3 MAJOR ACCIDENTS AND DISASTERS

3.1 INTRODUCTION

3.1.1 This chapter of the Environmental Statement (ES) describes and assesses the potential effects of the Development in terms of major accidents and disasters that could have the potential to occur on the Site in construction and its 40-year operational lifetime.

3.1.2 Relevant legislation and guidance which is relevant has been considered in this assessment.

3.1.3 This topic is included within this Environmental Statement due to the Screening Directive that was issued by the Secretary of State in November 2021. (Appendix 1.2). In relation to the area of major accidents the Screening Directive states

> **"It is noted that a 2017 EIA Regulations compliant Environmental Statement is required to consider the risks of, and vulnerability to, major accidents or disasters (including due to climate change) that are relevant to that development e.g. for project components such as battery storage or in relation to flood risk."**

3.1.4 This reference to risk from major accidents and/or disasters comes from Schedule 3,1(f) of the EIA Regulations. Schedule 3 of the Regulations is the selection criteria for screening of a Schedule 2 development. This list should be considered to determine which characteristics of a development have the potential to lead to a significant environmental impact. It is not, as the Screening Direction indicates, a requirement for all EIA's to consider the risk of a major accident or disaster. The scoping process as defined under Regulation 15 and 16 of these Regulations would be the route to determine if there was a justifiable reason why there is a risk of a "significant" environmental impact from the Proposed Development.

3.1.5 As stated in chapter 1 of this ES there has been no formal Scoping Request made to N&SDC. Therefore, this ES shall consider the risk of major accidents, including any increase in risk due to climate change and any impact due to flood risk through climate change or through a major accident.

3.2 HEALTH AND SAFETY – DESIGN, POLICY AND EQUIPMENT

Health and Safety at Work

3.2.1 There are various health and safety considerations particularly for workers during construction and decommissioning of the Development. Workers are in the closest proximity to the Development as a result are considered to be the most at-risk group.

3.2.2 Comprehensive health and safety assessments are an essential part of the construction process and would be carried out prior to construction by the contractor in accordance with legislation. A Construction, Design and Management (CDM)co-ordinator will be appointed responsible for the provision of a pre-construction information pack, as required under the Construction (Design and Management) Regulations 2015. The appointed contractor will be required to provide a construction phase plan.

3.2.3 The construction of the Development would be managed in accordance with the Health and Safety at Work Act 1974 and would comply with all other relevant Health and Safety Regulations, including:

- The Construction (Health, Safety and Welfare) Regulations, 1996:
- Construction (Design and Management) Regulations 2015; and
- Electricity Safety, Quality and Continuity Regulations, 2002.

3.2.4 The Development would operate to Health and Safety Executive 'Health and safety in the new energy economy: Meeting the challenge of major change" published in August 2010.

Unexploded Ordinance (UXO)

3.2.5 A preliminary online desk-based search of the potential for unexploded ordnance (UXO) present within the Site was undertaken in November 2021. The results identified the Site as a 'Low Risk' area, relative to other locations within the UK generally.

3.2.6 However, UXO will form part of the health and safety risk consideration when construction is taking place on the Site. Retaining this measure for UXO, will ensure that the risk to human health of the construction workers is considered to be low and not significant during the construction phase.

Design of the Equipment

3.2.7 The scheme that is being proposed is for the installation of ground mounted solar panels, battery storage containers and the necessary cabling and infrastructure to connect these items to the National Grid.

Construction and Decommissioning Phase

3.2.8 Health and Safety during construction is addressed earlier in this chapter. In summary, the risk to both construction workers and the general public is low and not significant during the construction and decommissioning phases.

3.2.9 It is intended that after the 40-year operational life of the solar farm the panels and batteries will be removed from the Site. However, the DNO substation will remain in place on the Site. This substation is connecting into the 132kV grid system which forms part of the transmission network for the UK. Once this DNO substation is built it is "adopted" by the DNO for their use and maintenance. It has been designed to fit with the electricity generation requirements of the Proposed Development.

3.2.10 Once the solar farm and batteries are removed, there will be capacity within the system for further energy generation to be moved through this section of the 132kV network and will in turn assist the DNO is balancing the network, beyond the 40-year life time of the scheme. This assistance for the DNO is balancing the 132kV grid system will create a benefit of minor significance.

