Appendix 16.1 Oxford Economics Report
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Prelude

The Becon Consortium led by EEW Energy from Waste UK Ltd, (the Consortium) commissioned Oxford Economics to provide estimates of the economic benefits associated with investment in a residual waste treatment project (RWTP).

The analysis was completed between July 2012 and February 2013, and thus the benefits modelling in Section 2 and economic sections (Section 5 and Appendix 1) use figures and data current to that period. The report narrative however was updated in June 2013 – though the underlying data for Section 2 and the economic sections were not revised. In addition we added clarification on our displacement assumptions in October 2013.

All of the information specific to the proposed project was provided by the Consortium and their consultants or through affiliated partners. The estimates are based on a mix of this information, published data, forecast estimates and assumptions which have been agreed with the Consortium.

The analysis makes no attempt to consider the impacts on income distribution and deprivation levels in the area. No detailed modelling analysis of employment displacement was conducted - this is examined in more general terms relating to the quarry and landfill changes as a consequence of the RWTP proceeding. As such, the model estimates are gross estimates assuming no displacement of jobs elsewhere, given the spare capacity in the economy and particularly the construction sector at present.

This economic impact study has been developed to form part of the assessment required to complement the planning application. As such, should the project be granted full planning permission and then constructed, the economic environment could potentially look significantly different.
Glossary

**Anaerobic digestion (AD):** Anaerobic digestion is a natural biological process where organic matter is broken down by bacteria in the absence of oxygen to produce biogas which can then be used for the generation of energy.

**arc21:** arc21 is one of three regional waste management groups within Northern Ireland (NI) and is a partnership between the eleven Councils in the east of the region (Antrim, Ards, Ballymena, Belfast, Carrickfergus, Castlereagh, Down, Larne, Lisburn, Newtownabbey and North Down). It was granted corporate body status in March 2004 through the local government Northern Ireland (NI) Order 2004. The body was formed with the objective to develop a long-term Waste Management Plan for the management of all controlled wastes produced within the arc21 region.

**Backward linkages:** Backward linkages refer to the channels through which money, materials or information flows between a company and its suppliers, creating a network of economic interdependence. In terms of this study, it refers to the fact that the construction phase of the residual waste treatment project (RWTP) will require the purchase and use of raw materials from sectors like building materials, steel, architectural services etc., which themselves will create supply chain jobs in the economy.

**Claimant on-flows:** Claimant on-flows relate to those who started a new unemployment claim.

**Direct (impact):** The direct impact is defined as the economic activity and numbers of people employed in the residual waste treatment project (RWTP) (both in construction and in on-going roles).

**Energy from Waste (EfW):** The thermal treatment of waste for the recovery of energy in the form of heat and/ or electricity generation.

**Full-time equivalents (FTE):** All the modelling completed by Oxford Economics and all the impacts associated with this modelling, assumes that employment is expressed in terms of full-time equivalents (FTE), which is important given the prevalence of part-time working especially in the construction sector. Accordingly, two part-time workers make up one full-time equivalent worker.

**Gross value added (GVA):** Gross value added (GVA) measures the value of goods & services produced in an area, industry or sector of an economy and is equal to output minus intermediate consumption.

**Incinerator Bottom Ash (IBA):** Material remaining following the thermal treatment process which has only been partially combusted or which is not suitable for combustion.

**Indirect (impact):** The indirect impact is defined as the economic activity and employment supported in the residual waste treatment project (RWTP)’s supply chain, as a result of its purchasing of inputs of goods and services from suppliers. Our input-output model is used to measure the indirect impact from the project.
**Induced (impact):** The induced impact is defined as economic activity and employment supported by those directly or indirectly employed spending their wage income on goods and services in the wider UK economy. This helps to support jobs in the industries that supply these purchases including in a range of service industries such as retail. Our input-output model is used to measure the induced impact from the project.

**Job years:** Any references to the employment benefits from the construction phase of the residual waste treatment project (RWTP) are expressed in terms of 'job years'. This is necessary given that construction phase activity spans more than a single year (41 months). A job year does not necessarily mean one job. Instead it refers to the amount of activity that is required. So for example two people could be employed for 6 months - this would equate to 2 jobs, but would actually only mean activity would take 1 job year of work to complete. Alternatively one person could be employed for two years - this would only equate to 1 job, but is actually 2 job years of employment. We don't need to use the term job years when talking about the on-going phase, as these benefits are all expressed in per annum terms as discussed above.

**Jobs:** Any references to the employment benefits from the on-going phase once the residual waste treatment project (RWTP) becomes operational are expressed in terms of 'jobs' per annum. As noted above, these jobs are full-time equivalent in nature.

**Mechanical Biological Treatment (MBT):** Processing of waste through a combination of mechanical separation of materials suitable for recycling or the production of a Refuse Derived Fuel (RDF) followed by the biological treatment of the remaining material to affect biological stabilisation.

**Mechanical Heat Treatment (MHT):** Mechanical heat treatment (MHT) is an alternative waste treatment technology to MBT involves the broadly same processes and outputs.

**Real (2009) prices:** Real (2009) price levels were used by Oxford Economics when calculating the quantifiable economic benefits in Section 2 of this report, to be consistent with National Accounts, and to account for inflation between years. As such, all wages/earnings, GVA and fiscal benefits presented throughout are expressed in 2009 prices.

**Refuse Derived Fuel (RDF):** Refuse Derived Fuel (RDF) is the type of fuel produced from the processing of solid waste.

**Residual Waste Treatment Project (RWTP):** The Project being procured by arc21 which entails the selection of a private sector partner to design, finance, build and operate (for a period of 25 years) a waste management facility for the treatment of residual municipal waste.

**Single Electricity Market (SEM):** The wholesale electricity market for the island of Ireland, regulated jointly by the Commission for Energy Regulation (CER) in the Republic of Ireland and the Northern Ireland Utility Regulator in Northern Ireland (NIAUR).
Type I multiplier: A Type I multiplier sums together direct and indirect effects. So multiplying a direct impact for a sector by its Type I multiplier will generate an estimate of direct + indirect impacts.

Type II multiplier: A Type II multiplier sums together total (i.e. direct, indirect and induced) effects. So multiplying a direct impact for a sector by its Type II multiplier will generate an estimate of total impacts.
Executive Summary

Background to the Research

arc21 is one of three regional waste management groups within Northern Ireland (NI) and is a partnership between the eleven Councils in the east of the region (Antrim, Ards, Ballymena, Belfast, Carrickfergus, Castlereagh, Down, Larne, Lisburn, Newtownabbey and North Down). It was granted corporate body status in March 2004 through the local government Northern Ireland (NI) Order 2004. The body was formed with the objective to develop a long-term Waste Management Plan for the management of all controlled wastes produced within the arc21 region, and to ensure that all waste facility and capacity issues are catered for in the statutory Waste Management Plan.

The principal objective of the Plan is to identify the options for managing waste within the arc21 region up to 2020, and aims to draw the right balance between:

- meeting strategic targets for reduction, recycling and recovery;
- the protection of the environment for present and future generations; and
- the provision and maintenance of sufficient disposal and treatment capacity to deal with the waste produced.

In selecting the preferred solution(s) for municipal waste management in the arc21 region, consideration has been given to a range of options, comparing their advantages and disadvantages and developing a scenario that best meets the arc21 objectives. The preferred solution(s) identified is a mix of treatments for residual municipal wastes, including inter-alia:

- treatment of residual wastes from households/commercial premises at a Mechanical Biological Treatment (MBT) facility from 2009 (the facility to sort recyclables, organic materials to be composted at the facility and where appropriate sort a suitable range of calorific value materials) with due regard to relevant targets;
- an Energy from Waste (EfW) facility for a suitable range of calorific value materials from either/or both MBT and of residual wastes from 2013 with due regard to relevant targets; and
- any balance of residual wastes and residues from waste treatment processes to continue to be disposed to landfill with due regard to relevant targets.
Description of the Proposed Project

The Becon Consortium, led by EEW Energy from Waste (the Consortium) is currently engaged in a bidding process to deliver the MBT and EfW facilities indicated in arc21’s Waste Management Plan.

The proposed development is to be situated on a 28 hectare site at the 60 hectare Hightown Quarry in Ballyutoag in Antrim Borough Council area (located on the border of the Newtownabbey Borough Council area). The proposed project comprises a number of integrated built elements including:

- A Weighbridge complex;
- A MBT facility;
- A Refuse Derived Fuel (RDF) Bale Storage building;
- An EfW thermal treatment facility;
- An IBA treatment facility;
- An Administration and Visitor Centre; and
- Upgrading/widening of the Boghill Road and related junction improvements.

Aim of the Report

Oxford Economics were commissioned by the Consortium to provide estimates of the economic benefits associated with investment in the proposed residual waste treatment project (RWTP).

The economic benefits contained within this report were estimated by Oxford Economics using their be-spoke economic impact model. This model used information provided directly by the Consortium combined with data/forecasts from Oxford Economics suite of models at a regional and local authority level where applicable. The be-spoke model is based on an input-output framework in order to devise estimates for the direct, indirect, induced and thus total benefits in terms of employment, output/gross value added (GVA) and wages, for both the construction and on-going phases of the project, as well as analysis of the possible fiscal benefits. Real (2009) price levels were used by Oxford Economics when calculating all of the quantifiable economic benefits, to be consistent with National Accounts, and to account for inflation between years.

No detailed modelling analysis of employment displacement was conducted - this is examined in more general terms relating to the quarry and landfill changes as a consequence of the RWTP proceeding. As such, the model estimates are gross estimates assuming no displacement of jobs elsewhere, given the spare capacity in the economy and particularly the construction sector at present.

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1 Grouped along with EfW facility in terms of modelling the economic benefits.
The results from Oxford Economics be-spoke economic impact model are for Northern Ireland (NI) as a whole, however where possible we have discussed the extent to which these benefits are likely to be realised within the local Council area in which the site is located or the arc21 area as a whole.

Furthermore, the report looks at wider benefits of the project in terms of meeting targets on waste management and energy generation, reduction of landfill and taxes, support of policy documentation and further unquantifiable (e.g. environmental) benefits. Finally, an economic overview at a global, UK, Northern Ireland (NI) and local authority district level is presented to place in context why private investment, in particular in a project of this type, should be strongly considered given current economic headwinds.

Benefits from Construction Are Significant

The total construction capital spend of £240m\(^2\) to develop the MBT facility, the EfW (and IBA) facility and the Administration and Visitor Centre is estimated to create or sustain 2,701 direct job years of employment, 2,220 of which account for construction related activities. The level of employment generated as a result of the construction phase will potentially create almost £58.0m of additional wages in the local economy and is expected to contribute an estimated £94.1m to regional Gross Value Added (GVA). When factoring in indirect and induced impacts, total benefits could amount to the creation or sustainment of 6,045 job years of employment, £122.1m of wages and £215.1m of GVA, with all sectors benefiting to some extent (Figure 1). It should be noted while these construction phase benefits are presented at a Northern Ireland (NI) regional level, it is likely that the local areas of Antrim, Belfast and Newtownabbey will enjoy a sizeable proportion of the benefits. Moreover, 25% of the raw materials from the EfW (and IBA) facility and 50% of the raw materials from the MBT facility will be sourced locally (for example concrete, steel (reinforced and structural) and metal cladding). As such it is reasonable to assume a notable proportion of the total benefits will be realised within the local areas. That is underpinned by the presence of Northstone (NI) Limited (trading as Farrans Construction), as the construction contractor – evidencing that the direct benefits from the construction phase will be enjoyed by an NI based firm.

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\(^2\) The Capital Investment of £300m includes £240m of construction costs plus £60m of project funding and development costs and professional services. Of the £240m construction capital spend, £192m relates to construction related costs and £48m relates to professional services related costs (e.g. Project Management, Engineering Design, Site Supervision and Management etc.).
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Operation To Bring On-going Benefits

The project has the potential to create or sustain 94 direct jobs per annum when it becomes fully operational and is expected to generate £2.6m of direct wages and £12.3m of direct GVA each year. The Administration and Visitor Centre is estimated to sustain 21 direct jobs per annum, with associated wages of £0.4m. The Visitor Centre could prove to be a local attraction for school visits, and is likely to exist as a permanent local resource. The operation of the project is expected to have a relatively significant impact with a Type II employment multiplier of 3.6 and the generation of approximately £131,000 value-added per direct employee. After accounting for indirect and induced impacts, the project is estimated to create or sustain approximately 337 jobs with £7.7m of wages and £24.6m of GVA per annum (Figure 2). It is worth noting that not all of the total impacts will be captured by the Antrim and Newtownabbey economies; rather they will be spread across the Northern Ireland (NI) region. While some of the direct on-going jobs will be taken up by local residents, some of the roles are specialised requiring unique skill sets and will potentially be drawn from the wider arc21 area (such as Belfast) or elsewhere in Northern Ireland (NI). Many of the indirect benefits will be realised in Belfast, where inputs such as diesel for mobile plant and EiW, process consumables for MBT and EiW, mobile plant leasing for MBT, recycling and disposal contracts for MBT and EiW residues and transport for MBT and EiW residues are expected to be purchased from. However it is reasonable to assume that the majority of the induced benefits will be realised within the two local Council areas.

Operation of the project could create or sustain approximately 337 jobs, £7.7m of wages and £24.6m of GVA per annum
As noted, the benefits from both the construction and ongoing operations phases of the proposed residual waste treatment project (RWTP) were gross estimates with zero displacement applied. A detailed assessment of displacement is a large undertaking with very few examples of studies that have tried to estimate this type of displacement (either within NI or for this type of development). While we did consider the merits of putting a displacement/relocation of jobs rate into our modelling calculations (as we have done with other economic impact studies we have undertaken), in our judgment the most robust course of action was to exclude any displacement assumptions given the niche type of project in question and for the reasons described below.

We did not use a displacement rate in the construction estimates given the significant spare capacity in the construction sector. As of the time of writing (21st October 2013,) the most recent Northern Ireland Construction Bulletin (http://www.csu.nisra.gov.uk/niconsq12013.pdf) notes:

"The total volume of construction output in the first quarter of 2013 decreased by 1.1% compared with Q4 2012 and was 12.1% lower compared to the same quarter in 2012. The level of construction output in Northern Ireland has remained broadly flat for the last three quarters. The value of construction output in real prices in Q1 2013 was estimated to be £465 million, 41.7% lower than the peak value in Q2 2007 (£798 million)... In the first quarter of 2013, the volume of New Work decreased by 2.8% compared to the previous quarter and was 15.5% lower than the same quarter in 2012. The overall trend in New Work output has been consistently downward since the peak in Q1 2007 with current output levels being approximately half of that reported in the peak quarter."

This has been reflected in the level of construction sector employment in NI. As our report outlines in Section 5.5, the “construction sector has suffered the largest amount of recessionary job losses of any sector”; indeed as a result, jobs levels in the sector have returned to those last experienced in the early 2000s. A large share of the unemployment on-flows (those starting to register for unemployment benefits) over the
course of the last few years have been construction workers in manual trade roles. The outlook for the sector remains one of slow recovery as government and businesses make cuts in capital expenditure, and a lack of demand from commercial and residential property persists. Job levels are likely to remain broadly flat and well below the peak not just over the short-term, but well beyond. The boom period for the sector from pre-recession (with the aid of demand for the Republic of Ireland) is very much a thing of the past. Even during the boom, the construction sector always seemed to cope with extra demand as it presented itself. All this published data and information is a clear sign of the spare capacity that exists.

Oxford Economics estimates for the benefits from the on-going operations phase consider only activity from the MBT facility, EfW (and IBA) facility and Administration and Visitor Centre related to the new RWTP and provide no counterfactual allowing for current activities at the site. Factoring in a displacement rate assumption to the on-going phase merits slightly more consideration, though ultimately a decision was reached not to factor in a displacement assumption given the niche type of project we are considering here. There are no similar projects like this in NI to displace activity from. While we would accept that there will be some displacement of jobs from those currently employed by Tarmac at Hightown Quarry and in landfill sites, it is hard to place an actual jobs level to this and the numbers involved are largely immaterial when placed in the context of the employment creation associated with the proposed RWTP.

Hightown Quarry has operated on a contract by contract basis since 2008. Shortly after the height of the construction boom in 2008, employment levels had reduced to 6 full time employees. With the aggregates market severely depressed since 2008 and showing no signs of any notable recovery, these numbers are likely to have fallen further; meaning the level of net jobs lost from the quarry is largely immaterial.

In relation to the landfilling activities, in 2011/12 the arc21 Councils landfill approximately 310,783 tonnes (Ref: Northern Ireland Local Authority Municipal Waste Management Statistics – Annual Report 2011/2012), at 3 landfill sites – Cottonmount operated by Biffa Waste Services Limited, Mullaghglass operated by Alpha Resource Management and Drumnakelly operated by Down District Council. Exact staffing levels at each of these sites are not known but typically the landfilling of this volume of waste would employ 10-12 permanent staff supported by 10-20 non-permanent sub-contractor staff.

Given the likely low levels of displacement and the uncertainty, in our judgment the most robust course of action was to exclude any displacement assumptions altogether from this part of the analysis. Our economic impact model has been developed to include displacement should more accurate data be made available though we suspect the resulting estimates will be close to the numbers we present in this report.

Fiscal Benefits

Given the aforementioned scale of investment and job creation, the Public Exchequer will benefit from a fiscal standpoint from the construction and operational phases. Total tax revenue from the construction phase is estimated at £48.8m while the operation phase is estimated to yield tax receipts of £3.1m per annum. Total unemployment savings are estimated to range from £16.3m to £32.3m over the period of construction and £0.9m to £1.8m per annum when the project becomes fully operational. This is crucial given the tight public spending environment.
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Recovery Facilities – Analysing the MBT and EfW Processes

Energy recovery has a major role to play within the framework of the DEFRA Waste Hierarchy and will take on added importance in Northern Ireland (NI). Once the preferred options of waste reduction, re-use and recycle are exhausted, Energy Recovery is one of the best available techniques used to recover the residual energy from the remaining waste. MBT mechanically and biologically treats (Authority) Waste to separate out recyclable materials, rejects and prepare RDF and includes front end recycling. EfW thermally treats the RDF produced in the MBT process and untreated waste including Third Party Waste, and harnesses this to produce power which in the case of this project is exported into the All-Island SEM. Recycling at the back end forms part of the process.

The UK and other EU countries, including Northern Ireland (NI), through European Waste Landfill Directives, have agreed to reduce the amount of biodegradable municipal waste (BMW) going to landfill to prevent further damage to the environment caused by land filling. The Northern Ireland Waste Management Strategy 2006 (and the Northern Ireland Landfill Allowance Scheme (NILAS)) set out the following specific targets for Landfill Diversion to reflect the EU Landfill Directive (1991/31/EC) – the quantity of biodegradable municipal waste sent to landfill should not exceed 75% of 1995 baseline levels by 2010; 50% of 1995 baseline levels by 2013; and 35% of 1995 baseline levels by 2020. Within arc21 in particular, the amount of BMW sent to landfill by arc21 in 2011/12 was 173,597 tonnes, approximately 30% less than their allocated allowance. This project is likely to help reduce this amount of waste sent to landfill further.

By the year 2019 / 2020 if the total contract waste for the proposed project is not treated and continues to be landfilled, the total landfill tax cost would be approximately £19.3m at the projected standard rate of tax of £80 per tonne In addition, a fine, under the NILAS compliance scheme, of up to £10.9m, could also be incurred by the arc21 constituent Council for failure to comply with the Landfill Diversion Targets.

This proposed site in Antrim Council area has been designed to accept and treat up to 300,000 tonnes of waste in any given year, which will be split between the MBT facility (capacity 300,000 tonnes) and the EfW facility (capacity 68MWTH). For the year 2019/20, based on the assumed waste composition and projected waste tonnages, the site is expected to accept and treat 265,198 tonnes of waste. The MBT facility is expected to accept and treat 241,319 tonnes of Authority Waste. The EfW facility is expected to thermally treat 187,041 tonnes of fuel generated in the MBT along with 23,879 tonnes of Third Party Waste. The EfW facility will export approximately 14MW of electricity to the All-Island SEM, which will provide over 100,000 MWh per year, enough electricity power over 30,000 homes. Full operation of the residual waste treatment project (RWTP) is expected in 2018. This is not the whole solution to Northern Ireland (NI) energy demand but it is a positive step forward.

In addition to electricity export, up to 10MW of the heat produced in the EfW may also be used to supply potential heat off-take, which could be used to support a
variety of local industrial/commercial or residential uses. The ash generated in the EfW will be processed on site to produce a material which can be used as an aggregate in the construction industry.

There are a growing number of EfW projects with approximately 36 established plants across Great Britain and a number of sites across Europe as a whole. A balance must be struck between the development of essential infrastructure and the importance of ensuring that material which could be reused or recycled is not drawn down the hierarchy and that waste generation is not encouraged in order to provide feedstock for recovery processes. There is potential for the sector to expand further as unrecoverable waste becomes increasingly recognised as a valuable source of local energy through EfW and can help the both the UK's and Northern Ireland's twin problems of diminishing landfill and expensive imports of energy.

Supports Existing Policy and Will Provide Unquantifiable Benefits

The sustainable and renewable energy sector is playing an ever increasing role across the globe as sources of oil, gas and coal grow in short supply and their costs spiral. Alongside the rest of the UK, Northern Ireland (NI) is having to play its part in the EU carbon emissions targets. As such, the region could potentially reap significant benefits in terms of improving the environment (i.e. reducing emissions) and securing supply of energy.

The proposed residual waste treatment project will complement a number of national, regional and local strategies. Environmental planning has become a primary priority of existing policy, given the significant impact that unsustainable levels of pollution and waste can have on quality of life, the landscape and the economy. There is an opportunity for the proposed facilities to contribute to a more sustainable environment whilst helping to meet energy demand across Northern Ireland (NI), the whole island of Ireland and the United Kingdom.

The new Strategic Energy Framework (SEF) 2010 published by NI's Department of Enterprise, Trade and Investment (DETI) details NI's energy future over the next ten year. It also confirms the new and ambitious renewable electricity and renewable heat targets by 2020. The four main objectives outlined by the Framework could all be addressed in part by the proposed waste residual treatment project within Antrim, which would provide an indigenous fuel source - building competitive markets; ensuring security of supply; enhancing sustainability; and developing energy infrastructure.

The arc21 Waste Management Plan, written in respect of the Northern Ireland Waste Management Strategy 2006-2020, primarily identifies the options for managing waste within the arc21 region up to 2020, and aims to draw the right balance between meeting strategic targets for reduction, recycling and recovery; the protection of the environment for present and future generations; and the provision and maintenance of sufficient disposal and treatment capacity to deal
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with the waste produced. The proposed project has been designed specifically to complement the aims of the arc21 Plan, and to address two of its primary aims - Household Waste Recycling and Composting Targets and Landfill Waste Diversion Targets. A range of criteria were considered when deciding on the preferred solution(s) for municipal waste management in the arc21 region. The solutions included a mix of treatment options for residual municipal waste, including both MBT and EFW, both of which are included the facilities within this development.

The export potential of surplus energy production is significant, while the existence of the MBT and EFW plants could potentially encourage further investment in complementary projects in Northern Ireland (NI). The additional energy source would enable the region to become more independent in relation to energy production as well as to contribute to a growing recognition of the people, skills and products that Northern Ireland (NI) has to offer.


Northern Ireland (NI) has suffered as much as if not more than any UK region from recessionary effects and faces many challenges especially in the short- to medium-term. The regional labour market recovery is expected to remain ‘jobless’, with job levels not forecast to return to their pre-recession peak by 2022. Indeed 20 out of 26 Northern Ireland (NI) Council areas are not expected to return to pre-recession peak employment levels before 2022⁴. The arc21 Council areas are likely to enjoy the crux of any limited job creation that does occur, given their strong base in exportable service sectors compared to elsewhere in the region.

Overall, the recession is likely to leave a legacy of unemployment in Northern Ireland (NI), with the level of almost 64,000 claimants likely to continue to rise in the short-term. Young people, those in lower skilled occupations and the long-term unemployed face particular risk of being frozen out of the labour market for some time to come. All Council areas within arc21, with the exception of Belfast, currently have amongst the lowest rates of claimant unemployment, and are forecast to experience among the greatest falls in these rates over the next decade (2012-2022).

Employment levels in the electricity and waste management sectors, which are most closely aligned to this proposed project, have remained resilient over the course of the recession in both the UK and Northern Ireland (NI), despite widespread job losses across most other sectors. Policy support to encourage

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⁴ Oxford Economics are aware of the fact that the Northern Ireland (NI) Assembly passed Local Government (Boundaries) Order (Northern Ireland) 2012 on 12th June, while the final Order (2012 No. 421) was made on 30th November 2012, cutting the number of Council areas from 26 to 11. However, given that we operate a ‘policy neutral’ approach, and given the lack of any economic data for the new Councils which will only come into effect in 2018, analysis in this report will be based on the current structure.
Further investment in the electricity and waste management sectors is essential to build on this recent strong performance.

The construction sector has suffered the largest amount of recessionary job losses of any sector and its outlook for growth remains bleak as government and businesses make cuts in capital expenditure. The construction phase of this proposed project is estimated to create approximately 2,701 direct job years (2,220 in the construction sector alone), and 6,045 total job years (3,031 in the construction sector alone), and would thus provide a much needed boost to the sector should it be approved. The arc21 constituent Council areas contains residents with a diverse mix of low skills, who can take up the lower value added construction jobs associated with the project (especially given the aforementioned rise in these types of unemployment claimant on-flows), as well as the highly skilled who can fill the professional, managerial and technical positions required in the on-going phase.

Concluding Thoughts

Our analysis suggests that should the proposed residual waste treatment project (RWTP) go ahead, the economic benefits would be significant. This is important given that the outlook for the economy is unusually uncertain, with a plethora of downside risks. The ‘jobless’ recovery expected across Northern Ireland (NI) means that job creation is likely to be the top priority for Central and local Government policy (replacing the previous focus on productivity). A project of this type will offer a range of employment opportunities in its construction and operation phases that are accessible to high and low skilled labour alike.

Features of the current macro-economic environment are rising commodity price inflation and persistent high demand. With a finite supply, economies must instead look to alternative energy sources to meet this escalating demand. Using waste to generate power is a lot more sustainable and environmentally friendly than fossil fuels such as oil that have been so heavily relied on up this point, and should aid the government in meeting local, regional, national and EU targets for reducing the amount of biodegradeable municipal waste sent to landfill. Furthermore the proposed MBT and EfW facilities will contribute to savings on costs to landfill and shipping waste to plants in the EU to be processed. They will also help in avoiding EU fines and ensure a more sustainable energy supply.

The arc21 Council areas should lead what limited job growth is forecast for Northern Ireland (NI), given their sectoral structure and strong skills profile

Should the proposed project go ahead, the economic benefits would be significant – particularly in terms of job creation and alternative & sustainable energy generation
1 Introduction

1.1 Background to the Research

arc21 is one of three regional waste management groups within Northern Ireland (NI) and is a partnership between the eleven Councils in the east of the region (Antrim, Ards, Ballymena, Belfast, Carrickfergus, Castlereagh, Down, Larne, Lisburn, Newtownabbey and North Down). It was granted corporate body status in March 2004 through the local government Northern Ireland (NI) Order 2004. The body was formed with the objective to develop a long-term Waste Management Plan for the management of all controlled wastes produced within the arc21 region, and to ensure that all waste facility and capacity issues are catered for in the statutory Waste Management Plan.

The principal objective of the Plan is to identify the options for managing waste within the arc21 region up to 2020, and aims to draw the right balance between:

- meeting strategic targets for reduction, recycling and recovery;
- the protection of the environment for present and future generations; and
- the provision and maintenance of sufficient disposal and treatment capacity to deal with the waste produced.

In selecting the preferred solution(s) for municipal waste management in the arc21 region, consideration has been given to a range of options, comparing their advantages and disadvantages and developing a scenario that best meets the arc21 objectives. The preferred solution(s) identified is a mix of treatments for residual municipal wastes, including inter-alia:

- treatment of residual wastes from households/commercial premises at a MBT facility from 2009 (the facility to sort recyclables, organic materials to be composted at the facility and where appropriate sort a suitable range of calorific value materials) with due regard to relevant targets;
- an EfW facility for a suitable range of calorific value materials from either/or both MBT and of residual wastes from 2013 with due regard to relevant targets; and
- any balance of residual wastes and residues from waste treatment processes to continue to be disposed to landfill with due regard to relevant targets.

1.2 Description of the Proposed Project

The Consortium is currently engaged in a bidding process to deliver the MBT and EfW facilities indicated in arc21’s Waste Management Plan.
The proposed development is to be situated on a 28 hectare site at the 60 hectare Hightown Quarry in Ballyutoag in Antrim Borough Council area (located on the border of the Newtownabbey Borough Council area). The proposed project comprises a number of integrated built elements including:

- A Weighbridge complex;
- A MBT facility;
- A Refuse Derived Fuel (RDF) Bale Storage building;
- An EfW thermal treatment facility;
- An IBA treatment facility;  
- An Administration and Visitor Centre; and
- Upgrading/widening of the Boghill Road and related junction improvements.

1.3 Potential Benefits

Investment in waste processing and energy production facilities offer a number of potential benefits (Figure 1.1 below provides a summary). These will include labour market benefits arising from both the construction and on-going operation of the residual waste treatment project (RWTP). As a consequence there will also be economic benefits through additional output/GVA, while income tax/National Insurance Contributions (NIC), rates, and savings to unemployment benefits will make fiscal contributions. The facilities will contribute to meeting targets on waste management, thereby helping to avoid fines to the EU, and supporting the fiscal position of the UK. We provide estimates of the above impacts in the remainder of this document.

While there are direct benefits to the environment, indirect savings on oil consumption and carbon production (through transport and incineration) will also be realised. Furthermore, 14MW of electricity will be generated and exported to the grid from a sustainable and renewable energy source, which will not only contribute to environmental benefits but also help Northern Ireland reduce its over dependency on imported fossil fuels.

Finally, as discussed in Section 4, the facilities support local, regional, national and European policy.

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5 Grouped along with EfW facility in terms of modelling the economic benefits.
Figure 1.1: Potential benefits from the investment

1.4 Structure of the Report

The report will be structured as follows:

- **Section 2** analyses the direct, indirect and induced impacts associated with the construction and operational phases of the project;

- **Section 3** analyses what is entailed within the MBT and EfW processes in more detail. It provides an overview of landfill policy targets and performance to date. It also considers the amount of tax charged by landfill weight and the energy produced from waste;

- **Section 4** discusses key existing policy and strategy targets which have the potential to be complemented by the proposed project and highlights key issues surrounding sustainable and renewable energy at a local, regional (NI) and national (UK) level. It sets out a number of unquantifiable, yet important social and economic benefits that are likely to arise from the proposed project;

- **Section 5** provides a socio-economic profile of the Northern Ireland (NI) economy and arc21 local economies, to place in context why private investment, in particular in a project of this type, should be strongly considered given current economic headwinds;

- **Appendix A** provides an overview of macro-economic trends at a global and UK level; and

- **Appendix B** provides information about Oxford Economics.
2 Economic Benefits

2.1 Economic Impact of the Construction Phase

This section assesses the direct, indirect and induced impacts associated with the construction of the MBT facility, EfW (and IBA) facility and the Administration and Visitor Centre between 2015 and 2018, prior to the facilities becoming fully operational in 2018.

Key points:

- Financed by the Consortium, the residual waste treatment project (RWTP) is estimated to result in a net capital construction spend of approximately £240m;
- The construction phase is estimated to create or sustain 2,701 direct job years of employment with associated direct wages of £58.0m and direct GVA of £94.1m;
- The estimated total benefits from the construction phase include the creation or sustainment of 6,045 job years, £122.1m of wages and £215.1m of GVA for the Northern Ireland economy;
- On-going direct impacts from operating the site are estimated to create or sustain 94 jobs, £2.6m of wages and £12.3m of GVA per annum;
- The estimated total benefits from the on-going operation of the project include the creation or sustainment of 337 jobs and £7.7m of wages per annum. It will also add £24.6m to the region’s GVA each year; and
- Given the scale of investment and job creation, the Public Exchequer will benefit from increased tax revenue and benefits savings.

2.1.1 Significant Investment in Strategic Infrastructure

Financed by the Consortium, construction of the residual waste treatment project (RWTP) at Mallusk is estimated to cost £240m. Construction of the MBT facility and the Administration and Visitor Centre is collectively estimated at £65m with the EfW (and IBA) facility estimated at £175m. An 80% and 20% proportional spend on construction related and professional services related activities respectively (including supply chain spending) have been applied to the overall cost of the proposed facilities. Therefore, construction related activity will equate to a total cost of approximately £192m with professional services activity (e.g. Project Management, Engineering Design, Site Supervision and Management etc.) accounting for £48m.

In total, the duration of construction of all on-site facilities is 41 months and is expected to start in 2015 and be completed in 2018. The impacts of construction
have been calculated using Oxford Economics’ GVA and productivity estimates (presented in 2009 prices\(^6\)) in each year between 2015 and 2018, over the period where construction activity is planned to take place. Potential additional earnings generated as a result of construction activity have also been calculated using Oxford Economics’ wage forecasts, which are again in real prices using a 2009 base year.

2.1.2 Direct Construction Impacts

A capital spend of £240m to develop a MBT facility, an EfW (and IBA) facility and an Administration and Visitor Centre is expected to create or sustain 2,701 direct job years of employment, 2,220 of which account for construction related activities (Table 2.1). **Given the spare capacity in the construction sector no displacement assumptions have been factored into these estimates.** As discussed in section 5, there have been widespread job losses in the sector and the amount of construction output and new work has fallen markedly since early 2007.

Using Oxford Economics wage forecasts by sector in Northern Ireland, the level of employment generated as a result of the construction phase will potentially create £58.0m of additional wages in the local economy. Again using Oxford Economics’ estimates of sectoral productivity in each year between 2015 and 2018, the investment is expected to contribute an estimated £94.1m to regional GVA.

<table>
<thead>
<tr>
<th>Construction phase impacts</th>
<th>Job years</th>
<th>Wages (£m)</th>
<th>GVA (£m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction related</td>
<td>2,220</td>
<td>£47.9</td>
<td>£69.8</td>
</tr>
<tr>
<td>Professional services related</td>
<td>481</td>
<td>£10.1</td>
<td>£24.3</td>
</tr>
<tr>
<td>Total</td>
<td>2,701</td>
<td>£58.0</td>
<td>£94.1</td>
</tr>
</tbody>
</table>

Source: Oxford Economics

Note: May not add due to rounding

There will be at least one Engineering, Procurement and Construction (EPC) Contractor assigned to the development of the proposed facilities. Typically these contractors design the installation, procure the necessary materials and construct the project – overseeing it from start to finish. As such, there will be additional benefits to the local economy arising from the need for accommodation during the construction phase. The EPC Contractors for the project have estimated the resource requirements over the duration to include a maximum of 455 workers (accounting for almost one-sixth of direct employment) or an average of 208 on-site.

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\(^6\) Real (2009) price levels used to be consistent with National Accounts, and to account for inflation between years. All wages/earnings, GVA and fiscal benefits presented in this section are expressed in 2009 prices.
This is not to say that all the direct jobs will be taken by those from outside the local area who require bedspace; indeed a proportion of the direct construction phase jobs could well be taken by those in the Antrim and Newtownabbey Council areas.

Table 2.2: arc21 certified hotel, guesthouse and bed and breakfast stock, 2011

<table>
<thead>
<tr>
<th>Area</th>
<th>Premises</th>
<th>Room</th>
<th>Bed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antrim</td>
<td>33</td>
<td>581</td>
<td>1,200</td>
</tr>
<tr>
<td>Ards</td>
<td>42</td>
<td>168</td>
<td>364</td>
</tr>
<tr>
<td>Ballymena</td>
<td>28</td>
<td>292</td>
<td>632</td>
</tr>
<tr>
<td>Belfast</td>
<td>62</td>
<td>3,369</td>
<td>6,978</td>
</tr>
<tr>
<td>Carrickfergus</td>
<td>14</td>
<td>188</td>
<td>412</td>
</tr>
<tr>
<td>Castlereagh</td>
<td>3</td>
<td>270</td>
<td>622</td>
</tr>
<tr>
<td>Down</td>
<td>61</td>
<td>542</td>
<td>1,266</td>
</tr>
<tr>
<td>Larn</td>
<td>28</td>
<td>210</td>
<td>463</td>
</tr>
<tr>
<td>Lisburn</td>
<td>33</td>
<td>237</td>
<td>506</td>
</tr>
<tr>
<td>Newtownabbey</td>
<td>12</td>
<td>165</td>
<td>356</td>
</tr>
<tr>
<td>North Down</td>
<td>28</td>
<td>359</td>
<td>722</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>864</td>
<td>10,690</td>
<td>23,890</td>
</tr>
</tbody>
</table>

Source: DETI Accommodation Survey, 2011

2.1.3 Indirect and Induced Construction Impacts

The supply chain or indirect impacts arising from the project have been estimated using the latest UK input-output tables (published by ONS).

One characteristic of construction activity is that it feeds through to numerous other related business activities. It has “backward linkages” into building materials; steel, architectural services, legal services and insurance, and the majority of these linkages tend to result in job creation in the local economy. This makes investment in construction particularly powerful in fuelling expansion in the economy.

Within the construction sector, an economic multiplier of close to 2.0 is employed. Typically offering an economic multiplier of 2.0, this means that for every £1 GVA or output by the sector, an additional £1 is created in the wider economy and every construction job created will generate at least two others in related areas and in downstream activities such as retailing, which will benefit when construction workers spend their wages.

Minor adjustments have been made to the UK input-output tables to account for the size of imports in Northern Ireland (NI) as the region will require more imported products than the UK as whole\(^7\). Indirect GVA is therefore estimated to

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\(^7\) Indirect GVA was scaled back by 20\% in sectors such as construction and manufacturing to account for Northern Ireland (NI) companies’ greater propensity to import products. The rationale behind this adjustment is based on comparing imports across geographies. The construction sector in the UK imports 8.4\% of its supply chain, showing that it can source most of what it needs internally. However Scotland, a devolved region like Northern Ireland (NI) imports 28.7\% and the Republic of Ireland imports 20.6\%.
be approximately £97.0m, creating or sustaining an estimated 2,396 job years of employment with associated wages of £51.3m (Table 2.3).

