3. ENVIRONMENTAL CONSIDERATIONS

The following sub-sections are intended to assess and describe specific areas of the existing baseline environment, to identify potentially significant impacts of the proposed development in respect of these areas, and to detail any proposed mitigation measures and on-going monitoring programmes, where appropriate.

3.1 HUMAN BEINGS

3.1.1 INTRODUCTION

All projects and developments that require an EIS *by virtue of their nature, size and location*, have the potential to have an impact on the environment. The impact on human's beings forms one of the most important aspects to be considered in an EIS. Any likely significant impact on human beings, including their community and activities, must therefore be comprehensively addressed. The principal concern in respect to this proposed development is that human beings should experience no significant unacceptable diminution in an aspect, or aspects of 'quality of life' as a consequence of the construction and operation of the proposed development.

This section of the EIS has been prepared in order to establish the human environment in the vicinity, and to assess the potential impact, if any, arising from the continued operation of a Waste Recovery Facility (WRF) at Foxtown quarry, on the existing environment in respect of human beings. Matters related to water, air quality, noise, landscape and other such environmental impacts are not considered here, as these are more appropriately dealt with in their respective sections of the EIS. Thus, the impacts of the proposed continuation of operations at the WRF on human beings in relation to particular issues are addressed in the following sections:

- Water – Section 3.4
- Air Quality – Section 3.6
- Noise – Section 3.7
- The Landscape – Section 3.8
- Cultural Heritage – Section 3.9
- Material Assets – Sections 3.10
- Traffic – 3.11

The issues considered here include, land use, population, economy & employment, social infrastructure, amenity, tourism and recreation and health and safety. The potential impact on human beings resulting from the proposed development is assessed, and possible mitigation measures proposed to reduce any significant impacts.

3.1.2 STUDY METHOD

The human environment was assessed by undertaking a desktop study and conducting visits to the site and the area. The desktop study was undertaken to compile, review and interpret available information and data pertaining to the human environment of the site and area.

The desktop study involved the assessment of all relevant demographic and socio-economic data for the area, much of which was sourced from the Central Statistics Office (CSO). The Meath County Development Plan (2013 – 2019) was also reviewed, whilst there are no plans for towns, villages or local areas relevant to the proposed development site. Prior planning and environmental reports on the Foxtown quarry (Williams Sheils 2005, JSPE 2008) provided much of the site-specific information. In addition, the desktop study used: (a) maps and site layout plans of the existing quarry development; (b) a copy of the conditions imposed on the quarry development under (P.A. Reg. Ref QY48, QC 17.QC2113); (c) copy of the waste management permit for the WRF (WMP 2007/22); (d) Greater Dublin Area Regional Planning Guidelines 2010-2022 (Dublin Regional Authority & Mid-East Regional Authority 2010); (e) the National Spatial Strategy 2002-2020 (DOELG 2002); and (f) the National Development Plan 2007-2013 (DOT 2004).

In preparing this section, regard was given to the relevant guidelines and recommendations set out in 'Guidelines on Information to be contained in Environmental Impact Statements' (EPA 2003). It is considered that there is a wealth of available data and information, which is sufficient to adequately assess the local environment with respect to human beings.

The assessment of impacts on the human environment were considered using criteria such as: (a) location of nearest sensitive receptors; (b) disturbance to the general amenity of the local environment; and (c) pre-existing use of the land and area. The construction and operational phases of the proposal were both considered. In carrying out the assessment both positive and negative impacts were considered in each case, and the significance of the impacts are rated as being either: imperceptible; slight; moderate; significant; or profound (See Table 3.1.3).

3.1.3 PROPOSED CONTINUATION OF MRF OPERATIONS

This EIS pertains to a proposal to continue operation of a WRF at Foxtown quarry in the Townland of Foxtown, Summerhill, Co. Meath. The quarry and WRF currently operate under the terms and conditions imposed under P.A. Reg. Ref QY48, QC 17.QC2113 granted by Meath County Council. The quarry site is currently being progressively restored using imported inert soil and stone subject to a Waste Management Permit granted by Meath County Council (i.e., Ref. No. WMP 2007/22).

Changes in Waste Management legislation which came into effect in June 2008 (S.I. No. 821 of 2007), now require a Waste Management Licence issued by the Environmental Protection Agency (EPA) in order to operate a WRF with a lifetime total intake volume in excess of 100,000 tonnes. An application for a Waste Management Licence was originally submitted in February 2009 (EPA Reg. No. W0262-01). Pursuant to Article 3(4) of the 2007 Regulations,

the WRF has continued to operate under the existing Waste Permit (Reg. No. WMP 2007/22), until such time as a decision is rendered in respect of the application for a Waste Management Licence.

The application area refers an area of c. 5.2ha which comprises the entirety of the quarry site and landholding, which is being progressively restored. Ultimately, the entire quarry site at Foxtown will be fully restored to agricultural and/or silvicultural use on closure of the quarry and WRF. The objective underpinning the proposal for continued operation of the existing WRF, is to recover up to 40,000 cubic metres per annum of inert Construction and Demolition (C&D) waste, principally soil and stone, for backfilling and restoration of the quarry in accordance with P.A. Reg. Ref QY48, QC 17.QC2113. Any small quantities of timber, plastic, paper and steel will be separated for recovery and/or disposal offsite. Once licenced, it is proposed that the operation will continue to use the existing site infrastructure, and to operate to the current standards for such facilities.

3.1.4 RECEIVING ENVIRONMENT

In this section, land use, recent demographic trends, employment characteristics, social infrastructure and amenity and tourism are examined.

3.1.4.1 LAND USE

The site of Foxtown quarry and WRF is located in a rural area in the townland of Foxtown, c. 6km southeast of Trim. The site of the WRF occupies the entirety of the quarry and landholding of c. 5.2ha, and is located on lands immediately west of, and with direct access to, an unnamed local road. The unnamed local road lies within c. 2km of either the R158 Trim to Summerhill Regional Road, or the R154 Trim to Dublin Regional Road. The site lies c. 10km west of Junction 6 of the M3 motorway at Dunshaughlin, whilst Ratoath and Ashbourne are a further 6.5 and 10km, respectively to the east. Navan lies c.15km to the north, Kilcock c. 14km to the south, Maynooth c. 18km to the south southeast, and Dunboyne c. 18km southeast.

The eastern boundary of the quarry and WRF site is defined by the unnamed local road, whilst the western boundary abuts agricultural land and the northern and southern boundary abut wooded land. The Foxtown area is located in the plain of the Boycetown River within the larger Boyne River Catchment. The Boycetown River flows in a roughly SE-NW direction c. 1km east of the site, whilst an unnamed tributary of the Boycetown River flows c. 500m west of the western boundary of the site. The Boycetown River drains north into the Boyne River at Scurlockstown, near Trim.

The site is situated at approximately 70-80m AOD in a predominantly rural area of south County Meath. The surrounding landscape constitutes lowland with minor hills occurring in an arc from the northeast round to the south, which are identified as Landscape Character Area (LCA) 12: Tara Skryne Hills by Meath County Council (2007). The Trim Esker, on which the quarry is developed, forms a narrow, meandering, topographic ridge running for c. 14.5km in a NW-SE direction. The esker crosses the SW-NE oriented Galtrim Morraine at Ballynamona, c 1km south of the site.

The predominant land use within the application site, which is co-located within the quarry site, is by definition that of quarrying activities related to the extraction of sand and gravel and associated operations such as placement of soil and stone in quarry restoration. The land-use in the area consists of a patchwork of agricultural fields that are designated as pasture and subordinate non-irrigated arable land, reflecting medium-high intensity agricultural. There are relatively low levels of forest cover in the area, restricted largely to the hedgerows, eskers and moraines, and river corridors, with some afforestation off to the west near Ginnet Great, Rathmoylan and Summerhill. The settlement pattern in the Foxtown area can be described as low-intensity rural settlement.

The WRF comprises the entirety of the quarry site, and the existing applicants land holding, which covers an area of c. 5.2ha, and is shown on EIS Figure B2.2 - Rev A, *EIS Section 2 Figures*. The northern section of the quarry site (i.e., Phase 1) site has been partly restored to agricultural use, and is currently supporting livestock. The southern section designated as Phase 2, and the central section designated Phase 3, which houses all of the site infrastructure, are yet to be restored and remain in a disturbed and degraded state, typical of active quarry workings.

The development will also continue to use the established quarry infrastructure including internal roads, crushing and screening plant, site office, workshop, wheelwash, and other ancillaries (Refer to EIS Figure B 2.1 – Rev A, *EIS Section 2 Figures*).

There are sixteen established individual residences within a 500m radius of the site, as shown on Figures B 2.1 – Rev A and B 2.2 – Rev A, *EIS Section 2 Figures*. There are no dwellings on the site or landholding, although three dwellings are located within 75m to the east of the site, on the east side of the unnamed local road.

3.1.4.2 POPULATION AND SETTLEMENT

Analysis of the 2011 Census indicated that in the 2006–2011 period, Meath experienced one of the highest population increases amongst the 26 counties (i.e., 13.1%), and for the first time the population eclipsed the pre-Famine population of 183,828 in 1841. Meath is the third most populace county in Leinster after Dublin (i.e., 1,273,069) and Kildare (i.e., 210,312). A population of 109,732 was recorded in 1996, 134,005 in 2002, 162,831 in 2006, and 184,135 in 2011, representing increases of 22.1%, 21.5% and 13.1% for the three inter-censal periods. The average inter-censal increase in population is 18.9%, whilst annual rate of population growth in the period was 3.78%. Births far outpace deaths, which for example were 3,474 versus 823 in 2009, adding c. 2,500 annually to the population. Thus, the increase in the population of Meath between 2006 and 2011 (i.e., 21,304) is comprised of comparable components due to natural increase (births over deaths) and net migration (i.e., both approximately 2,500).

Since 2006, the population of Leinster increased by 9.14%, while the population of the State increased by 8.22%. Thus, despite this significant population growth in both the Province and State, the population growth of Meath (13.1%) was only exceeded by that of Longford (i.e., 13.4%) and Laois (i.e., 20.1%). Nonetheless, Meath's share of the provincial population (i.e., 2,295,123) grew from 7.09% in 2006 to 7.35% in 2011. Meath, along with Dublin, Louth, Kildare and Wicklow, comprise the "Functional Area of the Dublin City Region" (FADCR), and

with a population of c. 1.8 million, accounts for 42% of the population of the State (Walsh & McNicholas 2009). The latter authors noted a contrast between areas of population decline in the inner suburbs of Dublin and various rural parts, compared to areas of high increase in southeast Meath, northeast Kildare and Fingal. This is reflected in County Dublin having the lowest population growth rate (i.e., 7.24%) in Leinster for the 2006-2011 inter-censal period, whilst the population of the FADCR increased by 8.64% in the same period. Meath's population represents an increasing proportion of the population of the FADCR from 9.18% in 2006 to 9.56% in 2011. Similarly, Meath's population as a percentage of the population of the Greater Dublin Area (GDA – includes Dublin, Meath, Kildare and Wicklow, but excludes Louth), also increased to 10.2% in 2011.

There are numerous large to medium towns with legally defined boundaries in Co. Meath, namely Navan (pop. 28,158), Ashbourne (pop. 11,338), Ratoath (pop. 9,043), Dunboyne (pop. 6,959), Dunshaughlin (pop. 3,903), Kells (pop. 2,208) and Trim (pop. 1,441). There are other significant urban areas, including the *census towns* of Drogheda Environs (i.e., 5,983), Laytown-Bettystown-Mornington (pop. 10,889), Maynooth Environs, Kilcock Environs, and a host of smaller towns and villages, including Duleek, Stamullen, Oldcastle, Athboy, Slane, etc. The nearest town to the Foxtown site is Trim, Co. Meath, which is designated a Moderate Sustainable Growth Town within the settlement hierarchy established in the GDA Regional Planning Guidelines (Dublin Regional and Mid-East Regional Authorities 2010).

The Dublin Regional and Mid-East Regional Authorities designate Navan and Dunboyne as Large Growth Towns I and II, respectively, whilst Ashbourne, Dunshaughlin, Kells and Trim are designated as Moderate Sustainable Growth Towns. Because of differences in the way boundaries between urban and rural areas are incorporated into the 2006 and 2011 censuses, it is difficult to give a consistent statement on the population growth of these towns. However, by including both urban and rural components in the comparisons, it is apparent that the population growth in the 2006-2011 period for Navan was 14.9% (i.e., 24,851 versus 28,559), compared to Dunboyne at 22.8%, Ashbourne at 33.0%, Dunshaughlin at 15.3%, Kells at 12.2%, and Trim at 20.4%. It is apparent from the data that the population growth of the towns generally increased with proximity to Dublin.

The National Spatial Strategy (NSS) recognises the strong functional interrelationships between the Dublin and the Mid-East regions as the GDA (DOELG 2002). There are a large number of towns in the GDA, and these are largely located on the main transport corridors radiating out from Dublin, such as the M1 (Swords, Balbriggan, Layton-Bettystown-Mornington and Drogheda), N2 (Ashbourne, Ratoath, Duleek and Slane), the M3 (Dunboyne, Dunshaughlin, Navan and Kells), and M4 (Maynooth, Kilcock and Enfield).

The NSS also identifies Dublin as the only Gateway within the Dublin and Mid-East Region or GDA, and does not identify any Hubs. Within the north central sector, which includes all of Meath and the wider area around Foxtown, there are three Primary Development Centres identified, namely Drogheda and Balbriggan on the M1, and Navan on the M3, and the County Town of Meath. These centres are strategically placed, strong and dynamic urban centres, located on major transport corridors, where development in the hinterland of Dublin should be concentrated. Despite the reduced connectivity in the transport network from the Foxtown area to Navan caused by the constraint of crossing the Boyne River, Foxtown falls within the

natural catchment of Navan (i.e., c. 22km by road). Foxtown falls just beyond the periphery of a large swathe of southeastern Meath that is identified as a *Rural Area under Strong Urban Influence* (Meath County Council 2013).

The quarry and WRF site is located in the townland of Foxtown within the civil parish of Galtrim, and the Electoral Division (ED) of Galtrim (Refer to Figure 3.1.1). The Galtrim ED is identified as being under low development pressure, whilst the neighbouring electoral divisions of Laracor to the southwest is identified as a strong rural area. The surrounding electoral divisions include Kilmessan, Kilcooly, Trim Rural, Laracor, Summerhill and Kilmore. The Foxtown area is located in a relatively sparsely populated rural area of south Meath, and the Galtrim ED includes no towns, but the Kiltale graig (pop. c. 300). Thus, the Galtrim ED, with an area of 20.96 km^2 and a population of 666 persons, has a relatively low population density of 31.8 persons per km^2 (CSO 2014). This compares to the population densities of 78.6 and 67 persons per km^2 for County Meath and the State, respectively, which themselves constitute low population densities relative to those in neighbouring UK and Europe (i.e., 255 and 112 persons per km^2, respectively).

Although the sex ratio for Meath is 0.997 (i.e., more females than males), the sex ratio for the Galtrim ED is 1.02 (i.e., 337 males versus 329 females), with females preferentially migrating to the towns, resulting in this characteristic pattern for rural areas throughout Ireland (CSO 2012a, 2014). The average age of the population in Meath is 33.8, which is significantly below the national average of 36.1, and is the second youngest in the State after Kildare (i.e., 33.5), albeit Fingal local authority has the youngest population (i.e., 32.9). The average age in the Galtrim ED in 2011 is approximately 38 (See Figure 3.1.2), and is thus markedly older than Meath in general. This is reflected in Galtrim's slow population growth rate of 8.1% in the 2006-2011 inter-censal period.

Age dependency shows the ratio of the old and young segments of the population to that of working age. Notably, the total age dependency ratio in the State increased by 3.5% from 45.8% in 2006 to 49.3% in 2011, whilst the ratio in Meath increased by 5.9% from 45.8% to 51.7% in the same period (CSO 2012b). The young dependency ratio is the number of young people aged 0-14 as a percentage of the population of working age. In 2011, the ratio was 31.9% for the State overall, whilst Meath had the highest ratio at 38.3%, reflecting its very young and fast growing population. In contrast, the old dependency ratio is the number of people aged 65 and older as a percentage of the population of working age. In 2011, the old dependency ratio in the State was 17.4%, whilst the ratio in Meath was 13.5%, which is the second lowest county after Kildare (11.7%), albeit the local authorities of Fingal (10.6%), Galway City (12.6%), and South Dublin (12.7%) had even lower ratios. Thus, while Meath has a moderately high total age dependency ratio, it reflects a very young, growing population versus an ageing population.

Table 3.1.1 gives population data for the electoral divisions in the vicinity of Foxtown, as well as for County Meath, the GDA, and the State from 2002-2011 (CSO 2012c). Notably, the populations of the seven electoral divisions that comprise the local area around Galtrim showed widely differing growth rates between 2002-2011 (i.e., 8.1% to 43.9%), although the combined population increased by almost a third in the decade. Much of this growth is related to the burgeoning population on Trim and urban sprawl into rural Trim, where the population

of the latter electoral division accounts for more than half of the local area. In contrast, the strongly rural electoral divisions of Galtrim, Laracor and Kilmore exhibit populations that are comparatively stagnant, with growth rates of 8.1%, 12.6% and 13.4%, respectively. Meath's population grew at the rate of 37.4% between 2002-2011, significantly higher than the more modest growth rates of 17.5% and 17.1% for the GDA and the State, respectively.

There are several large residential settlements in the wider area around the site, with Summerhill c. 4.5km to the south, Trim c. 6km to the northwest, Dunshaughlin c. 11.5km east, Kilcock c. 14km to the south, Navan c.15km to the north, Maynooth c. 18km to the south southeast, and Dunboyne c. 18km southeast. There is a substantial graig at Kiltale on the R154, c. 2.5km east of Foxtown, another graig at Monalvy c. 5km to the southeast, whilst the village of Rathmoylan lies c. 7km to the southwest. However, residential development in the vicinity of Foxtown consists predominantly of isolated farm dwellings and of owner occupied bungalow/houses along public roads (Refer to EIS Figures B 2.1 – Rev A and B 2.2 – Rev A, *EIS Section 2 Figures*). There are sixteen residences in the immediate area (i.e., within 500m) of the quarry and WRF site at Foxtown.

Table 3.1.1 Population in the Local Area 2002-2011

District	2002	2006	2011	%Change 2002-2011
Kilmessan	1,081	1,162	1,388	28.4
Kilcooly	277	311	323	16.6
Trim Rural	5,442	6,522	7,833	43.9
Laracor	506	526	570	12.6
Summerhill	1,118	1,205	1,299	16.2
Kilmore	1,329	1,427	1,507	13.4
Galtrim	616	616	666	8.1
Total Local Area	10,369	11,769	13,586	31.0
County Meath	134,005	162,831	184,135	+37.4
Dublin & Mid-East Region	1,535,446	1,662,536	1,804,156	+17.5
State	3,917,203	4,239,848	4,588,252	+17.1

Note: Data from CSO (2012c).

3.1.4.3 ECONOMY & EMPLOYMENT

Historically, Meath's location within the Pale, access to the ports of Dublin and Drogheda, and abundance of productive agricultural land bestowed great advantage on Meath. Today Meath's strategic advantage is its proximity to Dublin and location within the capital city region or GDA, which is the most economically dynamic and progressive area of the country. Meath benefits from this proximity to Ireland's primary economic hub and National Gateway, and the

largest market in the State. Meath also benefits from its strategic location on the Dublin-Belfast international corridor linking both capital cities and international airports. The excellent, multi-modal transport infrastructure which provides ready access to Dublin Airport and Dublin Port also delivers strong connectivity throughout the county with four national primary routes, three of which are motorway (i.e., M1, M3 and M4). The fertile soils of Meath also provide the basis for a thriving agricultural and food sector that can support the rural economy and communities.

With its rich array of cultural and heritage assets, such as the World Heritage Site of *Bru Na Boinne*, *Hill of Tara*, the seat of the High Kings, *Loughcrew Cairns*, the *Battle of the Boyne* site, *King John's Castle,* Trim, *Bective Abbey*, and the *Kells Crosses*, Meath has positioned itself as the *'The Heritage Capital'* of Ireland. Cultural tourism has been identified as a potentially significant driver of the county's modern economy. Meath County Council (2013) recognises that the sustainable development of green infrastructure and natural heritage and the maintenance and improvement of the unique rural and urban built heritage present strong attractions.

Meath is the second most affluent local authority area in the Mid-East Region, and sixth most in the State, and in general is not characterised by particular extremes of affluence or deprivation (Haase 2007). The most affluent areas are situated in the South East of the county, most probably including Foxtown, which lie within easy commuting distance to Dublin.

Although urban areas of Meath are home to a greater fraction of the population of Meath (i.e., 105,018 or 57% in 2011), rural areas are home to a substantial population (i.e., 97,117 or 43% in 2011). This urban/rural split of near-parity in Meath (i.e., 1.33) contrasts with that in the State, Mid-East Region and the GDA (i.e., 1.64, 1.74 and 43.6, respectively). Although rural areas account for 43% of the population, only 6% are employed in agriculture, forestry and fishing in 2011. Nonetheless, agriculture is the primary land-use in the county and the economy benefits significantly from the sector. The rural areas are also the location of major natural resources as well as major recreational, amenity, tourist and archaeological resources.

From Table 3.1.2, it is apparent that the dominant employment sectors in Meath are commerce and trade (23%), transport and communications (18%), manufacturing (13%) and professional services (12%).

Examination of the Central Statistics Office (CSO) Live Register figures for County Meath during the recession shows that unemployment levels rose dramatically from the end of 2007 to 2010 and remained a factor of about 3 times the pre-recession levels at c. 12,000 during 2010 and 2011 (See Figure 3.1.3). In the 2011 census, unemployment stood at 18% in Meath compared to 19% nationally. The unemployment level in Meath began to fall gradually from early 2012, and fell below the 10,000 mark in late 2013. In May 2014, the figure stood at 9,775, which equates to an unemployment rate of 9.9%, whereas the national rate was 11.8%. Thus, the unemployment rate in County Meath is approximately two percentage points lower than in the State. The dramatic increase in unemployment has been largely associated with the collapse of the construction industry and the associated service industries. The recent improvement in unemployment figures reflects stabilisation in job losses and an improving economic outlook, combined with the historical pressure valve of emigration.

'Commerce and Trade', which includes wholesale and retail trade, banking and financial services, real estate, renting and business activities, is the single largest employer (29,4%) in the Galtrim ED, with 'Professional Services' being the second largest employer (21.7%). Given that approximately half the workforce in Meath work outside of Meath, and given the proximity of the Galtrim ED to Dublin, it is probable that the dominance of 'Commerce and Trade' reflects the large fraction of the workforce in the Galtrim ED that works outside both the electoral division and county, in Dublin City. 'Agriculture, Forestry and Fishing' is the third largest employer (12.3%), as might be expected in a rural electoral division. The fourth largest employer is 'Building and Construction' (10.9%), which probably reflects a significant contraction, with the remaining categories constituting minor employers in the Galtrim ED (See Table 3.1.2).

Table 3.1.2 Employment by Industry in County Meath and Galtrim ED in 2011

Industry	County Meath		Galtrim ED	
Agriculture, forestry and fishing	2,862	7.37%	34	12.3%
Building and construction	1,719	4.43%	30	10.9%
Manufacturing	5,514	14.2%	17	6.16%
Commerce and trade	10,137	26.1%	81	29.4%
Transport and communications	1,832	4.72%	11	3.99%
Public administration	2,398	6.18%	20	7.25%
Professional services	9,376	24.2%	60	21.7%
Other	4,984	12.8%	23	8.33%
Total	38,822	100.0%	276	100.00%

Note: Excludes 32,942 workers who work outside Meath. Data from CSO (2014).

Historically, agriculture and businesses supporting agricultural production would have been the main source of employment in the area and nearby villages and towns. Local farms, McCormack Farms horticulture facility at Martinstown, and Teagasc's Animal Bioscience Research Centre at Grange, Dunsany, continue to offer employment in agriculture. Kiltale, Monalvy and Rathmoylan offer few employment opportunities, with the nearest commercial and industrial centre being in Summerhill Enterprise Centre, and Trim, the Enterprise Centre, the Eamon Duggan Industrial Estate, the Fairgreen Industrial Estate, the Oaktree Business Park, and the Scurlockstown Business Park. There are also some employment opportunities related to heritage sites in Trim, and throughout Meath, and in the many golf courses in the

wider area. However, outside of Trim, the major employment opportunities for the workforce resident in the Galtrim ED are probably in Navan and Dublin.

Facilitated by proximity to the M3 and M4 motorways, south Meath, including the Galtrim ED, recorded high transport energy consumption (Walsh & McNicholas 2009), and is most probably related to commuting to work in Dublin. This is consistent with the average journey times to work, school or college of c. 32 minutes for the Galtrim ED in 2011.

The quarry at Foxtown has provided employment for local people, both directly and indirectly. Kiernan Sand and Gravel Ltd employ two directly. An additional temporary employee is hired occasionally. The WRF requires one person operating a bull-dozer/back-hoe excavator and one general foreman to monitor and inspect the quality and suitability of imported materials being brought to the site for recovery. It is expected that an additional general operative will be appointed subject to an upturn in the economy and construction activity.

3.1.4.4 SOCIAL INFRASTRUCTURE

Foxtown is located in a rural area, which is under low development pressure for residential and economic uses associated with its proximity to Dublin. Nonetheless, there are few residences in the immediate area, indeed only 16 within 500m. Residential development consists of isolated farm dwellings and of owner occupied bungalow/houses along public roads (Refer to EIS Figures B 2.1 – Rev A and B 2.2 – Rev A, *EIS Section 2 Figures*). The Foxtown area lies just north of Galtrim House, which contains a cluster of five Protected Structures in a parkland landscape, an inventory of important cultural heritage that contributes to the sense of place for the community in the area.

There are many large residential settlements close to the site, with the graig of Kiltale c. 2.5km to the east and Moynalvy c. 5km to the southeast, the village of Rathmoylan 7km to the southwest, and the towns of Summerhill c. 4.5km to the south, Trim c. 6km to the northwest, Dunshaughlin c. 11.5km to the east, Kilcock c. 14km to the south, Navan c. 18km to the north, Maynooth c. 18km to the south southeast, and Dunboyne c. 18km to the southeast. With exception of the R154 and R158, the roads in the immediate area are of a local character and typical of a rural location. The M3 motorway (at Junction 6) lies c. 10km to the east, whilst the M4 motorway (at Junction 8) and the Dublin-Galway mainline railway run roughly along the Meath-Kildare border, and are only c. 12.5km to the south at Kilcock.

The nearest Post Office outlets are in Kilmessan at c. 5.5km, Trim at c. 6km, and Dunsany at c. 6.5km, whilst the nearest bank is also located in Trim, where a large range of shops is also available.

The nearest National School is Scoil Nais Mhuire Naofa, which caters for the primary education of over approximately 100 pupils. Also nearby are Dangan Mixed National School, Summerhill, Kilmessan Mixed National School, Scoil Naisiunta Naomh Seosamh, Dunsany, whilst there are four primary schools in Trim, the nearest of which is Gaelscoil Na Boinne on the Dublin Rd. (i.e., R154). Secondary schools are available at Schoil Mhuire (girls only) and the Community College in Trim, at St. Fintinas Post Primary School, Longwood, at the Community College, Dunshaughlin, at Scoil Dara, Kilcock, and at Maynooth Post Primary School.

The nearest third level Institutions are located in Blanchardstown (i.e., Blanchardstown Institute of Technology or BIT), Tallaght (i.e., Institute Technology Tallaght or ITT), Dublin (i.e., Dublin Institute of Technology or DIT), and Dun Laoghaire (i.e., Dun Laoghaire Institute of Art, Design & Technology or IADT), whereas the nearest universities are National University of Ireland in Maynooth, Dublin City University (DCU) in Glasnevin, Trinity College Dublin (TCD) in Dublin city centre, and University College Dublin (UCD) at Belfield, Dublin.

The nearest Roman Catholic Church to Foxtown is the Kiltale Church of the Assumption at c. 2km. Other churches in the region include: the Lady of Lourdes Church, Summerhill at c. 3.5km, the Moynalvy Church of the Nativity at c. 5km, and the Church of the Nativity of Mary, Kilmessan at c. 5.5km, and St. Patrick's, Trim at c. 6km. The nearest churches or houses of worship of other major denominations are: Church of Ireland: St. Patrick, Trim; and Presbyterian: Presbyterian Church in Ireland Bective St., Kells.

The Summerhill Primary Care Centre is the Primary Health Care Centre for south central Meath, whilst the Trim Primary Care Centre is also relatively close at c. 6km. The nearest public hospital is Navan General Hospital at c. 15.5km, followed by Connolly Hospital, Blanchardstown, Dublin 15 at c. 25km.

The nearest Fire Station is located in Trim, with next closest located in Dunshaughlin and Navan, all of which are retained services. The Meath Fire Brigade is headquartered in Navan. The nearest Garda Station is located on Trim Rd. (i.e., R158) in Summerhill, followed by the Garda Station at Castle St. in Trim, both of which fall within the Eastern Region of An Garda Síochána. Other facilities in the wider area, include the community centres and sports and leisure centres in Summerhill, Trim, Dunshaughlin and Navan.

Power to local residences is provided by over-head lines. The water supply for the area is provided by individual private bored wells, although there are Group Water Schemes in Kiltale and Rathmoylan. Most houses are serviced by septic tank systems and proprietary effluent treatment systems.

3.1.4.5 AMENITY, TOURISM AND RECREATION

Meath is named after the ancient Kingdom of Meath, and is also known colloquially as the "Royal County", because of its history as the seat of the High King of Ireland. It was also part of the area known as "The Pale", which was under the direct control of the English establishment during the Middle Ages. The area of County Meath is very much defined by the Boyne River Catchment, and it is the Boyne Valley which is home to the megalithic tumuluses of Dowth, Knowth and Newgrange at Brú na Bóinne, the Hill of Tara, and the source of the ABradan Feasa@ or ASalmon of Knowledge@ of Cú Chulainn mythology. With its numerous ancient monuments, ruins, castles, battlefields and Landed Estates (or Demesnes) with their Great Houses, Meath is a county steeped in history.

Foxtown is located in south County Meath, c. 35km from Dublin Airport and c. 40km from Dublin Port, whilst the nearby settlements are Kiltale (c. 2.5km), Summerhill (c. 4.5km), and Trim (c. 6km). There are community and recreational facilities in Kiltale, which include the Church of the Assumption, Scoil Mhuire Naofa National School, the Parish Hall, and the Kiltale Hurling & Camogie Club, whilst Summerhill hosts a Community Centre, a Primary Care

Centre, the Summerhill Tennis Club, a soccer club at Park Celtic Summerhill, and the Summerhill Gaelic Football Club. Trim hosts four national schools, two secondary schools, St. Patrick's Roman Catholic Church, the Church of Ireland Cathedral Church of St. Patrick, Primary Care Centre, the Aura Trim Leisure Centre, the Trim GAA Club, Trim Celtic soccer club, the Boyne Valley Activities Centre, and the Trim Flying Club based at the Trim Aerodrome. Trim annually hosts a Classic Car Show, a Haymaking Festival, the Trim Swift Festival, and the Royal Meath Show. There are also nearby GAA clubs at KIltale, Summerhill, Moynalvey, Dunsany and Rathmoylan.

Foxtown benefits from the myriad of amenities and attractions located within the county, as well as being within easy reach of the vibrant Capital City of Dublin. The Foxtown area contains numerous historical and archaeological sites, although Galtrim House is the locus of Protected Structures in the area. Further afield, Dunsany Castle Demesne, the historic seat of the Plunkett Family since the 1400s, offers viewing and guided tours of the castle, walled gardens and parkland.

Other heritage attractions in Meath include: the World Heritage Site and visitor centre at Bru na Boinne; Hill of Tara; Loughcrew Cairns; Kells Round Tower and High Crosses; King John's Castle, Trim; Bective Abbey; Battle of the Boyne Site, Oldbridge; Slane Castle; Ardbraccan House; and many more.

Trim is a large historic town and one of Meath's primary historic settlements. The town and its environs are steeped in history and have a wealth of historical and archaeological sites. King John's Castle is sited next to the River Boyne, and its floodplain provides open public space in a picturesque setting. Built by Hugh de Lacy at the end of the 12th century, King John's Castle is the largest Norman castle in Europe, dominates the townscape, and is a major tourist attraction. Trim is unusual for the number of surviving medieval buildings, which includes King John's Castle, Talbot Castle, St. Patrick's Cathedral, the Court House, and the Castle Street cottages. The medieval town of Trim boasted 2km of town wall defenses, sections of which survive today either above or below ground.

St. Patrick built a church near an ancient ford that crossed the Boyne at Trim, and it was from this that the town got its name. There are fascinating ruins which provide evidence of fervent religious activity in the area. Stone relics abound in St. Patricks Cathedral, its church and porch revealing a number of medieval graveslabs. St. Mary's Abbey is the remains of an Augustinian monastery founded in the 12th century. The Newtown Monuments consist of a large medieval cathedral, two monasteries and small church which date from 1206. The Friary of St. John the Baptist, is the remains of a 13th century Augustinian foundation, which was later converted to a hospital in the 18th century. The prominent ruins of the Yellow Steeple overlook the town from a ridge opposite King John's Castle. Originally part of the 13th century St. Mary's Augustinian Abbey, the steeple dates from 1368. The black Friary of the Dominicans was founded by Geoffrey de Geneville, Lord of Meath in 1263.

Meath also offers many other tourist attractions, including: Tower of Lloyd, Kells; eight heritage trails; numerous walking, hiking and biking trails; angling for salmon and trout on the famous Boyne and Blackwater Rivers; water sports at the Irish Aquatic Sports Centre, Summerhill, Boyne Valley Adventure Centre, Trim, and the Rathbeggan Lakes, south of Dunshaughlin; adventure activities at the Boyne Valley Activities Centre, Trim, and the Loughcrew Adventure

Centre, near Oldcastle; paintballing and go-carting at the Zone in Navan; and at Tayto Park, Ashbourne. The ecotourist can enjoy a walk at Girley Bog near Kells, or the nature trail and river walk at Sonairte National Ecology Centre in Laytown. There are also numerous festivals, such as Moynalty Steam Threshing; Tattersalls International Horse Trials and County Fair; and the Slane Castle Music Festival.

Golf enthusiasts visiting the area can enjoy a wide choice of excellent golf courses within short driving distance. Across Meath there are numerous links and heathland courses, including Royal Tara near Navan, The Headfort near Kells, Laytown and Bettystown, Ashbourne, and many others. The nearest course is at Knightsbrook Golf Club, c. 4km to the northwest near Trim, whilst within 10km, there is the South Meath Golf Club at Carberrystown, the County Meath Golf Club at Newtownmoynagh, the Glebe at Dunleever, Trim, and the Jack Nicklaus designed course at Killeen Castle Golf Club, Dunsany, the venue for the 2011 Solheim Cup.

Horse racing is also popular at the annual Laytown Beach Races in September, at the Bellewstown racecourse, Navan racecourse, and at Fairyhouse, the home of the Irish Grand National. Meath is one of Ireland's top destinations for equestrian sports and horse breeding with world class studs dotted right around the county. There are equestrian activities at numerous nearby equestrian centres, such as Kelly's Equestrian, Kilmessan, Royal Meath Equestrian & Language Centre, Drumree, Pelletstown Riding Centre, Drumree, Kilcarty Equestrian Centre, Dunsany, Bachelor's Lodge Equestrian Centre, Navan, Carton Equestrian Centre, Kilcloon, and Stewarts of Kilcloon.

3.1.4.6 HEALTH & SAFETY

Operations within the quarry site, which includes the WRF, are carried out in accordance with all relevant legislation / regulations and with the best work practices for the industry. The policy of the operator is to ensure the health and welfare of its employees by maintaining a safe, clean and tidy working environment, and employing safe working procedures. The policy has been extended to include the WRF, and is in accordance with the requirements of employment legislation, including the provisions of the "Safety, Health and Welfare at Work Act, 2005", and the relevant Regulations.

The wearing of protective clothing such as footwear, helmets and high visibility clothing is mandatory in operational areas. Careful attention is paid to safe practices when carrying out machinery maintenance and ensuring appropriate guarding of moving parts.

Adequate fencing, signage and other barriers have been erected around the quarry site, which will also corresponds to the WRF, for the safety of the general public and to prevent livestock straying into the development. Large lockable gates are in place to guard against unauthorised and unsupervised entry to the site outside of working hours.

3.1.5 ASSESSMENT OF IMPACTS

3.1.5.1 INTRODUCTION

The proposed continued operation of the WRF at Foxtown arises from: (1) from the continued demand of human beings to have their buildings, roads and structures, modified and improved, resulting in the generation of large volumes of inert C&D waste, including soil and stone; and (2) the requirement to restore land, previously disturbed and degraded by sand and gravel extraction at the Foxtown quarry, through backfilling with recovered inert soil and stone. The recycling and recovery of C&D waste is essential to reduce resource utilisation and divert reusable inert waste from landfill.

Although Foxtown is a rural location, it is strategically located within a large catchment area with numerous large settlements, such as Kiltale, Summerhill, Rathmoylan, Moynalvy, Trim, Kilmessan, Dunshaughlin, Kilcock, Duboyne, Blanchardstown and Navan, rendering the WRF well positioned to recover large volumes of inert soil and stone. This will contribute to the diversion of greater volumes of waste from disposal in landfill, as required under the Waste Framework Directive 2008 (2008/98/EC), and the European Communities (Waste Directive) Regulations, 2011 (S.I. 126 of 2011). There is also a preference for the deposition of soil and stone to be underpinned by a beneficial use in order to be considered waste recovery. Consequently, co-location of a waste recovery facility at Foxtown quarry has significant positive impacts, and is thus environmentally preferred.

The impact on human beings resulting from the proposed continued use of the WRF is assessed here, and possible mitigation measures proposed to reduce any significant impacts. Table 3.1.3 identifies the levels of impacts which are used here in order to evaluate the significance of potential impacts resulting from the proposed continuation of the WRF. These impact ratings are in accordance with impact assessment criteria provided in EPA's "Advice Notes on Current Practice in the Preparation of Environmental Impact Statements" (2003).

It is expected that the potential negative impacts on human beings and amenity of the area arising from the WRF, above those already arising from the quarry, relate mainly to nuisance from noise, dust and traffic.

There are a number of potential environmental impacts associated with the WRF that may directly, or indirectly, affect the local “human” environment. These potential impacts and the mitigation measures proposed are described in the following sections of this report under the headings detailed below:

- Flora & Fauna – Section 3.2
- Water – Section 3.4
- Air Quality – Section 3.6
- Noise– Section 3.7
- Landscape – Section 3.8
- Cultural Heritage – Section 3.9
- Material Assets – Sections 3.10
- Traffic – 3.11

Table 3.1.3. Glossary of Impacts following EPA Guidance Documents.

Impact Characteristic	Term	Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	A change which does not affect the quality of the environment
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An impact capable of measurement but without noticeable consequences
	Slight	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An impact that alters the character of the environment in a manner consistent with existing and emerging trends
	Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Duration	Short-term	Impact lasting one to seven years
	Medium-term	Impact lasting seven to fifteen years
	Long-term	Impact lasting fifteen to sixty years
	Permanent	Impact lasting over sixty years
	Temporary	Impact lasting for one year or less
Type	Cumulative	The addition of many small impacts to create one larger, more significant impact
	'Do Nothing'	The environment as it would be in the future should no development of any kind be carried out
	Indeterminable	When the full consequences of a change in the environment cannot be described
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
	Synergistic	Where the resultant impact is of greater significance than the sum of its constituents
	'Worst Case'	The impacts arising from a development in the case where the mitigation measures may substantially fail

3.1.5.2 LAND USE

The existing quarry development has been undergoing progressive reinstatement to agricultural/woodland using imported material for the past 7 years. A waste licence is now required to complete the final stages of the restoration programme. The impact of the restoration works to date has had a positive impact on the environment in returning these lands to beneficial use.

The quarry has put in place a number of mitigation measures with respect to environmental management and monitoring to ensure that operations do not result in significant impacts on the surroundings, including the human environment.

The area has an established history of sand and gravel working, and these activities have co-existed with other land uses in the area, particularly medium to high intensity agriculture. On completion of site activities, the site of the quarry and WRF will be decommissioned and left safe and secure. Furthermore, the site will be reinstated in accordance with the phased restoration scheme for the quarry, and thus integrated back into the surrounding landscape with the attendant improvement to the amenity of the area.

3.1.5.3 POPULATION AND SETTLEMENT

It is not anticipated that the proposed continuation of WRF operations will result in any change in population. However, by supporting and maintaining the workforce living in the area, it is considered that the WRF will have a positive impact on sustaining the population.

3.1.5.4 ECONOMY & EMPLOYMENT

Kiernan Sand and Gravel Ltd is a family run business that has been supplying building materials in the form of aggregates in County Meath since the early 1960's. The quarry has contributed indirectly to sustaining and developing the local and regional economy through the supply of building products, and has provided employment for local people, both directly and indirectly.

Kiernan Sand and Gravel Ltd employ two employees directly. An additional temporary employee is hired occasionally. The WRF requires one person operating a bull-dozer/back-hoe excavator and one general foreman to monitor and inspect the quality and suitability of imported materials being brought to the site for recovery. It is expected that an additional general operative will be appointed subject to an upturn in the economy and construction activity.

3.1.5.5 SOCIAL INFRASTRUCTURE

The proposed continuation of the WRF would provide a valuable and necessary resource to the county and wider region, providing a beneficial use for the recovery of inert soil and stone as an alternative to landfill. The WRF already exists and has an established record of meeting its regulatory obligations and current environmental standards.

There are no community facilities within close proximity of the WRF, with the national school or community centre or parish hall located in KIltale graig, c. 2.5km from the site, which

constitutes a very significant standoff distance. Thus, it is expected that there will be imperceptible impact on local community facilities as a result of the continued use of the WRF at Foxtown.

3.1.5.6 AMENITY, TOURISM AND RECREATION

There are no major tourism attractions in the immediate vicinity of the WRF, with the exception of Irish Aquatic Sports Centre, c. 3.5km southeast at Moynalvy/Summerhill, and the Knightsbrook Golf Club, c. 4km northwest near Trim. Given the history of quarrying and waste material recovery at this location it is expected that there will be imperceptible impact on local tourism as a result of the continued use of the WRF at Foxtown. There are numerous other attractions in south Meath, however all of these are very remote to the WRF and therefore will be not be impacted upon.

Traffic entering and leaving the site will use the existing established quarry site access. The quality of the pavement in the vicinity of the Quarry and Waste Recovery Facility entrance to the R154 is at present in good condition. The traffic impact of the Quarry and Waste Recovery Facility is at present considerably less than it was at full production prior to 2008. During this period the traffic generated by Quarry and Waste Recovery Facility had little adverse effect on traffic movements on the surrounding road networks. The continued use of the Quarry and Waste Recovery Facility at the predicted level will not increase the traffic over the present level. Further details with respect to the impact and mitigation of traffic are contained within this report (Refer to Section 3.11).

As the WRF is co-located within the existing quarry, there is negligible additional visual intrusion. There are no Protected Views and Prospects near or oriented towards the site (Meath County Council 2013). The visual impact of the WRF is discussed in more detail in Section 3.8 - Landscape. Upon decommissioning, the site will be restored in accordance with the approved restoration scheme for the quarry. Therefore in the medium term, the site will be assimilated back into the landscape in a planned manner.

3.1.5.7 CONSTRUCTION

As the WRF is already in operation under an existing Waste Permit (Reg. No. WMP 2007/22), there are no future adverse impacts on human beings arising from the construction and establishment of the WRF. There are however potential impacts arising from the operational phase of the WRF, and these include dust, noise and traffic (Refer to EIS Sections 3.6, 3.7 & 3.11 respectively). As no additional construction related to the WRF is envisaged, construction will thus have an imperceptible impact on the human environment.

3.1.5.8 OTHER

There are no Recorded Monuments within the proposed development area. There are four Recorded Monuments within the 1km study area. There are no Protected Structures, Architectural Conservation Areas, NIAH structures or NIAH historic gardens or designed landscapes within the proposed development area. As a result there will be no direct or indirect construction impact on the archaeological, architectural or cultural heritage resource.

The impact of inert waste disposal on this site will be considerable in local ecological terms but will not result in any loss of heritage values in the locality. In the long-term it will create pasture/woodland and, in habitat terms, simulate a feature of the pre-existing esker.

3.1.5.9 'DO-NOTHING' IMPACTS

If the proposed continuation of the WRF did not proceed, the recovery of inert soil and stone at the WRF would not occur, and result in the failure to divert these volumes from disposal in landfill, as required under the Waste Framework Directive 2008. Furthermore, the Foxtown site would be unable to complete the phased restoration of the quarry void and the proper reinstatement of the land. Additionally, the existing WRF would be forced to cease operations resulting in the loss of employment. This would have a significant and direct negative impact on the local human environment.

3.1.6 MITIGATION & MONITORING

Proposed mitigation measures with regard to environmental issues such as air quality, noise, traffic and visual impacts are provided for and are described in detail under the relevant sections (See above list in Section 3.1.5.1). Any impact on the natural environment will be mitigated against to the greatest degree practical, thereby minimising any associated impact on the "human" environment.

Kiernan Sand & Gravel has established an on-going environmental monitoring programme for the Foxtown quarry and WRF site. The programme will allow for on-going monitoring of environmental emissions (e.g., noise, dust, water) from the site, thereby assisting in ensuring compliance with any future requirements or regulations. The results of this monitoring will be made available to the EPA and the Local Authority on a regular basis, where members of the public may examine it. The future monitoring programme will be revised accordingly, subject to compliance with any conditions attached to a decision to grant a Waste Management License.

The development can be controlled and regularised in accordance with the scheme as outlined in this document, through continued environmental monitoring and by conditions imposed by the EPA. The proposal will have no major and/or long-term effect on the human environment.

3.1.7 RESIDUAL IMPACTS

Once the proposed continued operation of the WRF is authorised with a Waste Management License, and mitigation measures provided for, there are no significant residual impacts envisaged in terms of community and other socio-economic issues.

3.1.8 REFERENCES

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3.1.9 FIGURES

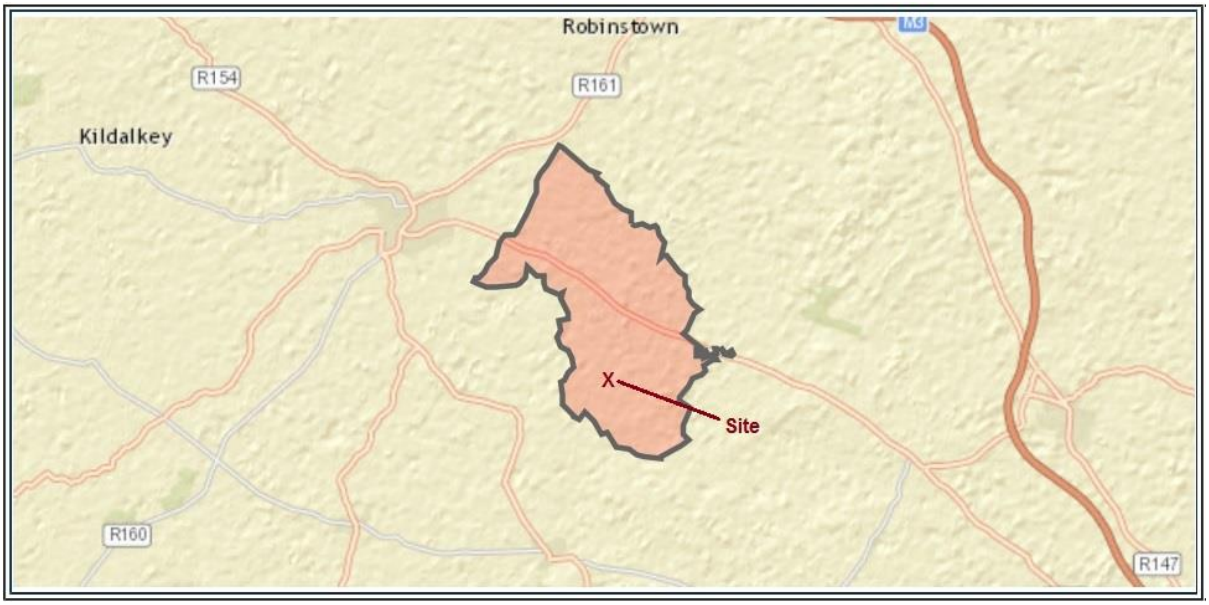

Figure 3.1.1. Electoral Division of Galtrim, showing Foxtown site (marked X), c. 6km southeast of Trim. Redrawn from CSO Census 2011 SAPMAP Viewer (CSO 2014).

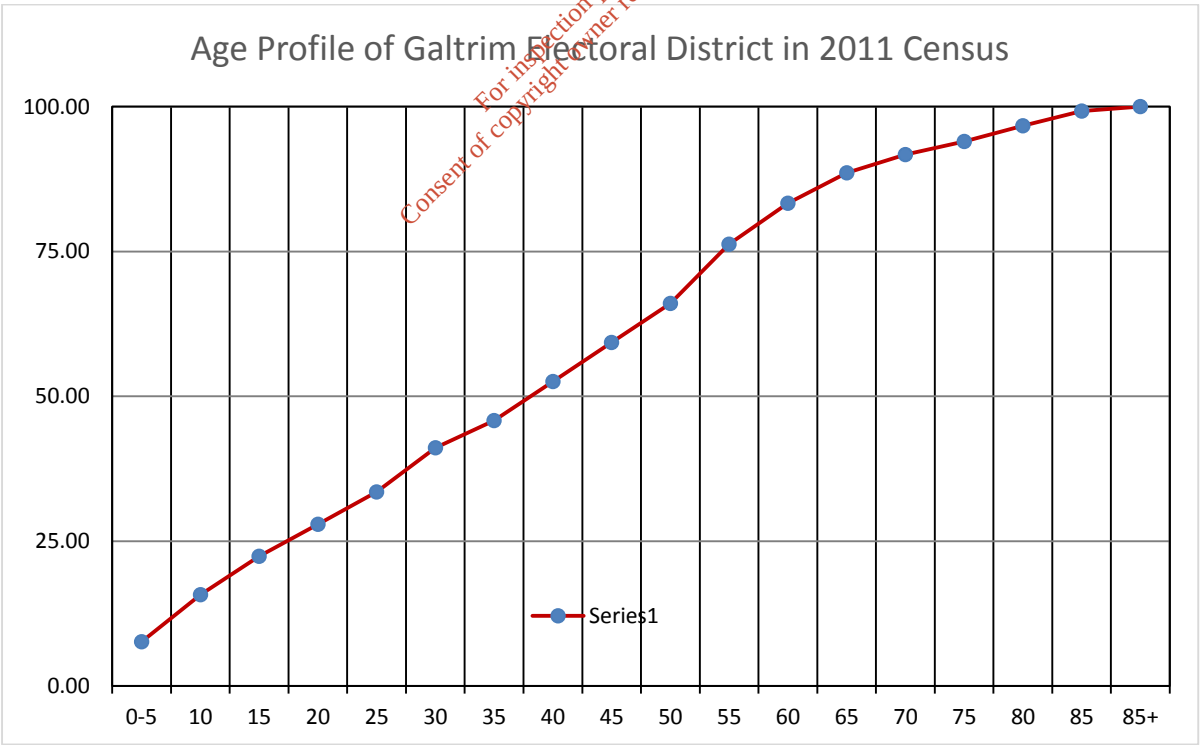

Figure 3.1.2. Age profile of population in the Galtrim Electoral Division in 2011. Note average age is approximately 38 years. The Census 2011 data was sourced from the CSO (2014).

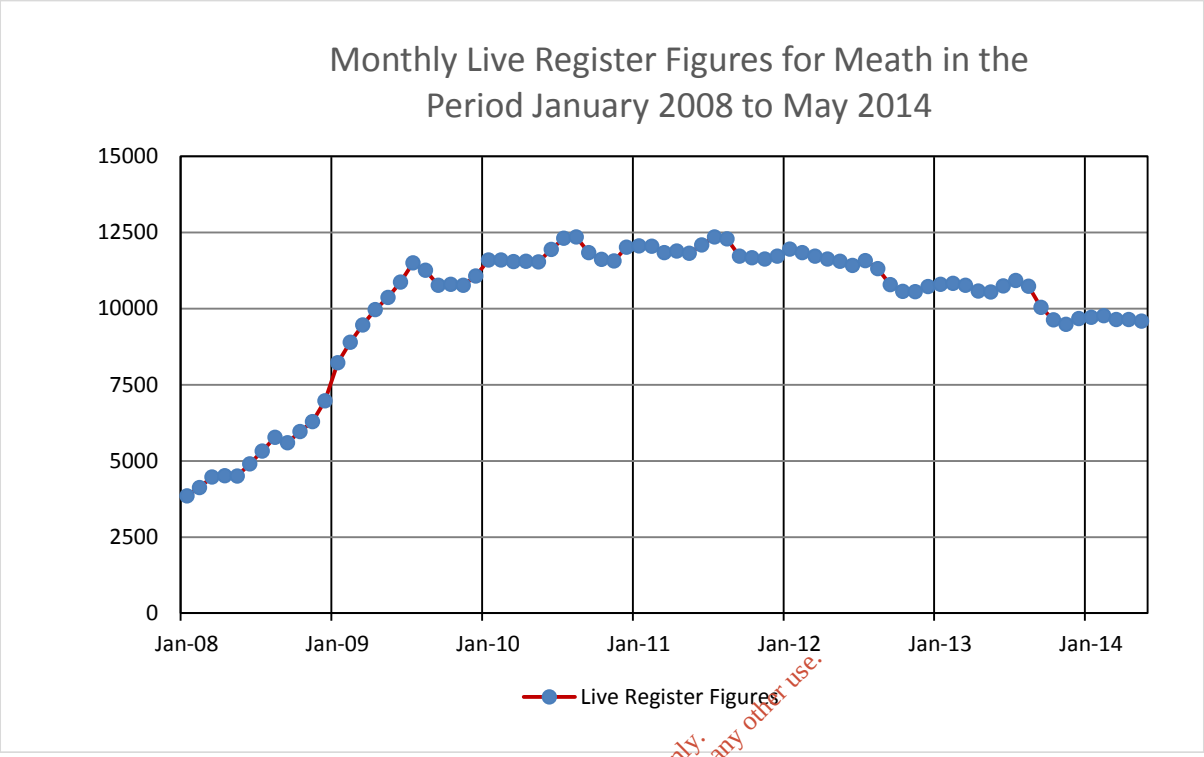

Figure 3.1.3. Live Register figures for Meath in the period from January 2008 to May 2014. Data from CSO (2014).

