for socio-economic impacts has been assessed at the national and local level. The national impacts have been considered in the context of the role of the ENRMF in the Augean business and the significance of the business in respect of the management of hazardous waste and LLW in the UK. The local impacts have been considered in respect of the site presence and its contribution to the local socio-economic climate as well as its compatibility with surrounding land uses.

## 22.2 Methodology

**22.2.1** Consideration of the socio-economic impacts of the development should take into account the type, spatial extent and duration of potential impacts. The scope of the assessment includes a review of the aspects which will be assessed, definition of the geographical area of consideration, definition of the timescale over which the assessment is relevant, establishment of the baseline position and the preliminary assessment of the impacts resulting from the development.

**22.2.2** In accordance with the National Policy Statement (NPS) for Hazardous Waste[60] potential socio-economic impacts as a result of the proposed development have been considered at a national, regional (where possible) and local level. Based on a review of the adopted development plan documents including the Northamptonshire Minerals and Waste Local Plan (2017)[61], North Northamptonshire Joint Core Strategy (2016)[62] and the Rural North, Oundle and Thrapston Plan (2008)[63] it is considered that the key socio-economic factors for the area which need to be considered include employment and economy,

[60] DEFRA (2013) National Policy Statement for Hazardous Waste: A framework document for planning decisions on nationally significant hazardous waste infrastructure
[61] Northamptonshire Minerals and Waste Local Plan, July 2017
[62] North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016
[63] Rural North, Oundle and Thrapston Plan, July 2011

housing and house prices, village infrastructure and services, tourism together with green infrastructure and accessibility.

**22.2.3** An assessment of the socio-economic impacts up to the closure of the treatment facilities and estimated completion date for the restoration of the landfill of December 2046 as well as the period beyond will be made.

## 22.3 Baseline

***National context***

**22.3.1** The generation of waste is an inevitable consequence of the socio-economic cycle even with the effective implementation of policies for the minimisation of the amount of waste which is generated. To sustain a high standard of living and environmental quality it is essential that a network of safe and secure facilities is established for the sustainable management of all wastes including hazardous waste and LLW.

**22.3.2** Augean is a national waste management business operating from 14 centres across the country. The company employs around 300 people and has an annual turnover of approximately £68.8M. Each of the company facilities operate as a profit centre that is essentially as a local business on its own. Where practicable it sources employment and services locally thereby contributes to the local economies in the areas in which it operates as well as the national economy. Augean provides specialist services in the treatment and disposal of our more difficult to manage wastes including hazardous waste, certain non-hazardous wastes and LLW. The company is primarily a treatment business seeking to drive waste management practices up the waste management hierarchy towards more sustainable practices. The company makes its investment decisions in response to regulations and policies issued by the Government. Accordingly the company is a market leader in investment in new technology and modernisation of the sector.

**22.3.3** The existing ENRMF is already part of an integrated network of waste recovery and disposal installations. The landfill and the waste recovery and treatment facility provide an integrated solution to hazardous waste management in the south and east of the UK and provides a suitable disposal facility for LLW at the lower end of the activity scale. The modernisation of existing facilities and introduction of new hazardous waste management technologies continues to be a core element of the company's business strategy. The availability of safe, secure waste treatment and recovery facilities as well as hazardous waste and LLW disposal capacity for residues from treatment and recycling is essential to support the investment in the sustainable management of wastes generated by UK industry.

**22.3.4** The increase in the throughput of the treatment facilities reflects the increasing need for waste treatment prior to recovery or disposal in preference to direct landfill disposal. The increased landfill void created will provide a hazardous waste disposal facility available for use by local, regional and national businesses for an additional 20 years. The continued provision of this hazardous waste treatment and disposal facility underpins the economy of the wider business community in supporting their activities which rely upon the availability of hazardous waste treatment and disposal facilities which are readily accessible.

**22.3.5** The provision of an effective and secure supply chain to safely and sustainably manage and dispose of LLW is critical to the timely and cost effective decommissioning of electricity generation and off-shore drilling sites managed on behalf of the government and private industry. These sites have contributed to the UK economy over many decades and the current priority is to manage their closure and decommissioning in a safe, sustainable and cost effective way.

**22.3.6** Thus the impact of the site on its local environment must be assessed and demonstrated as acceptable but its benefits must be considered primarily in terms of the wider regional and national economic environment.

***Regional context***

**22.3.7** The overarching purpose of the proposed development is to continue to meet the established need of regional businesses in the central, eastern and southern regions of the UK for the safe disposal of hazardous waste and LLW and the treatment and recycling of wastes beyond the consented life of the current site. The site lies in the south eastern corner of the East Midlands region and is geographically close to the West Midlands, East of England, Greater London and South Eastern regions. As discussed in Section 9 of this report and as shown in Tables 9.1 and 9.2, over 80% of the waste accepted at the waste treatment plant and over 95% of the waste accepted at the site for landfill disposal over the last five years originates from these five regions. As shown in Table 9.3 the total quantity of hazardous waste produced in England has been rising steadily over the last 5 years and was almost 6 million tonnes in 2018. The data in Table 9.4 show that in the regions nearest to ENRMF the quantity of hazardous waste generated each year is rising over time and in 2018 was approximately 3.3 million tonnes. A total of approximately 750,000 tonnes of hazardous waste was landfilled in England in 2018 with the quantity falling generally over the 5 years of data shown on Table 9.5. No new hazardous waste landfill facilities have been developed in the south of the country since the proposals for the currently consented activities was submitted. Based on the data assessed there is a continuing need for the provision of a waste management facility for the treatment and disposal of hazardous waste able to serve the businesses which generate wastes arising in the West Midlands, East Midlands, East of England, South East and Greater London.

**22.3.8** The ENRMF is centrally located for the wastes arising at the locations of the major LLW waste producers in the south and east of the country. The location

of the site is well placed to serve the producers of LLW from the nuclear and non-nuclear industries. ENRMF will continue to provide a closer and more convenient alternative for the disposal arisings than the more distant alternative facilities in the north west to support these public and private business activities.

***Local context***

**22.3.9** The site is located in a generally rural area with the majority of the surrounding land comprising open farmland or woodland. The proposed application boundary lies approximately 1.1km east south east of Duddington village and approximately 2km north north west of Kings Cliffe village at its closest points. The properties located closest to the site are shown on Figures 1.2 and 2.1.

**22.3.10** An overview of the local socio-economic context of the site is drawn from the Northamptonshire Minerals and Waste Local Plan (2017), North Northamptonshire Joint Core Strategy (2016)[64] and the Rural North, Oundle and Thrapston Plan (2008).

**22.3.11** The North Northamptonshire Joint Core Strategy (NNJCS) covers East Northamptonshire, Corby, Kettering and Wellingborough. There is a network of settlements within North Northamptonshire and the population at the time of the 2011 Census was 316,800[65]. It is anticipated that the population will grow to at least 370,600 by 2031[66]. The age structure of the population is forecast to change over the plan period with significant expansion in the 60+ age group and the 0-14 age group[67]. North Northamptonshire has around 0.85 jobs for each worker (economically active residents excluding those in full time education). It has become less self-reliant in terms of employment since 2001 with 69% of the labour force living and working in North Northamptonshire compared to 76% at the 2001 census[68]. 22 wards within Corby, Kettering,

[64] North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016
[65] North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016. Paragraph 2.19
[66] North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016 Paragraph 2.21
[67] North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016 Paragraph 2.23
[68] North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016 Paragraph 2.31

Wellingborough and East Northamptonshire have been designated by the government as Assisted Areas for the period 2014 to 2020. These comprise a mixture of urban and rural areas identified because they are less economically advantaged places that would benefit from additional support for development[69].

**22.3.12** The site is located in the Rural North area in the Rural North, Oundle and Thrapston Plan (RNOT) (2011). The Kings Cliffe area is described in the plan as a rural area with farmland, open pasture, pockets of woodland and villages built from local stone and stone slate. The area covered by the RNOT Plan is 42,174 hectares and the population at the time of the Census in 2001 was 25,116. The population density was 1.6 people per hectare and the average age was approximately 40 years. Around 19,000 people were economically active; of these approximately 8,200 are in full time employment. In 2011 nearly 75% of dwellings in the RNOT Plan area were owner occupied and 13% are socially rented.

**22.3.13** Based on the Rural North Plan it is considered that the key socio-economic factors for the area are employment and economy, housing and house prices, village infrastructure and services, tourism together with green infrastructure and accessibility. The employment and economy in the Rural North area is mixed, with an established agricultural and forestry base, mineral working and waste management, distribution and transport, light industrial and small businesses and military activities. The agricultural use is progressively diversifying into the service and tourism industries.

**22.3.14** It is necessary to outline the likely evolution of the baseline environment at the site without the implementation of the proposed development. If the proposed development was not implemented the existing ENRMF would continue to manage, treat and landfill hazardous wastes as well as provide a disposal facility for LLW. There would be no changes to the site operational practices

[69] North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016 Paragraph 2.39

and the operations at the site which support local jobs and services as well as regional and national businesses would cease by 2026. The aftercare and maintenance period for the site would continue to 2036.

## 22.4 Preliminary assessment of effects

***Preliminary assessment of effects at a national and regional level***

**22.4.1** The extension of the operating period and increase in the throughput of the waste treatment and recovery facility at ENRMF together with the extension of the landfill into the western extension area will provide security for the treatment and recovery of waste and for the disposal of residues generated by waste treatment processes including the Augean treatment business. The continued availability of hazardous waste and LLW landfill capacity facilitates safe disposal of hazardous wastes and LLW for local, regional and national businesses. In the event that the facility was no longer available these businesses would need to transport the waste over greater distances to the other suitable sites resulting in additional costs to those businesses and the UK economy.

**22.4.2** There are wider environmental and economic benefits as the use and extension of appropriate existing assets is preferable to the development of new facilities in undeveloped areas. In addition there is policy preference in the Northamptonshire Minerals and Waste Local Plan for extensions of existing sites rather than the development of new sites.

**22.4.3** The continuation and extension of the facilities for the disposal of LLW will assist the programme of nuclear decommissioning by not imposing unnecessary costs and reducing the distance that legacy wastes have to be transported from where they originate in the south of England given that the only alternative disposal facilities are in Lancashire and Cumbria (Figure 22.1).

**22.4.4** The development of facilities for the management and disposal of LLW is a key element of national policy for the decommissioning of power stations and oil

and gas extraction facilities. The Augean proposals will also support the many industries, research facilities and hospitals in the region that generate and use radioactive materials.

**22.4.5** The nuclear decommissioning supply chain industry is valued at £3billion a year[70]. The NDA Strategy 2019 states that there is a 120 year programme to clean up 17 of the earliest UK nuclear sites[71].

**22.4.6** The cost of the continued maintenance of the nuclear estate is a major cost to the nation and the sooner the decommissioning programme is delivered the sooner the cost burden will be diminished. The provision of alternative disposal routes to the LLWR such as the extension of ENRMF represents a significant financial saving to the nation. In addition the proposed development will facilitate the overall decommissioning programme thereby helping to secure the development and growth of businesses that support the decommissioning works. The proposals will provide for the continuation of the existing LLW business at Augean and support the continued growth of Augean plc.

**22.4.7** It is a requirement of national legislation that the waste management network for all types of waste shall enable waste to be recovered or disposed of in one of the nearest appropriate installations, by means of the most appropriate methods and technologies, in order to ensure a high level of protection for the environment and public health. Inevitably, where the management measures are more specialist, as they are at ENRMF, there will be fewer such facilities therefore each such facility will serve a wider area.

***Preliminary assessment of general employment and economic effects at a local level***

**22.4.8** The proposed development will help secure the continued employment of the 20 full time staff who currently work at ENRMF and 10 support staff based at

[70] DECC (2015) Strategic Environmental Assessment. Environmental and Sustainability Report,. Consultation draft. Volume 2 – the appendices.
[71] NDA (2019) Integrated Waste Management: Radioactive Waste Strategy. Page 5.

the Head Office in Wetherby. The total amount that Augean spends on wages per annum for the existing ENRMF site is approximately £590,000. The site employs almost entirely skilled staff either with appropriate scientific degrees or specialised plant operating skills. Most of the staff live within a 10 mile radius of the site with the majority in the Peterborough area and a few from Corby, Oakham and Stamford. Some employees from the site live or have lived in the immediate area, such as Kings Cliffe, Easton on the Hill and Orton but most commute from the nearby urban areas where house prices are more affordable.

**22.4.9** The site uses a range of local services contributing significantly to the local economy. In the period January 2019 to December 2019 the existing ENRMF site spent approximately £740,000 on local services within Northamptonshire and/or a 15 mile radius of the site. A summary of the local services supported in the period January 2019 to December 2019 is presented in Table 22.1.

**22.4.10** It may be of concern to local residents and businesses that the continued presence of the site accepting hazardous waste and radioactive waste may discourage companies from investing in the area. It may be argued that the community around ENRMF has not enjoyed the economic benefits of the employment and services of communities living in proximity to the businesses that generate hazardous waste or to nuclear power stations. However the local community together with the rest of the nation has enjoyed the socio-economic benefits of the products of those businesses and of reliable power supply for the past 60 years. As explained in the environmental impact assessment sections of this report, the physical presence of the ENRMF facility in the landscape has a limited impact due to its relatively small size and well contained location and the environmental impacts are well controlled to acceptable levels.

**22.4.11** While the presence of the site may be evident from the lorry traffic on Stamford Road there is a negligible effect on local villages from operations at the site. The site is visually well screened, it is not noisy and its presence is absorbed in the surroundings. The presence of the treatment and landfill operations at the

site have not stopped other business or housing developments in the vicinity from applying for and being granted planning permission. The area around the site continues to have a thriving rural economy.

**22.4.12** Since 2013 a number of applications have been submitted for dwellings in Kings Cliffe together with extensions to existing dwellings. A planning application for a caravan and camping facility (Planning permission reference 14/02225/FUL) located 200m south of Kings Cliffe Industrial Estate was granted by East Northamptonshire Council in November 2015. The conditions of the planning permission are in the process of being discharged. These applications indicate that the continued operation of ENRMF as an integrated waste management facility with a hazardous waste and LLW landfill and a waste treatment and recovery facility has had no significant adverse effect on these nearby developments and the associated local economy.