Table 2.3: Direct, indirect and induced benefits from construction phase

<table>
<thead>
<tr>
<th>Construction phase impacts</th>
<th>Job years</th>
<th>Wages (£m)</th>
<th>GVA (£m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>2,701</td>
<td>£58.0</td>
<td>£94.1</td>
</tr>
<tr>
<td>Indirect</td>
<td>2,396</td>
<td>£51.3</td>
<td>£97.0</td>
</tr>
<tr>
<td>Induced</td>
<td>948</td>
<td>£12.8</td>
<td>£23.9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6,045</strong></td>
<td><strong>£122.1</strong></td>
<td><strong>£215.1</strong></td>
</tr>
</tbody>
</table>

Source: Oxford Economics
Note: May not add due to rounding

A further swathe of benefits will spread through the region as the direct and indirect wages generated through the construction phase are spent in the local economy.

It is likely this will lead to induced or wider employment effects of approximately 948 job years and £12.8m of wages. The wage effect for the induced job years is typically lower than the indirect as a result of the makeup of sectoral demand (i.e. induced employment in restaurants, retail and other personal services are relatively low value added compared to business services in the supply chain).

Every sector in the economy is expected to experience an uplift in job levels, resulting in the creation of additional wages and GVA (Table 2.4).  

It should be noted while the modelling has estimated the construction phase benefits at a Northern Ireland (NI) regional level, it is likely that the local areas of Antrim and Newtownabbey will enjoy a sizeable proportion of the benefits in Table 2.4. Moreover, 25% of the raw materials from the EfW (and IBA) facility and 50% of the raw materials from the MBT facility will be sourced locally (for example concrete, steel (reinforced and structural) and metal cladding). As such it is reasonable to assume a notable proportion of the direct, indirect and induced benefits will be realised within the local areas. That is underpinned by the presence of Northstone (NI) Limited (trading as Farrans Construction), as the construction contractor – evidencing that the direct benefits from the construction phase will be enjoyed by an NI based firm.

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8 Individual projects will not necessarily require services from each sector of the economy; however such a technique for estimating employment and wage impacts uses industry averages.
Table 2.4: Sectoral benefits arising from construction spend

<table>
<thead>
<tr>
<th>Construction phase impacts</th>
<th>Job years</th>
<th>Wages (£m)</th>
<th>GVA (£m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>20</td>
<td>£0.3</td>
<td>£0.2</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>42</td>
<td>£1.5</td>
<td>£1.9</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>223</td>
<td>£5.6</td>
<td>£13.8</td>
</tr>
<tr>
<td>Electricity, gas, steam</td>
<td>5</td>
<td>£0.2</td>
<td>£1.0</td>
</tr>
<tr>
<td>Water supply; sewerage and waste</td>
<td>5</td>
<td>£0.1</td>
<td>£0.5</td>
</tr>
<tr>
<td>Construction</td>
<td>3,031</td>
<td>£96.5</td>
<td>£95.3</td>
</tr>
<tr>
<td>Wholesale and retail</td>
<td>798</td>
<td>£11.5</td>
<td>£21.9</td>
</tr>
<tr>
<td>Transportation and storage</td>
<td>156</td>
<td>£3.2</td>
<td>£5.2</td>
</tr>
<tr>
<td>Accommodation and food</td>
<td>218</td>
<td>£2.1</td>
<td>£4.2</td>
</tr>
<tr>
<td>Information and communication</td>
<td>61</td>
<td>£1.9</td>
<td>£3.9</td>
</tr>
<tr>
<td>Financial and insurance activities</td>
<td>48</td>
<td>£1.4</td>
<td>£2.9</td>
</tr>
<tr>
<td>Real estate activities</td>
<td>27</td>
<td>£0.5</td>
<td>£1.1</td>
</tr>
<tr>
<td>Professional, scientific, and technical</td>
<td>746</td>
<td>£16.3</td>
<td>£37.7</td>
</tr>
<tr>
<td>Administrative and support</td>
<td>388</td>
<td>£6.0</td>
<td>£10.2</td>
</tr>
<tr>
<td>Public administration and defence</td>
<td>42</td>
<td>£1.2</td>
<td>£2.1</td>
</tr>
<tr>
<td>Education</td>
<td>34</td>
<td>£0.8</td>
<td>£1.2</td>
</tr>
<tr>
<td>Health and social work</td>
<td>7</td>
<td>£0.2</td>
<td>£0.2</td>
</tr>
<tr>
<td>Arts, entertainment and recreation</td>
<td>91</td>
<td>£1.4</td>
<td>£2.5</td>
</tr>
<tr>
<td>Other service activities</td>
<td>103</td>
<td>£1.6</td>
<td>£2.2</td>
</tr>
<tr>
<td>Total</td>
<td>6,045</td>
<td>£122.1</td>
<td>£215.1</td>
</tr>
</tbody>
</table>

Source: Oxford Economics
Note: May not add due to rounding

Overall potential to create or sustain 6,045 job years of employment, £122.1m of earnings and £215.1m of GVA.

2.2 Economic Impact of On-Going Operations Phase

This section assesses the direct, indirect and induced impacts associated with the on-going operation of the MBT facility, the EfW (and IBA) facility and the Administration and Visitor Centre, which are expected to commence full service operation in 2018.

2.2.1 Direct Employment and Wage Impacts

The Consortium estimate 94 direct full-time on-going employees will work at the site once the project becomes fully operational in 2018.

Using Oxford Economics’ 2018 sectoral wage estimates (again using a 2009 base year); annual salaries were calculated based upon employee activities included in each type of facility. Applying these salary values and 2018 productivity estimates to the number of employees in each sector, the project is expected to generate £2.6m of direct wages and £12.3m of direct GVA per annum (Table 2.5).
The Administration and Visitor Centre alone is estimated to create or sustain 21 direct jobs, with associated wages of £0.4m per annum. The Administration and Visitor Centre could prove to be a local attraction for school visits, and is likely to exist as a permanent local resource.

Given the spare capacity in the economy, no displacement assumptions have been factored into any of the estimates relating to the on-going operations phase.

Our estimates suggest that the operation of the project will have a relatively significant impact with an employment Type II multiplier of 3.6 and the generation of approximately £131,000 value-added per direct employee. This is largely explained by activities to generate electricity from waste. The electricity sector is typically associated with high employment multipliers and the generation of high value-added per worker which is further explained in Box 2.

### Table 2.5: Direct employment capacity of the proposed project

<table>
<thead>
<tr>
<th>On-going phase impacts</th>
<th>Jobs</th>
<th>Wages (£m)</th>
<th>GVA (£m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBT Facility</td>
<td>36</td>
<td>£0.7</td>
<td>£3.3</td>
</tr>
<tr>
<td>EfW (and IBA) Facility</td>
<td>37</td>
<td>£1.4</td>
<td>£8.1</td>
</tr>
<tr>
<td>Administration and Visitor Centre</td>
<td>21</td>
<td>£0.4</td>
<td>£0.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>94</td>
<td><strong>£2.6</strong></td>
<td><strong>£12.3</strong></td>
</tr>
</tbody>
</table>

Source: Oxford Economics

Note: May not add due to rounding

On-going operations direct benefits include 94 jobs, £2.6m wages and £12.3m of GVA per annum
Box 2: Employment multipliers and productivity

The employment multiplier is an important mechanism that quantifies how the operation of the project will influence economic growth. A Type II employment multiplier greater than three means that for every direct job created in the electricity sector and related industries, two or more indirect and induced jobs are also created across the economy.

The electricity industry and its suppliers create particularly high-paying jobs. Employees working directly in the electricity sector are currently paid an average of almost £34,000 per year — the highest figure of any broad sector in the economy and more than the manufacturing, financial and insurance activities, professional, scientific and technical activities and public administration sectors. These high salaries result in relatively large induced income effects for the economy as a whole.

The electricity industry plays a significant role in enabling other parts of the economy to be more productive. However, it is worth noting that the sector itself remains a relatively high-productivity sector when compared with the rest of the Northern Ireland (NI) economy (Table 2.6). Value-added per worker in the electricity sector in 2012 was approximately £187,700 in 2009 prices, making it the second most productive sector in Northern Ireland (NI) behind financial and insurance activities (£278,622). Productivity in the electricity sector is over five times that in the economy as a whole and over triple that of manufacturing.

The electricity industry generates much higher output per worker than the UK average, reflecting high levels of investment and highlights the impact of improving technology on productivity in the sector.

Table 2.6: Sectoral productivities, Northern Ireland (NI), 2012

<table>
<thead>
<tr>
<th>SIC 2007 sector</th>
<th>Productivity - i.e. Value added per worker (£, 2009 prices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>8,981</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>49,983</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>55,104</td>
</tr>
<tr>
<td>Electricity, gas, steam and air conditioning supply</td>
<td>187,700</td>
</tr>
<tr>
<td>Water supply; sewerage, waste management and remediation activities</td>
<td>77,592</td>
</tr>
<tr>
<td>Construction</td>
<td>31,303</td>
</tr>
<tr>
<td>Wholesale and retail trade; repair of motor vehicles and motorcycles</td>
<td>25,749</td>
</tr>
<tr>
<td>Transportation and storage</td>
<td>31,641</td>
</tr>
<tr>
<td>Accommodation and food service activities</td>
<td>18,385</td>
</tr>
<tr>
<td>Information and communication</td>
<td>57,470</td>
</tr>
<tr>
<td>Financial and insurance activities</td>
<td>55,115</td>
</tr>
<tr>
<td>Real estate activities</td>
<td>278,622</td>
</tr>
<tr>
<td>Professional, scientific and technical activities</td>
<td>47,446</td>
</tr>
<tr>
<td>Administrative and support service activities</td>
<td>23,805</td>
</tr>
<tr>
<td>Public administration and defence; compulsory social security</td>
<td>45,535</td>
</tr>
<tr>
<td>Education</td>
<td>33,960</td>
</tr>
<tr>
<td>Human health and social work activities</td>
<td>26,804</td>
</tr>
<tr>
<td>Arts, entertainment and recreation</td>
<td>26,202</td>
</tr>
<tr>
<td>Other service activities</td>
<td>20,625</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>35,592</strong></td>
</tr>
</tbody>
</table>

Source: Oxford Economics, ONS
Note: The estimates produced here are measured in real (2009) prices
The combined additional wages of those in direct and indirect employment will result in induced activities as earnings are spent on products and services in the local economy. These wages are estimated to create or sustain a further 59 induced jobs most likely to be concentrated in sectors such as retail, accommodation and food, arts, entertainment and recreation and other service activity sectors. These induced jobs will potentially generate wages and GVA of approximately £0.8m and £1.5m per annum respectively (Table 2.7).

Table 2.7: Annual direct, indirect and induced benefits

<table>
<thead>
<tr>
<th>On-going phase impacts</th>
<th>Jobs</th>
<th>Wages (£m)</th>
<th>GVA (£m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>94</td>
<td>£2.6</td>
<td>£12.3</td>
</tr>
<tr>
<td>Indirect</td>
<td>185</td>
<td>£4.3</td>
<td>£10.8</td>
</tr>
<tr>
<td>Induced</td>
<td>59</td>
<td>£0.8</td>
<td>£1.5</td>
</tr>
<tr>
<td>Total</td>
<td>337</td>
<td>£7.7</td>
<td>£24.6</td>
</tr>
</tbody>
</table>

Source: Oxford Economics
Note: May not add due to rounding

Many of the indirect operational phase benefits will be realised within the arc21 region, especially in Belfast, where inputs are expected to be purchased from

Table 2.8 presents estimates of direct, indirect and induced employment and wages at a sectoral level. Intuitively most employment effects are felt in the electricity, gas and steam, water supply; sewerage and waste, wholesale and retail, professional, scientific and technical activities and administrative and support sectors.

Again, the model estimates presented for the on-going operations phase are felt across the entire Northern Ireland (NI) economy. It is worth noting that not all of the total on-going operations impacts will be captured by the Antrim and Newtownabbey economies - rather the estimates in Table 2.8 will be spread across the region. While some of the direct on-going jobs will be taken up by local residents, some of the roles are specialised requiring unique skill sets and will potentially be drawn from the wider arc21 area (such as Belfast) or elsewhere in Northern Ireland (NI). Many of the indirect benefits will be realised in Belfast, where inputs are expected to be purchased from, for on-going operation of the facilities. These inputs include:

- Diesel for mobile plant and EfW;
- Process consumables for MBT and EfW;
- Mobile plant leasing for MBT;
- Recycling and disposal contracts for MBT and EfW residues; and
- Transport for MBT and EfW residues.

However it is reasonable to assume that the majority of the induced benefits will be realised within the two local Council areas.
Overall, the on-going operation of the project is estimated to create or sustain 337 jobs, £7.7m of earnings and £24.6m of GVA per annum.

Box 3: The exclusion of displacement from this study

As noted, the benefits from both the construction and on-going operations phases of the proposed residual waste treatment project (RWTP) were gross estimates with zero displacement applied. A detailed assessment of displacement is a large undertaking with very few examples of studies that have tried to estimate this type of displacement (either within NI or for this type of development). While we did consider the merits of putting a displacement/relocation of jobs rate into our modelling calculations (as we have done with other economic impact studies we have undertaken), in our judgment the most robust course of action was to exclude any displacement assumptions given the niche type of project in question and for the reasons described below.

We did not use a displacement rate in the construction estimates given the significant spare capacity in the construction sector. As of the time of writing (21st October 2013,) the most recent Northern Ireland Construction Bulletin (http://www.csu.nisra.gov.uk/niconsq12013.pdf) notes:

"The total volume of construction output in the first quarter of 2013 decreased by 1.1% compared with Q4 2012 and was 12.1% lower compared to the same quarter in 2012. The level of construction output in Northern Ireland has remained broadly flat for the last three quarters. The value of construction output in real prices in Q1 2013 was estimated to be £465 million, 41.7% lower than the peak value in Q2 2007 (£798..."
The Becon Consortium (the Consortium)
Economic Impact Study

In the first quarter of 2013, the volume of New Work decreased by 2.8% compared to the previous quarter and was 15.5% lower than the same quarter in 2012. The overall trend in New Work output has been consistently downward since the peak in Q1 2007 with current output levels being approximately half of that reported in the peak quarter.”

This has been reflected in the level of construction sector employment in NI. As our report outlines in Section 5.5, the “construction sector has suffered the largest amount of recessionary job losses of any sector”; indeed as a result, jobs levels in the sector have returned to those last experienced in the early 2000s. A large share of the unemployment on-flows (those starting to register for unemployment benefits) over the course of the last few years have been construction workers in manual trade roles. The outlook for the sector remains one of slow recovery as government and businesses make cuts in capital expenditure, and a lack of demand from commercial and residential property persists. Job levels are likely to remain broadly flat and well below the peak not just over the short-term, but well beyond. The boom period for the sector from pre-recession (with the aid of demand for the Republic of Ireland) is very much a thing of the past. Even during the boom, the construction sector always seemed to cope with extra demand as it presented itself. All this published data and information is a clear sign of the spare capacity that exists.

Oxford Economics estimates for the benefits from the on-going operations phase consider only activity from the MBT facility, EfW (and IBA) facility and Administration and Visitor Centre related to the new RWTP and provide no counterfactual allowing for current activities at the site. Factoring in a displacement rate assumption to the on-going phase merits slightly more consideration, though ultimately a decision was reached not to factor in a displacement assumption given the niche type of project we are considering here.

There are no similar projects like this in NI to displace activity from. While we would accept that there will be some displacement of jobs from those currently employed by Tarmac at Hightown Quarry and in landfill sites, it is hard to place an actual jobs level to this and the numbers involved are largely immaterial when placed in the context of the employment creation associated with the proposed RWTP.

Hightown Quarry has operated on a contract by contract basis since 2008. Shortly after the height of the construction boom in 2008, employment levels had reduced to 6 full time employees. With the aggregates market severely depressed since 2008 and showing no signs of any notable recovery, these numbers are likely to have fallen further; meaning the level of net jobs lost from the quarry is largely immaterial.

In relation to the landfiling activities, in 2011/12 the arc21 Councils landfilled approximately 310,783 tonnes (Ref: Northern Ireland Local Authority Municipal Waste Management Statistics – Annual Report 2011/2012), at 3 landfill sites – Cottonmount operated by Biffa Waste Services Limited, Mullaghglass operated by Alpha Resource Management and Drumnakelly operated by Down District Council. Exact staffing levels at each of these sites are not known but typically the landfilling of this volume of waste would employ 10-12 permanent staff supported by 10-20 non-permanent sub-contractor staff.

Given the likely low levels of displacement and the uncertainty, in our judgment the most robust course of action was to exclude any displacement assumptions altogether from this part of the analysis. Our models have been developed to include displacement should more accurate data be made available though we suspect the resulting estimates will be close to the numbers we present in this report.
2.3 Fiscal Impact

2.3.1 An Increase in Tax Revenue and Slight Saving On Benefits

In estimating the additional tax receipts arising from the residual waste treatment project (RWTP), it was assumed that approximately 40% of total earnings would be paid towards improving the public accounts. This takes account of not only income tax and National Insurance Contributions (NIC), but value added tax through the purchase of goods and services by those in direct, indirect and induced employment.

During the period of construction, tax receipts will potentially equate to £48.8m (including direct, indirect and induced wage impacts) and the on-going operations phase is likely to provide £3.1m in additional tax receipts each year (Table 2.9).

Table 2.9: Annual tax revenues arising from operation of the project

<table>
<thead>
<tr>
<th>Total impacts</th>
<th>Wages (£m)</th>
<th>Tax revenue (£m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>£122.1</td>
<td>£48.8</td>
</tr>
<tr>
<td>On-going</td>
<td>£7.7</td>
<td>£3.1</td>
</tr>
<tr>
<td>Total</td>
<td>£129.8</td>
<td>£51.9</td>
</tr>
</tbody>
</table>

Source: Oxford Economics
Note: May not add due to rounding

In addition to tax receipts, employment creation will provide benefit savings. That is, assuming that each additional job attracts someone from unemployment directly or indirectly through the job chain effect, the construction or on-going operation of the site would reduce benefit payments.

Taking the lower and upper levels of unemployment benefit as of July 2012 (£51.85 and £102.75 per week) an estimated £16.3m to £32.3m of savings could be made during the construction period, including direct, indirect and induced impacts (Table 2.10). Similarly, the on-going benefits could provide savings of between £0.9m and £1.8m each year (Table 2.11).

Table 2.10: Annual unemployment savings arising from construction of the project

<table>
<thead>
<tr>
<th>Construction phase</th>
<th>Unemployment savings (£m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper</td>
</tr>
<tr>
<td>Direct</td>
<td>£14.4</td>
</tr>
<tr>
<td>Indirect</td>
<td>£12.8</td>
</tr>
<tr>
<td>Induced</td>
<td>£5.1</td>
</tr>
<tr>
<td>Total</td>
<td>£32.3</td>
</tr>
</tbody>
</table>

Source: Oxford Economics
Note: May not add due to rounding

Tax revenue of £48.8m from the construction phase and £3.1m per annum from the on-going operational phase

Total unemployment savings of £16.3m-£32.3m from the construction phase and £0.9m-£1.8m per annum from the on-going phase
Table 2.11: Annual unemployment savings arising from operation of the project

<table>
<thead>
<tr>
<th>On-going phase</th>
<th>Unemployment savings (£m)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Upper</td>
<td>Lower</td>
</tr>
<tr>
<td>Direct</td>
<td>£0.5</td>
<td>£0.3</td>
</tr>
<tr>
<td>Indirect</td>
<td>£1.0</td>
<td>£0.5</td>
</tr>
<tr>
<td>Induced</td>
<td>£0.3</td>
<td>£0.2</td>
</tr>
<tr>
<td>Total</td>
<td>£1.8</td>
<td>£0.9</td>
</tr>
</tbody>
</table>

Source: Oxford Economics
Note: May not add due to rounding

Total tax revenue from the construction phase is estimated at £48.8m while the operation phase is estimated to yield tax receipts of £3.1m per annum. Total unemployment savings are estimated to range from £16.3m to £32.3m over the period of construction and £0.9m to £1.8m per annum when the project becomes fully operational.
3 Recovery Facilities – Analysing the MBT and EfW Processes

This section analyses what is entailed within the MBT and EfW processes in more detail. It provides an overview of landfill policy targets and performance to date. It also considers the amount of tax charged by landfill weight and the energy produced from waste.

Key points:

- Energy recovery has a major role to play within the framework of the DEFRA Waste Hierarchy and will take on added importance in Northern Ireland (NI);

- The UK and other EU countries, including Northern Ireland (NI), have agreed to reduce the amount of biodegradable municipal waste (BMW) going to landfill to prevent further damage to the environment caused by land filling;

- The Northern Ireland Waste Management Strategy 2006 (and the Northern Ireland Landfill Allowance Scheme (NILAS)) set out the following specific targets for Landfill Diversion to reflect the EU Landfill Directive (1991/31/EC) – the quantity of biodegradable waste sent to landfill should not exceed 75% of 1995 baseline levels by 2010; 50% of 1995 baseline levels by 2013; and 35% of 1995 baseline levels by 2020;

- The amount of BMW sent to landfill by arc21 in 2011/12 was 173,597 tonnes, approximately 30% less than their allocated allowance. This project is likely to help reduce this amount of waste sent to landfill further;

- If the total contract waste for the proposed project was not treated and simply landfilled, the total landfill tax cost would be approximately £19.3m at the standard rate of tax £80 per tonne (projected landfill tax rate from April 2014). In addition, a fine, under the NILAS compliance scheme, of up to £10.9m, could also be incurred by the arc21 constituent Council for failure to comply with the Landfill Diversion Targets; and

- The site has been designed to accept and treat up to 300,000 tonnes of waste in any given year, which will be split between the MBT facility (capacity 300,000 tonnes) and the EfW facility (capacity 68MWTH). For the year 2019/20, based on the assumed waste composition and projected waste tonnages, the site is expected to accept and treat 265,198 tonnes of waste. The MBT facility is expected to accept and treat 241,319 tonnes of Authority Waste. The EfW facility is expected to thermally treat 187,041 tonnes of fuel generated in the MBT along with 23,879 tonnes of Third Party Waste. The EfW facility will export approximately 14MW of electricity to the All-Island SEM, which will provide over 100,000 MWh per year, enough electricity power over 30,000 homes. Full operation of the residual waste treatment project (RWTP) is expected in 2018.
“EfW is a cornerstone of any advanced sustainable waste management solution. Some materials are not suited to recycling and composting, while others do not produce a quality product through MHT\textsuperscript{9} or AD\textsuperscript{10} processing. Even the highest recycling rates recorded globally show specific materials, such as nappies or composites that just don’t suit recycling. Thus using this residual waste stream to generate electricity, and even more importantly heat is sensible, affordable and environmentally responsible”. Global Practice Director, AEA

“We have very little EfW capacity in the UK compared with the greenest countries in Europe. We have 25 plants for a 61m population, whereas Denmark has 32 plants for a population of just 5m. EfW gives Denmark 16% of its heat and power by combusting unrecyclable material. The UK has a growing energy crisis with supply not equalling demand from 2017, made worse by companies pulling out of building nuclear power stations. EfW can provide 11% of our energy needs from unrecyclable waste”. Director General, British Plastics Federation

3.1 Introducing the Processes of Energy Recovery

Energy recovery has a major role to play within the framework of the Department for Environment Food and Rural Affairs (DEFRA) Waste Hierarchy and will take on added importance in Northern Ireland (NI). Once the preferred options of waste reduction, re-use and recycle are exhausted, Energy Recovery is one of the best available techniques used to recover the residual energy from the remaining waste.

For the arc21 residual waste treatment project (RWTP) it is proposed to have a combination of Mechanical Biological Treatments (MBT) and Energy from Waste (EfW) technologies where:

**Mechanical Biological Treatment (MBT) is used to** mechanically and biologically treat (Authority) waste to separate out recyclable materials, rejects and prepare RDF and includes front end recycling.

**Energy from Waste (EfW) is used to** thermally treat the RDF produced in the MBT process and untreated wastes including Third Party Waste, and harnesses this to produce power which in the case of this project is exported into the All-Island SEM. Recycling at the back end forms part of the process.

There are further advantages - in that the vast majority of the waste is diverted from landfill; as well as the fact that the power provided is not produced directly from fossil fuels.

\textsuperscript{9} Mechanical heat treatment
\textsuperscript{10} Anaerobic digestion
The Becon Consortium (the Consortium)
Economic Impact Study

3.2 Landfill Targets

The UK and other EU countries, including Northern Ireland (NI), have agreed to reduce the amount of BMW going to landfill to prevent further damage to the environment caused by landfilling. This basis of this agreement is the EU Landfill Directive (1999/31/EC) which sets out targets for the UK (including NI) and other EU countries to reduce the amount of BMW sent to landfill. Under the EU Landfill Directive, the targets for the reduction of BMW landfilled are:

- To reduce by 2010 the quantity of BMW landfilled to 75% of that produced in 1995;
- To reduce by 2013 the quantity of BMW landfilled to 50% of that produced in 1995; and
- To reduce by 2020 the quantity of BMW landfilled to 35% of that produced in 1995.

The definition of municipal waste recently changed and the tonnage of the new targets is given in Table 3.1 below.

Table 3.1: Landfill diversion targets ('000 tonnes)\(^{11}\)

<table>
<thead>
<tr>
<th></th>
<th>Landfill diversion targets</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2010</td>
</tr>
<tr>
<td>England</td>
<td>21,773</td>
</tr>
<tr>
<td>Scotland</td>
<td>2,697</td>
</tr>
<tr>
<td>Wales</td>
<td>1,378</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>919</td>
</tr>
<tr>
<td><strong>UK</strong></td>
<td><strong>26,766</strong></td>
</tr>
</tbody>
</table>

Source: DEFRA

Within Northern Ireland the Department of the Environment (DOE) has set annually reducing targets between 2006 and 2020 on a council-by-council basis, called the Northern Ireland Landfill Allowance Scheme (NILAS). The NILAS Regulations (the Northern Ireland Landfill Allowance Scheme (NILAS)) came into operation in Northern Ireland on 1st April 2005. The Regulations place a statutory responsibility on district councils, in each scheme year, to landfill no more than the quantity of BMW for which they have allowances (each allowance represents one tonne of BMW that can be sent to landfill). If the annual limit is exceeded this may result in financial penalties of £150/tonne per exceeded allowance as per the Landfill Allowances Scheme (Amendment) Regulations (Northern Ireland) 2005. This scheme incorporates the step change reductions in the amount of biodegradable Municipal Waste (BMW) which can be landfilled by each council in 2010, 2013 and 2020 to ensure compliance with EU Landfill Directive (1999/31/EC).

Furthermore, proposals for tougher packaging recycling targets to stop 400,000 tonnes of packaging going to landfill by 2017 were announced in December 2011 by Environment Secretary Caroline Spelman.

The new targets for packaging producers will also ease the demand on raw natural materials and improve resource efficiency by making more recyclable materials available for businesses.

Environment Secretary Caroline Spelman said:

“...we all notice the amount of packaging that comes with the things we buy. An alarming amount of this is still going to landfill.

“These new, more ambitious targets will deliver real environmental and economic benefits. They will give a new incentive to companies to cut down on excess packaging and increase efforts to have their materials recycled.”

The proposed new targets are to:

- Increase the steel recycling target by 1% per year, from 71% in 2012 to 76% by 2017;
- Increase the aluminium recycling target by 3% per year, from 40% in 2012 to 55% in 2017;
- Increase the plastics recycling target by 5% per year, from 32% to 57% by 2017; and
- Increase the overall packaging recovery rate by 1% each year, from 74% in 2012 to 79% in 2017.

These targets were drawn up following recommendations from the Advisory Committee on Packaging and in order to fulfil a commitment in the Waste Review, published in summer 2011, to consult on increased recycling targets.

### 3.3 Performance In The arc21 Area

#### 3.3.1 Landfill Performance

In 2011/12, the total amount of BMW which was permitted to be sent to landfill was 465,950 tonnes in Northern Ireland (NI). The total amount of BMW reported to have been sent to landfill was 309,792 tonnes i.e. 33.5% of landfill allowances were not utilised. This was an increase of 8.13% compared to 2010/11 (25.37%).

The amount of BMW sent to landfill by arc21 was 173,597 tonnes, approximately 30% less than their allocated allowance (Table 3.2). The proposed project will contribute to a further reduction in the amount of waste sent to landfill in the future.

As well as contribute to the new proposed targets for recycling

The facilities should ensure further reductions in the amount of waste sent to landfill, building on recent gains
Table 3.2: Landfill allowance utilisation, arc21, 2011/12


| Note: May not add due to rounding |

<table>
<thead>
<tr>
<th>2011/12 allocation</th>
<th>BMW sent to landfill</th>
<th>BMW sent to landfill (% of allocation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antrim 13,490</td>
<td>7,647</td>
<td>56.7%</td>
</tr>
<tr>
<td>Ards 20,686</td>
<td>13,767</td>
<td>66.6%</td>
</tr>
<tr>
<td>Ballymena 16,242</td>
<td>10,648</td>
<td>65.6%</td>
</tr>
<tr>
<td>Belfast 70,573</td>
<td>62,055</td>
<td>87.9%</td>
</tr>
<tr>
<td>Carrickfergus 10,652</td>
<td>7,192</td>
<td>67.5%</td>
</tr>
<tr>
<td>Castlereagh 17,673</td>
<td>9,278</td>
<td>52.5%</td>
</tr>
<tr>
<td>Down 18,345</td>
<td>13,139</td>
<td>71.6%</td>
</tr>
<tr>
<td>Larne 8,336</td>
<td>4,759</td>
<td>57.1%</td>
</tr>
<tr>
<td>Lisburn 29,943</td>
<td>17,697</td>
<td>59.1%</td>
</tr>
<tr>
<td>Newtownabbey 21,787</td>
<td>13,899</td>
<td>63.8%</td>
</tr>
<tr>
<td>North Down 20,807</td>
<td>13,516</td>
<td>65.0%</td>
</tr>
<tr>
<td>arc21 total 248,533</td>
<td>173,597</td>
<td>69.8%</td>
</tr>
</tbody>
</table>

3.3.2 Landfill Tax

Table 3.3 shows the rates of tax charged on landfill wastes:

Table 3.3: Rates charged per tonne of landfill waste

<table>
<thead>
<tr>
<th>Date of change</th>
<th>Standard rate (£ per tonne)</th>
<th>Lower rate (£ per tonne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.04.10</td>
<td>48</td>
<td>2.5</td>
</tr>
<tr>
<td>01.04.11</td>
<td>56</td>
<td>2.5</td>
</tr>
<tr>
<td>01.04.12</td>
<td>64</td>
<td>2.5</td>
</tr>
<tr>
<td>01.04.13</td>
<td>72</td>
<td>2.5</td>
</tr>
<tr>
<td>01.04.14</td>
<td>80</td>
<td>To be announced (1)</td>
</tr>
</tbody>
</table>

Source: HMRC

Note (1): Budget 2010 announced that the standard rate of landfill tax would increase by £8 per tonne each year from 1 April 2011 until at least 2014. There will be a floor under the standard rate, so that the rate will not fall below £80 per tonne from 2014-15 to 2019-20

Landfill tax is chargeable by weight. The lower rate applies to those less polluting wastes listed in the landfill tax which include:

- Wastes which are not 'hazardous';
- Wastes with a low potential for greenhouse gas emissions; and
- Wastes with low polluting potential in the landfill environment.

The standard rate applies to all other taxable waste including:

- Rocks and soils;
- Ceramic or concrete materials;
- Minerals;
- Furnace slags;
- Ash;
Low activity inorganic compounds;
Calcium sulphate; and
Calcium hydroxide and brine

If the total contract waste for the proposed project was not treated and simply landfilled, the total annual landfill tax cost would be approximately £19.3m at the projected standard rate of tax of £80 per tonne (from April 2014). In addition, an annual fine, under the NILAS compliance scheme, of up to £10.9m, could also be incurred by the arc21 constituent Council for failure to comply with the Landfill Diversion Targets.

However, the introduction of the proposed project would lead to a fall in the amount of this type of waste sent to landfill. Under normal operations, it is estimated that only 3,750 tonnes of the arc21 contract waste would be sent directly to landfill incurring a Landfill Tax of approximately £300,000 and presenting no risk to the arc21 constituent councils of their meeting the Landfill Diversion Targets.

The ash generated in the EfW will be processed on site to produce a material which can be used as an aggregate in the construction industry.

3.3.3 How Will The MBT And EfW Processes In This Project Help?

The site has been designed to accept and treat up to 300,000 tonnes of waste in any given year, which will be split between the MBT facility (capacity 300,000 tonnes) and the EfW facility (capacity 68MWth). For the year 2019/20, based on the assumed waste composition and projected waste tonnages, the site is expected to accept and treat 265,198 tonnes of waste. The MBT facility is expected to accept and treat 241,319 tonnes of Authority Waste. The EfW facility is expected to thermally treat 187,041 tonnes of fuel generated in the MBT along with 23,879 tonnes of Third Party Waste.

There are two main elements in the MBT facility; the mechanical treatment and biological treatment. The mechanical treatment stage separates the waste into different fractions such as:

- materials which will be to be sold to reprocessors for recycling;
- undersize fraction which will undergo biological treatment; and
- midsized fraction which will be used as a RDF and thermally treated in the EfW.

Many different types of materials are removed using mechanical equipment and manual picking to maximise the recycling from the waste prior to thermal treatment. This will help arc21 to achieve its recycling targets as set out in its waste management plan and also reduces the overall cost in treating the arc21 residual waste. The biological treatment stage bio-dries the undersize material to reduce its mass and produce a RDF for thermal treatment in the EfW.

The EfW facility is designed to thermally treat the RDF produced in the MBT and any untreated waste streams, and to recover energy from the process through...
the generation of electricity. The EfW also provides the heat required for the biological treatment stage of the MBT. The EfW facility will export approximately 14MW of electricity to the All-Island SEM, which will provide over 100,000 MWh per year, enough electricity power over 30,000 homes. Full operation of the residual waste treatment project (RWTP) is expected in 2018. This is not the whole solution to Northern Ireland (NI) energy demand but it is a positive step forward.

3.4 Positive Future for EfW activities

There are approximately 36 Energy from Waste plants either in operation or consented across Great Britain and over 450 in operation in continental Europe; many of these are located in countries with long established ‘green’ credentials such as the Netherlands, Denmark, Switzerland and Germany. A balance must be struck between the development of essential infrastructure and the importance of ensuring that material which could be reused or recycled is not drawn down the hierarchy and that waste generation is not encouraged in order to provide feedstock for recovery processes. There is potential for the sector to expand further as unrecyclable waste becomes increasingly recognised as a valuable source of local energy through EfW and can help the UK and NI’s twin problems of diminishing landfill and expensive imports of energy.

As the Government makes positive steps towards supporting EfW technologies, it will be the UK that will need to catch up with other best practice examples in Europe, some of which are outlined below:

**Isséanne, Paris**

This EFW plant processes 460,000 tonnes of waste a year and is two thirds constructed underground. The waste comes from one million residents in West Paris and twenty nearby towns. It provides heating and hot water for 182,000 residents as well as hospitals, schools, businesses and museums including the Musée D’Orsay, within a 15km radius. The energy generated saves 110,000 tonnes of oil and reduces CO2 emissions by 330,000 tonnes p.a.

**Amsterdam, Holland**

The original EfW plant processes 900,000 tonnes of waste a year and provides electricity to all Amsterdam’s municipal buildings including the music hall, the tram system, sewage works and public lighting. The new EfW plant of 530,000 tonnes a year provides 25,000 households with energy via District Heating. Integration with the sewage plant means 100,000 tonnes a year of sewage sludge being processed. It accepts biogas and delivers back both heat and electricity.

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EEW Energy from Waste Premnitz, Germany

EEW Premnitz is located to the West of Berlin in the Havelland district. It is situated within the Premnitz industrial and commercial park, and operates a single-line circulating fluidised bed incineration (CFBI) plant with a combustion capacity of maximum 100,000 tons per annum plus a single-line grate-firing plant (GFP) with a maximum combustion capacity of 150,000 tons per annum. The industrial and commercial clients based within the park are supplied with electricity, process steam and district heating. Other intensive energy users, including a bio-ethanol producer, are planning to relocate to the Premnitz Park because of the availability of steam and electricity from the EIW plant. Electricity is also exported to the public power grid. Currently, the plant produces approximately 10 MW process steam and 14 MW of electricity per annum.

EEW Energy from Waste Heringen, Germany

EEW Heringen is located in the administrative district Hersfeld-Rotenburg in Hessen. The plant was developed in co-operation with mining corporation K&S AG specifically to make the company independent of rising energy prices by providing steam for the company’s potash works. A Build, Own, Operate and Transfer Project (BOOT) K&S AG will take over ownership of the facility at the end of the 30 year contract period. The K&S AG steam requirement is a complex one, as steam is required at different pressures. To meet this requirement, a gas-fired superheating unit was included in the plant’s design. Currently, the plant produces 110 MW of steam per annum.

MHKW Rothensee, Germany

The waste-to-energy plant, Müllheizkraftwerk Rothensee GmbH, is a joint venture between EEW Energy from Waste GmbH (EEW GmbH) and the municipal works (Städtische Werke) Magdeburg (SWM). The plant has four lines and provides 40,000 households in the city of Magdeburg with electricity, with 44,000 households also receiving district heating from the plant. With a total capacity of 660,000 metric tons, MHKW Rothensee is one of Germany’s largest waste incineration plants. As well as providing energy, the plant plays a significant role in the waste management system in the state of Saxony-Anhalt. Currently, the plant produces 154 MW of district heat and 58 MW of electricity per annum.

EEW Energy from Waste Göppingen, Germany

The EIW plant at Göppingen is located in a picturesque location at the base of the Swabian highlands Schwäbische Alb. The site provides district heating to a local hospital, (Klinik am Eichert) a residential area (Berfeld) as well as to a nearby police training academy. EEW Göppingen plays a vital role in the waste management system of the region. In addition to handling waste from the administrative district of Göppingen, the plant also treats commercial waste from the federal state of Baden-Württemberg via a private waste management company. Currently, the plant produces 36 MW of district heating and 9MW of electricity for the public grid per annum.
4 Unquantifiable Benefits

This section sets out a number of key existing policy and strategy targets which have the potential to be complemented by the proposed project and highlights key issues surrounding sustainable and renewable energy at a local, regional (Northern Ireland) and national (UK) level. It sets out a number of unquantifiable, yet important social and economic benefits that are likely to arise from the proposed project.