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3.2 FLORA AND FAUNA

3.2.1 INTRODUCTION AND METHODOLOGY

The purpose of this section is to describe and assess the ecological effects of the development and to comment on the mitigation measures that have or will be undertaken.

It is based on a site visit in June 2014 and a study of existing aerial photographs. The field investigation followed the methodology of the Heritage Council guidelines (Smith et al 2011) though mapping was not digitised in the field. Habitats are classified as in Fossitt (2000). Signs of mammals and birds were searched for at all times.

3.2.2 EXISTING ENVIRONMENT

3.2.2.1 HABITATS AND VEGETATION

The site is a former esker which runs parallel to a minor road in Foxtown. From the north there is a hardcore yard grading southwards into reclaimed pasture and then the open quarry itself, an expanse of spoil and bare ground (ED2 in Fossitt 2000), with some piles of exposed sand, gravel or till (ED1) and lesser areas of recolonising bare ground (ED3). The southern end consists of a wooded slope with trees of willow, birch and alder, most of them planted. Parts of the former esker survive along the roadside and are either dry, calcareous grassland (GS1) or scrubby oak, ash, hazel woodland (WN2). There is no water present, nor nearby watercourse.

Figure 3.2.1 is an aerial view of the site showing quarry void and floor including reclamation of part of Phase 1 to pasture with surrounding fields and woodland adjoining the southern boundary.

The bare areas are such because of traffic or infertility but at their edges some plant species are establishing. Dyer's rocket *Reseda luteola*, ragwort *Senecio jacobaea*, welted thistle *Carduus crispus* and opium poppy *Papaver somniferum* are the conspicuous examples but there is also:

Chamerion angustifolium	rose-bay
Atriplex patula	orache
Stachys sylvatica	hedge woundwort
Lapsana communis	nipplewort
Sonchus arvensis	field sow-thistle
Cirsium arvense	creeping thistle

A small area beside the internal road where surface runoff is ponding adds toad rush *Juncus bufonius*, bittersweet *Solanum dulcamara* and water speedwell *Veronica anagallis-aquatica* to this list but this is the only place that aquatic species occur.

Where traces of the original calcareous sand persist, as in the centre of the site, there are typical species such as glaucous sedge *Carex flacca*, self-heal *Prunella vulgaris* and fairy flax *Linum catharticum* but also

Potentilla reptans	cinquefoil
Hypericum perforatum	perforate St John's wort
Anthyllis vulneraria	kidney vetch
Verbascum thapsus	mullein
Aquilegia vulgaris	columbine
Daucus carota	wild carrot
Equisetum arvense	field horsetail
Tussilago farfara	coltsfoot
Fragaria vesca	wild strawberry
Sanguisorba minor	salad burnet

Most of these re-appear in the roadside slope where there is a little intact esker surface. They are augmented by meadow vetchling *Lathyrus pratensis*, the *hawkbits Leontodon hispidus, L.saxatile*, field scabious *Knautia arvensis* and yarrow *Achillea millefolium*. A single plant of viper's bugloss *Echium vulgare* grows near the central gate.

The southern end of the quarry was distinguished by a considerable growth of woody plants in the past though some of them have recently been cleared. *Gorse Ulex europaeus* was abundant and it and butterfly bush *Buddleja davidii* still appear in many places. Woodland remains dominant at the sloping southern end where Italian alder *Alnus cordata*, silver birch *Betula pendula*, butterfly bush *Buddleja davidii*, ash *Fraxinus excelsior* and grey willow *Salix cinerea* grow over a carpet of horsetail *Equisetum arvense*, glaucous sedge *Carex flacca*, scutch grass *Elytrigia repens* and creeping bent *Agrostis stolonifera*. What woodland remains on the esker slope beside the road is made up of ash and elm *Ulmus minor*.

In several places on the floor of the quarry, particularly at the southern end, there are piles of topsoil where agricultural weeds predominate. These include

Urtica dioica	nettle
Sinapis arvensis	charlock
Persicaria maculosa	redshank
P.lapathifolia	pale persicaria
Brassica rapa	wild turnip
Rumex obtusifolius	broad-leaved dock
Veronica persica	field speedwell
Papaver rhoeas	corn poppy

Two sections at the northwest end of the site have been reclaimed to ryegrass pasture. One is being grazed by horses, the other recently seeded.

3.2.2.2 FAUNA

The site supports a high population of rabbits and is visited by foxes but there was no sign of a permanent earth, or of badgers. There is probably some usage by bats at the southern end as the esker continues with better grown trees for some distance. The open parts of the site itself, however, have negligible value for these animals.

Very few birds were seen during the site visit; there were no sand martins, for example, a species which often nests in sand quarries. The birds that were present were the commoner garden birds and these were associated with the trees along the roadside. Blackbird, robin, dunnock, wren, willow warbler, chaffinch and bullfinch occur.

The absence of well-developed vegetation also means that insect species were poorly represented. Small white and tortoiseshell butterflies were the only species seen.

3.2.2.3 EVALUATION

The overall site is relatively barren with a lot of exposed material, both brought in and original. Its flora and fauna are also reduced though there are traces of most dry communities that develop in such sites. A feature is the occurrence of two plants found mainly in eastern Ireland – viper's bugloss Echium vulgare and welted thistle *Carduus crispus* (cf Preston *et al* 2002). Another feature is the relative lack of introduced species; apart from *Buddleja* there is only the prickly lettuce *Lactuca serriola* of those recent arrivals that are found in most quarries near Dublin or other urban areas.

There are no species of interest in the fauna.

3.2.3 DESIGNATIONS

The application site at Foxtown, which corresponds to the quarry site, is not included in any area with an ecological designation (NHA, cSAC or SPA). However, there are numerous designated sites within 15km, namely: Boyne River and Blackwater River cSAC (Site Code 002299); Boyne River and Blackwater River SPA (Site Code 004232); Trim Wetlands pNHA (Site Code 001357); Rathmoylan Esker (Site Code 000557); and Royal Canal (Site Code 002103). The nearest designated site to the Foxtown WRF is c. 4km to the northwest at Scurlockstown, and has triple designation as the Boyne River and Blackwater River cSAC and SPA, and Trim Wetlands pNHA.

3.2.4 IMPACT OF DEVELOPMENT

3.2.4.1 COUNCIL POLICY & POSSIBLE IMPACTS

The Meath County Development Plan (2013-2019) contains policies and objectives concerning conservation. For European sites (Natura 2000) and Natural Heritage Areas:

It is the policy of Meath County Council:

NH POL 5	To permit development on or adjacent to designated Special Areas of Conservation, Special Protection Areas, National Heritage Area or those proposed to be designated over the period of the plan, only where an assessment carried out to the satisfaction of the Meath County Council, in consultation with National Parks and Wildlife Service, indicates that it will have no significant adverse effect on the integrity of the site.
NH POL 6	To have regard to the views and guidance of the National Parks and Wildlife Service in respect of proposed development where there is a possibility that such development may have an impact on a designated European or National site or a site proposed for such designation.

It is an objective of Meath County Council:

NH OBJ 2	To ensure an Appropriate Assessment in accordance with Article 6(3) and Article 6(4) of the Habitats Directive, and in accordance with the Department of Environment, Heritage and Local Government Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities, 2009 and relevant EPA and European Commission guidance documents, is carried out in respect of any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect on a Natura 2000 site(s), either individually or in combination with other plans or projects, in view of the site's conservation objectives.
NH OBJ 3	To protect and conserve the conservation value of candidate Special Areas of Conservation, Special Protection Areas, National Heritage Areas and proposed Natural Heritage Areas as identified by the Minister for the Department of Arts, Heritage and the Gaeltacht and any other sites that may be proposed for designation during the lifetime of this Plan.

The quarry site at Foxtown, which includes the application site, is not included in any area with an ecological designation (NHA, cSAC or SPA).

In this case the River Boyne and River Blackwater (Site Code 2299), a river and valley system of European interest, is the only one within 15km of the proposed project.

Appropriate assessment was introduced by the EU Habitats Directive as a way of determining if a planned project is likely to have a significant effect on one of the Natura 2000 sites so far designated (i.e. the candidate SAC's and SPA's), or their conservation objectives.

Screening for Appropriate Assessment was carried out with respect to the licence application and a copy of this report was previously submitted to the EPA. The findings of the screening for Appropriate Assessment were that the activity, individually or in combination with other plans or projects is not likely to have a significant effect on the Natura 2000 network, or the conservation objectives of the sites. A Stage 2 Appropriate Assessment is therefore not required.

3.2.5 POTENTIAL IMPACTS

The impact of the continued disposal of inert waste in the quarry and its restoration to agricultural land or woodland is considerable in habitat terms as it will lead to the disappearance of most of the existing flora and fauna. The plants and animals that require open soils and disturbance to grow will diminish though some species will remain along internal roadways or at gates, as well as by the roadside. On the other hand the development of scrub and woodland on the site will tend to diversify the larger fauna such as birds and mammals and restore a few of the features of a naturally wooded esker.

Apart from the physical impacts there is no likelihood of sediment and/or chemical loss to surface waters. All run-off is contained on site or close to it because of the good drainage of the deposit. The nearest surface water is a pond in an arable field to the southeast. This is dominated by the surrounding agriculture.

Dust pollution, if any, will not cause ecological change in the surroundings as there is no great difference in pH between the substrate and the incoming fill.

3.2.6 MITIGATION MEASURES

Monitoring of groundwater and aerial emissions will be installed so that compliance with standards can be maintained.

Actions to ensure dust abatement include spraying of haul roads in dry weather and their upkeep and drainage to prevent ponding. In addition re-vegetation will be carried out on completed sections on an on-going basis.

Restoration will include the removal of all machinery and structures.

3.2.7 CONCLUSIONS

The impact of inert waste disposal on this site will be considerable in local terms but will not result in any loss of heritage values in the locality. In the long-term it will create pasture/woodland and, in habitat terms, simulate a feature of the pre-existing esker.

3.2.8 REFERENCES

Fossitt, J.A. 2000. *A guide to habitats in Ireland.* Heritage Council.

Preston, C.D., Pearman D.A. & Dines T.D. 2002*. New atlas of the British and Irish flora*. Oxford University Press.

Smith, G.F., O'Donoghue, P., O'Hora, K., & Delaney, E. 2011 *Best practice guidelines for habitat survey and mapping*. Heritage Council, Kilkenny.

3.2.9 FIGURES

Figure 3.2-1. Aerial photo of site showing quarry void and floor with surrounding fields and scrub. Redrawn from Bing Maps (2014).

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3.3 SOIL & GEOLOGY

3.3.1 INTRODUCTION

All projects and developments that require an EIS *by virtue of their nature, size and location*, have the potential to have an impact on the environment. This section of the EIS has been compiled in order to establish both the regional and local geological setting of the proposed Waste Recovery Facility (WRF) with respect to the soil, subsoil and geological bedrock environment. Furthermore, this section also assess the potential impact, if any, of the WRF on this existing baseline geological environment.

The section was prepared following a desktop study, which included research of relevant maps and data on the Geological Survey of Ireland (GSI) online mapping website (GSI 2014), and on the Environmental Protection Agency (EPA) Envision geoportal website (EPA 2104). Additional documents that were researched comprised geological maps and bulletins published by the GSI (GSI 2001), prior Planning & Environmental Reports for the Foxtown Quarry (Williams Sheils 2005 and JSPE 2008), the Geology of Ireland monograph edited by Holland & Sanders (2009), as well as other miscellaneous publications. The available information is considered sufficient to adequately characterise the geological environment of the site and its environs.

The potential impact on the geological environment resulting from the proposed development is assessed and possible mitigation measures proposed to reduce any significant impacts.

3.3.2 STUDY METHOD

No fieldwork other than a site walkover was undertaken as part of this geological assessment. The desktop study was undertaken to compile, review and interpret available information, data and literature pertaining to the natural environment of the site, its immediate environs and regional setting. The desktop study included the following:

1. Examination of physiographic and other maps, and aerial photography (e.g., Google Images (Google 2014), and EPA Ortho Photos 1995 to 2005: (EPA 2014));
2. Examination of the GSI datasets and maps pertaining to geological bedrock, soil and subsoil maps (GSI 2014);
3. Examination of EPA soil and subsoil maps (EPA 2014);
4. Observations made during the site walkover.

In the preparation of this geological assessment, all available regional and site specific information was compiled, assessed and interpreted. The geological maps and literature provide the regional geological context of the site, whilst prior Planning and Environmental Reports provide site-specific information. The geological assessment of the site is considered sufficiently detailed to adequately characterise the geological setting of the site. This section was prepared with consideration to the guidelines and recommendations set out in 'Guidelines on Information to be contained in Environmental Impact Statements' (EPA 2003), and the

'Geology in Environmental Impact Statements - A Guide' published by the Institute of Geologists of Ireland (IGI 2013).

3.3.3 TOPOGRAPHY

The site of Foxtown quarry and WRF is located in a rural area of the townland of Foxtown, c. 4km north of the town of Summerhill, and c. 6km southeast of Trim. It covers an area of c. 5.2ha. The shape of the site is a sinuous ribbon that is c. 250-300 in length and c. 40m wide, ranging from roughly 25m wide in the north to a maximum of 60m in width in the south, with the eastern boundary defined by an unnamed local road.

Both the soils and bedrock geology have an important role in determining the environmental characteristics of an area. The underlying bedrock has a major influence on the landform that develops, and the constituent rocks provide the parent material from which the soils are derived. The natural characteristics of the rock help determine the nature of the derived soil, as well as the rate at which it forms, whilst the soil strongly affects both the natural vegetation that emerges, and the type of agriculture that can be sustained.

As stated above, the topography is partly a reflection of the underlying geology, which is described in the succeeding subsections. The site occurs in an area identified as the Central Lowlands by Meath County Council (2007), and are limestone lowlands dominated by the Lucan Fm., otherwise known as the “Calp”. These lowlands occupy the floodplains of the Boycetown and Knightsbrook Rivers, and belong to the Boyne River Catchment. There are two glacial features that dominate the local area; namely the Trim Esker and the Galtrim Moraine. Both are linear topographic features or ridges that intersect southeast of the site at Ballynamona, and the Foxtown quarry was developed on the Trim Esker, in order to extract the constituent sand and gravel.

The wider landscape around Foxtown is generally of flat-lying lowlands (elev. c. 65-80m AOD) with hills occurring in an arc from the northeast round to the south. The hills are formed from Namurian sandstones and shales to the south and southeast (max. elev. c. 135m AOD), and mostly from Late Visean sandstones, shales and limestones of the Loughshinny, Donore and Balrickard Fms. to the east and northeast (max. elev. 159m AOD at Tara, and 172m AOD at Skryne). These hills are identified as the Tara Skryne Hills by Meath County Council (2007).

The landscape is predominantly rolling pastureland, with thick wooded hedgerows, some conifer plantations, and shelterbelts of ash and larch, separating medium to large fields. Deep roadside drainage ditches and banked hedgerows are common, and create enclosed rural road corridors with limited views. Forest cover is very limited throughout Meath, with small areas of broadleaf woodland and a few conifer plantations. The land use in the area is classed as dominantly pasture with subordinate non-irrigated arable land, and an area of discontinuous urban fabric at the nearby village of Kiltale.

The sand and gravel extraction at Foxtown exploits a meandering glacial ridge feature, known as the Trim Esker, which shows evidence of quarrying over much of its c. 14.5km length. The esker forms a NW-SE oriented ribbon of sand and gravel deposits with an elevated topographic profile. The topography of the site boundaries is elevated (elev. c. 75-90m AOD) relative to the surrounding terrain, due to unexploited ground at the quarry boundaries, which also rises

slightly to the south. The unrestored sections of the quarry have a typically irregular, but concave topographic profile reflecting the quarry void (min. elev. ≥ 68m AOD), whilst all sections will be restored back to a convex or domed profile (max. elev. ≤ 93m AOD). The land of the quarry site had been previously used for pasture only, according to the 1990 Corine Map (See EPA 2014), probably aided by the superior drainage of the underlying sand and gravel (See EIS Figure 3.3.3). The existing topographical contours are shown in EIS Figure B2.1 Rev A - Site Plan.

3.3.4 SOIL

Soil is an essential natural resource and is intrinsically valuable to the environment, and all life within it. Soil encompasses topsoil and subsoil, which together provide for several important functions, including:

- Contributes to the hydrological cycle in the filtration/recharge, storage and discharge of rainwater;
- Supports all terrestrial ecology, including all flora and fauna;
- Protects and enhances biodiversity;

Topsoil and subsoil may derive from parent geological material and organic matter under the influence of numerous processes, including weathering and erosion. In terms of subsoil, the profound influence of glaciation in Ireland is seen in the glacial till, which blankets much of the underlying rocks.

Visual assessment of the soils within the quarry site suggests that the soils are shallow, naturally well drained, with no indication of waterlogged soils.

3.3.4.1 TOPSOIL

The 2nd Edition of the General Soil Map of Ireland with accompanying Soil Survey Bulletin No. 36 was published by Gardiner & Radford (1980). The map has a publication scale of 1:575,000, which results in generalised features that provide inadequate geographic reference to allow useful spatial data on the scale of the property. The soil map of Co. Meath with accompanying Soil Survey Bulletin No. 37 was published by Finch et al. (1983), and was similarly compiled by surveying and mapping using direct visual inspection, profile pits and laboratory analysis. The soil map was developed on a nominal working scale of 1:10,560, condensed down to a publication scale of 1:126,720, and maps the distribution of soil types based on the classification of the Great Soil Groups of Ireland.

Teagasc and the EPA initiated a nationwide Soil and Subsoil Mapping Project, the final report for which was published by Fealy & Green (2009). The soil map of every county in Ireland were compiled by a remote sensing and GIS-based methodology. Soil type was predicted using key soil factors (e.g., vegetation) and geology (e.g., parent material) and topography (e.g., slope), and using a qualitative, expert-based classification system. In order to map all the soil variants in a single national soil map, the classification system of soil types had to be simplified relative to previous soil surveys, but retain a close relationship to the Great Soil Groups in Ireland. Although the maps have a maximum online scale of 1:2,000 (See EPA

2014), the nominal working scale of 1:100,000-150,000 was used during map preparation. Although the Teagasc/EPA Soil Maps are categorically simplified, they are cartographically detailed, and thus offer superior spatial definition. The distribution of the soil types at Foxtown is assessed by reference to Teagasc/EPA Soil/Subsoil Maps, with supplementary interpretation based on the Soil Map of Meath (Finch et al. 1983).

Two soil maps of the area including the site are shown in Figure 3.3.1 Soil Map of Foxtown Area from Finch et al. (1983), and Figure 3.3.2 EPA/Teagasc Soil Map of Foxtown Area.

The General Soil Map of Ireland by Gardiner & Radford (1980) shows that the predominant topsoil or soil type across the area is Grey Brown Podzolics (37), derived from limestone and shale glacial till, and has associated soils of Gleys (20) and Brown Earths (5). However, the scale of the map results in generalised or lost features, such as the Trim Esker, and thus provides inadequate geographic reference. The soil map of County Meath by Finch et al. (1983) indicates the predominant soil type in the area is Grey Brown Podzolics of the Patrickswell soil series (i.e., 60) derived from limestone till, with minor Brown Earth of the Ladestown series (i.e., 199), Boyne Alluvium (i.e., 223), and Baggotstown-Patrickswell-Elton complex (i.e., 208) associated with the Galtrim Moraine. The soil type occurring specifically on the Trim Esker, and thus in the Foxtown quarry site, is identified as Baggotstown Crush complex (i.e., 209), which is associated with eskers, and is derived mainly from limestone fluvioglacial sands and gravel. These are shallow soils that exhibit excessive drainage.

The soil types occurring at the site and in the wider area were also assessed by reference to the Teagasc/EPA soil map (EPA 2014). The dominant soil occurring at the Foxtown quarry site are designated as:

1. BminSW - Rendzinas / lithosols derived mainly from calcareous parent material (≈75%)
2. BminDW – Grey Brown Podzolics and Brown Earths derived mainly from calcareous parent material (≈20%)
3. AlluvMIN - Mineral Alluvium (≈3%)
4. BminSP – Shallow Surface water and Ground water Gleys derived mainly from calcareous parent material (≈1%)
5. Lac – Lacustrine-type soils (≈1%)

Grey Brown Podzolics are usually derived from a calcareous parent material, which counteracts the effects of leaching. These contrast with Podzols, which are heavily eluviated by heavy rainfall leaching through the organic layer in a process known as podzolisation. Rendzinas are shallow soils derived from calcareous parent material, whilst Lithosols are predominantly shallow soils derived from calcareous rocks or gravels with/without peaty surface horizons, and tend to be stony mineral soils.

It is our considered that the lithosols / regosols designated in the Teasgasc/EPA maps correspond to the Grey Brown Podzolic soils of Finch et al. (1983). In that Finch et al. (1983) determined soil type at a finer working scale, and by mapping using direct visual inspection, profile pits and laboratory analysis, it is considered that the designation of the soil as Grey Brown Podzolics as the dominant soil type in the area is valid. Furthermore, the occurrence

of Baggotstown Crush complex as the dominant soil type on site prior to quarrying operations is also indicated.

The quarry resource has been extensively worked, and the quarry void is in the process of being backfilled with imported soil and stone, capped with topsoil, as per the phased restoration scheme. Most of the original topsoil has already been utilised together with imported topsoil to restore previous sections of the site.

3.3.4.2 SUBSOIL

The subsoil types occurring at the site and in the wider area were determined by reference to the EPA subsoil map (EPA 2014). The dominant subsoil types are identified as:

1. GLs – Limestone sands and gravels (Carboniferous) (≈75%)
2. TLs – Limestone till (Carboniferous) (≈20%)
3. BasEsk - Basic esker sands and gavels (≈5%)
4. A – Alluvium (undifferentiated) (≈1%)
5. L – Lake sediments – undifferentiated (≈1%)
6. FenPt – Fen peat (<0.1%)

The subsoil of the Trim Esker, including the quarry site, consists solely of basic esker sands and gravels derived from Carboniferous rocks (i.e. BasEsk), and comprise the deposits being extracted. Other subsoil types in the wider area include: (1) sands and gravels derived from Carboniferous rocks; (2) limestone till derived from Carboniferous rocks; (3) alluvium deposits from modern fluvial systems within the Boyne Catchment; and a few other minor subsoil types.

The last Ice Age, known as the Late Midlandian or Devensian, peaked at approximately 20-25,000 years before present (BP), with total deglaciation of Ireland around 13,000 years BP. Soils would have begun to develop after deglaciation, around the beginning of Holocene epoch at 12,000 years BP. Thus, the origin of the subsoil is associated with deposition related to ice movement during glaciation, particularly during the glacial maxima, and later glacial retreat and melting during deglaciation. Ice sheets grind and pulverise the underlying bedrock, reducing it to fragments ranging from boulders to clay particles. Sediments and features formed during the glaciation are commonly treated under the general term Quaternary Geology.

This area of County Meath was completely overlain by a thick ice sheet (up to 1 km thick), which moved in a general south-easterly direction. The powerful erosive force of the ice sheet is considered to have sculpted the landscape in the region, as evidenced by many preserved glacial features. As the ice sheet melted, the meltwaters sorted and deposited sands and gravels in the form of characteristic glacial features, such as eskers and moraines.

Eskers, such as the Trim Esker, typically form in ice-walled tunnels near the terminal zone of glaciers and ice sheets, where ice is slower moving and thin. Eskers are preserved as meandering, sinuous ridges of stratified and well-sorted sand and gravel that can range in length from a few to 10s of kilometres. Recessional moraines, such as the Galtrim Moraine, are composed of unconsolidated debris deposited by a glacier or ice sheet, and form

transverse ridges behind the terminal or end moraine, marking the ice front during a temporary halt in the retreat of the ice sheet across the north central Midlands.

The Foxtown quarry is situated on, and extracted sand and gravel from deposits of well sorted and stratified sand and gravel within the Trim Esker, which were deposited by meltwaters in a subglacial river. The subsoil map of the area including the site is shown in Figure 3.3.3 Subsoil Map of Foxtown Area.

The GSI Groundwater Protection Scheme maps for Co. Meath and the borehole database held by the GSI indicate depths to bedrock of 4.6m immediately west of the site, 3.6m at Dangan (c. 3km west of site), 7m at Mitchelstown (c. 1km northeast of site), and up to 18.2m at Basketstown (c. 1km south of the site). Observations from site visits and information obtained from the facility operators, indicate that the quarry pit excavations extend to approximately 12m below the ridgeline of the esker, and thus indicate substantial thickness of soil and sand and gravel overlying the bedrock in the quarry site. Bedrock was encountered at the base of the excavations, and is described as “Calp” (i.e., Lucan Fm.). The following approximate maximum thicknesses of the overburden on the quarry site prior to operations are indicated: 0.3m of topsoil, ≤1.2m of subsoil, and 12m of sand and gravel at the base.

Because only Phase 1 of the quarry site has been restored or is in the process of being restored, visual assessment of the undisturbed subsoil on site was possible, and confirmed the classification of well stratified sand and gravel. The overall deposit consists of 30% fine sand and silt, and 70% gravel, predominantly occurring in the pebble and cobble size ranges, but with some boulders. Beds and lenses vary from silty sand with minor pebbles to well sorted fine gravel with minor sand, to prominent lenses of well sorted, ‘framework-supported’, coarse gravel, consisting of rounded cobbles and minor boulders, and with minor interstitial fines (See Figure 3.3.4. Section of Sand & Gravel Deposit). The operator noted that the gravel contains a high proportion of chert.

3.3.5 BEDROCK GEOLOGY

This subsection is based largely on GSI (2001) and Sevastopulo & Wyse Jackson (2009), but without explicit individual references in the text. The 1:100,000 scale maps of the Geology of Meath (Sheet 13) with accompanying geological report (GSI 2001) and online mapping (GSI 2014), indicates that all of the units within c.5km of the site are Mississippian (or Lower Carboniferous) in age. These are presented in chronological order in Table 3-1.

Table 3-1 Bedrock Units of the Foxtown Area

Bedrock Unit	Thickness (m)	Mississippian Substage
Namurian (undifferentiated) (NAM)	≈600m	Pendliean-Kinderscoutian
Loughshinny Formation (LO)	<150m	Asbian-Brigantian
Lucan Formation (LU)	300-800m	Chadian-Asbian
Waulsortian Limestones (WA)	<100-225m	Courceyan to Chadian

During the Ordovician and Silurian Periods (c. 490-415Ma), the Iapetus Ocean closed bringing Laurentia (including northwest Ireland) and Avalonia (including southwest Ireland) into collision and culminating in the Caledonian Orogeny c. 425-395Ma. During the Devonian Period (c. 417-354Ma) Ireland was part of the Laurasian super continent, also known as the Old Red Sandstone continent. The latter underwent extensive subaerial erosion, whilst laying in arid southern subtropical latitudes, giving rise to the characteristic red coloured, continental facies sandstones. During the early Carboniferous (c. 354-327Ma), a marine transgression advanced northward across the eroded and flat-lying continent (i.e., peneplain), and deposited a sequence of carbonate rocks that cover much of the Irish Midlands, including the study area.

The rocks of the Foxtown area belong to the Mississippian (Lower Carboniferous) marine sequence deposited in the Dublin Basin, a composite basin of sedimentary and structural origin, including the Namurian Summerhill sub-basin. The rocks of the area are dated from the Tournaisian, Visean and earliest Namurian Ages of the Mississipian Epoch (c. 358-318Ma), and were laid down as a retrograding sequence due to the northward advancing marine transgression.

Although no faults are identified as occurring in the site, two faults have been identified within 5km of the site according to GSI (2001 and 2014). The contact between the Lucan Fm. and the Namurian succession southeast of the site is a fault contact, whilst the contact between the Lucan Fm. and the Waulsortian Limestones west southwest of the site is also a fault contact. Both these faults follow a Caledonian trend (i.e., SW-NE orientation), and may be faults reactivated by crustal compression during the Variscan Orogeny around the end of the Carboniferous (c. 299Ma). The bedrock of the area including the site, is shown in Figure 3.3.5: Bedrock Geological Map of Foxtown Area.

The following descriptions are based on those from the Dublin Basin, and particularly the Navan-Meath sub-basin, which covers the greater part of the Dublin Basin in Sheet 13. The base of the Mississippian sequence in the wider Foxtown area is marked by the Waulsortian Limestone.

The Waulsortian consists of pale grey, massive, poorly bedded, pure limestone with distinctive cavity-filling stromatactis structures, and with thin shale interbeds locally. The lithology formed steep (<40^0) carbonate mudmounds or “banks”, with topography on a scale varying from a few metres to greater than 100m. These are commonly separated by an “off-bank” facies of dark-grey, argillaceous, shelve limestones, although the banks can also coalesce into continuous sheets. The Waulsortian is Courceyan to earliest Chadian in age, is up to 225m thick, and occurs in two SW-NE trending subcrops in the vicinity of Bray Hill and Ballinrig.

The next youngest unit is the Lucan Formation, also known as the “Calp”, which is widespread in County Meath and north County Dublin, and underlies the entire site and surrounding area (i.e., within c. 2.5km). The unit is Chadian-Asbian in age, and consists of dark grey, well-bedded, cherty, graded limestones and calcareous shales, which originated as calciturbidites. The formation varies widely in grains size and shale content, as well as in thickness (i.e., up to 300-800m). The lower part of the formation is composed of commonly conglomeratic

calciturbidites, whilst the upper part is largely composed of a fining-upwards sequence of distal calciturbidites.

The next youngest unit is the Loughshinny Formation, which is Asbian-Brigantian in age. This formation is up to 150m thick, and consists of laminated to thinly bedded, argillaceous, pyritic, locally cherty limestones, interbedded with dark grey to black shales. The Loughshinny was formerly grouped together with the Lucan Fm. as the Calp Limestone, but has been divided into a separate formation within the Fingal Group of predominantly basinal facies.

The youngest unit in the wider Foxtown area is a thick succession of Namurian, predominantly mudstones of the Pendleian-Kinderscoutian (i.e., early- to mid-Namurian) age, which are not differentiated in the area.

Bedrock was encountered at the base of the excavations in the application site, and is described as “Calp” by the operator (i.e., Lucan Fm.). However, no bedrock was observed during the recent site visit.

The spatial distribution of aquifers in the vicinity of the site is shown in Figure 3.3.6: Aquifer Map of Foxtown area. The Lucan and Loughshinny Fms. are identified as a Locally Important Aquifer (Lm), which are generally moderately productive, whilst the Waulsortian is identified as a Locally Important Aquifer (LI), which is moderately productive only in local zones. In contrast, the Namurian is identified as a Poor Aquifer (Pl), which is generally unproductive, except for local zones. Because the Lucan Fm. underlies the entire site, and is a locally important aquifer, the sensitivity of the geological and groundwater interest of the site is determined to be high.

3.3.6 GEOLOGICAL HERITAGE

The Irish Geological Heritage (IGH) programme identifies and selects a complete range of sites that represent Ireland’s geological heritage. The programme is operated by the Geological Survey of Ireland (GSI), and selected sites are proposed as County Geological Sites, for inclusion within the respective County Development Plan. County Geological Sites do not receive statutory protection afforded Natural Heritage Areas (NHA), but receive an effective protection from their inclusion in the planning system. The GSI may also propose to the National Parks and Wildlife Service (NPWS) that specific sites identified as important for conservation are designated as NHA’s, and thus receive statutory protection.

In its 2013-2019 County Development Plan (CPD), Meath County Council recognises areas of conservation value, which include twenty eight County Geological Sites. A search of the GSI Geological Heritage Database found that the site of the quarry and WRF is located on one of County Geological Sites, namely the Trim Esker. A second such site of geological interest occurs c. 1km south of the Foxtown site, namely the Galtrim Moraine. These two geological heritage sites, as well as the Bray Hill Quarry (See below) are shown in Figure 3.3.7: Geological Heritage Sites in the Foxtown Area. The following site descriptions are condensed from the individual site reports (Clarke et al. 2007).

The Trim Esker is of significance in world geological literature, largely because of its unique occurrence crossing a moraine (i.e., the Galtrim Morraine c. 1km south of site at Ballynamona), although the site of this intersection was destroyed by quarrying. The Trim Esker, as a

beaded, feeder system, and as one of the most studied and discussed eskers historically in the country, warrants designation as a County Geological Site. The total length of the esker is c. 14.5km, occurring in several segments, many of which have been destroyed by quarrying. Only one 6km segment is recommended for designation, parts of which are currently being exploited by several extraction companies. A prohibition on future quarrying has been recommended.

The Galtrim Moraine is a recessional moraine, which formed along the ice front of a melting ice sheet as it halted temporarily during its retreat across the north central Midlands at the end of the Midlandian (c. 17,000 years BP). The ridge is discontinuous, but forms a NW-SW trending arcuate ridge c. 3km long and up to 20m high at Basketstown-Ballynamona-Galtrim-Martinstown. The NW-SE trending eskers, such as the Trim Esker, which join the northern ice contact face of the moraine represent the main contemporaneous subglacial feeder channels. Quarrying has already destroyed much of the moraine, and future extraction should only be permitted subject to consultation with the GSI. Despite its national importance, the moraine has not been recommended as an NHA, because of the scale of the landforms.

There also three other geological heritage sites, namely Bray Hill Quarry c. 4km to the west; the Rathmoylan Esker c. 6.5km to the southwest; and the River Boyne c. 5.5km to the north. The full listing of geological heritage sites within c. 10km is as follows:

1. Trim Esker (Site Code: MH017; Theme: IGH 7)

Irish National Grid: 285500, 253100

Location: County: Meath; Townland: Numerous

Site Description: A 6km long section of a predominantly wooded esker ridge

Geological Feature: A long linear ridge composed of sand and gravel deposited by a subglacial river.

2. Galtrim Moraine (Site Code: MH012; Theme: IGH 7)

Irish National Grid: 286202, 251772

Location: County: Meath; Townland: Numerous

Site Description: Partially wooded, much quarried moraine ridge

Geological Feature: Glacial moraine marking retreating ice front.

3. Bray Hill (Site Code: MH019; Theme: IGH 8)

Irish National Grid: 281582, 253073

Location: County: Meath; Townland: Stokestown

Site Description: A working quarry face.

Geological Feature: Exposed faces of locally fossiliferous limestone with a good example of an igneous sill at the quarries base.

4. Rathmoylan Esker (Site Code: MH016; Theme: IGH 7)

Irish National Grid: 280119, 249430

Location: County: Meath; Townlands: Rathmoylan & Kilmore

Site Description: Remnant face in former sand and gravel quarry

Geological Feature: Segment of complex beaded esker.

5. Boyne River (Site Code: MH027; Theme: IGH 14)

Irish National Grid: 283691, 257601

Location: County: Meath; Townland: Trubley & Grange

Site Description: A section of the Boyne River

Geological Feature: River section with anastomosing (distributary) channels.

The impact of the development on the identified geological heritage of the site was assessed with reference to GSI consultation and to the "Geological Heritage Guidelines for the Extractive Industry" developed by the GSI and the Irish Concrete Federation. These guidelines are intended for Irish Concrete Federation (ICF) members so that they may follow best practice and receive clear information concerning geological heritage in relation to any proposed quarry or related development or land purchase.

The guidelines are also intended as a useful template for any quarry operator in addressing geodiversity issues, and thereby contributing to the databases of the Geological Survey of Ireland.

3.3.7 ASSESSMENT OF IMPACTS

3.3.7.1 DIRECT IMPACTS

The nature of the WRF involves the importation and placement of inert soil and stone as backfill in the quarry void. The application site for the WRF occupies the entire area of the existing quarry, and as such will have no impact on virgin soils, sands and gravels, which have already been stripped, disturbed or extracted. As a result of backfilling using inert soils and stones, the WRF will continue to progress the reinstatement of the quarry back to land suitable for forestry, and thus will have a positive impact.

The recommendation to prohibit future quarrying on the Trim Esker has no direct bearing on the Foxtown quarry or the current proposal, but underscores the importance of the Trim Esker and reinforces the argument for reinstatement of the original topographic profile with full restoration of the land.

Consideration had been given to soil and overburden management. For the placement of subsoil and topsoil, the machinery will work from the haulage track or the exposed subsoil surface and away from the reinstated part of the site.

Soils will only be handled in dry weather conditions. Soils will not be placed when the moisture content is high, such as after heavy rainfall. Soils will not be moved in unusually dry and windy weather conditions. All temporary storage mounds will have slope angles not greater than 1:1.5 and will be re-vegetated as quickly as possible to avoid soil erosion by air and water. Further details with respect to the management of topsoil and overburden soils are outlined in EIS Section 2.4.3.1.

3.3.7.2 INDIRECT IMPACTS

The WRF will have no indirect impact on the local or regional geology, as placement of the inert soil and stone will not release contaminants onto the lands, whilst dust from the WRF will be tightly controlled (Refer to EIS Section 3.6).

3.3.7.3 'DO NOTHING' IMPACTS

The WRF recovers significant quantities of inert soil and stone through backfilling in the quarry void. Failure to recover soil and stone for the beneficial use of land improvement, specifically reinstatement of a quarry, could result in unnecessary exhaustion of landfill space. Thus, it is considered that the proposed continuation of the WRF will have a positive impact.

3.3.7.4 INTERACTION WITH OTHER IMPACTS

The interaction of the quarry and WRF is seen as 'symbiotic' and positive, with no negative cumulative impacts on the geological environment identified.

3.3.8 MITIGATIONS & MONITORING

There is no bedrock exposed within the quarry or the site of the WRF, and as such no impact on bedrock geology as a result of the WRF is expected.

Whilst active quarrying on the site has effectively ceased at Foxtown it is proposed that consideration will be given to the "Geological Heritage Guidelines for the Extractive Industry" guidelines during the restoration of the site.

As part of the IGH Programme consultees are requested to assist with developing work on Irish geological heritage by following the guidelines/mitigation measures below;

End operation stage

- Finalise restoration plans in consultation with IGH, ideally having designed the operation of the quarry to consider end use. Plan for maximum geodiversity on closure, if appropriate. In particular, leave rock faces visible as exposure rather than covered with soil, vegetation or rock debris); make rock faces safely available to geologists, and to the public if possible, by creating public pathways and viewing areas with furniture and information panels (IGH can advise on interpretative materials).
- Maintaining access to the geological heritage interest promotes geoconservation in the community. There are more imaginative, and economical, end uses for quarries than the backfilling method that obliterates existing and newly created geodiversity and biodiversity, such as their modification as open-air amphitheaters or rock climbing facilities. Even if converted to light industrial use, the quarry walls can be retained for geodiversity interest.

Ultimately, after final land reclamation of the quarry site, with the land restored to agriculture and/or forestry, there will be negligible residual impact on the geological heritage of the site and surrounding environment. It is planned to minimise, eliminate or decrease long-term

ecological and visual impacts on the environment through the implementation of the final restoration scheme.

In reparation of the restoration scheme it is proposed to preserve a representative section of the residual pit face adjoining the eastern boundary of the site (Refer to Figure B2.4 – Rev A). In preparation of this application consultations were held with Dr. Sarah Gately, Head of Geological Heritage & Planning Programme, Geological Survey of Ireland (GSI) and their appointed consultant quaternary consultant, Dr. Robbie Meehan who has first-hand knowledge of the Trim esker and environs. A copy of the geological section of this report (Section 3.3) was provided to them for review.

The Geological Survey of Ireland has confirmed *"that it is fully satisfied that the proposed retention of a section of the residual pit face will preserve the geological heritage status of the site. In fact, the backfilling of the rest of the pit will enhance the appearance of this (important) feature, as at present, the base of the pit is quite haphazard".*

"The GSI would also like to request that future access to the residual face be permitted, for the purpose of scientific study by bona fide scientists".

3.3.9 REFERENCES

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3.3.10 FIGURES

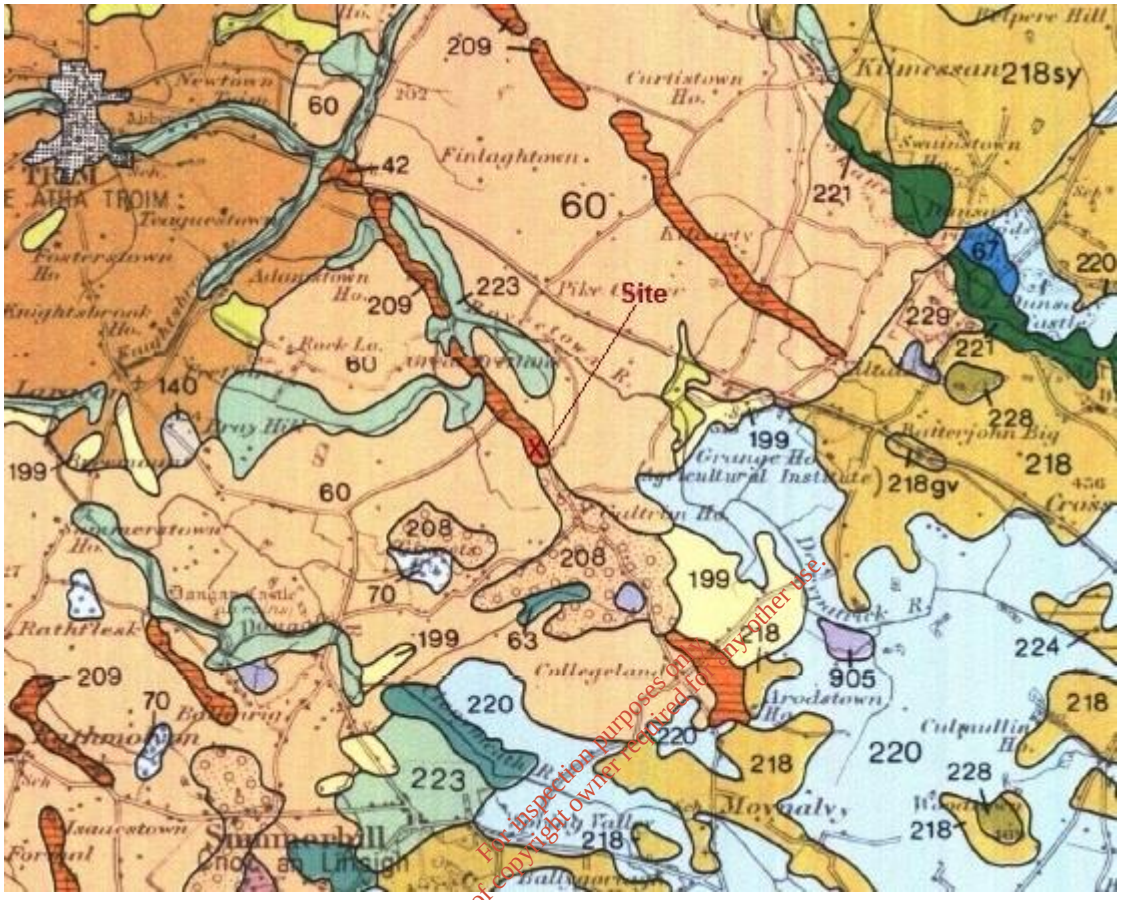

Figure 3.3.1. Soil Map of Foxtown Area.

Redrawn extract from Finch et al. (1983). Scale: Width of Field = 12.5km.

Soil Map Legend for major units in the vicinity of site:

60: Patrickswell Series Grey Brown Podzolic (Beige)

200: Rathowen Series Grey Brown Podzoilcs (Dark Brown)

208: Patrickswell-Baggotstown-Elton Complex (Beige with Circle Pattern)

209: Baggotstown Crush Complex (Orange with Cross-Hatching))

220: Ashbourne Series Gley (Light Blue)

223: Boyne Alluvium Complex (Light Green)

Figure 3.3.2. Soil Map of Foxtown Area.

Redrawn extract from EPA Envision online mapping website at http://gis.epa.ie/Envision. Scale: Grid Spacing = 1km.

Soil Map Legend:

Light Blue: BminSW - Rendzinas / lithosols derived mainly from calcareous parent material

Dark Blue: BminDW – Grey Brown Podzolics and Brown Earths derived mainly from calcareous parent material

Light Green: BminSP – Shallow Surface water and Ground water Gleys derived mainly from calcareous parent material

Orange: AlluvMIN - Mineral Alluvium

Yellow: Lac – Lacustrine-type soils

Figure 3.3.3. Subsoil Map of Foxtown Area.

Redrawn extract from EPA Envision online mapping website at http://gis.epa.ie/Envision. Scale: Grid Spacing = 1km.

Subsoil Map Legend:

Green: GLs – Limestone sands and gravels (Carboniferous)

Medium Green: TLs – Limestone till (Carboniferous)

Dark Green: BasEsk - Basic esker sands and gavels

Orange: A – Alluvium (undifferentiated)

Light Beige: L – Lake sediments – undifferentiated

Brown: FenPt – Fen peat

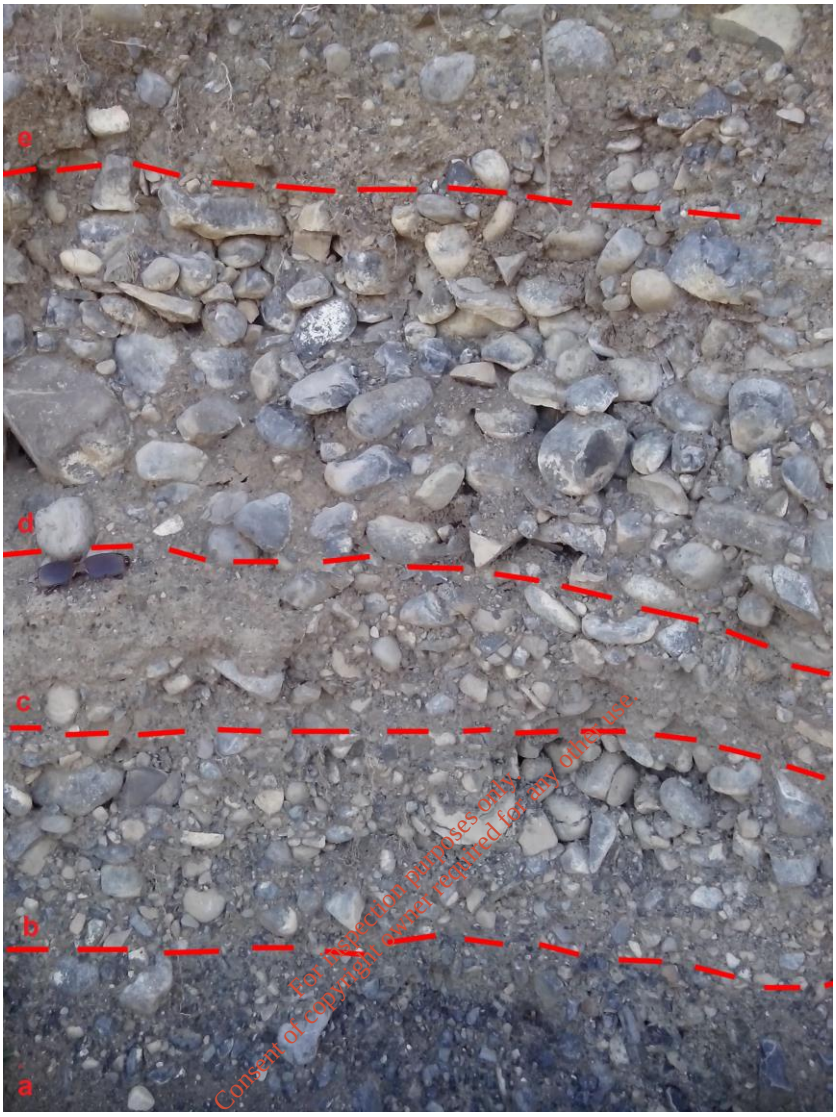

Figure 3.3.4. Section of the Sand & Gravel Deposit.

This 2m high section of sand and gravel from the Trim Esker is located inside the eastern boundary of the Foxtown quarry site. The stratified section consists of, from bottom to top: (a) well sorted gravel of predominantly sub-rounded pebbles with minor sandy fines; (b) moderately to poorly sorted gravel ranging from sub-rounded to rounded pebbles to boulders with minor to abundant silty sand fines; (c) very poorly sorted gravel consisting of sub-rounded to rounded cobbles with abundant sandy silt fines; (d) well sorted, framework-supported gravel consisting of rounded, medium sphericity cobbles and boulders with minor sand fines; (e) very poorly sorted gravel consisting of rounded cobbles and boulders with abundant sandy silt fines. Sunglasses at centre left for scale.

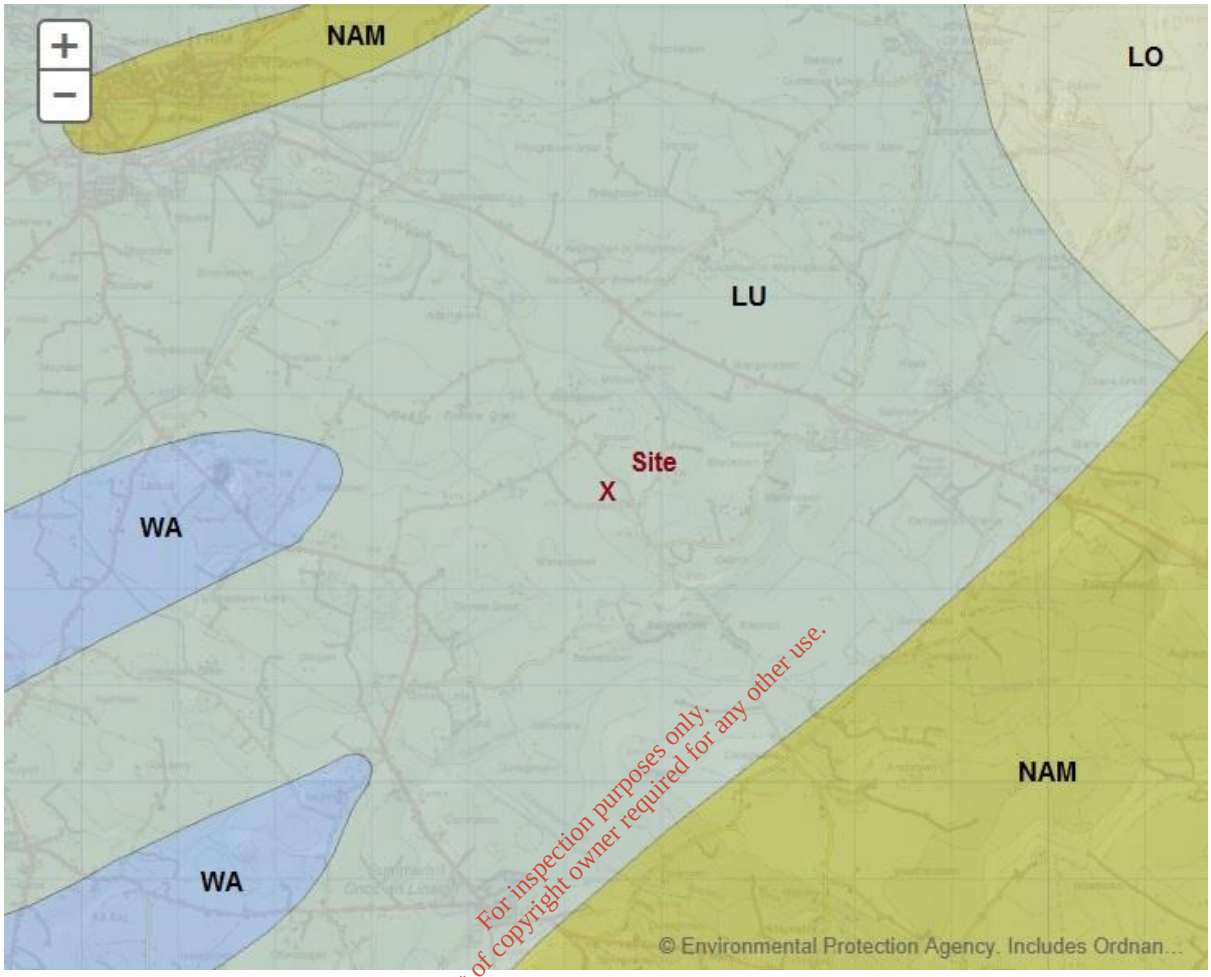

Figure 3.3.5. Geological Bedrock Map of the Foxtown Area.

Redrawn extracts from EPA Envision online mapping website at http://gis.epa.ie/Envision. Scale: Grid Spacing = 1km (Width of Field = c. 12.5km).

The Foxtown quarry is located on Lucan Fm. (LU) with no other units within 2.5km. Other bedrock units in the wider area include the Mississippian-aged Waulsortian Limestone (WA), the Loughshinny Fm. (LO), and undifferentiated Namurian shales and sandstones (NAM).