***Assessment of effects on agriculture and forestry***

**22.4.13** There has been no evidence that indicates that there would be or has been any adverse effect on plant growth or the quality of crops or stigma associated with the nature of the site operations which could subsequently harm agricultural or forestry businesses as a result of the existing ENRMF site. The environmental protection measures that are in place and that will continue provide protection to the whole environment surrounding the site including vegetation. The location of the woodland to the west and east of the proposed western extension is being considered in detail in the design of the landfill extensions and measures specifically to protect the trees are integral to the design.

***Assessment of effects on mineral working and waste management***

**22.4.14** Mineral can only be worked where it is found. In the local area there are clay resources (e.g. ENRMF), limestone (e.g. Collyweston Quarry, Cross Leys Quarry, Ketton Limestone and Cement Works, Thornhaugh Quarry and Cooks Hole Quarry). Quarries are the source of the limestone and ironstone that

provides the distinctive building stone used in the construction of the surrounding villages. While not necessarily a popular element of the rural environment quarries are an intrinsic part of the historic landscape and economy of the area.

**22.4.15** The use of residual waste to restore quarries is a sustainable solution and one of the primary options for bringing exhausted mineral workings back into beneficial use with the consequence that landfilling is an inherently rural activity. In the vicinity there are several landfill sites including Collyweston Quarry, Cross Leys Quarry and Thornhaugh Quarry. These sites provide services to the local authority, businesses and the construction industry contributing to the local infrastructure and economy.

**22.4.16** Given the above context the operations at ENRMF are not an alien activity in the locality. However, this does not detract from the need to ensure such facilities do not unacceptably affect the character of the countryside. As is identified in Section 13 of this report on the assessment of impacts on landscape, the existing and proposed extension to ENRMF is well contained and has a generally limited profile in the landscape.

***Assessment of effects on distribution and transport***

**22.4.17** The major road network in the locality comprising the A47, A1, A43 and the A14 is attractive for distribution and transport businesses. On the Stamford Road opposite ENRMF there is the established Howard's Transport yard a former farm diversification scheme. In addition planning permission has been granted for the development of a transport yard at the former depot approximately 300m to the north of the existing ENRMF site. No evidence has been identified of any adverse effects of the existing ENRMF site on these businesses or of potential impacts as a result of extension either in time or void. To the contrary, there is the potential for synergies between Augean and local distribution businesses of benefit to the local economy.

***Assessment of effects on housing provision and prices***

**22.4.18** It is identified in the Rural North Plan that attractiveness of the area to newcomers and therefore to house builders, has led to increases in both land and house prices. It is indicated that house prices in the area are high by Northamptonshire and East Midlands standards. In consequence, housing in the area has become less affordable to local people, making it harder for first time buyers in particular to access the housing market. As a result few of the employees at ENRMF live in the immediate area around the site but most live to the east where property is more affordable such as in Peterborough and the surrounding areas.

**22.4.19** A review of average house prices between 1999 – 2019 in Kings Cliffe and Duddington has been undertaken based on data obtained from the Land Registry. In the period 1 January 1999 to 31 December 2019 a total of 483 house sales took place in Kings Cliffe and Duddington. This figure does not include the initial sales at Sovereign Grange, a substantial new build development in Kings Cliffe between 2012 and 2016. If Sovereign Grange is included then the total number of house sales in this period rises to 597. There is a broad mixture of house types, both period and modern, available in both villages, with sold house prices ranging from below £100,000 to over £1.5 million. When comparing the average house price in Kings Cliffe between 1999 and 2019 to the national average and to the wider county of Northamptonshire the average prices show broadly similar trends over the same period. The average sales price for Kings Cliffe and Duddington is well above the UK average and never falls below this benchmark even at the lowest points. In comparison to the rest of Northamptonshire, Kings Cliffe and Duddington are well above the average for the county which falls below the national average (Figure 22.2). This demonstrates that house prices in the area have continued to rise in accordance with national trends despite the presence of the existing ENRMF facility. There is no reason to anticipate that the proposed development will change this situation.

***Preliminary assessment of effects on the village infrastructure and services***

**22.4.20** It is reported in the Rural North Plan that evidence based studies clearly demonstrate that Kings Cliffe functions as a local service centre to the network of surrounding villages. Kings Cliffe has a doctor's surgery, primary school which draws pupils from several other villages in the area, village hall, post office and community sports facility providing services to the surrounding network of villages but secondary school pupils need to travel by bus to Oundle. Other villages, notably Collyweston, Nassington, Wansford and Easton on the Hill have local rural services such as village shops and village halls. There are community halls in just over half the local villages. Duddington is a small village with a community hall but no other local services.

**22.4.21** The Rural North Plan emphasises the need to enhance the service centre roles of Oundle, Thrapston and Kings Cliffe thus enabling villages to thrive by ensuring that vital services are retained and local infrastructure deficiencies are resolved. For this to be achieved, appropriate opportunities must be available to meet housing and employment needs, including those of the farming communities.

**22.4.22** Since 2004 Augean South Ltd have invested more than £4 million into the local community through the Landfill Tax Credit scheme from the ENRMF and Thornhaugh Landfill Sites. . The Landfill Tax Credit scheme allows Augean to give to the local community a proportion of its landfill tax obligation which was £364,000 in 2019. Since 2011 the LLW community fund has produced over £160,000. The LLW community fund is administered by Northamptonshire County Council.

**22.4.23** Projects within a 10 mile radius of the site may apply for grants which are allocated by the Kings Cliffe Environmental Association. In 2019 17 projects

were given grants for between £5,000 and £50,000[72]. The projects included upgrades to halls, churches and sports facilities and recreation ground improvements. The full list is presented at Table 22.2.

**22.4.24** In addition Augean has directly funded a number of projects including £50,000 spent on improvements to the Kings Cliffe Sports Club House, £49,000 spent on improvements to Oundle Rugby Club, improvements to All Saints and St James' church and contributions to the Kings Cliffe and Area Community Sports Project.

**22.4.25** One key constraint of the Landfill Tax Credit scheme is that the funds cannot be used to pay for salaries. As part of the planning consent and Development Consent Order for the deposition of LLW at the site Augean entered into a Section 106 legal agreement to set aside for the community £5 per tonne of LLW deposited at the site to be deposited into a fund for the community. This money is not subject to the use restrictions for Landfill Tax credits and is available for uses other than capital expenditure including the payment of salaries hence this fund overcomes one of the principal constraints in providing support to the development of village services. This commitment will be continued for the future deposition of LLW if the Development Consent Order is granted. This fund has been used to fund community services such as after school clubs. In 2019 this fund raised £72,500 for the local community.

**22.4.26** Augean works with educational establishments including Kings Cliffe Endowed School where presentations about waste management activities have been given, competitions organised, placements and field trips carried out and assistance with careers fairs has been provided. Augean also host visits from Nottingham and Northampton Universities from time to time and encourages local residents to attend site engineering days to see the cell containment construction works taking place and to speak to contractors and CQA

[72] Grantscape (2020) Augean Community Fund Grants https://www.grantscape.org.uk/fund/augean-community-fund/augean-community-fund-grants-awarded/ Accessed 17.09.20

engineers. Augean remains committed to continuing to contribute to education around topics related to their activities although there has been little activity in 2020 due to the Covid-19 pandemic restrictions. Through consultation events, open days, presentations, newsletters and information on the company website including site monitoring data, Augean have and continue to inform and promote understanding of waste management in respect of policy, strategy, technology and impact. The company is committed to continuance of its open door policy, regular open days, the reception of visits from educational establishments and presentations to stakeholders.

**22.4.27** As explained further in Section 18 of this report, Augean continue to contribute a sum of £5,000 per year to Northamptonshire County Council Highway Authority for the maintenance of the road in the vicinity of the site access.

**22.4.28** No evidence has been identified of negative impacts on the village infrastructure and function of Kings Cliffe as a service centre as a result of the presence of the waste management facilities at ENRMF and there is no evidence that this will change as a result of the proposed development including the extension in time and void for the consented facilities. Augean has made positive contributions to the community through Landfill Tax and the LLW fund as well as directly to support the service function of village centres. These investments have the potential for long term benefit to the community well beyond the operational life of the site.

***Assessment of effects on tourism***

**22.4.29** The northern part of East Northamptonshire is described in the Rural North Plan as having many assets which attract visitors who contribute to the local economy. Visitor accommodation includes hotels, bed and breakfast accommodation, caravan parks, self catering accommodation and other places to stay overnight or for longer breaks. Tourist attractions, including a wide range of restaurants and public houses, can be found in the towns and in the

countryside. As stated above, a new camping and caravan facility is currently being constructed near Kings Cliffe.

**22.4.30** Given the visually contained nature of the site it is considered that the proposed development including the extended operating period and the western landfill extension at ENRMF is unlikely to have a significant negative impact on tourism in the locality now or in the future.

***Assessment of effects of green infrastructure and accessibility***

**22.4.31** The green infrastructure comprising the network of nature conservation and biodiversity, landscape and heritage assets together with accessibility of those assets to the village communities is an important element of the socio-economic fabric of the area. The nature conservation and biodiversity assets of the area are described in Section 12, the landscape assets are described in Section 13 and the heritage assets are described in Section 15 of this report. The NNJCS[73] states that:

> *'Compared to most of the country, North Northamptonshire has a low biodiversity offer, with habitats fragmented or degraded as a result of settlement expansion, infrastructure developments and agriculture.'*

**22.4.32** The assessments presented in the identified section of this report demonstrate that the proposals will not result in a significant cumulative adverse impact on these assets. In the long term based on the lifespan of the development until 2046 the restoration of the site will deliver significant biodiversity improvements and make space available for recreation with the potential for enhancement of the Local Rights of Way network. Further details on the restoration and biodiversity improvement proposals are provided in Sections 12 and 13 of this report.

[73] North Northamptonshire Joint Core Strategy 2011 – 2031, July 2016 Paragraph 2.16

## 22.5 Conclusion

**22.5.1** The proposed development represents a significant national and regional socio-economic benefit underpinning the need for the safe treatment of wastes and the safe disposal of hazardous wastes and LLW. It is evident that the activities at the site result in a positive contribution to the local economy and provide significant support to the function of the Kings Cliffe village as a service centre.

**22.5.2** It is concluded that based on the existing operations at ENRMF the proposed development will not give rise to any significant adverse socio-economic impacts on the local community and by the continued provision of safe, sustainable and cost effective waste management facilities will provide a beneficial socio-economic impact to local, regional and national businesses. The presence of the site and the Augean business will continue to result in support and contributions to the local community.

## 22.6 Benefits and mitigation

**22.6.1** The high standards of engineering and operational practice will continue to be applied at the site so that the activities do not result in significant environmental impact in the short or long term as demonstrated in the environmental impact assessment sections of this document.

**22.6.2** The site will be restored to blend with the surroundings and enhance the ecology and biodiversity of the site resulting in biodiversity improvements and a long term benefit in respect of green infrastructure well beyond the operational life of the site.

**22.6.3** The following commitments are proposed by Augean as part of the proposed development:

- Augean will share and explain the details of their proposals and the preliminary impact assessments and will actively seek to hear and

understand the views of the public during the forthcoming public consultation events.

- To consider the potential for the wider enhancement of green infrastructure connectivity in the long term and to integrate the findings in the restoration scheme.
- To continue to make available community funding from the Landfill Tax Credits as permitted by Government legislation.
- To continue to provide contributions to a community fund based on the quantity of LLW inputs to the landfill.
- To continue to use and give preference to of a range of local services.
- To continue to make a contribution of funding to the Local Highway Authority for the maintenance of Stamford Road.
- To continue to take part in and support educational activities and promotion of understanding of waste management through the open door policy, regular open days, periodic community newsletters, the reception of visits from educational establishments and presentations to stakeholders.

## 22.7 Cumulative impacts

**22.7.1** The cumulative impacts of all aspects of the collective proposals are taken into account in the assessments of the impacts on the local, regional and national socio-economic environment. It is considered that there will be no cumulative effects other than the effects which are assessed as an intrinsic part of the impact assessment hence are taken into account already in the socio-economic impact assessment as well as in the associated environmental impact assessments presented in other sections of this report.

## 23 Conclusions

**23.1** The existing ENRMF site is an established operational landfill site which accepts hazardous waste and low level radioactive waste (LLW). The site also includes an established waste treatment and recovery facility. The ENRMF site is the subject of a Development Consent Order (DCO) which was granted in July 2013 and amended in June 2018. The ENRMF DCO specifies the completion and restoration of the site by 31 December 2026. The facilities at ENRMF are an acknowledged part of the nationally significant infrastructure for the management of hazardous waste and LLW and as such it serves more than just a local need. In order to secure continuity of its operations and the provision of these specialist waste management facilities, Augean is proposing to submit an application for a new DC) for an extension in the area and timescales for the operation of ENRMF including an extension to the west of the existing site and increasing the throughput of the waste treatment and recovery facility.

**23.2** Augean is carrying out an Environmental Impact Assessment (EIA) of the proposal. Technical studies have been undertaken to establish the baseline environment of the application site and the surrounding areas to facilitate an assessment of the potential impacts associated with the proposed development. As part of the pre-application consultation this Preliminary Environmental Information Report (PEIR) has been prepared to explain the potentially significant impacts. The PEIR presents the environmental information collected to date and provides an initial assessment of the likely significant environmental effects. Once the assessment work is complete Augean will submit an Environmental Statement with the DCO application which will report on the likely significant environmental effects of the proposals identified in the EIA, the appropriate mitigation measures to be put in place where necessary and any residual effects. The extensive control measures that form an important and integral part of the proposals to prevent or minimise the effects of the proposed development on the environment and people are described in this report. In addition to a DCO, the operations at the site will be

controlled through Environmental Permits which are regulated by the Environment Agency. The Environment Agency is the regulator with responsibility for pollution control and for ensuring the safety of the public and the environment as a result of the proposed development, the Health and Safety Executive is responsible for overseeing the safety of the site workers and the Department for Transport is responsible for safety during transportation.

**Alternatives**

**23.3** The options and alternatives that have been considered during the development of the current extension proposals are explained. This includes assessment of the suitability of potential alternative sites as well as the current site location. Consideration has also been given to alternative locations of the treatment facility within the footprint of the site. For the proposed location the alternatives considered are set out and the constraints are identified which affect and lead to the choices that have been made with respect to the design of the proposed operations, the containment engineering design, the restoration profile hence the void generated, the operational and management proposals and the design of the restored site. The design parameters which are fixed at this stage are identified in the relevant sections of the report as are those which are subject to further refinement and where options are still being considered.