Key points:

- The proposed residual waste treatment project (RWTP), which includes MBT and EfW plants, is supported by the existing arc21 Waste Management Plan which specifies a mix of treatment options, including MBT and EfW, for the management and treatment of residual wastes;
- The proposed project will deal with three overarching policy aims – waste management, recycling and energy provision;
- With a prospective increase to supply in the region, the grid will have to be upgraded which could ultimately contribute to NI’s renewable electricity targets being met to 2020 and beyond (Section 4.1);
- Crucially, it will contribute to the fulfillment of the EU Landfill diversion targets and the reduction in CO2 emissions;
- Compared to the environmental impact of traditional energy sources, the environmental impact of a MBT and EfW plant is relatively minor; and
- Successful projects pioneering new technologies which can produce sustainable and renewable energy have the potential to stimulate further projects within the sector.

4.1 Supports Existing Policy

Northern Ireland (NI) has a number of renewable energy targets and priorities in place.

Prioritising renewable energy – NI

<table>
<thead>
<tr>
<th>Targets</th>
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<tbody>
<tr>
<td>15% of all energy consumed to be from renewable sources by 2020</td>
</tr>
<tr>
<td>12% of all energy consumed to be from renewable sources by 2012</td>
</tr>
<tr>
<td>40% of all electricity in 2020</td>
</tr>
<tr>
<td>10% of heat in 2020</td>
</tr>
</tbody>
</table>

The current share of electricity generated from renewable sources is just under 10%.

Source: Energy Ireland, Renewable energy supplement, agenda NI magazines.
Considering that Northern Ireland (NI) is 99% dependent on imported fossil fuels for its energy needs, it is timely that sustainable and renewable sources of energy are given priority. As such, there is a growing amount of interest and policy on investing in sustainable and renewable energy at a Northern Ireland (NI) and UK level. Marie Donnelly, renewable energy director for the European Commission, contends that “while the greenhouse gas target is on track and the renewable target could be exceeded by 0.6%, the energy efficiency projections only reach 10%. As a consequence, this is where our policy efforts are focused at the moment.”

There are a number of existing local, regional and national strategies, listed below, all of which target sustainable and renewable energy development:

- Antrim Environment Policy;
- Antrim, Ballymena and Larne Area Plan 2016;
- Belfast Metropolitan Area Plan (BMAP) 2015, Newtownabbey;
- Northern Ireland (NI) Programme for Government 2011-2015 (PfG);
- Regional Development Strategy 2035 (RDS);
- Investment Strategy Northern Ireland 2011-2021 (ISNI);
- arc21 Waste Management Plan;
- Energy: A strategic framework for Northern Ireland;
- Planning Policy Statement 18: Renewable Energy;
- National Renewable Energy Action Plan for the United Kingdom;
- The UK Renewable Energy Strategy;
- UK Energy Bill 2012/2013;
- UK Energy Act 2011; and

The interlinking relationship between these strategies and the proposed residual waste treatment project (RWTP) are highlighted in Figure 4.1.
Figure 4.1: Relationship between the proposed investment in MBT and EfW facilities and existing strategies

Source: Oxford Economics

4.2 Local Policy

4.2.1 ‘Antrim Borough...A Place for All’ Corporate Plan 2011-2016

Antrim Borough Council's Corporate Plan for 2011-2016 sets out Antrim Borough Council's vision for the Borough as “a place for all”. Sustaining the environment is one of the four key themes in the plan and therefore they aim to:

- Maintain Antrim Borough’s position with a population ranked amongst the highest recyclers in Northern Ireland (NI);
- Ensure Antrim Borough embraces opportunities to increase renewable energies and other sustainable and renewable technologies;

Ensure the quality of our built and natural environment by taking a sustainable approach to secure our assets for future generations;

Establish a strategic action group in collaboration with key public and other partners, to improve quality of and access to the greenways and waterways in the Borough and to connect public spaces with rivers and lakes and towns and villages; and

Maintain attention on emergency planning, management and response arrangements in order to ensure the best possible protection for our community.

One of the main drivers of the aforementioned aims is to maximise recycling and waste minimisation to avoid major European fines being imposed on Antrim's ratepayers.

The proposed residual waste treatment project (RWTP) in Northern Ireland (NI) has the potential to increase local opportunities for waste recycling as well as to enhance sustainable and renewable energy technologies in the area. Such a project will contribute to the local, national and international goals to substantially reduce the total tonnage of waste to landfill whilst increasing energy production from a sustainable and renewable source.

4.2.2 Antrim, Ballymena and Larne Area Plan 2016

The Antrim, Ballymena and Larne Area Plan 2016 Issues Paper acknowledges that the UK has embraced the principle of sustainable development based on stewardship of the environment and as such seeks to facilitate appreciation and care of the natural and man-made elements of the environment.

Waste management is defined as one of the key areas in which action should be taken in order to enhance the lives of the residents of Antrim, Ballymena and Larne.

4.2.3 Antrim Borough Council Environment Policy

Although more so a contract of environmental support, the Antrim Borough Council Environment Policy highlights the importance of continual improvement and prevention of pollution. The policy acts as a promise to demonstrate the effectiveness of environmental management and to improve environmental performance. The Council therefore endeavours to:

“Minimise the amount of waste generated internally and disposed of to landfill. Where reduction is not practical, seek to reuse or recycle waste and ensure the safe disposal of waste.” (P1)

MBT and EfW plants could contribute to a more sustainable waste management programme, directly complying with the key promises made in the borough’s environmental policy.

4.2.4 Belfast Metropolitan Area Plan (BMAP) 2015, Newtownabbey

The Belfast Metropolitan Area Plan 2015 (BMAP) is a development plan prepared by the Planning Service, an agency within the Department of the Environment.

Newtownabbey has been individually assessed in the BMAP 2015 plan. The environment and enhancing quality of life are key areas of the BMAP 2015 plan for Newtownabbey. MBT and EfW plants could contribute to a more sustainable environmental plan; reducing landfill waste and gaseous emissions which in turn would enhance the quality of life of residents within the local area.

4.2.5 Newtownabbey Draft Corporate Plan 2012-2016

Although still in draft format, the Newtownabbey Corporate Plan emphasises the environmental goals set out in the aforementioned national, regional and BMAP 2015 strategies. The very first aim stated in the plan refers to a “greener, cleaner and safer environment” of which a key objective is to:

“Reduce CO2 emissions and energy consumption throughout our facilities.” (P16)

As such, an aim by 2016 is to have reduced CO2 emissions and energy consumption using traditional and new technologies.

Landfill waste is a main concern in the local area. The plan highlights that a total of 28,000 tonnes of waste per year is sent to landfill; approximately 60% of all waste produced within the boundaries of Newtownabbey. In order to meet EU and UK targets, the Northern Ireland Minister for the Environment announced new plans to introduce a statutory 60% recycling target for local authority collected municipal waste. As such, the local area objectives include:

- To provide quality waste collection, treatment and recycling facilities; and
- To meet the requirements of the EU landfill and waste targets.

The main concern within the local area is the consequence of not contributing to governmental targets which have been set, particularly in relation to Landfill targets.

“We could be fined £150 for every tonne by which we exceed our target every year. To pay the fine we would have to increase Council rates by 0.5p for every 1000 tonnes of waste land filled above the target.” (P17)

As such, management of landfill waste and emissions locally is an essential part of the Newtownabbey Corporate Plan. In order to avoid monetary penalty which could affect the Borough Council and the residents of Newtownabbey alike, there has been recognition that new and sustainable waste treatment technologies should be employed at a local level.

4.3 Regional (Northern Ireland (NI)) Policy

4.3.1 Northern Ireland (NI) Programme for Government 2011-2015 (PfG)

The PfG sets the strategic context for both the Budget and the Investment Strategy for Northern Ireland (NI) by providing an overarching set of priorities:

- **Priority one**: Growing a sustainable economy and investing in the future;
- **Priority two**: Creating opportunities, tackling disadvantage and improving health and well-being;
- **Priority three**: Protecting our people, the environment and creating safer communities;
- **Priority four**: Building a strong and shared community; and
- **Priority five**: Delivering high quality and efficient public services.

Although the Northern Ireland (NI) Programme for Government does not solely relate to energy as with the strategies discussed thus far but acts as the all-encompassing strategy for Northern Ireland (NI). Out of the aforementioned priorities, priority three has the potential to be complemented by MBT and EfW plants in Northern Ireland (NI).

Within priority three, a target to adapt to/mitigate the risks of climate change is expressed. This target will be complemented by the addition of EfW plants, enhancing the sustainable and renewable energy offering that Northern Ireland (NI) currently has.

4.3.2 Regional Development Strategy 2035 (RDS)

The RDS offers a strategic and long-term perspective on the future development of Northern Ireland (NI) up to the year 2035. Its purpose is to deliver the spatial aspects of the Programme for Government. It complements the Sustainable Development Strategy and informs the spatial aspects of the strategies of all Government Departments. As is stated in the RDS:

“Development of Northern Ireland’s renewable energy sources is vital to increase its energy security, help combat climate change and achieve the renewable energy targets. The Strategic Energy Framework sets a target of

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40% electricity consumption from renewable sources and a 10% renewable heat target by 2020, in line with mandatory EU renewable targets. This is likely to mean an increase in the number of wind farms both on and off shore and the need to diversify renewables to include electricity from other sources such as tidal stream and bio-energy sources.” (P84)

The proposed project has the potential to fulfil a number of aims from the RDS 2035; particularly relating to the environment, which is one of the three main aims of the RDS. Table 4.1 offers an explanation as to how the proposed project complements the subsequent priorities set out in the RDS.

Table 4.1: How the development of arc21 residual waste treatment project (RWTP) has the potential to contribute to the targets of the RDS 2035

<table>
<thead>
<tr>
<th>Aims and objectives of the RDS</th>
<th>How the development of arc21 residual waste treatment project (RWTP) complements the RDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce our carbon footprint and facilitate mitigation and adaptation to climate change whilst improving air quality</td>
<td>&quot;Climate change is increasingly seen as one of the most serious problems facing the world. It is important that Northern Ireland plays its part by reducing air pollution and greenhouse gas emissions and preparing for the impacts of climate change. Consideration needs to be given on how to reduce energy consumption and the move to more sustainable methods of energy production.” (P43)</td>
</tr>
<tr>
<td>Increase the use of renewable energies</td>
<td>&quot;Energy production from fossil fuels is a major source of greenhouse gas emissions and other pollutants. Northern Ireland is largely dependent on fossil fuel combustion for electricity generation. Energy efficiency along with decarbonisation of the power sector is the key to achieving emissions reduction targets. The Strategic Energy Framework for Northern Ireland 2010 sets a target of 40% of electricity consumption from renewable sources by 2020 as well as achieving 10% penetration of renewable heat. This will require increasing numbers of renewable electricity installations and the grid infrastructure to support them.” (P44)</td>
</tr>
<tr>
<td>Contribute to the achievement of renewable energy targets</td>
<td>&quot;...a target of 40% electricity consumption from renewable sources and a 10% renewable heat target by 2020, in line with mandatory EU renewable targets.” (P84)</td>
</tr>
</tbody>
</table>

As mentioned above, the targets put in place are ambitious, but achievable. The targets have been set at a local, regional, national and EU level, stressing their importance and the proposed development of the MBT and EfW plants, as part of the arc21 residual waste treatment project (RWTP), will contribute to the realising of this target.
Aims and objectives of the RDS

How the development of arc21 residual waste treatment project (RWTP) complements the RDS

<table>
<thead>
<tr>
<th>Aims and objectives of the RDS</th>
<th>How the development of arc21 residual waste treatment project (RWTP) complements the RDS</th>
</tr>
</thead>
</table>
| Increase the contribution that renewable energy can make to the overall energy mix | “There will need to be a significant increase in all types of renewable electricity installations and renewable heat installations, including a wide range of renewable resources for electricity generation both onshore and offshore to meet the Region’s needs.” (P36)  
As the population grows, there is a necessity for increased power generation from a diverse range of sources. In order to limit greenhouse gas emissions, it is of high importance that this range of sources incorporates sustainable and renewable technologies such as MBT and EfW plants. |
| Reduce energy consumption and move to more sustainable methods of energy production | “The use of fossil fuels and greenhouse gas emissions can be reduced by recycling waste and recovering energy from it.” (P43)  
The proposed development will generate energy from a renewable and sustainable source and by exporting 14MW of electrical energy annually, sufficient to power 30,000 households; will help reduce Northern Irelands over dependency on imported fossil fuels. Each year, the electrical energy exported from the development will contribute approximately 51,000MWh towards Northern Ireland’s 2020 renewable energy targets. In addition, the development will provide a net benefit of 57,500 tonnes CO₂ Equivalent in Greenhouse Gas Emissions relative to the current practise of waste disposal to landfill within the arc21 region.  
Furthermore, the project will increase arc21’s constituent Councils’ overall recycling rates by up to 10% through the extraction of plastics, metals, aggregates and other valuable materials. |
| Develop significant new waste management infrastructure | “Northern Ireland currently produces some one million tonnes of municipal waste annually, of this, 33% was sent for recycling in 2009/10. The majority of the remaining municipal waste was sent to landfill (66%), with a very small amount reused. The EU Landfill Directive sets a series of increasingly strict limits on the amount of biodegradable waste that can be sent to landfill until 2020 to reduce the total land filled to 35% of 1995 levels by 2020.” (P85)  
Meeting the targets through the diversion of waste from landfill to other treatment methods will require the development of significant new waste management infrastructure such as MBT and EfW plants. The proposed development, incorporating both MBT and EfW technology has the potential to increase arc21’s constituent Councils’ overall recycling rates by up to 10% through the extraction of plastics, metals, aggregates and other valuable materials, whilst also diverting up to 250,000 tonnes per year of municipal waste away from landfill. |

Source: Oxford Economics

4.3.3 Investment Strategy Northern Ireland 2011-2021 (ISNI)²⁰

Delivering on the green economy is top of everyone’s agenda in Northern Ireland (NI) and the region is well placed to benefit from investment in this sector. The Northern Ireland (NI) Executive’s Investment Strategy supports the Programme for Government and the RDS with respect to investment in the emerging sustainable and renewable energy market.

“Our population has increased and a greater proportion is now older. Our towns and cities have grown and people’s needs and expectations about...”

Service entitlement and service standards have changed. New technology, for example, is opening up faster and better ways of delivering services, often at a lower cost per transaction. More energy efficient solutions are now available, delivering both cost and emission reductions and with the potential to increase our use of renewable energy sources rather than the traditional fossil fuels.

With less money to go around, we will invest in better and more efficient ways to deliver essential public services rather than simply cut the availability or quality of those services in order to save money.” (P11)

In a section entitled ‘Protecting our People and the Environment’, the Investment Strategy highlights the importance of renewable sources in electricity generation. The long-term targets are emphasised, stressing that the UK Climate Change Act 2008 legislated for an 80% mandatory cut in the UK’s carbon emissions by 2050 (compared to 1990 levels), with a target of 35% by 2025. In order to meet this target, the region has to aim to become more energy efficient. One suggested method is to replace inefficient infrastructure with new technologies; enabling Northern Ireland (NI) to become less reliant upon fossil fuels.

“Compliance with international standards is another driver of investment. In waste management, for example, European Law requires us to make less use of landfill and invest more in new waste treatment facilities.” (P13)

EfW and MBT plants in Northern Ireland (NI) would comply with EU law and could potentially bring a number of extra benefits to the region. The following list demonstrates just some of the key benefits associated with MBT and EfW plants:

- Cost effective thermal treatment process and established proven technology;
- No extensive preparation of waste material is required and the MBT and EfW facilities are adaptable to changes in the mix of waste material;
- The EfW process recovers energy in the form of electrical power and heat. Just 5MW of electricity is sufficient to light and heat 5000 homes;
- The combined MBT and EfW processes diverts waste from landfill, thus preventing greenhouse gas (methane) emissions; and
- Municipal waste is a non-fossil fuel. Recovery of energy from this source by EfW processing means that less fossil fuels such as coal, gas and oil need to be burned - preserving this limited resource for future generations.

The Northern Ireland (NI) Investment Strategy recognises the importance of managing waste effectively, combining this aim with a target to increase renewable energy generation. Considering the aforementioned benefits, MBT and EfW plants could potentially complement these interrelated targets.
4.3.4 Towards Resource Management, the Northern Ireland Waste Management Strategy 2006 – 2020

The current Northern Ireland Waste Management Strategy ‘Towards Resource Management’ (the 2006 strategy) was published in March 2006 and set the strategic direction for waste management in Northern Ireland at the time. A scoping exercise was carried out in 2011 to consider the 2006 Strategy in the context of EU requirements and policy developments in Northern Ireland and throughout the UK and Ireland. It was decided that the 2006 Strategy should be revised in the form of a ‘recast’ firmly based on the principles of adherence to the waste hierarchy while retaining the core principles contained in the 2006 Strategy. A consultation exercise on the revised Northern Ireland Waste Management Strategy ‘Delivering Resource Efficiency’ (‘the draft revised Strategy’) ran between 26 October 2012 and 18 January 2013.

The aim of the Waste Management Strategy is to help to manage waste and resources effectively. This means using material resources in a way that reduces the quantities of waste produced and, where waste is generated, to manage it in a way that minimises its impact on the environment and public health and contributes positively to economic and social development.

In order to support the aim, the strategy has a number of key objectives, namely:

- To move from waste towards resources management;
- To demonstrate Government’s commitment by setting an example to other sectors of good waste management practice and by using its purchasing power to drive change;
- To prevent waste, where possible;
- To use the necessary Government powers (legislative, regulatory and economic) to ensure improved waste management practices;
- To maximise recycling and recovery of those materials which enter the waste stream;
- To develop an integrated network of regional waste management facilities that represent value for money for Northern Ireland (NI);
- To attract investment, support economic development and create opportunities for increased employment and wealth creation;
- To improve data to support investment and facilitate monitoring;
- To maintain a regulatory framework which supports those businesses that work towards more efficient and sustainable use of resources; and
- To promote, encourage and facilitate public action through providing the opportunity to contribute to environmental protection at individual and household levels.

Although not all of these objectives are applicable to the proposed MBT and EfW project, the majority would support its cause.

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21 http://www.doeni.gov.uk/towards_resource_management.pdf
The MBT and EfW plants being proposed as part of the arc21 residual waste treatment project (RWTP), have the potential to contribute to the overall aim of the Waste Management Strategy; reducing landfill waste and instead managing it in such a way that it becomes beneficial to the environment. The strategy emphasises:

“The substantial quantity of waste generated must be recycled, composted or recovered by other methods, including energy recovery.” (P31)

In addition to extracting recyclable materials, the MBT processing can produce a fuel for use by EfW plants through subsequent thermal treatment. In addition, EfW has the potential to contribute to meeting NI’s non-fossil fuel obligations and Government’s policies on renewable energy, as well as helping the region to meet its landfill diversion targets.

“Government continues in its firm belief that energy from waste will be a necessary component of the preferred infrastructure, both in terms of its policies on renewable energy and to ensure that Northern Ireland meets its landfill diversion targets. Energy from waste facilities may also provide diversity and security of supply.” (P46)

The proposed project could therefore contribute towards local, regional, national and EU targets, as well as to satisfy governmental belief in its role in environmental change.

4.3.5 arc21 Waste Management Plan

The arc21 Waste Management Plan was adopted in January 2003. The first formal review of the plan was scheduled for 2007 but this was brought forward to coincide with the review being undertaken by the other two Waste Management Groups and to comply with the request of the Department of the Environment (DOE). It has been updated to account for recent developments in waste management in Northern Ireland, including:

- The Landfill Allowance Scheme (Northern Ireland) Regulations 2004 (NILAS);
- The Northern Ireland Best Practicable Environmental Option (NI BPEO) 2005
- The Thematic Strategy on the Prevention and Recycling of Waste; and

Although not all of these objectives are applicable to the proposed residual waste management treatment project, the majority would support its cause.

The arc21 Waste Management Plan takes account of the overall Northern Ireland (NI) Waste Management Strategy – the proposed project has been designed to complement the aims of the arc21 Plan.

http://www.arc21.org.uk/filestore/default.asp?categoryId=2&itemId=8
The Northern Ireland Waste Management Strategy 2006.23

The principal objective of the Plan is to identify the options for managing waste within the arc21 region up to 2020, and aims to draw the right balance between:

- meeting strategic targets for reduction, recycling and recovery;
- the protection of the environment for present and future generations; and
- the provision and maintenance of sufficient disposal and treatment capacity to deal with the waste produced.

The targets and methods for dealing with municipal wastes have been updated to take account of the Northern Ireland Landfill Allowance Scheme (NILAS) and the Northern Ireland Waste Management Strategy 2006. Two of the primary targets for municipal waste specified within the Plan relate to Household Waste Recycling and Composting Targets and Landfill Waste Diversion Targets:

a) Household Waste Recycling and Composting Targets:

- to recycle and compost 35% of household wastes by 2010;
- to recycle and compost 40% of household wastes by 2015; and
- to recycle and compost 45% of household wastes by 2020.24

b) Landfill Waste Diversion Targets

Reduce the quantity of biodegradable municipal waste landfilled, through adherence to NILAS allowances for arc21 District Councils, to:

- 75% of 1995 baseline levels by 2010;
- 50% of 1995 baseline levels by 2013; and
- 35% of 1995 baseline levels by 2020.

The Plan outlines that the management of waste within the arc21 region a combination of waste management options will be required, including:

- prevention;
- reuse;
- recycling;
- biological treatment;
- mechanical treatment;
- EfW; and

23 As noted previously, on the 26th October 2012, The Department of the Environment launched a public consultation on a revised Northern Ireland (NI) Waste Management Strategy entitled “Delivering Resource Efficiency” with the consultation period closing on the 18th January 2013. As a result a revision of the arc21 Waste Management Plan will closely follow on from the process relating to the revised Strategy. A public consultation on a revised Waste Management Plan is likely to commence early in the spring of 2013.

24 Note: this Target has been revised upward to 50% and in June 2012 the Northern Ireland (NI) Minister for the Environment, Mr Alex Attwood announced new plans to introduce a statutory 60% recycling target for local authority collected municipal waste.
landfill disposal.

In selecting the preferred solution for municipal waste management in the arc21 region consideration has been given to a range of options, comparing their advantages and disadvantages and developing a scenario that best meets the arc21 objectives. The preferred solution identified a mix of treatments for residual wastes, including inter-alia:

- treatment of residual wastes from households/commercial premises at a MBT facility from 2009 (the facility to sort recyclables organic materials to be composted at the facility and where appropriate sort a suitable range of calorific value materials) with due regard to relevant targets;
- an EfW facility for a suitable range of calorific value materials from either/or both MBT and of residual wastes from 2013 with due regard to relevant targets; and
- any balance of residual wastes and residues from waste treatment processes to continue to be disposed to landfill with due regard to relevant targets.

4.3.6 Energy: A Strategic Framework for Northern Ireland

The new Strategic Energy Framework (SEF) 2010 details NI’s energy future over the next ten years and illustrates the key energy goals in terms of building competitive markets, ensuring security of supply, enhancing sustainability and developing our energy infrastructure. It also confirms the new and ambitious renewable electricity and renewable heat targets by 2020.

The Department of Enterprise, Trade and Investment’s (DETI) strategic aim is for a more secure and sustainable energy system where:

- Energy is as competitively priced as possible alongside robust security of supply;
- Much more of our energy is from sustainable and renewable sources and the resulting economic opportunities are fully exploited; and
- Energy efficiency is maximised.

The key message of the strategic framework for Northern Ireland is that sustainable and renewable energy is an important asset for the region.

“There is general consensus that greater quantities of renewable energy are now an imperative for Northern Ireland. Our position on the western periphery of Europe with few fossil fuel resources creates a near 100% dependence on imports to meet our energy needs. This dependency creates uncertainty in terms of security of supply and exposes Northern Ireland to the volatility of world energy prices.” (P6/7)

As such, Northern Ireland (NI) priorities have shifted to incorporate a need for sustainable and renewable energy, to enable and encourage a local and secure supply.

“By harnessing our abundant renewable resources to provide significantly higher levels of renewable energy generation, Northern Ireland has the potential to increase its security of supply and reduce harmful emissions. Ensuring that downward pressure on energy prices is maintained for both business and domestic customers remains a key objective.” (P7)

As a result of these priorities, four main objectives have been set, namely:

- Building competitive markets;
- Ensuring security of supply;
- Enhancing sustainability; and
- Developing energy infrastructure.

Figure 4.2 outlines the four main objectives and plan to ensure that they are met.

**Figure 4.2: Objectives of the Northern Ireland (NI) Strategic Energy Framework**

- **Building competitive markets**
  - Ensure relevant European Union Directives are transposed and implemented to develop competitive regional markets.
  - Ensure the Single Electricity Market continues to encourage investment and is flexible enough to meet changing generation and demand patterns, with the aim of securing the lowest possible wholesale electricity price.
  - Ensure there is transparency in the setting of electricity/gas retail prices.

- **Ensuring security of supply**
  - Support the development of a range of renewable technologies to ensure the most cost-effective and reliable mix of generation which maximizes Northern Ireland’s sustainable energy resources.
  - Implement European Union Directives in a timely and pragmatic manner in order to promote and enhance regional energy infrastructure.
  - Work with NIAUR to encourage investment in an appropriate level of conventional power generation to support higher levels of renewable electricity generation.

- **Developing energy infrastructure**
  - Ensure that electricity and grid development plans are future proofed to facilitate a more decarbonised energy mix beyond 2020.

- **Enhancing sustainability**
  - Contribute to the 1% year on year energy saving targets identified in the United Kingdom’s National Energy Efficiency Action Plan.
  - Provide appropriate support for industry to increase its productivity through the deployment of sustainable energy technologies.
  - Give sustainability a higher priority in relation to other duties.
  - Ensure that support mechanisms for renewable energy to address the environmental impacts of climate change is recognised.
  - Promote and raise awareness of supply chain opportunities in sustainable energy technologies both locally and further afield.

Source: Oxford Economics

Of these four objectives, the creation of the SEM is perhaps more significant than most:
“Within the island of Ireland, the most significant policy intervention on electricity matters in recent years has been the creation of the SEM, which began cross-border trading in wholesale electricity in November 2007. It is already promoting greater competition; enhancing security and diversity of supply; and bringing efficiencies and economies of scale. As a result Northern Ireland is now seeing increased investment in power generation and a greater number of electricity suppliers entering the market.” (P6)

The EfW facility, being proposed as part of the arc21 residual waste treatment project (RWTP), will export approximately 14MW to the All-Island SEM once the site is fully operational in 2018, providing over 100,000MWh each year, enough to power over 30,000 homes.

Indeed, each of these objectives has the potential to be complemented by the arc21 residual waste treatment project (RWTP), being proposed for location in Northern Ireland (NI). Enhancing NI’s sustainable and renewable energy offering could potentially enhance the region’s competitive stance in the sector:

- supply could become more locally sourced ensuring that demand could be met;
- reducing landfill waste would enhance sustainability going forward; and
- infrastructure would be improved as additional supply and maintenance of electricity sources could prompt improvements to the region’s and all-island’s electricity grid.

4.3.7 Planning Policy Statement 18: Renewable Energy

The aim expressed in the Planning Policy Statement 18 is as follows:

“The aim of this Statement is to facilitate the siting of renewable energy generating facilities in appropriate locations within the built and natural environment in order to achieve Northern Ireland’s renewable energy targets and to realise the benefits of renewable energy.” (P12)

In order to meet this aim, the Department of the Environment has employed the following objectives:

- To ensure that the environmental, landscape, visual and amenity impacts associated with or arising from renewable energy development are adequately addressed;
- To ensure adequate protection of the Region’s built and natural, and cultural heritage features; and
- To facilitate the integration of renewable energy technology into the design, siting and layout of new development.

It is clear from the Planning Policy Statement 18 that renewable energy initiatives are being given priority in NI

In particular, this proposed project in Northern Ireland (NI) would complement the third objective of the planning policy statement. It is clear from the planning policy statement that sustainable and renewable energy initiatives are being given priority in Northern Ireland (NI).

4.4 National (UK) Policy

4.4.1 National Renewable Energy Action Plan for the United Kingdom

The National Renewable Energy Action Plan for the UK sets out the key energy objectives and subsequent targets from 2009 to 2020 and beyond. It acts as an overarching, all-encompassing referral document containing a summary of all energy strategies from each of the four countries of the UK. The action plan to enable the nation to meet these targets is highlighted.

“We want to secure our energy supplies through 2020 and beyond and provide a sound framework for business to develop in the new industries, providing jobs and cutting harmful greenhouse gases.” (P4)

The plan highlights three main objectives:

- Financial support for renewables;
- Unblocking barriers to delivery; and
- Developing emerging technologies.

The UK is establishing a financial framework that provides long-term, comprehensive and targeted support for sustainable and renewable technologies (‘Green Investment Bank’). In order to do so, investment in sustainable and renewable technologies is key. Through investment and financial planning, it is more likely that 2020 energy targets will be met.

The policies and measures to promote use of sustainable and renewable resources below, as listed in the National Renewable Energy Action Plan, are applicable to the proposed MBT and EfW plant.

- Renewables obligation: increase generation of renewable electricity from a range of technologies across all scales;
- Renewable heat incentive: a significant increase in renewable heat generation from a range of technologies to 12%;
- Bio-energy infrastructure scheme: Assist the development of the supply chain required to harvest, process, store and supply biomass to heat, combined heat and power; and
- Encourage planning authorities to support the development of a diverse range of energy technologies.

The residual waste treatment project (RWTP), which includes a MBT and EfW plant, would contribute towards these measures. An EfW plant captures heat that it creates from thermally treating municipal waste in a combustion plant or through the production of biofuels from composting or chemical processes. The heat may then be either distributed to nearby communities, or converted into electricity which is fed back into the National Grid/All-Island SEM. However, the Institution of Mechanical Engineers believes that the technology could provide a fifth of the nation's electricity. A report from the institution alluded to the fact that it was absolutely crucial for waste to be used for energy if Britain was to meet its target of getting 15% of all energy from renewable sources by 2020.

The use of waste to generate energy tackles two national problems – the need to reduce the volume of waste being landfilled and to generate power from a sustainable and renewable source.

4.4.2 The UK Renewable Energy Strategy

Published in 2009, the UK Renewable Energy Strategy set out the government’s plans for ensuring the UK meets its EU target. By sector, the government estimates that this means 30% of electricity, 12% of heat and 10% of transport energy will need to come from renewable sources. In order to meet the ambitious target to ensure that 15% of UK energy comes from renewable sources by 2020, the strategy highlights four main objectives, namely:

- Put in place the mechanisms to provide financial support for renewable electricity and heat worth around £30 billion between now and 2020;
- Drive delivery and clear away barriers;
- Increase investment in emerging technologies and pursue new sources of supply; and
- Create new opportunities for individuals, communities and business to harness renewable energy.

Looking ahead, the strategy highlights the role of Northern Ireland (NI) in meeting the aforementioned target, stating:

“In Northern Ireland also benefits from good natural resources for renewable energy. It has the potential to make significant progress in increasing the amount of energy from renewable sources in order to contribute to policy goals on security of supply, reduction of greenhouse gases, as well as contributing to business competitiveness, increasing competition in power generation and presenting opportunities for enterprise activity.” (P196)

In particular, the UK Renewable Energy Strategy highlights a number of actions being taken forward to help Northern Ireland (NI) secure its energy supply,

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realise economic and business opportunities from renewable energy and reduce carbon emissions, the following of which are applicable to a potential EfW plant:

- Co-operation with regulatory and industry partners on the whole island of Ireland to deliver new electricity grid infrastructure; and
- Maximise the amount of renewable heat generated and used.

The nation and region could potentially capitalise on the opportunity that is presented by an EfW plant. Increasing NI’s sustainable and renewable energy offering will reflect well upon the UK, helping the region contribute to the national target to ensure that 15% of energy comes from a renewable source.

4.4.3 UK Energy Bill 2012/2013

The UK Energy Bill 2012/2013 was presented to Parliament on 29th November 2012, had its second reading debate on 19th December 2012 and completed its committee stage on 7th February 2013. The Bill is due to have its report stage and third reading on a date yet to be announced.

The UK Energy Bill has an overarching aim that is likely to be complemented by the proposed residual waste treatment project (RWTP):

“To make provision for or in connection with reforming the electricity market for purposes of encouraging low carbon electricity generation or ensuring security of supply; for the establishment and functions of the Office for Nuclear Regulation; about the government pipe-line and storage system and rights exercisable in relation to it; about the designation of a strategy and policy statement; for the making of orders requiring regulated persons to provide redress to consumers of gas or electricity; about offshore transmission of electricity during a commissioning period; for imposing further fees in respect of nuclear decommissioning costs; and for connected purposes.”

4.4.4 UK Energy Act 2011

Published in October 2011, the UK Energy Act provides for a step change in the provision of energy efficiency measures to homes and businesses, and makes improvements to framework to enable and secure low-carbon energy supplies and fair competition in the energy markets. Despite being a more technical legislative document rather than a strategy per se, the act dedicates a section to ‘electricity from renewable sources’ and ‘carbon emissions reduction’ and thus has been included for all intents and purposes.

Within the aforementioned sections, a number of aims are highlighted, including:

- Energy efficiency;

References:
30 Currently only in report stage
The Becon Consortium (the Consortium)
Economic Impact Study

- Contribution to carbon budgeting under the Climate Change Act 2008; and
- Electricity from renewable sources.

The Energy Act amalgamates the individual energy regulations of England, Scotland, Wales and Northern Ireland (NI); with the nation coming together in order to meet an ambitious renewable energy target. EfW plants in Northern Ireland (NI) will contribute to the production of energy from a sustainable and renewable source.

4.4.5 UK Planning Policy Statement 10: Planning For Sustainable Waste Management

Planning Policy Statement 10 sets out the Government's policy to be taken into account by waste planning authorities and forms part of the national waste management plan for the UK. It states:

“The overall objective of Government policy on waste is to protect human health and the environment by producing less waste and by using it as a resource wherever possible... This means a step-change in the way waste is handled and significant new investment in waste management facilities.” (P5)

Figure 4.3 identifies a number of priorities from the Planning Policy Statement that are applicable to the development of MBT and EfW plants.

**Figure 4.3: Priorities of the Planning Policy Statement 10 that is applicable to the development of MBT and EfW plants in Northern Ireland**

- Providing sufficient opportunities for new waste management facilities of the right type, in the right place and at the right time
- Provide sufficient opportunities to meet the identified needs of their area for waste management for all waste streams
- Drive waste management up the waste hierarchy, addressing waste as a resource and looking to disposal as the last option
- Enable sufficient and timely provision of waste management facilities
- Ensure the design and layout of new development supports sustainable waste management
- Help secure the recovery or disposal of waste without endangering human health and without harming the environment

Source: Oxford Economics

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An EfW plant has the potential to contribute to these UK-wide priorities. In the last two decades, EfW technology has developed in response to public opposition to incinerator pollution. Today, tight EU emission regulations mean that modern EfW plants produce no greater air pollution than many common and accepted sources. A key benefit of an EfW plant is that it will also reduce the volume of waste being disposed off to landfill. As a result, waste could potentially be considered to be a useful resource, rather than a burden to the environment or to human health.

### 4.5 Environmental Benefits

Compared to the environmental impact of traditional energy sources, the environmental impact of MBT and EfW plants are relatively minor, reducing the impact of an existing environmental burden in the form of landfill waste.

The Local Government Improvement and Development Agency (iDeA), a UK based organisation working with Councils to develop good practice, have highlighted the key environmental benefits of EfW facilities, namely:

- It is a vital part of an area’s waste management plan and energy strategy, perhaps as part of carbon management;
- It greatly reduces waste to landfill; reducing landfill tax costs and allowing local authorities to remain within their legally binding landfill targets;
- It deals with waste streams for which there are no other treatment options;
- It produces many types of refuse derived fuels and other by-products with commercial value;
- Energy that is recovered from biological waste can be regarded as renewable; this includes energy from MBT and some aspects of thermal treatment;
- All EfW technologies have lower CO2 emissions than any fossil fuel plant across all EfW technology fuels and processes; and
- It prevents waste from emitting methane, which has a far higher global warming potential than CO2.

The thermal treatment of waste in an EfW facility is a modern way of reducing the volume of waste with the additional benefit of making electricity. Crucially, it has the potential to contribute to the fulfilment of the EU Landfill and emissions targets. It plays an important role in an integrated waste strategy, the waste hierarchy, and represents a step up from landfill.

### 4.6 A More Secure Energy Supply

With an ever-growing population and an increasing need for new technologies to meet demand, involvement from regulatory and industry partners will be required.
to deliver new electricity grid infrastructure to accommodate electricity generation from sustainable and renewable energy sources and from the facilities, such as MBT and EfW plants which harness these renewable energy sources and convert them into sustainable and renewable energy.

4.7 Catalyst for Further Sustainable and Renewable Energy Projects

Sustainable and renewable energy as a sector is growing quickly. Successful projects pioneering new technologies which can produce renewable energy have the potential to stimulate further projects within the sector. In the case of MBT and EfW plants, the benefits of increased developments are noteworthy. For example:

- Recovery of recyclable materials;
- Reduction in volume of waste being disposed of to landfill; and
- Recovery of sustainable heat and electrical energy from a sustainable and renewable source.

As such, the introduction of MBT and EfW plants could potentially stimulate similar projects which in turn would contribute to the statutory target to reduce emissions by 40% by 2020 as well as to cap landfill waste.

4.8 A Publicly Owned Asset

Although the proposed investment in the facilities for arc21 would be undertaken by the private sector, the asset will be owned by the public sector at the end of the concession period (25 years). The Consortium would be contracted to operate the facility for a period of around 25 years, however following this period, ownership would be handed over to arc21, the umbrella waste management group for 11 councils in the east of Northern Ireland (NI). arc21 was constituted as a body corporate in 2004 in accordance with the Department of the Environment's 'Northern Ireland Waste Management Strategy' which promoted the concept of a joint approach between councils in three geographical sub-regions across Northern Ireland.