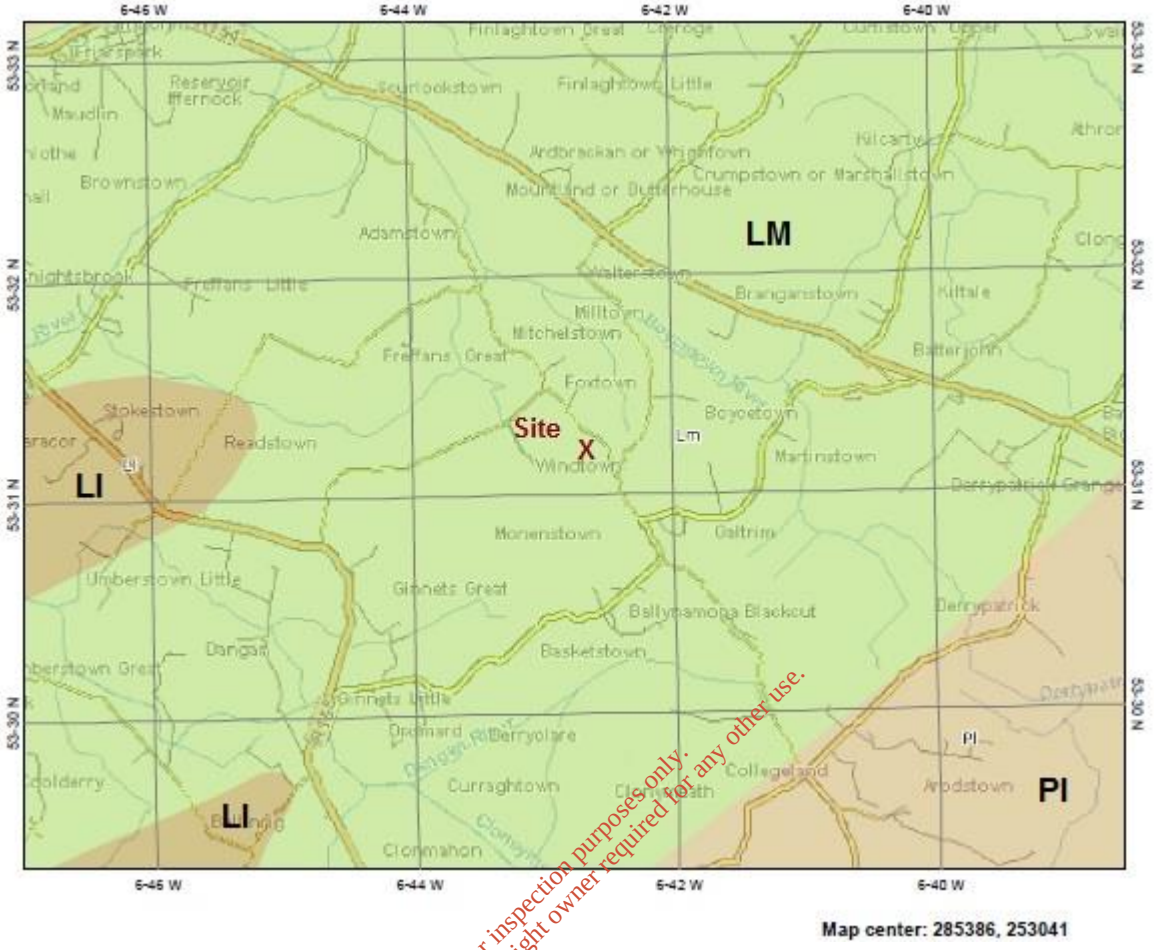

Figure 3.3.6. Aquifer Map of Foxtown Area.

Reproduced from GSI online mapping website at http://spatial.dcenr.gov.ie/GeologicalSurvey/Groundwater/Index.html.
Scale: Field Width = c. 4km.

Light Green – Lm - Locally important Aquifer – bedrock which is generally moderately productive

Medium Brown – LI – Locally important Aquifer – bedrock which is moderately productive only in local zones

Light Brown - PI – Poor Aquifer - bedrock which is generally unproductive, except for local zones

Figure 3.3.7. Geological Heritage Sites in the Foxtown Area

Redrawn from Clarke et al. (2007). Scale: Field Width ~c. 9km.

MH017: Trim Esker (blue highlighted)

MH012: Galtrim Moraine

MH019: Bray Hill Quarry

3.4 WATER

3.4.1 INTRODUCTION

This section of the EIS describes the hydrological and hydrogeological setting in a regional and local context. It provides a risk assessment of the potential impacts of the proposed WRF development on surface water features and groundwater in the vicinity of the site. The primary objective of the hydrological and hydrogeological risk assessment is to assess the impact posed to surface water and groundwater in the area by the proposed WRF activities. Where appropriate, mitigation measures are recommended. The hydrological and hydrogeological assessment has been prepared in accordance with guidelines on Geology in Environmental Impact Statements issued by the Institute of Geologists of Ireland.

3.4.2 SCOPE OF WORKS

The scope of works for the assessment undertaken comprised the following:

- Desk Study
  - Collation of existing regional information regarding the geology, hydrology and hydrogeology of the site and surrounding area;
  - Review of other available site information.
- Field Work
  - Site walkover and mapping of salient features, where present, on 23rd July 2014.
- Reporting
  - Preparation of a surface water and groundwater risk and impact assessment report.

Reference was made to the following documents:

- Department of the Environment, Heritage and Local Government (2004) Quarries and Ancillary Activities – Guidelines for Planning Authorities.
- Environmental Protection Agency (2006). Environmental Management in the Extractive Industry (Non-scheduled minerals).
- Institute of Geologists of Ireland (2007). Recommended Collection, Presentation and Interpretation of Geological and Hydrogeological Information for Quarry Development.
- Institute of Geologists of Ireland (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements

3.4.3 SITE LOCATION

The site of the proposed continuation of WRF operations is Foxtown Quarry, located in the townland of Foxtown, c. 6km southeast of Trim, Co. Meath (See EIS Figure A1.0 and B 2.1 – Rev. A). The site of the quarry and WRF comprises the entire landholding of c. 5.2ha. The site is in the shape of a sinuous ribbon that is c. 300 in length and c. 40m wide, ranging from roughly 25m wide in the north to a maximum of 60m wide in the south. The eastern boundary of the site is defined by an unnamed local road, whilst the remaining boundaries are bordered by agricultural and wooded lands.

The site lies in an area characterised as rural in nature, within the surrounding lowland landscape of south County Meath. According to the EPA Corine Landuse Map 2006, the area consists of a patchwork of agricultural fields that are classed as pasture and subordinate non-irrigated arable land, reflecting medium-high intensity agricultural. The area around Foxtown has a history of sand and gravel working, with extraction from the glacial deposits, such as eskers, moraines and other glaciofluvial outwash deposits.

The settlement pattern in the area can be described as low-intensity rural settlement. Residential property in the area typically comprises one-off single residences and farmsteads along public roads or at the end of lanes off the latter. Although there are no residences within the landholding, there are four nearby residences within 75m on the eastern side of the unnamed local road. Furthermore, there are an additional 14 (i.e., total of 17) residences within 500m of the site (Refer to Figures Nos. A1.0 and B 2.2 – Rev A, for site location details).

3.4.4 EXISTING ACTIVITIES ON THE APPLICATION SITE

The site is primarily used as a WRF for the recovery of inert C&D waste, primarily soil and stone, in the restoration of the quarry void. The land in the northern section of the site (i.e., Phase 1) is currently being restored to agricultural use, whilst the unrestored quarry area is dominated by bare, exposed ground with hedgerows and fragments of scrub at the edges of the site. Overburden stripped to access sand and gravel resource has been used for restoration of completed sections of the excavation.

3.4.5 TOPOGRAPHY

The site of the quarry and WRF is located in an area with a long history of sand and gravel working, with the consequential disturbance to the natural landform and landscape. As stated above, the northern section of the site is being restored, whilst the southern and central sections, which house all of the site infrastructure, are yet to be restored and remain in a disturbed and degraded state, typical of active quarry workings. The shape of the site, as a sinuous ribbon that is c. 250-300 in length and c. 40m wide, with the eastern boundary flanked by an unnamed local road, is owing to the fact that a winding ridge of sand and gravel sat at that location historically.

The site is located at an elevation of c. 65-85m AOD in an area identified as the Central Lowlands by Meath County Council (2007) and are limestone lowlands dominated by the Lucan Formation (Fm.), otherwise known as “Calp” limestone. There are two glacial features that dominate the

local area; namely the Trim Esker and the Galtrim Moraine, both of which are quasi-linear topographic features or ridges that intersect southeast of the site at Ballynamona. The Trim Esker shows evidence of quarrying over much of its c. 14.5km length, and the Foxtown quarry was developed within it, in order to extract the constituent sand and gravel.

The wider area around Foxtown is generally of flat-lying lowlands (elev. c. 65-80m AOD) with hills occurring in an arc from the northeast, around to the south. The hills are formed from Namurian sandstones and shales to the south and southeast (max. elev. c. 135m AOD), and mostly from Late Visean sandstones, shales and limestones to the east and northeast (max. elev. 172m AOD at Skryne). These hills are identified as the Tara Skryne Hills by Meath County Council (2007).

The lowlands in the Foxtown area occur within the floodplains of the Boycetown and Knightsbrook Rivers, and belong to the Boyne River Catchment. Foxtown is located on the southern flank and within the River Water Body (RWB) or Sub-basin of the Boycetown River. The Boycetown River flows in a northwesterly direction c. 1km north of the site, whilst an unnamed tributary stream flows c. 250m to the north of the site. The Boycetown River drains north into the Boyne River at Scurlockstown, near Trim, an important river system with numerous associated SACs, SPAs and pNHAs.

The topography of the site boundaries is elevated (elev. c. 75-90m AOD) relative to the surrounding terrain, due to unexploited ground at the quarry boundaries, which also rises slightly to the south. The unrestored sections of the quarry have a typically irregular, but concave topographic profile reflecting the quarry void (min. elev. ≥ 68m AOD), and these sections will be restored back to a convex or domed profile (max. elev. ≤ 93m AOD). The application site has had a detailed land survey carried out on it, and the existing topographical contours are shown in EIS Figure B 2.1 Rev A - Site Plan.

3.4.6 METEOROLOGY AND WATER BALANCE

An average surface water balance for the total site area of c.5.2ha is presented in Table 3.4.1 below. This calculation assumes that site area is bunded so that water ingress from outside of the existing site footprint does not enter the quarry area.

Rainfall data for the area was obtained from Met Eireann. The closest synoptic station to the Foxtown site is at the Teagasc facility at Grange, Dunsany, c. 3.5km east of the site (just east of Kiltale). The current station was commissioned in 2006, replacing a manual climate station which was installed at Dunsany in 1963, possibly explaining why Met Eireann do not give 30 year averages for the station. The next nearest synoptic station is Dublin Airport, c. 35km southeast of the site, for which 1981-2010 30 year weather averages are available. The average annual rainfall (AAR) at Dublin Airport, based on mean monthly rainfall data during the period 1981-2010, was calculated at 758mm/yr.

Long term Potential Evaporation (PE) data was also obtained for Dublin Airport. The average PE for this synoptic station (based on 1981-2010 average monthly data) is 540mm/year. A conservative estimate of the Actual Evaporation (AE) is taken to be 0.9 of PE. Therefore, the AE at the Foxtown quarry is estimated at 486mm/yr. Interestingly, based on data received

from Met Eireann, the average PE at Dunsany for the three year period 2011 to 2013 was determined to be 491.4mm/yr.

The Effective Precipitation (EP) is the amount of precipitation that is available to form recharge or runoff. The EP in the vicinity of the site boundary is estimated as follows:

$$EP = AAR - AE.$$

$$= 758mm/yr - 486mm/yr$$

$$EP = 272mm/yr$$

Based on the EP value determined above, the volume that is available for runoff or recharge directly on the application area is 14,144m^3/yr and is given by:

Application area run-off = Area x EP

= (52,000m^2)*(0.272m/yr)

= **14,144m^3/yr (38.75m^3/d or 0.46 l/s)**

Table 3.4.1 Mean Water Balance for the Existing Excavation Area and Ancillary Activities Area

Existing Quarry Area (m^2)	Average Annual Rainfall (mm)	Mean Annual Potential Evaporation (mm)	Actual Evaporation (mm)	Effective Annual Precipitation (mm)	Annual Volume of Water Available for Recharge or Runoff (m^3)	Annual Volume of Water Available for Recharge or Runoff (m^3/day)
52,000	**758**	**540**	**486**	**272**	**14,144**	**38.75**

3.4.7 RECHARGE

The term 'recharge' refers to the amount of water replenishing the groundwater flow system. The recharge rate is generally estimated on an annual basis, and assumed to consist of input (i.e., annual rainfall) less water loss prior to entry onto the groundwater system (i.e., annual evapotranspiration and runoff).

All effective precipitation formed within the site area recharges into the ground or runs off site. That which does not recharge to groundwater runs off. The hydrogeological controls determining the rate of groundwater recharge beneath the site as indicated by the Geological Survey of Ireland (GSI 2014) are provided in Table 3.4.2. The GSI National Recharge maps (GSI 2014) suggest that the average recharge in the vicinity of the site is 409mm/yr (See Figure 3.4.1).

For aquifers classed as Locally Important Aquifer (Lm), such as the Lucan Fm., no upper limit is assumed for the amount of recharge that they can accept, as is the case for poor aquifers,

such as Pu and Pl. When the natural recharge capacity is exceeded then rejected recharge occurs and this adds to surface runoff (or interflow) (Hunter-Williams et al. 2008).

Hydrogeological Controls	
Hydrogeological Setting:	2.ii (source: WGWG, 2005)
Hydrogeological Setting Description:	Sand & gravels subsoil overlain by well drained soil
Soil Drainage:	DRY
Subsoil Type:	BasEsk
Subsoil Description:	Basic Eskers sands and gravels
Subsoil Permeability:	H
Subsoil Permeability Description:	High
GW Vulnerability:	H
GW Vulnerability Description:	High
Aquifer Category:	Lm
Aquifer Category Description:	Locally Important Aquifer – Bedrock which is generally moderately productive
Recharge Coefficient (%):	85
Maximum Recharge Capacity (mm/yr):	0
Average Recharge (mm/yr):	409
Effective Rainfall (mm/yr)	481

Table 3.4.2 Hydrogeological Control Determining Groundwater Recharge for the Site

3.4.8 HYDROLOGY

In a regional context, the site is situated in the Boycetown River Sub Basin, within the catchment of the Boyne River, in the Eastern River Basin District. The Boycetown River rises as the Derrypatrick River at Culmullin near Old Cross Keys in the southern sector of hills identified as the Tara-Skryne Hills by Meath County Council (2007). It flows in a northwesterly direction and ultimately drains into the Boyne River at Scurlockstown, near Trim, an important river system with numerous associated SACs, SPAs and pNHAs. The Boycetown River passes c. 1km north of the site, whilst an unnamed tributary stream flows within c. 250m to the

north of the site. Thus, Foxtown is located on the southern flank and within the River Water Body (RWB) or Sub Basin of the Boycetown River.

A surface water feature, which is essentially a wet drainage ditch, and a tributary of the Boycetown River (See above), comes within c. 250m east of the eastern boundary of the application site. A second surface water feature, which is also essentially a wet drainage ditch, comes within c. 500m west and south of the western boundary of the site. In addition, a small wetland area with seasonal surface water, c. 40m in diameter and described as a lake, is located c. 400m southeast of the site near Galtrim (See EIS Figure B 2.2 - Rev A).

3.4.9 GEOLOGICAL SETTING

3.4.9.1 BEDROCK GEOLOGY

Reference to the 1:100,000 scale map of the Geology of Meath: Sheet 13 (GSI 2001) and online mapping (GSI 2014) suggests that the entire quarry site is underlain by the Lucan Formation (LU).

The Lucan Formation, also known as the "Calp" limestone, is widespread in County Meath and north County Dublin, and underlies the site and the surrounding area (i.e., within c. 2.5km). The unit is Chadian-Asbian in age (c. 330-358 million years ago), and consists of dark grey, well-bedded, cherty, graded limestones and calcareous shales, which originated as calciturbidites. The formation is basinal in origin, and varies widely in grains size, colour and shale content, as well as in thickness (i.e., up to 300-800m). The lower part of the formation is composed of commonly conglomeratic calciturbidites, whilst the upper part is largely composed of a fining-upwards sequence of distal calciturbidites.

According to the GSI online maps (GSI 2014), the major fault of Caledonian trend lies c. 2.5km to the southeast of the Foxtown site, and defines the contact between the Lucan Fm. and a succession of Namurian mudstones. A second fault of Caledonian trend defines the contact between the Waulsortian and the Lucan Fm. just south of Stokestown, and is projected to pass c. 750m north of the site (See Figure 3.3.5). Further details of the geological background of the area are given in Section 3.3 of this EIS.

3.4.9.2 SOILS AND SUBSOILS

3.4.9.2.1 Regional Data

Interpretation of the Teagasc/EPA Soil Map (Fealy & Green 2009), the Soil Map of Meath (Finch et al. 1983) and the General Soil Map of Ireland (Gardiner & Radford 1980) indicates that the dominant topsoil or soil type in the general area around Foxtown is Grey Brown Podzolics. Furthermore, the occurrence of Baggotstown-Crush complex as the dominant soil type on site prior to quarrying operations is also indicated. Two soil maps of the area including the site are shown in Figure 3.3.1 (Soil Map of Foxtown Area from Finch et al. (1983)), and Figure 3.3.2 (EPA/Teagasc Soil Map of Foxtown Area). These soils developed on glaciofluvial

sand and gravel derived from nearby Carboniferous limestones, and comprise shallow, well-drained soils derived from mainly calcareous parent material.

The subsoil of the Trim Esker, including the quarry site, consists solely of “basic” (or alkaline) esker sands and gravels derived from Carboniferous rocks (i.e., BasEsk), and comprise the deposits being extracted. These deposits of well sorted and stratified sand and gravel are glaciofluvial deposits, which were deposited by meltwaters in a subglacial river. The subsoil in the wider area is dominated by sands and gravels derived from Carboniferous rocks, with lesser amounts of limestone till derived from Carboniferous rocks, alluvium deposits from modern river systems within the Boyne Catchment; and a few other minor subsoil types (i.e., small pockets of peat, and bedrock outcrop and subcrop).

The GSI Groundwater Protection Scheme maps for Co. Meath and the borehole database held by the GSI (2014) indicate depths to bedrock of 4.6m at Windtown (immediately west of the site), 3m at Freffans (c. 1km northwest of site), 3.6m at Dangan (c. 3km west of site), 7m at Foxtown (c. 1km northeast of site), and up to 18.2m at Basketstown (c. 1km south of the site). Observations from site visits and information obtained from the facility operators, indicate that the quarry excavations extend to approximately 12m below the ridgeline of the esker, and thus indicate substantial vertical thicknesses of soil and sand and gravel overlying the bedrock in the quarry site. Bedrock described as “Calp” (i.e., Lucan Fm.) was encountered at the base of the excavations (c. 67mAOD), and fissure fracturing was noted. The following approximate maximum thicknesses of the overburden on the quarry site prior to operations are indicated: 0.3m of topsoil, ≤1.2m of subsoil and 12m of sand and gravel at the base.

3.4.10 HYDROGEOLOGICAL SETTING

Limestones of central lowlands are the principal source of groundwater in Ireland (Drew 2008). The Dinantian limestone of the Lucan Fm. or (“Calp”), which underlies the site, is an indurated bedrock with low intergranular permeability. The base of the Calp is comprised of coarse-grained, cleaner limestones with occasional thin shale bands and sandstone units. The lower Calp limestones are also often dolomitised, and together with faulting generate high well yields. The upper Calp is comprised of deeper basinal limestones that are largely fine-grained, black shales with limestones. The higher shale content ensures a much lower permeability and results in a lower yield.

The Lucan Fm. is identified generally as a ‘Dinantian Upper Impure Limestone’, and consists of dark grey to black, fine-grained, well-bedded limestones and shales. Shaley laminations and partings, other bedding planes, joint surfaces and faults create a network in which groundwater flow is dominated by fissure permeability in otherwise impermeable rock. In addition, groundwater will move in the upper broken and weathered zone of the bedrock.

A high number of wells in the Calp in County Meath are generally classified as good (>100m^3/d) or excellent (>400m^3/d), although yields can be as low as 10m^3/d for poor wells (Meath County Council 2009). The high number of good and excellent wells, including many of the Council’s major groundwater supplies, has resulted in the Calp Limestone being classified as a “Locally important aquifer - generally moderately productive” (i.e., Lm) by the GSI. Whilst the Calp exhibits significant hydrogeological variability, the principal groundwater

flows are concentrated in the upper fractured and weathered zone and along fracture/fault lines.

The hydrogeological significance of the Quaternary sediments is variable and is largely a function of their permeability, thickness and extent. Areas with a glacial till cover have increased runoff and less recharge, whilst areas with gravel exposed at the surface will have higher recharge and where sufficiently thick and laterally extensive will form aquifers. The Quaternary sediments of the wider Foxtown area consist of an aerial extensive deposit of glaciofluvial sands and gravels derived from Carboniferous limestone (See Figure 3.3.3). These deposits have high permeability and are laterally extensive, suggesting that if present in reasonable thicknesses, might constitute locally important sand and gravel aquifers.

3.4.10.1 AQUIFER CLASSIFICATION

Groundwater is water beneath the ground surface contained in void spaces, such as pore spaces between rock and soil particles, or in bedrock fissures (Han 2010). Groundwater is stored and moves through geological strata, where the direction of flow follows the topography. An aquifer is an underground layer of water-bearing permeable rock or unconsolidated materials (i.e., gravel, sand silt or clay) from which groundwater can be usefully extracted using a water well. The aquifer potential of a bedrock unit is determined by the groundwater productivity and the productivity is based on hydraulic characteristics compiled from borehole data throughout the country.

The Foxtown locality and its' underlying aquifer has been characterised by the GSI as being part of the Trim Groundwater Body (GWB). The Trim GWB comprises bedrock aquifers that are classified as mostly locally important aquifers, which are generally moderately productive (Lm; See EIS Figure 3.3.6). Some of the key characteristics of the Trim Groundwater Body have been identified by the GSI as follows:

- The area of the GWB is generally low-lying with some hillier areas to the southeast, and almost completely encloses the course of the River Boyne. The majority of the GWB comprises Dinantian Upper Impure Lirnestones of the "CaIp", which consist primarily of impure limestones and limestones interbedded with calcareous shales. The GWB area boundaries are defined by the extent of the "CaIp".
- The aquifer is mostly classified as Locally Important Aquifer, which is generally moderately productive (Lm), with small areas of regionally important (Rkd), locally important but generally poor (Ll) and poor (Pl) aquifers.
- The GWB is a large area of limestone, which is extremely heterogeneous. Key hydrogeological factors that affect groundwater flow within the aquifer, such as: karstification; the degree of structural deformation; the occurrence of open fractures in a connected network; the degree of confinement by impermeable tills; and the additional storage provided by the many gravel deposits overlying the aquifer, all show significant variability within the GWB.
- The nature of the bedrock is highly variable due to the different structural and weathering influences exerted on the rock. In some areas, significant cavities occur at depth of 50m below ground due to the coincidence of weathered bedrock and high inflows. In South Meath, the rocks are more folded and faulted, and severe

deformation occurs in the upper impure limestones, which are highly weathered and broken to depths of 35m.

- The nature of groundwater flow in this aquifer is determined by the degree of karstification, fracturing and the purity of the limestones. Within the GWB, in highly karstified limestone, flow is concentrated into conduits, which may draw water very deep underground. Where the limestone is less karstifled the flow systems is shallower and more diffuse. Although groundwater will still flow mainly along fractures, there is a lack of large-scale dissolution creating large conduits that can concentrate flow deep underground.
- Two recharge mechanisms occur in the GWB: point recharge and diffuse recharge. Diffuse recharge is a more widespread process across the GWB, being higher in areas where subsoil is thinner and/or more permeable. This will be the main recharge process in the extensive lowland areas of this GWB. Groundwater flow will be from local areas of high recharge e.g., areas of thin subsoils in the uplands, to the main surface water bodies overlying the aquifer, such as the Boyne.
- Discharge from the aquifer is also varied. The main discharge mechanism for this aquifer is where water discharges in a diffuse manner as baseflow to the River Boyne and its tributaries, as well as via springs. Structural deformation will influence the groundwater flow and hence the nature of the discharge from the aquifer. Conduit karstic flow is more likely where there is a high degree of fracturing. The development of a karstic groundwater system affects the transportation of pollutants to receptors, as groundwater flow is faster and more concentrated along karstic conduits. Where the karstic system is less developed the occurrence of large springs is less likely as the aquifer discharges as baseflow to the rivers.
- Where overlying quaternary deposits consist of thick limestone tills, these can act as a confining layer that produce artesian supplies.
- Waters in the GWB consistently show a Calcium Bicarbonate hydrochemical signature. Electrical conductivity ranges from 500 to 800μS/cm, with moderately hard to very hard waters, and alkalinities between 150 to 350mg/l.

The aquifer map of Ireland produced by the GSI (2014) has classified the Lucan Fm. under the Foxtown site as a locally important aquifer, which is generally moderately productive (Lm), rendering it a good source of water. The rock has low inter-granular permeability, so groundwater flow is concentrated in fractured and weathered zones, along joints and bedding planes, and in the vicinity of fault zones. Groundwater flows through a variably connected network of fractures, fissures, bedding planes and joints, giving a range in fissure permeability, which tends to decrease further with depth. The post-depositional processes of dolotomisation, deformation, faulting and karstification increase the secondary permeability of the limestone.

Most groundwater flux is likely to be in the upper part of the aquifer, comprising three broad zones: (1) a shallow zone of higher permeability may exist within the top few metres (i.e., c. 3m) of more fractured/weathered rock; (2) interconnected jointing and fissuring up to 30m-50m thick; and (3) a zone of isolated poorly connected fissuring typically less than 150m. Higher permeability may occur along fissures and fault zones, especially where significant dissolution and karsitifcation has resulted in karstic conduit flow, and can draw water very

deep underground. Where the limestone is less karstifled, the groundwater still flows mainly along fractures. However, the lack of large-scale dissolution creating large conduits that can concentrate flow deep underground, results in the flow systems that are shallower and more diffuse.

The network of connections between the joints, bedding planes, fissures and faults can result in relatively good aquifer storage and flow paths that can extend for hundreds of metres. Flow is still largely confined to fissure zones, and thus places a practical limit on the amounts of water, depending on the combination of the key hydrogeological factors. Nonetheless, the Lucan Fm. is capable of supplying a wide range of abstractions (e.g., public, group schemes, industrial and domestic supplies) from poor yields (i.e., <100 m^3/d, and often as low as 10m^3/d) to excellent yields (i.e., >400m^3/d).

Diffuse recharge is a widespread process across the GWB, and is the main recharge process in the large lowland areas. Diffuse recharge is higher in areas where subsoil is thinner and/or more permeable, allowing rainfall to percolate through the subsoil and rock outcrops. The Lucan Fm. has a variable 'recharge acceptance' due to its range in permeability and storage capacity. Consequently, a proportion of the effective rainfall will discharge to the streams in the groundwater body, especially where thicker, low permeability subsoil is present. Some recharge in the upper, more fractured/weathered zone is likely to flow along the relatively short flow paths and discharge to streams and springs.

Gravels where present would have a sustainable yield, although lenses of clay and silt would reduce their overall yield. A sand and gravel deposit is classified as an aquifer, if the deposit is highly permeable, has a saturated thickness greater than 5m, and is greater than 1km^2 in areal extent. The GSI classify the sand and gravel deposit west of Summerhill, c. 3km to the southwest of the site, and which covers an area of 10.79km^2, as a Locally Important Aquifer (Lg). However, the sand and gravel of the Foxtown locality is not considered to be part of this aquifer body.

The esker deposit on which the Foxtown quarry was developed consists of well stratified fine sand and gravel. It is estimated that the overall deposit consisted of 30% fine sand and silt, and 70% gravel, mostly in the pebble and cobble range but with significant quantities of large boulders. This sand and gravel deposit has been largely extracted from within the application area, leaving a thin veneer of sand/gravel and/or backfill material over the limestone bedrock at the base of the quarry void. There are no glacial tills or boulder clays in the application area, which might act as an impermeable layer (i.e., aquaclude) to isolate the groundwater in the underlying bedrock.

3.4.10.2 KARST FEATURES

Reference to the GSI karst database (GSI 2014) indicates that no karst features have been mapped in the vicinity of the site (i.e., within a 2km radius). The closest mapped karst feature, described as a borehole, is located in the Summerhill area, c. 4km south of the site, whilst only 4 in total are identified within a radius of 10km (See Table 3.4.3).

Feature No.	2623NEK002	2623NEK001	Unknown	Unknown
Type	Borehole	Borehole	Spring	Spring
Name	Trial Well No. 1	Well No. 1	Na.	Na.
Easting	284000	284500	247886	256297
Northing	249100	248000	278615	290700
Townland	Clonmahon	Summerhill Demesne	Na	Na.
Grid Accuracy	50m	50m	Na	Na.
Stratigraphic Unit	CPL: Basinal Limestone	CPL: Basinal Limestone	Na	Na.
Lithology	Limestone, muddy	Limestone, muddy	Na	Na.
Comments	Summerhill, 1991	Summerhill, 1985	Spring emerging in field. Rathmoylan	Spring piped to ditch 230m to west. Dunsany.
Distance from Site	4km	5km	8.5km	6km

Table 3.4.3. Karst Features within the Wider Area (10km radius) around Foxtown

3.4.10.3 GROUNDWATER ABSTRACTIONS AND BOREHOLE DRILLING

Reference to the GSI well database (GSI 2014) indicates four records of a public groundwater supply in close proximity (i.e., within c. 2km) of the site. The nearest recorded public groundwater supply is in the townland of Foxtown, which is a dug well with a locational accuracy of only 1km. A second public groundwater supply is in the townland of Freffans Little, approximately 2km northwest of the site, which is also a dug well with a locational accuracy of only 1km. There are also two public supply wells in Freffans, both of which are dug wells with locational accuracy of only 1km. The current status of the public supply wells is unknown. The nearest public supply source protection area to the Foxtown site is c. 3km to the northwest at Scurlockstown, and thus the site is not subject to restrictions or requirements in respect of any groundwater source protection zones.

The database indicates 37 no. groundwater wells within a c. 2km radius of the site (location accuracy varies from 20m to 1km), the details of which are given in Table 3.4.4. In addition to the four public wells, some of the wells are described as industrial or other (e.g., monitoring), whilst a third of the wells are domestic wells. The level of water abstraction in the area (i.e., within c. 2km) is indeterminate, but as the majority of wells are private supplies for single

houses, or monitoring wells, it is unlikely to be sufficient to affect groundwater conditions within the application site.

The water table is the surface of the underground saturated zone, below which all soil pores or rock fractures are filled with water. Seasonal changes such as precipitation and evapotranspiration, give rise to seasonal fluctuations of the water table in the area of as much as 2m. The overlying sand and gravel deposits have largely been extracted from within the application area at Foxtown, and the quarry floor is typically maintained at a depth of c. 1m above the winter water table level. Bedrock consisting of dark grey, well bedded, cherty limestones and calcareous shales of the Lucan Fm., was known to outcrop on the quarry floor but is now obscured by sand, gravel and backfill.

There are 3 wells within the Foxtown site (i.e., GW1 to GW3), and these are used to monitor groundwater water levels, and are sampled for chemical analysis. Foxtown is not serviced by a mains water supply, and water is abstracted in support of ongoing operations at the quarry and WRF, including road sweeping. The average water usage for the site was unavailable, but it is expected that water usage would be minimal.

The groundwater in the aquifer at Foxtown is unconfined, and the water level data from the three monitoring points in 2008 show that the trend of the hydraulic gradient is from the southwest to the northeast in the direction of Boycetown River. It is notable however, that the trend of the hydraulic gradient is not apparent from the 2014 data (See Table 3.4.5) as the samples were taken during a very dry summer and it is expected that the groundwater gradient in a well-fractured bedrock, under sand and gravel, would be negligible in such conditions.

Well	Comments	Irish National Grid Reference	Groundwater Level (mAOD)	
			February 2008	29/07/2014
GW1	Well house supply for quarry processing plant	E285603 N252921	72.8	68
GW2	Supply for wheelwash. Dug well	E285379 N253198	67.7	67.5
GW3	Supply for Readymix Plant (Not in use)	E285674 N252942	69	68.08

Table 3.4.5 Groundwater Monitoring Wells at Foxtown

3.4.10.4 GROUNDWATER LEVELS AND FLOW DIRECTION

The water level measured in monitoring wells allows the direction of groundwater flow beneath an area of interest to be determined. The water table is rarely horizontal and tends to follow local variations in topography, as groundwater flow is influenced by topography. Geological structures can also exert sufficient influence to cause the water table to deviate from following the topography. The slope of the water table or hydraulic gradient indicates changes in hydraulic head, and depends on the rate at which water is recharged or discharged from the aquifer, and its permeability. The slope of the water table gives the direction of groundwater flow, as groundwater will flow in the direction of maximum change in water table elevation.

As stated above, the water levels in the 3 wells are given in Table 3.4.5, and indicate an approximately northeasterly direction of groundwater flow in the area.

Table 3.4.4. Inventory of Groundwater Wells within c. 2km Radius of the Foxtown Site (Source: GSI Groundwater Database)

GSI Code	Well Type	Owner / Original Name	Drill Date	Locational Accuracy	Townland	Depth	Depth to Rock	Easting	Northing	Well Use	Comment
2625SEW014	Dug Well		1992	50m	Walterstown	4m		285620	254880	Domestic	'92 MSc Thesis: Well 43yrs old
2625SEW023	Borehole	BH1	1985	20m	Basketstown	14.2m	14m	285630	251450	Other	Piezometer installed at 5m depth
2625SEW024	Borehole	BH2	1985	20m	Basketstown	12.7m	12.3m	285370	251430	Other	2 Piezometers installed
2625SEW025	Borehole	BH3	1985	20m	Basketstown	13m	12.4m	285330	251550	Other	2 Piezometers installed
2625SEW026	Borehole	BH4	1985	20m	Basketstown	15.5m	15.5m	285320	251350	Other	2 Piezometers installed
2625SEW027	Borehole	BH5	1985	20m	Basketstown	10m	10m	285380	251170	Other	Piezometer 7.5m deep
2625SEW028	Borehole	BH6	1985	20m	Basketstown	8.9m		285430	251000	Other	Piezometers 6m + 8.9m
2625SEW029	Borehole	BH7	1993	20m	Basketstown	6.2m		285800	251240	Other	
2625SEW030	Borehole	BH8	1993	20m	Basketstown	6.2m		285740	251400	Other	
2625SEW031	Borehole	BH9	1993	20m	Basketstown	6.1m		285560	251320	Other	
2625SEW032	Borehole	BH10	1993	20m	Basketstown	6.1m		285640	251140	Other	
2625SEW033	Borehole	BH11	1993	20m	Basketstown	7m		285610	251600	Other	
2625SEW034	Borehole	BH12	1993	20m	Basketstown	12m		285440	251540	Other	
2625SEW035	Borehole	BH13	1993	20m	Basketstown	42.6m	18.2m	285570	251580	Other	Poor yield. Abstraction: 3m3/d
2625SEW036	Borehole	BH14	1993	20m	Basketstown	36.6m	30m	285540	251310	Other	Poor yield. Abstraction: 6m3/d
2625SEW037	Borehole	BH15	1993	20m	Basketstown	42.7m		285780	251220	Other	Yield: 25m3/d
2625SEW038	Borehole			20m	Windtown	61m	4.6m	285580	252870	Industrial	Behind washing plant
2625SEW040	Dug Well			50m	Foxtown	3.3m		285350	253550	Domestic	Concrete liners
2625SEW041	Borehole			20m	Foxtown	26m		285080	253660	Domestic	Possibly polluted by landfill
2625SEW042	Borehole			20m	Mitchelstown	17.5m		285040	253680	Domestic	Well serves 3 houses
2625SEW043	Borehole			50m	Mitchelstown	16.3m		284720	254150	Domestic	Well is polluted
2625SEW044	Dug Well			50m	Foxtown	4.7m		285130	253550	Domestic	1Concrete liners
2625SEW045	Borehole	TW1	1992	50m	Foxtown	6m		285120	253410	Other	100m PVC, screened 3.2-6m
2625SEW046	Borehole	TW2	1992	50m	Foxtown	6m		285040	253410	Other	100m PVC, screened 3.2-6m
2625SEW047	Borehole	TW3	1992	50m	Foxtown	6m		285120	253510	Other	100m PVC, screened 3.2-6m
2625SEW048	Borehole	TW4	1992	50m	Foxtown	15.2m	7m	284970	253780	Other	Inflows at 2.4m
2625SEW049	Borehole	TW5	1992	50m	Foxtown	6m		284980	253770	Other	100m PVC, screened 3.2-6m
2625SEW050	Borehole	P. Thornton Waste		50m	Foxtown			285770	253230	Industrial	Thornton 290 well
2625SEW061	Dug Well		1972	1km	Freffans	5.8m		283900	253850	Public	Yield Poor. Yield: 11.6m3/d
2625SEW062	Dug Well		1971	1km	Freffans	3.7m		283900	253800	Public	Yield: 12m3/d
2625SEW063	Borehole		1970	1km	Freffans	38.1m	3m	283900	253750	Domestic	Poor yield. Yield: 27m3/d
2625SEW064	Dug Well	Meath Co. Co.	1958	1km	Freffans Little	3.7m		283900	253700	Public	
2625SEW065	Dug Well		1970	1km	Freffans	4.3m		283900	253650	Domestic	Yield: 12m3/d
2625SEW066	Borehole			1km	Freffans	6.6m		283900	253600		Poor yield. Abstraction: 27m3/d
2625SEW089	Dug Well	Meath Co. Co.	1958	1km	Foxtown	6.7m		285400	253450	Public	
2625SEW090	Dug Well		1970	1km	Ginnets Great	7m		284100	252300	Domestic	Poor yield
2625SEW124	Dug Well		1970	1km	Branganstown	6.1m		286850	254220	Domestic	Poor yield

3.4.10.5 GROUNDWATER VULNERABILITY

Groundwater vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. The vulnerability of an aquifer is defined as the ease with which infiltrating water and potential contaminants may reach groundwater in a vertical or sub-vertical direction. The vulnerability of the aquifer is dependent on the nature of the geology, and the permeability and thickness of the overburden. The criteria for vulnerability classification are presented in Table No. 3.4.6. Where the subsoil thickness is <3m, the vulnerability is rated as Extreme (the highest risk situation). Where the subsoil thickness is >3m, the vulnerability is rated as High, Moderate or Low (depending on the permeability and thickness of the subsoil).

The GSI Vulnerability Map indicates that groundwater in the bedrock aquifer beneath the entire application site has been assigned a vulnerability rating of **High (H)** (See EIS Figure 3.4.2). This suggests that the sands and gravels on the site are greater than 3.0m deep, and of high permeability, and was confirmed by the operator who indicated depths to bedrock of ≥12m.

The **general** Groundwater Protection zone for the Foxtown site is conservatively therefore Lm/H across the site. This classification is a combination of the aquifer class and the groundwater vulnerability category, and refers to the locally important bedrock aquifer (Lm), with a high (H) vulnerability. It should be noted that this GSI vulnerability rating is based on regional data only, and has not considered and used in the mapping detailed, site-specific information.

The development is thus considered by GSI to be situated on a highly vulnerable and locally important aquifer. However, the subsoil deposits are both the aggregate resource as well as much of the protective cover to the aquifer, but have been removed from the Foxtown site as a function of the extractive process, which would suggest that the groundwater vulnerability has been increased further to **Extreme (E)**. The proposed continuation of the WRF operations will result in the restoration of the quarry lands to a topographic ridge similar to the pre-existing esker. Backfilling with inert C&D waste, mostly soil and stone, will result in the build-up of relatively impermeable material within the quarry void. The backfill will reinstate protection for the bedrock aquifer, and reduce the actual groundwater vulnerability to possible contamination by limiting infiltration to lower levels. Furthermore, all potential sources of contamination on the site are managed.

Subsoil Thickness	Hydrogeological Requirements				
	Diffuse Recharge			Point Recharge	Unsaturated Zone
	Subsoil Permeability & Type				
	High permeability (sand & gravel)	Moderate permeability (sandy subsoil)	Low permeability (clayey subsoil, clay, peat)	(Swallow holes, losing streams)	(sand & gravel aquifers *only*)
0-3m	**Extreme**	**Extreme**	**Extreme**	**Extreme (30m radius)**	**Extreme**
3-5m	**High**	**High**	**High**	**N/A**	**High**
5-10m	**High**	**High**	**Moderate**	**N/A**	**High**
>10m	**High**	**Moderate**	**Low**	**N/A**	**High**

Notes: (i) N/A = not applicable
(ii) Permeability classifications relate to the material characteristics as described by the subsoil description and classification method
(iii) Release point of contaminants is assumed to be 1-2m below ground surface

Table 3.4.6. General GSI Vulnerability Mapping Criteria (Adapted from DELF/EPA/GSI, 1999)

3.4.11 WATER QUALITY

3.4.11.1 OVERVIEW

The Water Framework Directive (WFD) of 2000 (Directive 2000/60/EC) represents a new approach to the protection and improvement of water resources and aquatic ecosystems across the EU. The WFD aims to protect all waters and water-dependent ecosystems: groundwater, rivers, lakes, transitional waters (estuaries), coastal waters and wetlands. A primary environmental objective of the WFD for surface waters is that the ecological and chemical status of all water bodies will be good or high by 2015, and that there will be prevention of any deterioration in status.

The WFD was transposed into Irish Law as the 2003 Regulations (i.e., SI 722 of 2003). The competent authorities responsible for implementing the regulations are the local authorities acting jointly and the EPA. The main unit of management is the River Basin District (RBD), which comprises one or more neighbouring river basins together with their associated wetlands, groundwaters and coastal waters. A river basin is an area of land from which all surface run-off flows through a series of streams, rivers and possibly lakes into the sea at a single river mouth or estuary. The applicable RBD in the Foxtown case is the Eastern RBD.

The definition of good status in the case of surface waters is based on: (1) ecological status, (i.e., the composition of the faunal and floral communities and the natural chemical and physical characteristics); and (2) chemical status, which refers to a number of specified toxic and/or bioaccumulative substances. In the case of groundwaters, good status relates to the

natural chemical composition of the water and to these same chemical substances as well as to quantitative status (i.e., extent to which annual recharge to aquifers is depleted by abstractions).

In addition to the setting stringent quality targets, the WFD promotes the sustainable use of water resources, the progressive reduction and prevention of pollution of groundwater, the elimination of the discharge of specified hazardous substances, and the mitigation of the effects of floods and droughts.

Two groundwater samples were taken from GW1 in January 2009 and July 2014. The location of GW1 is shown in Figure B 2.1 Rev. A. The water quality results were compared with the 'Maximum Allowable Concentration' (MAC) in groundwater, and the 'Interim Guideline Values' for surface water from the relevant legislation and/or guidance (See Table 3.4.7).

3.4.11.2 GROUNDWATER QUALITY

Groundwater is an important source of water for industry, agriculture and drinking water, and because it moves slowly through the ground, the impact of human activities lasts for a relatively long time. Groundwater also provides baseflow to surface water systems and accordingly its quality influences the amenity and recreational value of surface water and its potential use for water supply purposes. Agricultural, industrial and other human activities are posing increasing risks to groundwater quality and both EU legislation and national regulations require that pollution must be prevented as part of sustainable groundwater quality management.

There are no groundwater protection schemes in the vicinity of the Foxtown site, the nearest c. 3km northwest of the site at Scurlockstown.

Reference to the water data on the EPA Envision online mapping facility (EPA 2014) indicates that the rocks of the Lucan Fm. underlying the Foxtown site are classified as locally important and productive bedrock aquifer. The Trim Groundwater Body (GWB), of which the Foxtown site forms part, is assessed as having Good groundwater status in terms of Water Framework Directive (WFD) Status 2007-2009, but also as being 'at risk of not achieving good status' in 2015 (i.e., risk score of 1a).

Groundwater samples taken from the GW1 well in January 2009 and July 2014. The results of standard water quality analysis of these samples, as well as the Maximum Allowable Concentrations (MACs) derived from interim guideline levels set by the EPA (2003), are presented in Table 3.4.8. The results of the hydrochemical analysis show that the groundwater sample is compliant, meeting all the MACs, with the exception of the concentrations for chlorides and nitrates.

The concentration of **Chloride** (i.e., 69.8mg/l) is above the limit of 30mg/l set out by the EPA (2003), and the threshold level of 24mg/l set out in the 2010 Groundwater Regulations. Chloride does not pose a hazard to human health and the principal consideration is in relation to palatability. At Chloride levels above 250mg/l, water begins to taste salty and becomes progressively objectionable. Although Chloride occurs in all natural waters, an elevated concentration may indicate pollution by organic wastes, which is such a rich source of Chloride.

The concentrations of **Ammoniacal Nitrogen** in the sample (i.e., 0.03mg/l) is lower than the limit of 0.15mg/l set out by the EPA (2003), and the threshold level of 65μg/l set in the Groundwater Regulations of 2010.

Of the concentrations for **Nitrate**, **Nitrite** and **Total Oxidised Nitrogen (TON)**, only the concentration of **Nitrate** (i.e., 63.5mg/l) was elevated relative to the limit of 25mg/l set by the EPA (2003). Nitrate originates from artificial fertilisers, and from the oxidation of ammonia in sewage and waste discharges. Thus, the elevated nitrate concentration may reflect contamination of the groundwater by sewage or fertilisers. As nitrite is an intermediate stage in the ammonia-to-nitrate oxidation, the low nitrite and ammoniacal N levels observed here suggest that the elevated nitrate originates from fertiliser.

The observed value of **Conductivity** (i.e., 904μS/cm) is below the limit of 1,000μS/cm set out by the EPA (2003), but above the threshold level of 800μS/cm set in the Groundwater Regulations of 2010. Conductivity is a measure of the concentration of dissolved (ionisable) solids, and thus an estimate of salinity, and is consistent with the elevated Chloride concentration.

The chemical analyses of the groundwater from GW1 indicates minor contamination, most likely from agricultural activity on adjacent lands. It is known that intensive horticultural activity is practiced on the adjoining lands immediately west of the site. These lands are underlain by either sands and gravels or moderate permeability till, both of which are well drained and neither of which will denitrify significantly before recharge to groundwater. The site and the GW1 well lie down (hydraulic) gradient from these intensively farmed lands, which lie within 10m of GW1.

The site septic tank and associated infiltration area lie c. 25m down (hydraulic) gradient of the GW1 well. Microbiological analysis of the GW1 samples showed zero **Faecal Coliforms** levels, and suggests there is no contamination form organic wastes including sanitary sewage. The slightly elevated **Total Coliform** level can be attributed to exposure to air during sampling, coliforms from soils, or poor sampling practices.

The parameters likely to be indicative of risks associated with the activities of the WRF (e.g., heavy metals such as Pb, Zn, Cu and As, or EPH c8-c40) are compliant. There is therefore no indication of any significant contamination of the groundwater arising from the operation of the WRF at Foxtown quarry.

Parameter	Units	LOD	Jan 2009	July 2014	MAC
Dissolved Arsenic	ug/l	<2.5	0.96	<2.5	10
Dissolved Cadmium	ug/l	<0.5	<0.09	<0.5	5
Total Dissolved Chromium	ug/l	<1.5	1.2	6.8	30
Dissolved Copper	ug/l	<7	0.5	<7	30
Total Dissolved Iron	ug/l	<20	60.5	<20	200
Dissolved Lead	ug/l	<5	<0.38	<5	10
Dissolved Magnesium	mg/l	<0.1	14.91	14.9	50
Dissolved Manganese	ug/l	<2	2.3	<2	50
Dissolved Mercury	ug/l	<1	<0.2	<1	1
Dissolved Nickel	ug/l	<2	0.6	<2	20
Dissolved Potassium	mg/l	<0.1	0.98	1.3	5
Dissolved Sodium	mg/l	<0.1	25.44	31.7	150
Dissolved Zinc	ug/l	<3	<4.6	<3	100
EPH (C8-C40)	ug/l	<10		<10	-
Fats Oils and Grease	ug/l	<10		<10	-
Sulphate	mg/l	<0.05	22.37	33.05	200
Chloride	mg/l	<0.3	52.41	69.8	30
Nitrate as NO_3	mg/l	<0.2	7.34	63.5	25
Nitrite as NO_2	mg/l	<0.02	<0.003	<0.02	0.1
Total Oxidised Nitrogen as N	mg/l	<0.2	7.34	14.3	-
Ortho Phosphate as PO_4	mg/l	<0.06	0.037	<0.06	0.03
Ammoniacal Nitrogen as NH_4	mg/l	<0.03	<0.06	0.03	0.15
Total Alkalinity as $CaCO_3$	mg/l	<1	312	364	-
Electrical Conductivity @25°C	uS/cm	<2	834	904	1000
Faecal Coliforms	CFU/100ml		0	<1	0
pH	pH units	<0.01	7.1	7.19	9.5
Total Organic Carbon	mg/l	<2	1.09	<2	-
Total Coliforms	CFU/100ml		32	<1	0

MAC: Maximum Allowed Concentration - (values exceeded are shaded in yellow).
The MACs are taken primarily from the European Communities Drinking Water (No. 2) Regulations, 2007 and where not available from the Interim Guideline Value - Towards Setting Guideline Values for the Protection of Groundwater in Ireland Interim Report (EPA 2003) (pH, T, Ca, Mg, K, Zn, TDS, PO4, Faecal Coli.). The limit is set for Ammonium at 0.15 mg/l. This is reported as Ammoniacal Nitrogen, so the IGV standard has been converted.
Results marked with < indicate that it is below the level of detection of the measuring instrument.
Extractable petroleum hydrocarbons in diesel and lube oil range - EPH (c8–c40).
Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Table 3.4.7 Groundwater Quality Results for GW1 Well at Foxtown

3.4.11.3 SURFACE WATER QUALITY

Reference to the water data on the EPA Envision online mapping facility (EPA 2014) indicates that the Boycetown River has a single staff hydrometric gauges, but no recorder. The Boycetown River has a Moderate status (Q3-4) in respect of River Water Quality from 2004 to present, but is assessed as being 'at risk of not achieving good status' in 2015. However, the Boycetown River is assessed as having a Moderate status in terms of WFD Status 2007 to 2009.

As the only material imported onto the WRF site is C&D waste, principally soil and stone, it should not represent a source of possible contamination of surface waters. The nearest watercourse to the application site is the Boycetown River (c. 1km to the northeast), with a smaller tributary stream passing within c. 250m of the eastern boundary of the site. The natural drainage pattern existing on site means that surface water run-off within the site percolates to ground through the floor of the sand and gravel pit into the underlying limestone bedrock.

On-site activities will not discharge to any mains sewerage system, and it is proposed to continue to use the on-site toilet with septic tank and associated infiltration area discharging to groundwater. There is no discharge of surface water run-off from the site, and therefore it is not considered necessary to monitor surface water in the area.

3.4.12 CONCEPTUAL MODEL OF THE AQUIFER

The Dinantian-age Lucan Fm., which underlies the entire site, is part of the most widespread rocks in the GWB, and in County Meath and north County Dublin. The Lucan Fm. consists of dark grey to black, well-bedded, cherty, graded limestones and calcareous shales, which originated as calciturbidites. The rocks vary widely in grain size and shale content, which significantly affects porosity and permeability. The calciturbidites that comprise the formation tend to be coarser and conglomeratic near the base, and finer in the upper parts.

The Lucan Fm. has low inter-granular permeability, so groundwater flow is concentrated in fractured and weathered zones, along joints and bedding planes, and in the vicinity of fractures and fault zones. Thus, groundwater flows through this variably connected network giving a range in fissure permeability, which tends to decrease with depth. Post-depositional processes of dolotomisation, deformation, faulting and karstification increase the secondary permeability of the limestone. The groundwater flux is likely to occur in the upper part of the aquifer as: (1) a shallow zone of higher permeability may exist within the top 3-5 metres of more fractured/weathered rock; (2) interconnected jointing and fissuring up to 30m-50m thick; and (3) a zone of isolated poorly connected fissuring typically less than 150m. Higher permeability may occur along fissures and fault zones, especially where significant dissolution and karsitifcation has resulted in karstic conduit flow. In contrast, lower dissolution limits the flow to shallower and more diffuse systems.

The variety in the structural deformation of the rock and intensity of karstification increases the complexity of the conceptual model for the area. The network of connections between the joints, bedding planes, fissures and faults can result in relatively good aquifer storage and flow paths that can extend for hundreds of metres. Flow is still largely confined to fissure zones,

and the amounts of water depend on the combination of the key hydrogeological factors. Similarly, the range in permeability and storage capacity results in variable 'recharge acceptance'. Diffuse recharge is the main recharge process across the lowlands of the GWB, although point recharge is possible.

The sand and gravels of the esker, within which the quarry was developed, are very permeable and allow rainfall to percolate through the subsoil and infiltrate into the underlying limestone bedrock. In addition to this diffuse recharge of the aquifer, fissures observed in the limestone exposed at the base of the quarry floor, suggest that point recharge is also operating within the site.

An estimated 272mm/yr effective rainfall is available for recharge or runoff in the vicinity of the Foxtown site. Excavation of the gravels does not affect the volumes of recharge, as the rainfall continues to infiltrate downwards. Aquifers such as the Lucan Fm. underlying the entire site, are potentially capable of accepting all the recharge that may be available due to the capacity of the bedrock to both store and transmit the infiltrated water. Therefore, it is considered that the entire 272mm/yr of effective rainfall will probably contribute to groundwater recharge in the bedrock.

The groundwater vulnerability of the site and surrounding land is classified as High (H), because of the permeability and thickness of the deposits of sand and gravel within the overburden at Foxtown. However, the sand and gravel has been largely removed from the site during quarrying, leaving only a veneer of subsoil and backfill beneath the floor of the quarry. Thus, the effective groundwater vulnerability in the unrestored sections of the quarry has been increased to Extreme (X).

