ENVIRONMENTAL BALANCE IN DESIGN AND CONSTRUCTION

KNOCKHARLEY LANDFILL LTD.

ENVIRONMENTAL IMPACT ASSESSMENT REPORT (EIAR) FOR PROPOSED DEVELOPMENT AT KNOCKHARLEY LANDFILL

VOLUME 2 – MAIN EIAR

CHAPTER 4 – NEED FOR THE DEVELOPMENT & ALTERNATIVES CONSIDERED

NOVEMBER 2018

Knockharley Landfill Ltd.
Kentstown, Navan,Co.Meath

FEHILY TIMONEY & COMPANY

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4.1 Introduction

This chapter assesses the need for the proposed development in the context of the existing and future waste management environment in Ireland.

The need for the proposed development is determined through consideration of a number of factors:

- examination of the current levels of generation of particular waste streams and likely future rates of generation
- assessment of the adequacy of the existing means of management of these waste streams
- consideration for the need for contingency/emergency waste management capacity with the State in the event of an emergency arising, and
- consideration the relevant policy environment that pertains to the relevant waste stream

Chapter 3 of this Main Volume of the EIAR has examined relevant policy in detail and where applicable, these policies will be referenced in this section in the context of the need for the development as appropriate.

The relevant waste streams for which the proposed development can provide capacity over its lifetime will include:

- incinerator bottom ash (IBA)
- non-hazardous wastes of municipal (household and commercial) and industrial origin, including wastes of this origin arising from, for example, stabilised waste, repatriation, historic legacy sites, illegal landfills and emergency/contingency events and SHRHW
- non-hazardous soil and other C&D wastes

These waste streams are examined in further detail in the following sections in order to identify the reasons why the proposed development is required for their management. As a first step, however, an overview of the developments that have occurred in the landfill and wider waste management sectors in the past number of years, and that are likely to recur in the coming years, is presented, in order to set the context in which the proposed development should be considered, in terms of the provision of landfill capacity on a regional and national basis.

4.2 Context of Proposed Development

The context in which the application for permission in respect of the proposed development is made reflects a waste management sector which has undergone significant changes in the past number of years and which continues to undergo change. The waste management sector is transitioning from being heavily 'landfill supported', to one in which the role of landfill is diminishing. This reflects the requirements and objectives of European, national, regional and local policy, where waste management activities are focused on the higher tiers of the waste hierarchy.

However, what has occurred in Ireland in recent years is that this transition has occurred in a relatively uncontrolled manner, with national landfill capacity being significantly reduced over a short period of time, leading to significant pressures in the management of certain waste types, where suitable and sustainable outlets for landfillable waste have been lacking. Indeed, from time to time in recent years, emergency situations have arisen, in which waste acceptance was permitted under Section 56 of WMA. In addition, the treatment of certain wastes in higher tiers of the waste hierarchy, is resulting in different waste streams requiring further management, for which landfill is an acceptable and sustainable outlet.

In addition, there is an increasingly visible requirement for the availability of landfill capacity for the management of wastes illegally deposited at unauthorised sites, both within the Republic of Ireland and in Northern Ireland, where landfill is the only appropriate means of management of this material.

Accordingly, there will remain a requirement for landfill capacity as part of a fully integrated waste management system, which incorporates high rates of recovery and recycling, to provide management capacity for non-recoverable/non-recyclable wastes, as well as to provide back-up contingency and emergency capacity, as and when required.

It is in this context that this development is proposed.

4.2.1 Decreasing Landfill Capacity

Table 4-1 presents the number of landfills accepting MSW between 2008 and 2018 (November), sourced from EPA produced national waste reports for the years 2008 to 2012 and from respective facility annual environmental returns (AERs) and industry knowledge for subsequent years – in Table 4-1, 'O' represents a respective facility being operational in that year.

Table 4-1: Operational MSW landfills between 2008 and 2018

Facility	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Ballynacarrick	O	O	O	O	O	-	-	-	-	-	
Derrinumera	O	-	O	O	O	-	-	-	-	-	
Rathroeen	O	O	O	O	O	O	O	O			
Scotch Corner **	O	O	O	O	O	O	O	O	O	-	
Ballyeally	O	O	O	O	O	-	-	-	-	-	
Kyletalesha ***	O	O	O	O	O	-	-	-	-	-	
Whiteriver	O	O	O	O	O	O	-	-	-	-	
Arthurstown	O	O	O	-	-	-	-	-	-	-	
Rampere	O	O	O	O	O	-	-	-	-	-	
Powerstown	O	O	O	O	O	O	O	O	O	-	
Youghal	O	O	O	O	O	-	-	-	-	-	
North Kerry	O	O	O	O	O	O	O	-	-	-	
Gortadroma	O	O	O	O	O	O	O	-	-	-	
Donohill	O	O	O	-	O	O	O	-	-	-	
Holmestown	O	O	O	O	O	-	-	-	-	-	
East Galway	O	O	O	O	O	O	O*	O*	O	O	O
Drehid	O	O	O	O	O	O	O	O	O	O	O
Knockharley	O	O	O	O	O	O	O*	O*	O	O	O
Ballynagran	O	O	O	O	O	O	O	O	O	O	O
Corranure	O	O	O	-	-	-	-	-	-	-	
Inagh	O	O	O	O	-	-	-	-	-	-	
Kinsale Road	O	O	-	-	-	-	-	-	-	-	

Facility	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Derryconnell	O	O	O	-	-	-	-	-	-	-	
Ballynacarrick	O	O	O	O	-	-	-	-	-	-	
Balleally	O	O	O	O	-	-	-	-	-	-	
Dunmore	O	O	O	-	-	-	-	-	-	-	
Ballaghveny	O	O	O	O	-	-	-	-	-	-	
Derryclure	O	O	O	O	-	-	-	-	-	-	
Ballaghdereen	O	O	O	-	-	-	-	-	-	-	
Ballydonagh	O	O	O	-	-	-	-	-	-	-	
Killurin	O	-	-	-	-	-	-	-	-	-	
KTK	O	O	O	O	-	-	-	-	-	-	
Kerdiffstown	O	-	O	-	-	-	-	-	-	-	
No. of Operational facilities	**33**	**30**	**31**	**23**	**18**	**11**	**10**	**7**	**6**	**4**	**4**
** East Galway Landfill and Knockharley Landfill did not accept significant quantities of waste in 2014 & 2015*											
*** Scotch Corner ceased waste acceptance in Q2 2017*											
**** Kyletlaesha Landfill facility re-opened in Q3 2017 for the acceptance of C&D soil and stones*											

The purpose of Table 4-1 is to highlight the dramatic decrease in the number of operational landfills accepting MSW in the country between 2008 and 2018 – from 33 operational facilities in 2008 to just 4 in 2018. Approximately 3.2 million tonnes of household, commercial, industrial and C&D waste materials were accepted at the facilities in 2008, while the combined disposal capacity of the 4 remaining facilities, as per time of writing in 2018 is 698,000 tonnes. From 2012 onwards, the most dramatic drop off is observed.

Table 4-1 presents a visualisation of the dramatic reduction in landfill capacity within the country in the identified years – while a number of factors contributed to this reduction, not least economic factors associated with the economic downturn between 2008 and 2012, the waste management capacity removed by this reduction has not been replaced with sustainable solutions, leading to sectoral pressures discussed in more detail in the following sections.

Further discussion on current and future landfill capacity is presented in Section 4.4.1.

4.2.2 Capacity considerations

Landfill planning consent applications have historically presented arguments for the need for landfill development based on projections of future waste generation, assumptions around relevant recycling/recovery rates and identification of competing or alternative means of managements of wastes.

While a not dissimilar approach is taken in the following sections of this chapter in discussing the need for the proposed development, historically, the arguments around the need for landfill capacity have always centred on the objective (of the consenting authorities) of ensuring that 'over-capacity' of landfill did not result from granted consents. This is exemplified by the reduction in waste acceptance waste for disposal applied to the Knockharley Landfill from 2010, applied in the context of the applicable waste management plan at the time of application.

While the logic behind this objective appeared sensible at that time i.e. that providing overcapacity of landfill may have stymied efforts to improve recycling & recovery performance and develop a more integrated waste management system within the country, it is not appropriate to apply a similar logic to an application for landfill development consent in 2018.

This is due to the fact there now exists a range of other instruments, supported by national and regional policy measures, that control and influence waste to landfill including:

- the application of the landfill levy at a rate of €75 per tonne, which has applied since 2013.
- active enforcement of the requirement for landfill operators to demonstrate compliance with Section 53A of the Waste Management Act, 1996 as amended, such that appropriate charges are imposed for the disposal of waste at landfill facilities
- the requirement for pre-treatment being conditioned into landfill licences, in accordance with EPA guidance on the matter
- availability of other more cost-effective options for residual waste treatment in particular i.e. thermal treatment (incineration), mechanical treatment incorporating recovered fuel production, export of waste – the current applicability of these options in discussed in more detail in the following.

While not proposing a capacity-focussed approach to considering the overall need for the proposed development, there is a significant under capacity for the management of municipal solid wastes (and non-municipal wastes) nationally due to the lack of appropriate waste management infrastructure, as identified in each of the annual implementation regions by the three waste management regions, where each states that …*"during 2016 there was a national waste infrastructure deficit due to the lack of suitable outlets for municipal residual wastes".* This shortfall has resulted in the Section 56 authorisations (in relation to measures to prevent or limit environmental pollution caused by waste) being granted over the recent years, including in relation to depositing waste at the Knockharley landfill.

The Eastern Midlands Region Annual Report 2015/2016 also identifies that *"it is clear that an immediate requirement for significant additional active licensed capacity is required".* Further assessment of landfill capacity is provided in Section 4.4.1.

In a fully functioning, integrated waste management system, landfill provides the last option for wastes that cannot be managed alternatively, while providing an appropriate means of management for wastes for which there are no alternatives.

To this end, and specifically in light of the dramatic reduction in national landfill capacity, the application of a "capacity focussed" logic as a means of influencing/controlling volume of wastes to landfill is not appropriate in the current climate, given the other instruments that now influence waste movement towards landfill.

Future landfill capacity within the country will be provided at a small number of facilities, including at the Knockharley Landfill facility – it therefore is logical that these facilities operate at appropriate capacities, in order that:

1. sufficient capacity is provided for, at least, the quantities of MSW and non MSW residuals wastes that may be directed towards to landfill in future years
2. appropriate contingency capacity is provided to account for emergency, unplanned and unexpected events, as and when required.

In summary, future consideration of individual landfill capacities should focus on ensuring appropriate capacities are provided to account for likely and potential inputs including making provision for contingency / emergency events, rather than attempting to limit input quantities, as this is sufficiently influenced by the measures identified.

4.2.3 Capacity on a National Basis

Landfill capacity was historically considered in the context of the applicable waste management plans at the time of licence application, such that landfill capacity was primarily determined as providing capacity for the particular region in which a facility was located.

Subsequent to that, the concept of 'inter-regional movement of waste' was recognised by relevant authorities, as landfill facilities began to reduce in number with the consequent requirement to utilise capacity within other regions.[1]

With the rationalisation of waste management regions in Ireland from 10 down to 3, as required by the national policy document 'A Resource Opportunity', as identified in Chapter 3, the majority of existing landfill capacity is now located within the Eastern & Midlands waste management region: Knockharley Landfill, Ballynagran Landfill and Drehid Landfill. The East Galway Residual Landfill is located in the Connacht-Ulster Waste Management Region and is currently operational but planning for this site will expire in December 2018.

Therefore, in the coming years, with landfill capacity concentrated particularly within the Eastern Midlands waste management region, this capacity by default will be considered as national capacity, given the absence of landfilling capacity within the Southern and Connacht-Ulster regions.

4.2.4 Policy Environment

As identified in Chapter 3, national policy, as presented in 'A Resource Opportunity' identifies policy objectives relating to '*landfill elimination'.*

Thus, consideration of the policy environment in which the current situation, in terms of landfill capacity, exists, must always acknowledge and be tempered by the actual situation that is occurring within the waste sector, when determining any proposed development's consonance with policy.

4.2.5 Infrastructural Developments

The commencement of operations at the Dublin Waste to Energy facility in Q2 of 2017 is a significant factor in the future management of residual municipal solid waste, within the country. A significant quantity of residual waste materials that are currently exported are likely to migrate to this facility, and combined with the Carranstown Waste to Energy facility, and with thermal capacity provided at cement kilns within the country, indigenous thermal recovery of energy from waste will be the primary means of management of residual municipal waste nationally from this point onwards, in line with policy objectives of the regional waste management plans (where the national need for 300,000 tonnes of further thermal treatment capacity is identified).

This further 300,000 tonnes of thermal capacity may be provided through the development of another dedicated waste to energy facility, with a number of such facilities currently in various stages of the planning process at present, or through increased recovered fuel utilisation at cement kilns, where a number of planning applications relating to increased recovered fuel utilisation are being considered, or a combination of both. However, at the time of writing there is no certainty in relation to any timeline associated with the provision of this infrastructure.