Operational Phase

Solar PV Arrays

3.2.11 When operational the majority of the development comprises of solar PV modules which are inert. Electrical infrastructure will be located across the Development, in the form of inverters, transformers and cabling, all of which will be subject to routine maintenance such that it is not considered to pose a significant risk to creating an accident or disaster.

Electrical Compound

3.2.12 The substation compound which will include the substation transformers all of which will be subject to routine maintenance such that it is not considered to pose a significant risk of creating an accident or disaster.

3.2.13 The Site has also been designed to have battery storage capacity. The battery stations are in fields throughout the Proposed Development. This is an energy storage system which includes batteries, inverters and system controllers. Any system installed will be strenuously tested during the factory and pre-commissioning testing regime before being given the final signoff to energise. It is worth highlighting that the overwhelming majority of energy storage sites continue to operate without any problems which means that the risk is quite small.

3.2.14 There are three main battery storage options used within the industry. These are Li-ion, LIP/LEP (Lithium Ion Phosphate) and Flow Storage technologies.

- Li-ion is an established technology that has been used in mobile phone/laptops electric vehicles for many decades. Manufactures use that technology and scale it up to utilise it for storage on a Site such as this. The battery cells are housed in purpose-made containers, which include an extremely efficient an intelligent management system as well as state of the art cooling and fire suppression systems.

  The systems can detect the off gases predating the thermal runway event and shut down the malfunctioning cell/rack safely. The sensors used to do this are sensitive down to 1pmm (parts per million)
- Lithium -Ion Phosphate as a technology has a higher thermal runaway temperature threshold and hence, improved battery safety.
- Flow Storage uses electrolyte is an aqueous form which is inherently safe and non-flammable. Flow batteries are housed in similar purpose-made containers with slightly different management and support systems but ultimately functioning the same as the Li-ion batteries.

3.2.15 There is a potential fire risk associated with certain types of batteries such as lithium ion, although the battery stations include a cooling system which is designed to regulate temperatures to within safe conditions to minimise risk of fire.

3.2.16 The battery technologies on which the design is based details the following with regards to fire protection. The manufacturer undertakes extensive testing and analysis to assess fire risk. Based on their fire risk assessment the following recommendations are made:

- Do not install batteries where temperatures routinely approach or exceed $80^{O}C$ – this is not the case at the Site;
- Do not install batteries near heating equipment or heat sources – this is not the case at the Site;
- Protect the installation area from flooding – this has been done on the Site with the introduction of the above ground surface water areas which will slow down the flow of water across the Site; and
- Ensure that installation areas comply with the appropriate local fire, electrical and building code requirements – this would be case with this Proposed Development.

3.2.17 Fire detection and suppression features would be installed to detect (e.g. multi-spectrum infrared flame detectors) and suppress fire to minimise the effect of any fire. The Proposed Development design will include adequate separation between battery stations to ensure that an isolated fire would not become widespread and lead to a major incident.

3.2.18 The risk of fire is small and therefore not likely to lead to any major accidents or disasters as this has been mitigated by the design of the equipment and the design of the Site.

3.2.19 Once the system is commissioned, regardless of the technology used, the whole installation will report and be monitored continuously be a central hub (Operations and Maintenance Centre) where engineers and technology experts will be ensure that it is operating optimally and safely 24 hours a day, 7 days a week.

Cumulative

3.2.20 There are no sites that need to be considered from a cumulative perspective within this Environmental Statement.

Mitigation and Enhancement

3.2.21 Mitigation has been built into the design of the Site, using high quality equipment and following UK best practice for operational practices when on Site.

Conclusion

3.2.22 The Site design has offered 'mitigation through design' for the H&S risk of the construction process and operation of the solar panels and battery storage. The likelihood of a H&S an incident or a fire on the Site, when management is in place, is extremely low, and therefore the significant impact of the risk of a major accident from H&S failures, fire or UXO is negligible.

3.3 FLOOD RISK

Vulnerability of the Development

3.3.1 It is considered that the Development is only vulnerable to one type of major accident or disaster: that of surface water flooding. This full flood risk of the proposed development and any possible impacts have been assessed in full in the Flood Risk Assessment which accompanied the planning submission. (FRA, Calibro, 2nd July 2020 BR-629-0007).