The quarry floor is typically maintained at a depth of 1.5 to 2m above the winter water table level, whilst the groundwater quality, as measured at monitoring well GW1, indicates minor impact from nearby agricultural activities, but not to the activities of the existing quarry and WRF.

3.4.13 SITE WATER MANAGEMENT

The sand and gravel deposits have been worked dry with no extraction below the water table. The sand and gravel has in recent times been dry screened only, with no washing of aggregates.

All water requirements for on-site activities, including the wheelwash, are met by abstraction from the on-site wells. There is a toilet with septic tank and associated percolation area. Water management within the site can be divided into the components summarised in Table 3.4.8.

Component	Description
Direct Input	*Effective precipitation falling onto the site within the site boundary. *Abstraction from on-site wells.
Uses	*Toilet and canteen facilities. *Dust suppression. *Operation of restoration of site.
Outputs	*Evaporation from reinstated land and unrestored quarry floor. *Seepage to ground on reinstated land and unrestored quarry floor.

Table 3.4.8 Summary of Site Water Management Components on the Foxtown Site

3.4.14 SURFACE WATER RUNOFF

There will not be a requirement to discharge water from the site as it is proposed that the quarry and WRF will continue to be worked dry. The majority of surface water run-off on-site will be allowed to percolate to the underlying water table, and thus there will be no requirement to discharge the surface water run-off from the site. There are no active settlement lagoons or ponds on site, and therefore there is no need to discharge surplus waters from same.

All requirements for water on-site, including the wheelwash, are met by abstraction from the wells on site. Potable water is brought to the site on daily basis for office and canteen use.

3.4.15 RISK ASSESSMENT

3.4.15.1 INTRODUCTION

The concepts of Risk, Risk Assessment and Risk Management have become important tools in the area of environmental protection. The philosophical basis and language of risk is useful in that it provides a logical framework for considering the impact of potentially polluting activities on the environment.

This framework enables a more rigorous systematic approach to decision making. In reality it is putting a recognised framework to what is done intuitively, but in a systematic manner. In addition, it is an aid in conceptualising the potential impact of the discharge of effluent on the wider environment.

A **hazard** (**source**) presents a risk when it is likely to affect something of value (the **target/receptor**), which in this case is groundwater and/or surface water, which in turn may impact on humans. It is the probability of the hazard occurring and its consequences that is the basis of Risk Assessment.

The conventional Source-Pathway-Receptor model for environmental management can be applied to identify potential sources, receptors and pathways, and hence potential pollutant linkages relating to the site.

For a particular contaminant to present a risk to receptors, three components must be present:

Source An entity or action that releases contaminants into the environment

Pathway A mechanism by which receptors can become exposed to contaminants

Receptors The human or ecological component at risk of experiencing an adverse response following exposure to a contaminant

The qualitative risk assessment presented in Table 3.4.12 below is based on the hydrological and hydrogeological information collected to date in relation to the site, and incorporated into previous sections of this report.

3.4.15.2 SOURCES

The potential sources of groundwater/surface water contamination that are likely to be associated with the proposed site activities are presented in Table 3.4.9.

Contaminant	Associated Activities
Hydrocarbons Diesel Fuel Oils	Refuelling of machinery. Accidental spillages. Machinery maintenance/repair. Stockpiling of bituminous materials.
Nitrates Chloride Faecal Coliforms	Septic tank and percolation area.
Silt	Arising from backfill material placed into the quarry. Surface water runoff.
Low permeability inert backfill material	Infilling with low permeability inert fill material could create a low permeability zone altering infiltration patterns. Reduction in recharge due to the potentially low permeability inert infill material.

Table 3.4.9 Potential Site Contamination Sources

3.4.15.3 PATHWAY

The pathways into the groundwater and surface water and the likelihood of potential groundwater contamination occurring associated with a particular pathway are presented in Table 3.4.10.

Pathway	Description
Infiltration through quarry floor	Infiltration of standing water (rainfall) in unrestored quarry void through remaining subsoils. Infiltration of standing water (rainfall) through newly backfilled area. Runoff from stockpiled material from the WRF.

Table 3.4.10 Possible Site Pathways

3.4.15.4 RECEPTORS

The potential receptors to contamination sources from the quarry are presented in Table 3.4.11.

Receptor	Description
Groundwater	Groundwater directly beneath the site, which flows off-site.
Third Party Wells	Third party wells down-gradient of the site.
Surface water	Boycetown River located approximately c. 1km north of site, whilst a tributary stream c. 250m north of site. No discharge of surface waters to watercourse, but there may be some surface run-off to stream of east of site.

Table 3.4.11 Potential Receptors to Site Contaminants

3.4.15.5 SOURCE-PATHWAY-RECEPTOR MODEL

A summary of the Source-Pathway-Receptor model for the site, in the absence of mitigation measures in place, is presented in Table 3.4.12.

Source	Pathway	Receptor	Risk
Hydrocarbons Diesel Fuel Oils	Infiltration to ground	Groundwater beneath site	Extreme
	Direct pathway from base of quarry floor		Extreme
Nitrates Faecal Coliforms	Infiltration to ground	Groundwater beneath site	Extreme
	Surface water runoff from the site	Surface waters	Moderate to Low.
Silt	Infiltration to ground	Groundwater beneath site	Extreme where unsuitable backfill material is placed at base of restoration area
Unsuitable low permeability inert backfill material	Direct pathway from base of quarry restoration area	Groundwater beneath the site	Extreme where unsuitable low permeability inert backfill material is placed at base of restoration area

Table 3.4.12 Qualitative Risk Assessment

3.4.16 DO NOTHING SCENARIO

The “do nothing scenario” would result in the failure of the WRF development to continue operations. Thus, the recovery of inert C&D waste, mainly soil and stone, at the WRF would not occur, and the restoration works would proceed with only the materials available on site, and without any additional mitigation measures in place. This would leave the underlying aquifer more vulnerable than if the quarry void was backfilled with inert soil and stone, and appropriately capped.

3.4.17 POTENTIAL IMPACTS

3.4.17.1 SURFACE WATER

There are no surface water elements to the site. Surface water run-off will be allowed to migrate to the quarry floor where it will percolate to the underlying watertable. As the groundwater beneath the site is extremely vulnerable, it is possible that surface run-off with elevated

suspended solids will percolate to the underlying water table. There are no active settlement lagoons or ponds, and no surface water discharge from the site.

The implementation of mitigation measures specified in Section 3.4.17.2 will reduce the overall risk of surface water contamination in the groundwater aquifer and the Boycetown River during operation of the WRF, including quarry restoration works.

3.4.17.2 GROUNDWATER

The ongoing operation of the WRF has the potential to impact on groundwater in terms of the groundwater quality. Groundwater quality analysis (i.e., GW1) indicates some contamination by agricultural activities nearby. On-going water quality analysis of representative water samples from the monitoring wells would allow the groundwater quality beneath the site to be properly assessed during the course of the quarry restoration phase of the development.

Accidental spillages of on-site fuels, oils, etc. may result in contaminant residuals entering the groundwater via direct percolation. Implementation of mitigations measures specified in Section 3.4.17.3 will reduce the overall risk of groundwater contamination beneath and downgradient of the quarry during operation of the WRF, and restoration works at the quarry.

3.4.18 MITIGATION MEASURES

3.4.18.1 OVERVIEW

In order to reduce the impact of the ongoing restoration works on groundwater and surface water receptors, the following are details of remedial measures/procedures to be implemented at the site in order to ensure that the source and/or the pathway is removed. In this way, the potential risk for groundwater/surface water contamination at site is minimised.

Many of these recommendations are in accordance with the publication "*Environmental Management Guidelines – Environmental Management in the Extractive Industry (Non-scheduled Minerals)*" (EPA 2006).

The most effective means by which to implement the proposed measures is to condition the mitigation measures as part of a granting of license at the site. In general, the most effective mitigations measures for the site are:

- Adequate containment of on-site fuels and oils to prevent any accidental spillages which may migrate to the sand and gravel subsoils and underlying groundwater;
- Dedicated maintenance and refuelling locations;
- Good work practices to provide adequate control measures for accidental spillages;
- Strict control measures to ensure only suitable material is allowed onto the site, i.e., thorough inspection of waste loads entering the site to confirm inert nature prior to deposition on-site;
- Only granular wastes should be deposited into areas of exposed bedrock or immediately above the groundwater table, in order to prevent the influx of suspended solids into groundwater;

- Ensuring that surface run-off is free from contaminating substances and suspended solids.
- The specific mitigation measures could be included in an Environmental Management Plan as part of the conditions for the site waste licence.

3.4.18.2 SURFACE WATER

It is understood that the surface water run-off on-site will be allowed to percolate to the underlying water table. Water used in dust suppression will also percolate naturally to ground. There will be no requirement to discharge surface water run-off from the site.

The boundary areas of the quarry form narrow ridges with mature hedgerows that act as protective berms. This ensures that any nearby streams and drains are protected from untreated surface water run-off during the backfilling of the restoration area and from WRF stockpiling areas.

3.4.18.3 GROUNDWATER

Groundwater monitoring on-site is done on a single well that shows evidence of being contaminated to an extent by nearby agricultural activities. It is proposed that during the operation of the WRF and quarry restoration, additional groundwater monitoring be carried out on the three on-site wells (i.e., GW1 to GW3).

3.4.18.4 STOCKPILING AREA

High absorbency mats, pig tails and drums are to be added/maintained in the stock-piling area and in WRF/quarry vehicles to clean up any leaks from plant or machinery.

3.4.18.5 MACHINERY MAINTENANCE AND REPAIR

No servicing or maintenance of any plant or machinery takes place within the restoration area or WRF area. All plant and machinery is driven or tracked to the workshop or the hardstanding in front of the workshop for repairs.

High absorbency mats will be provided to contain any spills that may occur.

3.4.18.6 STORAGE OF FUEL/CHEMICALS

Diesel Plant on site is refueled using a mobile fuel bowser. Spill kits are provided.

Oil, lubricants and waste oil products are stored under cover. All oil barrels and lubricants will be stored on spill pallets/ spill trays. Spill kits and drip trays will also maintained on site and the Company will put in place an emergency response procedure for hydrocarbon spills and appropriate training of site staff in its implementation.

All waste oils are collected and removed offsite by an approved licensed waste collection contractor in the area. Further details are outlined in EIS Section 2.4.4.7.

3.4.18.7 RESTORATION

All material to be used for the restoration of the quarry should be inspected to ensure only suitable material is deposited. Only granular and high permeability material should be placed in low lying areas, areas of bedrock outcrop, or within the areas where groundwater is ponding.

3.4.18.8 WATER QUALITY MONITORING

It is proposed that groundwater monitoring be carried out for the standard set of parameters. This is recommended to ensure that the proposed continuation of the WRF and the restoration of the site is not adversely impacting on the groundwater beneath the site.

3.4.18.9 SEPTIC TANK AND INFILTRATION AREA

There is septic tank and infiltration area on-site, and it is proposed that the operators will have the septic tank desludged regularly, and the system monitored and repaired as required.

3.4.19 CONCLUSIONS

There are no surface water elements to the site. Surface water run-off will be allowed to migrate to the quarry floor where it will percolate to the underlying watertable. There are no active settlement lagoons or ponds, and no surface water discharges from the site. The implementation of mitigation measures specified in Section 3.4.17.2 will reduce the overall risk of surface water contamination in the Boycetown River during operation of the WRF, including quarry restoration works.

The ongoing operation of the WRF has the potential to impact on groundwater in terms of the groundwater quality. Groundwater quality (i.e., GW1) indicates some contamination by agricultural activities nearby. On-going water quality analysis of representative water samples from the monitoring wells would allow the groundwater quality beneath the site to be properly assessed during the course of the quarry restoration phase of the development.

Any potential risks to groundwater and surface water from operating the WRF will be minimised/prevented through the adherence to the proposed mitigation measures detailed in Section 3.4.17.

3.4.20 REFERENCES

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3.4.21 FIGURES

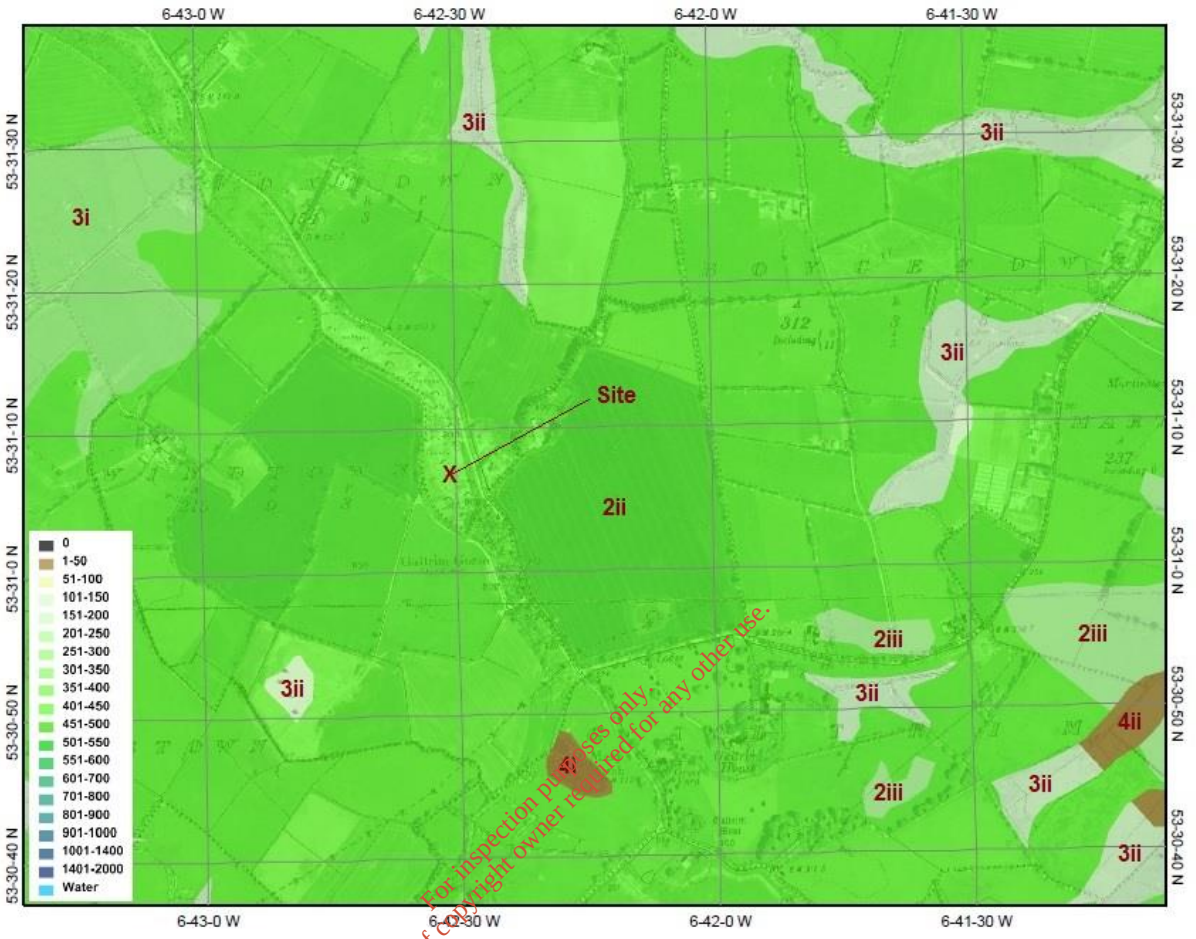

Figure 3.4.1. Recharge Map of Wider Area around Foxtown. Site is indicated by an "X". Modified from GSI online Groundwater Data Viewer. See http://spatial.dcenr.gov.ie/GeologicalSurvey/Groundwater/index.html.

Legend:

Green: 2ii - Average Recharge of 400-450mm/yr

Medium Green: 2iii – 204mm/yr

Light Green-Blue: 3i - 250-300mm/yr

Light Green: 3ii - Average Recharge of 100-150mm/yr

Brown: 4ii - Average Recharge 1-50mm/yr

Scale: Width of Graticules = c. 1.3km

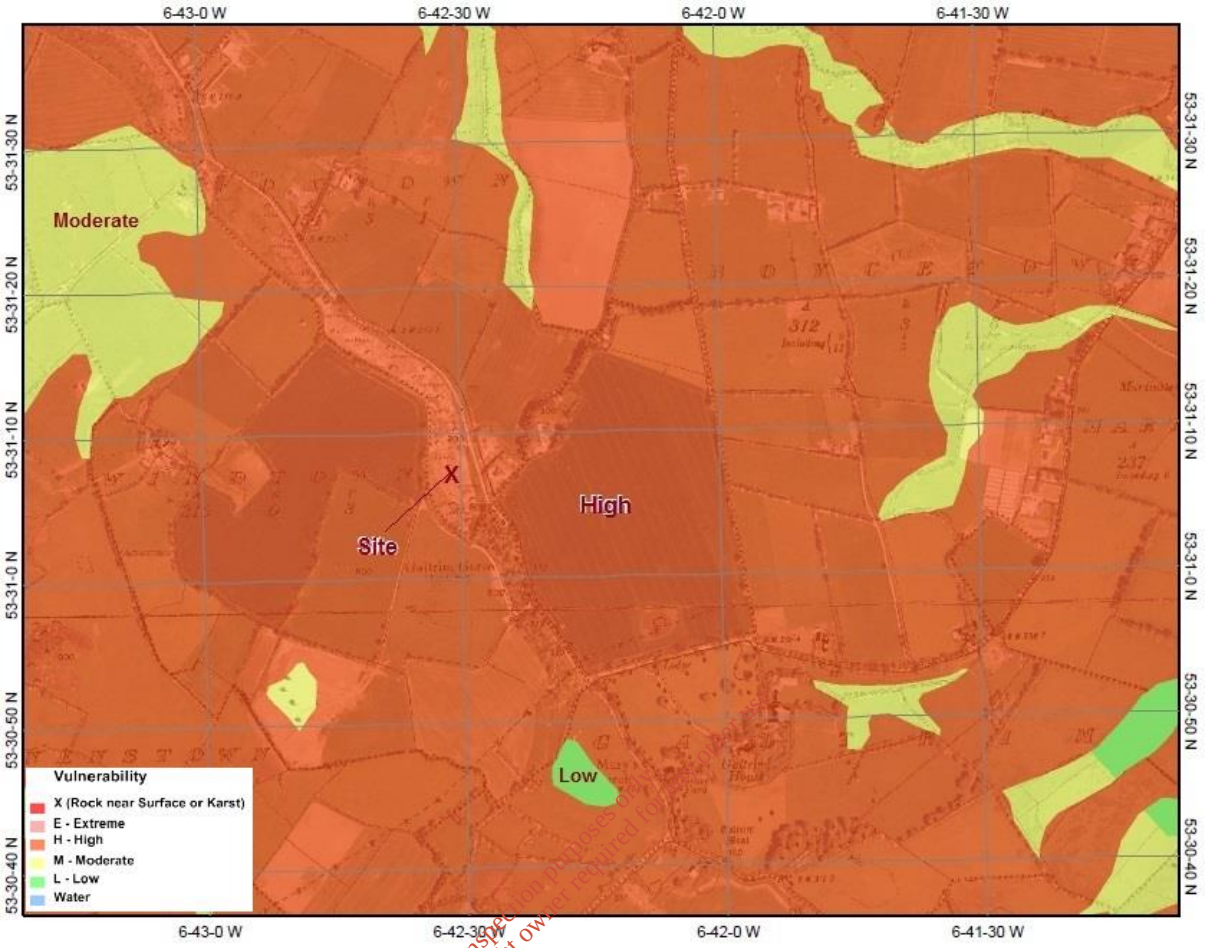

Figure 3.4.2. Groundwater Vulnerability Map of Wider Area around Foxtown. Site is indicated by an "X". Modified from GSI online Groundwater Data Viewer. See http://spatial.dcenr.gov.ie/GeologicalSurvey/Groundwater/index.html.

Legend:

Red-Orange (H): High

Yellow (M): Medium

Green (L): Low

Scale: Width of Graticules = c. 1.3km

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3.5 CLIMATE

3.5.1 INTRODUCTION

The Bruntland Commission stated "Sustainable development is the kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (UN 1987). There is no greater challenge to meeting the latter obligation than the issue of human-induced global climate change. Developments can have implications on a national or global scale, where for example, it may represent a significant proportion of the national contribution of greenhouse gases. In the context of most Environmental Impact Statements however, climate is restricted in scope to the local climatological conditions or "microclimate" of an area, such as local wind flow, temperature, rainfall or solar radiation patterns.

For the purposes of Environmental Impact Assessment, a development may be seen to have potential climatic implications if its emissions are likely to alter meteorological conditions with possible weather effects.

This section of the EIS addresses the issues related to climate for the proposed continued operation of the Waste Recovery Facility (WRF) in the Foxtown quarry site, and its impact on the climate of the application site and its environs as a result of the activities been undertaken.

The prevailing weather systems are described with emphasis on the long term patterns and trends. It involves an assessment of the prevailing climatic conditions, and assesses the potential impact of the development on the latter.

3.5.2 BASELINE ENVIRONMENTAL STUDY

3.5.2.1 OUTLINE OF THE BASELINE STUDY

The objective of this study was to:

- Assess the prevailing climatic conditions of the development area on a local and regional level.
- Determine the impact, if any, of the development on the local microclimate and regional macroclimate.
- Determine any interaction between other aspects of the development and the climate of the area.

3.5.2.2 CLIMATE

The Fifth Assessment Report of the Inter-Governmental Panel on Climate Change (IPCC 2013) states that "Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.

Cumulative emissions of CO_2 largely determine global mean surface warming by the late 21st century and beyond. Most aspects of climate change will persist for many centuries even if emissions of CO_2 are stopped. This represents a substantial multi-century climate change commitment created by past, present and future emissions of CO_2".

As a member of the EU, Ireland is a signatory nation to the Kyoto Protocol, and is obligated to cut CO_2 emissions to 13% above 1990 levels. There have been substantial reductions in Ireland's Greenhouse gases (GHG) emissions in recent years, due in significant part to the impact of the economic downturn. Under the Kyoto Protocol, Ireland's total emissions are limited to an average of 62.8 Mt CO_{2eq} per annum for the first commitment period 2008-2012. By 2012, Ireland was 5.68 Mt CO_{2eq} below the Kyoto commitment for the period, and thus broadly on track to meet its commitment under the Kyoto Protocol first commitment period. However, when the impact of the EU Emissions Trading Scheme and forest sinks are taken into account, Ireland exceeded the Kyoto limit by 2.1 Mt CO_{2eq} (EPA 2104a).

Although Ireland is on track to meet its Kyoto second commitment period 2013-2030 targets, there remains significant risk that these will not be met, even under the most ambitious emission reduction scenario. Total national GHG emissions are projected to decrease by an average of 0.4% per annum out to 2020, if all national policies are implemented and delivered. Emissions are projected to increase in 2020-2030 (12% in total), with strong growth in emissions from transport and agriculture, indicating that Ireland is not on a pathway to a low-carbon economy (EPA 2014b). Thus, Ireland needs to develop as a low carbon economy in order to meet future targets, rather than rely on economic recession.

Air quality in Ireland is of a high standard across the country and is among the best in Europe, meeting all EU air quality standards in 2010. This is due largely to prevailing clean Atlantic air and a lack of large cities and heavy industry. Over the past decade, levels of particulate matter have decreased in cities and large urban areas, arising principally from improvements in vehicle engine technology.

With regard to air emissions, the strategies implemented to achieve compliance with the EU National Emissions Ceilings Directive have successfully controlled emissions of sulphur dioxide, ammonia and volatile organic compounds. Emissions of all three are expected to remain below the prescribed ceilings. However, levels of nitrogen oxides are expected to remain above Ireland's national emission ceiling in the short term due to sustained emissions from road transport.

For Ireland to comply with its international commitments on air quality and air emissions, industrial emissions of pollutants to air must continue to be rigorously controlled; policies must be implemented to increase the use of alternatives to the private car and improve efficiencies of motorised transport, which accounts for 40% of national energy consumption (SEI 2009). Government departments, national agencies and local authorities must make air quality an integral part of their traffic management and planning processes. Households and businesses must use more efficient methods to burn fuel, and shift from solid fuel to cleaner alternatives including gas.

The World Meteorological Organization (WMO) recommends that climate averages are computed over a 30 year period of consecutive records. The period of 30 years is considered long enough to smooth out year to year variations. By collecting weather data from around the country every hour and by analysing these records over a long period of time, 30 year

average values are calculated. Met Éireann now reference 1981 to 2010 as the baseline period for day-to-day weather and climate comparisons (Met Éireann 2012).

The closest synoptic station to the Foxtown site is at the Teagasc facility at Grange, Dunsany, c. 3.5km east of the site (just east of Kiltale). The current station was commissioned in 2006, replacing a manual climate station which was installed at Dunsany in 1963, possibly explaining why Met Eireann do not give 30 year averages for the station. The next nearest synoptic station is Dublin Airport, c. 35km southeast of the site, for which 1981-2010 30 year weather averages are available.

Ireland has a typical temperate maritime climate, with relatively mild, moist winters and cool, cloudy summers. The prevailing winds are westerly to south-westerly. For the greater part of the year, warm maritime air associated with the Gulf Stream helps to moderate the climate from the extremes of temperature experienced by many other countries at similar latitude. The average humidity is high. Annual average precipitation is highest on the west coast and in inland areas of high relief.

3.5.2.2.1 Rainfall

Rainfall in Ireland normally arises from Atlantic frontal systems, which travel in a north-easterly direction delivering cloud and rain. Highest rainfall occurs in the Western half of the country and on high ground; rainfall generally decreases towards the Northeast (See Figure 3.5.1). Averaged over all Ireland, the average annual rainfall is approximately 1230mm. The driest seasons are spring and summer, with an all Ireland average of approximately 260 mm, autumn and winter have all Ireland averages of approximately 350mm. The driest months are April, May, June and July, with an all Ireland average of approximately 80mm each month. February, March, August and September have average rainfall totals of approximately 100mm, while October, November, December and January have all Ireland averages of approximately 130mm.

On an annual basis, averaged over the country, there has been an increase of approximately 5% in rainfall totals between the two normal periods (1961-1990 and 1981-2010), with the higher increases in the Western half of the country. All seasons show an overall increase in rainfall but there are regional differences. There are decreases of up to 10% in rainfall in the South and East in winter, with corresponding increases in the West and Northwest. Spring and summer show increases of 5-10%. While most months show an increase in rainfall of 5-10%, January and February had decreases of 5-10% in the South and East, while September had a

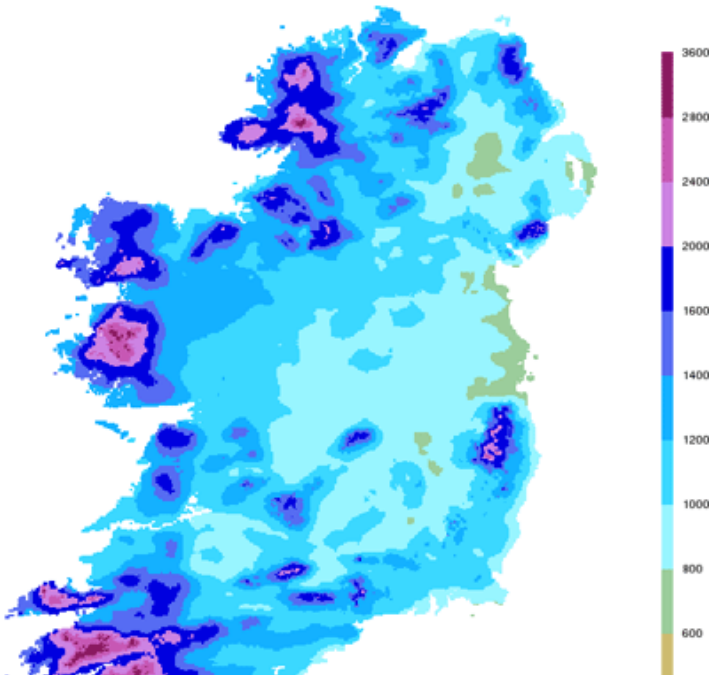

Figure 3.5.1 1981-2010 Mean Annual Rainfall (mm). Redrawn form Met Eireann (2014)

general decrease of up to 10%. In July, the average increase in rainfall was in the order of 15%.

Rainfall data for the area was obtained from Met Eireann. The average annual rainfall (AAR), based on mean monthly rainfall data during the period 1981-2010, is given as 758.0mm/yr. Long term Potential Evaporation (P.E.) data was also obtained for the synoptic station Dublin Airport. The average P.E. for this synoptic station (based on 1981-2010 average monthly data) is 540mm/year. The Actual Evaporation (A.E.) is taken to be 0.9 of P.E. Therefore, the A.E. at the quarry is estimated at 486mm/yr. The Effective Rainfall (ER) at the site is thus calculated to be 272mm/yr. Further details with respect to the water balance for the site are included in EIS Section 3.4 Water.

3.5.2.2.2 Temperature

The temperature regime in Ireland is greatly affected by the moderating effect of the sea, and height above sea level. Mean annual temperatures generally range between 9°C and 10°C with the higher values in coastal regions. Summer is the warmest season, followed by autumn, spring and winter. Highest temperatures occur inland during the summer, with mean seasonal maxima between 18°C and 20°C while highest values occur in coastal regions during the winter. July is the warmest month, followed by August and June; the coldest month is January followed closely by February and then December.

Generally, there has been an increase of approximately +0.5°C in mean temperature between the 1961-1990 and the 1981-2010 periods, with the highest increases in the Southeast. Maximum and minimum temperatures have also increased by approximately +0.5°C. All seasons show a rise in mean temperature with the spring and summer seasons displaying the largest differences between the two periods of approximately +0.7°C. Almost all mean monthly temperatures show an increase, except October and December, which show small decreases of up to -0.2°C in the West and Northwest.

The average daily air temperatures at Dublin Airport (1981-2010) range from 5.3ºC to 15.6ºC. These values can be considered comparable to those expected at the application site.

3.5.2.2.3 Wind

The prevailing wind direction over Ireland is between south and west. Average annual wind speeds range from 3m/s in parts of south Leinster to over 8m/s in the extreme north. On average there are less than 2 days with gales each year at some inland places like Carlow, but more than 50 a year at northern coastal locations such as Malin Head.

During the course of a typical day, the range (difference between the highest and lowest) of mean hourly wind speed is considerable. At Belmullet, a western coastal station, the mean diurnal range is 11.5m/s in January and is still as high as 8.4m/s in July. At Clones, a typical inland station the mean diurnal range is 8.4m/s in January and 6.2m/s in July. The diurnal variation is much more pronounced in summer than in winter.

Wind blows most frequently from the south and west for open sites while winds from the northeast or north occur least often. In January the southerly and south-easterly winds are more prominent than in July, which has a high frequency of westerly winds. Easterly winds occur most often between February and May and are commonly accompanied by dry weather.

The prevailing winds in this area are from west to west southwest as illustrated by the Wind Rose for the synoptic weather station at Dublin Airport approximately 35km southeast of the site (See Figure 3.5.2).

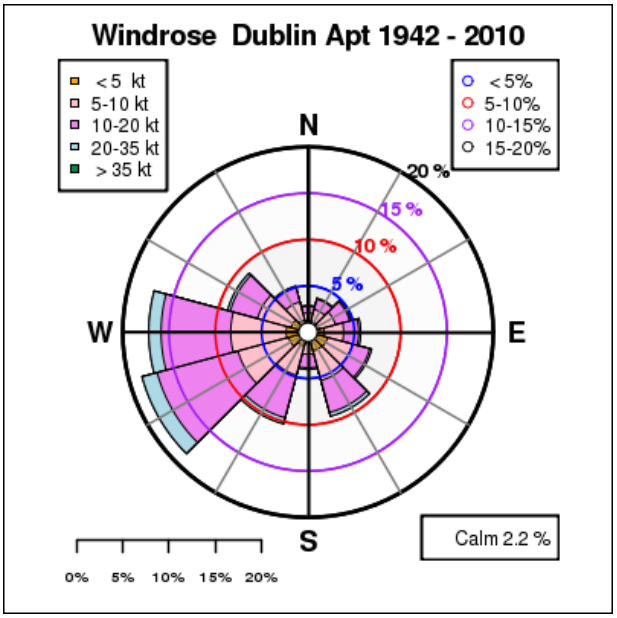

Figure 3.5.1. Dublin Airport Wind Rose based on 1942-2010 Averages. Redrawn from Met Eireann (2014).

3.5.3 ASSESSMENT OF IMPACTS

3.5.3.1 DIRECT / INDIRECT IMPACTS

The quarry development, including a co-located WRF handling only inert soil and stone, is not of sufficient scale to have any direct or indirect impacts on the regional or local climatic conditions.

3.5.3.2 DO NOTHING' IMPACTS

If the WRF is not licensed to continue operations, then inert soils and stone waste materials may have to be transported further afield with a consequential impact in terms of increased exhaust emissions for transport of materials to more removed WRF facilities and/or landfill sites. It is considered that the proposed continued operation of the WRF will have an imperceptible positive impact with respect to climate due to restoration of the lands to agriculture/woodland

3.5.3.3 INTERACTION WITH OTHER IMPACTS

The effect of climatic conditions (e.g., rainfall, wind, etc.) on other potential impacts of the development (e.g., dust deposition, drainage, etc.), are dealt with in the relevant sections of this EIS. The cumulative impact with respect to the operation of the WRF has also been taken into consideration throughout the preparation of the EIS.

3.5.4 MITIGATION & MONITORING

As the development is not expected to affect the local climate or microclimate of the area, there is no requirement for mitigation or monitoring within this development proposal in respect of climatic issues.

3.5.5 REFERENCES

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3.6 AIR QUALITY

3.6.1 INTRODUCTION

This section of the report deals with the issue of air quality associated with the development of a Waste Recovery Facility (WRF) at Foxtown quarry. It will assess the level of airborne dust and particulate matter in the vicinity of the site, the impacts and appropriate mitigation measures, if required, by the applicant to remedy any significant adverse effects on the environment.

3.6.2 METHODOLOGY

The baseline study comprised a desktop review of relevant policy, legislation including guidance with respect to air quality and emissions. Existing dust monitoring results were analysed to evaluate the current air quality conditions. From these results an assessment can be made of the impact of the development on the existing air quality of the area.

3.6.3 POLICY & LEGISLATION

3.6.3.1 AIR QUALITY

The principal national legislation for the control of air pollution is the Air Pollution Act, 1987 (SI No. 6 of 1987). This Act provides a comprehensive statutory framework for the control of air quality by Local Authorities, specifically through 'orders' or 'plans' produced under Part IV Special Control Areas and Part V Air Quality Management Plans and Standards to which Local Authorities must have regard to in planning. Part V of the Act also makes provision for transposing Air Quality Standards into law.

The Act also has relevance to potential nuisance emissions of dust and or odours. Section 24(2) of the Act states 'The occupier of any premises shall not cause or permit an emission from such premises in such a quantity, or in such a manner, as to be a nuisance'.

In order to protect our health, vegetation and ecosystems, EU Directives set down air quality standards for a wide variety of pollutants. The current standards are contained in the Clean Air for Europe (CAFE) Directive (EP & CEU, 2008) and the Fourth Daughter Directive (EP & CEU, 2004). These Directives also include rules on how Member States should monitor, assess and manage ambient air quality.

The CAFE Directive was transposed into Irish legislation as the Air Quality Standards Regulations 2011 (S.I. 180 of 2011), which revoked and replaced three earlier statutory instruments (S.I. 33 of 1999, S.I. 271 of 2002 and S.I. 53 of 2004).

These regulations set limit values/ target values for a range of pollutants, including sulphur dioxide; nitrogen dioxide and other oxides of nitrogen; particulate matter (PM10 and PM2.5); lead; benzene; carbon monoxide; and ozone.

The above directives require that Member States divide their territory into zones for the assessment and management of air quality. The zones adopted in Ireland are Zone A,

the Dublin conurbation; Zone B, the Cork conurbation; Zone C, comprising 21 large towns in Ireland with a population >15,000; and Zone D, the remaining area of Ireland.

Under the EU Directives, Ireland is required to monitor a number of air pollutants that have an impact on health and vegetation. These include NO_X, SO_2, carbon monoxide (CO), ground level ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), benzene, heavy metals and polycyclic aromatic hydrocarbons (PAHs). Across Europe the most problematic pollutants have consistently been NO_X, PM and O_3. Recently PAHs have also been identified as pollutants of concern.

NO_X refers to the two pollutants nitric oxide (NO) and nitrogen dioxide (NO_2). The main sources of these pollutants are vehicle exhausts and combustion sources. Exposure to NO_2 is harmful to health, while NO_X contributes to the formation of ground-level ozone and acid rain. NO_2 levels across Ireland have remained relatively static since 2002; however, an increasing trend at traffic-impacted sites in Dublin and Cork is emerging. These sites are approaching the 2010 limit value for NO_2 with one exceedance of the limit value recorded in 2009 at Winetavern Street, Dublin. This exceedance occurred before the limit value came into force on 1 January 2010. Figure 3.6.1 below shows annual mean nitrogen dioxide concentrations from 2002 to 2010 for monitoring sites across Ireland (EPA 2012).

PM_{10} and $PM_{2.5}$ are particles with diameters less than 10 micrometres and less than 2.5 micrometres, respectively. The health impacts of these small particles relate to their ability to penetrate deep into the respiratory tract. In Ireland the main sources are domestic use of solid fuel and vehicular traffic.

PM_{10} concentrations show a decreasing trend in cities and large urban areas since 2003. This is mainly due to the decreases in particulate emissions from traffic arising from improvements in vehicle engine emissions. However, this decrease is not seen in smaller towns, where domestic solid fuel emissions are more significant than traffic emissions. Many towns do not benefit from the ban on smoky coal, and often do not have access to cleaner fuel alternatives such as natural gas (EPA 2012).

Under the CAFE Directive, Ireland is required to achieve reductions in levels of $PM_{2.5}$ of 10% between 2012 and 2020. This reduction is challenging, as it will require an integrated approach across a number of sectors including industrial, transport and residential emissions. Figure 3.6.2 below shows annual mean PM_{10} concentrations 2002–2010 for monitoring sites across Ireland.

The sources of PAHs include industry, traffic emissions and domestic use of solid fuels such as wood and coal. Long-term exposure to low levels of PAHs may cause a number of diseases including lung cancer.

PAHs were monitored in Ireland for the first time in 2009 at five monitoring stations. In 2010, levels at two of the stations were at the limit value of 1 ng/m^3. Reductions in emissions from traffic and from domestic use of solid fuels are required to reduce ambient levels of PAHs.

Ozone is a gas that is formed as a secondary pollutant at ground-level by the reaction of a mixture of other chemicals – NO_X, CO and vOCs – in the presence of sunlight. Ozone is a powerful oxidising agent and can affect health and vegetation.

Short acute ozone pollution episodes are infrequent in Ireland; however, they have happened in the past, and will happen in the future. They are most likely to occur in summer months when a stable anti-cyclone is established over Ireland, bringing settled, warm weather combined with transmission of polluted air masses from other European countries. Reducing ozone requires limiting emissions of its precursors locally, regionally and globally. The objectives of both the Convention on Long-range transboundary Air Pollution (CLrtAP) and National Emissions Ceilings (NEC) Directive include addressing ground-level ozone. (EPA 2012).

The other health-relevant pollutants measured are SO2, CO, benzene, lead, arsenic, cadmium, nickel and mercury. Levels of all these pollutants are low in Ireland and below all relevant limit and target values (EPA 2012).

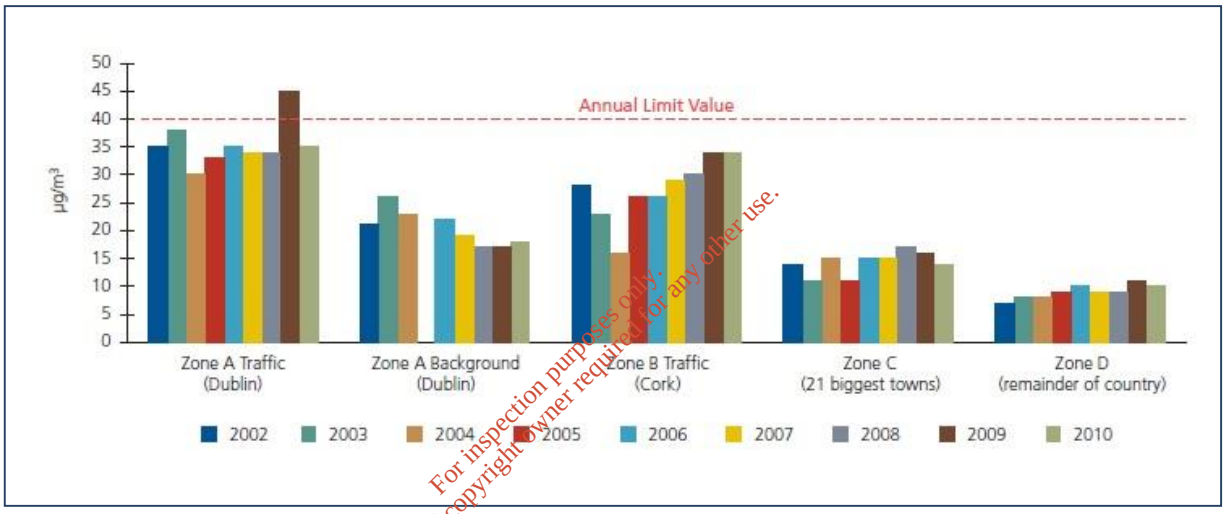

Figure 3.6.1 Annual Mean Nitrogen Dioxide Concentrations 2002-2010 (Source: EPA)

Figure 3.6.2 Annual Mean PM_{10} Concentrations 2002-2010 (Source: EPA)

Table 3.6-1 Emissions of the Four NEC Pollutants 1990-2010 (Source: EPA)

	1990 (kt)	1995 (kt)	2000 (kt)	2005 (kt)	2006 (kt)	2007 (kt)	2008 (kt)	2009 (kt)	2010 (kt)	2010 Emissions ceiling (kt)	Ceiling achieved?
SO_2	182.5	161.1	139.7	71.2	60.7	55.1	45.3	32.7	26	42.0	Yes
NO_X	129.2	129.5	125.1	116.6	113.4	113.0	106.2	88.8	72.6	65.0	No
vOCs	88.0	81.1	73.4	59.7	58.4	56.9	55.2	52.2	44.9	55.0	Yes
NH_3	105.5	112.9	120.9	113.3	112.4	107.6	107.4	107.8	106.2	116.0	Yes

Air quality in Ireland is of a high standard across the country and is among the best in Europe, meeting all EU air quality standards in 2010. This is due largely to prevailing clean Atlantic air and a lack of large cities and heavy industry. Over the past decade, levels of particulate matter have decreased in cities and large urban areas, arising principally from improvements in vehicle engine technology.

With regard to air emissions, the strategies implemented to achieve compliance with the EU NEC Directive have successfully controlled emissions of sulphur dioxide, ammonia and volatile organic compounds. Emissions of all three are expected to remain below the prescribed ceilings. However, levels of nitrogen oxides are expected to remain above Ireland's national emission ceiling in the short term due to sustained emissions from road transport.

For Ireland to comply with its international commitments on air quality and air emissions, industrial emissions of pollutants to air must continue to be rigorously controlled; policies must be implemented to increase the use of alternatives to the private car and improve efficiencies of motorised transport, which accounts for 40% of national energy consumption. Government departments, national agencies and local authorities must make air quality an integral part of their traffic management and planning processes. Households and businesses must use more efficient methods to burn fuel, and shift from solid fuel to cleaner alternatives including gas.

3.6.3.2 DUST DEPOSITION

The impact of dust is usually monitored by measuring rates of dust deposition (DoE, 1995). There are currently no Irish statutory standards or EPA guidelines relating specifically to dust deposition thresholds for inert dust. There are a number of methods to measure dust deposition but only the German TA Luft Air Quality Standards specify a method of measuring dust deposition – The Bergerhoff Method (German Standard VDI 2119, 1972).

On this basis, the DoEHLG(2004) recommended that the following TA Luft dust deposition limit value be adopted at site boundaries associated with quarry developments – total dust deposition (soluble and insoluble): 350 mg/m^2/day (when averaged over a 30-day period).

3.6.4 EXISTING ENVIRONMENT

3.6.4.1 BACKGROUND

The principle concern in respect of potential airborne dust emissions from the proposed development is the effect on residential amenity. Properties within the vicinity of the development are shown on Figures B.2.1 – Rev A and B.2.2 – Rev A, *EIS Section 2 Figures*.

The materials to be recovered are principally “soils and stone” and inert construction and demolition waste. Any dust generated by the operation will comprise inert particulate matter.

Experience of reclamation workings indicates that mechanical activity is the most significant factor in material erosion and dust generation. Dust emanates from the placement of materials, the movement of vehicles on internal roads, loading and processing operations. However the effect of wind is also an important factor in dust generation and problems may arise at reclamation workings when both factors arise simultaneously.

The impact of fugitive dust will be direct, temporary and non-cumulative and largely confined to the application site.

3.6.4.2 AIR QUALITY

The Environmental Protection Agency (EPA) manages the National Ambient Air Quality Network. For monitoring purposes, the country is divided into four air quality zones as follows: 'A' (Dublin); 'B' (Cork); 'C' (Large Towns) and; 'D' (Rural). The Foxtown area falls into zone D.

As stated previously (Refer to Section 3.6.3.1 above) under the EU Directives, Ireland is required to monitor a number of air pollutants that have an impact on health and vegetation.

The EPA's Air Quality Index for Health (AQIH) is a scale from one to 10 that ranks air quality, and is applied to characterise the current air quality in each zone. A reading of 10 means the air quality is very poor and a reading of one to three inclusive means that the air quality is good. The current air quality index for the Rural East AQIH Region in which Foxtown is situated in is “2 - good” (Refer to Figure 3.6.3 below).

The AQIH is based on measurements of five air pollutants, all of which can harm health. The five pollutants are:

- Ozone gas
- Nitrogen dioxide gas
- Sulphur dioxide gas
- $PM_{2.5}$ particles and
- PM_{10} particles

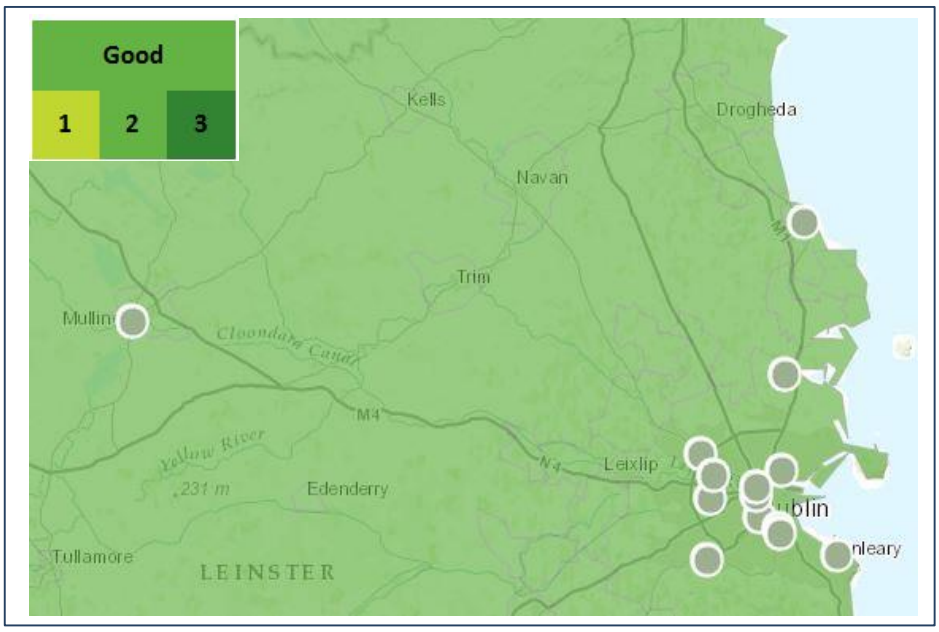

Figure 3.6.3 Air Quality Index for Health Map (EPA October 2014)

3.6.4.3 ENVIRONMENTAL MONITORING

Dust deposition monitoring is carried out in accordance with condition No. 8 of P.A. Reg. Ref. QY 48 (QC. 17.QC 2113) "*total dust deposition (soluble and insoluble) from the on site operations associated with the development shall not exceed 350mg/sq.m/day, averaged over a continuous period of 30 days.*"

In order to comply with this condition the operator has set up a dust monitoring programme using Bergerhoff Dust Gauges. Two dust monitoring stations (A2-4, A2-5) were established at the site boundary (Refer to Environmental Monitoring Plan Figure F 1.0 – Rev A, *EIS Section 2 Figures*). The results of dust monitoring are provided in Table 3.6.2 below.

Dust fall is measured using the Bergerhoff method as set out in German Standard VDI 2119. The normal recommended standard for dust emissions for this type of development is that "dust deposition shall not exceed 350 mg/m^2/day measured at the site boundaries and averaged over 30 days". This limit refers to total dust (using DIN method).

The above standard is also in accordance with guidance issued by both the Department of the Environment and the EPA in relation to dust deposition monitoring for these types of developments and will continue to be applied.

This programme will allow on-going monitoring of fugitive dust emissions from the site, thereby assisting in ensuring compliance with any future requirements or regulations.

Table 3.6-2 Dust Deposition Results (mg/m^2/day)

Monitoring Period	A2-4	A2-5
20/06/14 to 28/07/14	12.7	27.5

The results show that the dust levels at the site boundary are within the recognised TA Luft dust deposition limit value of *350 mg/m^2 per day*.

3.6.5 ASSESSMENT OF IMPACTS

3.6.5.1 DIRECT IMPACTS

Fugitive dust emissions are generated wherever there is movement of dust relative to the air. The emission of fugitive dust from inert soils and stone backfilling site activities is very dependent on weather conditions. Where nuisance complaints from activities arise, they are generally as a result of a combination of specific site activities and particular weather conditions (e.g. dry, windy).

Within the application area, the following site activities may give rise to potential fugitive dust emissions:

- Internal movement of vehicles
- Tipping and levelling of placed materials
- Loading and Unloading of Vehicles
- Processing Area

They are generally dispersed sources rather than specific point sources, and this dictates the measures required to mitigate potential dust related impacts.

The impact of fugitive dust will be direct, temporary and non-cumulative and largely confined to the application site.

The following flow diagram shows the sources of fugitive dust emissions arising on site and the methods of treatment/ abatement employed.

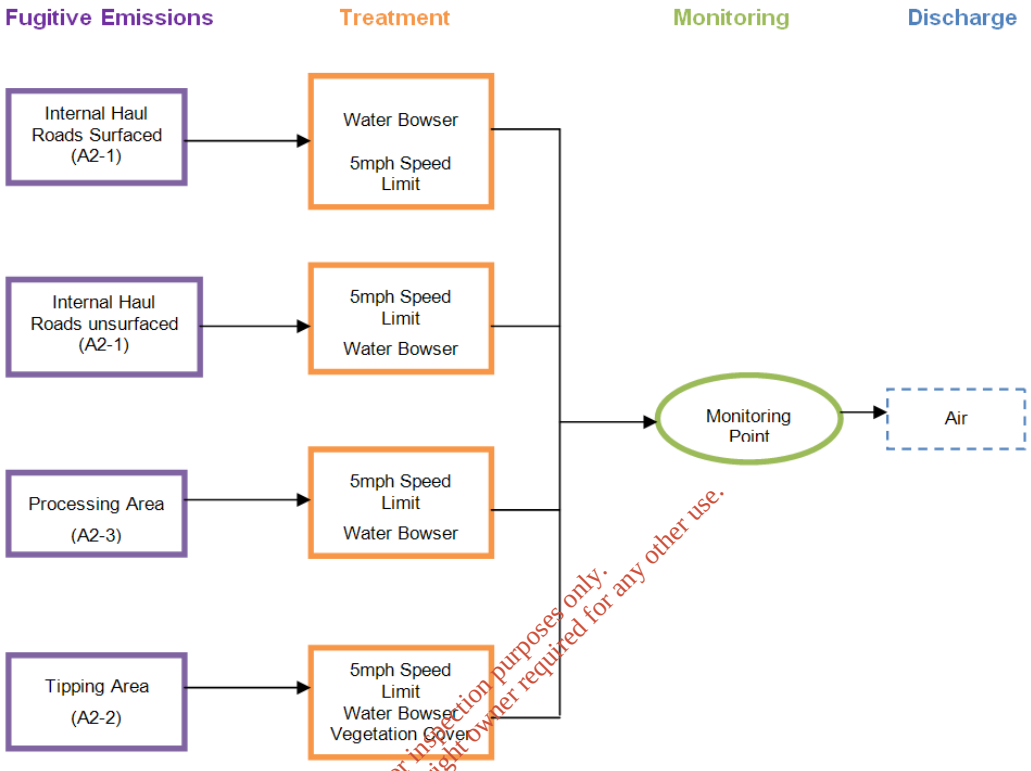

Figure 3.6.4 Operational Activities

The impacts of any dust deposition from the operations will be direct, of short duration, temporary and largely confined to the site area. Various mitigation measures have and will continue to be implemented to minimise any impacts as much as practical (Refer to Section 3.6.6 **Error! Reference source not found.**).

The recent dust monitoring results for the operation are given above (Refer to Table 3.6-2 above). These results show that the dust levels at the site boundary are within the recognised TA Luft dust deposition limit value, and are considered typical of dust levels in the quarry area. The existing operation has in place a number of mitigation measures to ensure the continued operation of the quarry and WRF will not result in any significant impact on residences or local amenities (Refer to Section 3.6.6 **Error! Reference source not found.**).