However, increased thermal treatment of wastes means increased generation of outputs from this process which will require management. With a combined 820,000 tonnes of thermal capacity (from 2018) from Carranstown and Dublin Waste to Energy facilities alone, this will result in the generation of c. 160,000 tonnes of incinerator bottom ash (IBA) that requires management – with potential alternative outlets for bottom ash (e.g. road construction aggregate) not yet developed within the country, IBA storage remains the most appropriate means of management of this material. Even in the event of alternative outlets for this material being developed, storage capacity will be required to be maintained, given the variability in demand that would likely be associated with such alternative outlets.

Increased recovered fuel utilisation is also likely to result in the increased production of residual municipal solid waste 'fines' material to be appropriately stabilised.

[1] National Waste Report (NWR) 2012, which states that declining numbers of landfills "*will lead to significant inter-regional movement of waste as the remaining capacity is not distributed evenly across the State*".

4.2.6 Removal of Previously Deposited Wastes

In addition to residual MSW and IBA material that requires management nationally, there is a significant quantity of waste material that requires management arising from obligations to deal with illegally deposited waste, where this material will effectively require removal as part of the remediation of these sites e.g. Whitestown landfill, Co. Wicklow.

As previously identified in Chapter 3, there is a requirement for the disposal of repatriated MSW from Northern Ireland as part of the intergovernmental agreement on the repatriation of waste[2]. As per the Eastern Midlands Region Waste Management Plan 2015-2021, an estimated 120,000 tonnes of waste that remains to be repatriated. Since the publication of the regional plans, a number of further sites have been discovered in Tyrone and Armagh in 2015 and 2016, such that it is now estimated that at least 170,000 tonnes of waste that remains to be repatriated[3].

It was originally envisaged in the July 2014 'Comptroller and Auditor General Special Report – Transhipment of Waste' that, on the basis of repatriation of the 7 remaining sites (at that time) at a rate of 2 sites per year, the repatriation programme would be completed by the end of 2018. Such progress has not been realised to date. A framework of approved landfills, identified as being appropriate to accept repatriated waste from Northern Ireland, which Knockharley Landfill is on, and is the closest landfills to Northern Ireland in terms of distances from the sites from which waste will be repatriated.

With an increased number of sites having been discovered, as well as progress not having been made at the rate expected in the Comptroller and Auditor General Special Report of 2014, it is evident that the requirement for repatriation capacity will extend until such time as all of the remaining sites are fully completed.

Chapter 3 also identifies the requirement for the remediation of a number of 'Class A' historic legacy sites, not only within the Eastern Midlands region, but nationally, where remediation by removal may likely to be required in some instances. There are 23 Class A sites identified with the Eastern Midlands Region, 16 in the Connacht Ulster Region and 34 in the Southern Region, with each regional plan referencing the development of a roadmap to identify the remediation of these sites over the lifetime of the plans i.e. 2015 to 2021. While it is not possible to quantify the exact amount of waste that may require removal from these sites, as in situ management may form part of individual remediation plans, with 73 sites requiring management nationally over the lifetime of the plans, there remains potential for the generation of significant waste volumes for management.

In addition, there are a number of other illegal landfills facilities identified for which the requirement for the removal of waste is highly likely - 2 no. illegals landfills alone having been identified in 2016 in Co. Meath[4] and Co. Donegal[5] and one significant illegal landfill having been identified as requiring significant remediation activity in Co. Wicklow in 2017[6].

These materials, if removed from the illegal and Class A sites, can only be managed by landfilling in an appropriate designed and managed facility, as it is unsuitable for thermal treatment.

Furthermore, it is also identified that it is intention of Wexford County Council to remove all waste accepted to date at the Holmestown Landfill facility, such that the site will no longer be designated a waste management facility and to allow it to be potentially utilised for other non-waste related activities. Holmestown Landfill commenced waste accepted in 2008 and ceased in 2012, over which time c. 120,000 tonnes of waste material was accepted including cover material. Should this material be removed, it too shall require management by landfilling at an alternative site.

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[2] Comptroller & Auditor General Special Report – Transhipment of Waste, July 2014: http://www.audgen.gov.ie/documents/vfmreports/84_Transhipment_Waste.pdf

[3] http://www.irishexaminer.com/ireland/euro7m-spent-removing-illegal-waste-dumped-in-north-307653.html http://www.independent.ie/irish-news/news/20000-tonnes-of-republics-waste-found-dumped-in-the-north-34523843.html

[4] http://www.irishexaminer.com/ireland/council-claims-land-used-for-illegal-dump-426632.html

[5] http://www.independent.ie/irish-news/exclusive-investigators-discover-massive-illegal-dump-after-threeyearlong-investigation-into-suspicious-activity-35224466.html

[6] https://www.irishtimes.com/news/crime-and-law/courts/high-court/wicklow-council-ordered-to-remove-up-to-1-4m-tonnes-from-dump-1.3146953

Therefore, there are significant quantities of waste that the State is or will be obliged to appropriately manage in the coming years, for which landfill will be the primary means of management of this material, given that it is unsuitable for acceptance at waste to energy or other facilities. Capacity for the management of this material must therefore be available.

4.2.7 C&D waste & soils and stone

The recently published report, prepared on behalf of the three waste management regions, entitled 'Construction & Demolition Waste – Soil and Stone Recovery/Disposal Capacity', referenced in Chapter 3, identifies a potential shortfall in capacity for C&D soil and stone in the range of c. 1.5 million tonnes in 2018 to just under 4 million tonnes in 2023. In the context of this proposed development, where potential to increase the acceptance of this type of material at the Knockharley Landfill facility exists, as described in Chapter 2, this identified lack of capacity is a significant contextual issue.

4.2.8 Summary of Context

This section is intended to provide an overview of the context in which the proposed development application is made. Issues touched upon in this section are expanded in the following sections where relevant. The following summarises the context of the proposed development application:

- The dramatic decrease in landfill capacity that has not been replaced by appropriate and sustainable alternative management options
- An identified immediate requirement for further infrastructural capacity for the management of MSW
- The development of a number of measures, primarily financial, that influence the acceptance of waste at landfill, that provide alternatives to the imposition of capacity restrictions, as historically applied in the granting of permissions for landfill development
- The consideration of landfill capacity as national rather than regional capacity
- The requirement to reflect the actual situation occurring within the waste management sector when assessing compliance with relevant policies
- The potential for further thermal treatment infrastructural development albeit with lack of certainty around associated timelines
- The continued requirement for landfill capacity for management of non-municipal wastes e.g. IBA and C&D material and soils, as well as the requirement for significant landfill capacity to appropriately manage waste from repatriated and unauthorised sites.
- This continued need for contingency landfill void in the event of an emergency arising.

4.3 Quantification of Wastes Requiring Management

This section presents analysis to quantify the likely future amounts of the waste materials proposed for acceptance, as part of this development, and as described in Chapter 2 'Description of the Proposed Development'. Subsequent sections of this chapter assess the means by which these wastes may be managed, such that the need for the capacity proposed as part of this development can be identified.

Waste types are examined in the following groupings:

- Household, commercial and industrial wastes, including stabilised residual fines
- Incinerator bottom ash (IBA)
- C&D, non-hazardous soil
- Other wastes – grit & screening, street sweepings, contaminated dry recyclables

In addition, contingency provision in terms of unforeseen events occurring is also discussed.

4.3.1 Household, commercial and industrial wastes, including stabilised residual fines

Schedule A of the existing IE licence W0146-02 for the Knockharley Landfill authorises the acceptance of 175,000 tonnes of "household, commercial and industrial waste" for disposal in the following proportions:

- Household – 100,000 tonnes
- Commercial – 45,000 tonnes
- Industrial – 30,000 tonnes

Schedule A also allows for the recovery of 25,000 tonnes of construction and demolition (C&D) waste.

While not identified as MSW in Schedule A, the three 'origins' of the waste authorised for disposal amount to the definition of municipal solid waste (MSW) where MSW is defined as "household waste as well as commercial and other waste that, because of its nature or composition, is similar to household waste[7].

For the purposes of this analysis, the description of "household, commercial and industrial waste" is taken as MSW.

As per the requirements of W0146-02, MSW must be accepted at the facility in a pre-treated form. Pre-treatment includes a variety of process including source segregation, separate collection, manual sorting, mechanical treatment etc. When mechanical treatment, in the form of tromelling or screening is applied to the residual ("black bin") fraction of MSW, 'fines' material is produced, which typically has a high organic fraction.

This material is typically biologically treated to produce a stabilised material with a reduced landfill gas and leachate generation potential, such that it can be landfilled. Thus, this 'stabilised fines' material is a material of municipal origin and is appropriate to be considered within this section. However, the quantification of this material is related to the extent of mechanical treatment that may be applied to residual MSW, and so the quantification of same, and hence the need for the proposed biological treatment facility, is addressed in the following sections that consider management options for this material.

Current & Future MSW generation

Current and future MSW generation is assessed on a national basis in the following section, given that consideration of future landfill capacity as being on a national basis, as previously discussed.

Current MSW Generation

The National Waste Report (NWR) 2012 remains the most recent, detailed published source of waste generation nationally. A national waste report was produced annually by the EPA for each year up to 2012 but due to a change in the way in which the EPA reports data to the European Union, annual reports are no longer published.

Table 4-2 over presents the following data in relation to national MSW generation, management and treatment in 2012 i.e. the most recent verified data available.

[7] As per National Waste Report 2012 - it excludes municipal sludges and effluents. In the context of the NWR, municipal waste consists of three main elements - household, commercial (including non-process industrial waste), and street cleansing waste (street sweepings, street bins and municipal parks and cemeteries maintenance waste, litter campaign material).

Table 4-2: MSW generated, managed and treated in 2012

Municipal Solid Waste:	Quantity (tonnes)
Generated	2,692,537
Managed	2,478,337
Landfilled	1,027,577
Incinerated	427,142
Recycled (ex. composting/digestion)	828,492
Composted/digested	156,212

Ireland is on target to achieve its targets under the Waste Framework by 2020 as follows[8]:

- reuse or recycle 50% of household derived paper, metal, plastic & glass
- reuse, recycling and other material of 70% by weight of C&D non-hazardous waste
- Establishment of a National Waste Prevention Programme

1,027,577 tonnes of residual MSW was landfilled i.e. the fraction of MSW remaining after a treatment or diversion step, across 18 landfills that were operating in 2012, which corresponds to a 41% disposal rate of MSW managed.

The remaining 59% recovery rate applies to material that was recycled, composted/digested or recovered in incineration and other facilities.

The c. 430,000 tonnes of residual MSW incinerated in 2012 was comprised of:

- c. 200,000 tonnes incinerated at the Carrranstown EfW facility i.e.
  - c. 170,000 tonnes of mixed residual waste and
  - c. 30,000 tonnes of recovered fuel derived from residual MSW
- c. 66,000 tonnes of recovered fuel accepted at Irish Cement
- c. 70,000 tonnes of recovered fuel accepted at Lagan Cement
- c. 94,000 tonnes of recovered fuel and mixed MSW exported to the continent

In total, there was c. 1,455,000 tonnes of residual MSW that was managed in Ireland and abroad by recovery through incineration and other thermal treatment (i.e. cement kilns) and disposal in landfill.

Future MSW Generation

Each of the three regional waste management plans published in 2015 provides projections of regional waste generation which, when combined, present future national waste generation projections. Given that these projections form the basis on which the policy objectives within the regional plans are made, it is considered appropriate to utilise the projections made within these plans in this need assessment.

Table 4-3 summarises the future MSW projections provided with the three regional plans, which are presented in detail up until 2021.

Figures presented within the regional plans are presented for every two years (2013, 2015, 2017 etc.) and so Table 4-3 reflects the intervening years as being the midpoints between the tonnages identified. These projections within the plans reflect a year on year growth of 2-3% for both household and commercial wastes.

[8] http://www.epa.ie/pubs/reports/waste/stats/EPA_Progress%20towards%20EU%20targets_Nov17.pdf

The regional waste plans also envisage an MSW generation total of approximately 3.9 million tonnes by 2030, which was determined by applying a 2.5% growth factor for the period for 2020 to 2030. While the tonnages for the intervening period between 2021 and 2030 are not presented within the plans, Table 4-3 applies the growth factors identified to the MSW generated to reach the figures presented for 2030.

Note that the regional plans allow for total MSW generated, rather than managed, the difference being 'uncollected waste', for which an assumption is annually included in national waste reporting (reference Table 4-2 where the difference between MSW generated and managed equated to 214,200 tonnes of 'uncollected waste'[9] i.e. approximately 8% of MSW generation in 2012). The regional plan projections have maintained a figure of 214,200 tonnes difference between MSW generated and managed to 2021, and Table 4-3 continues this inclusion to 2030 – as waste volumes increase, the % proportion of uncollected waste declines, which is considered likely to reflect improvements in waste collection coverage in future years.

Note also that projections within the regional plans do not include for street cleaning or cleansing wastes, which are typically included in municipal projections. This waste type is not included in Table 4-3 and instead is addressed in further detail in Section 4.3.4 following.