**23.4** The existing co-located treatment facilities and hazardous waste landfill and the nearby Augean Thornhaugh non-hazardous waste landfill provide substantial sustainability benefits as a result of the short distance for the transfer of treatment residues which cannot be reused for their final disposal. The extension of the existing site can be achieved using the existing site access and infrastructure including laboratory facilities as well as the existing suitably qualified and experienced workforce who are trained in the assessment and handling of hazardous waste and LLW. The current site setting has been demonstrated to be suitable and to provide for the safe disposal of hazardous waste and LLW. The impact assessment sections of this report demonstrate

that the proposed extension area also can be developed and operated without resulting in unacceptable impacts on the environment or human health. Accordingly, given that the western extension area is available to Augean, the development of an extension to the existing, established site rather than a site at a new location provides substantial sustainability, environmental, and policy and cost benefits.

**Population including impacts on health**

**23.5** The potential for direct and indirect effects on the health of people living and working around the site has been assessed. The nature of the activities and the wastes accepted at the site will not change significantly and, while they will take place over a larger area overall, the active area of operations at any one time will not be significantly different to the currently consented activities. The potential impacts of non-radiological and radiological effects on people and the environment have been assessed as part of the process for granting the current DCO and Environmental Permits for the current hazardous waste and LLW landfill site and the waste treatment and recovery facility. The acceptability of the impacts associated with the non-radiological and radiological effects of the current activities at the current locations has been confirmed by the granting of these consents. It will be necessary to review, extend and update the detailed risk assessments as part of the applications for variations to the Environmental Permits for the site to extend them to include the western extension area and the proposed changes to the activities if a DCO is granted for the proposed development.

**23.6** The principles of the design of the engineered containment and the leachate and gas management infrastructure of the landfill site will remain and will be extended to the proposed western extension area. The principles of the phasing of the landfilling and restoration activities will remain and will be extended to the western extension area. The methods of operation and control of the waste treatment and recovery facility will remain the same.

**23.7** A number of possible exposure pathways which might have the potential to expose people to contaminants which might affect their health have been identified and are assessed through risk assessments including for routine as well as unexpected events (accidents). The full and detailed risk assessments that will be provided with the Environmental Permit applications will be scrutinised robustly by the Environment Agency and Environmental Permits will not be issued unless the Environment Agency is satisfied that the site can be operated safely and that the health of those living and working at or near the site is protected.

**23.8** The potential impacts associated with the continuation of the operation of the consented and extended landfill and waste treatment and recovery facility to 2046 are similar to those for the current site operations but will be present over a longer time.

**23.9** The ENRMF will continue to be monitored and regulated through Environmental Permits to confirm that it is operating in compliance with all appropriate International, European and national health and safety standards. Environmental monitoring during the operational and aftercare phases will include the levels of contaminants and radiation in a range of environmental media such as landfill gas, air emissions, leachate, surface water, groundwater and dust. Samples are taken to an agreed programme specified in the Environmental Permits and follow protocols set by the EA, with the resulting monitoring data reported to it. The results of the monitoring will continue to be made available on the company web site to provide confidence that the site is being managed effectively.

**Ecology**

**23.10** Numerous ecological surveys have been carried out at the site and further ecological surveys are currently being undertaken. The detailed design of the extension area is currently being developed taking into account the findings from the ecology surveys and initial consideration of effects. Measures to

protect the ecology on site will be included in the detailed design of the development. The majority of the extension site area is agricultural land which typically has a low level of biodiversity. The restoration of the site is being designed to provide significant biodiversity gain.

**23.11** With the planned avoidance, protection and mitigation measures in place it is considered that there will be no significant adverse impacts on biodiversity throughout the operational stage of the proposed development and there will be a large positive net gain in biodiversity on completion of restoration.

**Landscape and visual resources**

**23.12** A preliminary landscape and visual impact assessment has been carried out. The existing visibility of the site has been determined and the effects on landscape features, landscape character and visual receptors at different stages of the proposed development have been assessed.

**23.13** The assessment concludes that there will be significant impacts on the topography of the proposed western extension area and on the character of the northern part of the western extension area as a result of the proposed development during the mineral extraction, cell construction and infilling stages. There will be no other significant impacts on any other landscape features or the character of the southern part of the western extension area during these operations. The assessment concludes that there will be significant beneficial impacts on hedgerows with trees and public rights of way as a result of the proposed restoration of the site with other beneficial effects for woodland/scrubby planting areas and neutral/calcareous grassland.

**23.14** The site location is generally enclosed. During the infilling operations there may be effects on the visual amenity of the residents of Westhay Lodge due to distant partial views of the infilling operations in the southern part of the western extension area. After the restoration stage the significance of any visual effects will be beneficial due to the restoration of the site and the establishment of

woodland and scrub vegetation which will merge well with the adjacent woodland.

**Soil resources and agriculture**

**23.15** A survey has been undertaken to establish the quality of the soil. The soils in the main part of the western extension area are classified as Grade 3b whilst the soils in the northern part of the western extension area are classified as Grade 3a which is considered as best and most versatile agricultural land.

**23.16** As the site will be restored to nature conservation habitats and it is not proposed to return the site to agricultural land there will be a potential permanent loss of approximately 6 hectares of best and most versatile agricultural land and a loss of approximately 20 hectares of lower quality agricultural land. All the soils will be stripped and retained on site using procedures designed to protect the soil structure and all the soils will be replaced and reused in the site restoration.

**Archaeology and cultural heritage**

**23.17** There is no surviving archaeology within the existing ENRMF site as all areas of the site have been disturbed and were subject to previous investigation and recording. A desk based study including an initial assessment of archaeological potential and the potential impacts on the setting of cultural heritage assets has been undertaken. A geophysical survey has also been undertaken of the proposed western extension area to identify any features of potential archaeological interest. The geophysical survey found little that can described as of archaeological interest with any certainty. Trial trenching will be undertaken in the western extension area to verify the findings of the geophysical survey and identify any features of archaeological interest which may be present below ground. The preliminary conclusion is that the proposed development will have neutral, negligible or not significant effects on cultural heritage and archaeology.

**Water resources**

**23.18** An initial assessment of potential impacts on geology, hydrology and hydrogeology has been carried out. A detailed site investigation has been carried out with the drilling of numerous site investigation and monitoring boreholes to establish the geology and hydrogeology of the western extension area. A swallow hole is present to the north west of the current landfill site and there is evidence of other solution features in the limestone geology (dolines). The area of the dolines has been investigated using geophysical surveys. Subject to further investigations into these areas, the extent of the proposed landfill will be adjusted to make sure that the engineered base and sides of the containment landfill will be suitably stable and that the containment system will provide suitable protection to the quality of the groundwater underlying the site. Consistent with the principles of the current site design, at least 2m of natural low permeability strata will be left in place below the base of the engineered landfill and above the limestone strata underlying the site.

**23.19** Based on the proposed measures for the design of the containment engineering and the control measures that will be incorporated into the design itis concluded that there will be no significant impact on groundwater quality or flow beneath the site or at receptors nearby as a consequence of the proposed void extension. The quality of the groundwater will be monitored routinely to confirm that the landfill is functioning as predicted by the risk assessments which will be carried out as part of the Environmental Permit application.

**23.20** Surface water from areas around the site will be collected in and channelled away from and around the landfill areas in a series of ditches. During the operational period all water on site which is in contact with wastes and which has the potential to be contaminated is retained on site. Following restoration of the site the runoff from the filled, capped and restored areas will be integrated with the surrounding ditches and additional ponds will be provided in

accordance with a restoration surface water management plan which will be prepared and agreed with the Environment Agency.

**23.21** It is considered that there will be no significant impact on the surface water and groundwater resources from the continued use and storage of fuel, lubricants and chemical reagents at the site and the refuelling of vehicles at the site provided that the procedures for the storage of fuel, lubricants and chemical reagents and refuelling continue to be followed.

**Flood risk assessment**

**23.22** The site is not located in an area which is identified as sensitive to flooding from rivers or the sea. The design of the proposed surface water management scheme for the site will include the necessary provisions for climate change in particular the predicted increase in frequency and intensity of rainfall storm events. It is considered that based on the implementation of an effective surface water management plan the proposed development can be undertaken without increasing the risk of flooding at or in the vicinity of the site.

**Transport and traffic**

**23.24** The traffic numbers associated with the currently consented activities at the site are being reviewed to confirm whether there will be any significant changes in the estimated average numbers of HGVs using the site as a result of the proposed development. In the assessment for the current site activities which was carried out to support the application for the current DCO, it was estimated that the average number of HGV vehicle movements associated with the combined activities that was assessed was 196 per day (98 movements in and 98 movements out). The combined activities include the importation of waste, the exportation of some treated wastes and the exportation of overburden and clay during the periods of mineral excavation and landfill cell development. The assumed probable number of movements is unlikely to change significantly as a result of this application but the final assessment will be based on the detailed

design of the phasing of the mineral excavation works which is being carried out currently. It was concluded in the current DCO application that there would be no adverse impact on highway safety or capacity as a result of the operation of the landfill and treatment facility. It is considered that provided the number of vehicle movements do not change significantly, this conclusion remains valid.

**Noise**

**23.25** A preliminary assessment of the noise impact of the proposed operations at the nearest sensitive receptors has been carried out. Due to the coronavirus pandemic it has not yet been possible to carry out representative background noise monitoring as activities in the vicinity have not yet returned to normal. In the meantime, it has been agreed with the Local Authority that background noise monitoring data obtained during 2011 can be used as an estimate of current background noise levels. The results of the preliminary assessment suggest that there will be no significant or unacceptable adverse impacts at noise-sensitive premises in the vicinity as a result of the proposed operations.

**Air quality**

**23.26** The site is not located in an air quality management area which means that national air quality objectives are being met. The monitoring of air quality and gas in the ground at the site is undertaken in accordance with the Environmental Permit. This will continue for the proposed western extension area.

**23.27** Based on the control measures which will continue to be implemented it is considered that the generation of fine airborne particulates as a result of the extraction and stockpiling of soils, clay and overburden will have no significant impact on air quality in the locality. It is considered that the proposed increase in throughput and time extension of the waste treatment and recovery facility will have negligible impact on air quality in the locality. It is considered that the restoration of the site will have a negligible impact on air quality at the site.

**23.28** The wastes that are accepted at the site for landfill and treatment have a low level of carbon which means they have a limited potential for biodegradation hence a limited potential for the generation of gases or vapours. The wastes have a limited potential to generate odour. Based on the proposed continuation of the current controls including those that will be specified and implemented through the Environmental Permits, and based on the nature of the current and proposed wastes accepted at the site it is considered that there will be no significant impacts on air quality including impacts associated with odour as a result of the site activities.

**Amenity**

**23.29** The potential effects on amenity of dust, mud on the road and lighting have been assessed. If no dust control measures were implemented there would be the potential for a negligible to moderate adverse effects associated with impacts from dust on nearby receptors. However dust emissions will continue to be controlled effectively as part of the proposed development using a range of control measures. The effectiveness of dust control will be confirmed through regular dust monitoring at locations on the boundary of the site as specified in the Environmental Permit.

**23.30** Based on the wheel cleaning facilities and the proposed cleaning and maintenance regime on the site and the adjacent Stamford Road, the risk of nuisance from the proposed development associated with mud and debris on the local road network is low.

**23.31** The lighting at the site is located in key areas at the main reception and office areas as well as the treatment facility for both security and health and safety considerations. Mobile lighting is used on the operational landfill area when needed. With the exception of security lighting the lighting will only be used during periods of low light and darkness when the site is operational and all lighting will be directed downwards to minimise the impact. It is considered that

there will not be an unacceptable impact on amenity as a result of the continued use of lighting as part of the proposed development.

**Socio-economic impacts**

**23.32** An assessment of the socio economic impacts of the proposed development has been carried out. The proposed development provides the continued opportunity for a significant national and regional socio-economic benefit by supporting the need of businesses and other activities for the safe treatment of wastes and the safe disposal of hazardous wastes and LLW. In addition the continuation of activities at the site will result in a further significant positive contribution to the local economy and provide substantial support to the function of the local villages and to local community and educational activities.

**23.33** Based on the absence of evidence of adverse socio economic impacts and the evident beneficial impacts of the existing operations at ENRMF, it is concluded that the proposed development will not give rise to any significant adverse socio-economic impacts on the local community. The continued provision of safe, sustainable and cost effective waste management facilities will provide a beneficial socio-economic impact to local, regional and national businesses. The presence of the site and the Augean business will continue to support and make contributions to the local community.

**Cumulative effects**

**23.34** The cumulative impacts of all the aspects of the collective proposals have been taken into account in the assessments of impacts on people and the environment. It has been demonstrated that the proposed development will not have an unacceptable impact on any of the receptors that have been assessed in the preliminary assessment. It is considered that in combination there will not be any unacceptable cumulative impacts as a result of the proposed development.