3.3.2 The potential effects on the development through climate change has also been considered due to the Screening Directive from the Secretary of State.

Flood Risk (Surface Water)

3.3.1 This section presents an assessment of the potential major accidents and disasters effects in terms of flood risk of the Proposed Development at Cotmoor Solar Farm, Halloughton. As there is no material difference in flood risk and hydrology between the Refused scheme Figure 1.3 and the Alternative scheme Figure 1.4 (in which 10 ha of panels have been removed) the assessment holds true for both schemes.

3.3.2 The proposals include a surface water attenuation feature to manage runoff from the substation in accordance with relevant policy on managing surface water runoff. This can be seen on **Figure 3.1 Surface Water Drainage Proposals.** The proposals also include two bunded attenuation features which would store water in the catchment of the Westhorpe Dumble and Potwell Dyke, which would reduce downstream flood risk in the town of Southwell which has experienced flooding in the recent past. The locations of these bunded features can be seen in the northern section of the Site in both Layout Plans that are considered within this ES (Figure 1.3 and Figure 1.4).

Methodology

3.3.3 This section covers the assessment of potentially significant adverse effects of the Proposed Development on the environment relating to major accidents and/or disasters.

3.3.4 The underlying objective of the assessment is to ensure that appropriate precautionary actions are taken for those developments which: '…because of their vulnerability to major accidents and/or natural disasters (such as flooding, sea level rise, or earthquakes), are likely to have significant adverse effects on the environment.' (Paragraph 15 of Directive 2014/52/EU)

3.3.5 The following steps were undertaken as part of the assessment:

- Risk identification
- Risk classification, likelihood and consequence: and
- Risk evaluation

Risk Identification

3.3.6 Risks are identified in respect of the Proposed Development's:

- Potential vulnerability to accidents or disasters
- Potential to cause accidents or disasters

Risk Classification

3.3.7 The likelihood of occurrence, classification of risk and risk matrix used for the assessment has been taken from 'A Guide to Risk Assessment in Major Emergency Management January 2010[1]' as shown in the following tables. This document was published by the Irish Government, but its matrix for determining risk follows a logical approach and one that has been used for the methodology for this assessment.

[1] A Framework for Major Emergency Management – Guidance Document 1, A Guide to Risk Assessment in Major Emergency Management, January 2010. https://www.gov.ie/en/publication/37414-a-guide-to-risk-assessment-in-major-emergency-management-january-2010/

Table 3.1: Classification of Likelihood

Ranking	Criteria	Example
1	Extremely Unlikely	May occur only in exceptional circumstances; Once every 500 or more years
2	Very Unlikely	Is not expected to occur; and/or no recorded incidents or anecdotal evidence; and/or very few incidents in associated organisations, facilities or communicates; and / or little opportunity, reason or means to occur; May occur once every 100-500 years.
3	Unlikely	May occur at some time; and /or few, infrequent, random recorded incidents or little anecdotal evidence; some incidents in associated or comparable organisations worldwide; some opportunity, reason or means to occur; may occur once per 10-100 years
4	Likely	Likely to or may occur; regular recorded incidents and strong anecdotal evidence and will probably occur once per 1-10 years
5	Very Likely	Very likely to occur; high level of recorded incidents and/or strong anecdotal evidence. Will probably occur more than once a year

Table 3.2: Classification of Impact

Importance	Consequence	Impact	Description
1	Minor	Life, Health, Welfare Environment, Infrastructure, Social	Small number of people affected; no fatalities and a small number of minor injuries with first-aid treatment. No Contamination, localised effects <0.5m Euros Minor localised disruption to community services or infrastructure (<6 hours)
2	Limited	Life, Health, Welfare Environment,	Single fatality; limited number of people affected; a few serious injuries with hospitalisation and medical treatment required. Localised displacement of a small number of people for 6-24 hours. Personal support satisfied through local arrangements Simple contamination, localised effects of