[9] Methodology for calculation of same provided in Appendix M of NWR 2012

Table 4-3: Regional Waste Management Plans projections

	Year	2013,t	2014,t	2015,t	2016,t	2017,t	2018,t	2019,t	2020,t	2021,t	2022,t	2023,t	2024,t	2025,t	2026,t	2027,t	2028,t	2029,t	2030,t
Connacht/Ulster Region	*High Range*	428,177	439,119	450,061	462,537	475,012	489,044	503,076	516,525	529,973	543,222	556,803	570,723	584,991	599,616	614,606	629,971	645,721	661,864
	Low Range	432,333	443,399	454,465	461,993	469,521	477,244	484,967	492,498	500,029	512,530	525,343	538,477	551,938	565,737	579,880	594,377	609,237	624,468
Eastern/Midlands Region	*High Range*	1,229,965	1,306,313	1,382,661	1,426,717	1,470,772	1,519,317	1,567,862	1,612,747	1,657,632	1,699,073	1,741,550	1,785,088	1,829,716	1,875,458	1,922,345	1,970,404	2,019,664	2,070,155
	Low Range	1,332,303	1,373,816	1,415,328	1,445,384	1,475,440	1,506,250	1,537,059	1,565,549	1,594,038	1,633,889	1,674,736	1,716,605	1,759,520	1,803,508	1,848,595	1,894,810	1,942,181	1,990,735
Southern Region	*High Range*	884,171	908,179	932,187	958,238	984,289	1,013,284	1,042,278	1,070,181	1,098,083	1,125,535	1,153,673	1,182,515	1,212,078	1,242,380	1,273,440	1,305,276	1,337,908	1,371,355
	Low Range	892,643	917,366	942,089	958,957	975,824	992,875	1,009,926	1,026,803	1,043,680	1,069,772	1,096,516	1,123,929	1,152,027	1,180,828	1,210,349	1,240,608	1,271,623	1,303,413
Total Generated	*High Range*	2,542,313	2,653,611	2,764,909	2,847,491	2,930,073	3,021,645	3,113,216	3,199,452	3,285,688	3,367,830	3,452,026	3,538,327	3,626,785	3,717,454	3,810,391	3,905,651	4,003,292	4,103,374
	Low Range	2,657,279	2,734,581	2,811,882	2,866,334	2,920,785	2,976,369	3,031,952	3,084,850	3,137,747	3,216,191	3,296,595	3,379,010	3,463,486	3,550,073	3,638,825	3,729,795	3,823,040	3,918,616
	Midpoint	2,599,796	2,694,096	2,788,396	2,856,913	2,925,429	2,999,007	3,072,584	3,142,151	3,211,718	3,292,011	3,374,311	3,458,669	3,545,136	3,633,764	3,724,608	3,817,723	3,913,167	4,010,996
Total Managed	High Range	2,328,113	2,439,411	2,550,709	2,633,291	2,715,873	2,807,445	2,899,016	2,985,252	3,071,488	3,153,630	3,237,826	3,324,127	3,412,585	3,503,254	3,596,191	3,691,451	3,789,092	3,889,174
	Low Range	2,443,079	2,520,381	2,597,682	2,652,134	2,706,585	2,762,169	2,817,752	2,870,650	2,923,547	3,001,991	3,082,395	3,164,810	3,249,286	3,335,873	3,424,625	3,515,595	3,608,840	3,704,416
	Midpoint	**2,385,596**	**2,479,896**	**2,574,196**	**2,642,713**	**2,711,229**	**2,784,807**	**2,858,384**	**2,927,951**	**2,997,518**	**3,154,756**	**3,160,111**	**3,244,468**	**3,330,935**	**3,419,564**	**3,510,408**	**3,603,523**	**3,698,966**	**3,796,795**

As identified, the regional plans estimated an MSW generation of approximately 3.9 million tonnes in 2030, which equates to the approximate midpoint between the 'total managed' low range and 'total generated' high range, as shown in Table 4-3.

Therefore, it is considered that taking the 'total managed' midpoint forecast range provides a reasonable projection of future MSW generation nationally, based on the regional plan data.

Future Residual MSW Projections

While future 'overall' MSW generations are presented in Table 4-3, it is only the residual fraction of MSW that may potentially be landfilled, after the application of pre-treatment or other treatment steps. In terms of projecting future residual MSW quantities, the residual fraction can be considered as that which remains after the application of recycling activities – therefore, the future recycling rate will influence the amount of residual MSW that is managed through non- recycling means, which will essentially be recovery through thermal treatment or disposal post treatment (which includes pre-treatment).

Table 4-4 below presents the future MSW projections identified in Table 4-3 and applies appropriate recycling rates to these figures, in accordance with targets laid out in the three regional plans, which assume the achievement of a 50% MSW recycling rate by 2020, with incremental growth in the years thereafter, such that recycling rates in excess of 60% are ultimately achieved by 2030 and beyond.

The starting point for the projected recycling rate presented is the 2012 position of 984,704 tonnes recycled, as per NWR 2012 i.e. material recycled (828,492 tonnes) plus material composted/digested (156,212 tonnes), as composting/digestion are considered recycling activities. Of MSW managed, this corresponded to a total of 39.7%, taken as 40%, which is close to the EU recycling average of 42%. Incremental linear increases of 1.25% per annum are applied from 2012 onwards, to reach 50% by 2020, and the same rate of increase is applied post 2020, as applied within the regional plans, resulting a recycling rate of 62.5% is observed by 2030.

It should be noted that the recycling rate projected to 2030 can be considered very challenging and reflects the efforts that will be required to further develop an extensive national biological treatment capacity to provide the higher composting/digestion rates that contribute to the high overall recycling rates, observed in countries such as Germany (65% recycling) and Austria (62% recycling), for example.

Table 4-4: MSW projections from 2013 to 2030

Year	MSW Projections	Recycling Rate	Projected Recycling Volume	Residual MSW remaining
2013	2,385,596	41.25%	984,058	1,401,538
2014	2,479,896	42.50%	1,053,956	1,425,940
2015	2,574,196	43.75%	1,126,211	1,447,985
2016	2,642,713	45.00%	1,189,221	1,453,492
2017	2,711,229	46.25%	1,253,943	1,457,286
2018	2,784,807	47.50%	1,322,783	1,462,023
2019	2,858,384	48.75%	1,393,462	1,464,922
2020	2,927,951	50.00%	1,463,976	1,463,976
2021	2,997,518	51.25%	1,536,228	1,461,290
2022	3,154,756	52.50%	1,656,247	1,498,509
2023	3,160,111	53.75%	1,698,560	1,461,551
2024	3,244,468	55.00%	1,784,458	1,460,011

Year	MSW Projections	Recycling Rate	Projected Recycling Volume	Residual MSW remaining
2025	3,330,935	56.25%	1,873,651	1,457,284
2026	3,419,564	57.50%	1,966,249	1,453,315
2027	3,510,408	58.75%	2,062,364	1,448,043
2028	3,603,523	60.00%	2,162,114	1,441,409
2029	3,698,966	61.25%	2,265,617	1,433,349
2030	3,796,795	62.50%	2,372,997	1,423,798

While acknowledged that projecting waste volumes is an inexact science, by applying the assumptions to the data presented within the regional waste management plans, it can be seen that it is likely that there will be between **1.40 and 1.49 million tonnes of residual MSW** requiring management each year over the next 15 years or so.

4.3.2 Incinerator Bottom Ash (IBA)

IBA is currently accepted at the Knockharley Landfill facility from the Indaver EfW facility in Carranstown, Co. Meath, with 15,198 tonnes accepted in 2016 and 13,200 tonnes in 2017. A portion of the IBA material is currently disposed of in the landfill void with the remainder used in the construction of temporary haul roads etc. within the landfill.

Current IBA Generation

At the time of writing, the Indaver Energy from Waste (EfW) facility at Carranstown is the only facility to have produced IBA over a number of years, given that Dublin Waste to Energy commenced operations only in Q2 of 2017 when it produced 33,982 tonnes of IBA[10] during this start up period. A review of the Carranstown annual environmental returns (AERs) for the past number of years confirms the following:

Table 4-5: IBA produced at Carranstown

Year	Tonnage
2012	40,507
2013	40,579
2014	33,451
2015	33,921
2016	35,565

The apparent reduction in quantities observed from 2014 onwards can be attributed to the increased direct recovery of ferrous and non-ferrous metals at the Carranstown facility.

Future IBA Projections

Future projections of IBA generation are based on the Carranstown and Dublin Waste to Energy facilities but also make an allowance for the future generation of IBA, in the event of a third energy from waste facility being developed nationally.

[10] http://www.epa.ie/licences/lic_eDMS/090151b280680b37.pdf

IBA projections presented in Table 4-6 following relate to the two known facilities that will produce IBA for management over the next 20 to 25 years i.e. the lifetime of the Carranstown Waste to Energy and Dublin Waste to Energy facilities, and allows for IBA produced from the proposed EfW in Ringaskiddy, Co Cork of c. 300,000 tonnes capacity (in line with identified requirement in regional waste management plans), assumes to be onstream from 2022/3.

Table 4-6: IBA quantities in future years (approximate)

Facility	2017	2018	2019	2020	2021	2022	2023 - 2030
Carranstown [11]	39,800	39,800	39,800	37,300	37,300	37,300	37,300
Dublin Waste to Energy [12]	60,000	120,000	120,000	120,000	120,000	120,000	120,000
3rd EfW facility (Ringaskiddy) [13]	-	-	-	-	-	*52,600*	*52,600*
Total, tonnes	**99,800**	**159,800**	**159,800**	**157,300**	**157,300**	**209,900***	**209,900***
*in event of a 3rd dedicated waste to energy facility being developed							

It should be noted that the management of IBA from the Dublin Waste to Energy facility is currently authorised through the facility planning permission as being through the export of this material - the 2006 EIS for the facility (Section 10.5.2 of the Main EIS) states that "*until the framework for re-use of bottom ash develops in Ireland, the bottom ash will be exported by ship for reuse in the UK or Continental Europe*". This point is expanded upon in Section 4.4.2 following.

4.3.3 C&D waste including non- hazardous soil.

Construction and demolition (C&D) waste is identified in the regional plans as typically comprising 68% soils and stone and 32% of other C&D wastes (timbers, metals, packaging etc.) and, from a management perspective, it is the non-hazardous soils and stone element that requires focus, given the relative ease in recycling other C&D waste components.

C&D generated inert classified soil and stone are typically managed through soils recovery activities, either in dedicated licensed, permitted or registered soils recovery facilities or within landfill facilities, where this material is used for cover and temporary capping activities.

Current & Future C&D soil and stone generation

The most up to date data source regarding C&D waste is the 'Construction & Demolition Waste – Soil and Stone Recovery/Disposal Capacity' report, produced by the three regional authorities, previously referenced in Chapter 3.

This report highlights a significant increase in total C&D waste collected between 2013 and 2015, as shown in Table 4-7, which belies a decreasing trend for this waste type that was presented in the three regional plans, which were based on 2012 data at the time of writing.

[11] Carranstown has permission to increase waste acceptance to 235,000 tonnes until end of 2019, reverting to 220,000 tonnes thereafter - figure calculated from pro-rata increase on 2015 IBA tonnage

[12] as per Section 1.11.3 of the 2006 Dublin Waste to Energy EIS (http://www.epa.ie/terminalfour/ippc/ippc-view-filter.jsp?regno=W0232-01&filter=b&docfilter=go), assume commencement beginning Q1 2018 (in terms of IBA being managed nationally)

[13] 6,583 kg/hr over 8,000 hrs, Planning Application, Section 4 of EIS; http://www.ringaskiddyrrc.ie/pdfs/Environmental_Impact_Statement/EIS_Vol_2_Main_Text/EIS_Ch_4_Project_Description_Issue_1.pdf

Table 4-7: Total C&D waste collected in 2013 -2015

Million tonnes	2013	2014	2015
Total C&D waste	2.926	3.787	5.1
Soil & Stones	2.02	2.86	3.5

It is identified that the c.1.5 million tonnes increase observed between 2013 and 2015 reflects increased construction growth, particularly in the Greater Dublin Area.

Table 4-8 below summarises the data from the report by applying the identified forecast growth rates from 2016 onwards, while also outlining the projected shortfall in capacity for the management of these materials in future years.

Table 4-8: Forecasted C&D soil and stones quantities, with shortfall identified

Soil & Stones	2016	2017	2018	2019	2020	2021	2022	2023
Forecast Quantity, t	4,004,000	4,644,640	4,988,343	5,237,761	5,499,649	5,774,631	5,947,870	6,126,306
Identified Shortfall	1,279,600	1,200,000	1,533,000	2,621,000	2,958,000	3,283,000	3,456,000	3,979,000

4.3.4 Quantification of Other Wastes

There are a number of miscellaneous waste streams that will require management in future years, that are not captured within the waste categories described previously – in addition, there are a number of waste types, produced in the categories previously identified, that do not follow a 'direct' route, in terms of their management, whereby they become 're-introduced' into the overall waste management system, such that they are seen to consume available waste management capacity on more than one occasion in their treatment.

Street Sweepings, Grit and Screenings

As identified in Section 4.3.1, sweet sweepings would historically have typically been included within MSW calculations and projections, given their generation by the population of a 'municipality'. The projections presented in Table 4-3, based on the regional waste management plan data, do not include for street sweepings. In terms of quantifying this material, the 3 regional waste management plans indicate that, in 2012, a combined c. 59,000 tonnes of litter and street sweepings waste was collected across the regions.

Grit and screenings are typically produced from water treatment processes and is a material that is typically landfilled. On the basis that Ringsend wastewater treatment plant (the largest nationally) produced c. 1,300 tonnes of grit and screenings in 2016 (as per facility AER), it is considered that 8,000 – 10,000 tonnes of this material is produced nationally annually.