The Air Quality Standards Regulations (2002 S.I. No. 271 of 2002) sets limit values for sulphur dioxide, nitrogen dioxide, particulate matter and lead in ambient air. The regulations apply to ambient air quality in the vicinity of land use/development types including quarries. The development requires movement of materials by road, and transport by other methods is not practical in this situation. Given the proximity of the site to the National Road network fuel consumption and therefore exhaust emissions will be reduced relative to more removed locations. The current air quality in the region is known to be “good” (Refer to Section 3.6.4.2

above), and thus the impact on air quality with respect to the existing quarry/WRF is considered to be negligible.

3.6.5.2 INDIRECT IMPACTS

Apart from the direct impact of the deposition of particulate material, there may be an associated visual impact with fugitive dust generation. This impact will be minimised by both the mitigation measures described to minimise dust in Section 3.6.6 below and those described to minimise visual impacts in Section 3.8.

3.6.5.3 INTERACTION WITH OTHER IMPACTS

There are no interactions with other impacts associated with air quality issues.

3.6.5.4 CUMULATIVE IMPACT

There were previously a number of nearby inert soil recovery operations and pits in operation (2008). Most of these have since ceased although planning permission has recently been granted for a waste recovery facility for soils and stones to enable restoration of part of an old quarry site to agricultural use at Mithchelstown, Trim Co. Meath. It is proposed to import 96,600 tonnes of waste soil and stone (EWC Code 17 05 04) over a period of 5 years. This site is c. 1km to the northwest of the facility at Foxtown. It is therefore considered that the site is sufficiently removed from other activities so as there will be no significant cumulative impact with respect to the operation of the proposed WRF within the existing quarry.

The restoration works using imported "soil and stone" are no different from normal quarry restoration operations. As such there is no cumulative impact with respect to the movement and placement of materials during the progressive restoration of the quarry development.

The proposed development will also be operated within acceptable standards for this type of development.

3.6.6 MITIGATION & MONITORING

A number of measures have been adopted to minimise dust emissions to the atmosphere from general site activity, internal haulage, processing and tipping operations as follows:

- During dry weather the haul roads and stockpiles are sprayed with water to dampen any likely dust blows. A water bowser is maintained on site for this purpose.
- Consideration will be given to location of mobile plant so as to ensure that any principle dust sources cannot adversely affect sensitive off-site locations.
- Static and mobile wet dust suppression systems will be located at strategic points in the process if required.
- Drop heights are kept to a minimum by using short conveyors and maintaining stocks under the head drum load out points.

- A wheel wash facility has been installed on site and all vehicles are required to pass through the wheel wash on exiting the site.
- All internal roadways will be adequately drained, to prevent ponding.
- The operator has purchased a road sweeper and ensures that the site entrance and adjoining public roadway is regularly cleaned. The sweeper is readily available at short notice to sweep up any materials which may accidentally fall onto the public roadway.
- Suitable vegetation is to be provided on restored areas at the earliest opportunity.
- Ongoing dust monitoring to ensure threshold limits are not exceeded.

Dust emissions from the facility will be controlled and monitored. Dust emissions and their management will be addressed in the 'Environmental Management System' (EMS) for the Foxtown site.

It is considered given the nature of the activity, control and abatement measures and management of the existing quarry that emissions of pollutants (as defined in Waste Management Acts 1996 to 2003 and Air Pollution Acts 1992 and 1987 respectively) to the atmosphere are not likely to degrade the environment (i.e., be injurious to public health, or have a deleterious effect on flora or fauna or damage property, or impair or interfere with amenities or with the environment).

The active working area of the site will be inspected frequently during dry, windy weather to assess the potential for dust blows, and when necessary, appropriate dust suppression and control measures will be implemented in response.

These measures are considered sufficient to ensure that dust emissions will remain below recognised thresholds for this type of development.

3.6.7 RESIDUAL IMPACT

Given the low inherent potential for dust generation and dispersion from the proposed development, the rural location, and the mitigation measures incorporated in the design, it is anticipated that the effect on the existing air quality will be negligible, and no residual impacts are predicted.

3.6.8 REFERENCES

1. Environmental Code 2nd Edition (2005), Irish Concrete Federation (ICF)
2. Environmental Management in the Extractive Industry, Environmental Protection Agency (EPA) 2006
3. Ireland's Environment 2012 - An Assessment, Environmental Protection Agency (EPA) 2012
4. Technical Instructions on Air Quality Control, TA Luft 1986
5. The Environmental Effects of Dust from Surface Mineral Workings – Volume 1 Summary Report and Best Practice Guides, Department of the Environment (DoE) 1995.
6. Quarries and Ancillary Activities Guidelines for Local Authorities 2004, Department of the Environment, Heritage and Local Government (DoEHLG) 2004

Internet Sources

http://epa.ie EPA

http://ec.europa.eu/environment/eia/eia-guidelines/g-screening-full-text.pdf European Commission (2001) Guidance on EIA Screening

http://www.irishstatutebook.ie/home.html Irish Statute Book, Office of the Attorney General

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3.7 NOISE

3.7.1 INTRODUCTION

This section of the EIS deals with the issue of noise associated with the development of a Waste Recovery Facility (WRF) at Foxtown quarry.

The section will determine the existing environment with respect to noise by assessing the level of noise in the vicinity of the site, the potential impacts on the environment, and propose appropriate mitigation measures, if required, by the applicant to avoid, reduce or remedy any significant adverse impacts on the environment.

3.7.2 METHODOLOGY

The baseline study comprised a desktop review of relevant policy, legislation including guidance with respect to noise emissions.

The purpose of the baseline study is to assess the existing levels of noise. Noise monitoring is carried out at the existing recovery facility in accordance with conditions imposed under P.A Reg. Ref. QY 48 (QC. 17.QC 2113) and waste management permit (WMP 2007/22).

The purpose of the baseline study was to assess existing levels of noise associated with the Foxtown site. Noise measurements surveys were undertaken at a number of noise sensitive locations and the results analysed to determine noise conditions. From these results, an assessment can be made of the impact of the development on the existing noise levels of the area.

The following has been taken into consideration with respect to noise monitoring surveys:

- Measurement of noise levels was undertaken using Type 1 instrumentation;
- Cognisance was taken of the EPA's 'Guidance Note for Noise: Licence Applications, Surveys and Assessments in relation to Scheduled Activities (NG4);
- The surveys were carried out in accordance with 'ISO 1996 Acoustics - Description and Measurement of Environmental Noise: Parts 1/2/3'.

The following parameters were recorded during the noise monitoring surveys:

$L_{Aeq,T}$ is the equivalent continuous A-weighted sound pressure level, in decibels, determined over a time interval *T* (the sampling interval).

$L_{A10,T}$ the A weighted level of noise exceeded for 10% of the specified measurement period (T). It gives an indication of the upper limit of fluctuating noise such as that from road traffic.

$L_{A90,T}$ the A weighted noise level exceeded for 90% of the specified measurement period (T). It is typically used as a descriptor for background noise, giving an indication of the underlying noise level or the level that is almost always their between intermittent noise events.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing.

L_{eq} is recommended by the International Organisation for Standardisation (ISO) for measuring and rating noises for traffic areas and for the description of environmental noise.

3.7.2.1 EMISSION LIMIT VALUE

The noise levels measured on site must be in compliance with P.A Reg. Ref. QY 48 (QC. 17.QC 2113) i.e. Condition No.6 - *"the noise levels associated with day to day activity, when measured from any house in the vicinity of the quarry, shall not exceed 55 dB (a) leq over a measured time interval of one hour by day time and shall not exceed 45 dB (A) leq over a measured time of 15 minutes by night time. These levels may be exceeded to allow temporary but exceptionally noisy phases in the extraction process or for short term construction activity which is required to bring long-term environmental benefits following written consent by Meath County Council".*

In accordance with the EPA (2012) Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4):

Typical Limit Values for Noise from Licensed Sites
Daytime (07:00 to 19:00hrs) – 55dB LAr,T;
Evening (19:00 to 23:00hrs) – 50dB LAr,T;
Night-time (23:00 to 07:00hrs) – 45dB LAeq,T

Under the above guidelines quarrying is considered a specific activity. Detailed guidance in relation to noise and vibration associated with these activities is provided in the Agency publication Environmental Management in the Extractive Industry (Non-Scheduled Minerals) Environmental Management Guidelines (2006). Section 3.5 Noise & Vibration of this document sets out appropriate Emission Limit Values (ELV's) and deals with control of noise, vibration and air overpressure. i.e.

In relation to quarry developments and ancillary activities, it is recommended that noise from the activities on site shall not exceed the following noise ELVs at the nearest noise-sensitive receptor:

Daytime:	08:00–20:00 h	LAeq (1 h) = 55 dBA
Night-time:	20:00–08:00 h	LAeq (1 h) = 45 dBA

It is therefore considered that the above EPA threshold should be applied for this development as this limit is a recognised standard within the industry and is a limit that is set by most of the Local Authorities. These levels are consistent with guidance issued by the Department of the Environment: "Quarries and Ancillary Activities – Guidelines for Planning Authorities (2004) DOEHLG".

3.7.3 EXISTING ENVIRONMENT

The lands are being restored to agricultural use by importation and recovery of inert materials in accordance with a phased restoration scheme. Designated internal haul roads are used to direct site traffic to the current tipping area. A bulldozer is used to appropriately grade and compact the material to the desired profile as shown by the detailed plans and sections (Refer to Figures B.2.4 – Rev. A and B.2.5 – Rev. A, *EIS Section 2 Figures*).

The principle concern in respect of potential noise emissions from the development is the effect on residential amenity. Properties within the vicinity of the development are shown on Figure B.2.2 – Rev A, *EIS Section 2 Figures*.

Noise monitoring to date has shown that site activity at the existing facility are within accepted thresholds for this type of development (Refer to Section 3.7.3.1 below).

3.7.3.1 NOISE MONITORING

Noise monitoring is carried out at nearby residences and site boundaries adjoining same (Refer to Figure F.1.0 – Rev A, *EIS Section 2 Figures*).

3.7.3.1.1 Noise Monitoring Survey 23/07/14

A baseline noise monitoring survey was undertaken at the site to determine the existing noise levels. The noise monitoring survey was carried out on the 23/07/14. The results of the noise survey are provided in Table 3.7.1 below.

Table 3.7.1 Noise Monitoring Results – 23/07/14

Location	Sampling Interval	L_{Aeq} dB	L_{A10} dB	L_{A90} dB	Sampling notes
N4	9:05-10:06hrs *23/07/14*	40.43	42.82	29.15	The weather conditions prevailing at the time were warm and sunny (20°C) with very light easterly breeze. Minimal site activity, excavator grading only. Agricultural (Harrowing) activity on adjoining lands audible. 4 passing cars and 6 airplanes overhead.
N5	10:12-10:58hrs *23/07/14*	51.18	44.56	30.78	The weather conditions prevailing at the time were warm and sunny (20°C) with very light easterly breeze. Site activity was not discernible at this location. Primary noise source was passing traffic. 7 passing cars and 4 airplanes overhead.
N6	11:08-11:38hrs *23/07/14*	47.06	45.49	32.03	The weather conditions prevailing at the time were warm and sunny (20°C) with very light easterly breeze. Site activity was not discernible at this location. Primary noise source was passing traffic and 5 minute period from construction activity at nearby residence. 4 passing cars and 3 airplanes overhead.

The noise levels measured on site are in compliance with condition No. 6 of P.A Reg. Ref. QY 48 (QC. 17.QC 2113).

3.7.3.1.2 Noise Monitoring Survey 13/05/08

Noise monitoring was also undertaken on 13th May 2008 at 3 noise sensitive locations (NSLs) locations as shown by the attached Environmental Monitoring Plan Figure F.1.0 – Rev A, *EIS Section 2 Figures.*

Normal quarry operations including processing of extracted sand and gravel and backfilling of workings were being undertaken throughout the monitoring periods. As such the noise levels being experienced at the site were considerably higher than the current quarry restoration (backfilling) operations.

The following table provides details with respect to the equipment in operation at the quarry during noise monitoring at the time.

Table 3.7.2 Quarry Plant & Machinery

Plant & Equipment	Location	Comments
Crushing Plant	Processing Area	Crushing plant in operation for duration of noise monitoring.
Loading Shovel	Processing Area	Loading shovel feeding crushing plant for duration of monitoring period.
Trucks	Processing Area	Intermittent noise - trucks loading out with Sand and Gravel
Trucks	Backfilling Area – Phase 1	Intermittent noise - trucks delivering inert soils for backfilling
Excavator	Backfilling Area – Phase 1	Intermittent noise - excavator placing inert soils into area under restoration

Weather Conditions

Dry, warm and sunny with light south-westerly breeze.

Noise results

The results of the noise monitoring were as follows:

Table 3.7.3 Noise Monitoring Results - Location N4 – 13/5/08

NSL	Monitoring Period	dB L_{Aeq}, T	dB L_{A10}, T	dB L_{A90}, T	Traffic Count (County Road)	
					HGV's	Cars/Vans
4	10:25 to 10:40	54	58	52	2	4

Noise monitoring station N4 was established close to the existing site entrance and nearest noise sensitive receptor. The crushing plant and loading shovel was clearly audible. Noise associated with crushing, mobile plant and trucks' serving another inert waste recovery operation to the north was also audible at this location (*This adjoining facility is no longer operational*). The observer did not detect a tonal or impulsive component. The processing plant area was screened from the monitoring location by the intervening roadside boundary hedgerows and final pit face.

Table 3.7.4 Noise Monitoring Results - Location N5 - 13/5/08

NSL	Monitoring Period	dB L_{Aeq}, T	dB L_{A10}, T	dB L_{A90}, T	Traffic Count (County Road)	
					HGV's	Cars/Vans
3	11:13 to 11: 28	50	54	44	1	2

Noise monitoring station N5 was established c.110 metres to the east of the south east corner of the site. The crushing plant and loading shovel were audible. Noise associated with crushing, mobile plant and trucks' serving another inert waste recovery operation to the north was also audible at this location (*This adjoining facility is no longer operational*). The observer did not detect a tonal or impulsive component. The processing plant area was screened from the monitoring location by the intervening roadside boundary hedgerows and final pit face.

Table 3.7.5 *Noise Monitoring Results - Location N6 - 13/5/08*

NSL	Monitoring Period	dB L_{Aeq}, T	dB L_{A10}, T	dB L_{A90}, T	Traffic Count (County Road)	
					HGV's	Cars/Vans
2	10:50to 11:05	55	53	42	2	4

Noise monitoring station N6 was established on the public road adjoining two residences 400 metres to the north of the site boundary. There was no discernible noise associated with the operations at Kiernan Sand and Gravel Ltd's facility. Noise associated with crushing, mobile plant and trucks' serving another inert waste recovery operation to the north (*This adjoining facility is no longer operational*). was also audible at this location. The observer did not detect a tonal or impulsive component.

The site is well removed from these noise sensitive locations (c. 400m) and there is significant screening afforded by the pit face and intervening topography and vegetation. At Station N6, noise levels were affected by passing traffic on the local road. The L_{A90} results are more representative of the noise levels at this location without the influence of road traffic noise.

The noise levels associated with the day-to-day quarrying/backfilling activity when measured in the vicinity of the noise sensitive locations (NSL 4 to 6) were in compliance with the limit of 55 dB (A) Leq specified in Condition No.6 of P.Ref. QY/48.

It is considered that the noise monitoring results from 2008 could be regarded as a worst case scenario with both quarry operations including restoration activities ongoing at the time. The current backfilling quarry restoration operations as shown by the monitoring results of 23/07/14 are at a much lower intensity.

3.7.4 ASSESSMENT OF IMPACTS

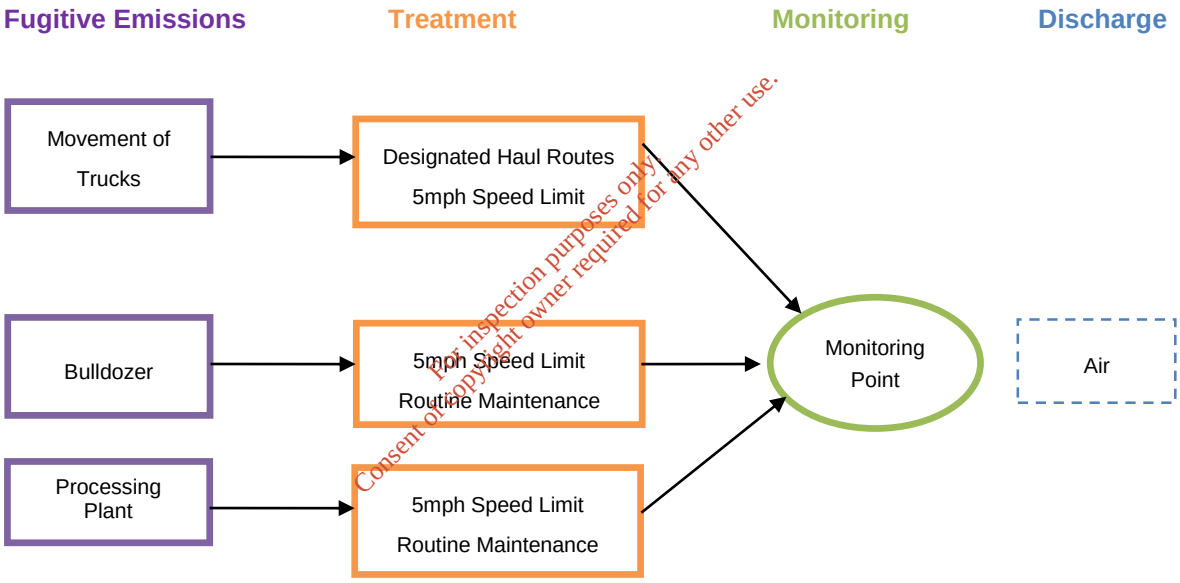
3.7.4.1 DIRECT IMPACTS

The main source of noise and vibration on site is from:

- Movement of trucks on internal haul roads and tipping of material
- Bulldozer placing and grading the infill material
- Processing Plant

Given the nature of the development the location of the above will vary dependent on area of site being restored (Refer to Figure B.2.1 – Rev A, *EIS Section 2 Figures*).

The following flow diagram shows the main sources of noise emissions arising on site and the methods of treatment/abatement employed.



The existing facility has been in operation under Waste Management Permit since 2007. Environmental noise monitoring has been carried out at this location in compliance with both the terms of the Waste Management Permit and planning permission pertaining to the site. Noise monitoring to date has shown that noise levels due to site activity are within acceptable thresholds for this type of development. Given that site activity will in general be further removed from the nearest noise sensitive locations the overall impact with respect to noise will be further reduced with respect to the continuance of operations.

3.7.4.2 INDIRECT IMPACTS

The main noise sources in the area are from the adjoining local Road. There were previously a number of nearby inert soil recovery operations and pits in operation (2008). Most of these have since ceased although planning permission has recently been granted for a waste recovery facility for soils and stones to enable restoration of part of an old quarry site to

agricultural use at Mithchelstown, Trim, Co. Meath. It is proposed to import 96,600 tonnes of waste soil and stone (EWC Code 17 05 04) over a period of 5 years. This site is c. 1km to the northwest of the facility at Foxtown. It is therefore considered that the site is sufficiently removed from other activities so as there will be no significant cumulative impact with respect to the operation of the proposed WRF within the existing quarry.

Noise monitoring to date has shown that site activity at the existing facility are within accepted thresholds for this type of development (Refer to Section 3.7.3.1 above).

The restoration works using imported "soil and stone" are no different from normal quarry restoration operations. As such there is no cumulative impact with respect to the movement and placement of materials during the progressive restoration of the quarry development.

The proposed development will also be operated within acceptable standards for this type of development.

3.7.4.3 INTERACTION WITH OTHER IMPACTS

There are no interactions with other impacts at the site. As regards disturbance, few if any animals are sensitive to noise from this sort of operation. Furthermore, as this is an established operation all species have had time to adjust.

3.7.5 MITIGATION & MONITORING MEASURES

3.7.5.1 MITIGATION

Noise resulting from the operations can be kept to acceptable levels by the implementation of good design, effective operation and management and by the adoption of 'best practices'. Reducing noise at source wherever possible is the most effective way of minimising the impact but barriers and screens between noise source and receptor can also be used to very good effect.

The type of mitigation techniques implemented to reduce noise are detailed below:

- The provision of temporary peripheral screen banks to screen site activities from outside views.
- General site activity will be within the existing pit and below the level of the nearest residences.
- The use of designated haul roads to ensure that site traffic is removed from nearest noise sensitive receptors.
- Regular maintenance of all plant and machinery is an integral part of site management and is important in helping to minimise noise impact.
- All plant and equipment will conform to noise emission limits set out in Statutory Instrument No. 320 of 1998 European Communities Construction Plant and Equipment-Permissible Noise Levels (Regulations, 1998) and amendment set out in Statutory Instrument No. 359 of 1996.

3.7.5.2 MONITORING

The operator has established an environmental monitoring programme to include noise monitoring.

It is proposed to continue to carryout noise monitoring at the three locations (N4 to N6) which includes the nearest noise sensitive locations (Refer to Figure F.10 – Rev A, *EIS Section 2 Figures*). It is proposed to carryout noise monitoring on a bi-annual basis.

The results of monitoring to date shows that the development can comply with the noise level threshold as specified and as a consequence the development will have no significant effects regards noise levels in the area. Noise emissions and their management will be addressed in the 'Environmental Management System' (EMS) for the Foxtown site.

This programme will allow on-going monitoring of noise emissions from the site, thereby assisting in ensuring compliance with any future requirements or regulations.

Through implementation of the proposed mitigation measures it is considered the development will continue to have no significant effects with regard to noise levels on the local residences, their property, livestock and amenity.

3.7.6 RESIDUAL IMPACT

Through implementation of these mitigation measures it is considered the development will have no significant effects with regard to noise levels on the local residences, their property, livestock and amenity.

Based on the impact assessment and existing mitigation measures in place, no additional remediation measures are considered necessary with respect to noise.

3.7.7 REFERENCES

1. British Standard 5228: Noise and vibration control on construction and open sites, British Standards Institute (BSI) 1997
2. Environmental Management in the Extractive Industry, Environmental Protection Agency (EPA) 2006
3. Integrated Pollution Control Licensing – Guidance Notes for Noise in Relation to Scheduled Activities, 2nd ed., Environmental Protection Agency (EPA) 2006
4. Quarries and Ancillary Activities Guidelines for Local Authorities 2004, Department of the Environment, Heritage and Local Government (DoEHLG) 2004

3.8 LANDSCAPE

3.8.1 INTRODUCTION

All projects and developments that require an Environmental Impact Statement (EIS) *by virtue of their nature, size and location*, have the potential to have an impact on the environment. This section of the EIS is essentially an overview of the landscape and visual amenity within the vicinity of the proposed development, coupled with an assessment of the potential impact, if any, of the proposed development on the existing environment in respect of these issues. The section addresses the landscape and visual impacts with respect to the proposed continued operation of a Waste Recovery Facility (WRF) at the Foxtown quarry site.

The application site is located within the Townland of Foxtown, County Meath, 6km southeast of Trim, and c. 4.5km north northeast of Summerhill. The site is located on the west side of an unnamed local road, which runs in a southeasterly direction, following a meandering topographic ridge known as the Trim Esker. Most site traffic serving the WRF is either off the Regional R158 Trim to Summerhill road at Dangan Bridge, or off the Regional R154 Trim to Dublin Road at Kiltale. The site lies c. 10km west of Junction 6 of the M3 motorway at Dunshaughlin, whilst Ratoath and Ashbourne are a further 6.5 and 10km, respectively to the east. Navan lies c.15km to the north, Kilcock c. 14km to the south, Maynooth c. 18km to the south southeast, and Dunboyne c. 18km southeast, rendering the WRF well positioned to deliver recovery of inert soil and stone from a large, relatively populous catchment area. The site location is highlighted on EIS Figure A1.0, *EIS Section 2 Figures*, whilst the WRF, which comprises the applicants entire land holding, and which covers an area of c. 5.2 ha, are shown edged red and blue, respectively on EIS Figure B 2.2, Rev. A, *EIS Section 2 Figures*.

The landscape consists of the visible characteristics of an area or region, including those elements that are physiographic (e.g., mountains and rivers), biological (e.g., vegetation and animals), transient (e.g., weather and climate), and human (e.g., built structures and land use). Landscapes variously combine human cultural influences superimposed on nature, creating places of unique character and identity, and by contributing to individual and social wellbeing and quality of life, are important in human fulfilment and in reinforcement of identity. Landscape also constitutes a resource favourable to economic activities, particularly tourism.

The European Landscape Convention 2000 states that landscape is “an area as perceived by people, whose visual features and character are the result of the action of natural and / or cultural (that is human) factors…landscapes evolve through time as a result of being acted upon by natural forces and human beings”.

EPA (2003) offers guidance on the description of the landscape in terms of context, character, significance and sensitivities, the analysis of the potential impacts on the landscape, and any proposed mitigation measures. This section also indicates the associated sections within the EIS that consider these impacts and any proposed mitigation measures.

The assessment of the landscape and visual impacts of the WRF has been prepared in accordance with the Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), published by the EPA (2003).

3.8.2 METHODOLOGY

3.8.2.1 BASELINE STUDY METHODOLOGY

The landscape and visual baseline study comprised a desktop study with follow-up field survey in the vicinity of the site. Analysis of the visual baseline information was used to identify the extent and nature of the existing views of the site from the principal representative viewpoints, and the nature and characteristics of the visual amenity of the potentially sensitive visual receptors.

3.8.2.2 METHODOLOGY FOR ASSESSMENT OF LANDSCAPE ASPECTS

Landscape effects consist of the changes in the landscape, its character and quality that might result from development. The effect that these changes have on the landscape reflects the sensitivity of that landscape to change and the magnitude of that change.

The assessment methodology was conducted in accordance with the EPA '*Guidelines on the Information to be contained in Environmental Impact Statements'* (EPA 2002). During the assessment, consideration was given to both the importance of an attribute and the magnitude of the potential environmental impacts of the proposed activities on that cited attribute. These impact ratings are in accordance with impact assessment criteria provided in the afore-mentioned EPA (2002) publication (Refer to Table 3.1.3 - Glossary of Impacts following EPA Guidance Documents).

For the purpose of assessment a matrix has been developed (Refer to Table 3.8.1) to define the significance of the landscape impacts. In completing the matrix the landscape resource is considered in terms of magnitude of change in landscape characteristics and sensitivity of the landscape to accommodate change or intervention without suffering unacceptable effects to its character and values. The significance of impact is the relationship between magnitude and sensitivity.

The sensitivity of the area was devised by consideration of designations such as Special Protection Areas, Natural Heritage Areas, by reference to Ordnance Survey 1:50:0000 discovery sheet mapping, aerial photography and any distinctive features of interest within the study area.

3.8.2.3 METHODOLOGY FOR ASSESSMENT OF VISUAL ASPECTS

Visual impact is the result of a change in view from receptors such as residences, prospects, public pathways and roads with views of the site. The magnitude of impact is assessed according to the scale of the effect, which will depend largely upon the size and type of the development and the distance of the receptor from the site.

Residential properties are considered the most sensitive receptors to changes in view whereas road users are the least sensitive as their experience is transient. The significance of visual impact depends upon the sensitivity of the receptor and the magnitude and duration of the effect.

The visual study consisted of a number of steps:

1. Examination of the Meath County Development Plan (CDP) 2013-2019 and supporting documentation including the Meath Landscape Character Assessment was undertaken.
2. Ordnance Survey Ireland (OSi) Discovery Series 1:50,000 and OSi 1:5,000 raster mapping and aerial photography were examined (Refer to Figures A 1.0 and B 2.2 – Rev. A, *EIS Section 2*).
3. Visual impacts are best assessed from specific viewpoints. Principal viewpoints were mapped and these views illustrated by photographs with annotations to describe any important characteristics, and the changes that have arisen as a result of the development (Refer to Plates 3.8.1 to 3.8.3).
4. For the purpose of assessment a matrix has been developed (Refer to Table 3.8.2) to define the significance of the visual impact with respect to the principal viewpoints identified.

3.8.3 PLANNING POLICY CONTEXT

Meath possesses a diverse range of landscapes, including coastline, drumlins in the north, rich pastures, tracts of peatland and raised bog in the southwest, and the central upland area that includes Tara - the ancient capital of Ireland. These landscapes intrinsically constitute an invaluable element of Meath's natural resource base. The sensitive development and conservation of this resource is essential to the underpinning of a strengthened rural economy and quality of life.

Planning legislation and national guidelines, such as the Draft Guidelines on Landscape and Landscape Assessment (DoEHLG) indicate that conservation of the landscape in all its contexts must now be integrated into all aspects of planning policy.

The Meath Landscape Character Assessment, which constitutes part of the Meath County Development Plan (CDP) 2013-2019, identifies and describes the landscape character of the entire county. It also evaluates the capacity of different areas to accept change, without disproportionate effects and proposes a series of policies and recommendations to guide developments in each type of landscape.

It is a goal of the Meath County Development Plan "To protect the landscape character, quality and local distinctiveness of County Meath" (Refer to CDP Section 2.5).

Key Objectives:

1. To improve the understanding of Co. Meath's landscape in terms of its inherent and unique character and to recognize what elements should be preserved, conserved or enhanced;
2. To predict the broad pattern of future changes and devise policies and objectives as guidance to planners and other parties which will ensure that change is complimentary to landscape character. Sensitivity and capacity of the landscape should be given due consideration in all aspects of decision-making, and;
3. To assist in the achievement of sustainable development, the underlying principle of all current planning practice and legislation will be adhered to by promoting a unified

approach to landscape planning and management which links policies and recommendations for landscape character to existing planning policies.

The following development plan policies and objectives are considered relevant with respect to the landscape and views and prospects:

It is the strategic policy of Meath County Council:

LC SP1	To protect the landscape character, quality, and local distinctiveness of County Meath in accordance with relevant government policy and guidelines and the recommendations included in Meath Landscape Character Assessment (2007) in Appendix 7.

It is the policy of Meath County Council:

LC POL1	To support and implement the provisions of the National Landscape Strategy.
LC POL2	To require that any necessary assessments, including landscape and visual impact assessments, are provided when undertaking, authorising, or approving development.

It is an objective of Meath County Council:

LC OBJ1	To seek to ensure the preservation of the uniqueness of all landscape character types, and to maintain the visual integrity of areas of exceptional value and high sensitivity.
LC OBJ 2	To assess development proposals having regard to the recommendations contained in the Meath Landscape Character Assessment 2007.

It is an objective of Meath County Council:

LC OBJ5	To preserve the views and prospects and the amenity of places and features of natural beauty or interest listed in Appendix 12 and shown on Map 9.5.1 from development that would interfere with the character and visual amenity of the landscape.

Insofar as the current regime of landscaping, screening and phased restoration at the quarry site, which encloses the WRF site is being operated and restored using imported inert soils under the terms and conditions imposed under P.A. Reg. Ref QY48, QC 17.QC2113, sections of Parts 10 and 11 of the CPD dealing with extractive industries are relevant.

Part 10 of the Meath CDP sets out the rural settlement strategy that will be applied by Meath County Council to ensure the continued vitality and viability of the rural area. The Council's goal in terms of Rural Development is "to encourage the continued sustainable development of rural communities without compromising the physical, environmental, natural and heritage resources of the County". In section 10.12, the Council acknowledges the need for extractive industries, but also notes that the industry can cause detrimental environmental and residential amenity effects including traffic generation, vibration, dust, noise, water pollution, visual intrusion and loss of ground water supplies. The goal in respect of extractive industries and building materials production is:

To facilitate adequate supplies of aggregate resources to meet the future growth needs of the County and the wider region while addressing key environmental, traffic and social impacts and details of rehabilitation.

On issues relating to the landscape, it is the policy of the Council:

RD POL22	To facilitate the exploitation of the county's natural resources and to exercise appropriate control over the types of development taking place in areas containing proven deposits, whilst also ensuring that such developments are carried out in a manner which would not unduly impinge on the visual amenity or environmental quality in the area.
RD POL23	To support the extractive industry where it would not unduly compromise the environmental quality of the county and where detailed rehabilitation proposals are provided.
RD POL24	To seek to ensure that the extraction of minerals and aggregates minimise the detraction from the visual quality of the landscape and do not adversely affect the environment or adjoining existing land uses.
RD POL26	To ensure that all existing workings shall be rehabilitated to suitable land uses and that all future extraction activities will allow for the rehabilitation of pits and proper land use management. The biodiversity value of the site should be considered in the first instance when preparing restoration plans. Where land filling is proposed, inert material is the preferred method. Each planning application shall be considered on a case by case basis and, where relevant, will be dealt with under the relevant regional Waste Management Plan.
RD POL27	To ensure that development for aggregates / mineral extraction, processing and associated processes does not significantly impact in the numerous areas, including sensitive landscapes.

Part 11 of the Meath CDP sets out development management guideline that will be applied by Meath County Council to ensure that future development is in accordance with established principles and best practice guidelines and to ensure that proposals are carried out in a manner which supports the policies and objectives of the Plan. While the Council recognises the importance of the extractive industry in the economic life of the County, extractive developments should not adversely affect the environmental, tourism, local communities, residential qualities and/or any adjoining existing land uses in the area, Natura 2000 sites or any protected species or habitat. Section 11.14 of the Meath CDP sets out the development management guidelines with respect to extractive industries.

Development proposals for extractive industries are required to address numerous issues, of which the following pertain to landscape:

- Rehabilitation and landscaping which must be in phase with extraction (suitable proposals in this regard must accompany all planning applications);
- Impact on the quality of the landscape, particularly sensitive landscapes and protected views

3.8.4 RECEIVING ENVIRONMENT DESKTOP STUDY

As part of the assessment an examination of the Meath County Development Plan (CDP) 2013-2019 and supporting documentation including the Meath Landscape Character Assessment was undertaken. Ordnance Survey Ireland (OSi) Discovery Series 1:50,000 and OSi 1:5,000 raster mapping and aerial photography were examined (Refer to Figures A1.0 and B 2.2 – Rev. A, *EIS Section 2 Figures*).

A topographical survey of the existing site was carried out and modeled using digital terrain modeling software (Refer to Figure B 2.1 – Rev A, *EIS Section 2 Figures*), from which cross sections were produced (Refer to Figure B 2.5 Rev. A, *EIS Section 2 Figures*). The desktop study was used to determine the nature of the visual amenity of the area, along with the approximate visibility of the development, which is determined through topographic analysis of map data. Potential receptors of visual effects, including residents and visitors through the area were also identified.

Visual impacts are best assessed from specific viewpoints. Principal viewpoints were mapped within the study area and these views illustrated by photographs with annotations to describe any important characteristics, and the changes that have arisen as a result of the development (Refer to Plates 3.8.1 to 3.8.3).

3.8.4.1 FIELD SURVEY

A site visits was undertaken on 23/07/2014. The purpose of the site visit was to become familiar with the site, establish the general landscape character of the area and identify principle representative viewpoints including residences, prospects, public pathways and roads with views of the site. The actual extent of visibility was also checked in the field due to the localised screening effects of buildings, walls, fences, trees, hedgerows and banks. Potential seasonal screening effects were also identified where necessary and recorded.

The visual survey also includes and is supported by a comprehensive photographic record from the principal and other relevant viewpoints. The photographs were taken at eye level (i.e., 1.6 metres above ground level) at the point of interest towards the development area using a digital camera. A panoramic image was produced by the careful ‘stitching’ together of single-frame images for each identified view.

The analysis of the visual baseline information identifies the extent and nature of the existing views of the site from the principal representative viewpoints, and the nature and characteristics of the visual amenity of the potentially sensitive visual receptors.

Principal viewpoints were mapped and these views illustrated by photographs with annotations to describe any important characteristics, and the changes that have arisen as a result of the development (Refer to Plates 3.8.1 to 3.8.3).

3.8.4.2 LANDSCAPE BASELINE CONDITIONS

3.8.4.2.1 Site Area Description

The site of Foxtown quarry and WRF is located in a rural area in the townland of Foxtown, c. 6km southeast of Trim. The site of the quarry and WRF occupies the entire landholding of c. 5.2ha, and is located on lands immediately west of, and with direct access to, an unnamed local road.

The unnamed local road lies within c. 2km of either the R158 Trim to Summerhill Regional Road, or the R154 Trim to Dublin Regional Road. The site lies c. 10km west of Junction 6 of the M3 motorway at Dunshaughlin, whilst Ratoath and Ashbourne are a further 6.5 and 10km, respectively to the east. Navan lies c.15km to the north, Kilcock c. 14km to the south, Maynooth c. 18km to the south southeast, and Dunboyne c. 18km southeast, rendering the WRF well positioned to deliver recovery of inert soil and stone from a large, relatively populous catchment area. The site location is highlighted on EIS Figure A1.0, *EIS Section 2 Figures*, at a scale of 1:50,000.

Topography

The Foxtown area is located in the plain of the Boycetown River within the larger Boyne River Catchment. The Boycetown River flows in a roughly SE-NW direction c. 1km east of the site, whilst an unnamed tributary of the Boycetown River flows c. 500m west of the western boundary of the site. Both the Boycetown and Knightsbrook Rivers drain north into the Boyne River at Scurlockstown, near Trim. The site is situated at approximately 70-80m AOD in a predominantly rural area of south County Meath. The surrounding landscape constitutes lowland with minor hills lying off to the east and south. The Trim Esker, on which the quarry is developed, forms a narrow, meandering, topographic ridge running for c. 14.5km in a NW-SE direction. The Esker crosses the SW-NE oriented Galtrim Morraine at Ballynamona.

The WRF site is co-located within, and occupies the entirety of the Foxtown quarry site and landholding of c. 5.2 ha. The site is in the shape of a sinuous ribbon that is c. 300 in length and c. 40m wide, ranging from roughly 25m wide in the north to a maximum of 60m in width in the south. The eastern boundary of the quarry site is defined by an unnamed local road. The workings are effectively screened by a steep bank running along this public road, which constitutes the un-extracted, remnant margin of the esker, and which is covered in dense, mature hedgerow. The topography of the quarry site is thus one of a hollowed-out quarry void with a rim elevated above the surrounding terrain, and occurring at approximately 70-80m AOD (See Figure B.2.1 - Rev A, *EIS Section 2 Figures*). There are many other dis-used quarries within the area, reflecting a history of sand and gravel extraction.

The wider landscape around Foxtown is generally of flat-lying lowlands (elev. c. 65-80m AOD) with hills occurring in an arc from the northeast round to the south. The hills are formed from Namurian sandstones and shales to the south and southeast (max. elev. c. 135m AOD), and mostly from Late Visean sandstones, shales and limestones of the Loughshinny, Donore and Balrickard Fms. to the east and northeast (max. elev. 159m AOD at Tara, and 172m AOD at Skryne). These hills are identified as Landscape Character Area (LCA) 12: Tara Skryne Hills by Meath County Council (2007).

The landscape of the Foxtown area is identified as LCA 6: Central Lowlands, which consists flat-lying lowlands, predominantly as rolling pastureland, with thick wooded hedgerows, some conifer plantations, and shelterbelts of ash and larch, separating medium to large fields. Deep roadside drainage ditches and banked hedgerows are common, and create enclosed rural road corridors with limited views. Forest cover is very limited throughout Meath, with small areas of broadleaf woodland and a few conifer plantations. The land use in the area is classed as dominantly pasture with subordinate non-irrigated arable land.

The Boycetown and Knightsbrook Rivers drain north into the Boyne River near Trim, c. 6km to the northwest of the site. The Boyne Valley is designated as LCA 5, and consists of a steep river valley with areas of rolling lowland. The LCA is a well wooded river corridor, which includes pasture farmland with a strong network of hedgerows, and some poorly drained marshland, adjacent to the river.

The unrestored quarry area is dominated by bare, exposed ground with hedgerows and fragments of scrub at the edges of the site. Overburden stripped to access sand and gravel resource has been used for restoration of completed sections of the excavation. The land in the northern section of the site (i.e., Phase 1) has been restored to agricultural use, with minor conifer plantation on the southern end of the site. The quarry site boundaries are largely maintained with well-treed, mature hedgerows and stock fencing, with only partial views offered at entrances and rare breaks in the hedgerows.

Hedgerows are perhaps the most characteristic feature of the Meath landscape and provide valuable refuges for biodiversity in a landscape dominated by large tracts of intensive agriculture. Hedgerows also tend to create enclosed landscapes, where views are restricted. In the vicinity of the Foxtown, the WRF is well screened from public view on the unnamed local road by existing mature hedgerow on the roadside. Peripheral hedgerows are very effective at screening views of the WRF site from viewpoints in the vicinity.

The potential viewshed of the WRF site is restricted to partial or restricted views at entrances, principally the southern main entrance. Thus, views of the site are largely screened by the intervening bank and mature hedgerow (Refer to Plates 3.8.1 & 3.8.3). The partially open views of the quarry at the two site entrances along the unnamed local road are largely passing views. However, two residences occur across from the main southern entrance, and are open to partial views of the existing quarry. These residences will benefit from the final restoration of the quarry lands to beneficial agriculture/woodland habitat in the medium term

Land Use

The land-use in the Foxtown area is characterised by a patchwork of agricultural fields that are designated as pasture and lesser non-irrigated arable land (See Figure 3.8.3), reflecting medium-high intensity agricultural, with relatively low levels of forest cover. High intensity horticulture is practiced on the lands immediately west of the site. There are several areas of afforestation established in the wider area, whilst parkland is associated with Galtrim House, Summerhill Demesne and Dunsany Castle. The agricultural lands of the area are characterised in general by mature hawthorn hedges with deciduous trees. Discontinuous urban fabric is identified at nearby Kiltale, Summerhill, Rathmoylan and Trim.

The unrestored quarry areas are largely dominated by bare, exposed ground with fragments of scrub at the edges. The boundaries of the landholding are largely maintained with high mature hedgerows and stock fencing (Refer to Site Plan Figure B.2.1 – Rev A, *EIS Section 2 Figures*). The site of the WRF coincides with the quarry site which comprises the entirety of the landholding (i.e., c. 5.2ha).

The area has an established history of sand and gravel working, and these activities have co-existed with other predominantly agricultural land uses in the area, principally medium-high intensity farming. The predominant land use within the WRF site, which is to be co-located within the quarry site, is by definition that of quarrying activities and associated operations. On completion of site activities, the site of the quarry and WRF will be decommissioned and reinstated in accordance with the approved quarry restoration scheme, and thus integrated back into the surrounding landscape. Thus, the land use will revert to agricultural use, primarily as grassland and woodland habitat.

Drainage & Geology

Drainage within the area is discussed in more detail in Section 3.4 - Water. The nearest watercourse to the site is the Boycetown River, which flows roughly SE-NW c. 1km east of the site, whilst an unnamed tributary of the Boycetown River flows c. 500m west of the western boundary of the site. The site occurs centrally within the Boycetown River sub-basin, and the Boycetown River, as well as the Knightsbrook River, drain north into the Boyne River at Scurlockstown, near Trim.

Details with respect to the local bedrock geology and soils are provided within Section 3.3 – Soils and Geology. Reference to the 1:100,000 scale map of the Geology of Meath (Sheet 13) (Geological Survey of Ireland, 2001) indicates that the WRF site and the surrounding area (i.e., within c. 2.5km) overly limestones of the Lucan Fm., also known as the “Calp”. No faults are recognized in the site or wider area. The bedrock of the area including the site, is shown in Figure 3.3.5: Bedrock Geological Map of Foxtown Area.

The only subsoil recognized as occurring at the Foxtown WRF site is described as Basic Esker Sands and Gravels (i.e., BasEsk), which covered the entire application site prior to quarrying operations. The subsoil thickness on site prior to quarrying was of the order of 12m, and visual examination of the subsoil confirmed the classification of a stratified deposit of sand and gravel, principally composed of limestone parent material, in which the sand to gravel ratio was approximately 30:70.

Tourism

Meath is named after the ancient Kingdom of Meath, and is colloquially known as the “Royal County”. Meath contains a rich array of cultural and heritage assets, such as the World Heritage Site of *Bru Na Boinne*, *Hill of Tara*, the seat of the High Kings, *Loughcrew Cairns*, the *Battle of the Boyne* site, *King John’s Castle,* Trim, *Bective Abbey*, and the *Kells Crosses.* With its numerous ancient monuments, ruins, castles, battlefields and Landed Estates (or Demesnes) with their Great Houses, Meath is a county steeped in history. Meath County Council has identified cultural tourism as a potentially significant driver of the county’s modern economy, and positioned itself as the *‘The Heritage Capital’* of Ireland.

Foxtown is located c. 4.5km from Summerhill and c. 6km from Trim, County Meath. Trim is a large historic town and one of Meath's primary historic settlements. The town and its environs are steeped in history and have a wealth of historical and archaeological sites. King John's Castle is sited next to the River Boyne, and its floodplain provides open public space in a picturesque setting. Built by Hugh de Lacy at the end of the 12th century, King John's Castle is the largest Norman castle in Europe, dominates the townscape, and is a major tourist attraction. Trim is unusual for the number of surviving medieval buildings, which includes King John's Castle, Talbot Castle, St. Patrick's Cathedral, the Court House, and the Castle Street cottages. The medieval town of Trim boasted 2km of town wall defenses, sections of which survive today either above or below ground.

St. Patrick built a church near an ancient ford that crossed the Boyne at Trim, and it was from this that the town got its name. There are fascinating ruins which provide evidence of fervent religious activity in the area. Stone relics abound in St. Patricks Cathedral, its church and porch revealing a number of medieval graveslabs. St. Marys Abbey is the remains of an Augustinian monastery founded in the 12th century. The Newtown Monuments consist of a large medieval cathedral, two monasteries and small church which date from 1206. The Friary of St. John the Baptist, is the remains of a 13th century Augustinian foundation, which was later converted to a hospital in the 18th century. The prominent ruins of the Yellow Steeple overlook the town from a ridge opposite King John's Castle. Originally part of the 13th century St. Mary's Augustinian Abbey, the steeple dates from 1368. The black Friary of the Dominicans was founded by Geoffrey de Geneville, Lord of Meath in 1263.

Foxtown benefits from the many amenities and attractions located throughout County Meath. Heritage attractions in Meath include: the World Heritage Site and visitor centre at Bru na Boinne; Hill of Tara; Loughcrew Cairns; Kells Round Tower and High Crosses; King John's Castle, Trim; Bective Abbey, Battle of the Boyne Site, Oldbridge; Slane Castle; Ardbraccan House; and many more. Meath also offers many other tourist attractions, including: Tower of Lloyd, Kells; numerous heritage trails, walking and hiking trails; angling on the famous Boyne and Blackwater Rivers; golfing; horse racing; and numerous festivals such as Moynalty Steam Threshing; Tattersalls International Horse Trials and County Fair; and the Slane Castle Music Festival.

Golf enthusiasts visiting the area can enjoy a wide choice of excellent golf courses within short driving distance. Across Meath there are numerous links and heathland courses, including Royal Tara near Navan, The Headfort near Kells, Laytown and Bettystown, Ashbourne, and many others. The nearest course is at Knightsbrook Golf Club, c. 4km to the northwest near Trim, whilst within 10 kms, there is the South Meath Golf Club at Carberrystown, the County Meath Golf Club at Newtownmoynagh, the Glebe at Dunleever, Trim, and the Jack Nicklaus designed course at Killeen Castle, the venue for the 2011 Solheim Cup.

Horse racing is also popular at the annual Laytown Beach Races in September, at the Bellewstown racecourse, Navan racecourse, and at Fairyhouse, home of the Irish Grand National. Meath is one of Ireland's top destinations for equestrian sports and horse breeding with world class studs dotted right around the county. There are equestrian activities at numerous nearby equestrian centres.

The two main rivers in the county, the Blackwater and the Boyne join at Navan, and the Boyne, the most historic waterway in Ireland, flows into the Irish Sea east of Drogheda. These waterways are rich in salmon and trout and are recognised as among the finest in Ireland. Water sports are available at Rathbeggan Lakes, south of Dunshaughlin. Other activities in the locality in the Meath area, include the Loughcrew Adventure Centre, near Oldcastle, paintball and go-carting at the Zone in Navan, and Tayto Park, Ashbourne. The ecotourist can enjoy a walk at Girley Bog near Kells, or the nature trail and river walk at Sonairte National Ecology Centre in Laytown.

There are no protected views and prospects near the site, or oriented toward the area of the site.

Residential

The nearest large residential settlement close to the site is village of Kiltale, located c. 2km to the east. Further afield, Summerhill is c. 4.5km to the south, Kilmessan c. 5.5 km to the north, Trim is c. 6km to the northwest, Rathmoylan is 7 km to the southwest, and Dunshaughlin is c. 11.5km to the east. The immediate area around Foxtown is rural and lightly populated with 16 residences within 500m of the site. The site of the WRF neither contains nor is contiguous with residential properties, although three properties on the east side of the unnamed local road lie within 50m, with two of these opposite the main entrance. Residential development consists of isolated farm dwellings and of owner occupied bungalow/houses along public roads; occasionally in clusters and graigs, such as at Moynalvy, Rathmoylan and Kiltale (Refer to EIS Figures B 2.1 – Rev A and B 2.2 – Rev A, *Section 2*). Roads are of a local character and typical of a rural location.

3.8.4.2.2 Areas of Significance or Special Importance

The application site at Foxtown, which corresponds to the quarry site, is not included in any area with an ecological designation (NHA, cSAC or SPA; See NPWS 2014). However, there are numerous designated sites within 15km, namely: Boyne River and Blackwater River cSAC (Site Code 002299); Boyne River and Blackwater River SPA (Site Code 004232); Trim Wetlands pNHA (Site Code 001357); Rathmoylan Esker (Site Code 000557); and Royal Canal (Site Code 002103). The nearest designated site to the Foxtown WRF is c. 4km to the northwest at Scurlockstown, and has triple designation as the Boyne River and Blackwater River cSAC and SPA, and Trim Wetlands pNHA.

In this case the River Boyne and River Blackwater (Site Code 2299), a river and valley system of European interest, is the only one within 15km of the proposed project. Screening for Appropriate Assessment was carried out with respect to the licence application and a copy of this report was previously submitted to the EPA. The findings of the screening for Appropriate Assessment were that the activity, individually or in combination with other plans or projects is not likely to have a significant effect on the Natura 2000 network, or the conservation objectives of the sites. A Stage 2 Appropriate Assessment is therefore not required.

The proposed continuation of the WRF was the subject of an assessment that involved the investigation of the cultural heritage including the archaeological, structural and historical

background of both the application area and the surrounding area (i.e., 1km radius) using a wide range of existing information as well as a field assessment (Refer to EIS Section 3.9).

There are no Recorded Monuments within the proposed development area. There are four Recorded Monuments within the 1km study area. There are no Protected Structures, Architectural Conservation Areas, NIAH structures or NIAH historic gardens or designed landscapes within the proposed development area (DoAHG 2014a, 2014b). As a result there will be no direct or indirect construction impact on the archaeological, architectural or cultural heritage resource.

3.8.4.2.3 Landscape & Landscape Character Assessment

This section is based mainly on the Meath Landscape Character Assessment 2007, without explicit referencing within the text.

Ireland ratified the European Landscape Convention in 2002 and agreed to implement national measures to promote landscape planning, protection and management. The Planning and Development Act 2000 requires every planning authority to include objectives in their Development Plan for the preservation of the character of the landscape insofar as proper planning and sustainable development of the area requires it, including the preservation of views and prospects and the amenities of places and features of natural beauty or interest.

A detailed Landscape Character Assessment of County Meath was carried out by Soltys Brewster Consulting on behalf of Meath County Council in 2007. The purpose of the study was to objectively describe, map and classify the landscape character of each part of the County. Importantly, defining landscape character enables an understanding of the inherent value and importance of individual landscape elements and processes that may alter landscape character in the future. The capacity of each area to accept change, without disproportionate effects, was evaluated and a series of policies and recommendations to guide development in each type of landscape was proposed. Another objective of the study was to drive sustainable development, the principle underlying current planning legislation, by promoting a unified approach to landscape planning and management.

Meath presents a wide range of landscapes. These range from: the scrubby rolling lowlands of the coastal plain; to the drumlins of Teerverchur uplands; to enclosed well-wooded river corridors; to the flat farmland of the central lowlands with numerous large estate landscapes and associated parkland; to raised bogs in the southwest lowlands, to the steeply rolling hills of the Bellewstown Hills of managed pasture and arable farmland with well wooded hedgerows creating an enclosed landscape. The site at Foxtown lies within LCA 6: Central Lowlands (See EIS Figure 3.8.1).

The baseline landscape character of each LCA is rated using three parameters: value, importance and sensitivity. The value of each LCA refers to the contribution the area makes to the inherent character of the county. Scenic quality, tranquillity, remoteness, rarity, cultural associations, history, conservation, recreational interests and broader social, economic and environmental aspects are all considered in deriving a rating for value.

The sensitivity of a LCA is defined as its overall resilience to sustain its character despite change and its ability to recuperate from loss or damage. Sensitivity is based on the

interaction of individual components such as landform, amount of evident historical features and distribution of viewers, as well as its general condition. A highly sensitive landscape is likely to be vulnerable, fragile and susceptible to change, whereas a low sensitivity landscape is likely to be more resilient of change. Landscape sensitivity mapping as applied to development control aids awareness and identification of the potential for disproportionate visual prominence. The existence and significance of a landscape sensitivity and its relevance to the specifics of the proposed development must be assessed. Sensitivity is thus a critically important parameter in assessing the impact of any proposed development.

The key characteristic for this LCA that have a bearing on the relative sensitivities or resilience to development are as follows:

- **Geology & Soils**

• Complex drumlin landform created by glacial movement.

• Diverse geological composition with the northeast comprising of shaly limestone and sandstone and micaceous and pebbly sandstone, whilst the rest formed from Calp limestone.

• Deep and shallow well-drained soils have been developed in the northeast for agriculture with estate landscapes more prevalent. In the southwest a mixture of well-drained soils and peaty soil have created a more diverse landscape with areas of fertile agricultural land interspersed with conifer plantations and birch woodland.

- **Land Use**

• Mix of small - medium rough pasture fields.

• Beech stands and rows of beech and pine.