## 24 Glossary

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| **Abstraction** | The removal of water or gas from any source either permanently or temporarily. |
| **Acoustic Environment** | Sound from all sound sources as modified by the environment. |
| **ADR** | European Agreement concerning the International Carriage of Dangerous Goods by Road. The European Agreement governs the safety standards needed for the transport of hazardous materials by road. The Agreement was created following a United Nations Treaty. |
| **Aerial Photographs (APs)** | Photographs taken from the air and used to identify archaeological sites either by low light for upstanding monuments or by differential crop growth on sites within arable fields. |
| **Aftercare** | The steps necessary to manage the land following restoration so that the quality of the land is at a satisfactory standard for the planned afteruse. |
| **ALARP** | As Low As Reasonably Practicable. A principle applied to ensure that all practicable steps are taken to minimise exposure to radioactivity or contaminants. |
| **Ambient Sound Level $L_{Aeq,T}$** | Totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far. |
| **Archaeological Monitoring** | Archaeological monitoring involves an archaeologist being present in the course of carrying out development works (which may include conservation works), to identify and protect archaeological deposits, features or objects which may be uncovered or otherwise affected by the works. (See Watching brief) |
| **Artefact** | An object or part of an object which has been used or created by a human and provides physical clues to the activity carried |

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| | out by humans in the area of discovery (This can range from Pottery, Metalwork, Woodwork, Worked Stones through to mortar samples) |
| **Assemblage (archaeology)** | A group of artefacts found together in a single context such as a grave or pit. |
| **Assemblage (ecology)** | The list of all species recorded in a specified habitat over a specified period or on a specified date. |
| **A-weighting** | The human ear is most sensitive to frequencies in the range 1 kHz to 5 kHz. On each side of this range the sensitivity falls off. A-weighting is used in sound level meters to replicate this sensitivity and respond in the same way as the human ear. |
| **Background Sound Level $L_{A90,T}$** | The A-weighted sound pressure level of the residual sound at the assessment position that is exceeded for 90% of a given time interval, T, measured using time weighting F. |
| **Basic Noise Level** | The basic noise level (BNL) is a measure of source noise. |
| **BAT** | Best Available Techniques. The available techniques which are the best for preventing or minimising emissions and impacts on the environment. |
| **BEIS** | Government Department for Business, Energy and Industrial Strategy |
| **Biodegradable** | Materials which will be broken down by bacteria or other biological means. |
| **Biodiversity** | Range of variation in living organisms including genetic variation and ecosystem variation. |
| **Bioremediation** | The use of biological methods, similar to composting, to remediate contaminated material, especially the addition of bacteria and other organisms that consume or neutralise contaminants in the soil. |

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| **Biodiversity Net Gain (BNG)** | Biodiversity Net Gain. Calculated by assigning a value to all habitats which will be lost and new habitats to be created and expressing the latter as a percentage of the former. Scores are determined by a DEFRA metric, with a minimum percentage positive value to be made statutory for all future development. |
| **Bq/g** | A Becquerel (abbreviated as Bq) is the unit for the specific activity of radioactive material. A Gram (abbreviated as g) is a unit of mass. A Becquerel per Gram (Bq/g) is therefore a measure of the concentration of radioactivity in a given mass of material. |
| **Bund** | A low bank or wall of material used to store soils or to provide a visual or acoustic screen. |
| **CIFA** | Chartered Institute for Archaeologists. An organisation for archaeologists in the United Kingdom that promotes professional standards and ethics for conserving, managing, understanding and promoting heritage. |
| **COMAH** | Control of Major Accident Hazards. A regulatory system used to ensure the safe storage of certain hazardous chemicals |
| **Conservation Area** | An area (usually urban or the core of a village) considered worthy of preservation or enhancement because of its special architectural or historic interest, "the character or appearance of which it is desirable to preserve or enhance," as required by the Planning (Listed Buildings and Conservation Areas) Act 1990 |
| **CQA** | Construction Quality Assurance. A system of managing construction to ensure specified standard are met. |
| **Cropmark** | An archaeological site no longer visible on the ground due to the removal of upstanding remains (often by ploughing). The sites are recorded from Aerial Photographs by differential crop growth over buried features such as pits, ditches and walls |

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| **Cumulative impact** | The combined positive and negative impacts on a specific receptor or medium. |
| **Curatorial Archaeologist** | An archaeologist with responsibility for management of the archaeological resource. The work of such organisations or individual is one of cultural resource management. County Archaeologists, Planning Archaeologists, Sites and Monuments Record staff, English Heritage, Historic Scotland and CADW are all within this role. |
| **DBA** | Desk-based Assessment. An assessment of both the known and potential archaeological resource within a specified area. A study is carried out on available sources such as SMRs, Map Evidence, and Documentary Sources Aerial Photographs. The study will provide a background for a decision to be reached on the potential archaeological resource in a local, regional, national context within the review area. |
| **DEFRA** | Government Department for Environment, Food and Rural Affairs |
| **Designation** | The various pieces of legislation used for legally protecting particular assets from damage and destruction (eg heritage, ecological, environmental) are grouped under the term 'designation' |
| **Disposal** | Emplacement of waste in an appropriate facility without the intention of retrieval. |
| **Doline** | Formed where solution of the limestone has created a depression on the surface of the limestone, but under a covering of soil. The unsupported soil subsides into the cavity and leaves a depression in the landscape. |
| **Dose** | General term for a measure of the energy deposited by radiation in a receptor as a result of exposure to ionising radiation. |
| **EA** | Environment Agency. The national environmental regulator. |

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| **EIA** | Environmental Impact Assessment. A process to assess the environmental implications of proposals. |
| **EMS** | Environmental Management System used by businesses to ensure environmental standards are implemented effectively. |
| **Environmental Archaeology** | The study of the interface between the environment of a locality and the human activity within the area, accomplished through the study of soils, plant and animal remains. |
| **Environmental Permit (EP)** | Environmental Permit. The authorisation issued by the Environment Agency when it is satisfied that a specified operation can be carried out without pollution of the environment or harm to human health. |
| **Environmental Statement (ES)** | The document that reports the findings of an Environmental Impact Assessment. |
| **EPR2016** | The Environmental Permitting (England and Wales) Regulations 2016. The principal regulations controlling waste management, water protection, the management of radioactive waste and industrial activities with the potential for significant emissions. |
| **Equivalent continuous A-weighted sound pressure level $L_{Aeq,T}$** | Value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval T, has the same mean square sound pressure as a sound under consideration whose level varies with time. |
| **ERICA** | Environmental Risk from Ionising Contaminants: Assessment and Management. A tool used to assess the radiological risk to terrestrial, freshwater and marine plants and animals. |
| **ESC** | Environmental Safety Case. The document in which are reported the full risk assessments for the management of radioactive material at a facility. |

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| **Evaluation** | A limited programme of non-intrusive and/or intrusive fieldwork, which determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area. This may take the form of an intrusive investigation of a percentage of the site, geophysical or topographical survey. The results of this investigation will establish the requirements for any further work. |
| **Excavation** | Intrusive fieldwork with a clear purpose, which examines and records archaeological deposits, features and structures and recovers artefacts, ecofacts and other remains within a specified area or site. This will lead to both a further programme of Post Excavation and Publication and perhaps further excavation. |
| **Exposure** | The experience of coming into contact with an environmental condition that has a harmful or beneficial effect. Exposure can be either external exposure to sources outside the body or internal exposure due to sources inside the body. |
| **FE** | Forestry England. An executive agency of the Forestry Commission, responsible for managing England's forests. |
| **Fieldwalking** | A form of evaluation that provides details of surface features visible during a physical search of the site area and is a systematic observation of the ground surface during. The recovery of artefacts that may indicate periods of occupation is also an important part of this evaluation (also termed walkover survey) |
| **Free-field Level** | The sound pressure level away from reflecting surfaces. Measurements made 1.2 - 1.5 metres above the ground and at least 3.5 metres away from other reflecting surfaces are usually regarded as free-field. |
| **Geophysical Survey** | A method of seeing beneath the ground surface using a number of methodologies, including Ground Penetrating Radar (GPR), Resistivity and Magnetometry. It takes a |

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| | specialist to both use the field equipment and interpret the data. When used with topographic survey data the results can be very effective, though it is very dependent on soil and geological conditions within the search area. |
| **Groundwater** | Refers to all subsurface water as distinct from surface water. It is considered generally that groundwater is water which is in the zone of saturation and contained in porous soil or rock stratum (aquifer). |
| **ha** | Hectare. A unit of area of 10,000$m^2$. |
| **Hazardous waste** | Waste which has properties which may make it harmful to human health or the environment as defined in legislation. |
| **HDPE** | High Density Polyethylene. A highly robust, chemically resistant material use in the construction of landfill sites as well as in other containment structures. |
| **HER** | Historic environment record. A database (usually computerised and sometimes online) of all archaeological sites and find locations from a given area, usually a county, maintained by the County Council, and adopted by formal resolution. |
| **Historic England (HE)** | The government agency charged with the protection and care of the monuments and heritage resources of England |
| **HRA** | Hydrogeological Risk Assessment undertaken to ensure that the landfill will not compromise groundwater quality. |
| **Hydraulic gradient** | The change in total hydraulic head per unit distance of flow in a given direction. |
| **Hydrogeology** | The quality, quantity, storage and movement of water in rock and the interaction with geology. |
| **Hydrology** | The surface water system and its operation. |
| **In situ** | In its original place |

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| **Inert** | Materials that will not dissolve, burn or react physically or chemically or undergo biodegradation. |
| **IRR17** | The Ionising Radiation Regulations 2017 which define the standards of safety for working with radiation. |
| **Irradiation** | The act of being exposed to radiation. |
| **$L_{A10,18hr}$** | The noise level, in dB, that is exceeded 10% of the time between 0600 and 2400. |
| **Landfill gas** | An end product of the degradation of biodegradable wastes in a landfill site comprising largely methane and carbon dioxide. |
| **Landscape** | An area, as perceived by people, the character of which is the result of the action and interaction of natural and/or human factors. |
| **Landscape character** | A distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different to another, rather than better or worse. |
| **Landscape character areas (LCAs)** | These are single unique areas which are the discrete geographical areas of a particular landscape type. |
| **Landscape character assessment** | The process of identifying and describing variation in the character of the landscape and using this information to assist in managing change in the landscape. It seeks to identify and explain the unique combination of elements and features that make landscapes distinctive. The process results in the production of a Landscape Character Assessment. |
| **Landscape receptors** | Defined aspects of the landscape resource that have the potential to be affected by a proposal |
| **Landscape values** | The relative value that is attached to different landscapes by society. A landscape may be valued by different stakeholders for a whole variety of reasons. |

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| **Leachate** | Liquid which seeps through waste in a landfill and becomes contaminated by the deposited waste. The leachate is collected in a drainage layer constructed below the waste but above the basal low permeability liner in each landfill cell. |
| **Listed building** | A building that has been placed on the Statutory List of Buildings of Special Architectural or Historic Interest. In England and Wales the authority for listing is granted to the Secretary of State by the Planning (Listed Buildings and Conservation Areas) Act 1990. |
| **LLW** | Low Level Radioactive Waste. With certain specific exceptions LLW is defined as waste which has an activity concentration in the range 0.4 – 4,000 Bq/g for alpha emitters and up to 12,000 Bq/g for beta-gamma emitters. |
| **LLWR** | Low Level Waste Repository Limited |
| **LOAEL** | Lowest observed adverse effect level |
| **LVIA** | (Landscape and Visual Impact Assessment) A tool used to identify and assess the likely significance of the effects of change resulting from development both on the landscape as an environmental resource in its own right and on people's views and visual amenity. |
| **MRF** | Materials Recovery Facility |
| **mSv** | Millisievert. One thousandth of a Sievert. Dose measurement for people. |
| **µSv** | Microsieverts. One millionth of a Sievert. Dose measurement for people. |
| **µGy/hr** | Micrograys per hour. Dose measurement for plants and animals. |
| **Natura 2000** | A network of protected areas covering Europe's most valuable and threatened habitats and species |

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| **NDAWG** | National Dose Assessment Working Group. The group was established to promote the use of best practice and consistent methodologies for assessing radiation doses from discharges of radionuclides to the environment. |
| **NE** | Natural England. The government's advisor for the natural environment in England. An executive non-departmental body sponsored by the Department for Environment, Food & Rural Affairs (DEFRA). |
| **NGR** | National Grid Reference |
| **NOEL** | No observed effect level |
| **NORM** | Naturally Occurring Radioactive Material |
| **NPPF** | National Planning Policy Framework which provides the primary policy basis for planning decisions. |
| **NPSE** | Noise Policy Statement for England |
| **NS-GRA** | The Near-surface disposal facilities on land for solid radioactive wastes – Environment Agency Guidance on Requirements for Authorisation |
| **Particulates** | Extremely small particles of a substance or substances. |
| **PEA** | Preliminary Ecological Appraisal. The first stage in any ecological site assessment |
| **Permeability** | A measure of the rate at which a fluid will pass through a solid medium. |
| **$PM_{10}$** | Particulates of less than 10 micron in diameter (1 micron = one millionth of a metre or 0.001 mm). |
| **PPG** | Planning Practice Guidance |
| **PRF** | Potential (bat) Roost Features, particularly in trees |

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| **PRRA** | Prior Radiation Risk Assessment. A risk assessment carried out to identify the radiation hazards present and evaluate the extent of the risks involved. The findings are used to identify the measures and controls needed to restrict exposure to ionising radiation. |
| **Radiation** | Energy in the form of waves or particles propagated through space. |
| **Radioactivity** | The phenomenon whereby atoms undergo spontaneous random disintegration, usually accompanied by the emission of radiation. |
| **Radionuclide** | A nucleus (of an atom) that possesses properties of spontaneous disintegration (radioactivity). |
| **Rating Level $L_{Ar,Tr}$** | The specific sound level plus any adjustment for the characteristic features of the sound. |
| **Reference Time Interval, $T_r$** | The specified interval over which the specific sound level is determined. This is 1hr during the day (07:00-23:00) and a shorter period of 15 min at night (23:00-07:00). |
| **Residual Sound Level $L_{Aeq,T}$** | Ambient sound remaining at a given position in a given situation when the specific sound source is suppressed to a degree such that it does not contribute to the ambient sound. |
| **RPA** | Radiation Protection Advisor. Trained and experienced advisor on the application of IRR 2017. Augean engages the national organisation Public Health England in this role. |
| **RPE** | Respiratory Protective Equipment. |
| **RPS** | Radiation Protection Supervisor. Personnel trained to supervise work with radioactive material. |
| **RRA** | Radiation Risk Assessment. |
| **RWA** | Radioactive Waste Adviser. An RPA who gives specific advice in respect of radioactive waste. |

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| **SAC** | Special Area of Conservation designated under EU Directive to protect natural habitats and wild flora and fauna |
| **Scheduled Monument** | A 'nationally important' archaeological site or historic building, given protection against unauthorized change. The protection to scheduled monuments is given under the Ancient Monuments and Archaeological Areas Act 1979. |
| **Sievert** | Symbol Sv. The unit of effective dose and equivalent dose for people. |
| **SNIFFER** | Scotland and Northern Ireland Forum for Environmental Research. |
| **SOAEL** | Significant observed adverse effect level |
| **Sound Power Level, $L_{WA}$** | The total amount of sound energy per unit of time generated by a particular sound source independent of the acoustic environment that it is in. It is a logarithmic measure of the sound power in comparison to a specified reference level. |
| **SPA** | Special Protection Area Site of international importance for nature conservation. |
| **Specific Sound Level (also referred to as 'site noise') $L_{Aeq,Tr}$** | Sound in the neighbourhood of a site that originates from the site i.e. the sound being assessed. The equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment position over a given reference time interval. |
| **SSSI** | Site of Special Scientific Interest. Sites of national importance designated under the Wildlife and Countryside Act 1981. Sites may be designated to protect wildlife, geology or land forms. |
| **Stratigraphy** | the building block of archaeology, where careful excavation and recording determines the precise sequence of events that took place to create the deposits, cuts and features that have been uncovered. |