A review of the 2016 AERs for Scotch Corner, Drehid, Knockharley and Ballynagran landfills indicate that a combined total of c. 67,000 tonnes of material, labelled as street sweeping, local authority clean-up waste and grit & screenings was landfilled.

Contaminated Dry Recyclables

Dry recyclables are part of the overall MSW stream and are 'captured' as part of the recycling rates assumed in Table 4-4 i.e. dry recyclable material collected separately is directed to a recycling activity and are not materials that are typically directed for recovery or disposal activities and hence are not considered in the residual waste quantities in Table 4-3.

However, given high contamination rates being observed in dry recyclable collections, reported by some waste operators as being in range of 30%, a significant proportion of material is being produced that is not suitable for recycling but is instead being directed to cement kiln facilities as a recovered fuel product.

While difficult to specifically quantify the amount of material being directed to kilns, it is considered that 50,000 tonnes per annum is an appropriate and conservative estimate, given the extent of contamination levels observed – note that, based on the 2012 National Waste Report (which is the most recent data source presenting accessible information on municipal recycling rates), c.830,000 tonnes of municipal materials were recycled (excluding biological treatment) in 2012, which is likely to be higher in 2018 – an allocation of 50,000 tonnes as contaminated material sent for recovery at cement kilns as a proportion of the overall quantity recycled is therefore considered a conservative figure.

Should performance in terms of reducing contamination rates with dry recyclable waste streams been seen to improve, this would likely be balanced out by overall increasing waste generation rates, and so it is appropriate to consider this value as remaining consistent in future years.

The effect of this material being accepted at cements kilns results in the situation described earlier – this material consumes cement kiln capacity that would otherwise be available for the utilisation of recovered fuels produced from residual MSW and as such it consumes 'recycling' treatment capacity as well as 'recovery' treatment capacity. This then results in a lesser capacity being available for residual MSW treatment through recovered fuel utilisation at kilns.

A further factor to bear in mind in relation to the potential for contaminated dry recyclables to consume cement kiln capacity is the as yet unknown impact on the stated Chinese intention to crack down on waste shipments with a contamination rate higher than 1.5%, at the end of 2017. This development has the potential to increase the quantity of dry recyclable material sent to kilns where this contamination limit cannot be met - where it may previously have been acceptable to export this material, outlets may now be limited. While not possible to quantify the impact of the Chinese ban, it certainly has the potential to increase the allocation of 50,000 tonnes identified above.

Incinerator Bottom Ash

Similar to the situation described above, the generation of incinerator bottom ash results in a situation where a portion of residual MSW sent for thermal treatment remains for management after thermal treatment – should this material be landfilled, it also then consumes landfill capacity that could be utilised for a range of other waste streams, if required. Therefore any assessment of landfill capacity must take this into account.

4.3.5 Contingency Capacity

While the previous identifies future quantities of waste material that can definitively be identified as requiring management in the years to come, it is also considered that there will be a requirement to provide capacity to address materials and/or events that will arise in coming years, that cannot yet be readily quantified, in what can be termed 'contingency capacity'.

As identified in Chapter 3, the regional waste management plans all acknowledge this contingency requirement, for example, as stated in Section 16.4.3 of the Eastern and Midlands Waste Management Plan 2015 – 2021, where *"the local authorities anticipate that there will be an ongoing need for landfill capacity during the plan period for processed residual wastes. There is also a need to maintain a contingency supply, in response to potential situations which pose a risk to the health and well-being of citizens, livestock and the environment".*

The requirement for contingency supply can be considered in two ways – in terms of foreseen events and unforeseen events.

Foreseen contingency relates to a number of the situations described previously – there are situations where a known contingency capacity is required. For example, Chapter 3 makes reference to the implementation of emergency measures, in accordance with Section 56 of the Waste Management Act 1996, as amended, since 2016, which resulted from the lack of available outlets for residual MSW for waste management operators. This resulted from an inability to secure outlets on the continent for exported residual waste, in combination with limitations of acceptance at operational landfills, including Knockharley Landfill.

As part of these Section 56 measures, Knockharley Landfill accepted c. 105,000 tonnes of waste above its normal authorised capacity in 2016 and c.40,000 tonnes in 2017/8 from the remediation of Timoole Landfill. Contingency capacity was effectively provided through the Section 56 measures in response to lack of available outlet and this remains a situation which is kept under constant review by each of the regional waste authorities.

Similarly, it is known that capacity is required for the management for repatriated waste, waste from Class A historic legacy landfills and waste from other illegal landfills, which is contingent on the availability of landfill capacity and the rate at which this material becomes available. As discussed in previous sections, it is estimated that at least 170,000 tonnes of waste that requires repatriation from Northern Ireland, with 300,000 tonnes of material considered as a reasonable estimate of waste deposited in illegal landfills. In terms of Class A historic legacy landfills, with 73 such sites identified nationally, 400,000 tonnes of excavated waste to be managed could be considered a legitimate estimate.

In this regard, a significant 'foreseen' contingency capacity is required nationally at present.

On the other hand, unforeseen contingency events will effectively be emergency events that cannot be predicted and therefore difficult to quantify in terms of capacities that may be required in response to them.

Therefore, it is clear that contingency capacity will need to be available to address either 'foreseen' or 'unforeseen' situations as and when such capacity is required – in terms of quantifying 'unforeseen' contingency capacity, it may be prudent to apply a nominal headspace figure over and above what might be considered the required capacity for 'foreseen' contingency event.

4.4 Management Options for Identified Wastes

While the previous section has attempted to quantify the amount of the differing waste streams which are proposed for acceptance as part of this development, as well as instances that could result in an increased demand for capacity, this section examines the differing means of managing these waste streams, such that the need for or role of the proposed development is identified within this assessment of management capacity.

Management capacity for the range of materials previously identified is provided by different options as follows:

- Capacity provided by Landfill
- Capacity provided by indigenous thermal treatment – waste to energy and cement kilns
- Capacity provided by Export
- Capacity provided by permitted facilities
- Capacity provided for biological treatment

4.4.1 Capacity provided by Landfill

Table 4-9 presents the existing and future projected disposal capacity at the remaining operational landfills, based on the extent of existing authorisations in terms of Drehid, Knockharley and Ballynagran Landfill and based on stated intentions in terms of East Galway landfill. Note figures presented here are based on what the facilities are approved to take under their relevant authorisations, rather than built capacity – it has been assumed that the required cells/void capacity will be in existence to provide the capacity identified.

Drehid Landfill has permission, in accordance with An Bord Pleanála authorisation reference PL09.PM0008, for the acceptance of 360,000 tonnes per annum for disposal until December 2017, reverting to 120,000 tonnes per annum for disposal. As per the 2016 AER for the Drehid Landfill facility, the projected closure date for the facility is 2028.

Knockharley Landfill, in accordance with Meath County Council Reference: AA161431, has permission for the continued disposal of 88,000 tonnes per annum of materials until December 2021, while Ballynagran Landfill has planning permission for the acceptance of 150,000 tonnes per annum for disposal until 2020.

Planning Permission expires on East Galway landfill facility in December in 2018.

Table 4-9: Current and Future Projected Landfill disposal capacity

Facility	2017	2018	2019	2020	2021	2022	2023	2024	2026	2028
East Galway	100,000	100,000	-	-	-	-	-	-	-	-
Drehid	360,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000
Knockharley	88,000	88,000	88,000	88,000	88,000	-	-	-	-	-
Ballynagran	150,000	150,000	150,000	150,000	-	-	-	-	-	-
Capacity	**698,000**	**458,000**	**358,000**	**358,000**	**208,000**	**120,000**	**120,000**	**120,000**	**120,000**	**120,000**

The above capacity provides for the acceptance of the following materials in accordance with the respective facility Industrial Emissions (IE) licences:

Knockharley Landfill (W0146-02):
- Household, Commercial, Industrial for Disposal & Construction & Demolition Waste for recovery

Ballynagran Landfill (W0165-02):
- Household, Commercial, Industrial for Disposal & Construction & Demolition Waste for recovery

East Galway Landfill (W0178-02):
- Household. Commercial & Industrial non-hazardous for Disposal and Inert waste for recovery

Drehid Landfill (W0201-03):
- Non-hazardous municipal, commercial and industrial wastes for landfill and inert waste for landfill engineering

Therefore, the capacity provided at the above facilities is approved for the management of all of the waste streams identified in Section 4.3 preceding i.e. residual municipal solid waste (including rMSW from repatriated waste, Class A historic legacy landfills, illegals facilities and other sources), incinerator bottom ash and C&D non-hazardous soil and stones.

Other existing constructed landfill capacity

While Table 4-9 outlines the future projected landfill disposal capacity, it is worth pointing out that there does remain other constructed landfill capacity nationally in existence at facilities that are not currently operational.

However, this capacity is not considered available in this assessment due to specific circumstances in relation to each of the specific facilities. The following identifies existing constructed capacity at closed landfill sites and provides background in relation to same.

- Bottlehill Landfill Facility, Co. Cork- licenced under W0161-02, this facility has never operated as an operational landfill facility. 5 no. landfill cells were constructed in 2005, of c. 65,000 m^2 in area but no waste has been placed in these cells to date.
- The planning permission pertaining to the facility requires the cessation of landfilling at the site by end of 2025, while an annual acceptance of 217,000 tonnes of waste is permitted under W0161-02[14]. In 2015, Cork County Council invited proposals from interested parties in relation to potential waste or non-waste related uses for the Bottlehill site.

[14] In 4th year of operation and subsequent years; 189,000 tonne in Year 1.

- Corranure Landfill, Co. Cavan (W0077-04) – some capacity remains within Cell 4 (total footprint of 17,800 m^2) of the Corranure facility, but this capacity is being consumed in 2017 by non-hazardous soils and alum sludges as part of the agreed remediation plan for the facility, as per AER 2016 for the facility.
- Kyletalesha Landfill Facility, Co. Laois (W0026-03) – capacity remains in Cell 15b of the Kyletlaesha Landfill facility and, as identified in Table 4-1, the facility re-opened in Q3 of 2017 to accept C&D soil and stones, in order to fill Cell15b as part of the remediation plan for the facility.
- Holmestown Landfill Facility, Co. Wexford (W0191-02) – AER 2016 for this facility identifies overall remaining capacity of c 1.1 million tonnes, and constructed cell capacity is c. 16,000 m^2. As previously identified, Wexford County Council have signalled their intention to remove existing waste material from this site, such that it may be utilised in a non- waste related application.
- Ballaghveny Landfill Facility, Co. Tipperary (W0078-03) – as per AER 2014, there remains capacity for c. 300,000 tonnes of waste within the existing constructed cells at this closed site, according to facility AERs. However, TCC are undertaking feasibility studies to determine if the site should be reopened.

4.4.2 Capacity provided by Indigenous Thermal Treatment

Indigenous thermal treatment capacity is provided through both waste to energy facility capacity as well as at cement kilns throughout the country. These thermal treatment capacities are considered as 'recovery' activities, in accordance with the 3rd Schedule of the Waste Management Act 1996, as amended. Existing and planned thermal capacity is outlined in the following.

Recovery at Indigenous Waste to Energy Facilities

Waste to energy capacity in Ireland is provided by:

- 200,000 tonnes of treatment capacity at the Indaver Carranstown facility, Co. Meath, for which an increased capacity of 235,000 tonnes to the end of 2019, reverting to 220,000 tonnes thereafter has been authorised
- 600,000 tonnes of treatment capacity at the Dublin Waste to Energy facility[15] at Poolbeg, Dublin, which commenced operations in Q2 of 2017.

A third energy from waste facility at Derryclure, Co. Offaly, is licenced under W0282-01 to provide 65,000 tonnes of MSW treatment capacity. At the time of writing, some preliminary construction works have begun at the facility location, but it is unclear as to if or when this development shall be completed.

In addition to the capacity provided by the above facilities, as outlined in Chapter 3 national policy (through the 3 no. regional waste management plans) supports the provision of a further 300,000 tonnes per annum of national thermal treatment capacity for residual MSW management – this capacity could be provided by a dedicated waste to energy facility or facilities and/or through increased recovery at cement kilns.

Waste to energy projects that are currently in the public domain include:

- The proposed 240,000 tonnes per annum Indaver waste to energy facility at Ringaskiddy, Co. Cork which was granted planning permission by An Bord Pleanála under reference PA0045.
- A 48MW gasification facility of c. 300,000 tonnes per annum at Gortadroma, Co. Limerick which is currently at Strategic Infrastructure Development pre-application consultation stage with An Bord Pleanála (PC0244).

[15] 600,000 tonnes represents the maximum capacity that can be accepted at the Dublin Waste to Energy facility, which can be impacted by the calorific value of the material – it is prudent to assume that facility will operate to its full capacity in an assessment of future management capacity

While no development that could provide the identified 300,000 tonnes of further thermal treatment capacity identified in the regional policy documents is yet commence, the provision of such capacity should be considered as being provided in future years when determining required capacities. For the purposes of this assessment, it is assumed that a capacity equivalent to that proposed by the Indaver facility at Ringaskiddy, Co. Cork is available from 2022 onwards, to allow for construction timelines etc. on foot of grant of permission.