4.9 Catalyst for Further Commercial/District Housing Heating Schemes

In addition to electricity export of 14MW of electricity, up to 10MW of the heat produced in the EfW may also be used to supply potential heat off-take, which could be used to support a variety of future local industrial/commercial or residential uses.
4.10 Summary

The sustainable and renewable energy sector is essential in the current environment, particularly with Northern Ireland (NI) having to play its part in the EU carbon emissions targets. As such, Northern Ireland (NI) could reap significant benefits should it take advantage of upcoming renewable energy emissions.

The proposed MBT and EfW plants have the potential to complement a number of national, regional and local strategies. Environmental planning has become a primary priority of existing policy, given the significant impact that unsustainable levels of pollution and waste can have on quality of life, the landscape and the economy. The opportunity to contribute to a more sustainable environment while meeting energy demand across Northern Ireland (NI) and the UK should be harnessed.

Similarly, the export potential of surplus energy production is significant, while the existence of MBT and EfW plants could potentially encourage further investment in complementary projects in the area. The additional energy source would enable the region to become more independent in relation to energy production as well as contribute to a growing recognition of the people, skills and products that Northern Ireland (NI) has to offer.

The scope for wider unquantifiable benefits stemming from the project is huge
5 Socio-Economic Baseline Analysis

This section comprises an overview of the Northern Ireland (NI) economy and the 11 Council areas that make up arc21, analysing a range of social and economic variables. Particular focus is paid to the labour market and the ‘jobless’ recovery that is likely to be a trend experienced by Northern Ireland (NI) and to a lesser extent the arc21 area over the course of the short- and medium-term. This means that any private sector investment in new projects that creates jobs should be viewed favourably and economic benefits should hold more merit. An overview of the global and UK economic environment is provided in Appendix A.

Key points:
- Northern Ireland (NI) has suffered as much as if not more than any UK region from recessionary effects and faces many challenges going forward;
- The regional labour market recovery is expected to remain ‘jobless’, with job levels not forecast to return to their pre-recession peak by 2022. The 11 Council areas within arc21 are likely to enjoy the crux of any limited job creation that does occur, given their strong base in exportable service sectors compared to elsewhere in the region;
- The recession has brought a legacy of unemployment, with young people, the lower skilled and the long-term unemployed at particularly high risk of being frozen out of the labour market for at least the short- to medium-term;
- The construction sector has suffered the largest amount of recessionary job losses of any sector and its outlook for growth remains bleak as government and businesses make cuts in capital expenditure. The construction phase of this proposed project is estimated to create approximately 2,700 direct job years (2,220 in the construction sector alone), and over 6,000 total job years (over 3,000 in the construction sector alone); and
- The proposed facilities will provide relatively lower- and higher-value added roles alike. They will give an avenue back into the labour market for the multitude of construction workers among the ranks of the unemployed, as well as providing higher skilled technical roles for the critical mass of qualified people within the arc21 region.

5.1 A ‘Jobless’ Recovery Ahead for Northern Ireland (NI), though arc21 Council Areas Are Expected To be At the Forefront of Any Job Creation

From the turn of the century to the onset of the recession, Northern Ireland (NI) enjoyed a period of normalisation with consistently rising employment levels.
Consumer and government spending provided major injections to local economies, creating jobs and attracting new migrants to the region. Total employment in Northern Ireland (NI) grew by almost 190,000 net jobs between 1993 and 2008 alone across a majority of sectors (Figure 5.1).

However, the price correction in the housing market, subsequent rise in redundancies and general uncertainty has changed the general economic landscape. Northern Ireland (NI) has suffered as much from recessionary impacts as any other UK region with net job losses of 56,000 or 6.5% between 2008 and 2012, a return to a level last experienced in 2006. We expect total employment to continue to fall modestly in 2013 and only return to marginal growth in 2015. It is likely to be well beyond the end of the forecast period (i.e. 2022) before NI's employment level returns to its pre-recession peak.

The historical trend in total employment in the arc21 area mirrors that of the Northern Ireland (NI) region as whole. The level of employment in arc21 rose from 405,000 jobs in 1993 to a peak of 500,000 jobs in 2008. The area is estimated to have suffered a loss of 32,000 jobs between 2008 and 2012 as a result of the recession. However, employment growth is expected to return in 2014, a year sooner than the Northern Ireland (NI) average, with the creation of 16,000 jobs between 2012 and 2022 (Figure 5.1).

The arc21 area should be at the forefront of what little job creation is forecast for Northern Ireland (NI) over the next decade, providing 16,000 (or two thirds) of the total job growth in the region as a whole between 2012 and 2022 (Table 5.1).

Figure 5.1: Total employment, Northern Ireland (NI) and arc21 Council areas, 1993-2022

Pre-recession employment growth was driven by increased opportunities within the wholesale & retail trade, administrative & support service activities and health sectors in Northern Ireland (NI) and the arc21 area (Table 5.1). The construction sector also enjoyed marked job growth, creating approximately...
28,000 net jobs in the region between 1998 and 2008 and 10,000 net jobs in the arc21 area alone.

The recession has impacted on job levels across the majority of sectors, with widespread losses, but two in particular who performed well in the decade previous - construction and wholesale & retail trade, with losses of 24,000 and 9,000 jobs respectively in Northern Ireland (NI) and 11,000 and 7,000 in arc21.

Any job growth going forward is likely to be concentrated in exportable service sectors, such as information and communication, professional services and administration services, offsetting job losses in primary services and the public sector. The retail sector is also likely to benefit, particularly in the short-term, on the back of Northern Ireland (NI)’s current marketing campaign for tourism (e.g. Derry City of Culture 2013 and the World and Fire Games), creating approximately 7,000 net jobs across Northern Ireland (NI) over the forecast period.

The electricity and waste management sectors in Northern Ireland (NI) are relatively underdeveloped, certainly compared to the UK as a whole. However employment levels in both sectors, both in Northern Ireland (NI) and the arc21 area, have remained stable over the course of the recession in the face of the economic headwinds which have claimed jobs in other sectors. Policy support to encourage investment in both sectors can only help in aiding their future development.

**Table 5.1: Employment by sector change, Northern Ireland (NI) and arc21 Council areas, 1998-2022**

<table>
<thead>
<tr>
<th>Employment change (000)</th>
<th>1998-2008</th>
<th>2008-2012</th>
<th>2012-2022</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NI arc21</td>
<td>NI arc21</td>
<td>NI arc21</td>
</tr>
<tr>
<td>Agriculture, forestry and fishing</td>
<td>-6 -2</td>
<td>-1 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Mining and quarrying</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>-23 -12</td>
<td>-8 -4</td>
<td>-5 -2</td>
</tr>
<tr>
<td>Electricity, gas, steam and air conditioning supply</td>
<td>-1 -1</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Water supply; sewage, waste management and remediation activities</td>
<td>1 1</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Construction</td>
<td>28 10</td>
<td>-24 -11</td>
<td>1 1</td>
</tr>
<tr>
<td>Wholesale and retail trade</td>
<td>29 11</td>
<td>-9 -7</td>
<td>7 3</td>
</tr>
<tr>
<td>Transportation and storage</td>
<td>8 5</td>
<td>-1 -1</td>
<td>3 2</td>
</tr>
<tr>
<td>Accommodation and food service activities</td>
<td>7 3</td>
<td>-2 0</td>
<td>4 3</td>
</tr>
<tr>
<td>Information and communication</td>
<td>6 5</td>
<td>0 0</td>
<td>4 4</td>
</tr>
<tr>
<td>Financial and insurance activities</td>
<td>6 5</td>
<td>-1 -1</td>
<td>0 0</td>
</tr>
<tr>
<td>Real estate activities</td>
<td>4 3</td>
<td>1 0</td>
<td>1 0</td>
</tr>
<tr>
<td>Professional, scientific and technical activities</td>
<td>8 5</td>
<td>-1 -1</td>
<td>4 3</td>
</tr>
<tr>
<td>Administrative and support service activities</td>
<td>22 15</td>
<td>-2 -3</td>
<td>8 5</td>
</tr>
<tr>
<td>Public administration and defence; compulsory social security</td>
<td>0 1</td>
<td>-4 -3</td>
<td>-8 -6</td>
</tr>
<tr>
<td>Education</td>
<td>7 4</td>
<td>-2 0</td>
<td>-2 -1</td>
</tr>
<tr>
<td>Human health and social work activities</td>
<td>24 15</td>
<td>-1 -2</td>
<td>0 0</td>
</tr>
<tr>
<td>Arts, entertainment and recreation</td>
<td>2 1</td>
<td>1 1</td>
<td>3 2</td>
</tr>
<tr>
<td>Other service activities</td>
<td>2 1</td>
<td>0 0</td>
<td>3 2</td>
</tr>
<tr>
<td>Total</td>
<td>126 69</td>
<td>-56 -32</td>
<td>23 16</td>
</tr>
</tbody>
</table>

Source: DETI, Oxford Economics

Note: Red shading represents sectors with largest employment losses; green shading represents sectors with largest employment gains

The reason for arc21’s relatively positive labour market outlook lies in its current sectoral employment structure. Figure 5.2 outlines the percentage point...
The arc21 area is well developed in exportable service sectors meaning it should be at the forefront of what little job creation is forecast for Northern Ireland (NI) over the next decade.

Of the 6 Council areas forecast to recovery peak employment over the forecast period, 4 are within arc21.

The road ahead is expected to be tough for the majority of Council areas across Northern Ireland (NI) with 20 out of 26 not expected to return to pre-recession peak employment levels before 2022. Of the 6 that are expected to return to peak, 4 are comprised by the arc21 area (Table 5.2). A key rationale behind these bleak forecasts is that a significant proportion of these Council areas experienced significant job losses, particularly within the construction sector. Therefore, it will be challenging to recover these losses in an environment where job opportunities are limited and where the amount of new work in the construction sector is limited given frail business confidence and a lack of affordable finance.

An estimated 85 total jobs will be created within these three sectors as part of the operations of the MBT facility, EfW (and IBA) facility and Administration and Visitor Centre, upon completion of the construction phase in 2018.

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Figure 5.2: Sectoral concentration of employment, arc21 Council areas vs Northern Ireland (NI), 2012

Source: Oxford Economics
Table 5.2: Return to peak employment level, Northern Ireland (NI) District Council areas

<table>
<thead>
<tr>
<th>Council areas</th>
<th>Return to peak employment (year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antrim</td>
<td>2013</td>
</tr>
<tr>
<td>Ards</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Armagh</td>
<td>2020</td>
</tr>
<tr>
<td>Ballymena</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Ballymoney</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Banbridge</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Belfast</td>
<td>2021</td>
</tr>
<tr>
<td>Carrickfergus</td>
<td>2019</td>
</tr>
<tr>
<td>Castlereagh</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Coleraine</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Cookstown</td>
<td>2019</td>
</tr>
<tr>
<td>Craigavon</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Derry</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Down</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Dungannon</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Fermangagh</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Larne</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Limavady</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Lisburn</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Magherafelt</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Moyle</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Newry &amp; Mourne</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Newtownabbey</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>North Down</td>
<td>2014</td>
</tr>
<tr>
<td>Omagh</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Strabane</td>
<td>Beyond 2022</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>Beyond 2022</td>
</tr>
</tbody>
</table>

Source: Oxford Economics
Note: Shading represents Council areas forecast to recover their peak level of employment by 2022; arc21 Council areas in bold

5.2 The arc21 Councils Areas On The Whole Possess a Critical Mass of The Highest Skilled Labour across Northern Ireland (NI)

Data published by the Department of Education (DENI) suggests that the Council areas within the arc21 group comprise a relatively small proportion of lower skilled workers and a relatively higher proportion of higher skilled workers than other locations, perhaps as a result of the area having a larger proportion of its employment in service sectors (Figures 5.3-5.5). In terms of the percentage of school leavers with no GCSEs, the three best performing Council areas are within arc21 – North Down (0.8%), Ballymena (1.1%) and Ards (1.1%). In terms of the percentage of school leavers with 2 or more A-Levels, North Down (63.6%) and Castlereagh (62.0%) place 1st and 3rd respectively. Antrim (where the site is located) and Newtownabbey (which provides a close border to the site) tend to have statistics fairly much in line with the Northern Ireland (NI) average.

DENI data reflects the relatively diverse and broadly strong skills base in arc21
Figure 5.3: % of school leavers with no GCSEs, Northern Ireland (NI) District Council areas, 2010-2011

Source: DENI
Note: arc21 Council areas shaded in darker blue; Northern Ireland (NI) shaded in black

Figure 5.4: % of school leavers with 2 or more A-Levels, Northern Ireland (NI) District Council areas, 2010-2011

Source: DENI
Note: arc21 Council areas shaded in darker blue; Northern Ireland (NI) shaded in black
5.3 A Legacy of Unemployment across the Region

Figure 5.6 shows the trend in the total number of claimants across Northern Ireland (NI) and the arc21 area between January 2000 and December 2012. With the economic boom creating jobs in nearly every sector of the economy over the start of the last decade, the unemployment count fell from 44,400 in Northern Ireland (NI) and 23,115 in arc21 in January 2000 to a low of 22,413 and 11,866 respectively in November 2007.

Since then however, the claimant count in Northern Ireland (NI) and arc21 has risen, to 63,575 and 32,662 respectively in December 2012. The majority of job losses were experienced throughout 2008 and 2009 as redundancy announcements became more frequent. However, the arc21 area did not experience as sharp an increase in claimant unemployment as Northern Ireland (NI) overall, evidenced by the widening of the gap in the two lines in Figure 5.6. This is due to the arc21 Council areas having less reliance on sectors like construction, manufacturing and retail, which experienced the greatest amount of recessionary job losses.
There seems to be little sign of improvement, with the most recent figures being equally as bleak. Given the subdued job market recovery that we forecast, it is unlikely that many of those unemployed in Northern Ireland (NI) will be able to secure employment in the short-term. All Council areas other than Magherafelt are forecast to experience a fall in their claimant unemployment rate over the next decade (Table 5.3). The economies forecast to experience the greatest falls are in urban areas where the majority of job creation is expected (e.g. Derry and Belfast). Many of the Council areas within arc21 are expected to be among the top performers, particularly Larne, Newtownabbey and North Down.
Table 5.3: Claimant unemployment rate change, Northern Ireland (NI) District Council areas, 2012-2022

<table>
<thead>
<tr>
<th></th>
<th>Unemployment rate (%)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2012</td>
<td>2022</td>
<td>Change</td>
</tr>
<tr>
<td>Antrim</td>
<td>4.0</td>
<td>3.4</td>
<td>-0.6</td>
</tr>
<tr>
<td>Ards</td>
<td>4.5</td>
<td>3.9</td>
<td>-0.6</td>
</tr>
<tr>
<td>Armagh</td>
<td>5.2</td>
<td>4.5</td>
<td>-0.7</td>
</tr>
<tr>
<td>Ballymena</td>
<td>4.4</td>
<td>3.5</td>
<td>-0.8</td>
</tr>
<tr>
<td>Ballymoney</td>
<td>5.5</td>
<td>5.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Banbridge</td>
<td>4.3</td>
<td>3.9</td>
<td>-0.4</td>
</tr>
<tr>
<td>Belfast</td>
<td>7.8</td>
<td>6.9</td>
<td>-0.9</td>
</tr>
<tr>
<td>Carrickfergus</td>
<td>4.7</td>
<td>3.7</td>
<td>-1.0</td>
</tr>
<tr>
<td>Castlereagh</td>
<td>3.5</td>
<td>2.6</td>
<td>-0.9</td>
</tr>
<tr>
<td>Coleraine</td>
<td>5.4</td>
<td>4.6</td>
<td>-0.8</td>
</tr>
<tr>
<td>Cookstown</td>
<td>4.6</td>
<td>4.1</td>
<td>-0.5</td>
</tr>
<tr>
<td>Craigavon</td>
<td>5.5</td>
<td>5.2</td>
<td>-0.3</td>
</tr>
<tr>
<td>Derry</td>
<td>8.6</td>
<td>7.6</td>
<td>-1.0</td>
</tr>
<tr>
<td>Down</td>
<td>5.4</td>
<td>4.8</td>
<td>-0.6</td>
</tr>
<tr>
<td>Dungannon</td>
<td>4.5</td>
<td>4.5</td>
<td>0.0</td>
</tr>
<tr>
<td>Fermanagh</td>
<td>5.0</td>
<td>4.5</td>
<td>-0.6</td>
</tr>
<tr>
<td>Larne</td>
<td>4.5</td>
<td>3.3</td>
<td>-1.2</td>
</tr>
<tr>
<td>Limavady</td>
<td>7.2</td>
<td>6.4</td>
<td>-0.8</td>
</tr>
<tr>
<td>Lisburn</td>
<td>4.8</td>
<td>4.7</td>
<td>-0.1</td>
</tr>
<tr>
<td>Magheraftelt</td>
<td>4.0</td>
<td>4.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Moyle</td>
<td>6.3</td>
<td>6.0</td>
<td>-0.3</td>
</tr>
<tr>
<td>Newry &amp; Mourne</td>
<td>5.9</td>
<td>5.4</td>
<td>-0.5</td>
</tr>
<tr>
<td>Newtownabbey</td>
<td>4.5</td>
<td>3.5</td>
<td>-1.0</td>
</tr>
<tr>
<td>North Down</td>
<td>3.9</td>
<td>2.8</td>
<td>-1.0</td>
</tr>
<tr>
<td>Omagh</td>
<td>5.2</td>
<td>4.5</td>
<td>-0.7</td>
</tr>
<tr>
<td>Strabane</td>
<td>7.5</td>
<td>6.4</td>
<td>-1.2</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>5.6</td>
<td>4.9</td>
<td>-0.7</td>
</tr>
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</table>

Source: Oxford Economics

Note: Red shading represents worst performing Council areas over the forecast period (i.e. smallest falls in unemployment rate or rises in unemployment rate); green shading represents best performing Council areas (i.e. largest falls in unemployment rate); arc21 Council areas in bold

5.4 The arc21 Area Is a Mix of Contrasts In Terms Of Deprivation, Though Overall Performance Is Strong

Table 5.4 presents the results of the Northern Ireland (NI) Multiple Deprivation Measure for 2005 and 2010, which ranks the Northern Ireland (NI) Councils in terms of deprivation based on a number of measures (income, employment, health, education, proximity to services, living environment and crime). The arc21 area is a mix of contrasts in terms of deprivation, though overall performance is strong. The arc21 area comprises 7 of the top 10 performing Council areas in Northern Ireland (NI) in 2010 including the three least deprived (North Down, Castlereagh and Antrim); however Belfast is the 2nd most deprived Council area in Northern Ireland (NI) behind Strabane.

Areas least deprived in arc21 are typically characterised by above average resident employment rates, high household incomes, excellent schools and low crime. The most deprived areas include city locations which tend to score badly in terms of crime and overall quality of life indicators such as less desirable living environments.
The property boom after the turn of the century created a wealth of opportunities in the construction sector in Northern Ireland (NI). However, as a result of the crash in the housing market and the subsequent return to more realistic lending and spending patterns, the sector is estimated to have been profoundly affected.

The Northern Ireland (NI) Index of Construction has fallen consistently from a peak of 108.8 in Q1 2007 to a level of 62.8 in Q3 2012. A lack of new work has been largely to blame for the job losses in the sector over the past three years. Limited business investment, a return to more cautious lending practices in banks and more prudent capital spending by the public sector, combined with dampened demand for office space and property has led to a consistent fall in the Index of New Work from a peak in Q1 2007 of 113.1 to a current level of 55.1 (Figure 5.7).
The construction sector is estimated to have experienced the greatest job losses of any sector during the recession with employment levels falling by 24,000 net jobs or 28.7% between 2008 and 2012, returning to a level previously experienced at the beginning of the last decade (Figure 5.8).

Anecdotal evidence suggests that tough times remain for the construction sector, certainly in the short-term, with job losses still prevalent. The significant cuts in capital project spend are likely to reduce demand further, or not create
any demand, dampening any potential recovery in the sector. Employment levels over the forecast period are expected to remain largely flat and well below the peak experienced in 2007. As such, given that the proposed facility will provide significant job creation in the sector and across all sectors, it should be considered for its merits.\[^{35}\]

5.6 Summary: Challenges To Overcome To Ensure Recovery

Northern Ireland (NI) has suffered from the effects of the recession, and must overcome significant challenges going forward. It is underdeveloped in export-orientated sectors which are expected to be at the forefront of job creation in the future, highlighting the need to re-address the balance and become less reliant on primary and public services. On the back of the tighter fiscal environment, the labour market outlook for Northern Ireland (NI) suggests recovery will remain ‘jobless’, with forecasts suggesting job levels are very unlikely to return to their pre-recession peak before 2022. The 11 Council areas within arc21 are likely to enjoy the crux of any limited job creation that does occur, given their strong base in exportable service sectors compared to elsewhere in the region. Urban economies such as Belfast and Lisburn should be at the forefront of any Northern Ireland (NI) recovery.

Overall, the recession is likely to leave a legacy of unemployment in Northern Ireland (NI), with the level of almost 64,000 claimants likely to continue to rise in the short-term. Young people, those in lower skilled occupations and the long-term unemployed face particular risk of being frozen out of the labour market for at least the short- to medium-term. All Council areas within arc21, with the exception of Belfast, currently have amongst the lowest rates of claimant unemployment, and are forecast to experience among the greatest falls in these rates over the next decade (2012-2022).

Of all the sectors in the economy, construction has been most adversely affected by the downturn. The crash in the housing market and the subsequent return to more realistic lending and spending patterns has resulted in a loss estimated 24,000 net jobs since 2008 in Northern Ireland (NI), and 11,000 net jobs in the arc21 area alone. Future growth in the sector remains relatively limited as government and businesses make cuts in capital expenditure. The construction phase of the proposed project is estimated to create 2,220 direct construction sector job years and 3,031 total construction sector job years between 2015 and 2018 – when annualised, and assuming a constant proportion of these benefits are realised in each year (which in practice is not strictly true) – this approximates to 0.9% and 1.3% of NI’s 2012 baseline level of employment in the sector respectively. In light of limited job creation elsewhere, the economic and labour market benefits associated with the operation of the facility in terms of generating wealth for the wider economy strengthen the case for this proposed project.

\[^{35}\] The construction phase of the project is estimated to create approximately 2,700 direct job years (2,220 in the construction sector alone), and over 6,000 total job years (over 3,000 in the construction sector alone)
Appendix A: Macro-Economic Trends

This section provides a brief overview of the current economic environment at a global and UK level.

Key points:

- The recession brought unprecedented change to global economies with the 'new normal' economic environment having to become more reliant on export-led growth;

- The global outlook remains somewhat uncertain given the challenges present, not least the level of government debt across many of the world’s most developed countries, particularly those within the Eurozone;

- Relatively low inflation and interest rates should not impede the recovery, though rising commodity prices, notably oil, are a cause for concern. According to a recent study published in the journal “Energy Policy” by researchers from Oxford University, demand for oil is expected to rise above supply by 2015, increasing the need for countries to embrace alternative energy sources;

- Global recovery is likely to be a longer-term realisation, with short-term ‘sentiment’ views adversely affecting the situation;

- The UK experienced a deeper and longer recession than many developed economies with its fortunes inherently linked to the Eurozone. Fears of a triple-dip recession remain;

- Historically, consumer spending has consistently driven UK economic growth, with the boom facilitated by the access to cheap finance and low interest rates, fuelling debt-led demand. This approach is no longer sustainable and the UK must develop its export potential to aid recovery;

- Despite interest rates remaining low, recent high and persistent inflation (especially in necessities like energy), weak earnings growth and frail confidence have squeezed household incomes and created a debt overhang problem, meaning that the outlook for the consumer is fraught; and

- The labour market is likely to remain a key source of domestic risk, with the private sector struggling to create sufficient jobs to offset cuts in the public sector over the forecast period. Any projects which do provide jobs therefore should be given due consideration.

---

A.1 Global Overview: On-going Difficulties across Developed Economies

A.1.1 The Recession Has Changed The Economic Landscape And Will Shape The Path To Recovery

Pre-recession growth in the global economy was driven by access to cheap credit, low inflation and significant growth in developing economies. In 2009, world real GDP contracted by 1.9% year on year primarily as a result of an unwinding of debt with the subsequent impacts on global trade, confidence and asset values.

The outlook for growth remains somewhat uncertain given the challenges present. Following 3.6% and 2.9% growth in 2010 and 2011 respectively, our baseline estimate for 2012 suggests growth will slow to approximately 2.3% year on year (Figure A.1). This reflects the many downside risks facing the global economy, particularly the threat of a Eurozone break-up and the US fiscal cliff. The downturn has changed the economic landscape forever. With access to cheap credit all but dried up for the time being, any recovery must be export-focused and is likely to be at best a long-term realisation.

Figure A.1: GDP growth, World, 1996-2015

Source: Oxford Economics

A.1.2 Relatively Stable Inflation and Low Interest Rates Should Not Negatively Impact On Global Recovery

Interest rates are increased to moderate demand and inflation and they are reduced to stimulate demand. If rates are set too low, this may encourage the build-up of inflationary pressure; if they are set too high, demand will be lower than necessary to control inflation. Interest rates have to be set based on what inflation might be over the short-term. This is because after a recession, when
output has been falling, there will be plenty of spare capacity in the economy – output will be able to rise relatively strongly without generating inflationary pressure.

Interest rates across the US, Eurozone and Japan as well as the UK experienced significant cuts as a result of the recession. Governments have opted to maintain these low rates of interest to date, in an attempt to encourage people to borrow and stimulate demand in the economy. While these interest rates are forecast to rise in the short-term, they are likely to be maintained at relatively low levels in order to continue to aid economic growth.

In a global context, inflation is perhaps presenting less of a problem to future growth than it has previously. In the US and the Eurozone, consumer price inflation (CPI) is currently running between 2% and 3% which is close to the targets central banks set, while Japan has actually experienced deflation over the past few years (Figure A.2). In the 1990s, inflation reached 4-5% in these areas and has been above 10% in times of hyperinflation in the past.

Figure A.2: CPI inflation, Eurozone, Japan and US, 1990-2015

Consumer price inflation remains lower than historical levels and close to targets set by governments

Commodity price inflation remains persistent - food & metal prices peaked in 2011 and remain high, while oil prices have continued to escalate throughout 2012 to reach a year-end level of $112 a barrel

A.1.3 Though Rising Commodity Prices, Notably Oil Prices, Continue To Escalate, Paving the Way for Alternative and Renewable Energy Resources

Despite showing how total inflation has been fairly consistent and on target over the last couple of years, commodity price inflation has been more persistent. Food and metal prices peaked during early 2011 and remain much higher than historical levels. The rationale behind the former lies with China and India where the rapid expansion in population creates more and more mouths to feed, while the rationale behind the latter is primarily due to the Chinese government demanding metals for their on-going construction activities.
World oil prices continue to escalate on the back of consistently rising demand (except for in 2009 when both fell as recessionary pressures took effect). By the end of 2012, oil prices were approximately $112 a barrel, while 89.4 million barrels per day (mbd) were demanded across the globe (Figure A.3). Our forecasts suggest this could rise to 92.0 mbd by 2015, at which time oil prices are forecast to have risen slightly to $113 a barrel. Obviously the oil-price spike of mid-2008 where a barrel reached a cost of $122 caused some stir in world media - our forecasts suggest this level could be exceeded by as early as 2018, further putting pressure on household budgets. According to a recent study published in the journal “Energy Policy” by researchers from Oxford University, demand for oil is expected to rise above supply by 2015, increasing the need for countries to embrace alternative energy sources.

![Figure A.3: Oil prices and demand, World, 1973-2015](image)

Source: Oxford Economics

A.2 UK: Overcoming Challenges to Ensure Export-Led Recovery

A.2.1 A Prolonged Recession; Uncertainty Still Prevalent

The UK experienced a deeper and longer recession than many developed economies, with real GDP contracting by 4.0% in 2009. Though the UK officially emerged from the downturn in Q3 2009, a ‘double-dip’ was experienced in early 2012, while fears of a ‘triple-dip’ still loom large given the most recent GDP estimates for Q4 2012 indicating a fall by 0.3%. The Eurozone crisis has already had a significant impact on confidence, but any further escalation of the crisis would risk a much deeper UK recession due to the strong trade links and the potential for spillovers into the UK banking system.


The UK experienced a deeper and longer recession than many developed countries
A.2.2 Austerity Measures– Biggest Cuts in State Spending Since World War II

At the start of its term in 2010, the Conservative-Liberal Democrat coalition government announced the biggest cuts in state spending since World War II. Savings estimated at about £83bn are to be made over four years. The plans included a cut of 490,000 public sector jobs, with most Whitehall departments facing budget cuts of 19% on average. The budget deficit equated to approximately 10% of GDP at the time.

In the 2012 budget, Chancellor George Osborne announced several measures to ease taxes, including a 5% cut to the top rate of tax and a rise in the personal income tax allowance threshold. However, he also cut the personal income tax allowance pensioners receive, reduced child benefit and raised taxes on tobacco and other items.

With the Government under pressure to recoup the nation’s debt, it will look to operate more efficiently and generate additional income for the public purse. ‘Green technologies’ have been pinpointed as an important growth sector and will help to ensure the supply of energy in the future.

A.2.3 The Recovery Must Be Export Rather Than Debt-Led

The boom years up to the recession were facilitated by the access to cheap finance and low interest rates, meaning growth in the UK was essentially debt-led. With the aforementioned levels of debt across the world’s economies, this approach is no longer sustainable. Business investment and consumer spending levels remain low as a result of economic uncertainty, while the government has already announced cutbacks in its spending patterns. As such, the UK must focus on developing its export potential and focus any recovery around its most exportable sectors. This is already evident with net exports rising by a faster rate per annum than GDP in 2008 for the first time since 1991 (Figure A.4).

Figure A.4: Domestic demand, net exports and GDP, UK, 1990-2016

Source: Oxford Economics

Recovery is likely to be export rather than debt-led, as was evident during last decade’s boom
A.2.4 Pressures Remain On the Consumer with Household Incomes Squeezed

The Bank of England's Monetary Policy Committee (MPC) maintained the Bank Rate of Interest at 0.5% in January 2013, for the 47th consecutive month. This decision came as little surprise given the extent to which the growth outlook has deteriorated. There have been intermittent calls during that time for the Bank of England to increase interest rates to try and choke off high rates of inflation; however it seems unlikely that the MPC will make its first move until later this year at least.

The decade prior to the recession saw a significant build-up in household debt, most of which was used to finance the purchase of houses. At the end of 2012, the household debt-to-income ratio stood at 138%, approximately twenty percentage points below its 2008 peak but still considerably higher than the level at the start of the last decade. We expect the household debt-to-income ratio to continue edging down, reaching 131% by 2015.

A.2.5 A Rebalancing Of the Labour Market Likely

The labour market is a key source of domestic risk for the UK economy. Between 2008 and 2012, the UK economy is estimated to have lost approximately 107,000 net jobs - showing that the strong bounce back in employment levels in 2012 alone was not enough to overcome widespread losses during the main part of the downturn. Total employment is expected to start remain largely unchanged in 2013 before rising again in 2014 to recover its peak level by the end of that year. Approximately 2 million net jobs are estimated to be created between 2012 and 2022. Although this recovery phase appears strong, job growth in the long-term is only forecast at just over half of the rate of during the boom period between 2000 and 2008 (0.6% compared to 1.0%).

The majority of sectors are estimated to have experienced job losses over the recession period with massive job losses in manufacturing, construction, retail and public administration and defence (approximately 766,000 net job losses between the four sectors over the course of 2008-2012). However the employment levels in the electricity and waste management sectors, which are most closely aligned to this proposed project, have remained resilient over the course of the recession.

Labour market recovery can no longer rely on the public sector. The cuts to expenditure are likely to affect the public administration and education sectors in particular, with forecasts suggesting the two sectors could lose 344,000 net jobs over the next decade. Instead, the rebalancing of the labour market will see exportable service sectors such as real estate, administrative and professional services driving job creation. Policy support to encourage investment in the electricity and waste management sectors is essential to build on the aforementioned gains during the recession, and to improve on the baseline forecast which suggests falling employment in both sectors (Table A.1).
Table A.1: Employment by sector, UK, 2000-2022

<table>
<thead>
<tr>
<th>Change in total employment</th>
<th>2000-2008</th>
<th>2008-2012</th>
<th>2012-2022</th>
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<tr>
<td></td>
<td>No. (000)</td>
<td>% p.a.</td>
<td>No. (000)</td>
</tr>
<tr>
<td>Agriculture, forestry and fishing</td>
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<td>-0.1</td>
<td>-5</td>
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<td>Mining and quarrying</td>
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<td>-1</td>
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<td>Manufacturing</td>
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<td>Electricity, gas, steam and air conditioning supply</td>
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<td>-1.4</td>
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<td>Construction</td>
<td>403</td>
<td>2.5</td>
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<td>Wholesale and retail trade</td>
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<td>Transportation and storage</td>
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<td>Accommodation and food service activities</td>
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<td>Professional, scientific and technical activities</td>
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<td>Public administration and defence; compulsory social security</td>
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<td>Education</td>
<td>356</td>
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<td>Human health and social work activities</td>
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<tr>
<td>Arts, entertainment and recreation</td>
<td>141</td>
<td>2.4</td>
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<tr>
<td>Other service activities</td>
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<td>Total</td>
<td>2,296</td>
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Source: Oxford Economics

Note: Red shading represents sectors with largest employment losses (in % p.a. terms); green shading represents sectors with largest employment gains (in % p.a. terms)

A.2.6 Concluding Thoughts

With commodity prices on the rise, particularly oil, and sources of fossil fuels growing more finite, it is important for the global and UK economy to invest in other methods in meeting the energy demands of the population.

The proposed facilities will not only contribute to meeting the demand for energy, they will also help aid what is likely to be an increasingly important consideration for government in the future – job creation. The project would benefit the economy in terms of creating jobs in the much beleaguered construction sector as well as providing on-going benefits through its on-going operation in the electricity, waste management, professional and technical and administrative support activities (on-site and from purchases through the supply chain). Indeed the employment levels in the electricity and waste management sectors, which are most closely aligned to this proposed project, have remained resilient over the course of the recession. Policy support to encourage investment for these two sectors is essential to build on these gains, and to improve on the baseline forecast which suggests falling employment in both sectors up to 2022.
Appendix B: About Oxford Economics

Oxford Economics - formerly Oxford Economic Forecasting - was founded in 1981 to provide independent forecasting and analysis tailored to the needs of economists and planners in government and business. It is now one of the world’s leading providers of economic analysis, advice and models, with over 300 clients including:

- International organisations, such as the World Bank, OPEC and the Asian Development Bank.
- Government departments in many countries, including HM Treasury in the UK; the US Department of Treasury and US Office of Transnational Issues; Ministries of Finance in, for example, Saudi Arabia, Slovakia, Bulgaria, Azerbaijan, Turkey and Egypt; the Economic Development Board in Libya; and tourism boards in the EU, US, Abu Dhabi, Dubai and the Caribbean.
- Central banks around the world, ranging from the UK and Spain to Chile, Hong Kong, Korea and Thailand.
- A large number of multinational blue-chip companies across the whole industrial spectrum, including, for example, IBM, Intel, BP, Shell, Unilever, HSBC, Banco Santander, Swiss Re, DaimlerChrysler and Boeing.

Oxford Economics commands a high degree of professional and technical expertise, both in its own staff of over 70 professionals based in Oxford, London, Belfast, Paris, the UAE, Singapore and Philadelphia, and through its close links with Oxford University and a range of partner institutions in Europe and the US.

Oxford Economics’ services include:

- International macroeconomic, sectoral and regional forecasts – with country briefing reports covering 190 countries; detailed projections for 85 sectors; and forecasts for local areas throughout the EU and cities in Asia.
- Bespoke econometric modelling – building detailed forecasting and simulation models and training clients’ staff to use them to support budget planning and policy decision-making.
- Detailed market analysis - translating our economic forecasts into forecasts for market segments and providing advice on market opportunities.
- Briefings for ministers, senior officials and executives – both presentations and tailored written reports on key economic issues.
- Outsourced economics support – providing on-call advice, data, modelling, briefing and policy advice.
- Economic impact assessments – analysing the economic and social contribution of particular sectors, investment projects or tax proposals.

The key framework in which Oxford Economics’ analysis is conducted is its own Global Econometric Model, which covers some 45 economies in detail and headline statistics for another 35 economies. This Model – which is unique among the commercial economic consultancies – provides a rigorous and
consistent structure for analysis and forecasting, and allows the implications of alternative global scenarios and policy developments to be readily analysed at both the macro, sectoral and regional level. It is provided with very powerful, user-friendly software which enables Oxford Economics' clients to use its Global Model to generate their own forecasts and undertake detailed scenario and policy analysis.
Residual Waste Management Facility

Health Impact Assessment

Hightown Quarry

On Behalf of EEW Energy from Waste UK Ltd
Residual Waste Management Facility

Health Impact Assessment

Hightown Quarry

On Behalf of EEW Energy from Waste UK Ltd

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Executive Summary

Background

The proposed project is located within the arc21 region representing eleven constituent councils of the Eastern Region of Northern Ireland (including Antrim, Ards, Ballymena, Belfast, Carrickfergus, Castlereagh, Down, Larne, Lisburn, Newtownabbey, and North Down councils).

In keeping with best practice and in response to the scoping response from the Public Health Agency to DoE Planning in November 2010, a Health Impact Assessment (HIA) has been commissioned by EEW Energy from Waste Ltd to investigate and address the potential impact of the proposed Residual Waste Management Facility to be located within the Hightown Quarry site, near Mallusk. The Residual Waste Management Facility will comprise:

- a weighbridge complex;
- mechanical biological treatment (MBT) facility;
- a refuse derived fuel (RDF) bale storage building;
- an energy from waste (EfW) facility;
- Incinerator Bottom Ash (IBA) treatment facility;
- an Administration/Visitor Centre; and
- upgrading/widening of Boghill Road

Approach and Methodology

The scope and focus of the HIA has been defined and iteratively refined through engagement with key stakeholders; initially through the formal EIA scoping exercise with statutory consultees; and subsequently through a separate HIA scoping exercise with key health stakeholders and local communities via an integrated engagement strategy. The assessment scope focuses on the health issues raised during formal consultation and informal engagement, and implements an integrated approach with the Environmental Statement (ES), to ensure that the HIA is based upon realistic changes in environmental and socio-economic conditions that are directly attributable to the proposed project.