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| | The term is also used to describe the deposited layers of geological materials. |
| **Surface water** | Whole or part of any river, stream, other watercourse natural or artificial, lake, pond, creek, estuary or arm of the sea except for certain sewers and water mains. In effect generally all waters that are not groundwater. |
| **Sustainable Development** | Development which meets the need of current generations without compromising the ability of future generations to meet their own needs. |
| **Swallow hole** | Formed by local chemical weathering of the limestone where water accumulates around a fissure or joint in the rock. This may be underneath the soil or on the ground surface. The hollow that is formed is drained of water through the fissure or joint, but not before it has dissolved some of the limestone. |
| **Tranquillity** | A state of calm and quietude associated with peace, considered to be a significant asset of landscape. |
| **Trial trenches** | See Evaluation |
| **Visual receptors** | Individuals and/or defined groups of people who have the potential to be affected by a proposal |
| **VLLW** | Very Low Level Waste. Radioactive waste considered suitable by the regulatory body for authorised disposal, subject to specified conditions, with ordinary waste in facilities not specifically designed or authorised for radioactive waste disposal. |
| **Watching brief** | A formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons within a specified area or site on land or underwater, where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive. |

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| **ZTV** | Zone of Theoretical Visibility. A map, usually digitally produced, showing areas of land within which a development is theoretically visible. The map can be produced using either DTM (digital terrain model or 'bare ground) 3d data or DSM (digital surface model, which includes built development, woodland canopies etc. to varying levels of accuracy) 3d data, often with a 3d representation of the proposed development inserted into the model. |

# TABLES

**Table 2.1**

**Details of the ecological and geological features for designated sites in the vicinity of the application site**

**The site locations are shown on Figure 1.2**

| Site name | Designation | Reason for designation | Approximate distance from the application boundary at its closest point | Direction from the application site |
|---|---|---|---|---|
| Collyweston Great Wood and Easton Hornstocks | National Nature Reserve<br>Site of Special Scientific Interest | Largest Northamptonshire remnant of the ancient Purlieu coppices of Rockingham Forest. Large range of semi-natural woodland types, a complex mosaic of vegetation, extremely rich ground flora and many locally-rare plants provide breeding bird fauna. | Adjacent | North and East |
| Cross Leys Quarry | Regionally important Geological Site | | 1.3km | ENE |
| Bonemills Hollow | Site of Special Scientific Interest | Grassland communities of calcareous and marsh types. Additional habitats provided by scrub, willow carr and reeds enhance the value of the area for birds and invertebrates. | 1.5km | ENE |
| West Abbot's and Lound Woods | Site of Special Scientific Interest | Range of lowland woodland types many of which are scarce in Britain. A narrow strip of land holds habitats of general wildlife value including a lake and a small marsh. | 4.1km | ENE |
| Bedford Purlieus | National Nature Reserve<br>Site of Special Scientific Interest | Ancient woodland supporting a variety of woodland community types. Great diversity of herbaceous plants and associated fauna. | 2km | ESE |
| King's Cliffe Banks | Site of Special Scientific Interest | Former Quarry. Oolitic limestone grassland. A high quality, species-rich closed calcareous grassland sward has developed on the thinner soils. Neutral grassland and scrub communities are associated with deeper soils. | 2.3km | SSE |
| Fineshade Woods | Local Wildlife Site | Mixed plantation on ancient woodland site with neutral grassland and ponds. | Adjacent | W |
| Collyweston Quarry | Local Geological Site | An active quarry with important limestone formations. | 0.5km | NW |

**Table 9.1**

**Waste input (tonnes) to the waste treatment and recovery facility at ENRMF from 2015 to 2019 together with the source of the wastes by region**

| Area | 2015 | 2016 | 2017 | 2018 | 2019 | Total | % of the Total |
|---|---|---|---|---|---|---|---|
| **East Midlands** | 31,075.99 | 41,139.96 | 32,471.17 | 23,363.99 | 57,986.23 | 186,037.34 | 20.48% |
| **East of England** | 10,229.49 | 16,237.80 | 16,474.34 | 35,453.01 | 39,339.27 | 117,733.91 | 12.96% |
| **Greater London** | 40,624.42 | 31,693.63 | 18,822.82 | 39,813.28 | 45,209.45 | 176,163.60 | 19.40% |
| **North East** | 5,876.30 | 10,962.87 | 296.24 | 148.42 | 1,169.50 | 18,453.33 | 2.03% |
| **North West** | 5,160.71 | 1,966.61 | 2,273.22 | 1,750.72 | 4,733.48 | 15,884.74 | 1.75% |
| **Scotland** | 130.84 | 67.40 | 249.26 | 0 | 170.92 | 618.42 | 0.07% |
| **South East** | 25,534.98 | 27,898.31 | 26,742.76 | 28,307.52 | 24,409.92 | 132,893.49 | 14.63% |
| **South West** | 9,184.75 | 9,462.59 | 12,137.21 | 11,435.54 | 15,987.34 | 58,207.43 | 6.41% |
| **Wales** | 5,037.47 | 595.05 | 736.14 | 2,376.98 | 6,454.25 | 15,199.89 | 1.67% |
| **West Midlands** | 25,213.24 | 27,135.01 | 25,026.61 | 27,861.64 | 30,169.57 | 135,406.07 | 14.91 |
| **Yorkshire and Humberside** | 7,647.52 | 13,162.25 | 12,556.97 | 11,739.97 | 6,549.76 | 51,656.47 | 5.69 |
| **Total** | 165,715.71 | 180,321.48 | 147,786.74 | 182,251.07 | 232,179.69 | 908,254.69 | |

*Source: Annual waste returns submitted to the Environment Agency*

**Table 9.2**

**Hazardous waste input (tonnes) to the landfill site at ENRMF from 2015 to 2019 together with the source of the wastes by region**

| Area | 2015 | 2016 | 2017 | 2018 | 2019 | Total | % of the Total |
|---|---|---|---|---|---|---|---|
| **East Midlands** (note this is mostly residues from the treatment facility) | 134,052.46 | 111,217.76 | 128,204.76 | 111,286.61 | 192,575.82 | 677,337.41 | 87.81% |
| **East of England** | 13,173.04 | 10,095.02 | 2,034.87 | 1,243.30 | 1,200.18 | 27,746.41 | 3.60% |
| **Greater London** | 7,863.50 | 5,787.29 | 8,695.19 | 2,722.47 | 2,014.97 | 27,083.42 | 3.51% |
| **Hampshire** | 0 | 0 | 0 | 366.26 | 0 | 366.26 | 0.05% |
| **North East** | 11.92 | 17.04 | 0 | 0 | 0 | 28.96 | 0.004% |
| **North West** | 21.28 | 44.62 | 57.24 | 5.56 | 0 | 128.70 | 0.02% |
| **South East** | 9,198.94 | 3,792.31 | 1,041.18 | 4,350.14 | 3,286.86 | 21,669.43 | 2.81% |
| **South West** | 575.07 | 148.93 | 97.10 | 75.80 | 130.78 | 1,027.68 | 0.13% |
| **Wales** | 23.88 | 24.64 | 0 | 328.98 | 10,130.18 | 10,507.68 | 1.36% |
| **West Midlands** | 1,232.01 | 553.58 | 863.20 | 692.94 | 1,845.55 | 5,187.28 | 0.67% |
| **Yorkshire and Humberside** | 31.46 | 92.49 | 39.02 | 59.30 | 59.12 | 281.39 | 0.04% |
| **Total** | 166,183.56 | 131,773.68 | 141,032.56 | 121,131.36 | 211,243.46 | 771,364.62 | |
| **Quantity arising at the site treatment facility** | 127,777.22 | 109,554.18 | 127,734.95 | 110,211.88 | 187,442.88 | 662,721.11 | |
| **Percentage landfilled arising at the site treatment facility** | 77% | 83% | 91% | 91% | 89% | 86% | |

*Source: Annual waste returns submitted to the Environment Agency*

**Table 9.3**

**Hazardous waste produced (tonnes) in England and Wales from 2014 to 2018**

| 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|
| 5,299,474 | 5,692,442 | 5,720,776 | 5,759,886 | 5,934,059 |

*Source: https://data.gov.uk/search?filters%5Bpublisher%5D=Environment+Agency. Data tables from 2014, 2015, 2016, 2017 and 2018. [Accessed September 2020]*

**Table 9.4**

**Hazardous waste produced (tonnes) in the regions nearest to ENRMF from 2014 to 2018**

| Area | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| East Midlands | 424,530 | 479,846 | 466,975 | 574,694 | 520,404 |
| West Midlands | 483,449 | 440,374 | 451,608 | 532,041 | 579,606 |
| East of England | 554,725 | 514,917 | 463,471 | 539,933 | 533,908 |
| London | 371,272 | 538,229 | 480,607 | 317,182 | 356,360 |
| South East | 1,294,375 | 1,141,517 | 1,300,403 | 1,202,014 | 1,302,816 |
| **Total** | **3,128,351** | **3,114,882** | **3,163064** | **3,165,864** | **3,293,095** |

*Source: https://data.gov.uk/search?filters%5Bpublisher%5D=Environment+Agency. Data tables from 2014, 2015, 2016, 2017 and 2018. [Accessed September 2020]*

**Table 9.5**

**Hazardous waste disposed of (tonnes) to landfill in England from 2014 to 2018**

| 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|
| 830,928 | 935,427 | 794,201 | 741,413 | 748,083 |

*Source: https://data.gov.uk/search?filters%5Bpublisher%5D=Environment+Agency. Data tables from 2014, 2015, 2016, 2017 and 2018. [Accessed September 2020]*

**Table 9.6**

**LLW input (tonnes) to the landfill site at ENRMF from 2015 to 2020**

| 2015 | 2016 | 2017 | 2018 | 2019 | 2020 (up to 20 October) | Total |
|---|---|---|---|---|---|---|
| 3,015.24 | 1,517.00 | 5,308.00 | 10,835.00 | 14,609.49 | 5,525.64 | 40,810.37 |

**Table 9.7**

**Current and future quantities of LLW from the major producers of LLW**

| | Volume ($m^3$) | Mass (t) |
|---|---|---|
| **LLW as at 1 April 2019** | 27,340 | 38,000 |
| **Estimated future LLW arisings** | 1,450,000 | 1,800,000 |
| **Total** | 1,477,340 | 1,838,000 |

*Source: The 2019 UK Radioactive Waste Inventory. Main Report. December 2019. Department for Business, Energy & Industrial Strategy (BEIS) and the Nuclear Decommissioning Authority (NDA). Table 6*

**Table 10.1**

**Summary of the main potential exposure pathways for non-radiological contaminants associated with the landfill and treatment plant that are assessed**

| Phase | Scenarios considered | Likelihood of occurrence of scenarios considered | Potential pathway | Receptor | Comments |
|---|---|---|---|---|---|
| **Acceptance and placement of the waste in the landfill or storage prior treatment** | Direct contact with waste during receipt and placement | Low potential to occur for site workers | Direct exposure | Site workers | Exposure to workers will be minimised through the implementation of waste handling and management procedures. Operational procedures specify that all wastes are handled by machines with air-conditioned and filtered cabins and that operatives generally will not enter the operational area on foot.<br>Deposited waste will be covered with a minimum thickness of cover material over all exposed surfaces following placement.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates) daily cover material is placed over deposited wastes.* |
| | Exposure due to loose waste tipping or waste placement in a stockpile prior to treatment | Low potential to occur for site workers<br>*Unlikely to occur to members of the public.* | Inhalation | Site workers and members of the public | Waste is expected to be damp. Dust suppression will be used as necessary to control dust generation. No tipping or stockpiling will be undertaken in windy conditions. Asbestos waste is delivered in double bags which are placed directly in the landfill and covered immediately with daily cover.<br>Dusty wastes at the treatment plant are stored in silos or in enclosed containers such as drums or specifically designed bags.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates).*<br>Boundary dust and fibre monitoring will continue to be undertaken to confirm that airborne particulates and fibres at the boundary do not exceed limits set in the Environmental Permit. |
| | *Dropped waste container resulting in spillage* | *Unlikely to occur* | *Inhalation* | *Site workers and members of the public beyond the site* | *Procedures are in place and will be implemented at the site in the event that any waste is spilled from a container or a container is dropped. A water bowser is available to spray and damp down loads in the event of a spillage.* |
| | *Contamination as a result of waste entering an open wound.* | *Unlikely to occur* | *Direct contact* | *Site workers* | *Workers will wear standard protective clothing and will not in normal circumstances be expected to handle wastes directly. Workers will not normally be working with open, undressed, wounds.*<br>*The site is not open to the public.* |
| **Operational phase including waste treatment and following waste placement and covering in the landfill including capping and the aftercare period when the landfill Environmental Permit remains in place** | Direct exposure to waste during operation of the treatment facility | Low potential to occur for site workers | Direct exposure<br>Inhalation | Site workers | Exposure to workers will be minimised through the implementation of waste handling and management procedures. Operational procedures specify that all wastes are handled by machines with air-conditioned and filtered cabins. Treatment procedures include the containment of potential emissions.<br>Boundary monitoring will be carried out to ensure that the emissions do not exceed anticipated levels. |
| | Exposure to emissions of landfill gas, vapours and combustion products from the gas flare | Normally expected to occur | Inhalation of releases through the surface of the waste or from the flare stack | Site workers and members of the public beyond the site | If gas or vapours are generated they will be collected in the gas management system and directed to the landfill gas plant for combustion. The potential for lateral migration and emissions through the surface is minimised by the low permeability containment system.<br>Gaseous emissions from the treatment plant are unlikely as a result of the treatment processes carried out. Where there is the potential for emissions, controls will be implemented as specified through the Environmental Permit.<br>Emissions from the gas combustion system and direct gaseous emissions from the site are monitored routinely for comparison with agreed emission criteria. |
| | *Excavation of previously deposited waste* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation*<br>*Ingestion* | *Site workers* | *Any excavations necessary would be carried out after a full risk assessment and with appropriate precautions in place.* |