Waste types permitted for acceptance at the Carranstown facility are relatively broad and are categorised as non-hazardous residual municipal waste, commercial and industrial hazardous wastes, sewage and industrial sludges, non-hazardous wastes, construction and demolition (C&D) waste (primarily combustible C&D) and small quantities of hazardous wastes. For the purposes of this assessment, it can be considered that the capacity at Carranstown will be mainly consumed by residual MSW type material in future, given that over 90% of the wastes accepted to the facility in 2017, was of municipal classification (20 codes) or its treatment (19 codes), as per the facility 2017 AER.

Similarly, waste types permitted for acceptance at the Dublin Waste to Energy facility comprise non-hazardous residual waste (19 and 20 codes) as well as a range of other commercial and industrial wastes – as with Carranstown, it is prudent to consider the maximum capacity at the facility will be consumed by municipal wastes identified in Section 4.3.

Waste to Energy Facility Downtime

While thermal treatment facilities will provide the primary means of management of residual MSW in the country in coming years, it should be borne in mind that it is the case that these facilities typically undergo scheduled maintenance downtime on a regular basis (either annually or every 18 months) over which duration they cannot thermally treat waste.

The EIS that accompanied the licence application for the Carranstown Waste to Energy facility[16] identifies that:

> "*…The capacity of the waste bunker will allow the acceptance of waste during shut downs up to 1 week. From experience of operating similar plants in Belgium, non-scheduled events typically require a maximum shutdown of one-week. A scheduled shutdown for maintenance takes place once a year. Such a shutdown is typically longer than 1 week, but less than 3 weeks. As these shutdowns are scheduled it is possible to organise an alternative outlet for the waste to be accepted. Alternatives would be another waste incinerator or a landfill facility, depending on their availability at the time.*"

Thus, with 1-week input capacity provided within the bunker and a potential period of up to 3 weeks for annual shutdown, the Carranstown Waste to Energy facility may not be a position to accept waste for 2 weeks per annum, requiring the provision of alternative capacity of c. 8,500 tonnes of input waste during that period.

Similarly, the EIS accompanying the Dublin Waste to Energy facility[17] identifies that:

> "*the bunker will have sufficient capacity to store one week's normal throughput of waste. In the event of a shut down, waste deliveries will be controlled so that no wastes for incineration will be delivered to the plant if it cannot be placed in the bunker. This will be managed by communicating with waste suppliers, etc to control deliveries…… The maintenance intervals are intended to be 18 months…. Typically, for maintenance one line at a time will be shut down while the other line continues to operate. Due to the buffer capacity of the waste bunker, normal waste deliveries will continue while one line is shut down."*

Therefore, every 18 months, the Dublin Waste to Energy facility requires maintenance, which will see the facility operating at 50% capacity (through 1 line). Assuming a 3-week maintenance period, and 1 weeks input capacity within the bunker, suggest that aa minimum of 23,000 tonnes will require alternative management or the period, twice every 3 years.

[16] http://www.epa.ie/licences/lic_eDMS/090151b2802893f3.pdf

[17] http://www.epa.ie/licences/lic_eDMS/090151b2800f9ce8.pdf

While difficult to exactly quantify, it is considered that on an annual basis, the scheduled maintenance periods at the Carranstown and Dublin Waste to Energy facilities, will result in at least 20,000 – 25,000 tonnes of residual MSW material that cannot be accepted at these facilities during their downtime periods.

In addition, the above does not consider the potential for unscheduled or emergency events at these facilities, which also has the potential to require the acceptance of waste at alternative facilities, depending on extent of same.

In considering the fact that these facilities incorporate a downtime period on an annual or biannual event, it is assumed that their annual intake allowance incorporates these periods i.e. their 'run rate' reflects their licenced input tonnage over, for example, 50 weeks per annum in the case of Carranstown as described above.

IBA Generation

As identified in Section 4.3.2 previously, the planning permission that currently applies to the Dublin Waste to Energy facility permits the management of bottom ash generated at this facility through export to continental Europe or the UK, given the absence of a framework for recovery of bottom ash in Ireland at present, where it could be used in a number of construction related application, as is common in other European countries.

The proposed IBA acceptance at the Knockharley Landfill facility can be considered the 'first phase' in the development of IBA recovery in Ireland and it is intended that the materials from this facility will ultimately all be used off site as a "secondary aggregate" in a variety of end-uses such as road construction, thus maximising the recovery, recycling and re-use potential of this material in keeping with national and regional policies and legislative objectives of the waste hierarchy.

However, it is likely that a period of time will be required for:

- the development of appropriate specifications/standards for IBA use in road/construction applications in conjunction with the EPA, National Roads Authority (NRA) and others
- the carrying out of trials and the acceptance of this material by the construction sector as a viable alternative to virgin aggregates

Therefore, until such time as these end-use markets may be developed, this material can be stored within the dedicated IBA cells proposed for development at Knockharley, such that it can be accessed in future should a demand as a replacement to virgin aggregate can be identified.

Recovery at Indigenous Cement Kilns

Cement kilns accept a refined, treated element of residual MSW that has been produced to a required specification through the mechanical treatment of residual MSW, which is generally recovered fuel or variation thereof e.g. solid recovered fuel (SRF) or refuse derived fuel (RDF) depending on the level of treatment applied. The mechanical treatment separates the larger plastics, card and papers from the waste stream which is then further refined (shredded and/or dried) to produce the recovered fuel.

During this treatment process, typically undertaken at a materials recycling facility (MRF), the elements not used for recovered fuel production (which contains a high percentage of biodegradable material) are also separated and typically undergo stabilisation at an off-site biological treatment facility, prior to landfilling. Treatment in this manner can be considered 'loose' mechanical biological treatment (MBT) arrangement, as opposed to a more conventional MBT process whereby mechanical and biological treatment may occur on the same site.

Table 4.10 lists the cement kiln facilities in Ireland that are currently EPA licenced to accept recovered fuels and identifies licenced capacity. The Lagan Cement facility, Kinnegad, Co. Westmeath, the Irish Cement facility in Platin, Co. Louth and the Quinn Cement facility, Ballyconnell, Co. Cavan have all accepted solid recovered fuel in recent years. The Irish Cement facility in Castlemungret, Co. Limerick is currently undertaking an EPA licence review and has had planning granted by ABP to accept recovered fuel.

Table 4-10: Consented Kiln Capacity

Facility	Licenced Capacity
Lagan Cement (P0487-06)	95,000
Irish Cement – Platin (P0030-04)	120,000
Quinn Cement (P0378-02)	127,875
Total	**342,875**

At the time of writing, a number of these facilities indicated their intention to apply for approvals to further increase the acceptance of alternative fuel (that can comprise SRF) at their facilities, as follows:

- Irish Cement (Platin)– increased acceptance of alternative fuels up to 600,000 tpa through EPA licence review (P0030-06), which, at time of writing has been confirmed as Strategic Infrastructure Development (SID) through pre-application Ref: PC0221 – it is understood that it is proposed that up to an extra 100,000 tonnes of the 600,000 tonnes will comprise SRF material, in addition to the potential 120,000 tonnes currently permitted, totalling 220,000 tonnes[18]
- Quinn Cement (P0378-04) - increased acceptance of alternative fuels up to 300,000 tpa which is currently in SID pre-application ref: PC0241
- Irish Cement (Castlemungret)– acceptance of alternative fuels up to 90,000 tpa through EPA licence review (P0029-05), with planning permission granted by Limerick County Council (Ref:16345) and upheld on appeal by An Bord Pleanála

Waste types accepted at kiln facilities span a relatively broad range and can include SRF (produced from household and commercial residual wastes), meat and bone meal (MBM), waste wood, waste tyres, solvents and other liquid wastes. Therefore, to quantify the proportion of SRF material that may be accepted is difficult – a review of SRF production nationally, as shown in Table 4-11, suggest c. 230,000 tonnes of SRF being produced in 2015 & 2016.

Table 4-11: Recovered Fuel production since 2012

Facility	2012	2013	2014	2015	2016
Panda Waste Services, Navan (W0140-04)	17,616	38,319	69,537	82,941	93,144
Greenstar, Millennium Business Park (W0183-01)	10,498	11,135	11,084	5,862	4,041
Pacon Waste & Recycling, Balbriggan (P1014-01)[1]	-	-	22,250	50,000	50,000
Thorntons Recycling, Killeen Road (W0044-02)	67,864	80,349	72,303	88,190	85,962
Total[2]	**95,978**	**129,803**	**175,174**	**226,993**	**233,147**

[18] Reference ABP pre-application meeting PC0221 with Eastern Midlands waste management region; http://www.pleanala.ie/documents/records/PC0/PPC0221E.pdf

When considering available thermal treatment capacity at cement kiln facilities, cognisance should be given to the potential for capacity to be consumed by contaminated dry recyclables, as identified previously, thus reducing the potential to process residual MSW derived recovered fuels.

Furthermore, available thermal treatment capacity in cement kilns is also reduced through the importation of solid recovered fuel material from Northern Ireland for consumption in cement kilns south of the border. A review of the national transfrontier shipment (TFS) waste transportation register for 2016[19] indicated that c 23,000 tonnes of solid recovered fuel (LoW Code 19 12 10) was brought into the country in that year, with cement kilns being its destination.

However, as with the issue of repatriation of waste discussed previously, the impact of Brexit has the potential to close off this option for Northern Irish recovered fuel producers.

4.4.3 Capacity provided by Export

As discussed in Section 3.3.2 in Chapter 3 'Policy', significant quantities of residual municipal waste have been exported to central and northern Europe since 2013 as a result of a number of factors identified by the regional plans, not least the increases in the landfill levy. The reduction in number of operating landfills, as shown in Table 4-1, from 11 in 2013 to 4 in 2017, must also be considered a factor in the increased quantity of waste exported.

Waste exported is accepted at facilities in continental Europe with available excess treatment capacity – however, the long-term sustainability and cost effectiveness of these outlets has been questioned by the regional Plans.

The policy objectives identified in each of the regional plan, represented as Policy A4 in the Eastern and Midlands Region Waste Management Plan 2015 – 2021, is to "*aim to improve regional and national self-sufficiency of waste management infrastructure for the re-processing and recovery of particular waste streams, such as mixed municipal waste, in accordance with the proximity principle*". Each Plan aim(s) to "*minimise the exporting of municipal waste resources over the plan period*".

To this end and considering the commencement of the Dublin Waste to Energy Facility, which will bring up to 600,000 tonnes of treatment capacity on the market, and assuming the future provision of the 300,000 tonnes of thermal capacity identified as being required in national capacity, it is considered that export of residual municipal waste to the continent will effectively cease over a period of time.

Based on industry knowledge, it is considered that c. 350,000 tonnes of residual waste was be exported in 2017, with an expectation of c. 300,000 tonnes in 2018, approximately reflecting the identified further thermal capacity required. As per Section 4.4.2 previously, where the identified 300,000 tonnes is assumed to come online by 2022, it is considered likely that export will continue at the rate of c. 300,000 tonnes until such time as this thermal capacity becomes available. Thereafter, it is not unreasonable to consider that some low level of residual waste export will continue at a rate of c. 50,000 tonnes per annum, given that the 'export channels' have been developed over the past number of years.

4.4.4 Capacity provided by permitted/registered facilities

Capacity provided by permitted facilities is assessed herein in relation primarily to the management of C&D soil and stones – there are no facilities operating under the permitting/registration regimes that provide management capacity (in terms of ultimate end treatment) for municipal wastes or incinerator bottom ash.

The 'Construction & Demolition Waste – Soil and Stone Recovery/Disposal Capacity' report identified the following permitted and register capacities in the 3 waste regions:

- Eastern & Midlands region – c. 375,000 tonnes
- Southern region – c. 1.25 million tonnes
- Connacht Ulster region – c. 780,000 tonnes

[19] http://www.dublincity.ie/main-menu-services-water-waste-and-environment-waste-and-recycling-national-tfs-office/ntfso-waste

In total, c. 2.4 million tonnes of C&D soil and stones capacity is provided at registered and permitted facilities across the country – however, in the context of the findings of the 'Construction & Demolition Waste – Soil and Stone Recovery/Disposal Capacity' report, which identifies a very significant shortfall in C&D soil and stone management capacity in future years, as shown in Table 4-8 previously, the capacity provided at these facilities is very likely to be fully consumed for the duration of these facilities lifespans.

4.4.5 Capacity provided for biological treatment

In terms of management of residual MSW, biological treatment of residual 'fines' provided management capacity for c. 115,000 tonnes of residual MSW material in 2015, as per the EPA 'Composting and Anaerobic Digestion in Ireland' Bulletin[20], which reflects the acceptance of residual fines material in 5 no. facilities throughout the country[21]. However, biological treatment does not provide 'final' treatment for fines, rather it stabilises the fines material and results in c. 50% mass reduction of the material. It must be supported by landfill capacity as a final disposal outlet.

The anticipated increase in Solid Recovered Fuel (SRF) production nationally is likely to result in increased fines generation from mechanical treatment of residual MSW to produce SRF.