Community Profile

Overall, local rural communities typically exhibit better health than the national trend, with pockets of health deprivation closer to and within urban areas (closely associated with socio-economic deprivation, lifestyle and poor health behaviour).

Local communities are not considered particularly sensitive to environmental health pathways, while data suggests communities would benefit from any activity that reduces or removes existing socio-economic inequalities, provides employment opportunities and encourages improvements in healthy lifestyle choices.
During consultation, communities raised concern that recent development had not been reflected in Ordnance survey context plans shown for the area and this has been addressed as part of the finalising work in preparing for the full planning application submission. Available statistics have been applied to define local circumstance and existing health burden, and a highly conservative approach applied in the assessment section to factor in potential unaccounted population growth and relative sensitivity in the area (namely by assuming that the total population of Antrim, Newtownabbey and Belfast Councils reside in a single household and are subject to the maximum process contribution from the proposed facility).

The HIA has considered such factors in its assessment, and also through the mitigation and community support initiatives within a Health Action Plan (HAP) intended to optimise potential health benefit uptake associated with the proposed development.

**Assessment**

The assessment investigates each of the potential health pathways associated with construction and operation stages of the proposed development, including:

- the potential health risk from changes in emissions to air (including odour);
- the potential for community disruption from noise and vibration;
- the potential health risk from additional road movements (risk of accidents and injury);
- the potential impact on house value and sales;
- the potential socio-economic health benefits from direct, indirect and induced income and employment opportunities;
- the potential health risk from changes in electromagnetic field exposure from underground cables;
- risk perception; and
- general accidents and safety.

**Results**

**Air quality**

A community health concern raised during public engagement is the potential risk from changes in air quality. Following a review of the available scientific evidence base and based on an exposure response assessment of worst case hypothetical scenarios, it is concluded that changes in concentrations of PM_{10}, PM_{2.5} and NO_{2} will be of minor significance. Total concentrations would remain well within air quality standards set to protect health and would not be of a magnitude sufficient to quantify any measurable adverse health outcome during construction and operation of the proposed project (including transport emissions). Such a conclusion is consistent with the current scientific evidence base and the position of authoritative independent bodies including the UK Health Protection Agency.
Noise and Vibration

Given the proposed site, design and proposed mitigation, construction and operational noise and vibration is not of a level to result in significant annoyance, result in sleep disturbance or result in any measurable adverse health outcome.

Traffic

Construction and operational traffic movements are not of a level to quantify any measurable impact upon health through changes in air quality or noise, and are unlikely to result in community severance. The potential risk from accident and injury is managed through road improvements, training and transport management planning. Following mitigation, the proposed development is not anticipated to present any meaningful increase in local risk from road traffic accidents or injury.

Socio-Economic

Construction of the proposed development will generate significant direct, indirect and induced income employment opportunities, with associated socio-economic, mental and physical health benefits. The distribution of direct benefits is anticipated to be largely captured within the region, with sufficient capacity within the building sector.

Once operational, the site will employ 94 staff divided between the MBT facility (36 staff), EfW facility and IBA area (37 staff) and site services including administration, Visitor Centre and the weighbridge (21 staff). In total, and as detailed in the ES (Chapter 16 Population), the development will create or sustain 337 direct and indirect jobs during its operational phase, generating £7.7million in total wages annually and contributing £24.7million of GVA to the Northern Ireland economy.

The employment opportunities during operation would have a more local distribution then the direct construction employment opportunities. However the benefits associated with indirect and induced benefits would be spread across the region, particularly in Belfast as it is anticipated that the area will supply a number of items for on-going operation of the facility (diesel, chemicals and mobile plant leasing). On the above basis it is concluded that the direct, indirect and induced economic impact of the proposed project presents an important contribution to both local and regional employment opportunities with subsequent beneficial health outcomes for those individuals.

A review of the effect of EfW on house price and sales indicates that there are two factors with the potential to impact upon house value, tangible environmental disamenity and risk perception. As demonstrated in the ES and HIA, and consistent with the scientific evidence base and position of Authoritative bodies, the proposed project will not give rise to significant environmental or any measurable health impacts. In light of the available evidence, it is concluded that measurable adverse effects on property values due to any tangible impact are therefore unlikely. It is appreciated however, that risk perceptions remain, and concerns raised as a consequence of unsupported opinion may have some influence on house price.
Electromagnetic fields

Based on the current scientific evidence base and Government guidance, the proposed project would have no significant human health impact due to EMF exposure from the proposed electricity transmission infrastructure (33 kV underground cables, transformer and circuit breaker).

Nuisance

A further community concern has been raised during consultation regarding potential nuisance effects from flies or litter from vehicles making waste deliveries (influenced by perceptions of the existing landfill). Waste deliveries will be made via enclosed specialist vehicles to an enclosed reception hall designed and operated to prevent nuisance issues from arising. No significant health pathway or adverse health outcome from these potential nuisance effects is therefore anticipated, and subject to consent, local communities will be able to monitor the facility for themselves through the proposed Visitor Centre.

Risk Perception

The ES and HIA have actively sought to investigate and address such risk perceptions through the scope of assessment but also through extensive community engagement and feedback. In addition, a site visit to operational facilities in Europe will be organised with key stakeholders to aid in further raising awareness and addressing common, yet often incorrect perceptions of EfW and MBT facilities. The proposed Visitor Centre in itself is key to addressing such risk perceptions, and will provide communities with some reassurance on the open approach taken in the design and operation of the proposed facility, and intention for on-going community engagement. Not only will local communities be able to inspect and monitor the facility first hand throughout its operational life (addressing risk perceptions and misconceptions), but is also intended to showcase an example of international best practice. As demonstrated during consultation, where issues of community concern have been raised, these have commonly been on the basis of perceived risk and fear, compounded by commonly stated but unsupported opinion. While consultation has proven effective in cataloguing, understanding and responding to such concerns, on-going engagement will be key to managing residual concerns. EEW in partnership with arc21 is committed to developing and maintaining strong and responsive relationships with the local community.

Conclusion

On the basis that all regulatory environmental standards set to protect health are predicted to be achieved; that the assessment from relative changes in air quality, noise and transport upon existing burdens of health are not sufficient to quantify any adverse health outcome; and when considering the approach proposed to address community concerns, perceptions and priorities; operational procedures; and the commitment for on-going community engagement, it is concluded that the proposed development does not constitute a significant risk to local community health.

When further considering the underlying factors defining local burdens of poor health in the area (largely socio-economic and lifestyle related), the direct, indirect and induced socio-economic benefits from the proposed development, and that the proposed facility is specifically designed to manage the municipal
waste requirements of arc21, and would effectively remove the vast majority of municipal waste sent to landfill within the boundary of arc21, the proposed project is considered to represent an enhancement, in terms of delivering a net beneficial effect on local health.
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1 Introduction

Background

1.1 The proposed project is located within the arc21 region representing eleven constituent councils of the Eastern Region of Northern Ireland (including Antrim, Ards, Ballymena, Belfast, Carrickfergus, Castlereagh, Down, Lame, Lisburn, Newtownabbey, and North Down councils).

1.2 In keeping with best practice, EEW Energy from Waste UK Ltd have commissioned a Health Impact Assessment (HIA) to inform and support the planning process and application for the proposed Residual Waste Management Facility to be located within the Hightown Quarry site, near Mallusk. The proposed Residual Waste Management Facility comprises of

- a weighbridge complex;
- mechanical biological treatment (MBT) facility;
- a refuse derived fuel (RDF) bale storage building;
- an energy from waste (EfW) facility;
- Incinerator Bottom Ash (IBA) treatment facility;
- an Administration/Visitor Centre; and
- upgrading/widening of Boghill Road

1.3 The remainder of this Chapter provides an introduction to the HIA, detailing its aims and objectives, the approach and methodology applied, the influence key stakeholders and communities have had on its scope and focus and its relationship to the Environmental Statement (ES).

Health Impact Assessment

1.4 HIA is a multidisciplinary process designed to identify and assess the potential health outcomes (both adverse and beneficial) of a proposed project, plan or programme and to deliver evidence-based recommendations that maximise health gains and reduce or remove potential negative impacts or inequalities (Ref. 1).

1.5 Although HIA is not a regulatory requirement of the UK planning process, there are wider drivers and inherent benefits that reinforce its voluntary commission on this project, including:

- HIA is encouraged by the Department of Health, Social Services and Public Services (DHSSPS) in their report ‘Investing for Health’ as best practice to promote health and reduce inequality (Ref. 2);
- Policy WM 1 of PPS 11: Planning and Waste Management states that a waste management facility will only be permitted where it can be demonstrated that the proposed project will not cause demonstrable harm to human health or result in an unacceptable
adverse impact on the environment (Ref.3). HIA therefore compliments the regulatory assessment and permitting process to fully address this policy requirement; and

- the ES scoping opinion, prepared by the Planning Service in November 2010 outlines the request from the Public Health Agency (PHA) for a voluntary HIA to investigate and address community concerns and perceptions (the full scoping opinion is provide in Appendix 5.1 of the ES and replicated in Table 1.1 below):

Table 1.1: Public Health Agency Scoping Input

| The Public Health Agency (PHA) recommends that the applicant should be asked to include a health impact assessment as part of the environmental statement. This will need to specifically address the health concerns which this type of project raises in the public mind. |
| Assurances are sought that only material considered for the site is domestic waste and no specified or special waste will be dealt by this process. |
| The treatment of exhaust Ca (OH)2 will require large volumes of this material to be brought on site and subsequent disposal arrangements put in place. This will need to be fully discussed in any future developments. |
| The injection of ammonia will require storage on site of this compound. Accordingly the arrangements for transport and storage of ammonia will need to be clarified. |
| Arrangements for capture and monitoring of Dioxins, PCPs and heavy metals will need to be more fully explained in subsequent documentation. |
| Further details will need to be supplied regarding the arrangements that will be made to remove and treat waste water from plant as it would appear that large volumes of water will be consumed. |
| When the plant is operational it is estimated that at least 50 additional lorry loads on the steep approach road to the site is likely to impede traffic. This and the noise could cause particular distress amongst the residents. Subsequent documentation would need to outline proposed mitigation factors in respect of this which should also be addressed through the Health Impact assessment referred to above. |

Underlined Text indicating text relevant to HIA

1.6 As per the PHA request, a voluntary HIA was commissioned and the scope, focus and necessary outputs discussed and agreed with the PHA during a supplemental HIA scoping exercise. Additional information on the supplementary HIA scoping exercise is provided in the methodology section below.

1.7 HIA therefore provides an added means to investigate and address local community health concerns, and to tailor mitigation and community support initiatives to more effectively address local community circumstance, relative sensitivity, concern and need.

1.8 The following section details the specific approach, aim and objectives of this HIA and presents the core stages performed.
**Approach**

1.9 The basis and principles of this HIA, which has been prepared in accordance with current guidance (Ref.1), are set on a broad socio-economic model of health that encompasses conventional health impacts such as communicable disease, accidents and risk along with wider determinants of health vital to achieving good health and wellbeing. These wider determinants of health include income, employment, housing, education, the quality of the urban environment, crime and the perception of crime. In this instance, the HIA also includes elements of Equalities Impact Assessment (EqIA), to ascertain if aspects of the proposed project have a disproportionate impact upon specific sensitive community groups.

1.10 A key aspect of the HIA approach has been to work alongside, draw from and build upon both the Pre-Application Discussion (PAD) process, and the technical assessments of the ES from the outset of the proposed project.

1.11 Integration with the PAD, planning and EIA process has enabled the HIA to iteratively inform the proposed development, to catalogue and address community concerns, but also ensures that the HIA is based upon realistic changes in environmental and socio-economic conditions directly attributable to the proposed project and suitable for planning submission.

**Aim and Objectives**

1.12 The aim of the HIA is to build upon and complement the outputs of the ES to further integrate health and well-being within the proposed project, identify and assess potential health outcomes and put forward recommendations to maximise health gains whilst minimising potential negative impacts and inequality.

1.13 This aim has been achieved through the delivery of the following objectives:

- HIA scoping to establish, justify and agree an appropriate scope and focus of assessment with key health stakeholders;
- development and implementation of an integrated EIA and HIA engagement strategy to facilitate meaningful consultation intended to identify, discuss and address local concerns and perceived risks during the PAD process, refining the scope of the final HIA to local needs;
- community profiling to establish local circumstance and relative sensitivity, forming the founding platform to the assessment process;
- iterative HIA support to address local circumstance and community health concerns through the refinement of the proposed project;
- development of an appropriate evidence base to address the key health pathways scoped within the HIA;
- quantifying and appraising the magnitude, distribution and likelihood of potential health outcomes (both adverse and beneficial) directly attributable to the proposed project; and
development of a bespoke Health Action Plan (HAP) to further address local circumstance, support the uptake of potential health benefits and inform on-going community engagement and feedback.

**Methodology**

1.14 Although guidance and a generic HIA process exists, the methods employed in HIA are often tailored to meet the particular assessment requirements of a project. In this instance, the HIA has been run in parallel with the PAD and Environmental Impact Assessment (EIA), drawing from technical outputs and integrating key stages of community and stakeholder engagement. As detailed below, core stages of the HIA included:

1. HIA Scoping;
2. Project Profile;
3. Community Profile;
4. Stakeholder Engagement;
5. Assessment; and

**HIA Scoping**

1.15 Scoping is the process by which the focus of the assessment is set, defining the key health pathways to be assessed (i.e. aspects with the potential to influence health, both adversely and beneficially); and just as importantly, rationalise aspects to be outside of the scope. This is necessary to ensure the HIA is fit for purpose, meets stakeholder expectations and identifies potential opportunities to support local and strategic health objectives but equally does not cover matters that it cannot influence or does not affect.

1.16 Although guidance defines HIA scoping as a distinct task, RPS best practice likens it more to an iterative process running throughout the entire HIA. In this instance, key scoping stages included:

- review of the November 2010 Scoping Statement, to identify statutory consultee health concerns to be investigated, assessed and addressed;
- the provision of a draft HIA Scoping document to the Northern Health and Social Care Trust (NHSCT) and the Public Health Agency (PHA) for comment and gap analysis (copy of the scoping document is provided in Appendix A);
- the provision of a HIA scoping exercise on the 12 January 2013 with the NHSCT and PHA where the aim, objectives, scope and focus of the HIA were deemed appropriate and did not require supplementation. The sole recommendation from the NHSCT and PHA was to expand discussion of the HIA scope with the appropriate Environmental Health Officers (EHO);
the provision of an additional HIA Scoping exercise with appropriate EHO's on the 5th February 2013 (as per the NHSCT and PHA recommendation), where the aim, objectives, scope and focus of the HIA were again deemed appropriate and did not require supplementation;

- presentation, discussion and refinement of the HIA scope at Council Meetings;

- attendance of the HIA Team at all of the PAD drop in sessions to discuss local community issues, priorities, opportunities and address community concerns (thereby further refining the assessment scope to local needs);

- review of PAD consultation feedback, gap analysis and confirmation of health pathways to be assessed); and

- engagement with local community group (including health themed meeting) to discuss community concerns and further refine the scope and focus of the HIA and HAP.

1.17 The RPS scoping approach is inclusive, applying the views, opinions, perceptions and relative health priorities of local communities and stakeholders to define the scope and focus of the HIA throughout its process. It also provides greater insight as to local issues and priorities that can inform initial planning preferences, returns more effective information to address local community concerns and also enables current affairs and emerging research to influence the final HIA and HAP.

Project Profile

1.18 The project profile draws from the planning application, the ES and available literature to outline the core activities and associated health pathways to be investigated in greater detail within the assessment stage. A health pathway can be described as the way in which an activity influences a known determinant of health. As an example of how the health pathway concept is applied, construction activities are known to influence environmental determinants of health including air quality, noise and traffic. A health pathway is identified when such influences have the opportunity to impact on communities with the potential to cause a response or health effect.

1.19 Identification of potential health pathways helps to define the scope of the study, from which it is possible to develop a suitable evidence base and a more informed community profile. The distribution, magnitude and significance of the health pathways are then investigated within the assessment stage.

1.20 Although the project profile primarily draws from technical information and transferable knowledge from similar projects to investigate and address potential issues directly associated with the project, it is important to note that it is also informed through consultation with local communities, in order to ensure that the HIA addresses wider concerns, perceptions and local priorities.
Community Profile

1.21 Evidence suggests that different communities have varying susceptibilities to health impacts and benefits as a result of social and demographic structure, behaviour and relative economic circumstance. A community profile therefore not only forms the basis to exposure response modelling, but also provides a means to consider how potential health pathways identified in the project profile might act disproportionately upon certain communities and sensitive/vulnerable groups. In this instance, the community profile makes use of available demographic and health care data, complementing the socio-economic profile given in the ES.

Stakeholder Engagement

1.22 An important component of gathering an appropriate evidence base and tailoring the HIA to local circumstance is seeking the views of stakeholders and key representatives of communities likely to be affected by the proposed project. In this instance, an integrated engagement strategy was applied to engage and catalogue community and stakeholder concerns, providing informed feedback at drop-in sessions and a mechanism to both refine the proposed project to address such concerns through design, and influence the scope and focus of the final assessment.

1.23 Section 4 of the HIA provides a brief summary of engagement stages and outputs pertinent to the HIA. However, for a more detailed account of the integrated consultation strategy, the methods applied, the stakeholders and communities engaged and all consultation outputs, please refer to the Statement of Community Involvement which forms part of the planning application submission.

Assessment

1.24 The assessment stage maps the project profile and technical outputs of the ES against the community profile to assess and appraise the magnitude, likelihood and distribution of potential health outcomes (both adverse and beneficial) that would be directly attributable to the proposed project.

1.25 To keep the HIA a concise and publicly-accessible document, the assessment draws upon the technical assessment outputs of the ES but does not seek to repeat or replicate them. Key inputs are, however, cross referenced with the ES to aid transparency, and enable readers to navigate to areas of the ES of specific interest to them.

Health Action Plan (HAP)

1.26 The HAP presents a series of recommendations to reduce community disruption, remove barriers to health benefit uptake and maximise opportunities to improve local circumstance, health and well-being.

1.27 The HAP expands upon the normal recommendations section within HIA guidance (Ref1), establishing recommended protocols and monitoring regimes to be implemented to further reduce and remove potential negative health impacts while maximising opportunities to increase health benefits. In this instance, the HAP draws from and builds upon the mitigation outlined in the ES,
informed and refined to address the bespoke requirements and concerns of communities expressed during consultation.
2 Project Profile

Overview

2.1 The following section provides a brief description of the core activities associated with the construction and operation of the proposed development and defines the potential health pathways to be investigated during the assessment stage.

2.2 For a more detailed account, please refer to Section 3 of the ES.

The Proposed Development

2.3 As detailed in Section 3 of the ES, the proposed development comprises the following elements:

- a weighbridge complex;
- a Mechanical and Biological Treatment (MBT) facility;
- a Refuse Derived Fuel (RDF) bale storage building;
- an Energy from Waste (EfW) thermal treatment facility;
- an Incinerator Bottom Ash (IBA) treatment facility;
- an Administration/Visitor Centre; and
- upgrading/widening of the Boghill Road and related junction improvements.

2.4 The proposed development has been designed to accept and treat up to 300,000 tonnes of waste in any given year, which will be split between both the MBT facility (capacity 300,000 tonnes) and EfW facility (capacity 68MWth). For the year 2019/20, based on the assumed waste composition and projected waste tonnages, the proposed development is expected to accept and treat 241,319 tonnes of Authority Waste and 23,879 tonnes of Third Party Waste (waste not under the control of its councils), giving an estimated total of 265,198 tonnes.

2.5 The site will be operational seven days a week, however, the majority of Authority Waste is expected to be delivered from 7am to 6pm Monday to Friday and 8am to 2pm Saturdays, with extended Saturday opening from 8am to 6pm for up to 12 Saturdays over the year. On occasion it will be necessary to deliver waste to the site outside of these hours when requested by the Authority, and this will be by prior arrangement with DoE. All Third Party Waste deliveries will run concurrently with Authority Waste deliveries.

Health Pathways

2.6 A health pathway can be described as the way in which an activity influences a known determinant of health. As an example of how the health pathway concept is applied, construction activities are known to influence environmental determinants of health including air, noise and traffic. A health pathway is identified when such influences could impact on communities with the potential to cause a response or health effect.
2.7 The identification of potential health pathways helps to define and rationalise the scope of the assessment, from which it is possible to develop an appropriate evidence base and an informed community profile. The distribution, magnitude and significance of potential health pathways are then investigated within the assessment stage.

**Construction Activities**

**Overview**

2.8 As detailed in Section 3 of the ES, construction works are programmed to commence on site following planning and permitting consent and land procurement by arc21. The construction and commissioning of the proposed project is expected to take up to 41 months, and at its height employ a workforce of 455 individuals (accounting for almost one fifth of direct employment).

2.9 Initial construction activity will be similar to typical quarry activities, involving enabling works within the quarry site to form the construction platforms and also the upgrading works for the Boghill Road.

2.10 The construction hours will be from 7am to 7pm Monday to Friday, 7am to 1pm on Saturdays and closed on Sundays. There will be certain circumstances where the construction work will be required to be more intensive and these are explained in detail in the Construction Management Plan (see Appendix 3.1 of the ES).

**Operational Activities**

**Overview**

2.11 As detailed in Section 3 of the ES, once operational, the site will employ 94 full time staff between the MBT facility, EfW facility and IBA area and site services including Visitor Centre, administration and the weighbridge. Once operational the EfW facility will run continuously throughout the year with the exception of shutdown periods for maintenance.

2.12 The site will be operational seven days a week however the majority of waste is expected to be delivered from 7am to 6pm Monday to Friday and 8am to 2pm Saturdays, with extended Saturday opening from 8am to 6pm for up to 12 Saturdays over the year.

**MBT and Waste Bale Production**

2.13 The MBT will mechanically and biologically treat waste to separate out recyclable materials and refuse derived fuel. The waste will first be separated into three size fractions, undersize, midsize and oversize. Oversized waste will be shredded before being returned to the process.

2.14 The remaining waste will be sorted using metal separators, optical sorters, ballistic separators and manual handpicking stations to remove recyclate. The extracted metals will be stored temporarily within the facility in skips before being collected for recycling. The paper, cardboard, plastic and textile material will be bundled and stored in a Recyclate Storage Area before being transported for reprocessing.
2.15 Once the recyclate has been extracted the remaining midsize fraction will be fed directly to the EfW facility. The undersize fraction will be biologically treated to decrease moisture content. After 2 weeks of drying the waste will then be conveyed to the EfW fuel bunker. The air used in the biodrying process will be chemically treated and passed through a biofilter to remove odour prior to release to atmosphere.

2.16 During periods when the EfW facility is shut down the MBT facility will bale the midsize refuse derived fuel for storage prior to future recovery and use in the EfW facility.

Energy Recovery

2.17 The Energy from Waste facility will take the refuse derived fuel produced from the MBT facility as well as any untreated waste (that has been discharged directly to the EfW) producing electricity for export to the grid. The EfW facility will have a thermal capacity of 68 MW\textsubscript{th}, operating 24 hours a day for at least 8,000 hours per year, with a four week shutdown period for planned maintenance. The exhaust gas will pass through a Flue Gas Treatment system before being discharged to atmosphere.

2.18 The Air Pollutant Control (APC) residue from the Flue Gas Treatment system will be stored in a sealed onsite silo before being transferred to a hazardous waste facility via sealed container. The Incinerator Bottom Ash (IBA) will be transported to the IBA Processing facility to be prepared for recycling.

Ash Storage and Treatment

2.19 The Incinerator Bottom Ash Processing facility is designed to treat the ash residue from the incineration process to separate out metals, unburned combustible materials and aggregate. After this processing the IBA will be transported to a landfill capable of accepting non-hazardous waste. For the purposes of the Transport Assessment (see Appendix 12.1), it has been assumed that the IBA will be transported to nearby Cottonmount for landfilling. This is only intended as a solution until a market in Northern Ireland to secure and recover maximum value from Incinerator Bottom Ash Aggregate (IBAA) for use in the construction industry can be commenced.

Tailoring the HIA to the Project Profile

2.20 Table 2.1 provides a summary of the potential health pathways associated with the proposed development and represents the scope of health topics to be addressed as part of the HIA.
Table 2.1: Health Pathways

<table>
<thead>
<tr>
<th>Feature</th>
<th>Health Pathway</th>
<th>Health Determinant</th>
<th>Potential Implication</th>
<th>Distribution</th>
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<tr>
<td>Construction Phase</td>
<td>Changes to local air quality (potential dust nuisance)</td>
<td>Environment</td>
<td>Adverse</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>Changes in noise exposure</td>
<td>Environment</td>
<td>Adverse</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>Changes in local transport nature and flow rates</td>
<td>Transport</td>
<td>Adverse</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>Increased direct, indirect and induced employment opportunities</td>
<td>Socio-economic</td>
<td>Beneficial</td>
<td>Local/Regional</td>
</tr>
<tr>
<td>Operational Phase</td>
<td>Changes to local air quality (emissions to air, including, odour)</td>
<td>Environment</td>
<td>Adverse</td>
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<tr>
<td></td>
<td>Changes in noise exposure</td>
<td>Environment</td>
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</tr>
<tr>
<td></td>
<td>Changes in local transport nature and flow rates</td>
<td>Transport</td>
<td>Adverse</td>
<td>Local</td>
</tr>
<tr>
<td></td>
<td>Change in net transport movements due to regional transportation of waste and reduced vehicle trips to landfill</td>
<td>Transport</td>
<td>Beneficial</td>
<td>Regional</td>
</tr>
<tr>
<td></td>
<td>Direct, indirect and induced income employment opportunities</td>
<td>Socio-economic</td>
<td>Beneficial</td>
<td>Local/Regional</td>
</tr>
<tr>
<td></td>
<td>Raised awareness, education and training</td>
<td>Education / Socio-economic</td>
<td>Beneficial</td>
<td>Local/Regional</td>
</tr>
</tbody>
</table>

2.21 The potential health pathways associated with the construction and operation of the proposed project do not discriminate upon any particular sensitive community group, and as a consequence an equalities impact assessment is not required.

2.22 On the above basis, the assessment stage will include:

- quantitative exposure response modelling for changes in PM$_{10}$, PM$_{2.5}$ and NO$_2$ exposure during construction and operation (applying the UK Department of Health's Committee on the Medical Effects of Air Pollutants (COMEAP) methodology) to quantify potential changes in life expectancy and local cardiovascular and respiratory hospital admissions);
- qualitative appraisal of the potential health risk from the ingestion of trace, heavy metals and dioxin/furans (building upon the quantitative outputs of the Human Health Risk Assessment in the Permit Application);
- risk assessment from changes in construction and operational road traffic movements and consequent risk of collisions directly attributed to the proposed development;
qualitative appraisal as to community disruption and potential health outcome from changes in construction and operational noise (drawing from the detailed noise assessment of the ES); and

qualitative appraisal as to the socio-economical health benefits from direct, indirect and induced income and employment opportunities (drawing from the socio-economic section of the ES).

2.23 Following a review of local concerns through the integrated engagement strategy, the HIA scope has been further expanded to include an assessment of potential changes in electromagnetic fields (EMF) exposure from underground cabling, impact on property value and sales, impacts from odour and vermin, and includes additional information to address commonly perceived risks for such facilities.

2.24 The socio-economic health benefits from the generation of electricity and heat from waste has not been assessed, as these the benefits are diffuse throughout Northern Ireland., making a small but useful contribution towards energy security.

2.25 Environmental benefits from reducing waste sent to landfill (be it offsetting more potent greenhouse gas emissions through to odour and vermin nuisance) have been assessed in the corresponding ES which includes a WRATE assessment undertaken as part of the ES (refer to chapter 15 and Appendix 15.1 of the ES). This is a recognised software package that assesses the impact of municipal waste management systems and compares the change from landfill to MBT/EfW. Although the proposed facility is specifically designed to manage the municipal waste requirements of arc21, and would effectively remove the vast majority of municipal waste sent to landfill within the boundary of arc21 (including the costs associated with landfill tax), a detailed commentary upon other facilities and their operations has not been provided within the scope of this HIA.
3 Community Profile

Overview

3.1 Evidence suggests that different communities have varying susceptibilities to both health impacts and benefits as a result of social and demographic structure, behaviour and relative economic circumstance. The community profile complements the socio-economic baseline within the ES (Section 16), providing an insight into how potential health pathways identified within the project profile may act disproportionately upon certain communities and sensitive groups.

Site Location and Setting

3.2 Hightown Quarry is located near Mallusk, in the south of Antrim, Northern Ireland (NI), and benefits from extant planning permission for unrestricted quarrying activity. The site lies approximately 1 km southwest of established residential areas of Hightown and Blackrock and 2.5 km southwest of Glengormley. The planning application site area extends to 52.4 hectares. The quarry floor is stepped between a floor level of +245 m AOD and +260 m AOD, along the south of the site the quarry face rises to +290 m AOD which is the original ground level.

3.3 The quarry is situated in the sparsely populated rural ward of Clady, adjacent to which is the ward of Mallusk in the Newtownabbey district and the ward of Legoniel in the Belfast district.

Figure 3.1: Site Location

Ordnance Survey data © database right 2013
3.4 The immediate area surrounding the proposed site includes moorland to the south and southwest of the quarry and enclosed pasture fields flanking Boghill Road to the north, west and east of the quarry.

3.5 The closest residential receptors are a scattering of individual houses and farms within half a kilometre of the site boundary, with the closest settlement located at the junction of Boghill road and Hydepark Road, including new housing development in the area. A community health concern expressed during engagement was the perceived failure of documentation utilised by the Becon team in accurately reflecting Ordnance Survey mapping to account for recent development and new communities in the area. The community profile applies current demographic and health statistics. However, to allay such concerns, a consistently conservative approach is applied during the assessment section to account for population growth that may not yet be recorded within demographic and health surveys.

**Local Demography**

**Population Structure**

3.6 The 2011 census indicates that the population in NI is 1,810,900 people representing an increase of 125,600 (7%) since the 2001 census. The data indicate that part of the reason for this growth is an increase in life expectancy; for example, the number of people aged 85+ in NI has increased by 35% since 2001.

3.7 Furthermore, the 2011 census shows an increase of 18% in the population aged 65+, 10% growth in the 16-64 age bracket and 19% growth in the number of people aged 40-64 years. The 2011 census indicates that the demographic structure of households has also changed, with a move toward homes occupied by one or two people. To meet this change in demand, the number of households has increased by 12% compared with overall population growth of 7%.

3.8 Figure 3.2 provides an overview of age structure across NI, including the Council areas of Antrim, Belfast and Newtownabbey and the wards within Antrim based on data from the 2011 census.
3.9 As shown in Figure 3.2, the age profiles of the three Council areas of Antrim, Belfast and Newtownabbey are relatively similar to that of NI. At the ward level, Crumlin and Toome show a younger age demographic compared with Balloo and Templepatrick wards. However, the ward in which the proposed facility is located (Clady) is reasonably consistent with the age profiles of neighbouring wards, NI, Antrim and Belfast.

3.10 Population density in Antrim (1.27 people per hectare) is relatively low when contrasted against NI (1.34 PPH), Newtownabbey (5.67 PPH) and Belfast (25.68 PPH), characteristic of the largely rural nature of the area. Equally, Clady, where the proposed site is located, demonstrates an even lower population density (0.38 PPH), and is significantly less dense than the neighbouring wards of Mallusk (3.54 PPH) in Newtownabbey and Legoniel (7.26 PPH) in Belfast (Ref.5).

3.11 In 2012, migration into NI fell by 24% from the 2005 to 2008 peak, with 23,300 people moving into NI; and the number of people leaving NI to live elsewhere reached to 24,600 increased by 14% from the same period (Ref.6).

3.12 A similar pattern can be seen at in Antrim, Belfast and Newtownabbey from 2005 to 2012, more people there left NI with the net external migration dropped from 272 to -57 in Antrim, from 291 to -665 in Belfast, and from -144 to -161 in Newtownabbey (Ref.7).

**Education**

3.13 As shown in Table 3.1, there is a higher proportion of people with no qualifications in NI compared with the UK, and also a noticeable difference in the number of people obtaining NVQ4 and above. This is based on qualifications held in 2012 by people aged 16-64 years old.
### Table 3.1: Qualifications at National Level

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Northern Ireland (%)</th>
<th>United Kingdom (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NVQ4 and above</td>
<td>27.5</td>
<td>34.2</td>
</tr>
<tr>
<td>NVQ3</td>
<td>15.7</td>
<td>17.1</td>
</tr>
<tr>
<td>Trade apprenticeships</td>
<td>5.6</td>
<td>3.7</td>
</tr>
<tr>
<td>NVQ2</td>
<td>17.3</td>
<td>16.8</td>
</tr>
<tr>
<td>NVQ1</td>
<td>10.7</td>
<td>12.1</td>
</tr>
<tr>
<td>Other qualifications</td>
<td>4.9</td>
<td>6.3</td>
</tr>
<tr>
<td>No qualifications</td>
<td>18.4</td>
<td>9.9</td>
</tr>
</tbody>
</table>

NVQ4: HND, Degree and Higher Degree level qualifications
NVQ3: 2 or more A levels, advanced GNVQ, NVQ 3, 2 or higher or advanced national qualifications (Scotland)
NVQ2: 5 or more GCSEs at grades A-C, intermediate GNVQ, NVQ 2, intermediate 2 national qualifications (Scotland)
NVQ1: fewer than 5 GCSEs at grades A-C, intermediate GNVQ, NVQ 2, intermediate 2 national qualifications (Scotland)
Other qualifications: includes foreign qualifications and some professional qualifications
No qualifications: no formal qualifications held

Source: Office for National Statistics (Ref.8).

3.14 As shown in Table 3.2, the 2011 census provides a further breakdown of qualifications held at district and ward levels. Particularly high proportions of people in Legoniel and Belfast have no formal qualifications; while Clady and Mallusk have higher proportions of qualified people and lower rates of no formal qualifications than the national and regional trends.

### Table 3.2: Qualifications at Local Level

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Northern Ireland (%)</th>
<th>District (%)</th>
<th>Ward (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Antrim</td>
<td>Belfast</td>
<td>Newtownabbey</td>
</tr>
<tr>
<td>Level 4</td>
<td>23.65</td>
<td>23.69</td>
<td>26.03</td>
</tr>
<tr>
<td>Level 3</td>
<td>12.3</td>
<td>12</td>
<td>13.14</td>
</tr>
<tr>
<td>Apprenticeship</td>
<td>4.22</td>
<td>4.52</td>
<td>3.26</td>
</tr>
<tr>
<td>Level 1</td>
<td>11.51</td>
<td>12.29</td>
<td>10.75</td>
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<tr>
<td>Other Qualifications</td>
<td>4.28</td>
<td>4.67</td>
<td>3.84</td>
</tr>
<tr>
<td>No Qualifications</td>
<td>29.12</td>
<td>26.29</td>
<td>30.39</td>
</tr>
</tbody>
</table>

No qualifications: No formal qualifications
Level 1: 1-4 GCSEs or equivalent qualifications.
Level 2: 5 GCSEs or equivalent qualifications.
Apprenticeships.
Level 3: 2 or more A-levels or equivalent qualifications.
Level 4 or above: Bachelor degree or equivalent, and higher qualifications.
Other qualifications including foreign qualifications.

Employment

3.15 Data from May 2013 – July 2013 indicate that approximately 72.7% of people aged 16-64 in NI are economically active, compared with 77.7% in the United Kingdom. The economic inactivity (April 2012 to March 2013) in NI is mainly influenced by a large student population (31.3%), people who have long-term illness (26.5%) and those who are looking after family (22.8%) (Ref.10).

3.16 Jobseeker Allowance Claimants figures (August 2013) show that in total 6.9% of working age adults in NI receive Jobseeker Allowance (JSA) compared with 4.2% in the United Kingdom. This rate is higher for males (8.9% in NI and 5.1% in the UK) than females (4.4% in NI and 3.2% in the UK) (Ref.10).

3.17 Employment occupation (April 2012 to March 2013) shown in Table 3.3, there is a higher number of people working in lower-skilled positions including elementary occupations in NI compared with the UK, but equally there is a higher percentage with a skilled trade in NI. As shown in Table 3.4, the 2011 census provides a further breakdown of occupation held at district level. Antrim, Belfast and Newtownabbey have more people working in lower-skilled positions including elementary occupations compared with NI; and only Antrim has a higher percentage with a skilled trade than NI (Ref.11).