**Table 10.1**

**Summary of the main potential exposure pathways for non-radiological contaminants associated with the landfill and treatment plant that are assessed**

| Phase | Scenarios considered | Likelihood of occurrence of scenarios considered | Potential pathway | Receptor | Comments |
|---|---|---|---|---|---|
| **Acceptance and placement of the waste in the landfill or storage prior treatment** | Direct contact with waste during receipt and placement | Low potential to occur for site workers | Direct exposure | Site workers | Exposure to workers will be minimised through the implementation of waste handling and management procedures. Operational procedures specify that all wastes are handled by machines with air-conditioned and filtered cabins and that operatives generally will not enter the operational area on foot.<br>Deposited waste will be covered with a minimum thickness of cover material over all exposed surfaces following placement.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates) daily cover material is placed over deposited wastes.* |
| | Exposure due to loose waste tipping or waste placement in a stockpile prior to treatment | Low potential to occur for site workers<br>*Unlikely to occur to members of the public.* | Inhalation | Site workers and members of the public | Waste is expected to be damp. Dust suppression will be used as necessary to control dust generation. No tipping or stockpiling will be undertaken in windy conditions. Asbestos waste is delivered in double bags which are placed directly in the landfill and covered immediately with daily cover.<br>Dusty wastes at the treatment plant are stored in silos or in enclosed containers such as drums or specifically designed bags.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates).*<br>Boundary dust and fibre monitoring will continue to be undertaken to confirm that airborne particulates and fibres at the boundary do not exceed limits set in the Environmental Permit. |
| | *Dropped waste container resulting in spillage* | *Unlikely to occur* | *Inhalation* | *Site workers and members of the public beyond the site* | *Procedures are in place and will be implemented at the site in the event that any waste is spilled from a container or a container is dropped. A water bowser is available to spray and damp down loads in the event of a spillage.* |
| | *Contamination as a result of waste entering an open wound.* | *Unlikely to occur* | *Direct contact* | *Site workers* | *Workers will wear standard protective clothing and will not in normal circumstances be expected to handle wastes directly. Workers will not normally be working with open, undressed, wounds.*<br>*The site is not open to the public.* |
| | Leachate collection and processing | Normally expected to occur | Direct exposure<br>Ingestion<br>Inhalation | Site workers at the processing plant and members of the public in contact with the treated discharges | Leachate is extracted and stored at the site prior to its use as part of the waste treatment process during which the containment process principles the subject of the Environmental Permit are applied. Excess leachate is exported from the site to a facility which itself is the subject of an Environmental Permit and therefore appropriate emission controls will be implemented through the permit for that facility.<br>Leachate quality is monitored regularly. |
| | *Leachate spillage off site* | *Unlikely to occur* | *Direct exposure*<br>*Ingestion*<br>*Inhalation* | *Members of the public* | *If leachate was spilled to land during management on site or during transport appropriate clean up measures would be undertaken. If leachate is spilled on site it will be contained in the site surface water management system (see below)* |
| | *Fire at the site* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation* | *Site workers and members of the public beyond the site* | *The waste acceptance criteria for the hazardous waste landfill exclude material with an organic carbon content above 6% and flammable wastes are prohibited from all landfill sites. There is no limit on the organic carbon content for wastes accepted at the treatment plant but flammable wastes are not accepted. Emergency procedures are in place in the unlikely event of a fire and the landfill containment system or the surface water management system in place in the other areas of the site will contain firefighting water on site.* |

**Table 10.1**

**Summary of the main potential exposure pathways for non-radiological contaminants associated with the landfill and treatment plant that are assessed**

| Phase | Scenarios considered | Likelihood of occurrence of scenarios considered | Potential pathway | Receptor | Comments |
|---|---|---|---|---|---|
| **Acceptance and placement of the waste in the landfill or storage prior treatment** | Direct contact with waste during receipt and placement | Low potential to occur for site workers | Direct exposure | Site workers | Exposure to workers will be minimised through the implementation of waste handling and management procedures. Operational procedures specify that all wastes are handled by machines with air-conditioned and filtered cabins and that operatives generally will not enter the operational area on foot.<br>Deposited waste will be covered with a minimum thickness of cover material over all exposed surfaces following placement.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates) daily cover material is placed over deposited wastes.* |
| | Exposure due to loose waste tipping or waste placement in a stockpile prior to treatment | Low potential to occur for site workers<br>*Unlikely to occur to members of the public.* | Inhalation | Site workers and members of the public | Waste is expected to be damp. Dust suppression will be used as necessary to control dust generation. No tipping or stockpiling will be undertaken in windy conditions. Asbestos waste is delivered in double bags which are placed directly in the landfill and covered immediately with daily cover.<br>Dusty wastes at the treatment plant are stored in silos or in enclosed containers such as drums or specifically designed bags.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates).*<br>Boundary dust and fibre monitoring will continue to be undertaken to confirm that airborne particulates and fibres at the boundary do not exceed limits set in the Environmental Permit. |
| | *Dropped waste container resulting in spillage* | *Unlikely to occur* | *Inhalation* | *Site workers and members of the public beyond the site* | *Procedures are in place and will be implemented at the site in the event that any waste is spilled from a container or a container is dropped. A water bowser is available to spray and damp down loads in the event of a spillage.* |
| | *Contamination as a result of waste entering an open wound.* | *Unlikely to occur* | *Direct contact* | *Site workers* | *Workers will wear standard protective clothing and will not in normal circumstances be expected to handle wastes directly. Workers will not normally be working with open, undressed, wounds.*<br>*The site is not open to the public.* |
| | Migration to public water supply via groundwater | Low potential to occur | Direct exposure Ingestion | People using abstracted water | As no material is completely impermeable small amounts of leachate may permeate through the low permeability liner. The liner is designed and constructed so that any permeation is at an acceptable level determined by the hydrogeological risk assessment and specified in the Environmental Permit. A quantitative risk assessment is carried out to demonstrate to the Environment Agency that the risks are sufficiently low. The risk assessment is reviewed regularly.<br>The treatment plant is located on a low permeability hardstanding with integrated surface water collection sump.<br>Groundwater monitoring is carried out routinely and the results are compared with trigger levels set in the Environmental Permit. |
| | Migration from the site via surface water runoff | Low potential to occur | Direct exposure Ingestion | People using surface water | A surface water management plan is in place for the current site and will be extended for the proposed extension area. Currently there is no discharge of surface water from the site even though a discharge consent is in place. Prior to the discharge of any surface water from the consented location it will need to be demonstrated that the quality meets the discharge criteria set in the Environmental Permit. Surface water quality at and around the site is monitored regularly. |

**Table 10.1**

**Summary of the main potential exposure pathways for non-radiological contaminants associated with the landfill and treatment plant that are assessed**

| Phase | Scenarios considered | Likelihood of occurrence of scenarios considered | Potential pathway | Receptor | Comments |
|---|---|---|---|---|---|
| **Acceptance and placement of the waste in the landfill or storage prior treatment** | Direct contact with waste during receipt and placement | Low potential to occur for site workers | Direct exposure | Site workers | Exposure to workers will be minimised through the implementation of waste handling and management procedures. Operational procedures specify that all wastes are handled by machines with air-conditioned and filtered cabins and that operatives generally will not enter the operational area on foot.<br>Deposited waste will be covered with a minimum thickness of cover material over all exposed surfaces following placement.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates) daily cover material is placed over deposited wastes.* |
| | Exposure due to loose waste tipping or waste placement in a stockpile prior to treatment | Low potential to occur for site workers<br>*Unlikely to occur to members of the public.* | Inhalation | Site workers and members of the public | Waste is expected to be damp. Dust suppression will be used as necessary to control dust generation. No tipping or stockpiling will be undertaken in windy conditions. Asbestos waste is delivered in double bags which are placed directly in the landfill and covered immediately with daily cover.<br>Dusty wastes at the treatment plant are stored in silos or in enclosed containers such as drums or specifically designed bags.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates).*<br>Boundary dust and fibre monitoring will continue to be undertaken to confirm that airborne particulates and fibres at the boundary do not exceed limits set in the Environmental Permit. |
| | *Dropped waste container resulting in spillage* | *Unlikely to occur* | *Inhalation* | *Site workers and members of the public beyond the site* | *Procedures are in place and will be implemented at the site in the event that any waste is spilled from a container or a container is dropped. A water bowser is available to spray and damp down loads in the event of a spillage.* |
| | *Contamination as a result of waste entering an open wound.* | *Unlikely to occur* | *Direct contact* | *Site workers* | *Workers will wear standard protective clothing and will not in normal circumstances be expected to handle wastes directly. Workers will not normally be working with open, undressed, wounds.*<br>*The site is not open to the public.* |
| | *Exposure of wildlife* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation*<br>*Ingestion* | *Various species* | *Immediately after placement all waste is covered with non-hazardous material. The operational landfill and treatment plant are not attractive environments for wildlife. The waste types deposited in the landfill and treated at the site do not comprise a food source for wildlife.*<br>*Following completion of landfilling in any cell or phase an engineered capping layer and restoration soils are placed. The waste has a minimum 1m thickness of suitable cover material above a 1m capping layer and 0.3m cap protection layer. The compacted, engineered clay capping layer is not conducive to burrowing animals.*<br>*Boundary monitoring is carried out to ensure that the emissions do not exceed anticipated levels.* |
| | *Recreational user of the site* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation* | *Members of the public* | *Following completion of the treatment activities at the site all the plant and infrastructure will be removed and the area will be landfilled.*<br>*Following completion of landfilling an engineered capping layer and restoration soils are placed before public access is allowed to the restored site. The waste has a minimum 1m thickness of suitable cover material above a 1m capping layer and 0.3m cap protection layer.* |
| | *Exposure due to groundwater contamination following deterioration of the containment system* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation*<br>*Ingestion* | *Members of the public* | *As leachate level monitoring will continue following completion of filling, capping and placement of the restoration materials, leachate levels will be controlled as necessary. The control of leachate levels at the site will continue until it is considered by the Environment Agency that the landfill is unlikely to present a significant risk to the environment if leachate management ceases. The Environmental* |

**Table 10.1**

**Summary of the main potential exposure pathways for non-radiological contaminants associated with the landfill and treatment plant that are assessed**

| Phase | Scenarios considered | Likelihood of occurrence of scenarios considered | Potential pathway | Receptor | Comments |
|---|---|---|---|---|---|
| **Acceptance and placement of the waste in the landfill or storage prior treatment** | Direct contact with waste during receipt and placement | Low potential to occur for site workers | Direct exposure | Site workers | Exposure to workers will be minimised through the implementation of waste handling and management procedures. Operational procedures specify that all wastes are handled by machines with air-conditioned and filtered cabins and that operatives generally will not enter the operational area on foot.<br>Deposited waste will be covered with a minimum thickness of cover material over all exposed surfaces following placement.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates) daily cover material is placed over deposited wastes.* |
| | Exposure due to loose waste tipping or waste placement in a stockpile prior to treatment | Low potential to occur for site workers<br>*Unlikely to occur to members of the public.* | Inhalation | Site workers and members of the public | Waste is expected to be damp. Dust suppression will be used as necessary to control dust generation. No tipping or stockpiling will be undertaken in windy conditions. Asbestos waste is delivered in double bags which are placed directly in the landfill and covered immediately with daily cover.<br>Dusty wastes at the treatment plant are stored in silos or in enclosed containers such as drums or specifically designed bags.<br>*The site is not open to the public during the operational period. Site security is in place to deter trespassers (boundary vegetation, fencing, locked gates).*<br>Boundary dust and fibre monitoring will continue to be undertaken to confirm that airborne particulates and fibres at the boundary do not exceed limits set in the Environmental Permit. |
| | *Dropped waste container resulting in spillage* | *Unlikely to occur* | *Inhalation* | *Site workers and members of the public beyond the site* | *Procedures are in place and will be implemented at the site in the event that any waste is spilled from a container or a container is dropped. A water bowser is available to spray and damp down loads in the event of a spillage.* |
| | *Contamination as a result of waste entering an open wound.* | *Unlikely to occur* | *Direct contact* | *Site workers* | *Workers will wear standard protective clothing and will not in normal circumstances be expected to handle wastes directly. Workers will not normally be working with open, undressed, wounds.*<br>*The site is not open to the public.* |
| **Following the completion of the site activities including beyond the period of the Environmental Permit when there are no management controls in place** | *Leachate migration to groundwater due to overtopping* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation*<br>*Ingestion* | *Members of the public* | *Permit for landfill sites cannot be surrendered until the Environment Agency consider that the site no longer presents a potential significant risk to the environment and human health including groundwater. On this basis the potential for escape of leachate through a degraded liner or the overtopping of leachate at a stage when the leachate could have an unacceptable impact on the environment is very unlikely to occur.*<br>*There are no groundwater abstractions close to the site.* |
| | *Exposure of people as a result of houses built directly on the site and the growing and consumption of vegetables* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation*<br>*Ingestion* | *Members of the public* | *The Environmental Permit cannot be surrendered unless the Environment Agency is satisfied that the low permeability capping layer and overlying soils have been installed in accordance with the agreed design and that the emissions from the site are in accordance with specified criteria. Construction of housing is very unlikely on reclaimed land that has been subject to land raise.* |
| | *Inadvertent excavation and intrusion into the waste* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation*<br>*Ingestion* | *Future site worker/ Members of the public* | *Records will be maintained of the location of hazardous waste at the site. Any excavation into the site would encounter the cap placed over the waste and visually obvious waste types and containers therefore it would be highly likely the presence of waste would be recognised and excavations would cease at an early stage.* |