4.4.6 Future Management Options

Based on the assessment of future residual MSW generation rates and existing and planned infrastructure, the following graph and tables present a potential scenario for future management of the waste streams identified herein in Ireland to 2030. A national approach is taken to developing this scenario for the reasons outlined in Section 4.3. It should again be pointed out that the assumptions in relation to future residual waste generation can be considered to be conservative, such that quantities of residual waste projected would reflect a very strong performance in terms of increased recycling nationally.

Naturally, this scenario can only be taken as only one potential future situation – waste does not flow in an orderly manner to different management options and the economics of different management options is a significant factor to be considered. However, in an assessment of quantity of wastes for management versus potential management outlets, the following is informative and is presented in Figure 4.1 and Table 4-12 following.

[20] http://www.epa.ie/pubs/reports/waste/stats/compost/EPA_Compost%20&%20AD_2015_web.pdf

[21] Those being: Drehid Composting, Enrich Environmental, McGill Environmental, Miltown Composting, OD Recycling

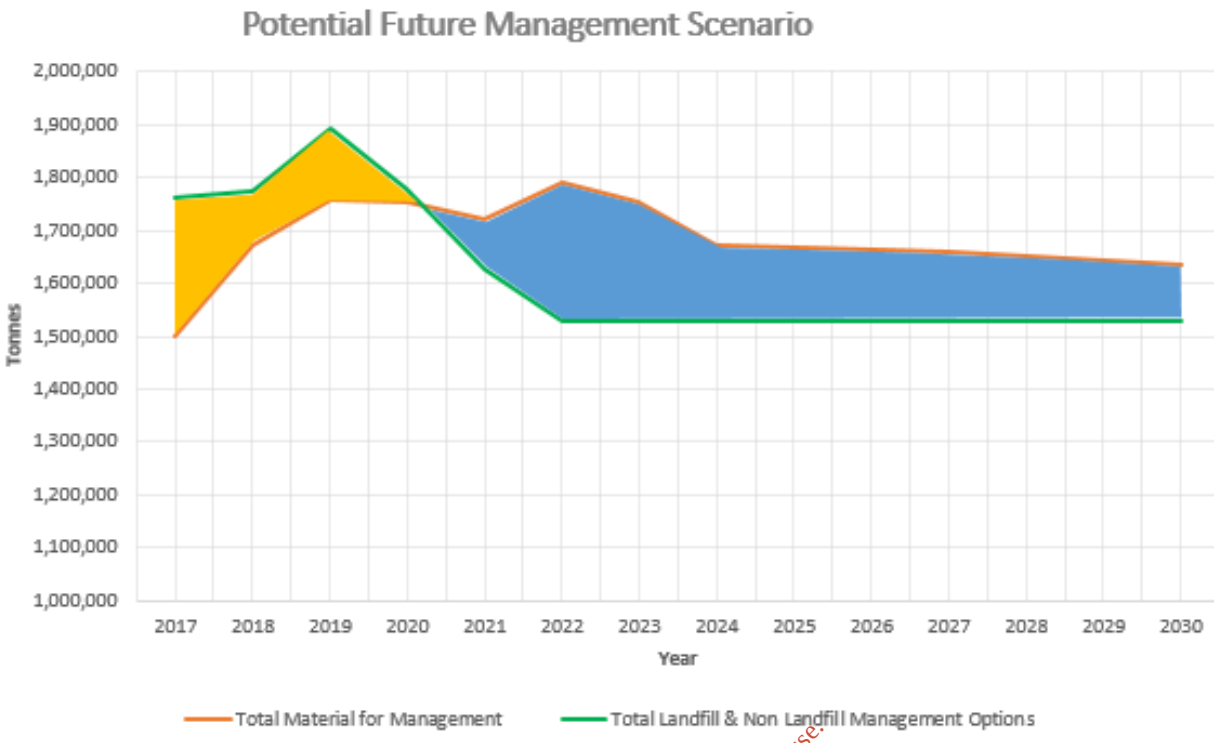


Figure 4-1: Potential Future Management Scenario

Table 4-12: Future Management Scenario

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1	Projected Municipal Solid Waste (MSW) Generation	2,711,229	2,784,807	2,858,384	2,927,951	2,997,518	3,154,756	3,160,111	3,244,468	3,330,935	3,419,564	3,510,408	3,603,523	3,698,966	3,796,795
2	Projected Recycling Rate	46.25%	47.50%	48.75%	50.00%	51.25%	52.50%	53.75%	55.00%	56.25%	57.50%	58.75%	60.00%	61.25%	62.50%
	Materials for Management														
3	Residual MSW for Management	1,457,286	1,462,023	1,464,922	1,463,976	1,461,290	1,498,509	1,461,551	1,460,011	1,457,284	1,453,315	1,448,043	1,441,409	1,433,349	1,423,798
4	Residual MSW adjusted for Stabilised Fines	1,399,786	1,404,523	1,407,422	1,406,476	1,403,790	1,441,009	1,404,051	1,402,511	1,399,784	1,395,815	1,390,543	1,383,909	1,375,849	1,366,298
5	Projected IBA for Management	39,800	159,800	159,800	157,300	157,300	209,900	209,900	209,900	209,900	209,900	209,900	209,900	209,900	209,900
6	Street Sweepings, Grit & Screenings	59,000	59,000	59,000	59,000	59,000	59,000	59,000	59,000	59,000	59,000	59,000	59,000	59,000	59,000
8	Waste Repatriation	-	50,000	50,000	50,000	20,000	-	-	-	-	-	-	-	-	-
9	Historic Legacy site dig out	-	-	80,000	80,000	80,000	80,000	80,000	0	0	0	0	0	0	0
10	*Total Materials for Management*	1,498,586	1,673,323	1,756,222	1,752,776	1,720,090	1,789,909	1,752,951	1,671,411	1,668,684	1,664,715	1,659,443	1,652,809	1,644,749	1,635,198
	Non Landfill Management Options														
11	Waste to Energy Capacity	535,000	835,000	835,000	820,000	820,000	1,060,000	1,060,000	1,060,000	1,060,000	1,060,000	1,060,000	1,060,000	1,060,000	1,060,000
12	SRF production	180,000	180,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
13	Allowance for export	350,000	300,000	300,000	300,000	300,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
14	*Total Non Landfill Management options*	*1,065,000*	*1,315,000*	*1,435,000*	*1,420,000*	*1,420,000*	*1,410,000*	*1,410,000*	*1,410,000*	*1,410,000*	*1,410,000*	*1,410,000*	*1,410,000*	*1,410,000*	*1,410,000*
	Existing Projected Landfill Capacity														
15	Knockharley	88,000	88,000	88,000	88,000	88,000	-	-	-	-	-	-	-	-	-
16	Drehid	360,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000	120,000
17	Ballynagran	150,000	150,000	150,000	150,000	-	-	-	-	-	-	-	-	-	-
18	East Galway Residual Landfill	100,000	100,000		-	-	-	-	-	-	-	-	-	-	-
19	*Total Combined landfill capacity*	*398,000*	*458,000*	*358,000*	*358,000*	*208,000*	*120,000*	*120,000*	*120,000*	*120,000*	*120,000*	*120,000*	*120,000*	*120,000*	*120,000*
20	*Total Landfill & Non Landfill Management Options*	*1,763,000*	*1,773,000*	*1,793,000*	*1,778,000*	*1,628,000*	*1,530,000*	*1,530,000*	*1,530,000*	*1,530,000*	*1,530,000*	*1,530,000*	*1,530,000*	*1,530,000*	*1,530,000*
21	**Difference**	264,414	99,677	36,778	25,225	-92,090	-259,909	-222,951	-141,411	-138,684	-134,715	-129,443	-122,809	-114,749	-105,198

Note 1	Projected Municipal Waste Generation as per Table 4-4	***Note 11***	Waste to Energy capacity projected as per Section 4.4.2, does not include for the facility at Derryclure
Note 2	Projected Recycling Rate as per Table 4-4	***Note 12***	Assumed Recovered Fuel (SRF) production rate, adjusted for capacity consumed by contaminated dry recyclables
Note 3	Project Residual MSW management as per Table 4-4	***Note 13***	Assumptions for decrease in export
Note 4	Adjustments for stabilised fines on the basis that c.115,000 tonnes of residual fines continues to be processed as per Section 4.4.5 – if 115,000 tonnes of fines is processed in biological treatment facilities, then 50% of this quantity remains post treatment for landfilling, therefore overall residual MSW quantity reduced by 57,500 tonnes to reflect the 50% mass losses (50% mass losses as per typical fines processing - Kuehle-Weidemeier, M. (2007)[22])	***Note 14***	Combined WtE capacity, recovered fuel production and Export influence
Note 5	Projected IBA quantity for management, assuming a 3rd facility developed (Ringaskiddy)	***Note 15***	As per Section 4.4.1
Note 6	As per 2012 generation rate, considered conservative ongoing	***Note 16***	As per Section 4.4.1
Note 7	Allowance for contaminated dry recyclables re-entering the loop for management as a residual material	***Note 17***	As per Section 4.4.1
Note 8	Assumes 170,000 tonnes of waste to be repatriated by 2021 (extended Brexit window)	***Note 18***	As per Section 4.4.1
Note 9	Allowance for the inclusion of the 'dig out' of legacy landfills at a rate of 40,000 tonnes per annum over a 10-year period	***Note 19***	As per Section 4.4.1
Note 10	Projected materials for management	***Note 20***	Combined Landfill and non-Landfill management options
		Note 21	Surplus (+) / deficit (-) in management capacity

[22] https://www.wasteauthority.wa.gov.au/media/files/documents/MBT_Paper_2014.pdf

Wastes to be Managed

The starting point of this scenario is the identification of materials to be managed. Starting with the potential quantity of residual MSW to be managed in future years, as projected previously which, in themselves, result from an ambitious recycling target performance, this quantity is then augmented by the IBA volumes identified in Section 4.3.2, which assumes the development of a 3rd EfW facility (Ringaskiddy) in accordance with the policy objectives for national thermal recovery capacity as outlined in the regional waste management plans.

Street sweeping, grit & screenings are also then considered, and projected in accordance with the figures identified in each of the regional waste management plans, with the assumption that this material is wholly directed to landfill.

An allowance for the management of repatriated waste from Northern Ireland is also included, given national obligations in this regard, on the assumption that this material will be managed through its acceptance at authorised landfill facilities (being the only facilities suitable for its acceptance), within the suggested 2 year extension period post Brexit i.e. by 2021.

In addition, consideration is also given to the requirement for the remediation of historic legacy landfills identified nationally through their 'dig out' and acceptance at authorised landfill facilities at a rate of 80,000 tonnes per annum over a 5-year period. While this exact volume may or may not materialise in the coming years for the duration modelled, it is considered prudent to allow for the management of this type of material, given the stated intention of the regional plans to address this issue over their lifetime.

An adjustment is made for the impact of biological stabilisation of residual fines on the quantity of residual waste generated, as is shown in Table 4-12, where a portion of the residual MSW fraction for management is reduced to reflect mass losses during this process, but with the outputs from this process remaining for management as a residual waste (where landfilling is the primary outlet). It is assumed that the same quantity of fines treatment capacity provided in 2015 i.e. 115,000 tonnes is available for the purposes of modelling this scenario, resulting in 57,500 tonnes of stabilised fines for landfilling.

The combined totals of these volumes are represented by the green line in Figure 4-1. Note that within this scenario, no consideration is given to the management of C&D soil and stone, other illegal landfills not classified as 'historic legacy' or for the provision of any contingency capacity for unforeseen events.

Means of Management

As identified previously, the primary means for future residual MSW management is considered to be thermal treatment. This scenario assumes that both the Carranstown and Dublin Waste to Energy facilities will operate at full capacity and this can be considered a reasonable assumption given their location within the State and the competitive gate fees they will be able to offer in comparison to other residual treatment options, either within the State or externally i.e. export to the Continent. From 2022/3 onwards, it is also assumed that a 3rd Waste to Energy facility will be operational which, for the sake of this scenario this is assumed to be the proposed Ringaskiddy facility.

The amount of waste material directed to cement kilns in the form of solid recovered fuel (SRF) is likely to be influenced by the rate of SRF production, rather than the capacity available within kilns for SRF acceptance (on the assumption that any SRF that is produced will be consumed by kilns with available 'alternate' fuels capacity). As identified, the kiln facilities typically accept a range of 'alternative fuels', of which SRF may be one, and while in theory the maximum capacity available could be consumed by SRF, the amount of SRF that may be produced is a more relevant figure in this regard. As previously identified, a figure of 350,000 tonnes of SRF production capacity in 2019 is likely – however, with the identified 'impact' of contaminated dry recyclables on the appetite for residual waste derived recovered fuels, this figure is adjusted downwards by 50,000 tonnes, as per Section 4.3.4.

Export of residual municipal solid waste in this scenario is modelled in keeping with the assumption outlined in Section 4.4.3 i.e. that export remains as a viable management until the 3rd waste to energy facility become operational by 2022. Notwithstanding the consideration of export in relation to the principles and proximity and self-sufficiency, it is considered likely that export of residual MSW will continue to some extent after 2022, due to the acceptable economics of export when compared with other management options, existing contracts that may have been entered into etc.

Consideration of landfill capacity, as outlined in Section 4.4.1 previously, allows for the continued operation of currently operating landfills, projected as per their currently permitted operational lifespans and tonnages.

When combined with Waste to Energy, export and SRF production as potential residual waste management capacity, this is represented by the green line in Figure 4-1.