		Infrastructure, Social	short duration 0.5-3M Euros Normal community functioning with some inconvenience
3	Serious	Life, Health, Welfare Environment, Infrastructure, Social	Significant number of people in affected area impacted with multiple fatalities (<5), multiple serious or extensive injuries (20), significant hospitalisation. Large number of people displaced for 6-24 hours or possibly beyond; up to 500 evacuated. External Resources required for personal support. Simple Contamination, widespread effects of extended duration. 3-10M Euros Community only partially functioning, some services available.
4	Very Serious	Life, Health, Welfare Environment, Infrastructure Social	5 to 50 fatalities, up to 100 serious injuries, up to 2000 evacuated Heavy contamination, localised effects or extended duration 10-25M Euros Community functioning poorly, minimal services available
5	Catastrophic	Life, Health, Welfare Environment, Infrastructure Social	Large numbers of people impacted with significant numbers of fatalities (>50), injuries in the hundreds, more than 2000 evacuated. Very heavy contamination, widespread effects of extended duration. >25M Euros Serious damage to infrastructure causing significant disruption to, or loss of, key services for prolonged period. Community unable to function without significant support.

Table 3.3 Degrees of Significance

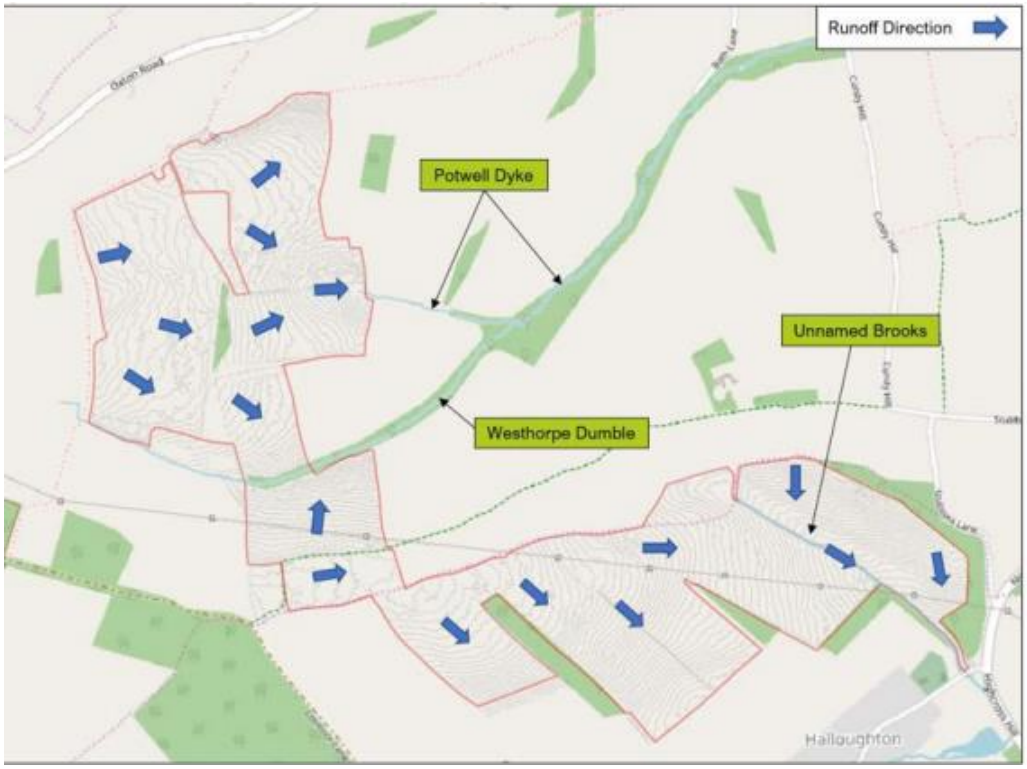
		Consequence Rating				
		Minor	**Limited**	**Serious**	**Very Serious**	**Catastrophic**
Likelihood Rating	**Very Likely**	Low Risk	Medium Risk	High Risk	High Risk	High Risk
	Likely	Low Risk	Medium Risk	Medium Risk	High Risk	High Risk
	Unlikely	Low Risk	Moderate adverse	Medium Risk	Medium Risk	High Risk
	Very Unlikely	Low Risk	Low Risk	Low Risk	Medium Risk	Medium Risk
	Extremely Unlikely	Low Risk	Low Risk	Low Risk	Low Risk	Low Risk

Baseline Conditions

Site Description and Context

3.3.8 There are three small Ordinary Watercourses recorded on open mapping data as shown in Figure 3.2.

Figure 3.2 Site Topography and Hydrology



3.3.9 The Site sits in an elevated position and consequently the catchment areas that drain to these ditches are very small (less than 1km^2). There are also land drainage ditches located across the site.