• Sand & gravel quarries southwest of Hill of Down and near Kilmessan. Mix of medium - large pasture and arable fields

- **Ecology & Habitat**

• 3 proposed National Heritage Areas (pNHA's): Duleek Commons, Thomastown Bog, and Balrath Wood

• Strong network of well-wooded hedgerows in most parts.

• Range of mature broadleaf copses and rows of pines. Some wetland habitat and wet pasture adjacent to Royal Canal.

• Boyne River Corridor and Stoneyford River are important due to the variety of habitats associated with the rivers.

- **History & Culture**

• Long established mixed scale farmland.

• Royal Canal.

• Estate landscapes.

• Buried archaeology, but few upstanding historical features.

- **Tourism**

• Royal Canal is a popular recreational boating route from Dublin to Mullingar.

• Designated walks which branch off the existing Royal Canal Way and provide links to other tourist attractions/heritage towns would be a valuable addition.

• Summerville Demesne at Kentstown has some tourist facilities and potential to develop further attractions.

- **Settlements & Culture**

• Longwood is the main settlement. Settlement type predominantly small villages with several medium to large villages.

• Settlements have most vernacular buildings. Built development in countryside consists of individual dwellings, generally modern rather than traditional buildings with concentrations of modern built development adjacent to Clonard.

With the exception of an area to the northeast, the Central Lowlands LCA is entirely underlain by Lucan Fm., or the "Calp" limestone, whose differential resistance to erosion relative to the surrounding bedrock, has contributed to the depressed topographic profile (Refer to EIS Section 3.3.2. Bedrock Geology).

The LCA consists of flat-lying lowlands, predominantly as rolling pastureland, with thick wooded hedgerows, some conifer plantations, and shelterbelts of ash and larch, separating medium to large fields. Deep roadside drainage ditches and banked hedgerows are common, and create enclosed rural road corridors with limited views. Forest cover is very limited throughout Meath, with small areas of broadleaf woodland and a few conifer plantations. The land use in the Foxtown area is classed as dominantly pasture with subordinate non-irrigated arable land, where field patterns are medium and the hedgerows are more wooded.

The landscape of LCA 6 is described as generally in good condition, and is rated as being of high value and of regional importance, whilst the sensitivity of the LCA is rated as being medium. The designations assigned to the landscape characteristics for LCA 6 are:

High Value

Areas which are considered to be of value by virtue of their positive characteristics, sense of place or local associations. These areas may be of regional or local importance.

Regional Importance

The landscape is afforded importance by a regionally recognised element or elements within it. These may relate to history, culture, geology or other associations. Such elements may be designated within the County Development Plan or may comprise smaller elements which are not designated but together form an important characteristic of an area, which is recognisable or distinct within the County or Province.

Medium Sensitivity

A landscape that can accommodate a certain amount of change without affecting the overall character. There are unlikely to be large numbers of people using or viewing this landscape.

Several recommendations pertaining to LCA 6 that have a potential bearing on the current proposal are:

Recommendations

- This LCA is in good condition so the existing methods of managing the rural landscape should be maintained.
- Future expansion of settlements should take place in accordance with design guidelines to inform layout, scale, detailing, use of materials and location. Also to ensure that the existing strong interfaces between urban and rural areas are maintained.
- Promote interpretation of historic nature of this LCA including 18th Century estate landscapes, buried archaeology and historic towns.
- Maintain the visual quality of the landscape by avoiding development that would adversely affect short range views between drumlins.
- Have particular regard to the retention of high quality landscapes on the tops of drumlins which are intervisible with the Hills of Tara and Skryne in LCA 12.

The potential capacity of each LCA's is determined based on indicative types of development, and estimates the ability of the landscape to absorb specific types of development. The capacity of LCA 6 to absorb most indicative developments was determined to be medium. Interestingly, low potential capacity indicates high sensitivity to the type of proposed development, which could have detrimental effect on landscape character or value, such as wind turbines in LCA 6 (See below). Unfortunately, the capacity of each LCA for quarrying, mineral extraction and landfill, nor for a WRF, was not determined. Three potentially relevant capacities are:

Potential Capacities

- This LCA is characterised by medium-scale farms so large agricultural buildings would be a change of character. This LCA is also of medium sensitivity and high landscape value. Overall the potential capacity to accommodate such development is medium.
- Medium potential capacity to accommodate road infrastructure and upgrades to existing roads as the small scale wooded nature of the landscape has the potential to screen such developments and there are few archaeological features present.
- Medium potential capacity to accommodate biomass and forestry due to the variety of land uses and strong landscape structure. Commercial forestry is already a feature of the landscape although overprovision for such development needs to be avoided as it will erode the structure of the landscape.

Corine Land Cover (CLC) is a map of the European environmental landscape based on interpretation of satellite images. Land cover is the observed physical cover, as seen from the ground or through remote sensing, including natural or planted vegetation and human constructions (buildings, roads, etc.) which cover the earth's surface. Water, ice, bare rock or sand surfaces count as land cover.

A map showing the CLC in the vicinity of the site has been produced (Refer to Figure 3.8.3). The map shows that the Foxtown area is characterised by a relatively simple land use pattern, dominated by pasture and lesser non-irrigated land, with some discontinuous urban fabric due to Kiltale. Whilst the Boycetown River corridor traverses the wider area, there are no areas of

bog or fen within the landscape. Although not shown in the CLC map, there are a many areas of broadleaf and coniferous afforestation to the west and southwest in the areas of Ginnets Great, Rathmoylan and Summerhill. There is also parkland associated with Galtrim House, c. 1km southeast of the site. It is noteworthy that intensive horticulture is practiced on lands immediately west of the Foxtown WRF site, whilst McCormack Farms operate commercial greenhouses c. 1.5km east of the WRF site at Martinstown. Also, Teagasc runs a large scale Animal Bioscience Research Centre c. 3km east of the WRF site at Grange, Dunsany, Co. Meath.

Finally, the whole area shows evidence of historical and current sand and gravel extraction, particularly associated with the Trim Esker and Galtrim Moraine, although hard rock quarries occur at Rathcore, Cloncowan and Tromman, near Rathmoylan, at Tullykane, Kilmessan, and at Bray Hill. Thus, the site of the quarry and WRF is surrounded by land that is principally, but not exclusively, occupied by agriculture.

The application pertains to an existing and active WRF within a quarry, and thus actually pertains to a non-extractive industrial facility that has slight potential to create medium term impacts on the existing landscape character. As the WRF is co-located within the existing quarry, it is considered that the WRF will not result in any adverse change in land cover, but rather reinstate disturbed and degraded quarry workings to agricultural land.

Meath has many vantage points that offer views and prospects of great natural beauty. The landscape and scenery are of amenity and economic value to residents and tourists, and contribute to the quality of life, such that views and prospects adjoining public roads and from publicly accessible places must be protected. In assessing the potential impacts of development proposals on these views and prospects, there is a need that developments do not obstruct the views and prospects, and should be designed and located to avoid visual intrusion in the landscape when viewed from these vantage points. There are no designated Scenic Routes within the general area (i.e., <5km radius) of Foxtown, nor are there protected views and prospects (Refer to Figure 3.8.2).

3.8.4.2.4 Characteristics of the Development

The proposed continuation of operations of the WRF co-located within the existing quarry at Foxtown will share much of the existing quarry infrastructure and plant. No additional plant, infrastructure or areas of hardstanding will be required. Operations at the WRF involve: importation by truck of soil and stone; examination of the material for contaminants; deposition of material; placement and levelling of material in the quarry void; capping with subsoil and topsoil; and finally reseeding.

The potential viewshed of the WRF site principally arises from minor gaps in the mature hedgerows associated with the two entrances to the site. Although when restored the site will attain a slightly domed topographic profile, existing peripheral screening of intervening banks with tall, mature hedgerows and possibly future forest plantings is expected to be effective at screening views, particularly in the absence of elevated ground overlooking the site. The partially open views of the quarry and WRF from the unnamed local road at the two site entrances are largely passing views.

However, two residences occur across from the main southern entrance, and are open to partial views of the existing quarry and WRF (Refer to Plates 3.8.1 & 3.8.3). Otherwise, the unrestored quarry void is generally not visible from outside vantages. The unrestored quarry void is largely dominated by bare, exposed ground with fragments of scrub at the edges, as well as infrastructure, plant, and stockpiles of materials.

The domed topographic profile of the site, when restored, may expose the backfilling and capping work of the restoration within the WRF site (i.e., currently Phase 1), whereas unrestored ground, where backfilling has yet to commence, is screened within the quarry void (i.e., Phases 2 and 3). Thus, backfilling work to partly reinstate the topographic profile may temporarily increase the visibility of the operation, until such time as the land is restored and returned to agricultural use.

Initially for each phase the void will be backfilled to the level of the adjoining public road. These workings will be screened from outside views by the existing steep natural bank running along the public road. The second stage will involve construction of an esker like feature to the final profile as shown by Figures B.2.4 – Rev A & B.2.5 – Rev A. In general material will be placed in a series of 2 metre lifts to ensure that the material is properly compacted on placement. The outer berm along the public road will be constructed first and subsequently grassed to provide additional screening of the workings from the nearest residences.

These residences will benefit from the final restoration of the quarry lands to beneficial agriculture/woodland habitat in the medium term.

The area has an established history of quarry working, and these activities have co-existed with other predominantly agricultural based land uses. Co-location of the WRF within the quarry is a synergistic integration of two complementary and mutually beneficial processes, and a requirement to complete restoration of the quarry and full reinstatement of the land.

3.8.4.3 VISUAL BASELINE CONDITIONS

As detailed above the desktop study was used to determine the nature of the visual amenity of the area along with the approximate visibility of the development, which is determined through topographic analysis of map data. Potential receptors of visual effects, including residents and visitors through the area were also identified. The desk study provided the basis for subsequent field surveys and was used to delineate the likely zone of visual influence, identify the principal viewpoints and highlight sensitive visual receptors.

A site visit was undertaken on 22/07/2014. Principal viewpoints were mapped and these views illustrated by photographs with annotations to describe any important characteristics, and the changes that have arisen as a result of the development (Refer to Plates 3.8.1 to 3.8.3).

3.8.5 POTENTIAL IMPACTS OF THE DEVELOPMENT

The landscape of the Foxtown area has medium sensitivity, and thus a limited capacity to absorb development, which can have a disproportionate visual impact. This arises from the limited capacity of this landscape of rolling lowlands of pastoral or rural character to physically or visually absorb development. Sensitive development and conservation of the landscape

resource is essential to the underpinning of the rural economy and quality of life of the area. However, it is recognised that areas where there is existing development probably have a high potential to absorb new development. Thus, the WRF is more readily absorbed by the pre-existence of, and co-location within the quarry. Phase 1 is currently being reinstated as part of the quarry restoration scheme, and is reinstating a domed topographic profile in the northern section of the quarry site. These restoration works may suffer from slightly higher visibility, but existing perimeter screening with hedgerows is considered very effective. No additional infrastructure, including buildings or hardstanding areas, have or will be constructed as part of the WRF.

Summary of Potential Landscape Impacts

The principal attributes (and impacts) to be assessed include *inter alia* the following:

- Change of landform from a 'degraded', disused section of quarry to restored agricultural land
- Change of land use from quarrying/extraction to restored agricultural land
- The loss of ecological habitat as a result of the quarry activity
- Views of restoration works from southern site entrance
- Views of broadleaf forest planting in a pastoral landscape

The results of the impact assessment are presented in Table 3.8.1 below

Table 3.8.1 Landscape Impact Assessment Matrix

Topic area	Description of impact	Magnitude[1]	Sensitivity[1]	Level of importance[1]					Quality[2]			Duration[2]					Significance[2]	Mitigation
				I	N	R	C	L	Positive	Neutral	Negative	ST	MT	LT	P	T		
Landform	Change of landform from a 'degraded', disused quarry to restored agricultural/forestry land.	MH	H														Slight to Moderate	Area will be reinstated to a domed topographic profile as improved land on completion of operations.
Land use	Change of land use from quarrying/extraction to restored agricultural/forestry land.	MH	H														Slight	The final restoration of the entire quarry site will return the WRF site to agricultural and/or forestry use.
Loss of ecological habitat	WRF is sited within previously quarried area and as such there will be no direct impact on the ecological habitat.	N	N														Imperceptible	Area will be reinstated to a domed topographic profile as improved agricultural/forestry land on completion of operations.
Loss of cultural heritage	No direct impacts on known archaeological or architectural heritage.	N	N														Imperceptible	As the WRF will have no direct or indirect impact on the archaeological, architectural or cultural heritage resource, it is considered mitigation measures are not required.
Views at southern site entrance	Backfilling work to partly reinstate the topographic profile may temporarily increase the visibility of the operation, until such time as the land is restored and returned to agricultural use.	MH	M														Moderate	The outer berm along the public road will be constructed first and subsequently grassed to provide additional screening of the workings from the nearest residences. These residences will benefit from the final restoration of the quarry lands to beneficial agriculture/woodland habitat in the medium term
Views of forest planting	Views of broadleaf forest from distant viewpoints.	ML	L														Slight	Broadleaf forest planting is not uncharacteristic of LCA, and will tend to blend with mature hedgerows and nearby wooded copses and stands.

Key

Level of importance I = International; N = National; R = Regional; C = County; L = Local

Magnitude and sensitivity N = Negligible; VL = Very Low; L = Low; ML = Medium–Low; M = Medium; MH = Medium–High; H = High; VH = Very High

Notes

1 Criteria used based on The Landscape Institute with the Institute of Environmental Management & Assessment, (2005) Guidelines for Landscape and Visual Impact Assessment - 2nd Ed.

2 The terminology used based on Chapter 5 –'Glossary of Impacts', Guidelines on the information to be contained in Environmental Impact Statements: Environmental Protection Agency (2002)

Table 3.8.2 PREDICTED VISUAL IMPACTS WITH MITIGATION

NATURE OF IMPACT			Level of importance[1]					Quality[2]			Duration[2]					Magnitude[1]	Receptor Sensitivity[1]	Significance[2]	Mitigation
Viewpoint Plate	Location	Description	I	N	R	C	L	Positive	Neutral	Negative	ST	MT	LT	P	T				
3.8.1	View from southern quarry entrance looking south on Local road	View opposite quarry entrance (no exit) and nearest residences. Phase 2 restoration area is screened by mature intervening hedgerow. Views are partially open to residences and passing traffic.														M	MH	Slight to Moderate	No mitigation considered necessary with respect to phase 2 restoration due to existing wooded and mature hedgerow. The outer berm along the public road for Phase 3 will be constructed first and subsequently grassed to provide additional screening of the workings from the nearest residences. These residences will benefit from the final restoration of the quarry lands to beneficial agriculture/woodland habitat in the medium term
3.8.2	View from southern quarry entrance looking north on Local road	View opposite quarry entrance and nearest residences. Phase 3 restoration area is mostly screened by roadside bank with partially open view limited to site exit. Old cement silo and some site infrastructure is also visible.														MH	MH	Slight to Moderate	Construct perimeter berm along eastern boundary during phase 3 restoration prior to main backfilling operations so as to provide additional screening. Remove old cement silo and associated infrastructure. These residences will benefit from the final restoration of the quarry lands to beneficial agriculture/woodland habitat in the medium term
3.8.3	View from main WRF Northern entrance	View towards main WRF entrance from unnamed local road. There are no views of plant, infrastructure or workings related to the quarry or WRF, just steel fencing and lockable gates in gap in mature, tall hedgerow screening. Views very restricted by substantial mature hedgerow and bank from passing traffic.														M	H	Slight	None considered necessary from this vantage..

Key

Level of importance I = International; N = National; R = Regional; C = County; L = Local

Magnitude and sensitivity N = Negligible; VL = Very Low; L = Low; ML = Medium–Low; M = Medium; MH = Medium–High; H = High; VH = Very High

Notes

1 Criteria used based on The Landscape Institute with the Institute of Environmental Management & Assessment, (2005) Guidelines for Landscape and Visual Impact Assessment - 2nd Ed.

2 The terminology used based on Chapter 5 –'Glossary of Impacts', Guidelines on the information to be contained in Environmental Impact Statements: Environmental Protection Agency (2002)

3.8.5.1 POTENTIAL VISUAL IMPACTS

The results of the visual field survey have shown that due to intervening topography, screening, and vegetation, views towards the WRF site are generally very limited views of the two entrances from the unnamed local road, and two residences on the eastern side of same (Refer to Table 3.8.2 and Plates 3.8.1 to 3.8.3). With the exception of the two entrances, the quarry and WRF are well screened from views from outside the lands.

In general, the views afforded by the two entrances of the quarry and WRF are partially open views, which are passing or transient. However, two residences occur across from the main southern entrance, and are open to partial views of the existing quarry (Refer to Table 3.8.2 and Plates 3.8.1 to 3.8.3).

3.8.5.2 INDIRECT IMPACTS

There are no indirect impacts associated with the proposed continuation of operations at the WRF and the surrounding areas.

3.8.6 MITIGATION MEASURES

Mitigation measures include avoidance, reduction, compensation and remedy of potential impacts. The primary means of mitigation involves an efficient design and layout for the WRF that optimises use of existing infrastructure and plant, discrete placement of imported materials, provision of screening berms, preservation of existing hedgerows and trees, and the full restoration of the WRF and quarry site, once operations at the site cease.

The objective of the restoration scheme is to ensure visual amenity and to restore the excavation to a beneficial after-use. This would be in accordance with the proper planning and sustainable development of the area.

Because the WRF is co-located within the Foxtown quarry site, it will benefit from existing mitigation measures. The quarry is largely screened from outside views by intervening topography and hedgerows. The boundaries are largely maintained with hedgerows and stock fencing. Views of the WRF site arise at the two quarry entrance, and generally these are partially open and passing. The domed topographic profile of the site may expose the restoration work within the WRF site to other more distant vantages, whereas unrestored ground is screened within the quarry void.

The WRF is located within the existing quarry workings. The quarry is not a skyline feature, occupying a low field of view from distant receptors; with field boundaries and trees forming the background. The views are mostly obscured by intervening topography and hedgerows. Where views are present, the views are very restricted.

The restoration plan involves the progressive backfilling of the quarry void on a phased basis, with natural inert soil and stone sourced externally and imported. Topsoil will be seeded and the area returned to useable improved land for agricultural grassland for livestock grazing and/or forestry. It is proposed that any imported soil and stone will be used to carry out restoration of existing quarry workings in accordance with the landscaping scheme submitted to Meath County Council in accordance with conditions imposed under P.A. Reg. Ref QY48, QC 17.QC2113).

Phase1 of the restoration scheme is nearing completion. Phase 1 is effectively screened from outside views by maintenance of the existing perimeter banks and mature hedgerow planting and trees.

No mitigation considered necessary with respect to phase 2 restoration due to existing wooded and mature hedgerow (Refer to Plate 3.8.1).

The outer berm along the public road for Phase 3 will be constructed first and subsequently grassed to provide additional screening of the main backfilling operations from the nearest residences.

Removal of the old cement silo and associated infrastructure near the southern quarry entrance would significantly mitigate any limited partial views of the quarry and WRF. (Refer to Plate 3.8.2).

Initially for each phase the void will be backfilled to the level of the adjoining public road. These workings will be screened from outside views by the existing steep natural bank running along the public road. The second stage will involve construction of an esker like feature to the final profile as shown by Figures *B.2.4 – Rev A & B.2.5 – Rev A.* In general material will be placed in a series of 2 metre lifts to ensure that the material is properly compacted on placement. The outer berm along the public road will be constructed first and subsequently grassed to provide additional screening of the workings from the nearest residences.

The final landform will comprise a ridge running northwest to southeast which will be similar in profile to the original esker ridge that ran through the lands (Refer to Figure B.2.4 – Rev A).

The residences near the southern quarry entrance will benefit from the final restoration of the quarry lands to beneficial agriculture/woodland habitat in the medium term.

Ultimately, on cessation of operations at the quarry and WRF, the infrastructure will be decommissioned and the site will be fully reinstated back to agricultural and or forestry land.

3.8.7 REFERENCES

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3.8.8 FIGURES

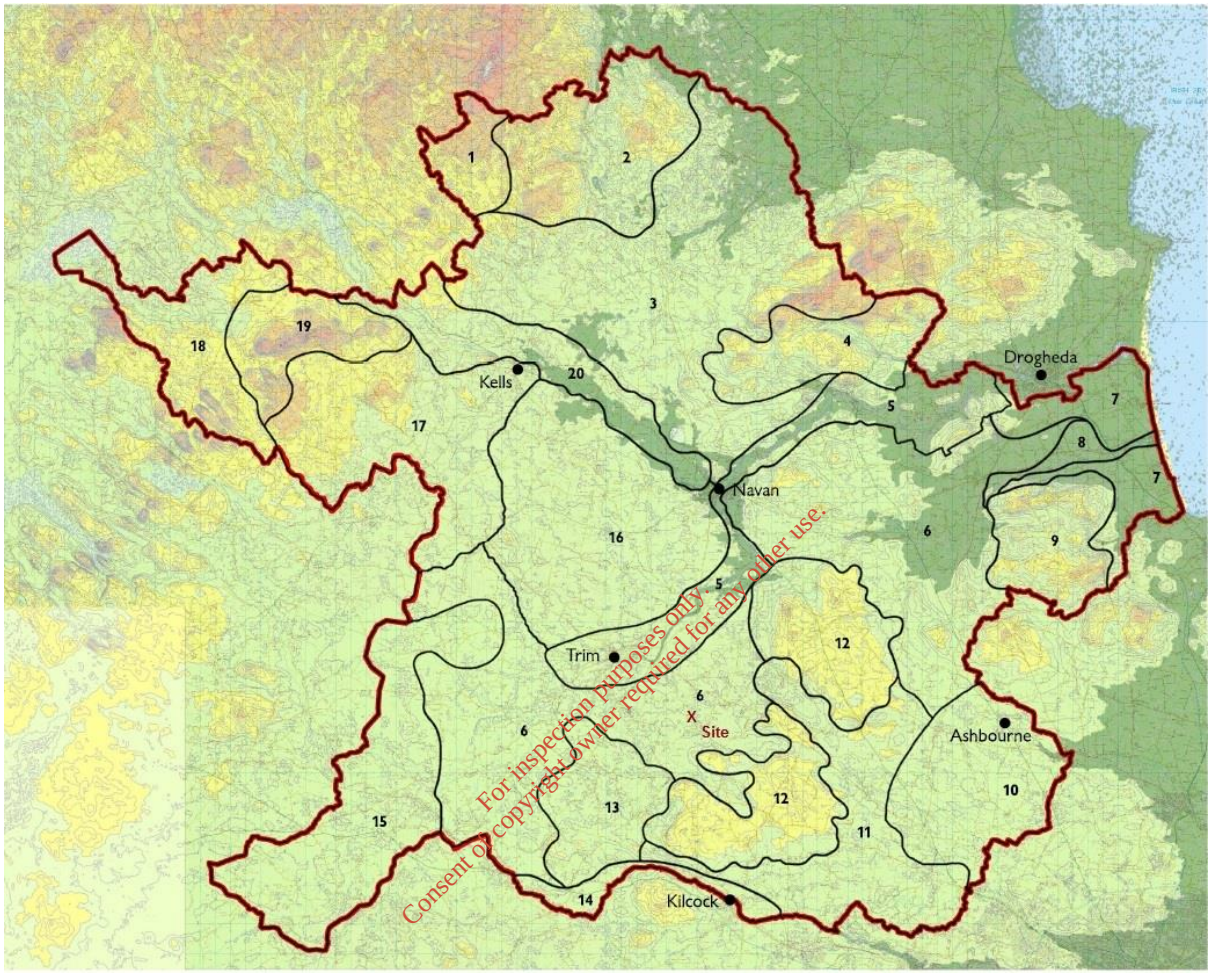

Figure 3.8.1. Landscape Character Areas (LCTs) of County Meath overlaid on the topographic map. Note that Foxtown occurs in LCA 6: the Central Lowlands, southeast of Trim, and in the shadow of the LCA 12: the Tara Skryne Hills. Site marked by X. Redrawn from the Meath Landscape Character Assessment by Meath County Council (2007).

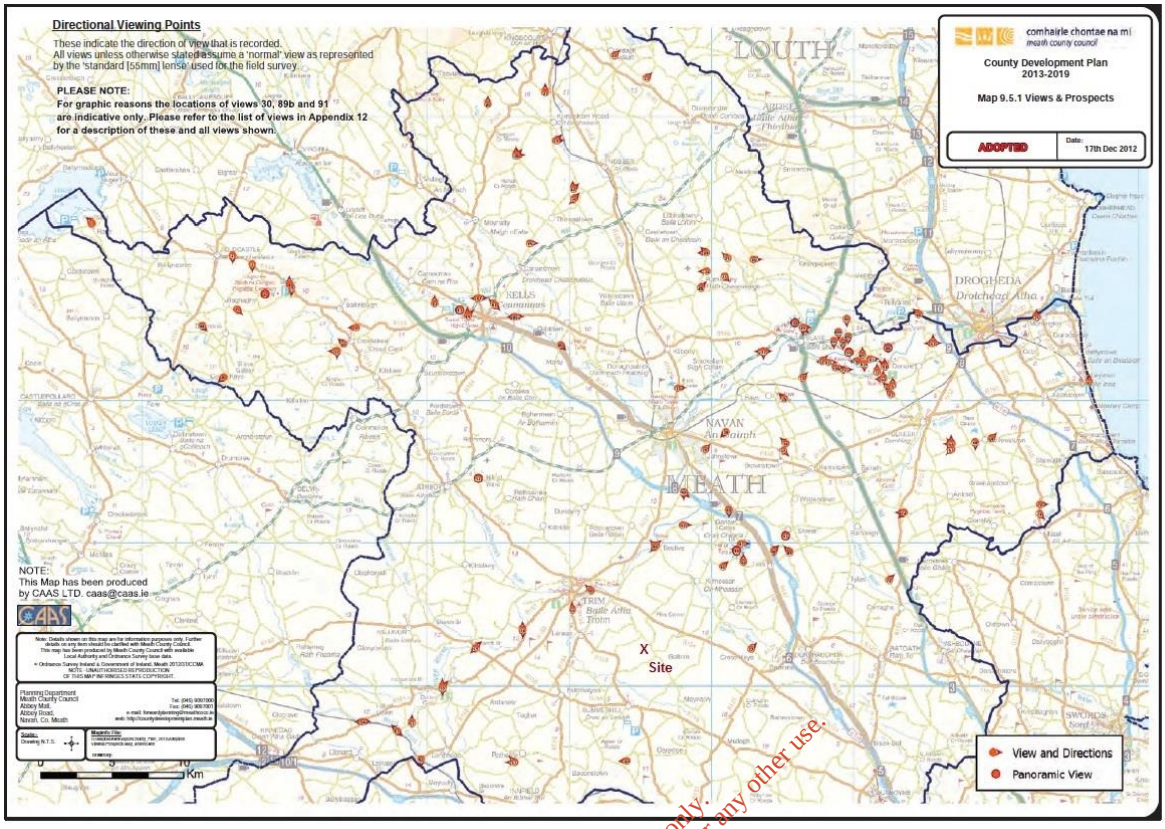

Figure 3.8.2. Views and Prospects of County Meath. Note that there are no views and prospects in the vicinity of the Foxtown site. Site marked by X. Redrawn from Meath County Council (2013).

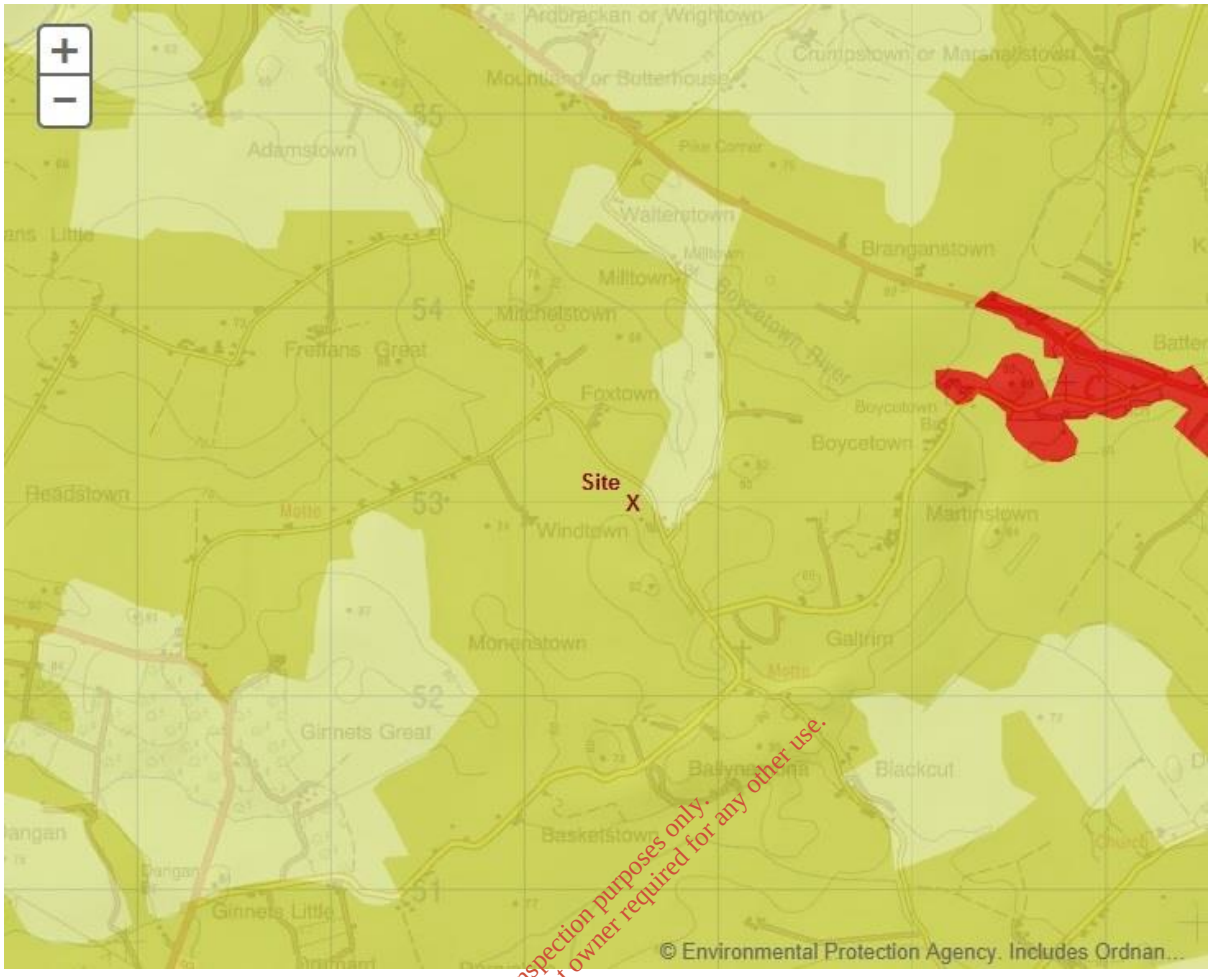

Figure 3.8.3. Corine Landcover (2006) Mapping. Medium green: pasture; light green: non-irrigated land (i.e., arable); Light red: discontinuous urban fabric of Kiltale. Notably, mineral extraction sites (i.e., quarries) are not indicated. Site marked by X. Scale: Grid Square = 1km.

3.8.9 PLATES

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Plate 3.8.1

Location: View from Southern Quarry Entrance Looking South on Local County Road

Description: View opposite quarry entrance (no exit) and nearest residences. Phase 2 restoration area is screened by mature intervening hedgerow. Views are partially open to residences and passing traffic.

Mitigation: No mitigation considered necessary with respect to phase 2 restoration due to existing wooded and mature hedgerow. The outer berm along the public road for Phase 3 will be constructed first and subsequently grassed to provide additional screening of the workings from the nearest residences. These residences will benefit from the final restoration of the quarry lands to beneficial agriculture/woodland habitat in the medium term

Plate 3.8.2

Location: View from southern quarry entrance looking north on Local road

Description: View opposite quarry entrance and nearest residences. Phase 3 restoration area is mostly screened by roadside bank with partially open view limited to site exit. Old cement silo and some site infrastructure is also visible.

Mitigation: Construct perimeter berm along eastern boundary during phase 3 restoration prior to main backfilling operations so as to provide additional screening. Remove old cement silo and associated infrastructure. These residences will benefit from the final restoration of the quarry lands to beneficial agriculture/woodland habitat in the medium term .

Date of Visual Survey: 23/07/2014

Weather: Dry bright day.

JSPE
31 Athlumney Castle,
Navan, Co Meath
Phone/Fax: 046 9073997
Email: johnsheils@jspe.ie

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Plate 3.8.3

Location: View from main WRF Northern entrance

Description: View towards main WRF entrance from unnamed local road. There are no views of plant, infrastructure or workings related to the quarry or WRF, just steel fencing and lockable gates in gap in mature, tall hedgerow screening. Views very restricted by substantial mature hedgerow and bank from passing traffic.

Mitigation: None considered necessary from this vantage.

Date of Visual Survey: 23/07/2014

Weather: Dry bright day.

JSPE
31 Athlumney Castle,
Navan, Co Meath
Phone/Fax: 046 9073997
Email: johnsheils@jspe.ie

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3.9 CULTURAL HERITAGE

3.9.1 INTRODUCTION

3.9.1.1 Outline of Scope of Works

3.9.1.1.1 General

This report has been prepared on behalf of Kiernan Sand and Gravel Ltd. in order to assess and define the impact, if any, on the archaeological, architectural and cultural heritage resource of the continued operation of a Waste Recovery Facility (WRF) at Foxtown townland, Summerhill, County Meath (OS Sheet 037, figure 3.9.1). The report has been prepared by Dermot Nelis.

This desk-based study will determine, as far as is reasonably possible from existing records, the nature of the cultural heritage resource within the proposed development area using appropriate methods of study.

The study involved interrogation of the archaeological and historical background of the proposed development area. This included information from the Record of Monuments and Places (RMP) of County Meath, Topographical Files of the National Museum of Ireland, Meath County Development Plan 2013-2019, cartographic sources, documentary records and aerial photographs. A field inspection was carried out on 19th July 2014 in an attempt to identify any previously unrecorded features and/or portable finds within the proposed development area. A study area of 1km has been imposed around the area of land take.

An impact assessment and mitigation strategy has been prepared. The impact assessment is undertaken to outline potential adverse impacts the proposed development may have on the archaeological, architectural or cultural heritage resource, while the mitigation strategy is designed to avoid, reduce or offset such adverse impacts.

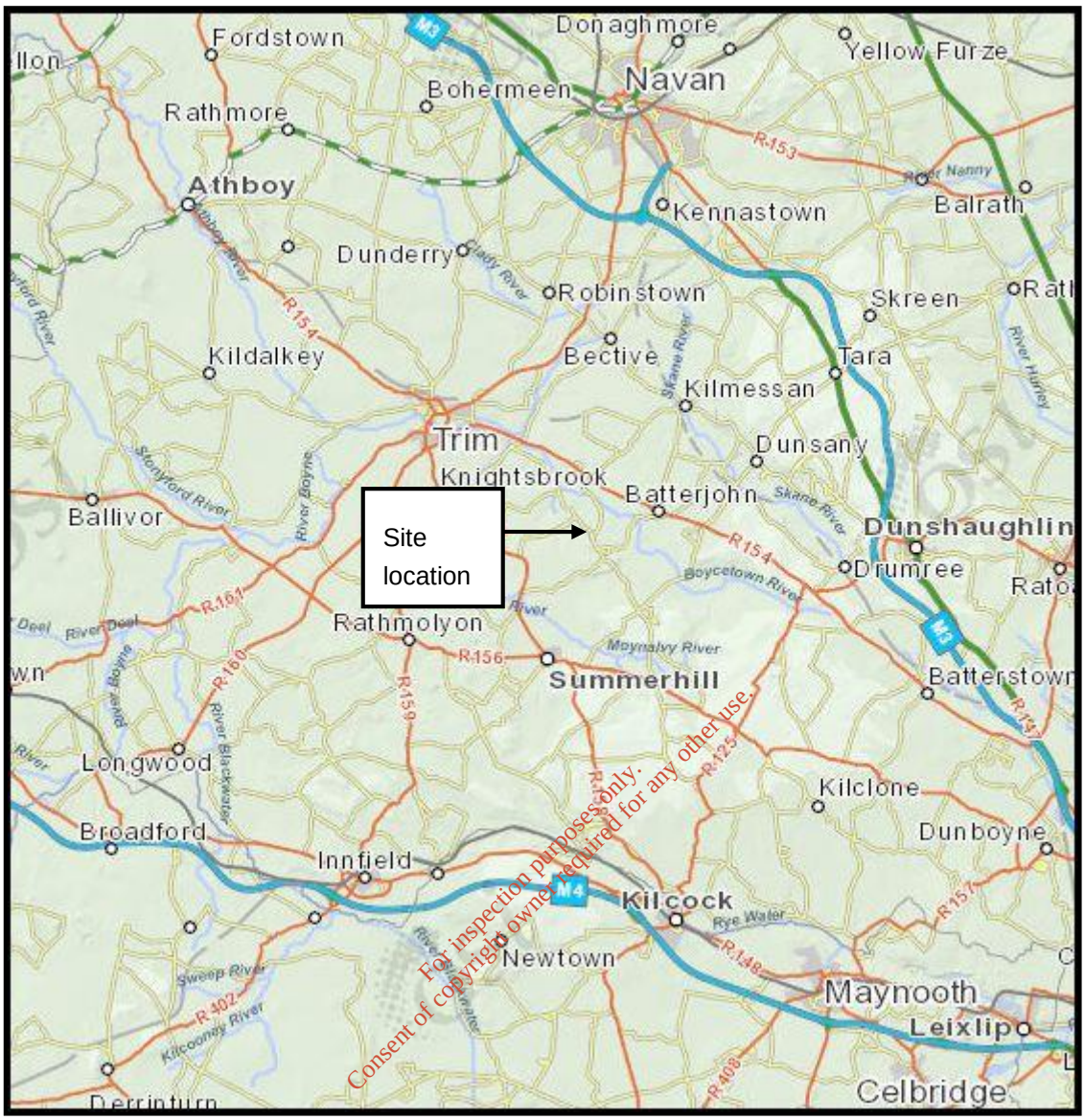

Figure 3.9.1: Site location

3.9.1.1.2 The Development

The proposed development is located approximately 5.7km south east of Trim and 5.1km north of Summerhill. It is proposed to continue the phased restoration of a sand and gravel pit using imported inert soils, stone and recovery of inert construction and demolition waste (figure 3.9.2). It is proposed that up to 40,000 cubic metres per annum of inert materials will be accepted to the site.

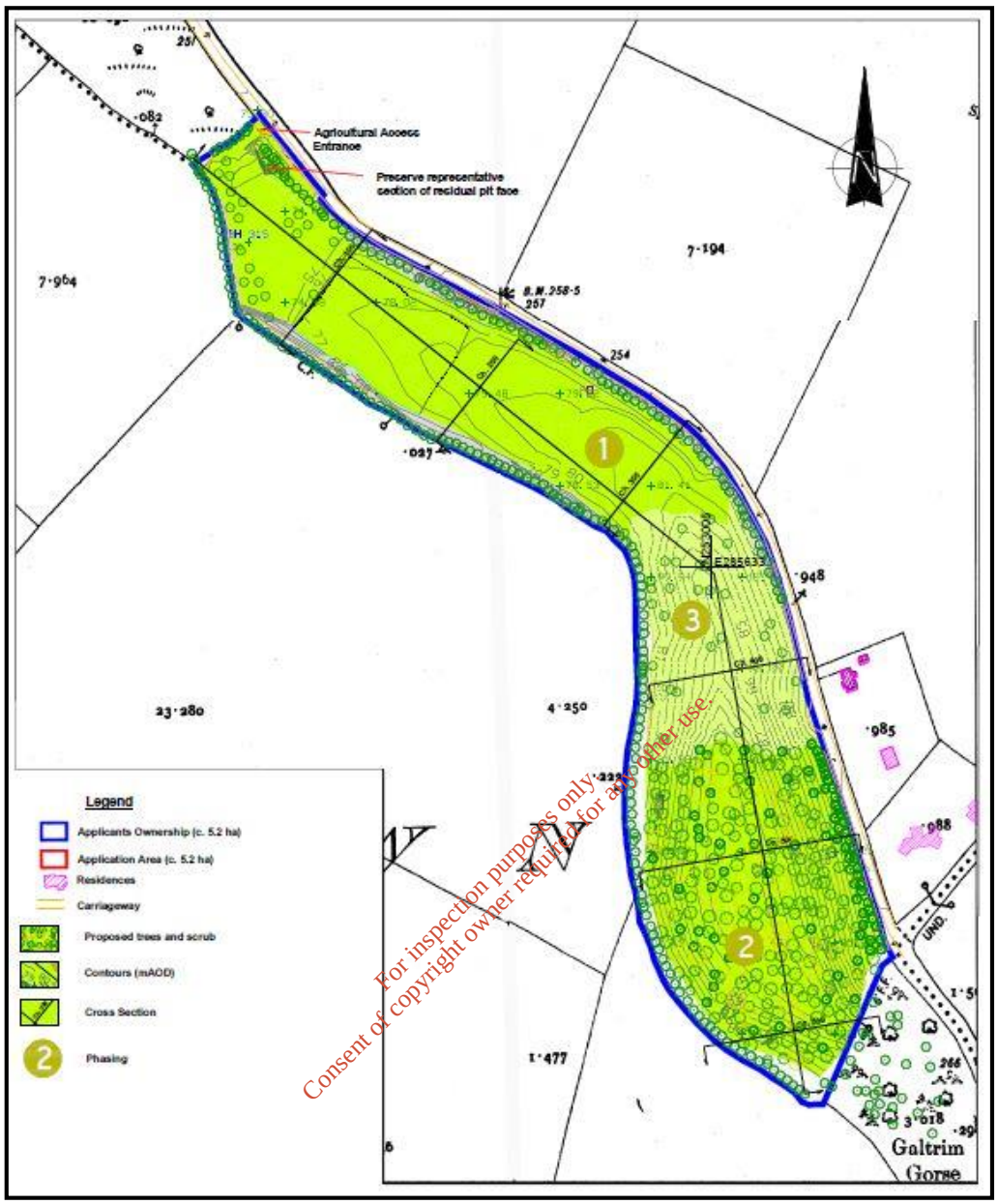

Figure 3.9.2: Site layout

3.9.1.2 PROJECT TEAM

Dermot Nelis BA ArchOxon AIFA MIAI

Dermot Nelis graduated from Queen's University Belfast, and after gaining extensive fieldwork experience undertook postgraduate studies at the University of Oxford in archaeological consultancy and project management.

Dermot has acted as Senior Archaeologist on several road schemes for various County Councils/National Roads Authority, and Directed large-scale multi-period excavations associated with those developments. He has completed over 100 Licensed fieldwork programmes and over 250 archaeological, architectural and cultural heritage desk-based reports and Environmental Impact Assessments.

3.9.2 BASELINE ENVIRONMENTAL STUDY

3.9.2.1 METHODOLOGY

Research has been undertaken in two phases. The first phase comprised a desktop survey of archaeological, historical and cartographic sources. The second phase involved a field inspection of the proposed development area.

3.9.2.2 PAPER SURVEY

The following sources were examined, and a list of sites and areas of archaeological, architectural or cultural heritage potential was compiled:

- Record of Monuments and Places of County Meath;
- Topographical Files of the National Museum of Ireland;
- Cartographic and documentary sources relating to the study area;
- Aerial photographs of Ordnance Survey Ireland and Bing aerial photography;
- Meath County Development Plan 2013 – 2019;
- National Inventory of Architectural Heritage.

Record of Monuments and Places is a list of archaeological sites known to the National Monuments Service. Back-up files of the Sites and Monuments Record (SMR) provide details of documentary sources and field inspections where these have taken place.

Topographical Files of the National Museum of Ireland is the national archive of all known finds recorded by the National Museum. This archive relates primarily to artefacts, but also includes references to monuments and unique records of previous excavations. The find spots of artefacts are important sources of information on the discovery of sites of archaeological significance.

Cartographic sources are important in tracing land use development within the area of proposed land take, as well as providing important topographical information on sites and areas of archaeological potential. Cartographic analysis of relevant maps has been made to identify any topographical anomalies that may no longer remain within the landscape.

Documentary sources were consulted to gain background information on the historical and archaeological landscape of the proposed development area.

Aerial photographic coverage is an important source of information regarding the precise location of sites and their extent. It also provides initial information on the terrain and its potential to contain previously unidentified archaeological remains.

Meath County Development Plan 2013-2019 contains Policies and Objectives on the preservation and management of archaeological, architectural and cultural heritage features. They were consulted to obtain information on sites within the proposed development area and the 1km study area.

National Inventory of Architectural Heritage (NIAH) is a section within the Department of Arts, Heritage and the Gaeltacht (DoAHG). The work of NIAH involves identifying and recording on a non-statutory basis the architectural heritage of Ireland from 1700 to the present day. The NIAH website also contains a non-statutory register of historic gardens and

designed landscapes in Meath, and this was assessed to look for the presence of any such features within the proposed development area and the 1km study area.

3.9.2.3 FIELD INSPECTION

Field inspection is necessary to determine the extent, character and condition of archaeological, architectural and cultural heritage remains, and can also lead to the identification of previously unrecorded or suspected sites and portable finds through topographical observation and local information.

3.9.3 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

3.9.3.1 GENERAL

During the Mesolithic period (*c*. 7,000–4,000 BC) people existed as hunters/gatherers, living on the coastline, along rivers and lakesides. They used flint and other stones to manufacture sharp tools, and locating scatters of discarded stone tools and debris from their manufacture can sometimes identify settlements. Their impact on the landscape was minimal, and the limited amount of evidence includes the remains of timber houses and primitive stone tools. In Meath, the Rivers Boyne and Blackwater were the most important means of travel and Mesolithic period settlements were concentrated on their banks (Meath County Council 2013, Volume 2, Appendix 7, 11).

In 1998 excavation at Moynagh Lough, Brittas, County Meath focused on an area of Late Mesolithic activity sealed beneath an Early Medieval crannog. Artefactual evidence included three polished stone axeheads, six spearheads of slaty sandstone, five elongated pebbles, nine hammerstones and two polishing stones. Approximately 2,000 pieces of chert, flint and other stone were recovered from the site. A single shallow pit exposed in isolation during archaeological testing in 2001, at Kilsharvan, County Meath, had upon analysis a radiocarbon determination *c*. 5,060–4,800 BC, dating it to the later Mesolithic (www.excavations.ie). Late Mesolithic conical, woven basketry fish-traps were discovered during archaeological excavations at Clowanstown, County Meath (Clancy 2009, 40-41). A Mesolithic fishing platform and Neolithic burnt mounds were revealed near the centre of a former lough. Five mounds were located at the western edge of a raised bog and a mooring was identified by the position of six substantial stakes around the landward side of the former lough. This possibly provided a structure to fish from as well as a potential mooring for a dugout canoe. Radiocarbon determinations from wood samples returned a date range of between 5,000–4,000 cal BC (www.excavations.ie).

The population became more settled during the Neolithic period (*c*. 4,000-2,400 BC) with a subsistence economy based on crop growing and stock-raising. This period also saw changes in burial practices, and a tradition of burying the dead collectively and carrying out of cremations emerged. Neolithic monuments from County Meath include portal, passage and wedge tombs. Some of the most recognisable Neolithic monuments in Ireland are located at Brú na Bóinne, County Meath. The megalithic tombs, which date from *c*. 3,000 BC, belong to the Neolithic period and are classified as passage tombs. They occupy the high ground on ridges in an area densely covered by archaeological remains. This archaeological zone is to a large extent bounded by the River Boyne to the south and to the north by its tributary, the River Mattock.

The Bronze Age (*c*. 2,400-600 BC) is characterised by the introduction of metalworking technology to Ireland and coincides with many changes in the archaeological record, both in terms of material culture as well as the nature of the sites and monuments themselves. Though this activity has markedly different characteristics to that of the preceding Neolithic period, including new structural forms and new artefacts, it also reflects a degree of continuity. During this period knowledge of metalworking was acquired resulting in changes in material culture such as the introduction of metal tools and artefacts as well as the introduction of a highly decorated pottery called Beaker pottery. In addition to changes in material culture, there were changes in burial rite from communal megalithic tombs to single burial in cists. These communities were responsible for the vast communal burial grounds such as the famous passage graves to be found at the Bend of the Boyne and the 30 cairns scattered over two hills at Slieve na Calliagh dating from *c*. 3,500 BC. Bronze Age monuments from County Meath include standing stones, stone pairs, cairns, barrows and *fulachta fiadh,* which are one of the most numerous monument types in Ireland with over 4,500 examples recorded (Waddell 2005, 174). The number and importance of prehistoric structures in County Meath is considered to exceed that of any other part of Ireland; high quality remains are most in evidence in the Boyne Valley, Hill of Tara and Loughcrew Hills.

RMP ME037-045 is recorded as a ring-ditch approximately 850m north west of the proposed development area in Mitchelstown townland. It is located on a slight south west facing slope. It is a circular area with an internal diameter of approximately 10m and is defined by a single ditch approximately 1 - 2m in width. There is a possible entrance gap approximately 2 - 3m wide at the north east. This feature is visible on aerial photography and does not survive above-ground.

Ring-ditches take the form of a circular or near circular ditch, usually less than 10m in diameter, and are visible as cropmarks/soilmarks on aerial photographs. The function of these monuments is unknown as they may be the remains of ploughed out barrows, round houses or other modern features and, in consequence, may date to any period from prehistory onwards.

During the Iron Age (*c*. 600 BC-400 AD) new influences came into Ireland which gradually introduced the knowledge and use of iron, although for several centuries bronze continued to be widely used. The Iron Age in Ireland however is problematic for archaeologists as few artefacts dating exclusively to this period have been found, and without extensive excavation it cannot be determined whether several monument types, such as ring-barrows or standing stones, date to the Bronze Age or Iron Age. Most knowledge for this period stems from Irish folklore, the epic poems and legends of warrior kings and queens that are traditionally believed to be Celtic in origin.

The Early Medieval period (*c*. 400-1169 AD) is depicted in the surviving sources as entirely rural, characterised by the basic territorial unit known as *túath.* Walsh (2000, 30) estimates that there were at least 100, and perhaps as many as 150, kings in Ireland at any given time during this period, each ruling over his own *túath.* Many sites in County Meath are said to have specific associations with St. Patrick. In particular the Hill of Slane was the site of the lighting of the first Paschal Fire by St Patrick in 432 AD, in defiance of King Leoghaire and pagan tradition. A number of St. Patrick's followers established churches and monasteries throughout County Meath, such as that founded by St. Erc at Slane and that at Trim by St. Loman. St. Patrick placed St. Cianan over the first Church in Duleek in the 5th century, and prior to his death in 489 AD he was credited with building the first stone church in Ireland. The first monastery said

to have been founded by St. Patrick was that at Donaghmore (Meath County Council 2013, Volume 2, Appendix 7, 13).

The new religious culture brought changes in settlement and agricultural patterns. The ringforts and associated field patterns of the Early Medieval period indicate a life largely based on grazing. During this turbulent period roughly circular defensive enclosures known as ringforts were constructed to protect farmsteads. They were enclosed by an earthen bank and exterior ditch, and ranged from approximately 25m to 50m in diameter. The smaller sized and single banked type (univallate) was more than likely home to the lower ranks of society, while larger examples with more than one bank (bivallate/trivallate) housed the more powerful kings and lords. They are regarded as defended family homesteads and the extant dating evidence suggests they were primarily built between the 7th and 9th centuries AD (Stout 1997, 22-31). The ringfort is considered to be the most common indicator of settlement during the Early Medieval period. The most recent detailed study (*ibid*., 53) has suggested that there is an approximate total of 45,119 potential ringforts or enclosure sites throughout Ireland.

A ringfort (RMP ME037-021) is recorded approximately 670m north of the proposed development area in Foxtown townland. It is recorded (www.archaeology.ie) as a raised sub-circular area defined by a scarp and with a surrounding ditch. It has an entrance and a causeway in the south south east and the monument measures 32m north/south x 29m east/west.

Ringforts (RMP ME037-022 and ME037-024) are recorded 1.2km and 1.03km north east respectively of the proposed development area in Branganstown townland.

Enclosure sites belong to a classification of monument whose precise nature is unclear. Often they may represent ringforts, which have either been damaged to a point where they cannot be positively recognised, or are smaller or more irregular in plan than the accepted range for a ringfort. An Early Medieval date is in general likely for this site type, though not a certainty.

The classification of archaeological monuments is often made difficult by their condition, whether it be the result of deliberate destruction, trampling by livestock or natural weathering and erosion. The term "*earthwork*" is used to denote any monument or feature of artificial origin which cannot be further categorised without excavation. The term "*earthwork site*" indicates sites which were levelled before detailed archaeological inspection took place. The majority of such sites may be levelled or destroyed ringforts. An earthwork (RMP ME037-023) is recorded approximately 1.1km north east of the proposed development area in Branganstown townland.

The Early Medieval period is also characterised by the foundation of a large number of ecclesiastical sites throughout Ireland in the centuries following the introduction of Christianity in the 5th century. The early churches tended to be constructed of wood or post-and-wattle. Between the late 8th and 10th centuries mortared stone churches gradually replaced the earlier structures. Many of the sites, some of which were monastic foundations, were probably originally defined by an enclosing wall or bank similar to that found at coeval secular sites. This enclosing feature was probably built more to define the sacred character of the area of the church than as a defence against aggression. An inner and outer enclosure can be seen at some of the more important sites; the inner enclosure surrounding the sacred area of church and burial ground and the outer enclosure providing a boundary around living quarters and craft areas. Where remains of an enclosure survive it is often the only evidence that the site was an early Christian foundation.