Therefore, when comparing the requirement for management capacity for the projected quantities of future residual waste, IBA, street sweepings, repatriated waste and historic legacy sites 'dig out versus the current likely projected means of management of these materials, a slight excess of capacity is shown in 2018/2019 as indicated by the yellow area in Figure 4-1 followed by a significant dearth in capacity post 2020, as shown by the blue area in Figure 4-1, in the average region of c.150,000 tonnes over the years 2030.

As previously stated, this scenario only reflects one particular situation that may occur, but it does identify that on the basis on the waste generation rates and available capacities identified, that a lack of capacity is likely to occur in future years for the appropriate management of the waste streams identified.

Furthermore, this scenario does include a number of variables that also have the potential to increase the identified potential capacity gap, should they come to pass (or not):

- In the event of the challenging recycling rates outlined in Section 4.3.1 previously not being achieved, a greater quantity of residual waste will require management, thus increasing the capacity gap identified
- Should a 3rd EfW facility (Ringaskiddy) not be developed or not be developed within the timelines suggested herein, then the potential management capacity identified may not be realised or may be delayed, putting pressure on other potential management options
- Should SRF production not increase to the projected level or should the availability/viability of export be impacted, there would be increased quantities of residual MSW for management

Scenarios/Materials not considered

It should be noted that **no** consideration within these totals is given to:

- the acceptance of C&D soil and stone
- the requirement for the management of illegal, 'non-historic legacy' sites
- the provision of any **contingency capacity** to cover unforeseen/emergency events.

C&D Soils Management

As outlined in Section 4.3.3, a significant shortfall in C&D soil and stones capacity is identified in the coming years, with Figure 4-2 visually representing the figures presented in Table 4-8 previously.

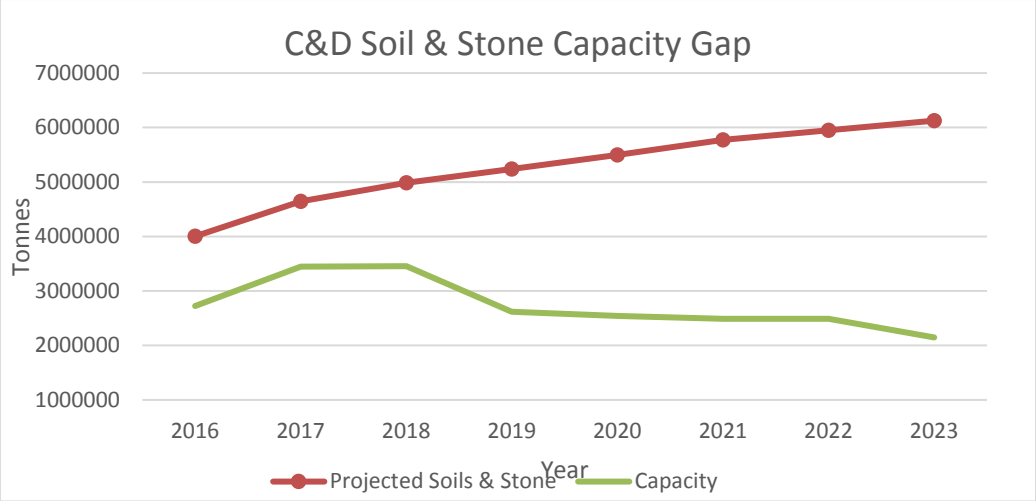


Figure 4-2: C&D Soil & Stones Capacity Gap

The significant need for C&D soil and stones capacity may be contributed to as part of the proposed development at Knockharley – alternative options for management of these materials, outlined in the 'Construction & Demolition Waste – Soil and Stone Recovery/Disposal Capacity' report identified previously, include expanding capacity at existing waste licenced facilities where it is stated that *"An existing waste licenced facilities with capacity to expand, or with a readiness to increase their annual limit, could choose to apply for an extension to their existing licenced capacity".*

Knockharley Landfill accepts C&D soils and stones for recovery activities in keeping with the condition of its waste licence with potential to accept material for both disposal and recovery as part of the proposed development, thus providing some alleviation to the significant under-capacity identified.

Management of illegal landfills and other sources

As identified in Section 4.3.5, it is considered a reasonable estimate that a minimum of 300,000 tonnes of illegally deposited waste will require management in future years, from more recently discovered illegal sites, in addition to the identified Class A historic legacy sites which are being managed under their own management regime.

In addition, the intended extraction of waste material from Holmestown Landfill is identified as another likely significant source of waste material to be managed.

The timing/duration of these works is unclear and is unlikely to be within the shorter term (e.g. to 2022), in which case capacity for management of same will likely be required when there is a demonstrated lack of capacity available.

Provision of Contingency Capacity

The scenario presented previously demonstrates the inability of the national waste management system, not only to provide sufficient capacity in future years for identified waste streams, but to provide any 'headroom' nationally for the unforeseen potential events, in keeping with the policies measures outlined in Chapter 3 'Policy'. As identified, the quantification of an appropriate contingency amount is difficult, but at present, there is no contingency for known waste volumes that will be generated (e.g. illegal facility described above), let alone contingency for unforeseen or emergency situation.

In attempting to quantify the volumes of material that could be associated with these items that have not been modelled, it is considered that:

- a contribution of a further 200,000 tonnes per annum to soils management (disposal and/or recovery) at licenced landfill facilities nationally could be considered a reasonable contribution to the lack of capacity for the management of these materials
- 40,000 tonnes per annum of repatriated waste averaged over 6 years is likely to require management

- The provision of 60,000 tonnes per annum in national landfill contingency is a reasonable and conservative consideration
- The remediation of Whitestown landfill which is anticipated to result in a dig out of between 290,000 and 1,000,000 tonnes.

To this end, a minimum further 600,000 tonnes of landfill capacity alone could be required to be provided to address these instances, in addition to the scenario modelled above.

4.5 The Need for Management Capacity

Table 4-12 presents a potential future scenario for the management of a number of waste sources from 2018 onwards, which assumes that:

- Dublin Waste to Energy and Carranstown EfWs operate at full capacity, with a third facility coming on-stream in 2022/3;
- that SRF production and utilisation increases;
- that Dublin Waste to Energy and Carranstown IBA is managed in Ireland through landfilling;
- that historic legacy landfill sites are managed in the short to medium term
- that export declines as a management option when a 3rd EfW (Ringaskiddy) comes online;
- and that biological stabilisation of residual fines continues to play a part in material management

This scenario, or an amalgam or variation of it, is considered to represent the likely direction of the future management of the identified waste streams in this country, insofar as future scenarios can be predicted.

Whatever future scenario is actually realised is not essential to the demonstration of the need for the proposed development at the Knockharley facility. Any integrated national waste management system needs to be supported by the presence of landfill capacity. What is clear is that there exists an impending lack of capacity across the various infrastructural elements of the national waste management system to manage waste streams that will clearly and evidentially arise. Post 2021, there is likely to be only 120,000 tonnes of landfill capacity in the country and that fact alone, when viewed against the identified capacity requirements, supports the need for further increased landfill capacity.

It cannot be argued that the presence of landfill capacity will negatively impact on the appropriate management of residual MSW through processes "higher up" the waste hierarchy – the presence of a significant landfill levy for material disposed in landfill removes any such effect that the presence of capacity might have and did have in the past. In fact, given the significant requirement for appropriate landfill capacity, the issue of where material is managed on the waste hierarchy is moot, if the material is not actually managed.

The capacity proposed for development at the Knockharley Landfill facility can contribute to the identified need in a number of ways:

- through provision of dedicated IBA management capacity
- through contribution to biological treatment of residual fines, resulting in mass loss and stabilisation of residual fines prior to landfilling
- through direct contribution to residual MSW management through disposal, as required
- through acceptance of C&D soils for disposal and/or recovery
- through acceptance of repatriated waste for disposal
- through acceptance of waste from historic legacy site for disposal
- through acceptance of waste from other unauthorised landfills for disposal
- through the continued operation of the site being available to provide contingency waste management solutions in an emergency

The 'proportion' of contribution to these different requirements is likely to vary on an annual basis (with the exception of IBA management and biological treatment of fines), with there likely to be a greater requirement for, for example, residual MSW disposal one year and soils recovery or repatriated waste disposal another year.

The 'fluid' nature of future capacity requirements does not belie the fact that significant capacity is required – as previously identified, the Eastern Midlands Region Annual Report 2016 identifies a "national waste infrastructure deficit" in 2016 and states that "it is clear that an immediate requirement for significant additional active licensed capacity is required". As evidenced by the scenario presented previously, the national waste infrastructure deficit identified in 2016 will be realised again in the coming years, and the proposed development Knockharley landfill has a significant ability to contribute to mitigating this deficit.

4.6 Alternatives Considered

This section outlines the reasonable alternatives studies for the proposed development together with the reasons for which a particular alternative was chosen.

The revised EIA Directive 2014/52/EU *on the assessment of the effects of certain public and private projects on the environment* requires an EIAR to contain:

'A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.'

The draft 2017 EPA *Guidelines on the Information to be contained in Environmental Impact Assessment Reports* state that, in relation to alternatives:

"The objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with 'an indication of the main reasons for selecting the chosen option'. It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account is deciding on the selected option. A detailed assessment (or 'mini-EIA') of each alternative is not required."

However, given that this draft guideline has not been finalised and were published before SI296 of 2018, the 2017 EC Guidelines on *Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report* are currently the most applicable. In summary, in order to address the assessment of alternatives the Developer must do the following:

- Assess "*reasonable*" alternatives
- The EIAR must include a description of the alternatives
- The approach should be project specific, taking into account over reaching national and local plans
- The consideration of alternatives should take into account consultation
- The guidance suggests the inclusion of "*project design, technology, location, size and scale*" but is clear in saying that these are just suggestions
- The assessment of alternatives should be "*targeted and focused*"

According to the 2017 EC guidance "'*Reasonable Alternatives' must be relevant to the proposed Project and its specific characteristics, and resources should only be spent assessing these Alternatives. In addition, the selection of Alternatives is limited in terms of feasibility*." It gives the example that if an "*Alternative is very expensive or technically or legally difficult, it would be unreasonable to consider it to be a feasible Alternative*".

Consequently, taking consideration of the available guidance in relation to an assessment of alternatives, this section addresses the topic under the headings of:

- Alternative site development locations
- Alternative layout design

- Alternative technology
- 'Do nothing' alternative

4.6.1 Alternative Site development locations

Two active landfill facilities are currently under the ownership of the AGB Landfill Holdings Ltd., which is the parent company of the applicant, Knockharley Landfill Ltd.:

- Knockharley Landfill, Kentstown, Co. Meath
- Ballynagran Landfill, Ballynagran, Co. Wicklow
- Kilcullen Closed Landfill, Co. Kildare

While the Kilcullen Landfill in Co. Kildare is also under the ownership of AGB Landfill Holdings Ltd., as a closed landfill undergoing restoration and entering its aftercare phase, it is not considered an appropriate location for the proposed development, given its inability to accept waste. Therefore, the proposed development is assessed as being potentially carried out at these two facilities.

While the 2014 EIA Directive and SI296 of 2018 state that the main reasons for selecting a chosen option should be described, which includes environmental considerations, the 2017 EC guidance states that other factors may also be considered such as *technological obstacles, budget, stakeholders and legal or other requirements*.

In this instance, the economic fact that both the Knockharley and Ballynagran landfill facilities are owned and operated by AGB Landfill Holdings Ltd., and considering they have existing planning and waste licence authorisations, is an important factor in that these were considered the only reasonable alternative locations. The consideration of other alternative development locations, either greenfield sites or other licensed waste management facilities not controlled by AGB Landfill Holdings Ltd., is not considered to be a reasonable alternative for AGB Landfill Holdings Ltd., given that such sites are not owned or controlled by them. Therefore, facilities of this type are not considered relevant in the assessment of alternative site locations.

The consideration of alternative locations is undertaken between Knockharley Landfill and Ballynagran Landfill.

In order to compare the two development locations, a number of broad criteria are applied to the sites to facilitate the assessment of the strengths and weaknesses of each. These criteria are:

- Location & Accessibility – Criterion 1
- Available development footprint – Criterion 2
- Suitability for development – Criterion 3
- Environmental Considerations – Criterion 4

Criterion 1 – Location & Accessibility

Location

Both sites are located within the Eastern & Midlands Waste Management Region, which has a population of 2,325,122 persons, as per the 2016 Census. Of this population, the 4 no. Dublin region local authorities i.e. Dublin City Council, Fingal County Council, South Dublin County Council and Dun Laoghaire-Rathdown County Council, comprise 57% of the population (1,345,402 persons). Therefore, Dublin City and County can reasonably be considered the 'centre of waste generation' for the region, with more than half of the waste being generated within these 4-local authority functional areas.

In addition, the Carranstown Energy from Waste (EfW) facility is located in Carranstown, Co. Meath, while the Poolbeg EfW facility is located in the Dublin city docklands.

In a comparison of distances from:

- the Dublin local authorities 'centre of waste'
- sources of incinerator bottom ash at Carranstown and Poolbeg EfWs

the Knockharley site is located closer to these waste sources than Ballynagran Landfill and is therefore the preferable option in terms of this criterion.