**Table 10.2**

**Summary of the main potential exposure pathways for radioactive emissions associated with the landfill of LLW that are assessed**

| Phase | Scenarios considered | Likelihood of occurrence of scenarios considered | Potential pathway | Receptor | Comments |
|---|---|---|---|---|---|
| **Acceptance and placement of the waste** | Direct exposure to waste during receipt and placement | Normally expected to occur | Direct exposure | Site workers and members of the public beyond the site | Exposure to workers will be minimised through the implementation of waste handling and management procedures. Operational procedures specify that all wastes are handled by machines with air-conditioned and filtered cabins and that operatives generally will not enter the operational area on foot.<br>Most LLW will be delivered to the landfill in containers or packages. LLW is only accepted when the activity level 1m from any package face (or covered loose waste) is less than 10μSv/hr. The LLW waste will be covered with a minimum thickness of 300mm of suitable cover material over all exposed surfaces. The emissions at 1m above from the top of the cover material will be monitored to confirm they are less than 2μSv/hr. Additional cover material will be added immediately if necessary in order to ensure that the criterion is not exceeded.<br>The site is not open to the public. |
| | Exposure due to loose waste tipping | Normally expected to occur | Inhalation | Site workers and members of the public beyond the site | Waste is expected to be damp. Dust suppression will be used as necessary. No tipping will be undertaken in windy conditions. |
| | *Dropped waste container resulting in spillage* | *Unlikely to occur* | *Inhalation* | *Site workers and members of the public beyond the site* | *Procedures are in place and will be implemented at the site in the event that any waste is spilled from a container or a container is dropped. A water bowser is available to spray and damp down loads in the event of a spillage. A risk assessment will be carried out to demonstrate that the risks from exposure as a result of a dropped load would not be unacceptable.* |
| | *Contamination as a result of waste entering an open wound.* | *Unlikely to occur* | *Direct contact* | *Site workers* | *Workers will wear standard protective clothing and will not in normal circumstances be expected to handle wastes directly. Workers will not normally be working with open, undressed, wounds.*<br>*A risk assessment will be carried out to demonstrate that the risks from exposure would not be unacceptable.*<br>*The site is not open to the public.* |
| **Operational phase following waste placement and covering including capping and the aftercare period when the Environmental Permit remains in place** | Direct exposure to emissions from landfilled waste through cover materials | Normally expected to occur | Direct exposure | Site workers and members of the public beyond the site | Immediately after placement all waste is covered with non-hazardous material. The LLW waste will be covered with a minimum thickness of 300mm of suitable cover material over all exposed surfaces. The emissions at 1m above the top of the cover material will be monitored to confirm they are less than 2μSv/hr. Additional cover material will be added immediately if necessary in order to ensure that the criterion is not exceeded.<br>A risk assessment will be carried out to demonstrate that the risks from exposure would not be unacceptable.<br>The site is not open to the public.<br>Boundary monitoring is carried out to ensure that the emissions do not exceed anticipated levels. |
| | Gas emissions | Normally expected to occur | Inhalation of releases through the surface of the waste or from the flare stack | Site workers and members of the public beyond the site | If gas or vapours are generated they will be collected in the gas management system and directed to the landfill gas plant for combustion. Emissions from the gas combustion system and direct gaseous emissions from the site are monitored routinely for comparison with agreed emission criteria. The potential for lateral migration and emissions through the surface is minimised by the low permeability containment system.<br>A risk assessment will be carried out to demonstrate that there will be no unacceptable risks from exposure to gaseous emissions. |
| | *Cell excavation* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation*<br>*Ingestion* | *Site workers* | *Any excavations necessary would be carried out after a full risk assessment and with appropriate precautions in place. LLW will not be deposited within 2m of the side liner or within 1m of the capping layer.* |

**Table 10.2**

**Summary of the main potential exposure pathways for radioactive emissions associated with the landfill of LLW that are assessed**

| Phase | Scenarios considered | Likelihood of occurrence of scenarios considered | Potential pathway | Receptor | Comments |
|---|---|---|---|---|---|
| | Leachate processing off site | Normally expected to occur | Direct exposure<br>Ingestion<br>Inhalation | Site workers at the processing plant and members of the public in contact with the treated discharges | Leachate is extracted and stored at the site prior to its use as part of the waste treatment process during which the containment process principles the subject of the Environmental Permit are applied. Excess leachate is exported from the site to a facility which itself is the subject of an Environmental Permit and therefore appropriate emission controls will be implemented through the permit for that facility.<br>Leachate would not be dispatched to an off-site treatment plant without a full assessment of the risks so that appropriate controls can be applied. |
| | *Leachate spillage off site* | *Unlikely to occur* | *Direct exposure*<br>*Ingestion*<br>*Inhalation* | *Members of the public* | *If leachate was spilled to land during transport appropriate clean up measures would be undertaken.* |
| | *Fire at the site* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation* | *Site workers and members of the public beyond the site* | *The waste acceptance criteria for the hazardous waste landfill exclude material with an organic carbon content above 6% and flammable wastes are prohibited from all landfill sites. Emergency procedures are in place in the unlikely event of a fire and the landfill containment system or the surface water management system in place in the other areas of the site will contain firefighting water on site.* |
| | *Migration to public water supply via groundwater* | *Unlikely to occur* | *Ingestion* | *People using abstracted water* | *As no material is completely impermeable small amounts of leachate may permeate through the low permeability liner. The liner is designed and constructed so that any permeation is at an acceptable level determined by the hydrogeological risk assessment and specified in the Environmental Permit. A quantitative risk assessment will be carried out to demonstrate to the Environment Agency that the risks are sufficiently low* |
| | Exposure of wildlife | Normally expected to occur | Direct exposure<br>Inhalation<br>Ingestion | Various species | Immediately after placement all waste is covered with non-hazardous material. The LLW waste will be covered with a minimum thickness of 300mm of suitable cover material over all exposed surfaces. The emissions from the top of the cover material will be monitored to confirm they are less than 2µSv/hr at 1m above the ground. Additional cover material will be added immediately if necessary in order to ensure that the criterion is not exceeded. The operational landfill and treatment plant are not attractive environments for wildlife. The waste types deposited in the landfill and treated at the site do not comprise a food source for wildlife.<br>Following completion of landfilling in any cell or phase an engineered capping layer and restoration soils are placed. The waste has a minimum 1m thickness of suitable cover material above a 1m capping layer and 0.3m cap protection layer. The compacted, engineered clay capping layer is not conducive to burrowing animals.<br>Boundary monitoring is carried out to ensure that the emissions do not exceed anticipated levels.<br>A quantitative risk assessment will be carried out to demonstrate to the Environment Agency that the risks are sufficiently low. |
| **Following the surrender of the Environmental Permit when there are no management controls in place** | Recreational user of the site | Normally expected to occur | Direct exposure<br>Inhalation | Members of the public | The waste has a minimum 1m thickness of suitable cover material above a 1m capping layer and 0.3m cap protection layer. A quantitative risk assessment will be carried out to demonstrate to the Environment Agency that the risks are sufficiently low. |
| | *Exposure due to groundwater contamination following deterioration of the containment system* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation*<br>*Ingestion* | *Members of the public* | *As leachate level monitoring will continue following completion of filling, capping and placement of the restoration materials, leachate levels will be controlled as necessary. The control of leachate levels at the site will continue until it is considered by the Environment Agency that the landfill is unlikely to present a significant risk to the environment if leachate management ceases. The Environmental Permit for landfill sites cannot be surrendered until the Environment Agency consider that the site no longer presents a potential significant risk to the environment and human health including groundwater. On this basis the potential for escape of leachate through a degraded liner or the overtopping of leachate at a stage when the leachate could have an unacceptable impact on the environment is very unlikely to occur.*<br>*There are no groundwater abstractions close to the site.*<br>*A quantitative risk assessment will be carried out to demonstrate to the Environment Agency that the risks are sufficiently low.* |
| | *Leachate migration to groundwater due to overtopping* | *Unlikely to occur* | *Direct exposure*<br>*Inhalation*<br>*Ingestion* | *Members of the public* | |

**Table 10.2**

**Summary of the main potential exposure pathways for radioactive emissions associated with the landfill of LLW that are assessed**

| Phase | Scenarios considered | Likelihood of occurrence of scenarios considered | Potential pathway | Receptor | Comments |
|---|---|---|---|---|---|
| | *Exposure of people as a result of houses built directly on the site and the growing and consumption of vegetables* | *Unlikely to occur* | *Direct exposure Inhalation Ingestion* | *Members of the public* | *The Environmental Permit cannot be surrendered unless the Environment Agency is satisfied that the low permeability capping layer and overlying soils have been installed in accordance with the agreed design and that the emissions from the site are in accordance with specified criteria. Construction of housing is very unlikely on reclaimed land that has been subject to land raise.*<br>*A quantitative risk assessment will be carried out to demonstrate to the Environment Agency that the risks are sufficiently low.* |
| | *Inadvertent excavation and intrusion into the waste* | *Unlikely to occur* | *Direct exposure Inhalation Ingestion* | *Future site worker/ Members of the public* | *Records will be maintained of the location of LLW at the site. Any excavation into the site would encounter the cap placed over the waste and visually obvious waste types and containers therefore it would be highly likely the presence of waste would be recognised and excavations would cease at an early stage.*<br>*A quantitative risk assessment will be carried out to demonstrate to the Environment Agency that the risks are sufficiently low* |
| | *Exposure of people running a smallholding on site* | *Unlikely to occur* | *Direct exposure Inhalation Ingestion* | *Members of the public* | *The Environmental Permit cannot be surrendered unless the Environment Agency is satisfied that the low permeability capping layer and overlying soils have been installed in accordance with the agreed design and that the emissions from the site are in accordance with specified criteria.*<br>*Records will be maintained of the location of LLW at the site. Any excavation into the site would encounter the cap placed over the waste and visually obvious waste types and containers therefore it would be highly likely the presence of waste would be recognised and excavations would cease at an early stage.*<br>*A quantitative risk assessment will be carried out to demonstrate to the Environment Agency that the risks are sufficiently low.* |

**Table 10.3**
**Radioactivity exposure limits compared with natural radiation and more familiar exposure situations**

| Item | Radioactivity Average annual or event dose | Source document |
|---|---|---|
| **EXPOSURE LIMITS** | | |
| Legal dose limit for workers (UK) | 20 mSv/yr | The Ionising Radiations Regulations 2017 (Statutory Instrument 2017 No. 1075) |
| Legal dose limit for the public (UK) | 1 mSv/yr | The Ionising Radiations Regulations 2017 (Statutory Instrument 2017 No. 1075) and The Environmental Permitting (England and Wales) Regulations 2016[74] |
| Design Dose criterion for exposure of workers for the landfill sites | 1mSv/yr | Design Dose criterion for workers at the landfill sites for routine operational activities. |
| Other constraint for the public from a single source | 0.3 mSv/yr | Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom. March 2007, Defra and devolved administrations and The Environmental Permitting (England and Wales) Regulations 2016 (Statutory Instrument 2016/115). |
| Other constraint for the public from a single site | 0.5 mSv/yr | Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom. March 2007, Defra and devolved administrations and The Environmental Permitting (England and Wales) Regulations 2016 (Statutory Instrument 2016/115) |
| Design Dose criterion for exposure of members of the public for the landfill sites | 0.3 mSv/yr | Design Dose criterion for exposure of members of the public as a result of routine operational activities during the management period. |
| | 0.02mSv/yr | Design Dose criterion for exposure of all persons following the management period. |
| | 3mSv/yr | Design Dose criterion for exposure of all persons as a result of intrusion following the management period. For intrusion events a dose of 3mSv/yr is used which is at the lower end of the guidance dose range of 3mSv/yr to 20mSv/yr allowed in the guidance for intrusion events. |

[74] Schedule 23 Part 4 Section 1 Paragraph 1b references the legal limits in the EU Basic Safety Standards (Article 13, Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom). The BSS Directive refers in turn to Section (Table) 2.3 of ICRP Publication 116

| Item | Radioactivity Average annual or event dose | Source document |
|---|---|---|
| ***Note:*** *Design Dose criteria are adopted for normal operational activities as well as for accidents. The adopted design dose criterion for each circumstance is either the legal dose limit, the relevant dose constraint specified in legislation or regulatory guidance or a dose level proposed by Augean which is lower (ie more protective) than the dose constraint specified in legislation or regulatory guidance and which is achievable based on the proposed activities and waste types to be accepted.* | | |
| **NATURAL RADIATION** | | |
| Average annual exposure of UK population to radiation | 2.7 mSv/yr | Ionising Radiation Exposure of the UK Population: 2010 review Public Health England (2016). (PHE-CRCE-026) |
| The average annual exposure in Northamptonshire from natural sources | 3.6 mSv/yr | Ionising radiation exposure of the UK population: 2005 review. Watson S.J., Jones A.L., Oatway W.B. and Hughes J.S. (2005) HPA-RPD-001. Didcot, Oxfordshire. |
| Average annual exposure of UK population from background sources | 2.3 mSv/yr | Ionising Radiation Exposure of the UK Population: 2010 review Public Health England (2016). (PHE-CRCE-026) |
| Average annual exposure in Cornwall from natural sources | 6.9 mSv/yr | Public Health England (2011) Ionising radiation: dose comparisons. https://www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons |
| **COMPARATIVE DOSES** | | |
| Food; for example 100g of Brazil nuts | 0.01 mSv | Ionising Radiation Exposure of the UK Population: 2010 review Public Health England (2016). (PHE-CRCE-026) |
| Chest x-ray | 0.014mSv | Public Health England (2011) Ionising radiation: dose comparisons. https://www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons |
| Dental x-ray | 0.005 mSv | Public Health England (2011) Ionising radiation: dose comparisons. https://www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons |
| London to US return flight | 0.08 mSv | Ionising Radiation Exposure of the UK Population: 2010 review Public Health England (2016). (PHE-CRCE-026) |
| CT scan of chest | 6.6 mSv | Public Health England (2011) Ionising radiation: dose comparisons. https://www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons |
| UK action level for Radon in homes | 200Bq/$m^3$ (equivalent to 10mSv/y) | Health Protection Agency. 2010. Limitation of human exposure to radon in homes. RCE 15.<br><br>Supporting Target Level of 100Bq/$m^3$ |

**Table 19.1**

**2011 baseline noise survey summary data**

| Location | Daytime (0700 - 1900) | | | Evening (1900 - 2200) | | | Night-time (2200 - 0700) | | |
|---|---|---|---|---|---|---|---|---|---|
| | $L_{Aeq}$ dB | $L_{A90}$ dB | $L_{Amax}$ dB | $L_{Aeq}$ dB | $L_{A90}$ dB | $L_{Amax}$ dB | $L_{Aeq}$ dB | $L_{A90}$ dB | $L_{Amax}$ dB |
| Westhay Cottages and Farm | 54 | 40 | 78 | 48 | 30 | 79 | 48 | 31 | 80 |
| Westhay Lodge | 49 | 33 | 78 | 47 | 28 | 73 | 42 | 26 | 81 |
| Cuckoo Lodge | 60 | 50 | 81 | 58 | 43 | 73 | 55 | 35 | 82 |
| Duddington Village | 53 | 46 | 76 | 50 | 39 | 78 | 50 | 38 | 77 |