3.3.10 The entire Site falls within the Trent Catchment and the Humber River Basin District. The northern part of the forms part of the headwaters of the Westhorpe Dumble and the Potwell Dyke. The Potwell Dyke flows through Southwell before discharging into the River Greet. The southern part of the Site generally drains in southeasterly direction to join an unnamed watercourse which is a tributary of the Halloughton Dumble.

3.3.11 The Site generally comprises clayey soils over impermeable bedrock geology. The Site is currently used predominantly for arable agriculture with the land generally ploughed downslope and left denuded for large periods of time following harvest. The land use promotes the formation of shrinkage cracks.

3.3.12 There have been several flood events in Southwell which receives flows from the Westhorpe Dumbell and Potwell Dyke. A site visit was carried out with representatives from the Trent Rivers Trust and the Southwell Flood Forum who advised that the catchment had a rapid response to rainfall events especially when saturated by rainfall or when the ground is particularly dry and cracked. It is understood that flooding predominantly affects highways but that some properties have also been affected.

Assessment of Likely Significant Effects (Surface Water Flooding)

Construction

3.3.13 During construction the potential for significant flooding of the Site is considered to be Very Unlikely given its elevated position and the Consequence is assessed as being Minor. The risk is therefore assessed as being Low and no specific mitigation is required.

3.3.14 As part of the construction works the proposed surface water attenuation features will be formed at an early stage which will contain surface water and provide a reduction in runoff rates. The risk of flooding from the Proposed Development due to extreme weather is therefore considered to not require further assessment.

3.3.15 There are no reservoirs or canals upstream of the Proposed Development which could present a risk of flooding following an accident and therefore no further assessment is required.

3.3.16 The proposals include two bunded storage areas which will contain approximately 400m^3 of water when at capacity. The risk of accidental release of this water through damage to the bunds is considered to be Extremely Unlikely. The bund will only contain water during extreme events during which time construction activities will be ceased. The consequence is considered to be Minor, unless it coincided with a large flood from other sources in which case the incremental impact would be limited. The risk of flooding from the Proposed Development during construction is therefore considered to not require further assessment.

Operation

3.3.17 The Proposed Development has been designed taking due account of flood risks due to extreme weather and would not be impacted by a 1 in 1,000 year event. These models takes into account the current predicted effects from climate change. The risk of flooding from the Proposed Development due to extreme weather is therefore considered to not require further assessment.

3.3.18 There are no reservoirs or canals upstream of the Proposed Development which could present a risk of flooding following an accident and therefore no further assessment is required.

3.3.19 The risk of accidental release of water from the above ground storage through damage to the bunds is considered to be Extremely Unlikely. The two bunded storage areas will be subject to regular inspection and maintenance. The consequence of such an event is considered to be Minor, unless it coincided with a large flood from other sources in which case the incremental impact would increase but it would still be limited and therefore have a low risk when considering the possible significance of impact. The risk of flooding from the Proposed Development is therefore considered to not require further assessment.

Cumulative

3.3.20 There are no sites that need to be considered from a cumulative perspective within this Environmental Statement.

Mitigation and Enhancement

3.3.21 The design mitigations that have already been designed into the Site layout, namely the above ground storage areas, have been incorporated to slow down the surface water flow to aid the existing surface water flow rates. This mitigation has not been added to the design of the Site to offer mitigation to the potential risk from a major accident or disaster.

3.3.22 Running an appropriate management scheme of the solar farm site which will include checks on the bund boundaries of these above ground storage areas will mitigate any increased risk on the Site for a major accident.

Conclusions

3.3.23 The Site design has offered 'mitigation through design' for the risk of surface water flooding. Management of this design mitigation will also minimise the risk of a major accident from the above ground storage areas breaching or breaking. The likelihood of such an event, when management is in place, is extremely low, and therefore the significant impact of the risk of a major accident from surface water flooding is negligible.

3.4 CLIMATE CHANGE

3.4.1 This section will assess the potential effects of the proposed residential development of land at Cotmoor Farm for energy generation and climate change.