Figure 4.3 presents the locations of the Knockharley and Ballynagran Landfills with respect to Carranstown and Poolbeg EfWs.

Accessibility

In terms of accessibility, both sites can be accessed directly from the M50 via the N11/M11 for Ballynagran and via the N2 for Knockharley.

Knockharley Landfill, being located directly off the N2 and accessed by a left hand turning lane when travelling from the south and a dedicated right hand ghost island priority junction when travelling from the north, will ensure that queuing to enter the site when travelling from the north or south will not be an issue. This is addressed in further detail in Chapter 8 'Roads, Traffic & Transportation'. Similarly, when exiting, any potential for queuing to turn right (south) will be contained within the dedicated site access road.

Criterion 2 – Available Development Footprint

Both sites have significant area for development within the wider site footprints, with:

- the Ballynagran site having an overall site area of 129 ha of which 31 ha is permitted for landfill activities and
- the Knockharley site having an overall site are of 135 ha of which 25 ha is permitted for landfilling activities.

However, the Ballynagran site is not under the ownership of AGB Landfill Holdings Ltd., rather it is leased from a private land owner.

Therefore, while the two sites are considered similar in terms of available development footprint to facilitate the elements of the proposed development, the more defined control over the lands at Knockharley make it a more preferable option in terms of further development.

Criterion 3 – Suitability for Development

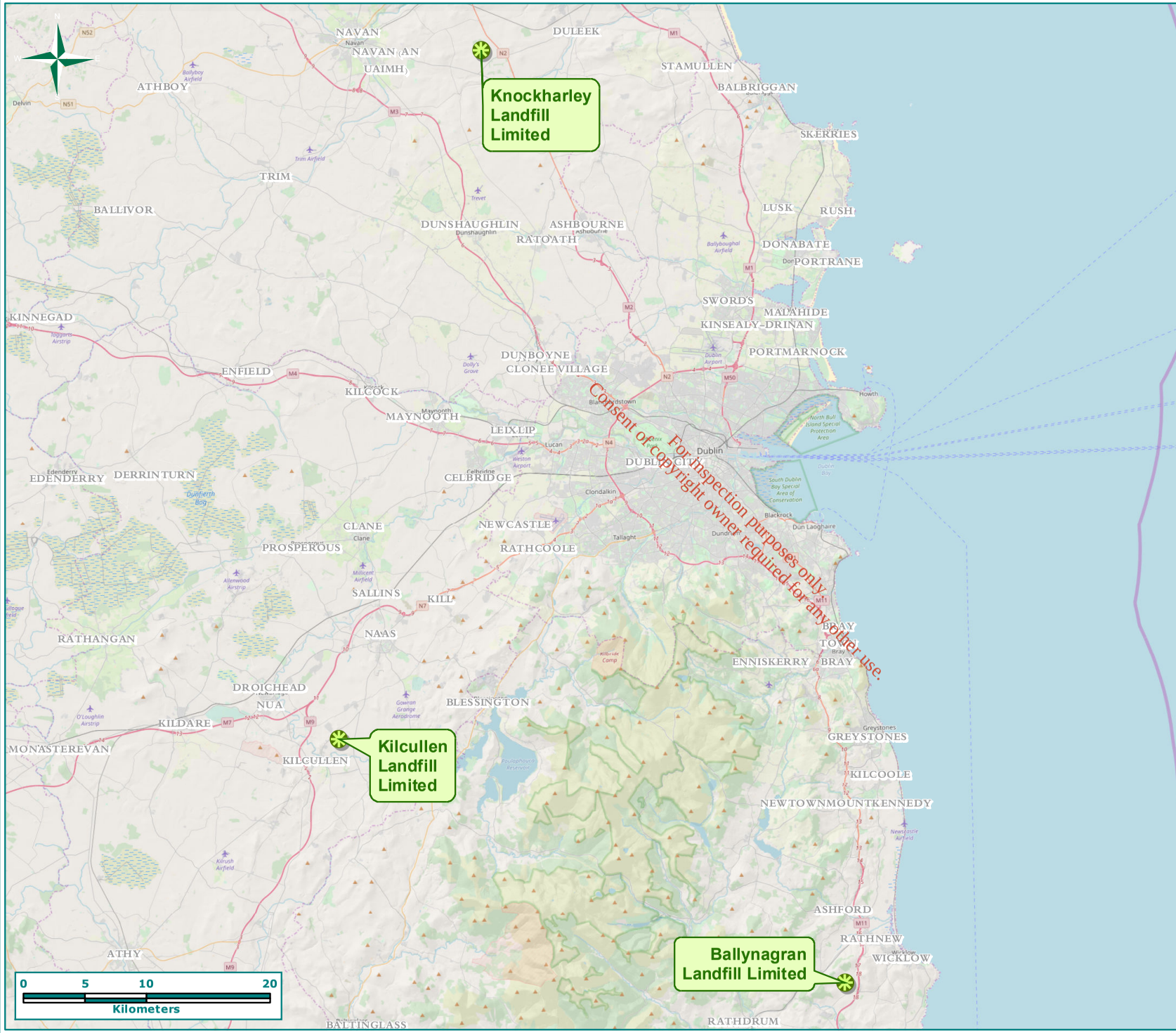
Further development at the Knockharley site is considered more preferable due to the relatively flat topography of the site and hence easier constructability. All materials for the 1m engineered clay barrier layer for cell construction will be won on site.

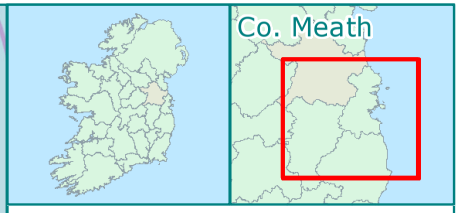
Ballynagran, by comparison, is developed in an irregular manner with challenging topography, which would require more extensive design input and a potentially more challenging construction.

Criterion 4 – Environmental Considerations

As facilities that both currently operate under licences from the EPA, protection of the environment and assessment of the environmental capacity of each site is overseen by the requirements of these licences – to this end, environmental considerations in terms of site location are considered neutral.

Of the 4 no. criteria assessed as part of the alternative site development locations, the Knockharley site is considered the preferable location across three of the four criteria, with environmental considerations being considered as neutral.





Legend

Location of Landfill Facilities

Date	21/11/2018
Client Name	Knockharley Landfill Ltd.
Project Title	Proposed Development at Knockharley Landfill
Figure Title	Location of Landfill Facilities
Figure No.	4-3
Rev.	A
Scale	1:430,982 @ A4

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4.6.2 Alternative Site Layout Design

With Knockharley Landfill being considered the preferable development location, there are a number of options in terms of the siting of the various elements of infrastructure proposed, within the overall footprint of the site.

The various elements of the proposed development could potentially be developed in a number of areas within the site. 4 location options are considered:

- Option 1 – IBA storage facility – east of the existing permitted landfill footprint
- Option 2 – IBA storage facility - west of the existing permitted landfill footprint
- Option 3 – Biological treatment facility Location 1
- Option 4 – Biological treatment facility Location 2

Given the current existence of a leachate lagoon, the logical location for leachate treatment infrastructure is adjacent to the lagoon and therefore alternative layouts for these elements were not considered.

The layout location options outlined above are shown Drawing No. LW14-821-01-P-0000-012 in Volume 4 of the EIAR.

IBA Storage Facility

Options for the location of the dedicated IBA cells within the overall site footprint were considered as being directly east (Option 1) and directly west (Option 2) of the existing permitted landfill footprint, due to the availability of the required footprint in these areas.

Upon consideration of:

- Operational issues – ease of access, utilisation of existing weighbridge
- Design issues – integration with existing drainage and electrical infrastructure
- Construction issues – management and re-use of soils

Option 1 was considered as being the preferable location of the location of the IBA cells.

Biological Treatment Facility Locations

The biological treatment facility location options (3 & 4) were considered on the basis of the potential environmental impact associated with emissions from the biofilter stack associated with the facility.

An odour modelling exercise was applied to the emission values, in terms of odour units, modelled as being emitted from stack shown in location options 3 & 4. Based on the finding of this modelling exercise, Option 4 was deemed as being the preferable location.

4.6.3 Alternative Treatment Technologies

Upon identification of the preferred locations for the IBA storage, leachate treatment infrastructure and biological treatment plant, consideration was given to the different technologies and processes that can be applied as part of these processes. Further details on the technologies and processes to be implemented has been given in Chapter 2 'Description of the Proposed Development'.

Processing Options for Biological Waste Treatment

There is a large range of processing options available for the treatment of biodegradable waste. Legal requirements constrain the choice to some type of 'in-vessel' technology, given that biodegradable waste of municipal waste or food waste origin is classified as an 'animal by-product' material. That is because of the requirement to guarantee time-temperature parameters so that destruction of pathogens can be effective.

In-vessel processes can be aerobic (presence of oxygen) or anaerobic (absence of oxygen). Odour management and odour control are common to both as are waste reception facilities and by-product management. The vessels can be manufactured using a range of metals or concrete. The shape and orientation of the individual components is usually technology provider driven.

Based on 'tried and tested' technology, the preferred technology option to be employed as part of the proposed development is aerobic composting using concrete composting vessels (tunnels) with all waste handling occurring indoors, and with full control of process air and liquids (leachates), in terms of environmental controls.

Processing Options for Leachate Treatment

Leachate treatment technologies can combine physical, chemical and/or biological processes to reduce the strength of the leachate. The choice of technology is influenced by the degree of treatment required and/or and the acceptance standards imposed by recipient's wastewater treatment plants.

As part of the proposed development, it is intended to utilise a combination of leachate treatment processes facility to reduce the leachate strength prior to offsite disposal at wastewater treatment plants.

Options for the IBA Storage

The containment design for waste landfills, from inert to hazardous classification, is prescribed by Council Directive 99/31/EC, on the Landfill of Waste, and landfill design must comply with the provisions of Annex I of the Directive. In summary, the design of the cells for the IBA placement comprise, in conjunction with the requirements of the Directive:

- Water control and leachate management
  - Control/prevention of precipitation/surface water from entering the IBA storage cell
  - Leachate collection
  - Leachate pre -treatment

- Protection of soil and water (IBA cell lining)
  - Combination of bottom liner (geomembrane) and appropriate geological barrier (clay or variant) under the IBA
  - Combination of top liner (geomembrane) and appropriate geological barrier (clay or variant) over the IBA
  - Basal soil liner to comprise (for non-hazardous waste) the equivalent of ≥ 1m of soil with a permeability K< 1.0 x 10^{-9} m/s.

- Gas control
  - In the case of the IBA material, the absence of biodegradable material will negate the potential of landfill gas generation and active gas management; however, as described in Chapter 2, the potential for hydrogen gas generation requires the presence of a passive gas venting system

- Nuisance and Hazards
  - The IBA material will not have potential for odour generation while mitigation measures associated with potential dust generation are an operational consideration
  - The absence of litter in the waste will eliminate the risk of wind-borne material
  - Waste placement has potential for noise which has been considered in terms of noise mitigation measures including screening berm

- Birds, vermin and insects are not attracted to IBA material as it contains no biodegradable material
- There is no aerosol potential from the type of waste proposed for this landfill

There is no option but to comply to the standards set down in the Directive (and summarised above) and in doing so, relevant environmental factors are inherently considered. The shape and size of the IBA cell area has been determined by factors such as accessibility, available space and target volume.

4.6.4 'Do nothing' Alternative

The primary objective of the proposed development is to provide management capacity for a range of non-hazardous waste materials, comprising non-hazardous municipal solid wastes (MSW) from varying origins, incinerator bottom ash, C&D soils & stones and other similar commercial and industrial wastes.

The 'do-nothing' alternatives, in terms of the environmental considerations of the management of the different waste streams proposed, are described in the following.

'Do nothing' Alternative for residual MSW

In a 'do-nothing' scenario for residual MSW, residual MSW will continue to be managed through a combination of existing landfilling capacity, thermal treatment and export, with 'pressure points' (similar to the Section 56 emergency events implemented in 2016 and 2017) potentially occurring, until such time as sufficient extra national capacity is provided. Such 'pressure points' have the potential to have negative environmental impacts from, for example, longer storage at waste transfer facilities due to lack of available outlets, increasing potential for odour generation at these sites.

In a 'do nothing' scenario for the management of repatriated wastes and historic legacy sites, this material will be competing for the limited landfill capacity that will exist in coming years, resulting in instances where waste material will not be removed due to lack of available landfill outlets, with resultant continuance of the negative environmental impacts resulting from the presence of this material at these sites.

'Do nothing' Alternative for IBA

In the 'do-nothing' IBA management scenario, IBA material produced from the Carranstown EfW will compete with other materials for the limited landfill capacity available in the coming years and the potential resource value of that material will continue to be lost as it is co-landfilled with other materials.

IBA material produced from the Dublin Waste to Energy facility will continue to be managed through export, with the environmental benefits associated with recovery of this material being potentially realised in in the end destination country, rather than in Ireland.

'Do-nothing' alternative for C&D soil and stones

A 'do-nothing' alternative for C&D soil and stones will see the identified lack of capacity continue, with the proposed development not making any contribution in terms of national capacity provision. Lack of appropriate management capacity could result in negative environmental impacts associated with the inappropriate management of this material as it arises.

4.7 References

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