A church (RMP ME043-001) is recorded in Galtrim townland approximately 630m south east of the proposed development area. It is recorded (www.archaeology.ie) that the present church was erected in 1800 but it could have been built on the foundations of an earlier church, since the north wall has base batter. Hood mouldings built into the south wall and the north and south windows on the present tower may be reused. Projecting east from the present church are the remains of a chancel.

The commencement of Viking raids at the end of the 8th century and their subsequent settlement during the following two centuries marked the first ever foreign invasion of Ireland. Viking settlement evidence is scarce and has been found in Dublin and Waterford, however, excavations there have revealed extensive remains of the Viking towns. Outside these towns understanding of Viking settlement is largely drawn from documentary and place-name evidence. In addition to Dublin and Waterford, documentary sources provide evidence for the Viking foundation of the coastal towns of Limerick, Wexford and Cork (Edwards 2006, 179). Other indirect evidence which suggest Viking settlement, or at least a Norse influence in Ireland, is represented by upwards of 120 Viking-age coin hoards, possible votive offerings of Viking style objects and the assimilation of Scandinavian art styles into Irish design. Whilst the initial Viking raids would have been traumatic, the wealth and urban expansion brought into the country as a result of Viking trading would have eventually benefited the Gaelic Irish and the cultural assimilation in some parts would have been significant.

In the 9th century County Meath suffered from invasions by the Danes. Turgesius sailed up the River Boyne in 838 and after a period of devastation, often directed at the church, set up his regime and rule near Tara. The Danes however continued their attacks until 980 when they were defeated at Tara. During their period of power the Viking invaders promoted a more commercial and urbanised lifestyle, and the founding of towns and villages grew apace after the Norman invasion (Meath County Council 2013, Volume 2, Appendix 7, 13).

The arrival of the Anglo-Normans in Ireland towards the end of the 12th century caused great changes during the following century. Large numbers of colonists arrived from England and Wales and established towns and villages. They brought with them new methods of agriculture which facilitated an intensification of production. Surplus foods were exported to markets all along Atlantic Europe which created great wealth and economic growth. Results of this wealth can be seen in the landscape in the form of stone castles, churches and monasteries.

The county of Meath was granted to Hugh de Lacy, by Henry II, to hold by the service of 50 knights. Under the Normans the system of landownership was a manorial one with towns and villages established around castles. The town of Trim was the centre of Norman power in County Meath. Kells was also prominent as a Norman fortification, although most of the remains from that period have not survived.

The political structure of the Anglo-Normans centered itself around the establishment of shires, manors, castles, villages and churches. In the initial decades after the Anglo-Norman invasion a distinctive type of earth and timber fortification was constructed- the motte and bailey. Mottes were raised mounds of earth topped with a wooden or stone tower while the bailey was an enclosure, surrounded by an earthen ditch with a timber palisade, used to house ancillary structures, horses and livestock. There are 24 motte and baileys and 42 mottes recorded in County Meath (www.archaeology.ie).

A motte (RMP ME043-002) is recorded in Galtrim townland, approximately 750m south east of the proposed area of land take. It is recorded (www.archaeology.ie) as an oval flat-topped

earthen mound, defined by a ditch from north to south east. It measures 36m north west/south east x 24m north east/south west at the top with maximum base dimensions of 62m and a height of 7m. A bailey may have existed along the ridge to the south east. A motte (RMP ME037-020) is also recorded approximately 1.35km west of the proposed development area in Ginnets Great townland.

In certain areas of Ireland however Anglo-Norman settlers constructed square or rectangular enclosures, now termed moated sites. Their main defensive feature was a wide, often water-filled, fosse with an internal bank. As in the case of ringforts, these enclosures protected a house and outbuildings usually built of wood. They appear to have been constructed in the latter part of the 13th century, although little precise information is available. There are 22 moated sites recorded in County Meath (www.archaeology.ie).

More substantial stone castles followed the motte and bailey and moated sites in the 13th and 14th centuries. Tower houses are regarded as late types of castle and were erected from the 14th to early 17th centuries. Their primary function was defensive, with narrow windows and a tower often surrounded by a high stone wall (bawn). An Act of Parliament of 1429 gave a subsidy of £10 to "*liege*" men to build castles of a minimum size of 20ft in length, 16ft in breadth and 40ft in height (6m x 5m x 12m). By 1449 so many of these £10 castles had been built that a limit had to be placed on the grants. The later tower houses were often smaller, with less bulky walls and no vaulting. There are 58 tower houses recorded in County Meath (www.archaeology.ie).

The present tower at Trim Castle was completed by William Peppard in 1220 AD. Combined with the massive curtain walls, gates and associated buildings, it is the largest castle in Ireland. More modest than Trim were the baronial castles of Dardistown, Killeen and Dunsany (Meath County Council 2013, Volume 2, Appendix 7, 15).

The 14th century throughout north west Europe is generally regarded as having been a time of crisis, and Ireland was no exception. Although the Irish economy had been growing in the late 13th century, it was not growing quickly enough to support the rapidly expanding population, especially when Edward I, was using the trade of Irish goods to finance his campaigns in Scotland and Wales. When the Great European Famine of 1315-17 AD arrived in Ireland, brought about by lengthy periods of severe weather and climate change, its effects were exacerbated by the Bruce Invasion of 1315-18 AD. Manorial records which date to the early 14th century show that there was a noticeable decline in agricultural production. This economic instability and decline was further worsened with the onset of the Bubonic Plague in 1348 AD.

Before the Tudors came to the throne the kings of England were also the kings of western France and so, during the 14th and 15th centuries, the various lords who ruled in Ireland were largely left to themselves. The Tudor conquest however brought a much greater interest in the affairs of Ireland. They wanted to put a stop to the raids of the Gaelic Irish on the areas under English rule. To do this, they ruthlessly put down any rebellions and even quashed inter-tribal feuds. English settlers were then brought in to settle their lands. The first of these plantations occurred in the mid-16th century in what is now Laois and Offaly. After the Desmond rising in Munster in 1585 AD came another plantation, and parts of south western Tipperary were planted at that time.

From 1593 AD until 1603 AD, there was a countrywide war between the Gaelic Irish, who were supported by the French, and the Elizabethan English. The Irish were finally defeated and with

the "*Flight of the Earls*" from Rathmullan, County Donegal in 1607, Ulster, which had previously been independent of English rule, was planted.

Expansion in the agricultural sector following a period of economic growth in Ireland from the mid-1730s led to rising prices and growth in trade. This increase in agricultural productivity resulted in growth in related industrial development throughout the country.

The proposed development area is located in Foxtown townland, which is in barony of Deece Lower and parish of Galtrim. Lewis (1837, Vol. I, 638) notes that the parish of Galtrim contained 716 inhabitants and that it:

> "*comprises 3953 statute acres, of which about two-thirds are under tillage*".

Lewis also notes (*ibid*., Vol. II, 582) that Summerhill contained 49 houses and 331 inhabitants.

> "*This town, which has a neat appearance, is pleasantly situated on the road from Dublin to Trim, by Kilcock, and also on that by Dunboyne, which latter is the nearer by three miles*" (*ibid*.).

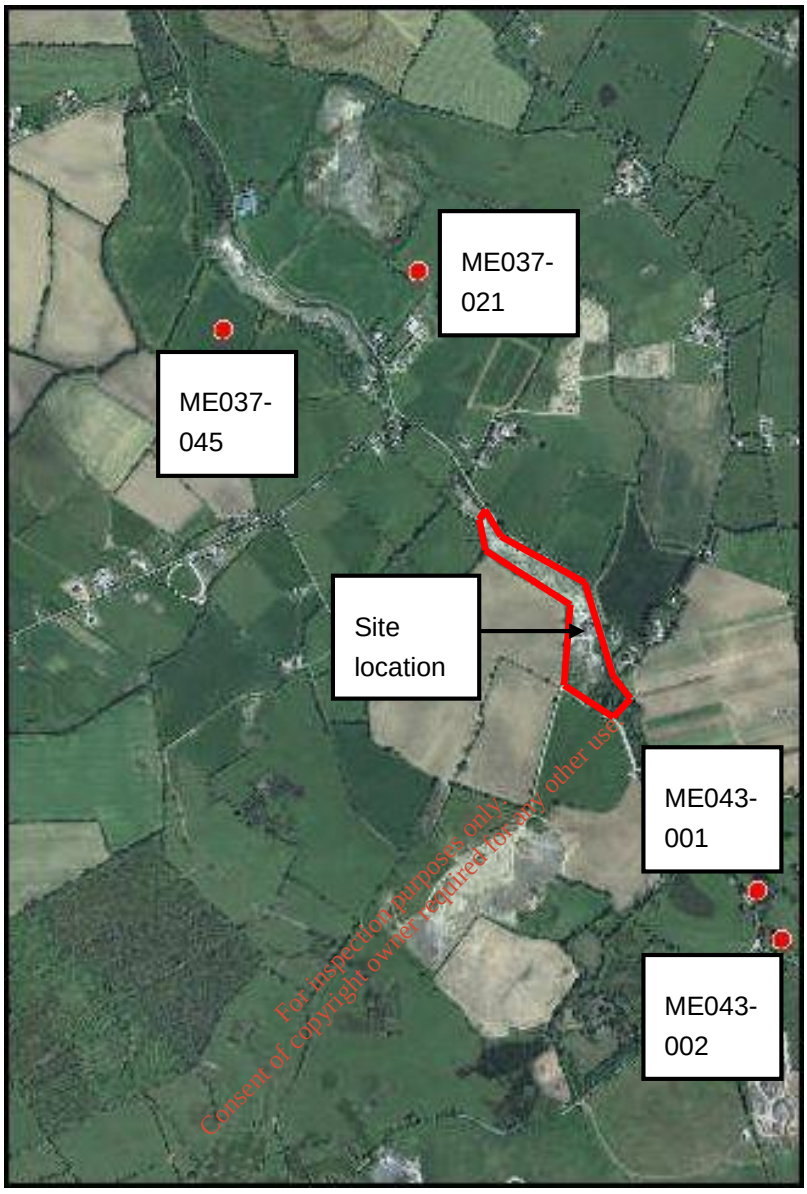

Figure 3.9.3: RMP sites within the 1km study area

3.9.3.2 SUMMARY OF PREVIOUS FIELDWORK IN THE STUDY AREA

Reference to Summary Accounts of Archaeological Excavations in Ireland (www.excavations.ie) revealed that no fieldwork projects have been carried out in Foxtown townland, the location of the proposed development.

3.9.3.3 TOPOGRAPHICAL FILES OF THE NATIONAL MUSEUM OF IRELAND

Information on artefact finds and excavations from County Meath is recorded by the National Museum of Ireland. Location information relating to such finds is important in establishing prehistoric and historic activity in the study area.

There are no entries recorded in the Topographical Files for Foxtown townland, the location of the proposed development.

3.9.3.4 CARTOGRAPHIC ANALYSIS

Ordnance Survey Map First Edition 1:10,560 1837 (figure 3.9.4)

The southern side of the proposed development area is recorded as a townland boundary on the First Edition Ordnance Survey map. Research suggests that:

> "*hoards and single finds of Bronze Age weapons, shields, horns, cauldrons and gold personal objects can all be shown to occur on boundaries*" (Kelly 2006, 28).

A small north east/south west oriented roofed structure with two short associated field boundaries is recorded in the extreme southern end of the proposed development area. There was no evidence of this structure revealed during the walkover survey.

The proposed area of land take is recorded as unenclosed on its northern side, while all other boundaries are recorded as they exist today. With the exception of the two short field boundaries associated with the roofed structure in the extreme southern end of the proposed development area, the area of land take is recorded as one large field on the First Edition Ordnance Survey map. A "*Gravel Pit*" is noted along the eastern boundary.

There are no additional archaeological, architectural or cultural heritage features recorded on the First Edition 1:10,560 map within the area of proposed land take.

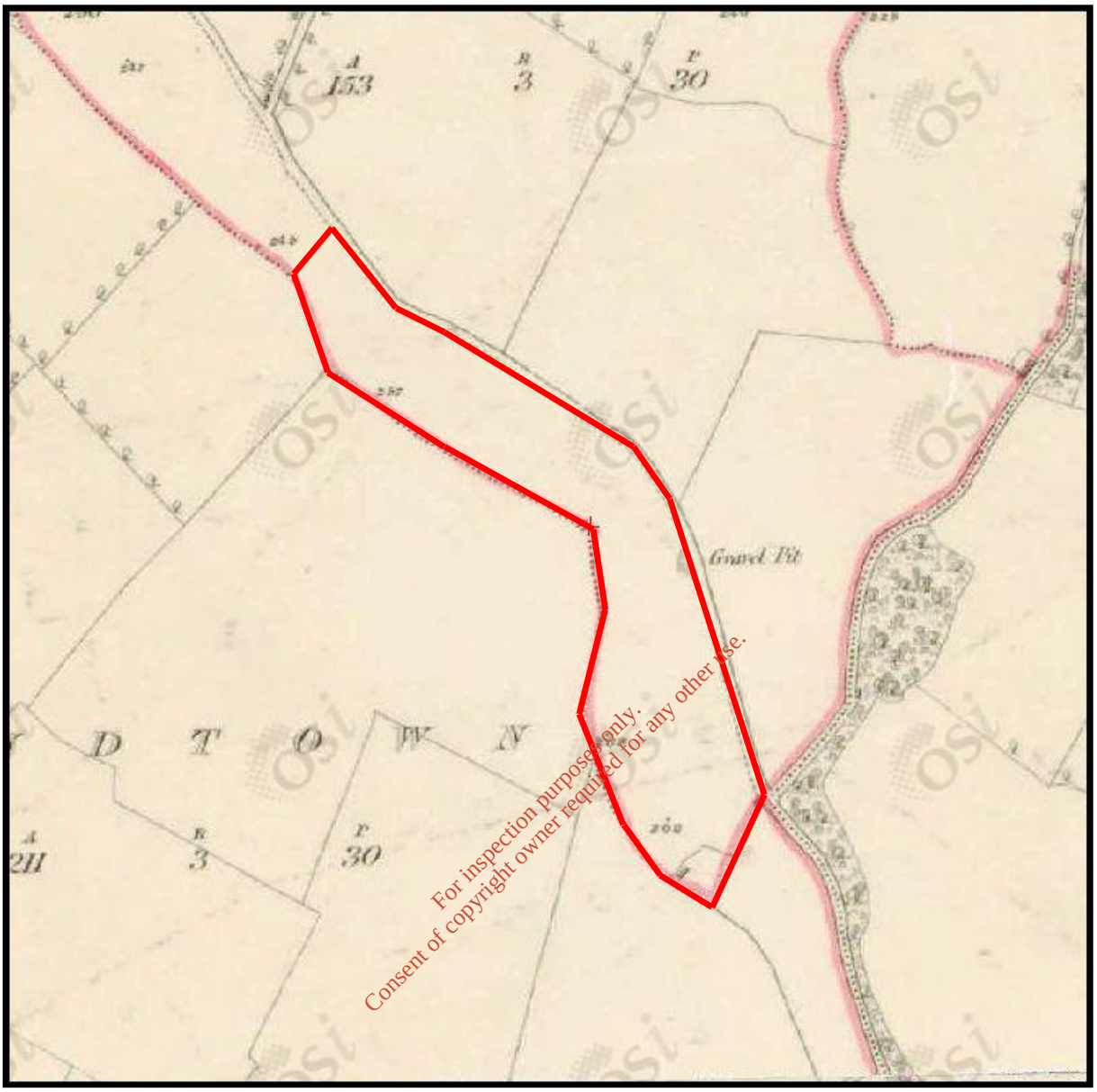

Figure 3.9.4: Extract from First Edition 1:10,560 OS map (1837) showing development area

Ordnance Survey Map Third Edition 1:10,560 1907-1911 (figure 3.9.5)

The Third Edition 1:10,560 OS map records a similar landscape within the area of proposed land take as the First Edition 1:10,560 map. The proposed development area is recorded as rough pasture with furze or whins on the Third Edition map, and a possible small gravel pit with an associated north west/south east oriented access track is located towards the eastern boundary. A bench mark is recorded immediately north of the northern end of the proposed development area and outside the proposed area of land take.

The small north east/south west oriented structure recorded on the First Edition map in the extreme southern end of the proposed development area is not shown on the Third Edition map.

There are no archaeological, architectural or cultural heritage features recorded on the Third Edition 1:10,560 map within the area of proposed land take.

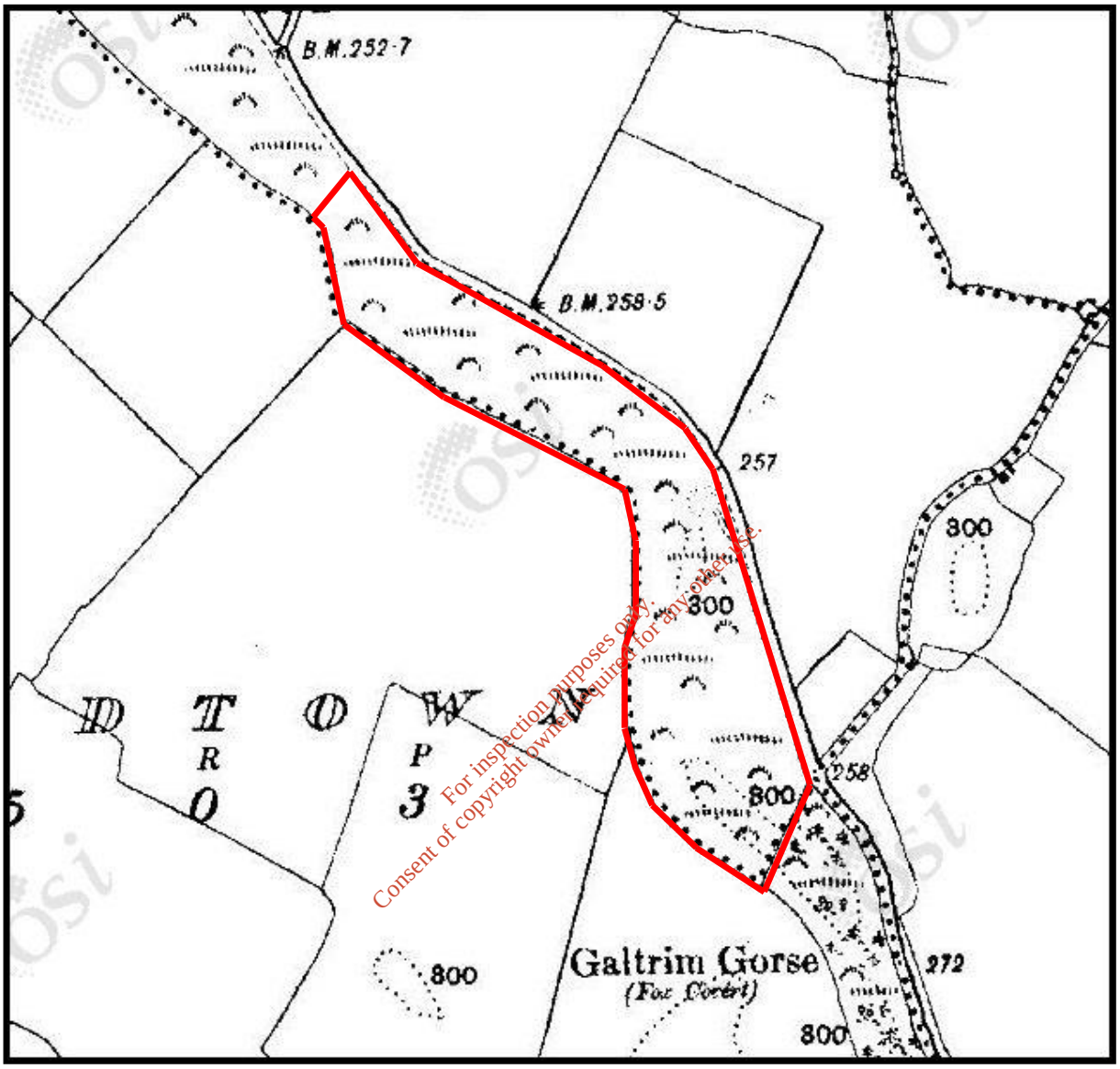

Figure 3.9.5: Extract from Third Edition 1:10,560 OS map (1907-1911) showing development area

Ordnance Survey Map First Edition 1:2,500 1908-1911 (figure 3.9.6)

A "*Gravel Pit*" with an associated north west/south east oriented access track is recorded towards the eastern boundary of the proposed development area. A bench mark is again recorded immediately north of the northern end of the proposed development area and outside the proposed area of land take. The small north east/south west oriented structure recorded on the First Edition map in the extreme southern end of the proposed development area is not shown on the First Edition 1:2,500 map. The proposed development area is recorded as rough pasture with furze or whins on the First Edition map.

There are no archaeological, architectural or cultural heritage features recorded on the First Edition 1:2,500 map within the area of proposed land take.

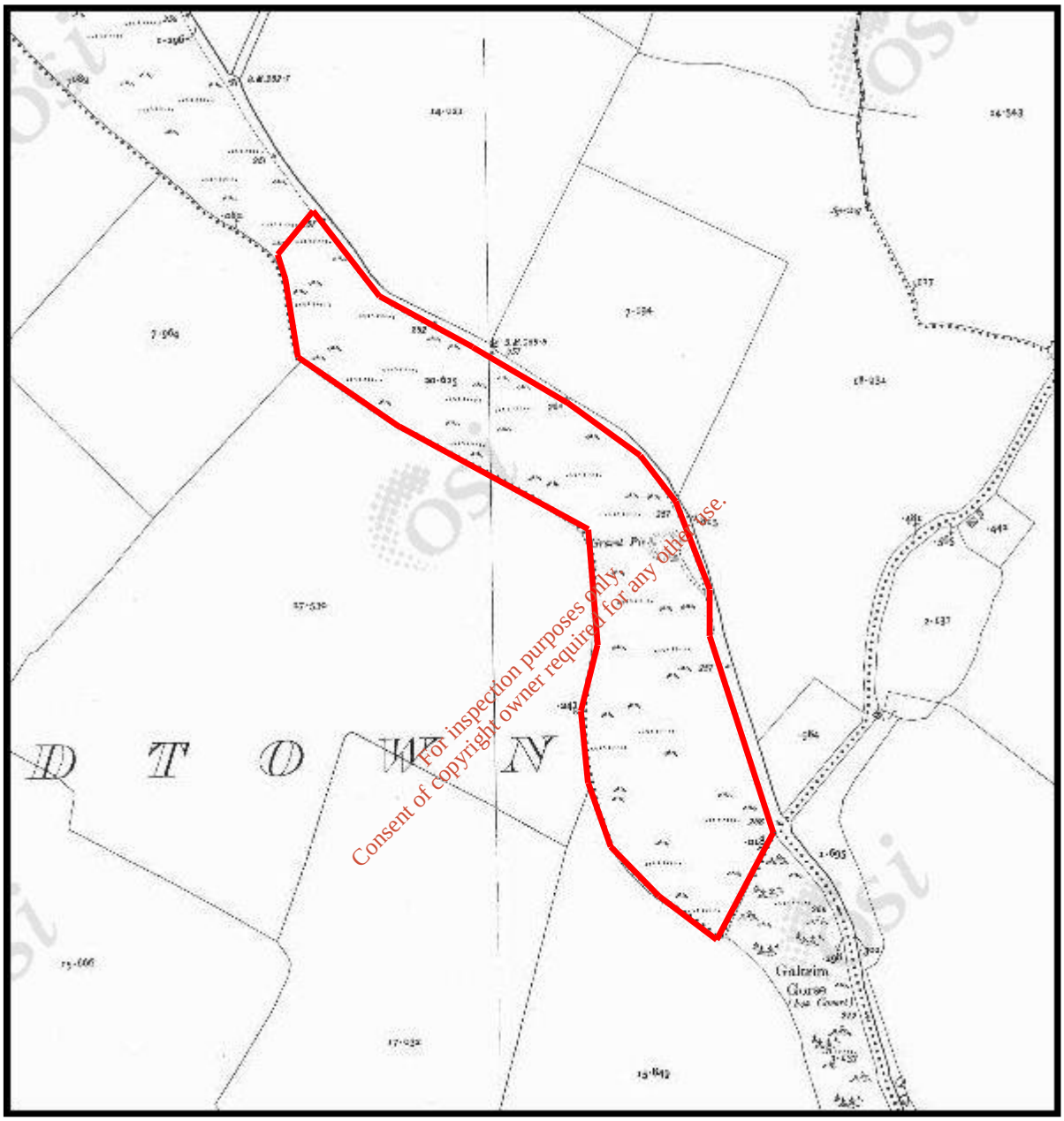

Figure 3.9.6: Extract from First Edition 1:2,500 OS map (1908-1911) showing development area

3.9.3.5 AERIAL PHOTOGRAPHS

Aerial photographs held by Ordnance Survey Ireland (www.maps.osi.ie) were consulted to look for the presence of archaeological or architectural remains within the proposed development area.

The 2000 and 2005 photographs record a similar landscape to that which was noted during the walkover survey (see **3.9.3.10** below), with an excavated sand and gravel pit being noted.

The proposed development area is recorded as an excavated pit and a partially restored area on more recent aerial photography (www.bing.com/maps).

There was no evidence of any archaeological, architectural or cultural heritage features recorded on aerial photographs within the land take of the proposed development area.

3.9.3.6 COUNTY DEVELOPMENT PLAN

Meath County Development Plan 2013-2019

It is an Objective (CH OBJ 7) of Meath County Council to:

> *"protect archaeological sites and monuments, underwater archaeology, and archaeological objects, which are listed in the Record of Monuments and Places, and to seek their preservation in situ (or at a minimum, preservation by record) through the planning process*" (Meath County Council 2013, 218).

There are no RMP sites within the proposed development area. There are four RMP sites within the 1km study area.

It is an Objective (CH OBJ 13) of Meath County Council to:

> "*protect all structures (or, where appropriate, parts of structures) within the county which are of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest and which are included in the Record of Protected Structures*" (*ibid*., 221).

Appendix 8 of the Meath County Development Plan (*ibid*., 393 - 520) contains the *Record of Protected Structures*. There are no Protected Structures within the proposed development area. There are five Protected Structures within the 1km study area:

RPS No.	Description	Townland	Distance from proposed development area
MH043-100	Galtrim House gate lodge	Galtrim	*c*. 460m
MH043-101	Post box	Galtrim	c. 650m
MH043-102	St. Mary's Church of Ireland church	Galtrim	c. 620m
MH043-104	Galtrim House	Galtrim	c. 720m
MH043-105	Galtrim House stables	Galtrim	c. 720m

Appendix 9 of the Meath County Development Plan (*ibid*., 522 - 540) contains a list of *Architectural Conservation Areas*. There are no Architectural Conservation Areas within the proposed development area or the 1km study area.

Appendix 11 of the Meath County Development Plan (*ibid*., 548 – 555) contains a list of *National Monuments in State Care* and the *Register of Historic Monuments*. There are no National Monuments in State Care or Registered Historic Monuments within the proposed development area or the 1km study area.

3.9.3.7 NATIONAL MONUMENTS

The Department of Arts, Heritage and the Gaeltacht maintains a database on a county basis of National Monuments in State Care. The term National Monument is defined in Section 2 of the National Monuments Act (1930) as:

> "*a monument or the remains of a monument the preservation of which is a matter of national importance by reason of the historical, architectural, traditional, artistic or archaeological interest attaching thereto*".

There are no National Monuments in State Care within the proposed development area or the 1km study area.

There are no sites with Preservation Orders or Temporary Preservation Orders within the proposed development area or the 1km study area.

There are no World Heritage Sites or Candidate World Heritage Sites within the proposed development area or the 1km study area.

3.9.3.8 NATIONAL INVENTORY OF ARCHITECTURAL HERITAGE

NIAH maintains a non-statutory register of buildings, structures *etc*. recorded on a county basis. There are no entries recorded on the NIAH building survey within the proposed development area. There are five entries recorded within the 1km study area:

NIAH Number	Townland	Description	Rating	Distance from proposed development area
14404301	Galtrim	Country house	Regional	*c*. 720m
14404302	Galtrim	Farmyard complex	Regional	*c*. 720m
14404303	Galtrim	Gate lodge	Regional	*c*. 460m
14404304	Galtrim	Post box	Regional	*c*. 650m
14404305	Galtrim	Church/chapel	Regional	*c*. 620m

NIAH also maintains a non-statutory register of historic gardens and designed landscapes recorded on a county basis. There are no such features within the proposed development area. There is one entry recorded within the 1km study area:

NIAH Number	Name of Site	Description	Distance from proposed development area
ME-42-N-863523	Galtrim House	Main features substantially present- peripheral features unrecognisable	*c*. 400m at its nearest point

3.9.3.9 TOPONYMS

Townland names are an important source in understanding the archaeology, geology, land-use, ownership and cultural heritage of an area.

Foxtown, the location of the proposed development, translates from the Irish *Baile an t-sionnaigh* as "*town of the fox*" (www.logainm.ie).

3.9.3.10 FIELD INSPECTION

The field inspection sought to assess the site, its previous and current land use, the topography and any additional environmental information relevant to the report. The inspection took place on 19th July 2014 and weather conditions were dry.

The site visit confirmed the proposed development area to consist of an excavated and partially restored sand and gravel pit.

No archaeological, architectural or cultural heritage features were revealed within any areas of proposed land take as a result of carrying out the walkover survey.

Plate 3.9.1: North west corner of proposed development area, looking south

Plate 3.9.2: South east corner of proposed development area, looking north

Plate 3.9.3: Middle of proposed development area, looking south

Plate 3.9.4: Northern end of proposed development area, looking north west

3.9.3.11 CONCLUSIONS

There are no Recorded Monuments within the proposed development area. There are four Recorded Monuments within the 1km study area. There are no Protected Structures, Architectural Conservation Areas, NIAH structures or NIAH historic gardens or designed landscapes within the proposed development area. There are no National Monuments within the proposed development area or the 1km study area. There are no sites with Preservation Orders or Temporary Preservation Orders within the proposed development area or the 1km study area. There are no Registered Monuments within the proposed development area or the 1km study area. There are no World Heritage Sites or Candidate World Heritage Sites within the proposed development area or the 1km study area. There are five Protected Structures within the 1km study area. There are no Architectural Conservation Areas within the 1km study area. There are five entries recorded on the NIAH building survey within the 1km study area. There is one NIAH historic garden or designed landscape within the 1km study area. Reference to Summary Accounts of Archaeological Excavations in Ireland revealed that no fieldwork projects have been carried out within the proposed development area. There are no entries recorded in the Topographical Files for Foxtown townland, the location of the proposed development. The southern side of the proposed development area is recorded as a townland boundary on the First Edition Ordnance Survey map. A small north east/south west oriented roofed structure with two short associated field boundaries is recorded in the extreme southern end of the proposed development area on the First Edition Ordnance Survey map. There was no evidence of this structure revealed during the walkover survey. A gravel pit with an associated north west/south east oriented access track is recorded towards the eastern boundary of the proposed development area on the cartographic sources. No additional archaeological, architectural or cultural heritage features were noted on the historic maps within the proposed development area. There was no evidence of any archaeological, architectural or cultural heritage features recorded on aerial photographs within the proposed development area. No archaeological, architectural or cultural heritage features were revealed within the area of proposed land take as a result of carrying out the walkover survey.

3.9.4 ASSESSMENT OF IMPACTS

3.9.4.1 IMPACTS

The proposed development will involve the importation of inert waste material into part of an existing quarry from which the soils and underlying sand and gravel deposits have been excavated. As a result of carrying out this Environmental Impact Assessment, the following potential archaeological, architectural and cultural heritage impacts have been identified:

There are no Recorded Monuments, Protected Structures, Architectural Conservation Areas, NIAH structures or NIAH historic gardens or designed landscapes within the proposed development area. As a result there will be no direct or indirect construction impact on the archaeological, architectural or cultural heritage resource.

There will be no construction or operational visual impact on the archaeological, architectural or cultural heritage resource.

There will be no construction noise impact on the archaeological, architectural or cultural heritage resource.

There will be a negligible operational noise impact on the archaeological and architectural resource.

3.9.4.2 RESIDUAL IMPACTS

There will be no residual impacts on the archaeological, architectural or cultural heritage resource.

3.9.4.3 CUMULATIVE IMPACTS

There will be no cumulative impacts on the archaeological, architectural or cultural heritage resource.

3.9.5 MITIGATION MEASURES

There will be no direct or indirect construction impact on the archaeological, architectural or cultural heritage resource. As such, no mitigation measures are required.

There will be no construction or operational visual impact on the archaeological, architectural or cultural heritage resource. As such, no mitigation measures are required.

There will be no construction noise impact on the archaeological, architectural or cultural heritage resource. As such, no mitigation measures are required.

There are no mitigation measures available to offset the negligible operational noise impact on the archaeological and architectural resource.

Please note that all recommendations are subject to approval by National Monuments Service, Department of Arts, Heritage and the Gaeltacht.

3.9.6 REFERENCES

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www.buildingsofireland.ie	National Inventory of Architectural Heritage
www.excavations.ie	Database of Irish Excavation Reports
www.logainm.ie	Placenames Database of Ireland
www.maps.osi.ie	Ordnance Survey Ireland aerial photographs
www.meath.ie	Meath County Council

3.9.7 APPENDICES

APPENDIX 3.9.1	RMP SITES WITHIN THE STUDY AREA
APPENDIX 3.9.2	LEGISLATIVE FRAMEWORK PROTECTING THE CULTURAL HERITAGE RESOURCE
APPENDIX 3.9.3	IMPACT ASSESSMENT AND THE ARCHAEOLOGICAL RESOURCE
APPENDIX 3.9.4	MITIGATION MEASURES AND THE ARCHAEOLOGICAL RESOURCE

APPENDIX 3.9.1 RMP SITES WITHIN THE STUDY AREA

RMP No.:	ME037-021
Townland:	Foxtown
Classification:	Ringfort
Description:	A raised sub-circular area defined by a scarp (dimensions 32m north/south x 29m east/west) and surrounded by a ditch. An entrance and causeway are located at the south south east.
RMP No.:	ME037-045
Townland:	Mitchelstown
Classification:	Ring-ditch
Description:	Located on a slight south west facing slope. The cropmark of a circular area (internal diameter *c*. 10m) defined by a single ditch feature (width *c*. 1 - 2m) is visible on *c*. 2013 aerial photography. There is a possible entrance gap *c*. 2 - 3m wide at the north east.
RMP No.:	ME043-001
Townland:	Galtrim
Classification:	Church
Description:	Present church erected in 1800 could have been built on foundations of older church, since north wall has base batter. Hood mouldings built into south wall and north and south windows on present tower could be reused. Projecting east from present church are remains of a chancel (8m long x 6m wide).
RMP No.:	ME043-002
Townland:	Galtrim
Classification:	Motte
Description:	Oval flat-topped earthen mound (dimensions of top 36m north west/south east x 24m north east/south west, maximum dimension of base 62m, height 7m) defined by a ditch from south east to north. A bailey may have existed along the ridge to the south east.

APPENDIX 3.9.2 LEGISLATIVE FRAMEWORK PROTECTING THE CULTURAL HERITAGE RESOURCE

The Archaeological Resource

The **National Monuments Act**, **1930 to 2004** and relevant provisions of the **National Cultural Institutions Act**, **1997** are the primary means of ensuring the satisfactory protection of archaeological remains, which includes all man-made structures of whatever form or date except buildings habitually used for ecclesiastical purposes.

A number of mechanisms under the National Monuments Act are applied to secure the protection of archaeological monuments. These include the Record of Monuments and Places, the Register of Historic Monuments, the placing of Preservation Orders and Temporary Preservation Orders on endangered sites and National Monuments in the Ownership or Guardianship of the Minister for Arts, Heritage and the Gaeltacht or a Local Authority.

The Minister may acquire National Monuments by agreement or by compulsory order. The State or the Local Authority may assume Guardianship of any National Monument (other than dwellings). The owners of National Monuments (other than dwellings) may also appoint the Minister or the Local Authority as Guardian of that monument if the State or Local Authority agrees. Once the site is in ownership or Guardianship of the State, it may not be interfered with without the written consent of the Minister.

Section 5 of the 1987 Act requires the Minister to establish and maintain a Register of Historic Monuments. Historic monuments and archaeological areas present on the Register are afforded statutory protection under the 1987 Act. Any interference with sites recorded on the Register is illegal without the permission of the Minister. Two months notice in writing is required prior to any work being undertaken on or in the vicinity of a Registered Monument. The Register also includes sites under Preservation Orders and Temporary Preservation Orders. All Registered Monuments are included in the Record of Monuments and Places.

Sites deemed to be in danger of injury or destruction can be allocated Preservation Orders under the 1930 Act. Preservation Orders make any interference with the site illegal. Temporary Preservation Orders can be attached under the 1954 Act. These perform the same function as a Preservation Order but have a time limit of six months, after which the situation must be reviewed. Work may only be undertaken on or in the vicinity of sites under Preservation Orders with the written consent, and at the discretion, of the Minister.

Section 12(1) of the 1994 Act requires the Minister for Arts, Heritage and the Gaeltacht to establish and maintain a Record of Monuments and Places where the Minister believes that such monuments exist. The Record comprises a list of monuments and relevant places and a map/s showing each monument and relevant place in respect of each county in the State. All sites recorded on the Record of Monuments and Places receive statutory protection under the National Monuments Act 1994.

Section 12(3) of the 1994 Act provides that:

> *"where the owner or occupier (other than the Minister for Arts, Heritage and the Gaeltacht) of a monument or place included in the Record, or any other person, proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such a monument or place, he or she shall give notice in writing to the Minister of*

Arts, Heritage and the Gaeltacht to carry out work and shall not, except in the case of urgent necessity and with the consent of the Minister, commence the work until two months after the giving of notice".

Architectural and Built Heritage Resource

The main laws protecting the built heritage are the **Architectural Heritage (National Inventory) and Historic Properties (Miscellaneous Provisions) Act, 1999** and the **Planning and Development Act, 2000 (Amended 2010)**. The Architectural Heritage Act requires the Minister to establish a survey to identify, record and assess the architectural heritage of the country. The National Inventory of Architectural Heritage (NIAH) records all built heritage structures within specific counties in Ireland. As inclusion in the Inventory does not provide statutory protection, the document is used to advise Local Authorities on compilation of a Record of Protected Structures (RPS) as required by the Planning and Development Act, 2000.

The Planning and Development Act, 2000 requires Local Authorities to establish a Record of Protected Structures to be included in the County Development Plan (CDP). This Plan includes objectives designed to protect the archaeological, architectural and cultural heritage resource during the planning process. Buildings recorded in the RPS can include Recorded Monuments, structures listed in the NIAH, or buildings deemed to be of architectural, archaeological or artistic importance by the Minister. Sites, areas or structures of archaeological, architectural or artistic interest listed in the RPS receive statutory protection from injury or demolition under the 2000 Act. Damage to or demolition of a site registered on the RPS is an offence. The RPS list is not always comprehensive in every county.

The Local Authority has the power to order conservation and restoration works to be undertaken by the owner of a Protected Structure if it considers the building in need of repair. An owner or developer must make a written request to the Local Authority to carry out any works on a Protected Structure and its environs, which will be reviewed within 12 weeks of application. Failure to do so may result in prosecution.

Meath County Development Plan 2013 - 2019

Meath County Council has written Policies and Objectives on the preservation of archaeological, architectural and cultural heritage remains in advance of permitted development. These relate to archaeological monuments and objects, vernacular structures and industrial heritage features amongst others.

APPENDIX 3.9.3 IMPACT ASSESSMENT AND THE ARCHAEOLOGICAL RESOURCE

Potential Impacts on Archaeological Remains

Impacts can be identified from detailed information about a project, the nature of the area affected and the range of archaeological resources potentially affected. Development sites can affect the archaeological resource of a given landscape in a number of ways.

- Permanent and temporary land-take, associated structures, landscape mounding, and their construction may result in damage to or loss of archaeological remains and deposits, or physical loss to the setting of historic monuments and to the physical coherence of the landscape;
- Archaeological sites can be affected adversely in a number of ways: disturbance by excavation, topsoil stripping and the passage of heavy machinery; disturbance by vehicles working in unsuitable conditions; or burial of sites, limiting accessibility for future archaeological investigation;
- Hydrological changes in groundwater or surface water levels can result from construction activities such as de-watering and spoil disposal, or longer-term changes in drainage patterns. These may desiccate archaeological remains and associated deposits;
- Visual impacts on the historic landscape sometimes arise from construction traffic and facilities, built earthworks and structures, landscape mounding and planting, noise, fences and associated works. These features can impinge directly on historic monuments and historic landscape elements as well as their visual amenity value;
- Landscape measures such as tree planting can damage sub-surface archaeological features, due to topsoil stripping and through the root action of trees and shrubs as they grow;
- Ground consolidation by construction activities or the weight of permanent embankments can cause damage to buried archaeological remains, especially in colluvium or peat deposits;
- Disruption due to construction also offers in general the potential for adversely affecting archaeological remains. This can include machinery, site offices, service trenches etc;
- Although not widely appreciated, positive impacts can accrue from permitted developments. These can include positive resource management policies, improved maintenance and access to archaeological monuments and the increased level of knowledge of a site or historic landscape as a result of archaeological assessment and fieldwork.

Predicted Impacts

There is no standard scale against which the severity of impacts on the archaeological and historic landscape may be judged. The severity of a given level of land-take or visual intrusion varies with the type of monument, site or landscape feature and its existing environment. Severity of impact can be judged taking the following into account:

- The proportion of the feature affected and how far physical characteristics fundamental to the understanding of the feature would be lost;
- Consideration of the type, date, survival/condition, fragility/vulnerability, rarity, potential and amenity value of the feature affected;

- Assessment of the levels of noise, visual and hydrological impacts, either in general or site specific terms, as may be provided by other specialists.

Impacts are defined as:

> *"the degree of change in an environment resulting from a development"* (Environmental Protection Agency 2002, 30).

Impacts are described as indeterminable, negligible, minor, moderate or major on archaeological, architectural and cultural heritage remains. Moderate or major impacts are considered to be significant in Environmental Impact Assessment terms.

Significance Criteria:

Level of Impact	Significance Criteria
Major	An impact which obliterates sensitive characteristics
Moderate	An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
Minor	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
Negligible	An impact capable of measurement but without noticeable consequences
Indeterminable	An impact on a feature of unknown archaeological significance

APPENDIX 3.9.4 MITIGATION MEASURES AND THE ARCHAEOLOGICAL RESOURCE

Mitigation is defined as features of the design or other measures of the proposed development that can be adopted to avoid, prevent, reduce or offset negative impacts.

The best opportunities for avoiding damage to archaeological remains or intrusion on their setting and amenity arise when the site options for the development are being considered. Damage to the archaeological resource immediately adjacent to developments may be prevented by the selection of appropriate construction methods. Reducing adverse impacts can be achieved by good design, for example by screening historic buildings or upstanding archaeological monuments or by burying archaeological sites undisturbed rather than destroying them. Offsetting adverse impacts is probably best illustrated by the full investigation and recording of archaeological sites that cannot be preserved *in situ*.

Definition of Mitigation Strategies

The ideal mitigation for all archaeological sites is preservation *in situ*. This however is not always a practical solution, and a series of recommendations are therefore offered to provide ameliorative measures where avoidance and preservation *in situ* are not possible.

Archaeological excavation involves the scientific removal and recording of all archaeological features, deposits and objects to the level of geological strata or the base level of a given development. Full archaeological excavation is recommended where initial investigation has uncovered evidence of archaeologically significant material and where avoidance of the site is not possible.

Archaeological test trenching is defined as:

> *"that form of excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location which it is proposed to develop (though not normally to fully investigate those deposits or features) and allow an assessment to be made of the archaeological impact of the proposed development"* (DAHGI 1999a, 27).

Archaeological monitoring:

> *"involves an archaeologist being present in the course of the carrying out of development works (which may include conservation works), so as to identify and protect archaeological deposits, features or objects which may be uncovered or otherwise affected by the works"* (DAHGI 1999a, 28).

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3.10 MATERIAL ASSESTS

3.10.1 INTRODUCTION

All projects and developments that require an EIS *by virtue of their nature, size and location*, have the potential to have an impact on the environment. This section of the EIS is essentially an overview of the material and amenity resources within the vicinity of the proposed development, coupled with an assessment of the potential impact, if any, of the development on the existing environment in respect of these assets. The section addresses the impacts on the material assets of the site and wider area with respect to the proposed continued operation of a Waste Recovery Facility (WRF) at the Foxtown quarry site.

The assessment of economic assets tend to be concerned with ensuring their equitable and sustainable use, whereas the assessment of cultural assets tend to be concerned with securing their integrity and continuity, and their necessary context. Key issues of residential development, amenity, land use, roads and utility services are addressed. Natural resources of economic value (Refer to table 3.10.1) which are also considered as material assets, are dealt with where necessary in their respective EIS sections (EPA 2003).

Material Assets is considered to include architectural and archaeological heritage and cultural heritage. For the purpose of this EIS an assessment of the potential impact, if any of the development on the existing environment with respect to these assets is considered in EIS Section 3.9 Section - Cultural Heritage.

EPA (2003) defines material assets as "resources that are valued and that are intrinsic to specific places ….. and may be either human or natural origin, and the value may arise from either economic or cultural reasons". The Waste Recovery Facility (WRF) use of, or proximity to, the area's material assets, can directly and indirectly result in potential environmental impacts. Therefore, the objective of this assessment is to identify the material assets of the area, determine the potential impacts of the proposed continued use of the WRF on these assets, and propose mitigation measures where necessary to ensure that they are addressed in an appropriate manner. This section also indicates the associated sections within the EIS that consider these impacts and any proposed mitigation measures.

3.10.2 STUDY METHOD

The assessment of material assets has been prepared in accordance with the Advice Notes on Current Practice (in the preparation of Environmental Impact Statements), published by the EPA (2003). Table 3.10.1 outlines the categories of assets, which the EPA suggests may need to be examined as part of the material assets study.

On the basis of categories in Table 3.10.1 and the nature of the proposed development, the material assets which potentially could be impacted by the WRF, and which have been identified for assessment are: (1) non-renewable resources (minerals, soils); (2) settlement - residential development; (3) land use; (4) transport infrastructure (roads); (5) major utilities; (6) cultural assets - archaeological, historic and architectural heritage; and (7) landscape and natural heritage. Most of these assets have been considered elsewhere within other sections of the EIS, as indicated below:

- Non-renewable resources (minerals, soils) are discussed in Section 3.3 - Soils and Geology
- Settlement and land use are discussed in Section 3.1 – Human Beings
- Transport infrastructure (Roads) is discussed in Section 3.11 - Traffic
- Cultural assets are discussed in Section 3.9 - Cultural Heritage
- Landscape is discussed in Section 3.8 - Landscape

Table 3.10.1 EPA's Classification of Types of Material Assets

Asset Type	
Economic Assets - Natural Origin	- Assimilative capacity (air, water) - Non-renewable resources (minerals, soils) - Renewable resources
Economic Assets - Human Origin	- Settlements - Transport infrastructure (roads) - Major utilities (water, sewage, power, telecommunications) - Ownership and access
Cultural Assets – Physical Type	- Archaeology - Architecture - Settlements - Monuments, features and landmarks - Historic sites and structures - Landscape - Geological heritage
Cultural Assets – Social Type	- Language and dialects - Folklore and tradition - Religion and belief - Literary and artistic association

3.10.3 EXISTING ENVIRONMENT

3.10.3.1 NON-RENEWABLE RESOURCES

The Meath County Development Plan 2013-2017 recognises that there are unparalleled natural resources in the county. The potential of the resources to underpin construction output and provide employment and economic growth in the local and regional economy is also recognised, as is the need to exploit such resources in an environmentally sound and sustainable manner.

Meath has significant resources in terms of aggregates, a resource that had come under pressure due to increased demand prior to the collapse of the construction industry in 2008. Since aggregates can only be worked where they occur, it is important to identify the location of these resources with a view to safeguarding them, coupled with the protection of amenities, prevention of pollution and the safeguarding of aquifers and ground water.

The area around Foxtown has a history of sand and gravel working, with extraction from the glacial deposits, such as eskers, moraines and other glaciofluvial outwash deposits (See Figure 3.3.3). These activities, including the existing quarry, have co-existed with other land uses in the area mainly agriculture. Importantly, Meath County Council have identified the Trim Esker, on which the Foxtown quarry and co-located WRF is sited, and from which sand and gravel is extracted, as a geological heritage site (See Section 3.3.3 – Geological Heritage).

The quarry at Foxtown has provided employment for local people, both directly and indirectly. Kiernan Sand and Gravel Ltd employ two directly. An additional temporary employee is hired occasionally. The WRF requires one person operating a bull-dozer/back-hoe excavator and one general foreman to monitor and inspect the quality and suitability of imported materials being brought to the site for recovery. It is expected that an additional general operative will be appointed subject to an upturn in the economy and construction activity.

3.10.3.2 SETTLEMENT - RESIDENTIAL DEVELOPMENT

There are few residences in the immediate area, with only 16 within 500m. Residential development predominantly consists of isolated farm dwellings and of owner occupied bungalow/houses along public roads (Refer to EIS Figures B 2.1 – Rev A and B 2.2 – Rev A, *EIS Section 2 Figures*). The nearest large residential settlement close to the site is village of Kiltale (pop. c. 300), located c. 2km to the east. Further afield, Summerhill (pop. 832 in 2011) is c. 4.5km to the south, Kilmessan (pop. 586 in 2011) c. 5.5 km to the north, Trim (pop. 6,827 in 2011) is c. 6km to the northwest, Rathmoylan (pop. 2989 in 2011) is 7 km to the southwest, and Dunshaughlin (pop. 3,903 in 2011) is c. 11.5km to the east.

With the exception of the R158 Trim to Summerhill Regional Road, and the R154 Trim to Dublin Regional Road, the roads in the area are of a local character and typical of a rural location. The site lies c. 10km west of Junction 6 of the M3 motorway near Dunshaughlin, and c. 14km north of Junction 8 of the M4 motorway near Kilcock.

Adequate fencing, signage and other barriers have been erected around the site for the safety of the general public and to prevent livestock straying into the development area, albeit

livestock is availing of some of the restored lands. Large lockable gates are in place to guard against unauthorised and unsupervised entry to the site outside of working hours.

3.10.3.3 LAND USE

Foxtown is located rural south County Meath c. 6km southeast of Trim. The Foxtown site is located c. 2km west of the village or graig of Kiltale, c. 4.5km north of the village of Summerhill, and c. 6km southwest (Refer to Figure 1.1). The eastern boundary of the quarry site is defined by an unnamed local road, whilst the other boundaries abut agricultural and wooded land, with no contiguous residential properties. There are however three residential properties within 75m on the east side of the unnamed local road, and 16 residential properties within 500m.

The surrounding landscape consists of rolling lowlands, developed principally over "Calp" limestones (elev. c. 70-80m OAD), with hills to the southeast and the valley of Boyne River to the northwest. The Boycetown River, a tributary of the Boyne, flows in a roughly SE-NW direction c. 1km east of the site, whilst a unnamed tributary of the Boycetown River flows c. 500m west of the western boundary of the site. The quarry has been developed on a section of a c. 14.5km long, NW-SE oriented, sinuous topographic ridge of sand and gravel, known as the Trim Esker. The eastern and western boundaries of the quarry and WRF site are defined by the limits of the esker deposit, conferring a truncated ribbon-like shape to the site. The Esker crosses the SW-NE oriented Galtrim Morraine at Ballynamona, where there has been a concentration of sand and gravel extraction.

The predominant land use within the application site, which is co-located within the quarry site, is by definition that of quarrying activities related to the extraction of sand and gravel and associated operations such as placement of soil and stone in quarry restoration. The land-use in the area consists of a patchwork of agricultural fields that are designated as pasture and non-irrigated arable land (See Figure B2.2 - Rev A, *EIS Section 2 Figures*), reflecting medium-high intensity agricultural, with relatively low levels of forest cover. The settlement pattern can be described as medium- to low-intensity rural settlement.

The Foxtown area is described by Meath County Council (2007) as lying in LCA6: the Central Lowlands (See Figure 3.8.2), which consists of flat-lying lowlands, predominantly as rolling pastureland, with thick wooded hedgerows, some conifer plantations, and shelterbelts of ash and larch, separating medium to large fields. Deep roadside drainage ditches and banked hedgerows are common, and create enclosed rural road corridors with limited views.

Meath has <5% forest cover, and the 2006 Corine Map indicates no forest cover in the Foxtown and wider area (EPA 2014). However, aerial photography shows considerable conifer and broadleaf afforestation and woodland in the Ginnets Great, Rathmoylan and Summerhill areas, whilst native woodland is common on sections of the Trim Esker (Google Maps 2014). Timber production is the principal objective and economic benefit of forestry, although carbon sequestration is a significant environmental benefit of forestry. Forests represent an important renewable resource and contribute to sustainable rural economic development. However, broadleaf woodland and forests are only a minor land use in the wider local area, but together with high, mature banked hedgerows, deep drainage ditches and rolling terrain, contribute to an enclosed pastoral landscape.

The site of the WRF coincides with the quarry site which comprises the entirety of the applicants landholding (i.e., c. 5.2ha), and is shown on EIS Figure B2.2 - Rev A, EIS Section 2 Figures. The predominant land use within the WRF site, which is to be co-located within the quarry site, is by definition that of quarrying activities related to the extraction of sand and gravel and associated operations such as placement of soil and stone in quarry restoration. Ultimately, the site will be reclaimed in accordance with the approved quarry restoration scheme, and thus undergo a change of land use back to agricultural and/or forestry land. Thus, as the WRF is co-located within the quarry, the proposed continuation of the WRF will result in a change in land use from mineral extraction to agricultural and/or forestry use.