### Table 3.3: Employment by Occupation (April 2012 to March 2013)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Northern Ireland (%)</th>
<th>United Kingdom (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Managers, directors and senior officials</td>
<td>8.6</td>
<td>10.1</td>
</tr>
<tr>
<td>2 - Professional occupations</td>
<td>18.4</td>
<td>19.4</td>
</tr>
<tr>
<td>3 - Associate professional &amp; technical</td>
<td>10.0</td>
<td>14.0</td>
</tr>
<tr>
<td>4 - Administrative &amp; secretarial</td>
<td>12.0</td>
<td>10.9</td>
</tr>
<tr>
<td>5 - Skilled trades occupations</td>
<td>13.5</td>
<td>10.6</td>
</tr>
<tr>
<td>6 - Caring, leisure and other service occupations</td>
<td>9.2</td>
<td>9.0</td>
</tr>
<tr>
<td>7 - Sales and customer service occupations</td>
<td>8.6</td>
<td>8.1</td>
</tr>
<tr>
<td>8 - Process plant &amp; machine operatives</td>
<td>6.9</td>
<td>6.3</td>
</tr>
<tr>
<td>9 - Elementary occupations</td>
<td>10.7</td>
<td>10.9</td>
</tr>
</tbody>
</table>

Source: Office for National Statistic (Ref.10).
Table 3.4: Employment by Occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Northern Ireland (%)</th>
<th>Antrim (%)</th>
<th>Belfast (%)</th>
<th>Newtownabbey (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - Managers, directors and senior officials</td>
<td>8.04</td>
<td>8.67</td>
<td>6.89</td>
<td>8.51</td>
</tr>
<tr>
<td>2 - Professional occupations</td>
<td>17.15</td>
<td>15.88</td>
<td>20.89</td>
<td>16.22</td>
</tr>
<tr>
<td>3 - Associate professional and technical occupations</td>
<td>8.64</td>
<td>8.94</td>
<td>9.93</td>
<td>9.79</td>
</tr>
<tr>
<td>4 - Administrative and secretarial occupations</td>
<td>14.06</td>
<td>13.85</td>
<td>14.79</td>
<td>17.09</td>
</tr>
<tr>
<td>5 - Skilled trades occupations</td>
<td>14.02</td>
<td>14.24</td>
<td>7.82</td>
<td>10.87</td>
</tr>
<tr>
<td>6 - Caring, leisure and other service occupations</td>
<td>9.28</td>
<td>9.51</td>
<td>8.87</td>
<td>8.56</td>
</tr>
<tr>
<td>7 - Sales and customer service occupations</td>
<td>10.05</td>
<td>8.79</td>
<td>12.26</td>
<td>11.54</td>
</tr>
<tr>
<td>8 - Process, plant and machine operatives</td>
<td>7.96</td>
<td>8.16</td>
<td>5.15</td>
<td>6.82</td>
</tr>
<tr>
<td>9 - Elementary occupations</td>
<td>10.8</td>
<td>11.96</td>
<td>13.38</td>
<td>10.61</td>
</tr>
</tbody>
</table>

Source: 2011 census (Ref.11)

3.18 The NISRA conducts a census of employment every two years in NI at district/borough/council level. The latest survey was conducted in 2011, identifying employers based on VAT and PAYE registration, excluding the self-employed and agricultural industries. The total number of employee jobs in NI in September 2011 was 693,083, a decrease of 2.1% since September 2009. Across the 26 districts in NI, 20 recorded a decrease in jobs. Newtownabbey had a decrease of 5.2%, whereas Belfast recorded a slight increase of 0.3% and Antrim the highest increase of all districts at 4.3% (or 1,077 jobs). Across NI, employee jobs have decreased in both the public and private sector, with a large decrease in the construction sector (-11.7%) and service sector (-1.8%) (Ref.12). The construction sector has particularly suffered following the recession and crash in the housing market (Ref.13).

3.19 In terms of overall incomes in 2012, as shown in Table 3.5, the average weekly earnings for male employees in the three districts are higher than the national average, and only such for female employees in Newtownabbey is slightly lower than the national average.

Table 3.5: Weekly Earnings in 2012

<table>
<thead>
<tr>
<th>Type</th>
<th>Antrim</th>
<th>Belfast</th>
<th>Newtownabbey</th>
<th>Northern Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median gross weekly earnings male employees</td>
<td>426.9</td>
<td>480.3</td>
<td>422.1</td>
<td>420.5</td>
</tr>
<tr>
<td>Median gross weekly earnings female employees</td>
<td>345.5</td>
<td>359.4</td>
<td>269.8</td>
<td>298.6</td>
</tr>
</tbody>
</table>

Source: Department of Enterprise, Trade and Investment (Ref.14).
3.20 Statistics are also available for the percentage of households in relative poverty, which is the proportion whose income is below 60% of the UK median household income. In 2011/12 there were 379,000 people in relative poverty, and 422,000 people in absolute poverty in NI, both before housing costs (BHC). This equates to 21% of the population in relative poverty and 24% in absolute poverty (BHC) (Ref.15).

**Deprivation**

3.21 Socio-economic circumstance is a key determinant of health, influencing a range of factors important to health and wellbeing (i.e. lifestyle, risk taking behaviour, access to health care and social, mental and physical health support etc).

3.22 The 2010 NI Multiple Deprivation Measure (NIMDM) produced by NISRA provides a measure of deprivation across seven weighted domains. These are income deprivation (25%), employment deprivation (25%), health deprivation and disability (15%), education skills and training deprivation (15%), proximity to services (10%), living environment (5%) and crime and disorder (5%).

3.23 The NIMDM provides a rank of the 890 Super Output Areas (SOA) in NI with each area representing approximately 2000 people, in which a rank of 1 indicates the most deprived area and 890 indicates the least (Ref.16). The proposed site is located in Clady, which ranked 695 out of 890 (78% least deprived area in NI), indicating a relatively low spatial sensitivity.

**Health**

**Life Expectancy**

3.24 Life expectancy at birth in the UK including NI is 78.2 years for males and 82.3 years for females. The districts of Antrim (78.1 for males, 81.2 for females) and Newtownabbey (78 for males, 81.9 for females) are close to the national average, whereas Belfast (73.9 for males, 79.8 for females) falls further below the national average. The gap between life expectancy in the UK and Belfast has widened since 2001, most notably for males, having increased from a gap of 2.4 years in 2001 to 4.3 years in 2010 (Ref.17, 18).

3.25 The major causes of death in Antrim, Belfast, Newtownabbey and Northern Ireland are shown in Figure 3.3; this indicates a high rate of mortality attributable to malignant neoplasms (cancer), circulatory disease and respiratory disease.
3.26 However, an analysis of mortality patterns in NI also demonstrates significant variation and an
inequality in all-cause mortality, where social deprivation has a significant effect on mortality and
life expectancy (Ref.20).

Cancer Prevalence

3.27 The number of diagnosed cancer cases across NI increased during the period 1993 – 2003. The
mortality rate also increased, but not at the same rate, indicating an improvement in diagnosis
and/or treatment. Cancer is more common in males than females, with 14% more cases and 40%
more deaths for males. The prevalence of lung cancer has, however, decreased amongst males
while remaining stable for females. The largest change for females has been in relation to an
increase in breast cancer cases (Ref.21).

3.28 Standardised incidence ratios (SIR) are available at the local district level to provide a measure
for cancer incidence in one group compared with another. A SIR of 100 implies that the incidence
rate is the same across all groups (comparable with the national average for NI). A number
greater than 100 implies a higher risk and a number lower than 100 implies that the risk is lower
than the national average.

3.29 Table 3.6 presents the SIR for all cancers and cancers by type across local district governments
including Antrim, Newtownabbey and Belfast during the period of 2006 - 2010. Antrim and
Newtownabbey have an incidence ratio for all cancer types combined that is lower than what
would be expected within this population. In contrast, Belfast has an incidence ratio for all cancer
types that is higher than to be expected.
<table>
<thead>
<tr>
<th>Local Government District</th>
<th>All Cancers Combined</th>
<th>Oesophageal Cancer</th>
<th>Stomach</th>
<th>Colorectal</th>
<th>Pancreatic</th>
<th>Lung</th>
<th>Melanoma</th>
<th>Non-melanoma</th>
<th>Kidney</th>
<th>Bladder</th>
<th>Brain</th>
<th>Non-Hodgkin’s Lymphoma</th>
<th>Leukaemia</th>
<th>Head and Neck</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antrim</td>
<td>98.4</td>
<td>73.3</td>
<td>71.4</td>
<td>100.6</td>
<td>108.3</td>
<td>105.2</td>
<td>114.9</td>
<td>94.1</td>
<td>122.7</td>
<td>91</td>
<td>126.3</td>
<td>113.9</td>
<td>97.1</td>
<td>90.4</td>
</tr>
<tr>
<td>Ards</td>
<td>91.4</td>
<td>105</td>
<td>64.6</td>
<td>97.1</td>
<td>71.1</td>
<td>87.8</td>
<td>108.1</td>
<td>82.5</td>
<td>87.8</td>
<td>107.3</td>
<td>101.6</td>
<td>98.5</td>
<td>91.3</td>
<td>88.9</td>
</tr>
<tr>
<td>Armagh</td>
<td>101.1</td>
<td>132.6</td>
<td>71.9</td>
<td>99.6</td>
<td>101.5</td>
<td>76.0</td>
<td>126.5</td>
<td>95.5</td>
<td>103.3</td>
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<td>87.8</td>
<td>126.8</td>
<td>99.0</td>
<td>95.7</td>
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<tr>
<td>Ballymena</td>
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<td>94.0</td>
<td>70.9</td>
<td>91.5</td>
<td>56.7</td>
<td>68.1</td>
<td>95.6</td>
<td>96.8</td>
<td>74.7</td>
<td>103.2</td>
<td>104.6</td>
<td>94.4</td>
<td>96.8</td>
<td>91.4</td>
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<td>73.1</td>
<td>99.5</td>
<td>78.6</td>
<td>90.4</td>
<td>61.8</td>
<td>117.3</td>
<td>70.7</td>
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<td>Banbridge</td>
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<td>77.5</td>
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<td>115.7</td>
<td>105.7</td>
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<td>102.7</td>
<td>98.0</td>
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<td>106.6</td>
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<td>94.5</td>
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<td>86.5</td>
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<td>94.8</td>
<td>80.8</td>
<td>93.1</td>
<td>124.1</td>
<td>69.7</td>
<td>97.8</td>
<td>106.8</td>
<td>108</td>
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<td>109.2</td>
<td>95.5</td>
<td>70.6</td>
<td>90</td>
</tr>
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<td>Cookstown</td>
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<td>77.8</td>
<td>83.1</td>
<td>97.3</td>
<td>108.4</td>
<td>88.7</td>
<td>97.2</td>
<td>104.9</td>
<td>86.9</td>
<td>71.0</td>
<td>78.7</td>
<td>116.8</td>
<td>59.2</td>
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<td>Derry</td>
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<td>109.4</td>
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<td>94.8</td>
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<td>120.5</td>
</tr>
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<td>Down</td>
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<td>96.8</td>
<td>114.8</td>
<td>84.7</td>
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<td>116.4</td>
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<td>Stomach</td>
<td>Colorectal</td>
<td>Pancreatic</td>
<td>Lung</td>
<td>Melanoma</td>
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<td>Bladder</td>
<td>Brain</td>
<td>Non-Hodgkin's Lymphoma</td>
<td>Leukaemia</td>
<td>Head and Neck</td>
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<td>110.4</td>
<td>97.1</td>
<td>86.9</td>
</tr>
</tbody>
</table>

Source: NISRA (Ref.22).
Respiratory and Circulatory Disease

3.30 Table 3.7 provides an overview of hospital admissions for respiratory and circulatory disease in Antrim, Belfast and Newtownabbey. Compared with the average in NI, Antrim and Newtownabbey have a lower rate of hospital admissions for each disease type; and Belfast has a greater rate.

Table 3.7: Circulatory and Respiratory Disease Hospital Admission per 100,000

<table>
<thead>
<tr>
<th>Hospital Admissions per 100,000 (2009/2010)</th>
<th>Antrim</th>
<th>Belfast</th>
<th>Newtownabbey</th>
<th>Northern Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>All respiratory diseases</td>
<td>2844</td>
<td>3490</td>
<td>2482</td>
<td>2850</td>
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<tr>
<td>All circulatory diseases</td>
<td>4099</td>
<td>5165</td>
<td>4069</td>
<td>4466</td>
</tr>
<tr>
<td>Asthma and diabetes</td>
<td>791</td>
<td>1146</td>
<td>769</td>
<td>869</td>
</tr>
<tr>
<td>Coronary artery bypass graft (CABG) or angioplasty</td>
<td>133</td>
<td>177</td>
<td>152</td>
<td>171</td>
</tr>
</tbody>
</table>

Source: The Health Well (Ref.23).

3.31 In 2002, over half (52%) of respiratory deaths were due to primary infection, of which 93% occurred in the elderly. Respiratory disease is most prevalent amongst older people and as the population continues to age, it is predicted that there will be an associated increase in the incidence of respiratory disease (Ref.24).

3.32 Figure 3.4 shows age standardised mortality rates per 100,000 people for respiratory and circulatory disease during 2006–2010 in Antrim, Belfast and Newtownabbey. Each district has a greater age standardised mortality rate for respiratory disease than NI. The pattern is similar for circulatory disease, with the exception of Antrim (marginally lower than the NI rate).

Figure 3.4: All Age Standardised Mortality Rate for Respiratory and Circulatory Disease (2006 - 2010)

Source: NISRA (Ref.25, 26)
3.33 Although the years for which hospital admissions data is provided are different to those for the age standardised death rate, the data indicate that Newtownabbey has a rate of hospital admissions for both respiratory disease and circulatory disease that is below the national average, but a death rate that exceeds the national average, highlighting a discrepancy between access to and uptake of healthcare against health outcomes (i.e. lower detection and intervention, leading to higher mortality).

**Lifestyle**

3.34 Lifestyle can have a wider ranging influence on overall health and well-being. This includes elements such as diet and the level of physical activity a person undertakes, but also covers risk-taking behaviour, alcohol consumption and smoking, which are directly correlated with a range of adverse health outcomes. The following section considers each of these parameters.

**Alcohol**

3.35 Alcohol is a contributory factor in a number of illnesses. Information on diagnosis collected for inpatients provides a measure of alcohol-related hospital admissions across NI. During the last ten years, the number of admissions to hospital with an alcohol-related diagnosis increased by 31.1% from 9,375 admissions in 2001/02 to 12,291 in 2010/11 (Ref.27). Alcohol also contributes to individual mortality and morbidity. Similar to hospital admission rates, alcohol-related deaths across NI also increased from 206 in 2001 to 252 in 2011 (Ref.28). As show in Figure 3.5, the same rate in Belfast and Newtownabbey decreased, and Antrim increased from 2001 to 2011.

**Figure 3.5: Alcohol Related Death (2001-2011)**

![Graph showing alcohol-related deaths in Northern Ireland, Antrim, Belfast, and Newtownabbey from 2001 to 2011](image)

Source: NISRA (Ref.28).
Smoking

3.36 Smoking is the single greatest cause of preventable illness and premature death. It is estimated that tobacco smoking is responsible for more than a quarter of cancer deaths in the UK (Ref.29), with approximately 2,700 to 3,000 deaths each year from tobacco use in NI (Ref.30). During 2009 to 2010, the percentages of smoke in Antrim, Belfast, Newtownabbey and NI were the same at 24% (Ref.31).

Drugs

3.37 The 2006/07 drug prevalence survey of households in Ireland and NI reported that 28% of respondents aged 15-64 years reported taking illegal drugs at some point in their life. Illegal drug use is generally more common among men, with 34% of men reporting use in their lifetime compared with 22% of women. The highest rate of use was found in the 25-34 years (42%) age bracket followed by the 15-24 year age group (38%) (Ref.27).

Exercise and Obesity

3.38 Being overweight or obese increases the risk of a range of adverse health outcomes including cardiovascular disease, diabetes, and hypertension. The number of people classed as obese is increasing across the UK. The health and wellbeing survey 2005/06 included a measure of adult obesity for each Health and Social Services Board (HSSB) in NI. In 2005, 35% of adults were classified as overweight and a further 24% as obese in NI. The figure is slightly lower than that in the Northern HSSB that includes Antrim and Newtownabbey, where 36.6% of adults were classified as overweight and 25.7% as obese; but higher than that in the Eastern HSSB that includes Belfast, where 32% were overweight and 21.2% were obese (Ref.32).

3.39 In 2007, a similar pattern would be seen for childhood obesity. 15.7% of children were overweight and 5.1% were obese in NI; 17.2% of children were overweight and 5.3% were obese in the Northern HSSB; and 13.7% of children were classified as overweight and a further 4.6% as obese in the Eastern HSSB (Ref.33).

3.40 During 2005 to 2006, 23% of people were physically inactive in NI. Such percentage was higher than that in Antrim (20%), Newtownabbey (20%) and Belfast (22%) (Ref.34).

Community Profile Summary

3.41 The proposed site is located in the Clady ward of Antrim Borough Council, an area that is generally sparsely populated, albeit with a growing community located at the edge of urban Newtownabbey at the meeting point of the junction of Boghill road and Hydepark Road.

3.42 Overall, local rural communities typically exhibit better health than the national trend, with pockets of health deprivation closer to and within urban areas (closely associated with socio-economic deprivation, lifestyle and poor health behaviour).

3.43 Educational attainment within the districts of Antrim, Newtownabbey and Belfast is above the NI average; these areas also have a higher percentage of low-skilled workers and show a higher
percentage of Job Seekers Allowance claims. Although the average weekly earnings in Antrim, Belfast and Newtownabbey in 2012 are higher than the national average, Clady, where the proposed site locates, has lower levels of socio-economic deprivation.

3.44 Life expectancy is comparable between Antrim, Newtownabbey and NI, but is lower in Belfast. Similarly, the Standardised Incidence Ratios for all cancer types is better than the NI average in Antrim and Newtownabbey, but Belfast has a higher incidence of cancer than the national average.

3.45 Local communities are not considered particularly sensitive to environmental health pathways, while data suggest that communities would benefit from any activity that reduces or removes existing socio-economic inequalities, provides employment opportunities and encourages improvements in lifestyle choices (diet, physical activity and reductions in smoking and alcohol consumption).

3.46 On this basis, the assessment section will apply a conservative approach to address concerns of new communities that as yet may not be fully captured by national statistics and Ordnance Survey data. Equally, the Health Action Plan will investigate opportunities to support community health through targeted training, employment and lifestyle initiatives.
4 Stakeholder Engagement

Overview

4.1 An essential component of gathering an appropriate evidence base and tailoring the HIA to local circumstance is seeking the views of stakeholders and representatives of communities likely to be affected by the proposed project. The following section provides an overview of the key stages of engagement and the core health issues raised during each stage.

4.2 For a full account of the integrated engagement strategy and its outputs, please refer to the Statement of Community Consultation which forms a separate document as part of the wider planning application submission.

HIA Scoping Exercise

4.2 In keeping with best practice, a draft HIA Scoping Statement was developed and issued in January 2013 to the Chief Executive of the Northern Health and Social Care Trust (NHSCT) and the Director of Public Health at the Public Health Agency (PHA) to aid discussion regarding the key health pathways to be assessed and to tailor them to local community and key health stakeholder concerns. A copy of the scoping document is provided in Appendix A.

4.3 Feedback indicated that the aim, objectives, scope and focus of the HIA were appropriately set and did not require supplementation. The key recommendation was to expand discussion of the HIA scope with the appropriate Environmental Health Officers (EHO).

4.4 The subsequent scoping exercise with the Antrim, Belfast and Newtownabbey EHO’s took place on the 5th February, 2013. Feedback again indicated that that the aim, objectives, scope and focus of the HIA were welcomed, appropriately set and did not require supplementation.

Consultation Programme

4.5 The formal pre-application public consultation programme provided stakeholders, local residents and businesses with advanced information about the proposed project and allowed for discussion with members of the development team to help refine the application and associated environmental assessment, to define necessary community feedback and inform wider community support initiatives.

4.6 This included:

- A review of previous waste management consultation programmes: The use of MBT and EfW as part of an integrated solution to waste has been the subject of public consultation on four occasions over the last nine years through the NI Waste Strategy 1999 & 2001 and arc21’s Waste Management Plan in 2002 and 2006.
Pre-Application Discussions (PAD) have taken place with a wide spectrum of statutory and non-statutory consultees as part of the initial information gathering exercise for the ES and the HIA.

A highly collaborative PAD consultation of the draft ES and related application documentation for statutory consultee review and formal feedback has taken place in parallel with an extensive public consultation strategy, which has included:

- local and national media campaign to underpin the proposed project and to cover energy / waste / climate change issues;
- circulation of a project information brochure to some 28,000 people within a two mile radius of the site to introduce the project, provide information on the technologies and explain the status of the project and desire to engage and get local feedback prior to submission of a planning application;
- briefing meetings and presentations to Councils, councillors, party groups on Council, and community interest groups (including health and HIA themes);
- individual political briefings;
- a series of initial and then extended public exhibitions to further accommodate local participation and enable a clear understanding of the proposed development;
- working with established community and liaison groups;
- press releases and press adverts;
- a dedicated website / email address / free phone telephone number with all related PAD documentation uploaded for review and feedback, a first for a major development project in NI; and
- a 'Frequently Asked Questions' document.

4.7 The HIA team was fully integrated within the engagement and consultation process, reviewing all website, leaflet and telephone consultation information and attending all of the public exhibitions (including the extended exhibitions). The HIA team further provided iterative support to the engagement team to address and respond to local community concerns during the course of the project, and provided a health themed workshop at the request of a local community group, to discuss and address perceived health risks.

4.8 The HIA team’s integration within the engagement process has been comprehensive and responsive to local requirements. Outputs of the engagement process have subsequently been applied to test (and where appropriate refine) the HIA scope and focus, thereby meeting the PHA scoping recommendation that the HIA specifically address local concerns and perceptions.

4.9 Key changes to the scope and focus of the HIA as a consequence of engagement has included:

- an electromagnetic field assessment, to address perceived risks and allay concerns from the proposed underground grid connection;
refinement of the air quality exposure response assessment to:
  o clearly demonstrate how all communities (including new developments that may not be fully accounted for in national demographic and health statistics) are considered through a conservative assessment;
  o include an assessment of abnormal operations; and
  o inclusion of a nanoparticle section;
  
the investigation of impacts upon property value and sales from similar developments due to proximity to such facilities;

the addition of a risk perception section, to summarise health concerns raised on other waste management projects and to help allay perceived risks and concerns; and

expansion of the Waste Management Health Evidence (Appendix B) to include a list of authoritative information to further inform and address community perceptions and concerns.

4.10 Equally, engagement outputs have also informed the Health Action Plan, where a number of participants expressed the need for more information and support through potential training, employment and procurement initiatives, further reassurance on the mitigation proposed, transport routes to be applied and the cleanliness of the site and surrounding area (including odour management).
5 Assessment

Overview

5.1 The following assessment investigates each of the previously identified potential health pathways associated with the construction and operation of the proposed development, including:

- the potential health risk from changes in emissions to air (including odour);
- the potential for community disruption from noise and vibration;
- the potential health risk from additional road movements (risk of accidents and injury);
- the potential impact on house value and sales;
- the potential socio-economic health benefits from direct, indirect and induced income and employment opportunities;
- the potential health risk from changes in electromagnetic field exposure from underground cables;
- risk perception; and
- general accidents and safety.

5.2 A further community concern has been raised during consultation regarding potential nuisance effects from flies or litter from vehicles making waste deliveries. In keeping with current practice, waste deliveries will be made by enclosed vehicles to an enclosed reception hall, operated to maintain hygiene on the site and manage vermin. Comparable facilities throughout Europe demonstrate the effectiveness of such design and operation, with no risk of adverse health outcome to local communities.

Emissions to Air

5.3 A health pathway associated with the proposed project is the generation of emissions to air and consequent community exposure.

5.4 Research into the potential health effects of air pollution is extensive and provides statistically significant associations between many air pollutants (i.e. particulate matter, nitrogen dioxide and sulphur dioxide) and effects on a wide range of cardiovascular and respiratory health outcomes. The following section applies the current scientific evidence base to quantify the potential health outcome from emissions relating to the proposed project.

Construction

5.5 During the construction phase, the key influence on air quality is expected to arise from construction vehicles and activities that create nuisance dust. This includes ground clearance and excavation, deliveries of construction materials and landscaping activities.
5.6 However, construction-related emissions from the existing quarry site will not materially differ to permitted quarrying operations at the site, nor are they of a type, concentration or level of exposure to result in any measurable adverse health outcome. The mitigation measures detailed in the air quality assessment and Construction Management (CMP, ES Appendix 3.1) are sufficient to control potential nuisance dust and any respiratory risk to staff or neighbouring communities.

**Operation – Stack Emissions**

5.7 An air quality impact assessment has been undertaken as part of the EIA. Two separate atmospheric dispersion models (AERMOD and ADMS 5) have been used to estimate process contributions (PCs) from the operational EfW facility, based on the worst-case scenario of the facility treating its maximum annual waste throughput and releasing air pollutant emissions at the maximum permitted concentration under the Industrial Emissions Directive (IED)\(^1\). PCs have also been estimated for the MBT facility, based on the expected achievable air pollutant emissions concentrations, and continuous operation at maximum throughput.

5.8 Actual emissions from the EfW facility are likely to be considerably lower than the emission limits set out in the IED. Therefore, the results of the assessment are conservative and likely to overestimate the actual contributions that would arise from the proposed EfW facility.

5.9 The air quality chapter of the ES shows the existing background air pollution concentrations, and how these would change with the addition of the PC from the EfW facility at nearby sensitive receptors such as dwellings, and at a grid of receptors that covers a 10 km radius area / 16 km by 16 km area. It concludes that air quality standards set to protect health would not be breached at any of the receptors, and that the worst-case change in air pollutant exposure would be characterised as a slight deterioration upon air quality.

5.10 It likewise concludes that air pollutant emissions with the PC from the MBT facility would not breach air quality standards to protect health, and that the worst-case change in air pollutant exposure would again be characterised as minor. The air quality assessment suggests that as the MBT facility emissions would affect only a small area, localised to the facility, the cumulative impacts of air pollutant emissions from both the MBT and EfW facilities would not be greater at the identified nearby sensitive receptors than the greatest PC from each facility individually.

5.11 The following sections provide further and bespoke analysis to quantify potential for local health effects. Their focus is on emissions from the EfW facility, as the air quality assessment has shown that the MBT facility emissions would affect only a small, localised area, and its PC at nearby sensitive receptors would not be greater than that from the EfW facility. The key pollutants for further health assessment through exposure response in this case are considered to be nitrogen dioxide (NO\(_2\)) and fine particulate matter (PM\(_{10}\)).

\(^1\) Directive 2010/75/EU on industrial emissions (integrated pollution prevention and control) (recast)
5.12 A detailed consideration of the health pathways and exposure response for the other pollutants that would be emitted from the proposed development (such as metals, dioxins and furans, and volatile organic compounds) is addressed through the human health risk assessment (HHRA), that by regulatory requirement accompanies the ES and permit application to the Environment Agency. For further information, please refer to the full HHRA in Appendix 14.9 of the ES.

PM$_{10}$ and PM$_{2.5}$

5.13 As a worst-case assessment of possible adverse health impacts, a hypothetical situation has been considered, in which the entire population of Antrim, Belfast and Newtownabbey (419,529 people) were to live at the residential receptor / receptor grid point that would experience the greatest increase in annual average PM$_{2.5}$ exposure.

5.14 The Committee on the Medical Effects of Air Pollutants (COMEAP), reviewing epidemiological data regarding air pollutant exposure and health, has suggested (Ref.35) as a best estimate that there is a 6% increase in relative risk of mortality (all causes) associated with long-term exposure to a 10 µg.m$^3$ increase in ambient PM$_{2.5}$ concentration, and that this scales linearly in the exposure range 7 µg.m$^3$ to 30 µg.m$^3$.

5.15 In earlier work, COMEAP concluded that the evidence is not sufficient to confidently quantify an increase in disease or mortality risk due to NO$_2$ exposure, and that a smaller increase in risk of respiratory and cardiovascular disease hospital admissions is associated with PM$_{10}$.

5.16 For the prediction of PM$_{2.5}$ exposure, a conservative approach has been taken, where the entire PM$_{10}$ fraction is assumed to be PM$_{2.5}$, making this a worst-case assessment of mortality impacts.

5.17 The site location lies close to the vertex of the Antrim, Belfast and Newtownabbey local government districts, and the population from all three districts has been used in the hypothetical exposure response assessment. The districts had age-standardised all-cause mortality rates per 100,000 people of 861, 955 and 791 respectively in the period 2004-2008 (Ref.36). Applied to their populations in 2011 (53,428, 280,962 and 85,139 respectively (Ref.37), this would equate to a mortality rate of 3,815 deaths per year $^2$ within the population as of the 2011 census.

5.18 The increase in PM concentration predicted at the most-affected residential receptor is 0.026 µg.m$^3$. Under the hypothetical assumptions outlined above, this would lead to a 0.02% increase in mortality, equating to an additional 0.6 deaths brought forward per year $^3$.

5.19 This indicates that even in a hypothetical, worst-case assessment, where the facility is operating at the maximum permitted concentration under the Industrial Emissions Directive, that all PM$_{10}$ is assumed to be PM$_{2.5}$ (applying the higher risk ratio) and that the entire population of Antrim, the entire population of Belfast and Newtownabbey reside in the same household subject to the

\[ (861.21 / 100,000 \times 53,428) + (954.63 / 100,000 \times 280,962) + (790.62 / 100,000 \times 85,139) \]

\[ (1 + (0.06 / 10 \times 0.026)) \times 3,815.39 – 3,815.39 \]
highest process contribution for a year, the relative change in air quality is still not sufficient to quantify any measurable annual change in health outcome.

5.20 The maximum contribution to long-term particulate matter exposure from the proposed facility will be extremely minor compared to the existing variations in background air quality that people living in different locations already experience. For example, the average long-term urban background PM$_{2.5}$ concentration in Belfast is around 4.6 $\mu$g.m$^{-3}$ greater than background PM$_{2.5}$ in the area of Hightown Quarry. This existing variability in air quality is around 177 times greater than the 0.026 $\mu$g.m$^{-3}$ maximum contribution to PM$_{2.5}$ exposure from the proposed facility, even assuming as a worse-case that all PM emitted from the EfW facility is PM$_{2.5}$.

5.21 This reinforces the current evidence base that demonstrates that the proposed facilities are not a significant source of PM, present a slight deterioration in air quality (as detailed in the ES) and no measurable risk to health.

**Nanoparticles**

5.22 There is no universally accepted international definition of a nanoparticle. However, the term nanoparticle generally refers to particles with a mean aerodynamic diameter of 100 nanometres, equal to 0.1 microns, or less. Nanoparticles are a subset of PM$_{2.5}$ and PM$_{10}$. The largest source of nanoparticle emissions in the UK is diesel road transport, at around 44.3% of the total. The ‘other fuels’ subdivision in the electricity sector (of which energy from waste facilities form a part) contributes around 6.4% to the total (Ref.38).

5.23 The approach to quantifying potential risk from changes in exposure to nanoparticles is addressed through the PM$_{2.5}$ exposure response assessment. Although the COMEAP review of toxicological and epidemiological research underpinning the risk ratio used did not seek to establish the specific risk ratio for nanoparticles, the potential health risk is applied within the broader PM$_{2.5}$ exposure response risk ratio.

5.24 Given the conservative assumptions applied in the air quality modelling within the ES, the change in emission concentration attributed to the proposed development is not estimated to be of a level to quantify any meaningful change in health due to changes in PM exposure, including the nanoparticle fraction.

5.25 On this basis, and in keeping with the current scientific evidence base, the proposed facility will comply with all air quality standards set to protect health. Even when applying a highly hypothetical worst case scenario, emissions are not of a level to quantify any measurable change in health.

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4 Belfast AURN air quality monitoring, 2009-2012, reported in the air quality chapter, and Defra local air quality estimation maps for 2009-2012 at the 1km by 1 km grid square in which the proposed development will be located.
**Dioxin, furans, PAHs and heavy metals**

5.26 There are no statutory or non-statutory limits for concentrations of dioxins and furans in ambient air; and air concentrations of dioxins and furans are recognised as an insignificant route of exposure via the respiratory route for humans to these substances. However, the IED does make provision for a limit on dioxins and furans in the stack emissions, setting a maximum concentration of 0.1 µg.m$^3$ (one-tenth of a millionth of a gram per cubic metre of air).

5.27 The polycyclic aromatic hydrocarbon (PAH) benzo(a)pyrene is also included in the HHRA, as a marker of carcinogenic risk from the sixteen potential PAHs emitted. Emissions are based on the conservative assumption of 2.5 times the maximum recorded level from 13 samples at EfW facilities in the UK from 2009-2011.

5.28 The HHRA also assesses emissions of the heavy metals antimony, arsenic, cadmium, chromium, mercury, lead, nickel and thallium, at the emissions limit rate given in the IED.

5.29 Five potential pathways for these pollutants to be taken into the body are considered in the HHRA: direct inhalation from concentrations in ambient air; ingestion of soil (e.g. by infants); ingestion of drinking water from surface water bodies; ingestion of a range of home-grown vegetables or meat; and ingestion of fish caught in local surface water bodies. This is based on the fact that emissions from the EfW will not only influence ambient air concentrations of the pollutants of concern, but also through deposition of these pollutants, can transfer them into soils and surface water.

5.30 Skin contact with soil and water are not considered as pathways in the HHRA on the basis that they are unlikely to be significant contributors to risk; ingestion of drinking water from groundwater sources is not included on the basis that there is no evidence in the area of Hightown Quarry (i.e. of groundwater abstraction for drinking water) to support including this pathway.

5.31 Exposure via these pathways is assessed in the HHRA for both adults and children, as it is recognised that children can be more vulnerable to some health impacts from environmental pollutants. Throughout the HHRA, conservative scenarios for pollutant exposure are used, that will over, rather than under-estimate risk.

5.32 Taking these data together, the HHRA concludes that the total lifetime cancer risk due to emissions from the proposed facility would be well below an annual risk rate of 1 in 100,000 at any of the residential receptor locations or at the point of maximum predicted air concentration or watershed deposition. The 1 in 100,000 criterion is a level considered to represent ‘minimal risk’. For non-cancer health risks, the HHRA concludes that the hazard index at these locations would be below 1.0. The hazard index is relative to a standard exposure level estimated to pose no appreciable likelihood of adverse health impacts, so an index of below 1 indicates that the hazard is below this no-appreciable-impact level.

5.33 Daily intake of dioxins and furans is also assessed in the HHRA (including via the additional pathway of infant ingestion of breast milk from an exposed adult) against guidelines set by the
WHO and by the former UK Environment Agency for a tolerable daily intake (TDI) to protect health; in all locations assessed, the estimated daily intake is below both TDIs.

5.34 Finally, the HHRA assesses the potential impact from dioxin emissions during abnormal operation of the proposed facility, concluding that abnormal operation would not lead to a daily dioxin intake for persons exposed at the most-affected location that would pose a risk to health.

**Air pollutant emissions summary**

5.35 It is understood that local community groups have expressed concern regarding the impact on air quality from the proposed project. On the basis of the assessments above, it is concluded that there is no risk of a significantly adverse air quality impact from the proposed development, and that emissions to air will not constitute a significant risk to health during construction or operation.

**Odour**

5.36 The potential impact of odours on health is largely psychosomatic, where the perception of odour may result in psychological health outcomes such as increased annoyance, anxiety and changes in social behaviour. Aside from possible health impacts from these psychological effects, odour is not normally associated with physical health effects.

5.37 Waste processing within the MBT facility will be kept under slight negative pressure and the exhaust air will be circulated to wet scrubbers and passed through a biofilter to reduce odour emissions to an acceptable level which the operator will be bound by through the environmental permitting regime regulated by NIEA IPRI. Similarly, the EfW facility RDF handling areas will also be kept under slight negative pressure with the air drawn from these areas supplied to the furnace so that any odorous compounds are combusted and destroyed.

5.38 Further to this, the operator will work in accordance with an Odour Management Plan (OMP) that details how the operator will assess and manage the risk of odour. On the above basis, and as evidenced at existing facilities, odour emissions are unlikely to present a significant risk of community annoyance, nor give rise to physical or psychological effects on the local population.

**Abnormal operations**

5.39 Abnormal operation typically includes incidents such as technically unavoidable stoppages, disturbances or failures of the pollution control equipment or monitoring equipment. A range of potential scenarios for abnormal operation have been assessed in the air quality impact assessment. It concludes that none of the potential scenarios would lead to pollutant exposure that would breach the standards set to protect health. Abnormal operations will be avoided under good management practices for the proposed facility, and the duration of any periods of abnormal operations is limited by the IED.

5.40 During the consultation stage, concern was expressed regarding the potential risk from catastrophic failure or arson at the facility. In such an unlikely situation, the proposed facility includes a fire suppressant system with onsite water storage. Given the nature of the building and municipal waste, the potential risk to neighbouring communities from fire and fumes is low,
comparable to a house fire (in terms of materials). Given the location of the proposed facility, together with its design and fire suppression system, any fire would be contained and unlikely to present a risk to neighbouring communities.

**Operation – Road Traffic Emissions**

5.41 The key atmospheric emissions associated with road traffic are nitrogen oxides (NOₓ) and particulate matter. An assessment of the potential changes in local air quality associated with changes in traffic flow characteristics is typically undertaken only where annual average daily traffic (AADT) movements exceed 1,000 or there are more than 200 AADT movements for heavy duty vehicles, as impacts are unlikely to be significant where traffic generated is below these levels. The traffic flows associated with the proposed project will not exceed the above criteria, and as such have not been assessed in the air quality impact assessment. In qualitative terms the increase in traffic movements will have a marginal impact on local air quality, and would not be not of a level to quantify any change in local health outcome.

**Emissions to Air: Summary**

5.42 On the above basis, it is concluded that the proposed development does not constitute a significant risk to health from emissions to atmosphere during construction or operation. This conclusion is consistent with the current evidence base on the potential health effects from modern Energy from Waste facilities (summarised in Appendix B), and is consistent with the UK Health Protection Agency position and guidance on Municipal Waste Incineration (Ref.39).

‘The Health Protection Agency has reviewed research undertaken to examine the suggested links between emissions from municipal waste incinerators and effects on health. While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable.

This view is based on detailed assessments of the effects of air pollutants on health and on the fact that modern and well managed municipal waste incinerators make only a very small contribution to the local concentration of air pollutants.

The Committee on Carcinogenicity of Chemicals in Food, Consumer Products and the Environment has reviewed recent data and has concluded that there is no need to change its previous advice, namely that any potential risk of cancer due to residency near to municipal waste incinerators is exceedingly low and probably not measurable by the most modern techniques. Since any possible health effects are likely to be very small, if detectable, studies of public health around modern, well managed municipal waste incinerators are not recommended.’

5.43 The findings of the assessment concurs with the previous and latest Health Protection Agency’s position paper, which indicates that modern, well managed energy from waste facilities present a negligible contribution to ambient air quality and no measurable impact upon health.
Noise and Vibration

5.44 Consensus on the level and duration of noise required to instigate potential health impacts is not clearly defined. Therefore, the main emphasis of noise standards, regulations and guidance is placed on annoyance and sleep disturbance, as they are the most immediate consequences of noise effects and applicable to everyone.

Construction

5.45 As identified in the ES the sources of noise and vibration during construction include the movement of vehicles and equipment, site clearance and excavation, piling, deliveries of construction materials and landscaping activities. In general, noise from construction activities can have an impact on people at up to 100-200m from the site boundary. As the closest noise sensitive receptor (NSR) is located 385m from the site it is considered unlikely to experience an adverse impact during general construction works. However, a slight adverse noise impact at this property is predicted during slipforming construction works although this will be short term.