**Table 19.2**

**Calculated sound power levels based on measurements of plant and activities at the existing ENRMF site (July 2020)**

| Noise Source | Measured Sound Pressure Level dB(A) | Calculated Sound Power Level dB(A) |
|---|---|---|
| Excavator loading dumptruck | $L_{Aeq}$ 72.1 at 20m | 106.1 |
| Dozer | $L_{Aeq}$ 83.6 at 5m | 105.6 |
| Tanker Compressor | $L_{Aeq}$ 82.1 at 5m | 104.0 |
| 360 Excavator loading HGV | $L_{Aeq}$ 76.0 at 10m | 103.8 |
| Loading Ash Hopper with telehandler | $L_{Aeq}$ 75.1 at 10m | 103.0 |
| Dumptruck (movements) | $L_{Amax}$ 74.9 at 10m | 102.9 |
| Soil Plant (Treatment) | $L_{Aeq}$ 73.3 at 10m | 101.3 |
| Loading Shovel Loading Dumptruck | $L_{Aeq}$ 73.4 at 10m | 101.1 |
| Tipping of materials | $L_{Aeq}$ 72.2 at 10m | 100.3 |
| Road Lorry (movements) | $L_{Amax}$ 71.0 at 10m | 99.0 |
| Telehandler (Unloading) | $L_{Aeq}$ 70.2 at 10m | 98.2 |
| Dust Suppression Unit (Cannon) | $L_{Aeq}$ 70.3 at 10m | 98.2 |
| Generator | $L_{Aeq}$ 76.1 at 5m | 98.1 |
| Leachate Pump | $L_{Aeq}$ 72.7 at 5m | 94.9 |
| HGV manoeuvring on weighbridge | $L_{Aeq}$ 66.3 at 10m | 94.3 |
| Plant 4 (Treatment) | $L_{Aeq}$ 71.7 at 5m | 93.7 |
| Wheelwash | $L_{Aeq}$ 70.5 at 5m | 92.6 |
| Wheelwash Pump | $L_{Aeq}$ 74.5 at 3m | 91.8 |
| Wheelwash Generator | $L_{Aeq}$ 68.3 at 5m | 90.5 |
| Laboratory Extract Plant | $L_{Aeq}$ 65.3 at 4m | 85.5 |
| HGV idling on weighbridge | $L_{Aeq}$ 62.0 at 5m | 84.0 |

**Table 19.3**

**Initial estimate of noise impact during the daytime (BS 4142)**

| Assessment Location | Daytime Background Sound Level ($L_{A90,15min}$ dB) | Specific Sound Level ($L_{Aeq,1h}$ dB) | Acoustic Feature Correction (dB) | Rating Level ($L_{Ar,Tr}$ dB) | Initial Estimate<br>Excess of rating over background sound level (dB) |
|---|---|---|---|---|---|
| Westhay Cottages | 40 | 40 | 0 | 40 | **0** |
| Westhay Farm | 40 | 44 | 0 | 44 | **+4** |
| Westhay Lodge | 33 | 39 | 0 | 39 | **+6** |
| Cuckoo Lodge | 50 | 40 | 0 | 40 | **-10** |
| Duddington Village | 46 | 31 | 0 | 31 | **-15** |

**Table 19.4**

**Initial estimate of noise impact during the night-time (BS 4142)**

| Assessment Location | Night-time Background Sound Level ($L_{A90,15min}$ dB) | Specific Sound Level ($L_{Aeq,15min}$ dB) | Acoustic Feature Correction (dB) | Rating Level ($L_{Ar,Tr}$ dB) | Initial Estimate<br>Excess of rating over background sound level (dB) |
|---|---|---|---|---|---|
| Westhay Cottages | 31 | 20 | 0 | 20 | **-9** |
| Westhay Farm | 31 | 24 | 0 | 24 | **-7** |
| Westhay Lodge | 26 | 23 | 0 | 23 | **-3** |
| Cuckoo Lodge | 35 | 25 | 0 | 25 | **-10** |
| Duddington Village | 38 | 19 | 0 | 19 | **-19** |

**Table 20.1**

**Estimated concentrations of air quality parameters around ENRMF for 2019**

| | $PM_{2.5}$ | $PM_{10}$ | $NO_2$ | $NO_x$ |
|---|---|---|---|---|
| **Average concentrations around ENRMF[75] (annual mean)** | 9.29 µg/m³ | 15.45 µg/m³ | 8.39 µg/m³ | 10.92 µg/m³ |
| **National Air Quality Objective concentration[76] for the protection of human health (annual mean)** | 25 µg/m³ | 40 µg/m³ | 40 µg/m³ | 30 µg/m³ (target value for the protection of vegetation and ecosystems) |

[75] DEFRA (2020) UK Ambient Air Quality Interactive Map https://uk-air.defra.gov.uk/data/gis-mapping

[76] DEFRA (2020) National Air Quality Objectives https://uk-air.defra.gov.uk/assets/documents/Air_Quality_Objectives_Update.pdf

**Table 21.1**

**Summary dry hours wind data for 2000 to 2019 from the Wittering weather station located approximately 3.3km north east of the proposed development**

| Mean wind speed (m/s) | True wind direction (% of the total dry hours) | | | | | | | | | | | | | | | | All observations |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N | NNE | NE | ENE | E | ESE | SE | SSE | S | SSW | SW | WSW | W | WNW | NW | NNW | |
| 0 | | | | | | | | | | | | | | | | | 0.975% |
| 0.5 to 2 | 0.552% | 0.381% | 0.344% | 0.324% | 0.467% | 0.527% | 0.735% | 0.701% | 0.924% | 0.533% | 0.527% | 0.470% | 0.584% | 0.382% | 0.382% | 0.335% | 8.168% |
| 2 to 3 | 1.045% | 0.807% | 0.677% | 0.600% | 0.631% | 0.679% | 0.796% | 0.762% | 1.190% | 0.911% | 0.800% | 0.871% | 1.283% | 0.899% | 0.755% | 0.684% | 13.391% |
| 3 to 4 | 1.405% | 1.035% | 0.862% | 0.759% | 0.584% | 0.488% | 0.560% | 0.602% | 1.407% | 1.202% | 1.023% | 1.365% | 2.476% | 1.170% | 1.056% | 0.902% | 16.895% |
| 4 to 5 | 1.223% | 0.997% | 0.831% | 0.658% | 0.434% | 0.337% | 0.368% | 0.458% | 1.300% | 1.337% | 1.134% | 1.656% | 2.497% | 1.138% | 1.077% | 0.821% | 16.264% |
| 5 to 7 | 1.291% | 1.276% | 1.213% | 0.767% | 0.412% | 0.359% | 0.265% | 0.602% | 2.153% | 2.470% | 2.489% | 3.398% | 3.046% | 1.745% | 1.179% | 0.919% | 23.584% |
| 7 to 9 | 0.321% | 0.363% | 0.549% | 0.269% | 0.117% | 0.050% | 0.048% | 0.226% | 1.066% | 1.771% | 1.839% | 2.114% | 1.673% | 0.882% | 0.350% | 0.278% | 11.915% |
| Equal to or greater than 9 | 0.063% | 0.071% | 0.182% | 0.115% | 0.017% | 0.009% | 0.002% | 0.050% | 0.566% | 1.353% | 1.402% | 1.299% | 1.274% | 0.391% | 0.083% | 0.061% | 6.939% |
| Missing/Incomplete | | | | | | | | | | | | | | | | | 1.868% |
| All observations | 5.901% | 4.930% | 4.657% | 3.491% | 2.662% | 2.448% | 2.774% | 3.401% | 8.607% | 9.577% | 9.215% | 11.172% | 12.833% | 6.607% | 4.883% | 4.000% | 100.000% |
| % year wind between 0.5-5m/s | 4.22% | 3.22% | 2.71% | 2.34% | 2.12% | 2.03% | 2.46% | 2.52% | 4.82% | 3.98% | 3.48% | 4.36% | 6.84% | 3.59% | 3.27% | 2.74% | 54.718% |
| % year wind greater than 5m/s | 1.68% | 1.71% | 1.94% | 1.15% | 0.55% | 0.42% | 0.32% | 0.88% | 3.79% | 5.59% | 5.73% | 6.81% | 5.99% | 3.02% | 1.61% | 1.26% | 42.439% |

**Notes:** The true wind direction is the direction from which the wind is blowing

The percentage of days with calm wind is 0.98%

There is missing data for 1.87% of the days

Average wind speed is 4.84 m/s

**Table 21.2**

**Summary of the risk of potential dust disamenity effects at specific receptors within 400m of the site without operational controls in place**
*The receptor locations are shown on Figure 21.1*

| Receptor details and location | | Approximate location relative to nearest dust source | Residual source emissions | Pathway effectiveness | Dust impact risk | Receptor sensitivity | Magnitude of dust effect |
|---|---|---|---|---|---|---|---|
| R1 | Properties at Westhay Cottages (Residential) | 23m east of the existing ENRMF<br><br>105m north north east of the site entrance | Large<br><br>Medium | Moderately effective<br><br>Moderately effective | Medium risk<br><br>Low risk | High | Moderate adverse effect<br><br>Slight adverse effect |
| R2 | Westhay Farm (Residential) | 75m east of the existing ENRMF<br><br>57m east of the site entrance | Large<br><br>Medium | Moderately effective<br><br>Moderately effective | Medium risk<br><br>Low risk | High | Moderate adverse effect<br><br>Slight adverse effect |
| R3 | Collyweston Great Wood and Easton Hornstocks NNR and SSSI | Adjacent to and north of the existing ENRMF and north east and east of the western extension area | Large | Ineffective<br><br>Moderately effective | Low risk<br><br>Medium risk | Low | Negligible effect |
| R4 | Fineshade Woods Local Wildlife Site | Adjacent to and west of the western extension area | Large | Ineffective | Low risk | Low | Negligible effect |
| R5 | Footpath MX13 | 230m west of the western extension area | Large | Ineffective | Low risk | Low | Negligible effect |
| R6 | Footpath MX15 | 102m west of the western extension area | Large | Ineffective | Low risk | Low | Negligible effect |
| R7 | Footpath MX18 | 312m west of the western extension area | Large | Ineffective | Low risk | Low | Negligible effect |
| R8 | Footpath NE13 | 211m south west of the western extension area | Large | Ineffective | Low risk | Low | Negligible effect |

**Table 21.3**

**Dust control measures which will continue to be implemented at ENRMF**

| Activity | Controls | Effectiveness of controls |
|---|---|---|
| Extraction, movement and stockpiling of clay and overburden | • Current controls will continue to be used for future extraction and handling of clay. A water bowser will be used to dampen down the clay and internal hauls roads if the generation of dust is likely or has been observed during extraction and/or handling operations. | High |
| Landfill engineering works | • During landfill engineering works clay is in a damp condition to ensure that the optimum moisture content is maintained. | High |
| Waste treatment | • Processes at the treatment plant will be wet processes or will incorporate damping systems as an inherent part of the treatment processes. | High |
| Movement of HGVs, plant and machinery | • Mobile plant will be regularly serviced.<br>  • The site haul road is hard-surfaced to the wheelwash area on the southern boundary of and close to the south eastern corner of the site to reduce the mud and debris which may be carried by vehicles onto the local road network.<br>  • Other site haul roads are formed of compacted hardcore or similar material.<br>• The movement of mobile plant and site traffic is restricted to defined haul routes.<br>• Haul roads will be sprayed as necessary.<br>• The hard-surfaced areas of the haul routes will be checked daily and cleaned as necessary.<br>• The running surface of unsurfaced roads will be maintained to prevent the formation of ruts and potholes.<br>• All vehicles leaving the site following delivery of waste or the collection of clay are inspected visually by site operatives before leaving the site and are obliged to use the wheel wash.<br>  • The hard surfaced site road and Stamford Road are swept regularly to clear mud or debris.<br>• Vehicle exhausts will point above the horizontal. Vehicle speed limits of 15mph will be enforced to minimise the potential for dust generation during vehicle movements.<br>• Careful loading to minimise spillage and drop heights. | High |
| Soil stripping and placement during restoration | • Soils must be handled when dry and friable therefore only limited use can be made of water sprays to dampen the material.<br>• Minimise drop heights for tipping.<br>• Movement of materials within the site will cease during high winds if it could generate dust emissions beyond the site boundary.<br>• Stockpiles which will be in place for a long period will be seeded where necessary to minimise wind blow as soon as conditions permit following formation.<br>• Restored areas will be planted with vegetation as soon as possible after soil placement. | High |

**Table 22.1**

**Total Augean expenditure at businesses within Northamptonshire and/or 15 miles of the site between January 2019 and December 2019**

| Type of service | Location | Expenditure by Augean |
|---|---|---|
| Silo construction and maintenance | Kings Cliffe | £176,000 |
| Electrical installations and testing | Peterborough | £3,000 |
| Construction company | Peterborough | £13,000 |
| Mobile plant and equipment | Weldon | £117,000 |
| Tyres | Stamford | £7,000 |
| Tyres | Wansford | £17,000 |
| Plant and equipment maintenance | Peterborough | £17,000 |
| Car sales and repair | Peterborough | £16,000 |
| Car sales | Corby | £18,000 |
| Fuel and oil | Wansford | £68,000 |
| Cleaning products supplier | Stamford | £11,000 |
| Plant and machinery hire | Wellingborough | £225,000 |
| Repair and sale of machinery | Peterborough | £6,000 |
| Hydraulic repair | Peterborough | £6,000 |
| Logistics | Kings Cliffe | £2,000 |
| Catering services | Kings Cliffe | £2,000 |
| **Total** | | **£704,000** |

**Table 22.2**

**Augean Community Fund grants awarded in 2019**

| Project | Funding |
|---|---|
| Castor and Ailsworth Cricket Club, Replacement Electricity Generator and Cricket Outfield Roller | £11,476 |
| Thornhaugh and Wansford Parish Councils, Burial Ground Boundary Wall Repair | £5,000 |
| The Southwick Shuckburgh Arms Community Pub, Furniture and Garden Equipment Refurbishment Project | £7,726 |
| Preston Village Meeting, Refurbishment of Preston Pond | £21,700 |
| Friends of Barnwell Country Park, Secure Compound Project | £50,000 |
| Kings Cliffe & Area Community Sports Project Limited, Active Play Space | £25,205 |
| Ufford Park Cricket Club, Improvement of Outdoor Cricket Nets | £13,803 |
| Folksworth, Washingley & Morborne Village Hall, Replacing Toilets and New Meeting Room | £50,000 |
| Barnack Parochial Church Council, Heating Project | £30,000 |
| Adrenaline Alley, Adrenaline Rhythm Training Centre | £43,943 |
| Gretton Baptist Church, Replace Heating System & Rebuild Side Rooms | £25,000 |
| Kings Cliffe Ex-servicemen's Social Club, Refurbishment | £50,000 |
| Oundle Rugby Football Club Ltd, Clubhouse Extension & Improvements | £49,000 |
| South Luffenham Parish Council, Recreation Ground Improvements | £19,082 |
| Stamford Tennis Club, Floodlight Replacement | £8,175 |
| Sutton Parish Council, Nene Way & Sutton Village Recreation Ground Improvements | £12,000 |
| Thornhaugh & Wansford PCC, St Mary's Lead Roof Replacement & Alarm | £31,500 |