3.10.3.4 TRANSPORT INFRASTRUCTURE

The Foxtown site is located c. 6km southeast of Trim, on the west side of an unnamed local road, which follows the meandering Trim Esker in a southeasterly direction (Refer to Figure A 1.0, EIS Section 2 Figures). The road extends for c. 7.5km from the L2204 near Trim to the L2210 at Collegeland Townland, south of which it becomes the Monalvy Manor, according to Google Maps (2014).

The roads of the area form a network of local and regional roads between two radiating motorways from Dublin, namely the M3 (connecting Dublin, Dunboyne, Dunshaughlin, Navan, and Kells), and the M4 (connecting Dublin, Leixlip, Maynooth, Kilcock, Enfield, etc.), and bounded or constrained by the Boyne River to the northwest. The regional road network in the area is dominated by the radiating pattern from Trim, historically the major settlement in the area, and likely only crossing of the Boyne for many kilometres. The main regional roads in the area are the R158 Trim to Summerhill Regional Road and the R154 Trim to Dublin Regional Road, which both radiate from Trim. The unnamed road that services the site runs very roughly equidistant between the R154 and R158 regional roads. Most site traffic serving the WRF is either off the R158 at Dangan Bridge, or off the R154 at Kiltale. The site lies c. 10km west of Junction 6 of the M3 motorway near Dunshaughlin, whilst Ratoath and Ashbourne are a further 6.5 and 10km, respectively to the east. Kilcock c. 14km to the south via the R158, Maynooth c. 18km to the south southeast via R158 and R148, and Dunboyne c. 18km to the southeast.

Dublin is the only Gateway within the Greater Dublin Area (GDA), but lies c. 35km to the southeast. Within the north central sector of the GDA, which includes all of Meath and the area around Foxtown, there are three Primary Development Centres identified, namely Drogheda and Balbriggan on the M1, and Navan on the M3, and the County Town of Meath (DEHLG 2002). These centres are strategically located, dynamic, urban centres on major transport corridors, where development should be concentrated. Navan is the closest Primary Development Centre, being c. 15km north of the site.

The significant roads in the region include:

- M3 is the motorway joining the capital city, Dublin to Navan and Kells, and via the N3 to Cavan and Bellturbet via the N3, and Enniskillen via the A509. It is one of the strategic radial corridors as identified in the National Spatial Strategy (DEHLG 2002).
- M4 is the motorway joining the capital city, Dublin to Maynooth, Mullingar, Longford, Carrick-on-Shannon and Sligo, and via the M5 to Castlebar and Westport, and via the

M6 to Athlone, Ballinasloe and Galway. It is one of the strategic radial corridors as identified in the National Spatial Strategy (DEHLG 2002).

- R154 Regional Road is oriented WNW-ESE, and is the Trim to Dublin road, connecting Trim to Kiltale, Cross Keys and Batterstown, and now terminates at the M3 c. 5km north of Clonee.
- R158 Regional Road is oriented NNW-SSE, and is the Trim to Summerhill road, connecting Trim to Summerhill and terminates at Kilcock.
- R156 Regional Road is WNW-ESE oriented, and connects Summerhill to Dunboyne and terminates at the M3 near Clonee.
- R159 Regional Road is oriented N-S, and connects Enfield to Rathmoylan and Trim via a short section (c. 2.5km) of the R158
- R125 Regional Road is NNE-SSW oriented, and connects Kilcock to Dunshaughlin.
- Unnamed local road which services the site is NW-SE oriented, and runs very roughly equidistant between the R154 and R158 regional roads. The road extends for c. 7.5km from the L2204 near Trim to the L2210 near Monalvy.

The Dublin-Galway mainline railway and the royal canal also run E-W and roughly follow the route of the M4 motorway, at least as far as Mullingar, and run along the Meath-Kildare border for c. 45km. The nearby towns of Maynooth, Kilcock and Enfield are serviced by the main line railway service on Iarnrod Eireann's Dublin to Galway line. Dublin is identified as the nearest designated Gateway (DEHLG 2002), and Dublin Airport is the nearest airport at c. 35km due south southeast of the site, whilst Dublin is also the nearest port at c. 40km.

The R154 and R158 consist of realigned, single surface dressed carriageways with wide grass verges over most of their length, right turning lanes with ghost traffic islands, and safety or crash barriers. With the exception of the R154 and R154, roads in the area are of a local character and typical of a rural location.

Traffic entering and leaving the site will use the existing established quarry site access. The quality of the pavement in the vicinity of the Quarry and Waste Recovery Facility entrance to the R154 is at present in good condition. The traffic impact of the Quarry and Waste Recovery Facility is at present considerably less than it was at full production prior to 2008. During this period the traffic generated by Quarry and Waste Recovery Facility had little adverse effect on traffic movements on the surrounding road networks. The continued use of the Quarry and Waste Recovery Facility at the predicted level will not increase the traffic over the present level.Further details with respect to the impact and mitigation of traffic are contained within this report (Refer to Section 3.11).

3.10.3.5 MAJOR UTILITIES

The water supply for the quarry and WRF is provided by the existing well on site. Potable water is brought to the site daily. There is a toilet with septic tank and associated percolation area. The houses in the area are also served by bored wells, and are serviced by septic tank systems and proprietary effluent treatment systems.

Power to local residences is provided by overhead lines, which form part of ESB's country-wide, typically low voltage, electricity distribution network. The electrical power to the area is provide from a single HV distribution line operated by ESB Networks, running from Maynooth to Trim, roughly following the route of the R158, and then on to Navan.

The transmission grid in the area of south central Meath consists of three HV lines operated by Eirgrid: (a) 400kV line running from Moneypoint Power Station, Co. Clare to Woodlawn, near Dunshaughlin; (b) 110kV line running from Lanesboro to Dublin; and (c) 220kV line running from Tandragee, Co Armagh (via interconnection to Louth) to Maynooth (See Figure 3.10.1).

EirGrid, the national electrical transmission operator (TSO) has recently completed development of the 400kV 500MW East-West Interconnector from Deeside, Wales which makes landfall at Rush, County Dublin and runs essentially E-W to Woodland near Dunshaughlin, Co. Meath. This line is thus >10km from Foxtown. Eirgrid has also rolled out a grid development strategy called GRID25, which governs development of the transmission infrastructure to ensure that grid reinforcements enable connection of significant amounts of renewable energy generation. Eirgrid has planned a second interconnector with the UK, namely the 400kV 500MW North-South Interconnector from Tyrone to Woodland near Dunshaughlin. Eirgrid's preferred route for the interconnector, with overhead lines carried on towers (pylons) up to 43m high, is planned to approach within c. 1km east of Foxtown (See Figure 3.10.2).

Bord Gais have two subsea gas pipeline interconnectors with Scotland that come ashore near Gormanstown, Co. Meath and Loughshinny, County Dublin. These pipelines connect into the network, which in the east of Ireland consists of a main line running from Cork to Dublin and up the east coast to N. Ireland, with multiple spurs to supply towns on route. One spur supplies nearby Duleek, Navan and Trim, whilst the main E-W pipeline to Galway supplies Ashbourne, Ratoath, Dunshaughlin and Enfield. The latter main E-W pipeline passes c. 2km north of Summerhill, and c. 2.5km south of Foxtown (See Figure 3.10.2). Thus, there are no gas pipelines in the near vicinity of Foxtown (i.e., within c. 2km).

There are numerous mobile masts or base stations for the transmission and reception of mobile telecommunication in the region around Foxtown. These masts house both point to point microwave links and cellular technologies used in the provision of telecommunication services. The nearest cell masts to the Foxtown site are located at Summerhill c. 4.5km to the south, at Cross Keys c. 5km to the east, at Rathmoylan c. 7km to the southwest, and multiple masts at Trim c. 6km to the northwest.

3.10.3.6 CULTURAL ASSETS

The proposed continuation of operations of the WRF was the subject of an assessment that involved the investigation of cultural heritage including the archaeological, structural and historical background of the application area and the surrounding area using a wide range of existing information, as well as a field assessment (Refer to EIS Section 3.9).

There are no Recorded Monuments within the proposed development area. There are four Recorded Monuments within the 1km study area. There are no Protected Structures, Architectural Conservation Areas, NIAH structures or NIAH historic gardens or designed

landscapes within the proposed development area. As a result there will be no direct or indirect construction impact on the archaeological, architectural or cultural heritage resource.

3.10.3.7 LANDSCAPES & NATURAL HERITAGE

The immediate landscape of the Foxtown area is defined by the sinuous topographic ridge of the Trim Esker meandering in a southeasterly direction through the rolling lowlands for kilometres. Sections of the esker are naturally well wooded and have high ecological value.

The Foxtown area is described as lying in the Central Lowlands (Meath County Council 2007), which consists of flat-lying lowlands, predominantly as rolling pastureland, with thick wooded hedgerows, some conifer plantations, and shelterbelts of ash and larch, separating medium to large fields. Deep roadside drainage ditches and banked hedgerows are common, and create enclosed rural road corridors with limited views. Forest cover is very limited throughout Meath, with small areas of broadleaf woodland and a few conifer plantations. The land use in the Foxtown area is classed as dominantly pasture with subordinate non-irrigated arable land, where field patterns are medium and the hedgerows are more wooded.

The enclosed landscape has a medium capacity to absorb most development, as the enclosed landscape can physically or visually absorb development, mitigating the visual impact on the landscape. Nonetheless, sensitive development and conservation of the landscape resource is essential to the underpinning of the rural economy and quality of life of the area.

The application site at Foxtown, which corresponds to the quarry site, is not included in any area with an ecological designation (NHA, cSAC or SPA; See NPWS (2014). However, there are numerous designated sites within 15km, namely: Boyne River and Blackwater River cSAC (Site Code 002299); Boyne River and Blackwater River SPA (Site Code 004232); Trim Wetlands pNHA (Site Code 001357); Rathmoylan Esker (Site Code 000557); and Royal Canal (Site Code 002103). The nearest designated site to the Foxtown WRF is c. 4km to the northwest at Scurlockstown, and has triple designation as the Boyne River and Blackwater River cSAC and SPA, and Trim Wetlands pNHA.

In this case the River Boyne and River Blackwater (Site Code 2299), a river and valley system of European interest, is the only one within 15km of the proposed project. Screening for Appropriate Assessment was carried out with respect to the licence application and a copy of this report was previously submitted to the EPA. The findings of the screening for Appropriate Assessment were that the activity, individually or in combination with other plans or projects is not likely to have a significant effect on the Natura 2000 network, or the conservation objectives of the sites. A Stage 2 Appropriate Assessment is therefore not required.

The impact of inert waste disposal on this site will be considerable in local terms but will not result in any loss of heritage values in the locality. In the long-term it will create pasture/woodland and, in habitat terms, simulate a feature of the pre-existing esker.

The Trim Esker, the geological feature upon which the quarry is sited, and from which sand and gravel is extracted, is designated a County Geological Site (i.e., MH017), but has not been afforded the greater protection of a NHA designation (Clarke et al. 2007). The site report stated that extraction companies are currently exploiting parts of the esker, but future quarrying should be prohibited. As the deposit has all but been worked out within the Foxtown

quarry, the best outcome for both the quarry site and the County Geological Site is considered to be reinstatement of the land to agriculture and/or forestry use.

In preparation of this application consultations were held with Dr. Sarah Gately, Head of Geological Heritage & Planning Programme, Geological Survey of Ireland (GSI) and their appointed consultant quaternary consultant, Dr. Robbie Meehan who has first-hand knowledge of the Trim esker and environs (Refer to EIS Section 3.3.6).

It is proposed to preserve a representative section of the residual pit face adjoining the eastern boundary of the site (Refer to Figure B2.4 – Rev A, *EIS Section 2*).

The Geological Survey of Ireland has confirmed *"that it is fully satisfied that the proposed retention of a section of the residual pit face will preserve the geological heritage status of the site. In fact, the backfilling of the rest of the pit will enhance the appearance of this (important) feature, as at present, the base of the pit is quite haphazard".*

"The GSI would also like to request that future access to the residual face be permitted, for the purpose of scientific study by bona fide scientists".

Although of a rural, pastoral character, the locality is not noted particularly for amenities/activities such as fishing, walking, cycling and other outdoor pursuits. There are no Protected Views and Prospects oriented toward the area (Meath County Council 2013), which might be affected by the continued operation of the WRF. The visual impact of the WRF is discussed in more detail in Section 3.8 - Landscape.

On completion of waste recovery activities at the WRF, the entire site will be reinstated in accordance with the approved quarry restoration scheme. Therefore in the medium term, the site will be assimilated back into the landscape in a planned manner, with the attendant improvement to the visual amenity of the area.

3.10.4 POTENTIAL IMPACTS AND PROPOSED MITIGATION MEASURES

The proposed continued operation of the WRF at Foxtown arises from: (1) from the continued generation of large volumes of inert C&D waste, including soil and stone; and (2) the requirement to restore land, previously disturbed and degraded by sand and gravel extraction at the Foxtown quarry, through backfilling with recovered inert soil and stone. The recycling and recovery of C&D waste, mainly soil and stone, is essential to reduce resource utilisation and divert reusable inert waste from disposal in landfill, as required under the Waste Framework Directive 2008 (2008/98/EC), and the European Communities (Waste Directive) Regulations, 2011 (S.I. 126 of 2011).

The Foxtown site is located on an unnamed local road, c. 6km southeast of Trim, and c. 4.5km north northeast of Summerhill. Most site traffic serving the WRF is either off the Regional R158 Trim to Summerhill road at Dangan Bridge, or off the Regional R154 Trim to Dublin Road at Kiltale. The site lies c. 10km west of Junction 6 of the M3 motorway at Dunshaughlin, whilst Ratoath and Ashbourne are a further 6.5 and 10km, respectively to the east. Navan lies c.15km to the north, Kilcock c. 14km to the south, Maynooth c. 18km to the south southeast, and Dunboyne c. 18km southeast, rendering the WRF centrally positioned to deliver recovery of inert soil and stone from a large catchment area within the GDA with many burgeoning population centres and under strong development pressures.

There is a preference for the deposition of soil and stone to be underpinned by a beneficial use in order to be considered waste recovery. Consequently, co-location of a waste recovery facility at Foxtown quarry, has significant positive impacts, and is thus environmentally preferred.

The impact on material assets resulting from the proposed continuation of the WRF is assessed here, and possible mitigation measures proposed to reduce any significant impacts. It is expected that the potential negative impacts on material assets of the area arising from the WRF will relate primarily to nuisance from noise, dust and traffic. Indirect or cumulative impacts associated with other similar developments within the area are dealt with where necessary under the respective topic in the EIS.

The potential impacts associated with the WRF and any proposed mitigation measures in relation to the material assets described above are covered under relevant sections of the EIS as follows:

Ref.	Material Asset	Relevant EIS Section
3.10.3.1	Non-Renewable Resources	2.4.3.1, 3.3
3.10.3.2	Settlement - Residential Development	2, 3.1, 3.6, 3.7, 3.8, 3.11
3.10.3.3	Land Use	2, 3.1, 3.2, 3.3, 3.8
3.10.3.4	Transport Infrastructure	2.4.2.11 3.1, 3.11
3.10.3.5	Major Utilities	2.4, 3.1
3.10.3.6	Cultural Assets	3.9
3.10.3.7	Landscape & Natural Heritage	2, 3.1, 3.2, 3.6, 3.7, 3.8

Foxtown Sand & Gravel Ltd. has established an on-going environmental monitoring programme on site. This programme will allow on-going monitoring of environmental emissions (noise, dust, water) from the site, thereby assisting in ensuring compliance with any future requirements or regulations. The results of this monitoring will be made available to the EPA and the Local Authority on a regular basis, where members of the public may examine it. The future monitoring programme will be revised in order to ensure compliance with conditions attached to any decision to grant a Waste Management License.

The development can be controlled and regularised in accordance with the scheme as outlined in this document, through continued environmental monitoring and by planning conditions imposed by the EPA. The development does not have a significant impact on lands, property or amenity within the area and hence there will be no significant effect on material assets.

3.10.5 REFERENCES

1. DoELG (2002) The National Spatial Strategy for Ireland 2002-2020, Dept. of the Environment and Local Government (DOELG), Dublin Ireland, [Available at http://nss.ie/pdfs/Completea.pdf] 160 p.
2. Eirgrid (2008) Grid25: A Strategy for the Development of Ireland's Electricity Grid for a Sustainable and Competitive Future, Eirgrid, Dublin 4, Ireland [Available at http://www.eirgrid.com/media/Grid%2025.pdf] 48 p.
3. Eirgrid (2013) North-South 400kV Interconnection Development: Preferred Project Solution Project, Eirgrid, Dublin 4, Ireland, [Available at http://www.eirgridprojects.com/projects/northsouth400kvinterconnectiondevelopment/preferredprojectsolutionreport/] 137 p.
4. EPA (2002) Guidelines on the Information to be contained in Environmental Impact Statements, Environmental Protection Agency (EPA), Johnstown Castle, Co. Wexford, Ireland, [Available at http://www.epa.ie/pubs/] 33 p.
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6. EPA (2014) Envision Geoportal, Online Website, Environmental Protection Agency (EPA), Johnstown Castle, Co. Wexford, Ireland, [Available at http://gis.epa.ie/Envision]
7. Google (2014) Google Maps, Online Website, [Available at https://www.google.ie/maps/]
8. Meath County Council (2007) Meath Landscape Character Assessment, Meath County Council, Navan, Co. Meath, Ireland, [Available at http://www.meath.ie/] 95 p.
9. Meath County Council (2013) Meath County Development Plan (2013-2019), Meath County Council, Navan, Co. Meath, Ireland, [Available at http://countydevelopmentplan.meath.ie/adoptedplan/] Vols. 1-4
10. NPWS (2014) Online Website, National Parks & Wildlife Service (NPWS), Dublin 2, Ireland, [Available at http://www.npws.ie]

3.10.6 FIGURES

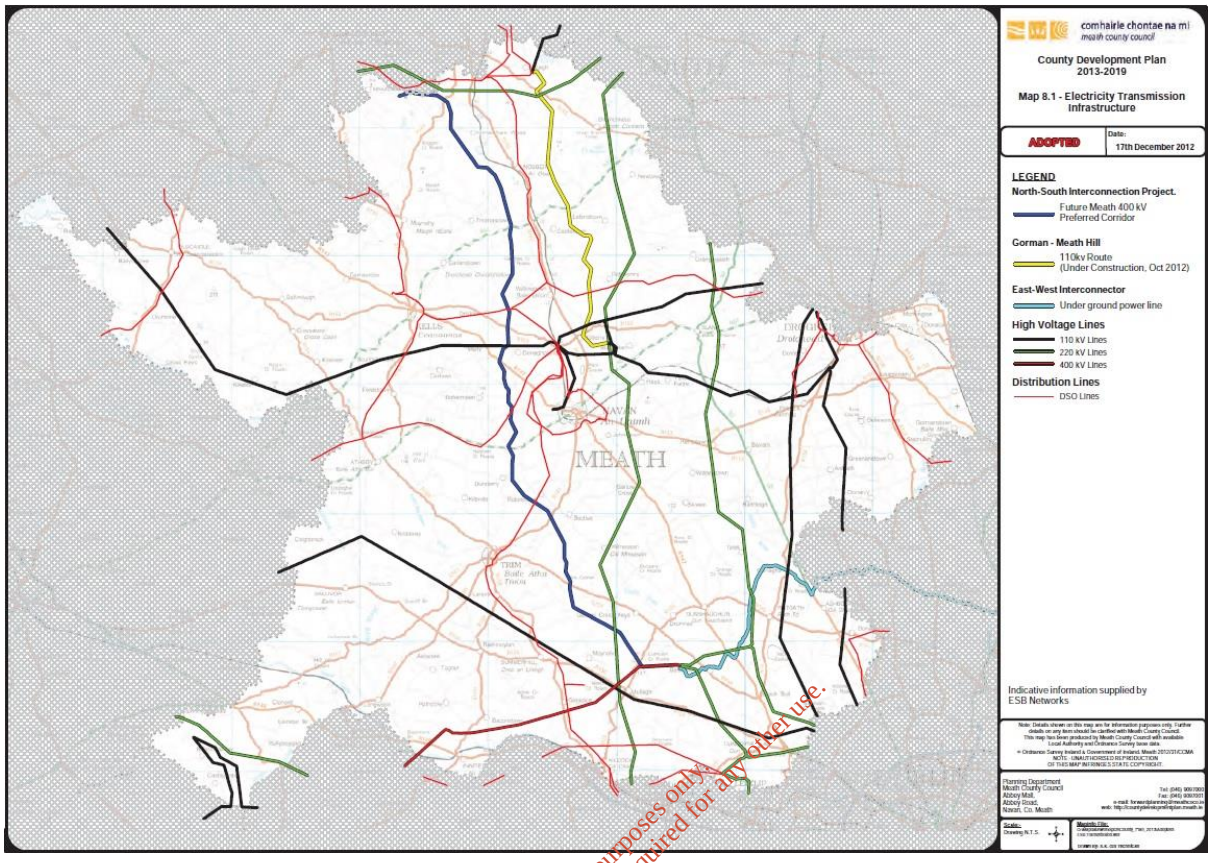

Figure 3.10-1 Electricity Transmission Grid in County Meath. Note the proposed 400kV North-South Interconnector traversing County Meath in vicinity of Foxtown. Redrawn from Meath County Council (2013).

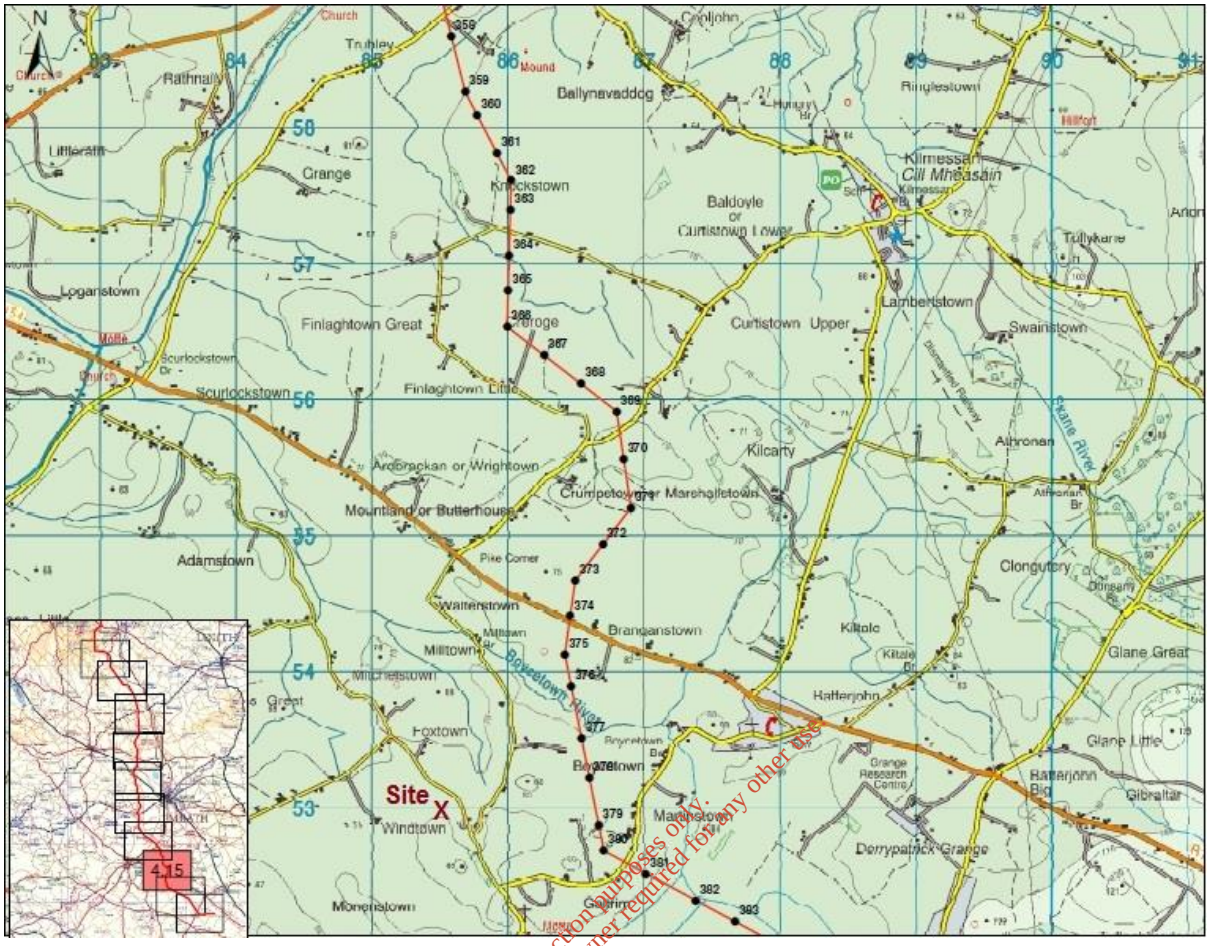

Figure 3.10-2. Eirgrid's Preferred 400kV North-South Interconnector Route. Note the proposed route traverses County Meath in vicinity of Foxtown. Site of Foxtown quarry and WRF marked with X. Redrawn from Eirgrid (2013).

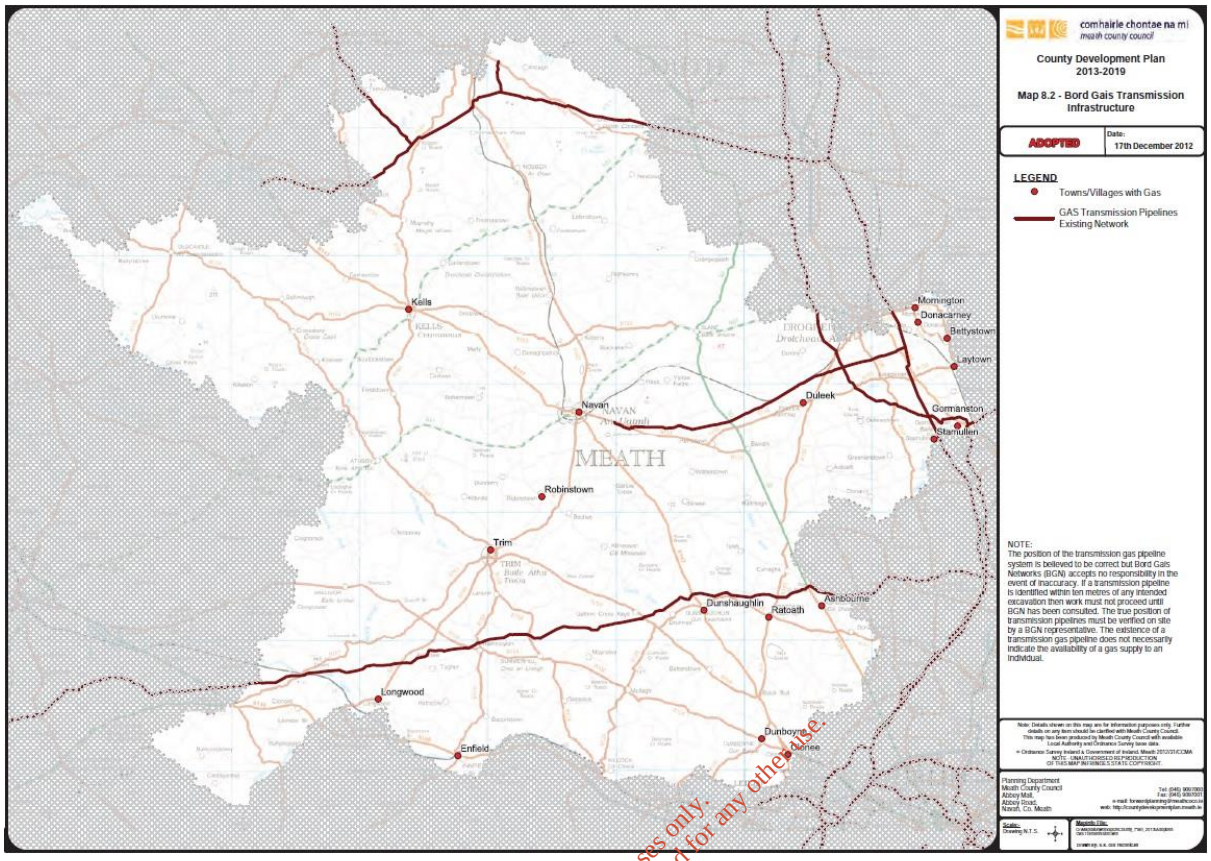

Figure 3.10-3. Bord Gais Pipeline Network in County Meath. Redrawn from Meath County Council (2013).

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3.11 TRAFFIC

3.11.1 INTRODUCTION

The proposal is to continue the restoration of a sand and gravel pit using imported inert soils, stone and recovery of inert C & D waste.

The nature of the development is the continued phased restoration of a sand and gravel pit using imported inert soils, stone, and recovery of inert construction and demolition waste. Up to circa 40,000 cubic metres per annum of inert materials is being accepted to site. It is estimated that only c. 10,000 tonnes per annum of inert construction and demolition waste will be recovered at the facility. Recovered material will be used for internal haul roads and/or dispatched off site.

This section assesses the traffic impacts of the proposed development on the road network adjacent to the existing Quarry. The traffic assessed is the traffic generated by the Quarry and Waste Recovery Facility, the traffic independent of the Quarry and Waste Recovery Facility and the interaction of both. The assessment comprises the following main elements:-

- The Receiving Environment.
- The Current Development
- Road and Junction Capacities
- The Parking Requirements
- The impact of the Development
- Remedial and Mitigation measures.

This section of the EIS has been prepared by Tony J. McNulty B.E, F.I.E.I. Chartered Engineer. Tony was previously a Mayo County Council Senior Engineer and has 40 years experience in road design, construction and maintenance, preparation of Traffic Management and Safety plans and the traffic sections of EIS.

3.11.2 SCOPE

The traffic section has been prepared taking into account the following documents: -

- National Roads Authority (NRA) 'Traffic and Transport Assessment Guidelines, June 2005.
- NRA National Roads and Traffic Flow 2004 (2005).
- Meath County Council Development Plan 2013 – 2019.

3.11.3 STUDY METHOD

The approach undertaken for the assessment is described in this section. Included are the details of all surveys undertaken, technical references used and assumptions made in the study. Traffic flows on the R154 and the Quarry and Waste Recovery Facility access junction were obtained by surveys carried out on 1st & 2nd September 2014. The traffic volumes using the Quarry and Waste Recovery Facility and direction distribution at peak production pre 2008 have been obtained from the Quarry and Waste Recovery Facility owner. These results are shown in Tables 3.11.1 & 3.11.2.

3.11.4 THE RECEIVING ENVIRONMENT.

This section describes the site location and the existing road network in the immediate vicinity of the Quarry and Waste Recovery Facility development.

3.11.4.1 SITE LOCATION

The site is situated in County Meath to the Southeast of Trim in the townland of Foxtown and to the south of the Regional road R154. The Quarry and Waste Recovery Facility site is situated on a Local road 2.5 km south of the village of Kiltale.

Site layout plan is shown in Fig. B 2.1 Rev A, *EIS Section 2 Figures.*

The access to the Quarry and Waste Recovery Facility is from the R154 Regional Route at the village of Kiltale, then 1.8 kms Southwest along a Local road to a T junction and thence continuing northwestwards along a Local road for a distance of 400m and 650m to the first and second access points respectively.

3.11.4.2 EXISTING ROAD NETWORK

3.11.4.2.1 Network Description

The Quarry and Waste Recovery Facility has two entrances located off the south side of a Local Route in the townland of Foxtown, Co. Meath.

The Quarry and Waste Recovery Facility access roads form 90º at grade junctions with the Local Road within the 80km/hr. speed limit zone.

Short 6m gravel access roads lead into the quarry at both entrances. The access roads have a gradient of 0.25% towards the Local road. The access roads surfaces are unpaved gravel. Inside the main entrance (northern) to the Waste Recovery Facility the access road leads to the inspection area and the placement areas. The Quarry and Waste Recovery Facility proper contains an office with a parking area for cars and vehicle parking.

Thìs Local Road leads to the R154 Regional road at the village of Kiltale. A branch Local Road leads from this Local Road to the R158 Summerhill to Trim road. The local roads in this area serve dispersed residents and agriculture. The local roads have sufficient capacity to cater for the Quarry and Waste Recovery Facility. It is therefore proposed to examine the effect the Quarry and Waste Recovery Facility generated traffic will have on the R154/Kiltale junction.

The R154 Regional road is the main access from the former N3 Dublin – Dunshaughlin road to Trim. A branch Regional road R125 leads from the R154 to the M3 near Dunshaughlin. The local road from Kiltale to the quarry is an unaligned two lane 6m surface dressed single carriageway with 2 No. 1m sloping grass verges in the vicinity of the Quarry and Waste Recovery Facility entrance. Overall right of way width is 8 m.

The cross section of the Local road at the site is shown in Figure No. 3.11.1

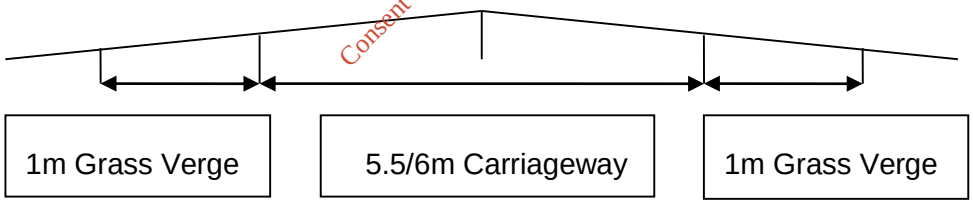

Figure 3.11.1 Local road Cross Section

3.11.4.2.2 Access Visibility

The Local road in the vicinity of the Quarry and Waste Recovery Facility entrance is unaligned. The access is located within the 80 km/hr speed limit area. The access sight distances are set out in the NRA DMRB TD 41- 42/11 and Meath County Council Development Plan 2013 - 2019. The ‘y’ distance required is 60m and the ‘x’ distance 3m. The junction of the Quarry and Waste Recovery Facility entrance with the R154 Regional has full access visibility requirements as set out in the NRA DMRB TD 41- 42/11 and the Meath County Council Development Plan 2013 -2019. The Quarry and Waste Recovery Facility access road approaches the Local road at right angles thus fulfilling the need for stopping distance and junction form recognition. The gradient of the access towards the Local road is 0.25%

3.11.4.3 EXISTING TRAFFIC FLOW CONDITIONS

The existing traffic volumes on the road network in the vicinity of the Quarry and Waste Recovery Facility are low. A traffic count was carried out on the junction R154 and the Kiltale /Quarry and Waste Recovery Facility access at the village of Kiltale on 1st & 2nd September 2014. The flows on the R154 are shown in Table 3.11.1.

Table 3.11.1. Traffic Volume Survey on R154/Kiltale to Quarry and Waste Recovery Facility Access (Vehicles)

TRAFFIC COUNT SUMMARY on R154/KILTALE to QUARRY AND WASTE RECOVERY FACILITY ROAD								
Hour Ending	**9.00**		**10.00**		**18.00**		**18.30**	
Movement No.	**HGV**	**Total**	**HGV**	**Total**	**HGV**	**Total**	**HGV**	**Total**
1	15	553	16	383	10	256	6	263
2	1	25	0	23	0	24	0	18
3	0	14	1	25	2	24	1	19
4	1	35	4	34	3	24	1	21
5	1	27	6	30	1	26	0	28
6	15	210	12	248	10	617	8	665
Two Way flow R154 (Vehicles)	33	860	39	746	26	971	16	1031
% HGV	3.8		5.2		2.7		1.6	

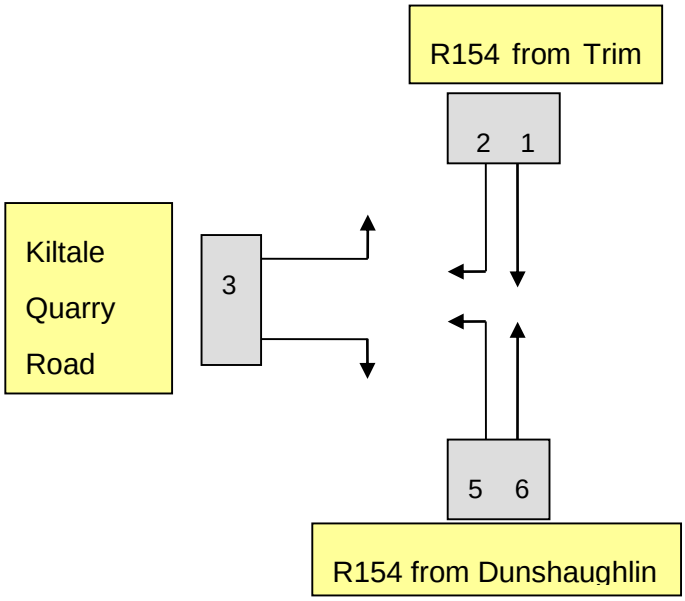

Figure 3.11.2. Junction Movements Diagram

There was some pedestrian and pedal cycle traffic observed in the immediate area.

The morning and evening peak flows were found to be 8.15-9.15 hrs and 17.15-18.15 hrs respectively. The evening peak traffic generates the greatest flows on the junction. The R154 traffic data was obtained by a traffic count on the 1st & 2nd September 2014. This gave a 2014 AADT of 12615 with a 5% HGV content.

Table 3. 11.2. Peak Hour Flows in 2014 (Vehicles)

LINK	AADT	PEAK HOUR FLOW
R154	12615	971
Quarry and Waste Recovery Facility Access /Kiltale	N/A	11

3.11.5 TRAFFIC GENERATED BY DEVELOPMENT

3.11.5.1 TRAFFIC GENERATION

The volume of peak hour traffic generated by the development is the determining factor of the impact of the development. The projected import of material for recovery into the Quarry and Waste Recovery Facility is estimated to be up to 40,000 cu.m (80,000 tonnes) per annum of inert C&D waste predominantly soils and stone. It is estimated that only c. 10,000 tonnes per annum of inert construction and demolition waste will be recovered at the facility. Recovered material will be used for internal haul roads and/or dispatched off site.

This material can be divided as follows:-

Table 3. 11. 3. Summary of Proposed Traffic Generated (Vehicles)

Material	Load Type	Total Import /Annum	Total Export/ Annum	Number of Loads/ Annum	Number of Trips/ Annum	Number of Trips/Day
C & D /	20T loads	80000		4000	8000	30
Recovered	20T loads		5000	250	500	2
TOTAL		80000	5000	4250	8500	32

Based on a 50 week year this represents an average weekly import of 1600 tonnes or a maximum 30 truck movements per day and an export of recovered material of 100 tonnes per week or a maximum 2 truck movements per day. The traffic generated by the Quarry and Waste Recovery Facility therefore falls into a number of categories:-

- C&D Material import haulage traffic entering laden and leaving empty the development onto the public road network. This will be typically by means of 6 x 4 Rigid trucks with maximum weight of 20 tonnes.
- Recovered material export haulage traffic entering empty and leaving laden the development onto the public road network. This will be typically by means of 6 x 4 Rigid trucks and with maximum weight of 20 tonnes.
- Employees cars. (2 employees)
- Delivery Vehicles

As construction activity has reduced since 2008 the present traffic generated by the Quarry and Waste Recovery Facility is considerably reduced. The future continued use of the facility as it exists will continue to generate traffic at the same level as present. The proposal is to import material for infill and recovery which will generate import and export traffic as shown in Table 3.11.4.

Table 3.11.4. Peak Daily Quarry and Waste Recovery Facility Traffic 2014

Vehicle Type	Number of Trips	Average Trips	Peak Hour
HGV	32	32	8
Cars	4	4	2

The volume of traffic generated by the existing Quarry and Waste Recovery Facility will comfortably be absorbed by the local roads. The most significant effect on traffic will be at the R154/Kiltale-Quarry Road junction. This junction is located within a 50 kph speed zone. It is predicted that the existing Quarry and Waste Recovery Facility traffic will be 90% northeastwards towards the M3 and 10% towards Trim.

It is therefore proposed that traffic generated by the existing Quarry and Waste Recovery Facility will be analysed in relation to the R154/Kiltale-Quarry Road junction.

The peak hour Quarry and Waste Recovery Facility traffic does not necessarily coincide with the AM and PM peaks on the R154. However by applying the peak hour figures for the R154 to the predicted traffic generated by the Quarry and Waste Recovery Facility activity calculated above it will result in the most robust analysis of the traffic assessment.

3.11.5.2 TRAFFIC DISTRIBUTION

The generated low volume split of existing Quarry and Waste Recovery Facility related traffic at the R154/Kiltale-Quarry Road junction is estimated to be 90% northeastwards towards the M3 and 10% towards Trim. While this percentage may change in the future it will not change to such a significant extent so as to adversely affect the traffic distribution.

3.11.5.3 TRAFFIC ASSIGNMENT

The resulting assignment of the generated two way traffic by the Quarry and Waste Recovery Facility activity along the Kiltale/R154 junction road is shown in Table 3.11.5 : -

Table 3.11.5 Assignment of Average Daily Quarry and Waste Recovery Facility Traffic (Vehicles/Day) to Kiltale/R154 junction

Direction	Vehicle Type		
	Car/LGV	HGV	Total
R154 Southwestwards towards Quarry 50%	2	16	18
Northeastwards from Quarry towards R154 50%	2	16	18
Total	4	32	36

3.11.5.4 PEAK HOUR QUARRY AND WASTE RECOVERY FACILITY TRAFFIC

The Quarry and Waste Recovery Facility opening hours are 08.00 hrs - 18.00 hrs. Monday to Friday, and 08.00 hrs - 13.00 hrs. Saturday.

The traffic generated during the morning and evening peak is calculated. The evening peak will be greatest due to the Quarry and Waste Recovery Facility as the traffic count indicated. When this is added to the other vehicle daily average it yields an evening peak flow to the Quarry and Waste Recovery Facility of 8 vehicles inward and 10 outwards. The morning peak flow will be of the order of 10 vehicles inward and 8 outwards.

Table 3.11.6. Assignment of Morning Peak Hour Quarry and Waste Recovery Facility Traffic (Veh/hr & PCU's)

Direction	Vehicle Type					
	LGV/Car		HGV		Total	
	V/H	PCU	V/H	PCU	V/H	PCU
Quarry and Waste Recovery Facility to R154	0	0	4	12	4	12
R154 to Quarry and Waste Recovery Facility	2	2	4	12	6	14
Total	2	2	8	24	10	26

Table 3.11.7. Assignment of Evening Peak Hour Quarry and Waste Recovery Facility Traffic (Veh/hr & PCU's)

Direction	Vehicle Type					
	LGV/Car		HGV		Total	
	V/H	PCU	V/H	PCU	V/H	PCU
Quarry and Waste Recovery Facility to R154	2	2	4	12	4	12
R154 to Quarry and Waste Recovery Facility	0	0	4	12	6	14
Total	2	2	8	24	10	26

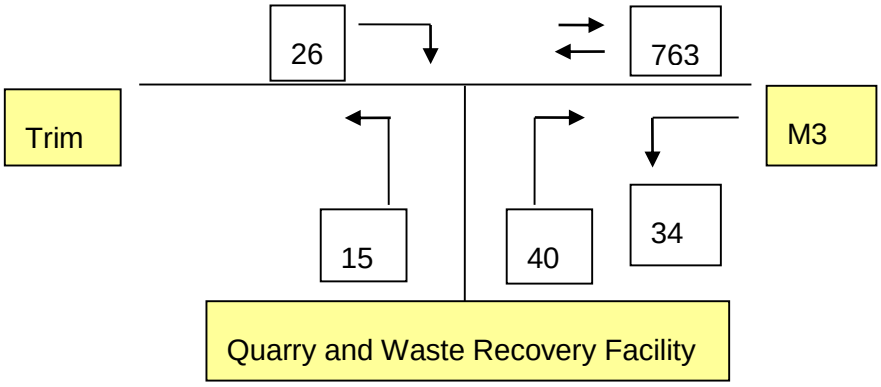

Figure 3.11.3 Quarry and Waste Recovery Facility Traffic Assignment AM Peak Hour (Vehicles/hr) at the R154/Kiltale junction

The peak hour additional Quarry and Waste Recovery Facility traffic would increase the junction movements by 1.1%.

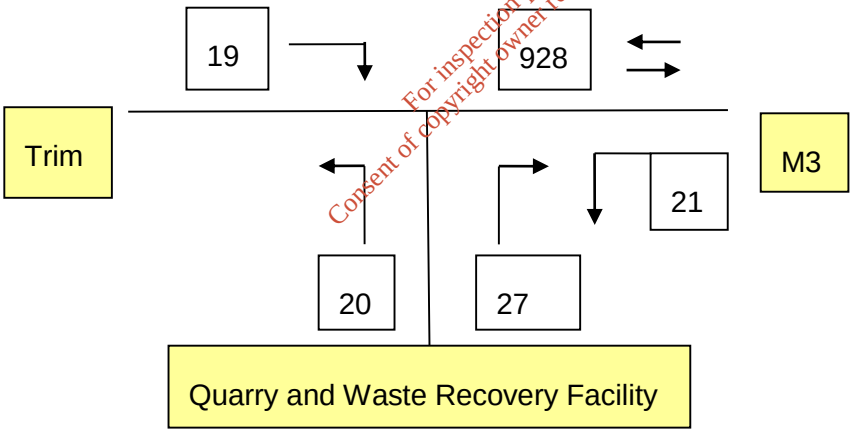

Figure 3.11.4 Quarry and Waste Recovery Facility Traffic Assignment PM Peak Hour (Vehicles/hr) at the R154/Kiltale junction

The peak hour additional Quarry and Waste Recovery Facility traffic would increase the junction movements by 1%.

The evening peak flow of Quarry and Waste Recovery Facility traffic been the greater it will be used for the assignment. If these figures are combined with the evening peak flow traffic on the R154 Regional road it will yield the worst scenario for assessment of the traffic day (See Section 3.11.4.3).

3.11.6 TRAFFIC FLOW ASSESSMENT

3.11.6.1 GENERAL

The existing traffic volumes on the road network in the vicinity of the Quarry and Waste Recovery Facility would appear to be lower than the peak flow volumes in 2007/2008. It is anticipated this will be the future level of traffic with the addition of the calculated traffic using the Quarry and Waste Recovery Facility.

The current volumes on the R154 are obtained from the traffic count carried at the R154/ Quarry and Waste Recovery Facility access on 1st & 2nd September 2014. These flows on the R154 are shown in Table 3.11.1.

This information defined the morning and evening peak hour flows as 8.00-9.00 hrs & 17.30-18.30 hrs. As the evening peak was the greater this was the figure used for assessment.

The impact of the Quarry and Waste Recovery Facility on the road network was assessed by examining the performance of the Quarry and Waste Recovery Facility access with the R154 as outlined in Section 3.11.5 above.

The peak HGV movements on the R154 / Quarry and Waste Recovery Facility junction were calculated and assigned using the historical traffic from the Quarry and Waste Recovery Facility. The peak hourly movements of traffic at the R154 junction are the combination of the Quarry and Waste Recovery Facility movements and the R154 movements. The results are shown in Tables 3.11.6 & 3.11.7 and Figures 3.11.3 & 3.11.4 above.

3.11.7 JUNCTION OPERATION

An assessment of the R154/Quarry and Waste Recovery Facility junction was carried out and it was found that there would be an increase of 1% in overall traffic using the junction. The additional traffic generated by the Quarry and Waste Recovery Facility is predicted to be 90% generated from the East thus there will be minimal generated cross turning movements conflicting with the mainline Trim to the M3 traffic. This junction is located within a 50 kph speed zone. The traffic on the quarry leg of the Kiltale junction is predicted to increase by 6 vehicles in the evening peak hour or 10.5%.

The above results show the maximum traffic generated by the Quarry and Waste Recovery Facility development has a negligible effect on the operation of the junction and the R154.

3.11.8 IMPACTS OF THE DEVELOPMENT

The impact of the Quarry and Waste Recovery Facility on the local road network has been assessed for the Operation and Restoration phases of the Quarry and Waste Recovery Facility.

3.11.8.1 OPERATIONS OF THE DEVELOPMENT

This has been outlined in Section 3.11.5.1 above. In brief the Quarry and Waste Recovery Facility generates traffic which will have an impact on the adjacent road network. In addition the continuing use of the development will maintain the current level of traffic movements on the junction. While the traffic specifically associated with the Quarry and Waste Recovery Facility business has reduced significantly since 2008 it is proposed that the future annual intake of material will be 80,000 tonnes of inert material including the recovery of 10,000 tonnes of inert construction and demolition.

3.11.8.2 FINAL RESTORATION

The final restoration of the development will continue as material is received on site and will require the use of earth moving machinery for completion. This machinery is already available on site and as such there no additional traffic associated with mobilising earthmoving onto and off the site. The proposal for the import of the material into the Quarry and Waste Recovery Facility will result in the availability of inert material for the restoration of the Quarry.

3.11.9 PARKING

The parking requirements for the Quarry and Waste Recovery Facility operation mainly relate to the Quarry and Waste Recovery Facility employees and visitors. While the Meath County Council Development Plan 2008 – 2014 does not specifically detail the requirements for quarries it would be reasonable to provide sufficient for employees and visitors. The maximum number of employees at peak was 3. Therefore a car park provision of 3 + 25% for visitors (say 4 spaces) would be required. The present car park is laid out just inside the entrance of the Quarry and Waste Recovery Facility. This area will be more than adequate for the provision of greater than 4 spaces.

3.11.10 MITIGATION

The Quarry and Waste Recovery Facility will continue to import material for infill until the infill area is exhausted and the lands restored to beneficial after-use.

All trucks exiting the site will leave through the existing wheelwash facility.

Traffic direction signs, warning signs, speed limit signs are established throughout the site.

In the event of material being spilled on the public road the quarry operator will ensure that spilled material is removed from the road surface in a safe and timely manner, as soon as they notice or are notified that a spillage has arisen.

Regular sweeping of the access road and site entrance will also be carried out.

No site traffic will be permitted to travel north on the Local road.

Warning signs to alert passing traffic have been provided on the Local road.

It is considered that given the scale of the proposed development and the nature and condition of the road serving the site, and the proposed mitigation measures that the development will not lead to a greater risk to public safety by reason of traffic hazard.

3.11.11 CONCLUSIONS

The following are the conclusions of the analysis of the traffic impact of Quarry and Waste Recovery Facility:

1. The capacity of the R154 at the Kiltale Junction is between 700 and 1350 pcu's/hr and the existing volume on the R154 falls within this envelop of the available capacity. The Kiltale/Quarry and Waste Recovery Facility site has an approximate capacity of 250 pcu's/hr .The proposed peak hours volumes are considerably less than this.
2. The traffic impact of the Quarry and Waste Recovery Facility on the surrounding roads and the R154 network is considered minimal, (on average the projected Quarry and Waste Recovery Facility traffic is 1% of the total traffic at the peak hour given the present and forecasted level of activity at the Quarry and Waste Recovery Facility.
3. The traffic impact of the Quarry and Waste Recovery Facility is at present considerably less than it was at full production prior to 2008. During this period the traffic generated by Quarry and Waste Recovery Facility had little adverse effect on traffic movements on the surrounding road networks. The continued use of the Quarry and Waste Recovery Facility at the predicted level will not increase the traffic over the present level.
4. The level of turning movements at the R154/Quarry and Waste Recovery Facility Access junction are of a low volume within the total capacity of the road network and the Quarry and Waste Recovery Facility traffic represents 10.5 % average of these low volume movements.
5. The local road at the quarry entrance is an unaligned single carriageway road with verges stretching to the north and south of the Quarry
6. The local road from the Quarry and Waste Recovery Facility Access to the Kiltale junction with the R154 is an unaligned single carriageway road with verges. There a footpath on the east side in the vicinity of the R154.
7. The quality of the pavement in the vicinity of the Quarry and Waste Recovery Facility entrance to the R154 is at present in good condition.
8. The adjacent road receiving network to Kiltale village is of a medium quality but is capable to cater for the Quarry and Waste Recovery Facility generated traffic.

3.12 INTERACTION OF THE FOREGOING

3.12.1 INTRODUCTION

Schedule 6 of the Planning and Development Regulations 2001 (S.I. 600/2001) sets out the requirement to consider the interrelationships of certain aspects of the environment as part of the EIA process. The requirement arises from the recognition that all environmental factors are inter-related to some extent.

Interactions are usually highly complex, and a change in any one factor, such as land-use or water quality, could affect all of the other interrelated factors. Although almost all environmental aspects are inter-related to some degree only the significant interactions are usually considered in an assessment.

The interactions of the impacts and mitigation measures between one topic and another, where applicable, are discussed under the respective sub-sections within Section 3, rather than in a specific "Interactions" section. Because an EIS is typically prepared by a number of specialist consultants it is important that the interactions between the various disciplines are also considered. This section draws attention to significant interaction and interdependencies in the existing environment.

3.12.2 POTENTIAL IMPACTS AND MITIGATION MEASURES

In terms of protecting the environment, the impacts of the proposed development of a Waste Recovery Facility (WRF) at Foxtown have been assessed and where required, appropriate mitigation measures provided to remedy any significant adverse effects on the environment.

The following matrix has been generated to show where possible interactions may result between the various environmental impacts. For details of any interactions refer to the relevant sections of the EIS.

Table 3.12.1 Interaction Matrix

Section	3.1 Human Beings	3.2 Flora & Fauna	3.3 Soils & Geology	3.4 Water	3.5 Climate	3.6 Air Quality	3.7 Noise	3.8 Landscape	3.9 Cultural Heritage	3.10 Material Assets	3.11 Traffic
3.1 Human Beings											
3.2 Flora & Fauna											
3.3 Soils & Geology											
3.4 Water	•	•	•								
3.5 Climate											
3.6 Air Quality	•	•			•						
3.7 Noise	•	•									
3.8 Landscape	•	•				•					
3.9 Cultural Heritage								•			
3.10 Material Assets	•			•		•	•	•	•		
3.11 Traffic	•	•				•	•			•	