5.46 Deliveries of construction material would be periodic and would not significantly vary from the HGV flows associated with the existing quarry. The majority of construction activities will take place during the daytime with noise and vibration further minimised through best practice techniques. On this basis, it is not anticipated that noise from the construction of the proposed project would result in any measurable health outcome.

Operation

Facility noise

5.47 The ES outlines noise predictions for the nearest NSRs, once operational noise sources include the Air Cooled Condenser (ACC), cooling water, stack and roof exhausts. As the EfW facility will be operational continuously, the main area for consideration is night-time noise, which has the greater likelihood of creating a disturbance. The ES provides a quantitative assessment of the expected noise levels from the construction of the proposed project and during its operation. It concludes that during slip forming operations for the EfW bunker there is likely to be short term slight adverse impact on one property. The residual effects of the operational plant are assessed as being slightly adverse on the basis that it will be audible albeit at a low level at the nearest noise sensitive receptors. In terms of operational impact the assessment is considered to be of minor significance.

5.48 On this basis the proposed development will not present any measurable health effect from site noise during construction and operation.

Vehicle Noise

5.49 As detailed in the ES, operational noise associated with delivery HGVs attending the site will be lesser than that experienced from the active quarry (due to lighter levels of HGV movement than the peak periods of activity experienced at the quarry over the period 1999-2008 and the lighter load type with less vibration and noise), and has been assessed to have an insignificant degree
of change and negligible impact on the three most-affected properties along Boghill road, the main access point to the site. Nevertheless, mitigation in the form of low-noise road surfacing along this road link will be provided.

**Noise and Vibration: Summary**

5.50 Given the proposed site, design and proposed mitigation, construction and operational noise and vibration is not of a level to result in significant annoyance, result in sleep disturbance or result in any measurable adverse health outcome.

**Road Traffic**

5.51 Potential health pathways associated with changes in road traffic movements include increased risk of road traffic accident and injury, community severance and exposure to vehicle exhaust emissions and noise.

**Construction**

5.52 During construction, traffic movements will include cars and light good vehicles (LGVs) for construction workers as well as heavy goods vehicles (HGVs) to deliver construction materials and plant to the site. Due to the movement of materials and the nature of construction sites a potential impact exists for the spillage of materials and carrying of soil from the site onto the carriageways. A predicted impact will occur in terms of inconvenience and disturbance to adjacent landowners and people who use the Boghill Road as a consequence of the need to manage its construction. This will require alternative longer routes to be used and cause short term inconvenience, as explained in the Construction Management Plan (ES Appendix 3.1). The impact during the construction phase of the proposed development on transport is assessed as moderate. However it should be noted that this will be a short term impact.

5.53 Operating in accordance with the Construction Management Plan (CMP) and close liaison between the contractor and the local Road Service section officer, the traffic impact on the site or its general vicinity during the construction will be reduced to minimum.

**Operation**

5.54 During operation, the proposed development will generate additional 448 two-way vehicle trips a day, including 286 two-way operational trips (Heavy Goods Vehicles) and 162 two-way staff trips (cars or vans etc.)(Ref.40).

5.55 The majority of movements of vehicles in and out of the site will be undertaken outside of peak hours to avoid unnecessary delays and ensure efficiency in operations. The waste operation hours for the site will be between 07:00 and 18:00 during the weekdays and therefore waste operational vehicles will only enter and depart the site during this time. Waste deliveries will also occur on Saturday mornings although there will be no Sunday deliveries.
5.56 It is important to note that a proportion of vehicle movements will constitute redistribution rather than an increase in traffic, as waste vehicles are already on the local network travelling to Cottonmount landfill.

Road Capacity
5.57 As detailed in the ES, there is sufficient road capacity, where both off-site junctions demonstrated that they will operate well within capacity thresholds during both morning and evening peak periods in the opening year of the development (2018) and both design years (2028 and 2033). The assessment also considers the potential impact of the completion of the Hightown Link road which is expected to reduce traffic volumes along Hightown Road.

Road Safety
5.58 The major and most obvious hazard associated with road traffic is the potential increased risk of human injury as a result of collisions. The transport assessment in the ES contains personal injury and accident data for the Hydepark Road/Boghill Road, Hydepark Road/Upper Hightown Road, Mallusk Road/Hightown Road and Mallusk Road/Hydepark Link/Scullions Road.

5.59 The ES concludes that existing accident levels are minimal on the local highway network and the proposed facility is unlikely to materially influence this. However, additional measures have been proposed to improve road safety and further manage potential risk through a traffic management plan, training of staff and during the upgrading and widening of Boghill Road. This will deliver improvements to the visibility splays at the Boghill Road/ Hydepark Road junction and much enhanced forward visibility on Hydepark and Boghill Roads.

5.60 Following mitigation, the proposed development is not anticipated to present any meaningful increase in local risk from road traffic accidents or injury.

Severance
5.61 Operational traffic is not of an order, nature or along a route that would result in community severance.

Road Traffic Summary
5.62 Construction and operational traffic movements are not of a level to quantify any measurable impact upon health through changes in air quality or noise, and unlikely to result in community severance.

5.63 The potential risk from accident and injury is managed through road improvements, training and transport management planning. Following mitigation, the proposed development is not anticipated to present any meaningful increase in local risk from road traffic accidents or injury.
Socio-economic

Employment and Income

5.64 Employment and income are potentially the most significant determinants of long-term health, influencing a range of factors including the quality of housing, education, diet, lifestyle, coping skills, access to services and social networks. Consequently, poor economic circumstances can influence health throughout life, where communities subject to socio-economic deprivation are more likely to suffer from morbidity, injury, suffer from mental anxiety, depression and tend to suffer from higher rates of premature death than those less deprived (Ref. 41, 42, 43).

5.65 Projects with the potential for long-term, stable employment with opportunities for promotion and advancement through training and experience will contribute in improving health and wellbeing of socio-economically deprived communities.

5.66 It is important to note, however, that increasing employment and income opportunities alone will not maximise health benefits. Increased support, training and community involvement is required in order to link and develop skills to employment and reduce the risk of inequality.

Construction

5.67 Overall the duration of construction of all on-site facilities would be 41 months. As demonstrated through the socio-economic assessment a direct benefit arising from the construction phase is the direct creation of 455 jobs. As shown in the community profile the construction industry has experienced a dip in employment and as such is considered to have capacity to absorb the additional jobs created by the proposed project.

5.68 In addition to the direct jobs created during construction there are also economic benefits associated with indirect and induced employment. As detailed in the socio-economic assessment prepared by Oxford Economics (ES Appendix 16.1) the construction sector links with and generates a wide range of employment within the local economy. When factoring in direct and indirect jobs during construction this is estimated to generate £122.1 million in total wages and £215.1 million Gross Value Added (GVA) for the Northern Ireland economy.

5.69 While these construction phase benefits are presented at a Northern Ireland (NI) regional level, it is likely that the local areas of Antrim, Belfast and Newtownabbey will enjoy a sizeable proportion of the benefits. It is expected that 25% of the raw materials from the EfW and IBA facilities and 50% of the raw materials from the MBT facility will be sourced locally (for example concrete, steel (reinforced and structural) and metal cladding). As such it is reasonable to assume a notable proportion of the total benefits will be realised within the local areas.

5.70 The level of employment generated as a result of the construction phase will potentially create £58.0m of additional wages in the local economy. Using Oxford Economics’ estimates of sectoral productivity in each year between 2015 and 2018, the investment is expected to contribute an estimated £94.1m to regional GVA.
Operation

5.71 The site will employ 94 staff divided between the MBT facility (36 staff), EfW facility and IBA area (37 staff) and site services including administration, Visitor Centre and the weighbridge (21 staff). In total, and as detailed in the ES (Chapter 16 Population), the development will create or sustain 337 direct and indirect jobs during its operational phase, generating £7.7million in total wages annually and contributing £24.7million of GVA to the Northern Ireland economy.

5.72 The employment opportunities during operation would have a more local distribution then the direct construction employment opportunities. However the benefits associated with indirect and induced benefits would be spread across the region, particularly in Belfast as it is anticipated that the area will supply a number of items for on-going operation of the facility (diesel, chemicals and mobile plant leasing).

5.73 On the above basis it is concluded that the direct, indirect and induced economic impact of the proposed project presents an important contribution to both local and regional employment opportunities with subsequent beneficial health outcomes for those individuals.

Property Values

5.74 Housing is an often-underrated determinant of health. It not only provides shelter from the elements, but also acts as a socio-economic buffer that supports good physical, mental and social health. As such, a project that impacts upon the quality, availability and value of housing can have a subsequent impact on an individual’s health and wellbeing.

5.75 The value of property is constituted by the amenity characteristics of the property itself, the amenity of its surrounding environment, the willingness of buyers to pay for different amenity values, and the liquidity of the property market. If the proposed project were to have significantly adverse impacts on the local environment, this would have potential to directly reduce one aspect of property value. However, there is also potential for indirect impact due to perceived health risk or perceived risk of environmental impact, which could adversely affect a buyer’s perception of environmental amenity, and willingness to pay for it, even in the absence of actual detrimental impacts. Separating actual environmental disamenities from perceived risk of possible disamenities is important in considering potential effects on property value.

5.76 The property market within a given geographic area will have some wider or outside influences (such as the availability of credit within a national economic setting, supply and demand), but will be strongly influenced by its local context, at that time (i.e. the wide range of factors such as transport, employment, quality of environment and quality of housing stock that differ significantly over geographic areas). The environmental and health impacts of waste management facilities also differ and are influenced by their design and local context. Similarly, the perceived risk of impacts may also differ, due to factors such as the information available, past record in that area, and trust in the operator and regulators.

5.77 It is therefore unlikely to be very meaningful to treat evidence of an effect or lack of effect on property values from one context (for instance, a particular type of facility, or a facility in a country
5.78 Analysis of the effect that a development and disamenity resulting from it could have on property value is complex, particularly in discerning and attributing the effect of the development among other factors that influence property prices within the market. A simple before-and-after comparison of property sale prices or an aggregated property price trend over time is unlikely to effectively distinguish the effect of an EfW facility on property price, although it can potentially provide an indication of whether the trend in property values within a market has been significantly disturbed. More sophisticated approaches adopted in the research literature for identifying property price impacts from disamenity attempt to isolate and value effects through revealed preference (hedonic analysis) or stated preference (some form of contingent valuation).

5.79 Again, establishing a trend or observing co-variance of factors (such as distance from an EfW and property value) does not prove causality (perhaps the choice of EfW site reflected a low value location due to existing disamenities), although a time series in which other factors have been isolated can assist in that regard. It should also be noted that using average values or aggregated value trends across a market may mask disproportionate impacts on individual properties.

5.80 The timescale of a typical EfW development is lengthy, and divided into several stages (e.g. first proposal; detailed planning; construction; first operation; established operation), each of which could have different effects, if any, on property value. The property market itself will also take time to adjust – any effects may not be immediate, and effects may not last (the market may recover).

5.81 Although there is a wide literature regarding environmental disamenities (such as aircraft noise) and property value, only a small number of studies specific to EfW facilities or incinerators has been found.

5.82 Overall, insufficient evidence is available to make a definitive statement regarding the impact of EfW facility developments on property values in general. Insufficiency of evidence of any significant impact on property value, and the likelihood that any effects felt would be small, were also reportedly [44] the conclusions of the planning inspectors and Secretary of State in examining proposed EfW developments at Portsmouth (2001) and Ridham Docks (2002), both in England.

5.83 There is some evidence that in the US, waste management sites including hazardous landfills can adversely impact individual property prices. A summary of research funded by the US Environmental Protection Agency is given in [45]. In one US study specific to an incinerator facility, the degree of impact was found to vary over time but not to be apparent before construction [46]. However, these studies are from the 1970s through to 1990s and their findings reflect a different property market, culture, facility type, and regulatory environment to that of the
proposed project, all of which would affect the perceived and actual disamenity from the facilities and how this would translate into property value.

5.84 There is some evidence [47] [48] that EfW facilities in a more comparable context (England, within the last decade) do not decrease aggregate property values in the area around them. Average property prices in the area around the Chineham, Marchwood, Portsmouth and Newhaven EfW facilities have been shown to continue to rise following the facilities’ construction, in some cases by more than the regional average. A study of property prices in Dublin [49] [50] likewise found that there was no impact on prices or saleability of residential properties in the vicinity of a proposed EfW facility (Poolbeg). After visiting and soliciting opinions regarding a number of EfW’s co-existing with residential communities around Europe, the authors of that study further concluded that they had found no evidence that well-managed facilities have had an impact on property values, desirability or sales.

5.85 One interpretation [51] of property value data near a number of EfW facilities in England and Scotland has suggested some impact on house prices, but variability in the data led the authors to conclude that they could only be confident that the impact was adverse within a narrow distance band (0.4 km to 1.6 km). If the EfW facilities caused an adverse impact on property prices, one would expect (and studies of environmental disamenity impacts typically find) that the adverse impact would correlate with distance, and for the adverse impacts to be apparent close to the facility location.

5.86 In the England studies discussed, analysis is based on aggregated prices, and may not reflect possible disproportional impacts on individual properties. The studies attempt to control for physical and socio-economic factors that would affect property prices only to the extent that price trend analysis uses geographic areas assumed to have similar characteristics.

5.87 There is stronger evidence from a large scale study conducted on behalf of Defra in 2003 [52] that actual environmental disamenity associated with landfills in the Great Britain has been associated with lower property values, within a limited distance (around 0.5 miles), when controlling for other factors that influence property value. This hedonic analysis assessed property value impacts near all landfills in Great Britain (recorded in a mid-1990s dataset). Insufficient data was available to include landfills in NI. The study noted that disamenities from landfills include noise, odour, litter, vermin, visual intrusion and perceived discomfort. This suggests that actual disamenity (as opposed to perceived risk of possible disamenity) is important in explaining the impact shown.

5.88 From the evidence reviewed, two key questions arise. Firstly, will the proposed project result in actual and significant environmental disamenity? If it were to do so, it would be reasonable to conclude that there could be an impact on property values, within at least a limited area (i.e. that affected by the disamenity). Secondly, if it will not cause actual disamenity, will public perception of risk of disamenity affect property values?
5.89 Regarding the first question, the evidence presented in the ES establishes that the proposed project would not give rise to any significantly adverse environmental impacts (such as from noise, air pollutants, visual intrusion or traffic) and it would be a well-managed facility, as required by its environmental permit, unlikely to give rise to significantly adverse impacts due to odour, litter or vermin.

5.90 This HIA concludes that the proposed project's construction and operation will not cause any measurable adverse health outcomes. Taken together, this indicates that the proposed project is not expected to cause any significant environmental or health disamenities, and hence is unlikely to have any significant direct impact on property values due to detrimental changes in the quality of the local environment.

5.91 Regarding the second question, despite an extensive PAD engagement process (including extended exhibitions), public response and concern for house price has been relatively minor, and as to be expected, largely voiced locally as a perceived risk. The unsupported perceptions of risk have been publicised via social network sites to invoke opposition. It is entirely possible that such action may influence local housing value and markets. However, in the absence of any actual disamenity, any property value effect from unsupported risk perception would be temporary, and it is reasonable to conclude that the market would adjust during the proposed project's operation.

5.92 In summary, actual environmental disamenities have been shown in the case of landfills to have an adverse impact on property values. The evidence regarding EfW facilities, however, is mixed: several analyses of house price trends show no impacts on property value due to proximity to an EfW facility, but others indicate that there may be a negative impact, albeit without a clear distance trend in the evidence from the UK. These studies are limited by their aggregated analysis approach (with limited or no control of confounding factors), different contexts (poorly applicable to the proposed project site and NI) or both. The ES and this HIA indicate that the proposed project will not give rise to significant environmental or health impacts, and in light of the available evidence, it is concluded that measurable effects adverse on property values are therefore unlikely.

**Nuisance Effects**

5.93 Community concern has been raised regarding perceived operational nuisance effects including fly and vermin risk. Unlike landfill, such facilities receive and manage all waste materials within an enclosed environment and operated to prevent external impacts from odour and vermin. It is such design and operational features that enable such facilities to operate within urban environments and city centres throughout Europe with no issue.

5.94 On this basis, the proposed facility is not anticipated to constitute a significant risk of nuisance from odour, flies or vermin, removing municipal waste that would otherwise go to landfill with associated nuisance effects.
Electro Magnetic Fields (EMF)

5.95 Whenever electric power is used or transmitted, electric and magnetic fields (which together can be called electromagnetic fields – EMF) are generated. Electromagnetic forces are a fundamental part of the physical world, including mediating processes of chemistry that are part of life. EMF occurs naturally within the human body (through nerve and muscle activity) and also arise from the magnetic field created by the Earth and electric fields in the atmosphere.

5.96 Operation of the underground grid connection cable will generate electric and magnetic fields; however, the electric field will be fully screened by the cable sheath material and the trench infill. Only the magnetic field could be experienced at receptors above ground level.

5.97 Magnetic fields, which are generated by a variety of everyday sources such as household appliances as well as power lines, can interact with the body. Exposure guidelines set to protect health have been developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). Following an EC recommendation (1999/519/EC) (Ref.53), the 1998 ICNIRP guidelines have been adopted in the UK under the advice of the Health Protection Agency (HPA). ‘Magnetic field strength’ (magnetic flux density) is typically expressed in tesla (T), or, due to the small magnitude of the fields involved, microtesla (µT – millionths of a tesla).

5.98 In February 2011 the Department of Energy and Climate Change (DECC) published a voluntary Code of Practice document (updated in March 2012), detailing the recommended approach for demonstrating compliance with EMF exposure limits. The Code of Practice ‘has been developed following publication of the Government response to the Stakeholder Advisory Group on extremely low frequency electric and magnetic fields (ELF EMFs) (SAGE) First Interim Assessment...[and] agreed by the Department of Health, the Energy Networks Association, the Welsh Assembly, the Scottish Executive, the Northern Ireland Executive and the Health and Safety Executive’ (Ref. 54, page 2). It implements the ICNIRP guidance under the terms of the 1999 EC Recommendation in the UK context. This Code of Practice was formally adopted by the Northern Ireland Executive on 8th March 2012, and its documents are published online for Northern Ireland by the Department of Enterprise, Trade and Investment.

5.99 The Code of Practice specifies a guideline limit of 360 µT for general public exposure to a 50 Hz magnetic field. This is the external field strength that is equivalent to the ‘basic restriction’ for induced current density in the body in the 1998 ICNIRP guidance. It is based on modelling undertaken for the HPA in 2005 (Ref.55), and its specification in the Code of Practice supersedes the 1998 ICNIRP ‘reference level’ of 100 µT.

5.100 Under the Code of Practice, compliance of all underground cables at 132 kV and below with the guideline general public exposure limit value for magnetic field strength is demonstrated by the electricity industry through calculated field strength for a published hypothetical worst-case example cable design. The hypothetical worst-case underground cable example is one circuit of three phase AC power, with three cores separated by 1 m, at 1 m burial depth, operating at maximum load (1 kA per phase) (Ref. 56).
5.101 This hypothetical cable would produce a magnetic field of 72 µT at 1 m above ground level. This is well below (20%) of the 360 µT value for long-term exposure set to protect health. On this basis, all practical designs for underground cables at 132 kV and below would comply with the guideline exposure limit. The maximum magnetic field strength would be experienced above the cable route, and would drop rapidly with distance laterally from the cable. The proposed 33 kV cable would be expected to have a significantly weaker magnetic field than the ‘worst case’ hypothetical example.

5.102 Based on the current scientific evidence base and Government guidance, the proposed project would have no significant human health impact due to EMF exposure from the proposed electricity transmission infrastructure.

**Perception of Risk**

**Investigating and Addressing Perceived Risks**

5.103 Existing pre-conceptions surrounding energy from waste facilities can engender a wide range of perceived health risks, and as outlined by the Risk and Regulatory Advisory Council (RRAC) can be further heightened by ‘risk actors’ and ‘risk mongers’. Risk actors, through their actions, shape perceptions and responses to public risk and risk mongers distort perceptions fostering community concern, that if not appropriately addressed can encourage poor decision-making (Ref.57).

5.104 Such subjective and intangible factors are generally not effectively addressed through the regulatory assessment process, which concentrates on changes in environmental and socio-economic conditions directly attributed to what is proposed, and is structured to comply with planning requirements and expectations. For this reason, non-regulatory required assessments such as HIA are increasingly and voluntarily commissioned to proactively investigate, assess and address local concerns and fears through the factual dissemination of scientifically robust information.

5.105 In this instance, the voluntarily commissioned HIA provides a robust assessment of the health pathways associated with the proposed project and applies a robust scientific evidence base for each assessment protocol. The HIA is therefore intended to inform decision making, but is also intended as a source of information to help alleviate local community concerns and perceived risk through the assessments provided and through the recommendations within the HAP to raise awareness, address fears and help address local community circumstance.
Perceived Risk as a Material Planning Consideration

5.106 As shown below, the perception of health risk has been raised on a number of previous EfW planning determinations and appeals.

Table 5.1: Energy from Waste: Perceived Health Issue Decisions

<table>
<thead>
<tr>
<th>Case</th>
<th>Date</th>
<th>Context</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lostock Energy from Waste – Fuelled</td>
<td>October 2012</td>
<td>Public concerns about perceived health impacts and increase in dioxin in abnormal operating conditions</td>
<td>The development has well established processes for dealing with emissions and the release of pollutants in abnormal operating conditions and compliance with the Waste Incineration Directive and the revised Waste Framework Directive.</td>
</tr>
<tr>
<td>Ringaskiddy EfW Facility</td>
<td>June 2011</td>
<td>Concern increase in dioxin</td>
<td>I am satisfied that the environmental permit has been issued after a detailed examination of the plant and its capabilities, the processes and controls involved and the likely impacts upon the environment and health.</td>
</tr>
<tr>
<td>Ardley EfW Oxfordshire</td>
<td>December 2010</td>
<td>Concern regarding air pollution and subsequent perceived risk to health</td>
<td>There is no evidence, which demonstrates the appellant’s assessment should not be accepted. There was no support of the objector’s views from the relevant consultees. Furthermore, the inspector concluded that ‘most of the concerns are not planning matters as they are dealt with by the EA’.</td>
</tr>
<tr>
<td>Oxwellmains EfW, Dunbar</td>
<td>December 2010</td>
<td>Concern regarding air pollution and subsequent perceived risk to health</td>
<td>Satisfied that there was no evidence to conclude that the impacts of the proposal were likely to exceed current air quality objectives and limits, or would otherwise be unacceptable. ‘Fundamentally, the issue of impact on public health stands to be considered under the PPC licensing regime’.</td>
</tr>
<tr>
<td>Shore Road EfW, Perth</td>
<td>November 2010</td>
<td>Concern regarding air pollution and subsequent perceived risk to health</td>
<td>Same Recorder as Oxwellmains EfW with same reasoning.</td>
</tr>
<tr>
<td>Sinfin Lane EfW, Derby</td>
<td>November 2010</td>
<td>Concern regarding air pollution and subsequent perceived risk to health</td>
<td>The Inspector concluded that residents’ fear in itself is not sufficient on its own to warrant refusal, but did accord it some weight in the final decision’.</td>
</tr>
<tr>
<td>Avonmouth Biomass</td>
<td>March 2010</td>
<td>No objection raised on health grounds</td>
<td>No further consideration was given to health issues.</td>
</tr>
<tr>
<td>Teesport Biomass Extension</td>
<td>March 2010</td>
<td>No objection raised on health grounds</td>
<td>No further consideration was given to health issues.</td>
</tr>
</tbody>
</table>
### Case | Date | Context | Decision
--- | --- | --- | ---
Rivenhall EfW, Essex | March 2010 | Concern regarding air pollution and subsequent perceived risk to health | The Inspector concluded that the plant could be operated without causing material harm to human health. Despite this, the concern of local residents to health risk, albeit unfounded, would remain as a detrimental impact of the development.

Peterborough EfW | November 2009 | Concern regarding air pollution and subsequent perceived risk to health | Secretary of State determined that in light of the need for an environmental permit to operate, and the position of the Health Protection Agency there was no need to consider the matter further.

Teesport Biomass | July 2009 | No objection raised on health grounds | No further consideration was given to health issues.

Tilbury Docks EfW, Essex | August 2009 | No objection raised on health grounds | No further consideration was given to health issues.

Eastcroft EfW, Nottingham | December 2008 | Concern regarding air pollution and subsequent perceived risk to health from communities and GP | The inspector noted that the appellants’ evidence showed significant margins would exist between the impact of the proposed and the recognised thresholds where health could be affected. He also noted that despite the views of local GPs, the PCT Health Impact Assessment concluded that a perception of risk rather than actual risk could occur. The inspector was not persuaded that the perceptions were a reason for refusal especially in light of WSE2007. The Inspector concluded that there would not be any material risk to the health of the local population.

Ince Marshes EfW, Cheshire | October 2008 | Concern regarding air pollution and subsequent perceived risk to health | The inspector identified that the perception of a risk to health was the principal matter of objection. The Inspector was not persuaded by the evidence of objectors about a direct impact on health as it did not relate to modern incineration plants. He concluded that the public anxiety should not carry great weight.

Ineos Chlor EfW, Cheshire | September 2008 | Regarding air pollution and subsequent perceived risk to health | Health Impact Assessment was made a planning condition to further investigate and address local community concerns and perceived risks.

Stallingborough, Lincolnshire | June 2008 | No objection raised on health grounds | No further consideration was given to health issues.

5.107 However, the most prominent examples where perceived risks have been made a material planning consideration include the Kidderminster EfW facility, and the Sinfin EfW facility appeal decisions.

5.108 More locally, the Ringaskiddy EfW facility appeal is also noteworthy, where similar, yet unsupported health concerns were raised by local interest groups, informed by the same individual that is currently providing information to local communities within Mallusk and to constituent councils of the Eastern Region of Northern Ireland (September/October 2013).
5.109 Each appeal decision is discussed below, alongside the inspector’s interpretation of case law, and concludes with the salient points on the basis for the management of, and weight given to, perceived risk in planning.

**Kidderminster EfW Facility Appeal**

5.110 One of the earliest high profile decisions where perceived risk was raised as a material consideration related to the Kidderminster EfW appeal dated 10th July 2002.

5.111 The proposal was a major integrated waste management facility comprising an EfW facility utilising moving grate technology and two Materials Recycling Facilities (MRFs) at Kidderminster, Worcestershire. Here the inspector found that there were four material adverse impacts. The first three all resulted in breaches of Development Plan policy. The fourth, regarding perceived risks, was defined as ‘a negative factor of some significance to place in the scales of the decision making process’ (paragraph 149).

5.112 The four points were balanced against the benefits of the scheme, and ultimately the planning application was dismissed on the basis that it did not constitute the Best Practicable Environmental Option (BPEO). Although risk perception was raised as a negative factor, it was not a determinative factor, requiring evidence of risk for it to be balanced against the benefits of the proposal.

5.113 Following the decision, the Government removed BPEO from the planning framework and published its ‘Review of Environmental and Health Effects of Waste Management: Municipal Solid Wastes and Other Similar Wastes’ (Defra 2004) to support decision making, and more effectively address common misconceptions and perceived health risks.

**Sinfin EfW Facility Appeal Decision (November 2010)**

5.114 The Sinfin waste treatment facility (that included an EfW facility) was designed to process up to 190,000 tonnes of municipal solid waste per year in a 3-line process employing gasification technology.

5.115 The perception of health risk was a material factor in the appeal’s dismissal, and is commonly cited by opposition groups on other EfW projects as grounds for rejection due to similar perceptions. However, the appeal decision is similar to that of the Kidderminster appeal, where although perceived risk was given weight, it was not the determining factor, and was not enough in itself to warrant dismissal of the appeal. As before, unsubstantiated fear is not sufficient to oppose development, but is a subject that should be given due care and attention during the planning process to prevent unnecessary fear, anxiety and stress (Ref.58).

5.116 Table 5.2 provides an extract of the inspector’s decision.
Table 5.2: Sinfin EfW Facility Appeal

54. In the case of Newport BC v Secretary of State for Wales and Browning Ferris Environmental Services Ltd the Court of Appeal held that the fear of harmful effects on the health of people living close to a chemical waste transfer station was capable of being a material consideration, even when there was no objective evidence to support such a fear. The Court added, however, that by itself such unfounded fear would rarely (if ever) be a reason to justify the withholding of planning permission.

55. I have already made it clear that paragraph 31 of PPS10 provides guidance in respect of health issues; namely that decision-makers should not carry out their own health studies but rely on guidance from the relevant health authorities and agencies. In the High Court case of Pam Jean Harris v the First Secretary of State, Peterborough City Council and Hutchinson 3G UK limited, it was established that a departure from national policy guidance in respect of health issues should occur only in exceptional circumstances. In this particular appeal. I cannot find any exceptional circumstance that justify a departure from national policy guidance in respect of health issues.

56. In the light of the above, I have reached the view that local residents’ fear about harmful health effects is not something that in itself warrants a dismissal of this appeal. It is nevertheless a material consideration of some weight.

Source: APP/C1055/A/10/2124772

5.117 As shown in Table 5.3, the final determination was not based upon perceived health risks, but a balance of tangible benefits and dis-benefits of the project.

Table 5.3: Sinfin EfW Facility Appeal

84. I have decided that the points in favour of the proposed WTF do not outweigh the points against it. This is largely because of the substantial weight I have given to the likely increase in traffic congestion, the significant weight I have given to the adverse effect on the AQMA, and the substantial weight that I have given to the adverse effect on the living conditions of local residents.

Source: APP/C1055/A/10/2124772

5.118 The decision on the second appeal on Sinfin EfW in September 2012 is similar to that of first appeal in 2010, where although perceived risk was given weight, it was not the determining factor, and was not enough in itself to warrant dismissal of the appeal. As before, unsubstantiated fear is not sufficient to oppose development, but is a subject that should be given due care and attention during the planning process to prevent unnecessary fear, anxiety and stress (Ref.59)

Table 5.4: Sinfin EfW Facility Appeal in 2012

117. I conclude on this issue that there is no evidence to suggest that the proposal would adversely affect the health of those living in this part of Derby. Accordingly, I do not consider that the proposal conflicts with WLP Policies W4 and W6 and LP Policies GD5, EP14 and E12.

118. In considering the proposal against the various site specific impacts such as being compatible with the character and appearance of the locality, effect on the local highway network, impact on air quality and effect on health, I conclude that the proposal does not breach any RP, WLP or LP policy. In short, I find that the proposal complies with the relevant policies in the development plan.

129 It is an assessment that is based on the most conservative of assumptions and even on these assumptions it can be concluded that the plant would not result in particulate emissions of a level that would have any measurable health outcome.

Source: APP/C1055/A/10/2124772.
Lostock Energy from Waste – Fuelled Generating Station (2012)

5.119 The proposal was to construct and operate a 60MW EfW on land formerly occupied by the Lostock Power Station, Northwich, Cheshire.

5.120 Whilst perceived health impact was not a formal objection of the RPA, the Secretary of State considered potential health impacts since considerable representations have been made during the Public Inquiry, and further representations afterwards. In the Inspectors conclusions on perceived health risk, the Inspector stated that the proposal is well established for dealing with emissions and the release of pollutants in abnormal operating conditions.

Ringaskiddy EfW Facility Appeal (June 2011)

5.121 The proposal was for a hazardous and non-hazardous waste EfW and a transfer station facility, on a 12 hectare site located on lands opposite the National Maritime College, at Ringaskiddy, County Cork.

5.122 During the appeal, opposition to the proposed facility presented a health proof of evidence including general risk from nanoparticles, dioxins and health impact from incineration. However, when challenged to support the opinion, the expert witness failed to demonstrate any significant risk, and was criticised for failing to correctly apply the current scientific evidence base to the proposed development, and for confusing hazard with risk.

5.123 The Board refused the application for the following four reasons: incompatible with local and regional waste plans; size; flood risk of the access roads; and the suggested coastal protection measures and possible impacts of those protection measures (Ref. 60).

5.124 The final determination was similar to those of the Kidderminster and Sinfin appeals; the application was refused not based upon perceived health risks, but a balance of tangible benefits and dis-benefits of the project.

5.125 In summary a review of recent EfW cases where perceived health risks have been raised demonstrates that:

- there is an established regulatory regime that controls hazards and manages risk from regulated facilities, including emissions and accidents that have the potential to affect health;
- local feelings and public opposition in its own right are not sufficient grounds for a material consideration;
- although perceptions of risk are given weight during planning decisions, unjustified, unsupported or irrational fear in itself is not sufficient on its own to warrant refusal;
- where such concerns are justified, they are considered alongside other material factors and balanced against benefits to form the final decision;
- there is little legal support for turning down development on the sole basis of unjustified perception; and
unfounded fear would rarely (if ever) be a reason to justify the withholding of planning permission.

Risk Perception Summary

5.126 The HIA has investigated a wide range of potential health pathways and perceived risks associated with the proposed development, and applied the current scientific evidence base to assess the potential impact on community health via air quality, noise, transport and EMF health pathways, in addition to wider socio-economic determinants of health.

5.127 In so doing the assessment has not only helped to separate perceived from actual risks, but also puts such risks into context to aid in understanding their distribution, magnitude and likelihood of potential influence on local community health and relative circumstance. On this basis, perceived risks have not only been appropriately investigated and assessed, but are further managed through the HAP.

Accidents and Safety

5.128 During the consultation stage, concern was expressed regarding the potential risk from catastrophic failure or arson at the facility. In such an unlikely situation, the proposed facility includes a fire suppressant system with onsite water storage. Given the nature of the building and municipal waste, the potential risk to neighbouring communities from fire and fumes is low, comparable to a house fire (in terms of materials). Given the location of the proposed facility, together with its design and fire suppression system, it is highly unlikely that an uncontrolled fire would present a safety risk to neighbouring communities or households. All visitors and staff will fall under the facility’s Health and Safety Policy.
6 Conclusion

Overview

6.1 The proposed development has a number of features that could potentially influence the health of neighbouring communities (both positively and negatively). This HIA has drawn from the available literature and local community input to define the scope and focus of the study, and examine the extent of these in a manner that considers local circumstance and the best available scientific evidence.

Health Outcome

Air Quality

6.2 The main community health concern raised during public engagement is the potential risk from changes in air quality. Following a review of the available scientific evidence base and based on an exposure response assessment of worst case hypothetical scenarios, it is concluded that changes in concentrations of PM$_{10}$, PM$_{2.5}$ and NO$_2$ will be of minor significance. Total concentrations would remain well within air quality standards set to protect health and would not be of a magnitude sufficient to quantify any measurable adverse health outcome during construction and operation of the proposed project (including transport emissions). Such a conclusion is consistent with the current scientific evidence base and the position of authoritative organisations including the UK Health Protection Agency.

Noise and Vibration

6.3 Given the proposed site, design and proposed mitigation, construction and operational noise and vibration is not of a level to result in significant annoyance, result in sleep disturbance or result in any measurable adverse health outcome.

Transport

6.4 Construction and operational traffic movements are not of a level to quantify any measurable impact upon health through changes in air quality or noise, and unlikely to result in community severance. The potential risk from accident and injury is managed through road improvements, training and transport management planning. Following mitigation, the proposed development is not anticipated to present any meaningful increase in local risk from road traffic accidents or injury.

Socio-economic

6.5 Construction of the proposed development will generate significant direct, indirect and induced income employment opportunities, with associated socio-economic, mental and physical health
benefits. The distribution of direct benefits is anticipated to be largely captured within the region, with sufficient capacity within the building sector. Direct and indirect income and employment opportunities spread at a regional and local level to accommodate construction activities and staff.

6.6 Once operational, the site will create and sustain a total 337 direct and indirect jobs, generating £7.7 million in total wages annually and contributing £24.7 million of GVA to the Northern Ireland economy. The distribution of direct employment uptake and health benefits is anticipated to be local, with associated local induced income and employment opportunities and local spending (from staff and visitors).

6.7 A review on the effect of EfW on house price and sales indicates that there are two factors with the potential to impact upon house value, tangible environmental disamenity and risk perception.

6.8 As demonstrated in the ES and HIA, and consistent with the scientific evidence base and position of Authoritative bodies, the proposed project will not give rise to significant environmental or any measurable health impacts. In light of the available evidence, it is concluded that measurable adverse effects on property values due to any tangible impact are therefore unlikely.

6.9 It is appreciated however, that risk perceptions remain, and concerns raised as a consequence of unsupported opinion may have more of an influence on house price.

6.10 The ES and HIA have actively sought to investigate and address such risk perceptions through the scope of assessment but also through extensive community engagement and feedback. In addition, site visits to comparable facilities in Europe are likely to be organised in parallel with the application determination process with key stakeholders to aid in further raising awareness and addressing common, yet often incorrect perceptions of EfW facilities.

6.11 The proposed Visitor Centre in itself is key to addressing such risk perceptions, and should provide communities with some reassurance on the transparency of the proposed facility, but also intention for on-going community engagement. Not only will local communities be able to inspect and monitor the facility first hand throughout its operational life (addressing risk perceptions and misconceptions), but is also intended to showcase a prime example of best practice.

**Nuisance Effects**

5.129 The proposed facility will receive and manage all waste materials within an enclosed environment and be operated to prevent external impacts from odour and vermin. Such design and operational features enable such facilities to operate within urban environments and city centres throughout Europe with no issue. The proposed facility is not anticipated to constitute a significant risk of nuisance from odour, flies or vermin.
Electromagnetic Fields

6.12 Based on the current scientific evidence base and Government guidance, the proposed project would have no significant human health impact due to EMF exposure from the proposed electricity transmission infrastructure.

Risk Perception

6.13 Community concern is centred on perceived risk and fear, compounded by commonly stated but unsupported opinion. While consultation has proven effective in cataloguing, understanding and responding to such concerns, on-going engagement will be key to managing residual concerns.

Accidents and Safety

6.14 Given the nature of the building and municipal waste, the potential risk to neighbouring communities from uncontrolled fire and fumes is low and comparable to a house fire (in terms of materials). Given the location of the proposed facility, together with its design and fire suppression system, it is highly unlikely that an uncontrolled fire would present a safety risk to neighbouring communities or households. All visitors and staff will fall under the facility’s Health and Safety Policy.
7 Health Action Plan

Overview

7.1 A Health Action Plan (HAP) expands upon the normal recommendations section within Health Impact Assessment guidance, establishing recommended protocols to reduce and remove potentially adverse health outcomes and inequality, while maximising opportunities to improve health.

Construction

7.2 The key health pathways with the opportunity to influence health during the construction stage include local level changes in air quality, noise and road traffic movements. As discussed in the assessment section, these changes are not of a level to result in any meaningful adverse community health outcome. In practice, construction activities present the opportunity to improve local and regional income and employment opportunities (direct, indirect and induced).

7.3 The following initiatives are intended to further reduce and address potential disruption and annoyance, and improve the uptake of local socio-economic health benefits.

Training and Employment

7.4 As detailed in the community profile, there is a sufficient construction skills base within the region to deliver the construction phase. To maximise this uptake and associated health benefits, Beacon has developed a series of education, training, employment outreach and recruitment initiatives to maximise opportunities for people to gain employment.

7.5 As detailed in the Socio-Economic section of the ES, Beacon will seek to work with local employment agencies to place people into sustainable employment. This will include people who already have appropriate skills, and also identify and address skill needs and barriers to work for target groups including the unemployed and young people not in education, employment or training (NEETs) (with a target to recruit 10 people who are long term unemployed and 15 apprentices).

Site Management

Good site management can reduce the potential for annoyance and disruption to the local area. As detailed in the ES, a bespoke Construction Management Plan has been developed and is available as Appendix 3.1 to the ES. This includes commentary and work instructions on site environmental management such as controlling traffic and managing air quality (including dust), noise and vibration, land use and landscape issues, soil management, ecology and biodiversity, archaeology and cultural heritage, water, energy, socio economic aspects and a site waste management plan for the effective management of construction waste.
Construction Traffic

7.6 As outlined in the Transport Assessment within the ES and as detailed in Appendix 3.1 to the ES, a series of transport mitigation and management programmes are proposed within the CMP to further reduce potential disruption from construction traffic movements and manage risk, these include, but are not limited to the following:

- maintenance of site and off site roads (the latter predominantly during Boghill Road upgrade);
- provision of adequate signage to identify and manage potential hazards;
- provision of road edge markers along road to improve safety during poor weather conditions;
- construction vehicle parking to prevent any impact on neighbouring communities;
- provision of site pedestrian access and safe crossing points;
- establishment and enforcement of an appropriate site speed limit;
- vehicle specific transport risk assessments will be carried out, and appropriate procedures implemented to manage bespoke risks;
- vehicle selection, inspection and maintenance will be performed to reinforce site safety and to ensure vehicle safety, and that emissions / noise are within operational norms;
- site traffic and pedestrian rules will be established and enforced with all general site operatives and plant operatives, visitors will be made aware of any hazardous areas or activities when they sign in at the reception;
- encourage staff to travel to work using sustainable methods including the use of car share schemes;
- community construction and transport complaint data will be logged, as will the actions implemented to manage and prevent future annoyance, and applied to inform the operational stage of the facility; and
- all construction staff will be made aware of the transport strategy and its purpose to further reduce risk and disruption to the wider area and community during induction.

7.7 For a more detailed account, please refer to Appendix 3.1 of the ES.

Operation

7.8 Once operational potential health pathways with the opportunity to influence health are largely socio-economic, where air quality, noise and transport impacts are negligible and not of an order to quantify any measurable health outcome. There remains however, a health and house price risk perception that would benefit from further dissemination.
7.9 The following initiatives are intended to further reduce and address potential disruption and annoyance, and improve the uptake of local socio-economic health benefits.

**Training, Education, Employment Opportunities**

7.10 The operational phase will employ a total of 94 members of staff split across the MBT Facility, EfW Facility, IBA Area and wider site services. The jobs vary from highly skilled positions to lower and unskilled labour, as detailed in section 16 of the ES, a policy is proposed to both support the uptake of employment locally and then further afield if required. The policy further outlines training and apprenticeship schemes targeted toward local communities in close proximity to the site. Such a scheme would help to pump prime the local skills base increasing the potential for recruitment within the local community, but also increase local indirect and induced income and employment opportunities.

7.11 A Visitor Centre will be located on site to provide an opportunity for local residents to view the operation of the proposed project. The centre would be built and equipped to accommodate up to 40 people, making it suitable to host a number of community groups including local school children to help give a better understanding of waste management.

7.12 The Visitor Centre also provides an opportunity to catalogue and present how community health has been implicitly considered through the planning process, helping to address perceived risk and maintain on-going community engagement.

**Operational Traffic**

7.13 The ES includes as part of its mitigation widening of the Boghill Road to provide additional capacity and width to accommodate site traffic. Direct access to the site by public transport and walking are limited, however within the site, pedestrian and cycle routes and also cycle parking will be provided to encourage active forms of transport.

7.14 Where appropriate staff should be encouraged to use pedestrian and cycle routes and encouraged to car share to further reduce vehicle movements to and from the site. Such an approach can be established through the adoption of a traffic management plan that is geared toward minimising congestion and maximising more sustainable and active forms of transport.

7.15 To further encourage active transport to the site, staff facilities should include secure, sheltered cycle locking facilities, lockers and showers, and staff made aware of company bike purchase schemes.
Risk Perception Management

7.16 Existing pre-conceptions surrounding energy from waste facilities can engender a wide range of perceived health risks. Such subjective and intangible factors are generally not effectively addressed through the regulatory assessment process, which concentrates on changes in environmental and socio-economic conditions directly attributed to what is proposed, and is structured to comply with planning requirements and expectations.

7.17 The provision of factual, scientifically robust information can help to alleviate such community concerns, raising awareness of the proposed project and demonstrating how both the environment and community health have been considered throughout the planning process.

7.18 It is therefore recommended that the non-technical summary for the HIA and the literature review of the available health evidence base is made available locally, and the key findings disseminated with constituent councils of arc21.

7.19 During operation such information can also be made readily accessible through the Visitor Centre.

Community Investment

7.20 A community fund is proposed during construction and operation of the plant. This will be managed by Becon working with the community and appropriate local agencies.

7.21 It is recommended that a Corporate Social Responsibility (CSR) programme also be developed detailing operational community relations during the lifetime of the project, addressing local concerns and perceptions and reinforce EEWs commitment to local communities.
Appendices
Appendix A: HIA Scoping Statement
Commercial in Confidence

EfW and MBT Facility

HIA Scoping Report

Hightown Quarry

On Behalf of E.ON Energy from Waste UK Ltd
Commercial in Confidence

EfW and MBT Facility

HIA Scoping Report

Hightown Quarry

On Behalf of E.ON Energy from Waste UK Ltd

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## Quality Management

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Figure 1.2  3D Model – Proposed Site

Figure 1.3  3D Model – Site Overview
1 Introduction

Project Overview

1.1 E.ON Energy from Waste UK Ltd (E.ON) have voluntarily commissioned a Health Impact Assessment (HIA) as part of the planning process for the proposed Mechanical Biological Treatment Plant (MBT) and Energy from Waste Facility (EfW) to be located within the Hightown Quarry site. The location of the quarry is shown in Figure 1 below.

Figure 1.1 Application Site

1.2 The proposed facility is located within the arc21 region representing eleven constituent councils of the Eastern Region of Northern Ireland. These Councils comprise Belfast City Council, Lisburn City Council, Antrim Borough Council, Ards Borough Council, Ballymena Borough Council, Carrickfergus Borough Council, Castlereagh Borough Council, Down District Council, Larne Borough Council, Newtownabbey Borough Council and North Down Borough Council.

1.3 The site itself is designed to treat a maximum of 300,000 tonnes of waste per annum split between the MBT and EfW facilities. The split would be dependent on the quantity and composition of waste delivered to the site, estimates for the year 2019/20 highlight that the MBT is expected to accept 241,319 tonnes of Authority Contract Waste and the EfW is expected to accept 23,879 tonnes of Third Party waste. The MBT facility will have a maximum capacity to
treat up to 300,000 tonnes per annum with the EfW Facility designed with a maximum feedstock capacity of 244,000 tonnes (CV Dependant). The proposed development will include:

- a Weighbridge Complex;
- Mechanical and Biological Treatment (MBT) facility;
- Refuse Derived Fuel (RDF) bale storage building;
- an Energy from Waste (EfW) facility;
- an Incinerator Bottom Ash (IBA) processing facility;
- an educational Visitors’ Centre; and
- upgrading/widening of the Boghill Road and related junction improvements.

1.4 The MBT will separate out recyclable materials from incoming waste. The Energy from Waste facility will take the Refuse Derived Fuel produced from the MBT facility as well as any untreated waste (that has been discharged directly to the EfW) to produce electricity for export to the grid. The EfW facility will have a thermal capacity of 68 MW, operating 24 hours a day for at least 8,000 hours per year, with a 4 week shutdown period for planned maintenance.

1.5 The facility will employ 94 staff across the site; these positions will be a combination of support jobs (i.e. manual hand pickers) and skilled technical jobs (i.e. machine operators and engineers), providing long term job security and the opportunity for on the job training and professional development.

**Project Design**

1.6 The 3D model for the site is shown in Figure 1.2 and 1.3, providing an impression of how the building would look against the surrounding area.
Figure 1.2 3D Model – Proposed Site

Figure 1.3 3D Model – Site Overview
Scoping Report

1.7 This HIA Scoping Report is intended to inform the Chief Executive of the Northern Health and Social Care Trust (NHSCT) and the Director of Public Health at the Public Health Agency (PHA) to aid discussion regarding the key health pathways to be assessed and to tailor them to local community and key health stakeholder concerns.
2 Approach and Methodology

Health Impact Assessment

2.8 HIA is a multidisciplinary process which draws from and builds upon the information presented within the Environmental Statement, including Air Quality, Noise; Transport and Socio-economic outputs as well as the more intangible elements important to good health and well-being. It is designed to identify and assess the potential health outcomes (both adverse and beneficial) of a proposed project, plan or programme and to deliver evidence based recommendations that maximise health gains; and reduce or remove potential negative impacts or inequalities on health and well-being (Ref.1).

2.9 Although not a regulatory requirement of the UK planning process, HIA is listed by the Department of Health, Social Services and Public Services (DHSSPS) in their report ‘Investing for Health’ as a means to promote health and reduce inequality (Ref. 2). Policy WM 1 of PPS 11: Planning and Waste Management states that a waste management facility will only be permitted where it can be demonstrated that the proposal will not cause demonstrable harm to human health or result in an unacceptable adverse impact on the environment (Ref. 3).

2.10 Furthermore the ES scoping opinion, prepared by the Planning Service in November 2010 states ‘the Public Health Agency recommends that the applicant should be asked to include a health impact assessment as part of the environmental statement. This will need to specifically address the health concerns which this type of proposal raises in the public mind’.

2.11 In addition to meeting the HIA expectation, HIA provides an effective means to further separate perceived from actual risks, in addressing community concerns and aid in developing, rationalising and enhancing the effectiveness of community support initiatives.

Approach

2.1 The basis of the HIA will be in accordance with UK guidance and set on a broad socio-economic model of health that encompasses conventional health impacts such as communicable disease, accidents and risk, along with wider health determinants vital to achieving good health and well-being (Ref. 1).

2.2 A key aspect of the approach will be integration with the regulatory consultation and environmental assessment process. Such an approach ensures the HIA remains consistent with the Environmental Statement (ES), and that the final HIA recommendations are given similar recognition and weight as those prescribed in the ES.
Aim and Objectives

2.3 The aim of the HIA is to build on and complement the outputs of the ES, to further integrate health and well-being within the Project, identify and assess potential health outcomes and put forward recommendations to maximise health gains whilst minimising potential negative impacts.

2.4 This aim will be achieved through the following objectives:

- community profiling to establish local circumstance and relative sensitivity utilising national statistics;
- quantifying and appraising the magnitude, distribution and likelihood of potential health outcomes (both adverse and beneficial) directly attributable to the Project; and
- preparation of a dedicated Health Action Plan (HAP), supporting the development of bespoke mitigation and community support initiatives.

Process and Methodology

2.5 Although guidance and a generic HIA process exists, the methods employed in HIA are often tailored to meet the particular assessment requirements of a project, and further vary depending on the level of integration within the regulatory assessment process. In this instance, the HIA has been designed to support and supplement the Environmental Impact Assessment (EIA) process, and will be submitted as a planning document. Such an approach provides a more joined up approach to planning, the environment and health, but also provides a means to more effectively feed back and address local community health concerns.

2.6 As set out below, the HIA comprises six key stages including: 1) scoping exercise; 2) a project profile; 3) a community profile; 4) stakeholder engagement; 5) assessment; and 6) a Health Action Plan.

Scoping Exercise

2.7 The HIA scope and focus has primarily been influenced from a review of the available literature on the health effects of EfW and HIA case studies/experience. The scope and focus will be refined through the scoping exercise with key health stakeholders. Such input provides a means for health stakeholders to further influence the scope and focus of the assessment, but to also tailor the HIA to local community concerns to address any wider requirements or necessary outputs.

Project Profile

2.8 The purpose of the project profile is to identify features associated with the scheme that potentially influence key determinants of health from both the construction and operation of the proposed facility. The profile will be compiled through both project specific and broad information including:
• the project description developed as part of the planning application;
• the Environmental Statement (ES) and associated technical appendices (air quality, noise, traffic, socio-economic etc.); and
• consultation with E.ON and the ES project team (including the consultation team).

2.9 By developing the project profile it is possible to list potential causal pathways and wider health concerns, to aid in refining the development of an appropriate evidence base, to support the development of a meaningful community profile and to focus the core issues to be assessed and addressed.

2.10 In addition to known environmental and socio-economic health pathways the outputs from stakeholder engagement (detailed below) will be applied to iteratively identify and address wider health concerns within the assessment and Health Action Plan.

Community Profile

2.11 Evidence suggests that different communities have varying susceptibilities to health impacts and benefits as a result of social and demographic structure, behaviour and relative economic circumstance. A community profile therefore not only forms the basis to exposure response modelling but also allows an insight as to how potential health pathways identified in the project profile might act disproportionately upon certain communities and sensitive receptors.

2.12 In this case, the community profile will make use of available small area demographic and socio-economic statistics taken from National Statistics supported by health and hospital admissions data available from the Northern Health and Social Care Trust (NHSCT). The profile will also take into account the wider socio-economic benefits of the project across Northern Ireland.

Stakeholder Engagement

2.13 Seeking the views of key stakeholders and local communities will form an important component of gathering an appropriate evidence base and tailoring the HIA to local circumstance. Furthermore, this ensures that local communities are informed and involved, and that their views influence the planning process.

2.14 The HIA will implement a tiered engagement strategy. Specific tiers of engagement are to include:

• HIA Scoping Exercise: this stage introduces the scope and focus of the assessment enabling high level input from key stakeholders responsible for protecting the health and wellbeing of local communities; and

• EIA/HIA consultation: the EIA consultation strategy includes public exhibitions that will be supported by information relating to the HIA and the attendance of a member of the HIA team.
2.15 In addition to the above the overall communication strategy for the project will incorporate a wide range of activities, although these are not specific to the HIA they help to ensure that key stakeholders and the local community remain informed and updated, such activities include the following:

- letters to local and political stakeholders: this form of communication, whilst very traditional, is personal and specifically targeted, recognises the importance certain individuals have in local decision-making and community life;
- local and national media campaign to underpin the proposal and to cover energy / waste / climate change issues;
- regular newsletters to communities surrounding the Site (within a five mile radius): newsletters are a very useful, tangible tool for communicating a large amount of information, very clearly, to a wide audience;
- briefing meetings and presentations to councils, councillors, party groups on Council, and community interest groups. Such briefings recognise the special status of politicians and community leaders, whilst also providing a useful forum from which feedback can be gained;
- individual political briefings: as above;
- working with established liaison groups: where such groups exist, E.ON will work within existing frameworks to make best use of their contacts, links, and communication tools;
- press releases and press adverts: the media is a useful supplement to more direct approaches to the community and key stakeholders and can widen the reach of the messages being communicated, but this is for supplementary communication only, and will not be used in isolation;
- launch of a dedicated website / email address / free phone telephone number: websites are particularly useful for younger, hard to reach audiences, or middle class professionals who may not have time to attend meetings or a public exhibition. They provide a ‘real time’ communications tool, and are easy to update and adapt;
- a ‘Frequently Asked Questions’ document: essential tool for everyone involved in the communication process. This will be reviewed and updated on an on-going basis and will be informed by issues arising from the planning and procurement phase; and
- site visits to similar facilities for key stakeholders and politicians: visits are an extremely useful method of breaking down barriers with politicians and key stakeholders, widening their understanding of what the facility will look like and how it operates, and enabling them to potentially become unofficial ‘champions’ of the role it plays.
**Assessment**

2.16 The assessment stage of the HIA is to draw from and build upon appropriate technical topic areas within the ES to ensure the HIA is based upon realistic changes in environmental and socio-economic conditions as a consequence of the proposed development.

2.17 The assessment will seek to address each of the core health pathways identified during the project profile and where possible, apply internationally recognised quantitative assessment methods to establish the distribution, significance and likelihood of worst-case potential health outcomes. However, as a minimum the assessment is anticipated to include:

- quantitative exposure response modelling for changes in NO₂ and PM₁₀ exposure during the operation of the facility with reference to the available scientific evidence base;
- qualitative assessment of construction phase effects (including dust and air quality, transportation and noise and vibration) considering the magnitude and significance of effects on local community health and well-being;
- quantitative risk assessment from changes in road traffic movements and subsequent risk of collisions directly attributed to the proposed scheme (drawing upon the detailed traffic assessment within the ES);
- qualitative appraisal of community disruption and the potential health outcome from changes in noise and vibration (drawing from the detailed noise and vibration assessments of the ES); and
- qualitative appraisal as to the socio-economic health benefits from direct, indirect and induced income and employment opportunities (drawing from the socio-economic section of the ES).

**Health Action Plan**

2.18 A Health Action Plan (HAP) expands upon the normal recommendations section within HIA guidance, establishing and committing protocols and monitoring regimes to be implemented to further reduce and remove potential adverse health outcomes and disruption, while maximising opportunities to increase health benefits by addressing local circumstance and needs.

**Health Evidence Base**

2.19 A review of the current health and waste evidence base will be included as an appendix to the HIA to present the position held by authoritative bodies including Defra and the HPA regarding potential health impacts from EfW facilities.
3 Next Steps

Consultation

3.20 The use of MBT and EfW as part of an integrated solution to waste has been the subject of public consultation on four occasions over the last nine years through the NI Waste Strategy 1999 & 2001 and arc21’s Waste Management Plan in 2002 and 2006. Pre-Application Discussions (PAD) have taken place with a number of regulatory bodies as part of the initial information gathering exercise for the ES. Further consultation is anticipated to take place from January-April 2013 with submission of the draft Environmental Statement and related application documentation for statutory consultee review and formal feedback, in parallel with an extensive public consultation strategy including the activities summarised at paragraph 2.14 and 2.15.

Scoping Exercise

3.21 The scoping document is intended to inform key health stakeholders about the project and provide a basis to further refine the scope and focus of the HIA, tailoring the assessment to reflect local circumstance and health priorities.

3.22 Please send any comments or feedback you may have to:

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Appendix B: Health and Waste Management Evidence Base

Introduction

1.1 The following section presents the available health evidence base on Materials Recycling Facilities (MRF), Thermal Waste Treatment Processes (including incineration, gasification and pyrolysis) and Landfills.

Material Handling and Recycling Facilities

1.2 Materials Recycling Facilities (MRF) including Mechanical Biological Treatment (MBT) allows materials to be processed (separated/segregated) or stored temporarily.

Materials Recycling Facilities

1.3 There are several types of MRFs, but they can generally be divided into those that sort and process construction and demolition waste and those that sort and process source segregated household and commercial waste. A MRF mechanically or manually sorts dry recyclable materials to market specifications for processing into secondary materials (Ref.1). MRFs may be attached to, or incorporated within transfer stations or other waste facilities or may be separate dedicated facilities dealing purely with the recyclable fraction of collected municipal waste. Waste material entering a MRF has normally been subject to some pre-segregation by the householder, but further mechanical or manual sorting is also required. These are commonly called clean MRFs (as opposed to dirty MRFs which accept non-separated waste).

1.4 Dirty MRF's are facilities which combine a number of screening/sorting techniques to divide residual municipal waste into a recyclable material stream and a non-recyclable residual waste stream disposed to landfill. The research undertaken for Defra, 2004, reported that, due to market acceptability of recyclates and operational experience over the preceding ten years in the UK, it was unlikely that MRFs processing organic waste or, dirty MRFs, would find any significant future application in the UK (Ref.2).

1.5 A more advanced MRF may be used to produce a third stream comprising either a primarily biodegradable waste stream which can be sent for Anaerobic Digestion or In-vessel composting, or a relatively high calorific value stream for conversion to RDF. This type of application will classify the plant as an MBT.


Potential Health Pathways Associated with MRFs

1.6 Potential exists for MRFs to generate odour, dust and litter. However, MRFs are typically enclosed and fitted with appropriate ventilation and filter systems. Noise is primarily produced by vehicle movements and from the mechanical processing and ventilation systems. There is also a potential for occupational exposure to bio-aerosols, depending on the type of MRF. Contaminated sharps from domestic sources are also encountered in many MRFs in the UK (Ref.3). Contaminated sharp edges refer to glass or metal and needles that may lead to infection or disease, of particular interest are tetanus, hepatitis or less likely HIV.

Health Impacts Associated with MRFs

1.7 In the Defra study no epidemiological studies were identified for populations living near MRFs. In their review of potential health associated with MRFs, and in order to enable the potential health effects in local populations to be assessed, Defra (2004) examined studies that assessed adverse health effects associated with plant workers. The highest risk from these facilities was found to be related to bio-aerosols, similar in nature to those associated with composting plants, although likely to be of lower magnitude, if mainly dry recyclable are handled in clean MRFs. In addition to bio-aerosols, significant chemical hazards including exposure to vapour and particles that may extend outside the plant were also reported in relation to dirty MRFs (Ref.4).

1.8 A number of studies have reported workers experiencing adverse health effects including skin and eye irritation, fatigue, asthma and other symptoms. However, most of these studies were unclear on the exact nature of the materials being processed, or the resulting emissions.

1.9 In a large American study (Ref.5), emissions of trace metals and silica were considered to be very low or undetectable and lower than the occupational standard in six American MRFs which covered a range of manual and mechanically segregated waste sorting techniques. Measurements of metals in downwind communities as well as PCBs and pesticides showed little evidence of elevated readings. The study concluded that there was no significant impact by a MRF on the surrounding community from these parameters. Some elevation in the total occupational suspended particulates was reported in this same study.

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1.10 A study of eleven MRFs handling a mixture of household and commercial waste materials in England and Wales is discussed in several references (Ref.6, 7, 8). Measurements of dust and bio-aerosols, including endotoxin and glucan, VOCs, electromagnetic field, cadmium and mercury were conducted in this study. Cross sectional questionnaires were also given as a personal interview to each operative working within nine of these MRFs. The results of this study indicate that exposure to dust, endotoxins and glucans for workers in a MRF environment show a dose-response relationship in terms of exposure and respiratory and gastrointestinal effects. The results illustrated that total dust exposure is mainly related to diarrhoea and skin problems, although upper respiratory nose and throat irritations were also apparent. The situation with endotoxin was found to be more complex. Workers exposed to higher levels of glucan were reported to be potentially more prone to developing a range of health symptoms. The reported symptoms were not considered unusual for workers in the waste industry. Also measured in this study were VOCs, electromagnetic field, total and viable microorganisms, cadmium and mercury. In common with similar studies, these results did not show any significant amounts in the MRFs. Lead was also detected in the air of one facility and was found in very small amounts in settled dust in all of the MRFs measured. It was concluded that these metals are not expected to significantly affect MRF workers. This study concluded that workers exposed to higher levels of total dust, endotoxins and glucan at their work sites exhibited various work-related symptoms primarily respiratory and gastrointestinal effects.

1.11 A detailed review of health problems by Poulsen O. M., et al. (Ref.9) from sorting and recycling was referred to in the EA 2005 report and concluded that workers handling the source segregated paper or cardboard fraction do not appear to have an elevated risk of occupational health problems related to bio-aerosols exposure (Ref.6).

1.12 From the available evidence base potential health impacts are occupational in nature and that potential adverse health impact to local communities is unlikely to be significant. Bio-aerosols, especially endotoxins and glucan were demonstrated to potentially affect worker’s health. Note however, that in clean MRFs, potential emission of bio-aerosols is expected to be very limited due to the nature of handled waste. Facilities that treat organic waste may be expected to have

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similar bio-aerosol emissions and similar occupational health risks to manage as organic treatment facilities.

**Waste Transfer Stations**

1.13 Waste transfer stations handle municipal waste from industry, commerce and the general public. The waste is bulked and compacted before being transported to other waste treatment facilities. Handling and sorting of waste within these facilities is the main cause of worker exposure. These sites are commonly used to reduce the number of waste transport vehicle trips by transferring the waste from smaller vehicles to larger ones.

1.14 Wastes handled at a transfer station may include municipal solid waste, green waste, household waste and recyclables with appropriately licensed stations also handling hazardous waste.

**Potential Health Pathways Associated with Waste Transfer Stations**

1.15 There is the potential for Waste Transfer Stations to generate bio-aerosols, dust and gases. Odour, noise and litter are also common problems with these types of facilities. Noise would be primarily produced by vehicle movements. There is also the potential for accidents and injuries caused by vehicle movements as well as slips, trips and falls especially around the tipping floor.

**Health Impacts Associated with Transfer Stations**

1.16 The EA (2005) report discussed the limited published research on transfer or sorting sites and the common focus by these studies on occupational health (Ref.10).

1.17 The report also discussed a variety of published studies that monitored the internal air quality at transfer stations and the overall conclusion of elevated microbial concentrations. Elevated concentrations of ammonia, carbon dioxide, hydrogen sulphide and VOCs such as chlorinated hydrocarbons, aliphatic, cyclic and aromatic hydrocarbons were also reported. However, most of these studies noted that outdoor air quality downwind was unaffected by the operations in terms of both bio-aerosol and gases.

1.18 A wide range of studies was reported to consider occupational health problems and possible causes from sorting and recycling domestic waste. Some of these studies found significant association between exposure to organic dust and a fall in Forced Expiratory Volume (FEV). Others reported asthma, a decrease in lung function and possible allergic sensitisation, frequent symptoms of Organic Dust Toxin Syndrome, some cases of severe pulmonary disease, gastrointestinal symptoms, and irritation of eyes and skin. Some studies reported high cadmium blood

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concentration among the waste handlers that was related to exposure to electrical batteries in the waste, this was not thought harmful to health.

1.19 If poorly managed, such facilities can be a source for odour, noise, and dust which may pose nuisance to the neighbouring premises.

1.20 From the available evidence base, potential health risk is occupational in nature with limited evidence to suggest a potential risk to local communities.

**Thermal Waste Treatment Processes**

1.21 The following section presents the available health evidence base on Thermal Waste Treatment Processes, including incineration, gasification and pyrolysis.

**Incineration**

1.22 Waste incineration usually involves the combustion of MSW with varying degrees of pre-treatment to the incoming feedstock. To allow the combustion to take place a sufficient quantity of air is required to fully oxidise the fuel, a proportion of which is generally drawn from waste storage areas to reduce odour emissions beyond the facility.

1.23 During incineration, flue-gases are created that contain the majority of the available fuel energy as heat. All modern municipal waste incinerators recover energy, either in the form of steam for local industrial use or Borough heating or for conversion into electricity via a steam turbine. Some recover both heat and power. It should be noted that Borough heating schemes, carry a premium in terms of cost, depending on the site-specific demand characteristics, and requires careful planning.

1.24 There are a number of different types of incinerators depending on the furnace technology used:

- **Grate incinerators**: widely applied for the incineration of mixed municipal wastes (at large scale). In addition grate incinerators can also treat commercial and industrial non hazardous wastes, sewage sludges and certain clinical wastes;

- **Rotary kilns**: widely applied for the incineration of hazardous wastes and also commonly used for clinical waste, although only used at the small scale (oscillating kiln) in the UK. They are very robust and almost any waste, regardless of type and composition, can be incinerated; and

- **Fluidised bed**: applied to the incineration of finely separated wastes like Refuse Derived Fuel (RDF) and sewage sludge. It has been used for decades, mainly for the combustion of homogeneous fuels like coal, although there are currently only two examples operating on MSW in the UK. Fluidised bed requires an additional process to prepare the fuel for combustion and is not considered to be as robust as the moving grate technology on waste derived fuels.
All waste incinerators are subject to specific emission limits set by the EC Waste Incineration Directive (WID). Key pollutants regulated under the Waste Incineration Directive include:

- Nitrogen Dioxide (NOx);
- Sulphur Dioxide (SO₂);
- Total Dust (including PM₁₀ that constitutes the PM₂.₅ fraction);
- Carbon Monoxide (CO);
- Total Organic Carbon (TOC);
- Hydrogen Fluoride (HF) and Hydrogen Chloride (HCl);
- Cadmium (Cd) & Thallium (Tl);
- Mercury (Hg);
- the sum of Antimony (Sb), Arsenic (As), Lead (Pb), Chromium (Cr), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni) and Vanadium (V); and
- Dioxins / Furans (PCDD / PCDFs).

For any waste management facility to operate it is necessary to demonstrate that the facility does not constitute a risk to the environment and health. This is established through an Environmental Permit from the EA (subject to the requirement of Integrated Pollution Prevention and Control). The Environmental Permit will require that each facility is compliant with all other applicable environmental and health regulations.

**Potential Health Pathways**

Exposure in relation to gaseous emissions and residual waste are generally the main areas of community concern, and often engender concerns relating to cancer, respiratory disease, congenital abnormalities and infant mortality. The potential health risk from gaseous emissions is discussed in more detail below.

Potential health risk from noise, odour, vermin and bio-aerosols generally present less significant health pathways, and are typically addressed through the site selection and design stages.

Potential changes in road transport movements of residual waste present a more diffuse health pathway, including potential changes in noise, air quality and more importantly risk of road traffic accidents in collection areas and between waste transfer facilities. Such risks are largely managed through the planning process by the appropriate choice of location and provision of good access. Residual effects can be managed through the development of a Traffic Management Plan. It is important to note that such facilities do not typically create any net overall increase in road transport movements within a region, but redistribute and contribute in reducing the number of road transport movements by managing waste closer to source and reducing the volume of waste sent to landfill.
Gaseous Emissions

1.30 Air pollution (from all sources) can have an adverse effect on health, and most notably on susceptible people (including the young, the elderly and infirm). The Committee on the Medical Effects of Air Pollutants (COMEAP) has reported that evidence regarding the effect of long-term exposure to air pollution points to an association between long-term exposure to particulate air pollution and effects on mortality. Studies on health effects from other combustion gases such as nitrogen dioxide and sulphur dioxide were found to be less consistent.

1.31 However, extrapolating health effects associated with exposure to these pollutants in general to the relatively small additional exposure from thermal waste treatment facilities is often the cause of significant but unnecessary community concern.

1.32 The Defra review of environmental and health effects of waste management (2004) concluded that whilst thermal waste treatment facilities generate a considerable amount of public concern it was not possible to identify any peer-reviewed study showing that modern thermal waste treatment facilities release hazardous substances at a level causing harm to the people in the vicinity (Ref.11).

Cancer

1.33 Several epidemiological studies have suggested a possible association between thermal waste treatment facilities emissions and a variety of cancers including stomach, colo-rectal and liver cancers; larynx and lung cancers; childhood cancers and soft tissue sarcomas and non-Hodgkin's lymphomas. However, the review carried out by Defra in 2004 concluded that there is no consistent or convincing evidence of a link between cancer and thermal waste treatment facilities (Ref.11). In the UK, the large epidemiological studies from the Small Area Health Statistics Unit (SAHSU) examined an aggregate population of 14 million people living within 7.5 km of 72 municipal solid waste incinerators. This included all incineration plants irrespective of age up to 1987. Despite the inclusion of incinerators with emissions much higher than would occur from modern thermal waste treatment facilities, both the Defra and SAHSU studies were unable to convincingly demonstrate an excess of cancers.

1.34 Following these studies, the Department of Health's Committee on Carcinogenicity published a statement in March 2000 evaluating the evidence linking cancer with proximity to municipal solid waste incinerators in the UK. The committee specifically examined the results of these studies and concluded that:

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'any potential risk of cancer due to residency (for periods in excess of ten year) near to municipal solid waste incinerators was exceedingly low and probably not measurable by the most modern techniques' (Ref.12).

1.35 In February 2010, The Department of Health's Protection Agency Radiation, Chemical and Environmental Hazards reproduced their 2009 position paper on cancer incidence in proximity to municipal solid waste incinerators in the UK. The update undertook a further review of recent epidemiological studies on cancer incidence near municipal solid waste incinerators. They concluded that there is insufficient evidence to suggest that well managed and regulated thermal waste treatment facilities present a significant risk to health (Ref.12).

1.36 Noting that emissions from modern thermal waste treatment facilities are orders of magnitude lower than from older incinerators, it may be concluded with some confidence that any impact on cancer rates in local people are small or non-existent and unlikely to be quantified through epidemiology (Ref.13).

**Respiratory Function and Disease**

1.37 Available studies have typically examined respiratory health around the older generation of incinerators, which were subject to less stringent levels of control than the modern plants regulated under the WID (2000). Overall, there is little evidence to suggest that thermal waste treatment facilities are associated with increased prevalence of respiratory symptoms in the surrounding population.

1.38 This is consistent with emissions and ambient air quality monitoring in the vicinity of thermal waste treatment facilities, which indicate that modern, well managed facilities make a very small contribution to background levels of air pollutants and are not a significant contributor to local air pollution.

1.39 The Defra Study concluded that modern thermal waste treatment facilities simply do not generate sufficient concentrations of emissions to quantify any meaningful change in health effect (Ref.13). In the absence of any exposure response coefficient specific to thermal waste treatment facilities, the current approach is to use known exposure response coefficients derived from more significant emission sources (e.g. road emissions) to quantify the magnitude and distribution of health outcome. Here, the UK Department of Health's Committee on the Medical Effects of Air Pollutants (COMEAP) has established that:

- There is a 0.75% increased risk in the background rate of all cause mortality per 10 µg.m⁻³ increase in PM₁₀ per 100,000 individuals exposed;

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There is a 6% increased risk in the background rate of all cause mortality per 10 µg.m\(^{-3}\) increase in PM\(_{2.5}\) per 100,000 individuals exposed; and

There is a 0.8% increased risk in respiratory and cardiovascular hospital admissions per 10 µg.m\(^{-3}\) increase in PM\(_{10}\) per 100,000 individuals exposed (Ref.14).

Such potential health outcomes are primarily dependent upon the level of community exposure and their existing burden of poor health. However:

- Modern thermal waste treatment facility emissions are not of a level to result in a significant impact upon ambient air quality;
- Changes in ambient concentrations of particulate matter emissions are typically orders of magnitude lower than the 10 µg.m\(^{-3}\) increase required to quantify any meaningful change in health outcome; and
- Community exposure is typically far lower than the 100,000 population exposure used as the basis to quantify any meaningful health outcome.

A review of research by the Health Protection Agency concluded that;

"The Health Protection Agency has reviewed research undertaken to examine the suggested links between emissions from municipal waste incinerators and effects on health. While it is not possible to rule out adverse health effects from modern, well regulated municipal waste incinerators with complete certainty, any potential damage to the health of those living close-by is likely to be very small, if detectable. This view is based on detailed assessments of the effects of air pollutants on health and on the fact that modern and well managed municipal waste incinerators make only a very small contribution to local concentrations of air pollutants" (Ref.15).

This is reflected through EfW Development Guidance prepared by WRAP, a government funded body who seek to minimise resource use and divert waste from landfill. The guide states ‘health protection is an inherent feature of the design, assessment and permitting of EfW facilities’ and also refers to the HPA position on municipal waste incinerators (Ref.16).

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Congenital Abnormalities

1.43 High exposure to environmental pollutants is known to adversely affect the reproductive system of animal test subjects. However, epidemiological studies fail to establish any convincing links between thermal waste treatment facility emissions and congenital abnormality (Ref.17). In a study of spontaneous abortion and prevalence at birth of congenital anomalies in women residing or working near the municipal solid waste find there is little evidence of risk of adverse pregnancy outcomes in women due to exposure to emissions from a modern municipal solid waste incinerator (Ref.18).

Infant Mortality

1.44 Risk of increased infant mortality as a consequence of emissions from thermal waste treatment facilities is a frequently raised issue by concerned communities. However, there is no evidence publicised in the scientific literature to suggest that modern thermal waste treatment facilities increase the risk of infant mortality (Ref.17). There are a number of websites which published material relating to excess infant mortality near incinerators. These material do not however appear in peer reviewed scientific literature and cannot therefore be accepted as credible without further clarification of the evidence applied.

1.45 Based upon the available evidence base, it is concluded that well-managed and regulated thermal waste treatment facilities contribute little to the concentrations of monitored pollutants in ambient air and that the emissions from such plants have little effect on health. This conclusion is consistent with the Position Statements issued by the Environment Agency in 2008 (Ref.19), UK Health Protection Agency (Ref. 20 ) in 2010 and the Chartered Institute of Water and Environmental Management in 2006 (Ref.21).


1.46 The evidence base indicates that there is limited evidence to suggest that well managed and regulated MRF and thermal waste treatment facilities present a significant risk to community health.

1.47 This conclusion is consistent with the Position Statement issued by the Environment Agency, UK Health Protection Agency and the Chartered Institute of Water and Environmental Management.

1.48 However, it is also recognised that variation at the project level (including the size and location of the facility and type of potential exposure) coupled with local community circumstance can influence relative sensitivity to particular health pathways, hence the requirement and benefit for Health Impact Assessment.

### Additional Sources of Authoritative Information and Guidance

**Table B.1 Reference Documents for Health Impact of Energy Recovery From Waste**

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<th>Organization</th>
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<td>Committee on the Medical Effects of Air Pollutants (COMEAP), the Health Protection Agency</td>
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<td><a href="http://www.hpa.org.uk/webc/HPAwebFile/HPAweb/C/1317137020526">http://www.hpa.org.uk/webc/HPAwebFile/HPAweb/C/1317137020526</a></td>
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<td>Health Impact Assessment of Waste Management: Methodological Aspects and Information Sources</td>
<td>Environment Agency</td>
<td>2005</td>
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</tbody>
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