Methodology

3.4.2 The format of this section follows a standard study pattern, by setting out an appraisal of the baseline conditions, details of the proposed development, followed by an identification of potential environmental impacts due to the proposed development. The importance and an assessment of each potential impact are then considered along with mitigation measures and recommendations for further investigations where necessary.

Baseline Conditions: Energy and Climate Change

3.4.3 In 2004, more than a quarter of the UK's carbon dioxide emissions – a major cause of climate change – came from the energy used to run our domestic residences - heating, lighting, hot water and all other energy uses in the home.

3.4.4 Historic rates of energy embodiment and use within homes and industry is recognised as being both wasteful and unsustainable for the future good of natural resources, changes to climate and the likely effects resulting. The use of energy and related carbon dioxide emissions in the construction, operation, alteration and ultimate removal of any development is an issue of concern, not just locally, but nationally and globally.

3.4.5 Whilst some climate change is now seen as inevitable in the short term as a result of human activity generally, changes in activities towards better energy efficiency and more sustainable sourcing of resources including energy, are being promoted in order to limit effects on climate change.

3.4.6 Governmental policies, public concerns, and serious pressure groups are calling for measures to promote reduced environmental impact in all areas of our lives and activities. Creation of new sources of renewable energy (solar power) plus a storage route to enable that renewable power to be released to the Grid at the times when it is needed by consumers (battery storage) is one route that is needed to reduce the impact humans are having on the global climate.

Assessing the Significant Effects (Energy and Climate Change)

Construction

3.4.7 It is inevitable that the manufacture of the panels, batteries and the necessary infrastructure will result in additional CO_2 being generated and released into the atmosphere. This is true for nearly all new forms of development and should not be deemed an unusual or significant impact of a development.

3.4.8 The panels would have to be brought into the UK from abroad as at this time there are no major UK manufacturers of solar panels. The routes for transporting the panels to the Site have been considered in the Transport Assessment that supports this planning application and this has determined the most favourable route to the Site for the construction traffic.

Operation

3.4.9 Both the design options for this site (Refused and Alternative Layout) have the potential capacity of a 49.9MW solar farm. This is possible through the utilisation of different solar panel types and through the continue improvements and efficiencies in this technology as it is developed across a global market.

3.4.10 It is therefore calculated that a 49.9MW solar farm has the capacity to generate enough electricity each year to power 12,000 homes, which would in turn offset 20,690 tonnes of CO_2,, when comparing this electricity generation to coal fired electricity generation. The use of battery storage to enable this generation to released in the local electricity grid system when there is demand, aids the 'Grid Balancing' and ensure the reduced requirement for non-renewable power stations to remain on standby to cope with times of high demand on the National Grid.

3.4.11 The creation of this level of renewable energy over 40 years and the reduction of CO_2 by 20,690 tonnes each year over 40 years would result in a moderate beneficial significant effect.

Cumulative Impact

3.4.12 There are no sites that need to be considered from a cumulative perspective within this Environmental Statement.

Mitigation and Enhancement

3.4.13 There are no mitigations or enhancements for this Site

Conclusions

3.4.14 Although the manufacture of the solar panels, batteries and ancillary equipment will result in the release of CO_2 into the atmosphere, this cannot be reduced by choosing a firm within the UK to manufacture the panels as currently, there are no manufactures based in the UK. The CO_2 that is released will soon be offset through the electricity generation process.

3.4.15 The operation of the solar farm will have a moderate significant beneficial effect through the generation of renewable energy and the reduction of 20,690 tonnes of CO_2 being released each year. When considering these savings against the significance matrix outlined in Chapter 1 of this ES, this saving of CO_2 would be a major beneficial effect which is a significant positive in terms of Environmental Assessment.

3.5 SUMMARY

3.5.1 The environmental risk for a major accident or disaster through this development has been designed out of the proposal through adhering the National Policy for Health and Safety for construction and operation. The likelihood of a H&S an incident or a fire on the Site, when management is in place, is extremely low, and therefore the residual significant impact of the risk of a major accident from H&S failures, fire or UXO is negligible.

3.5.2 The risk of a major accident from surface water flooding has also been mitigated through design and appropriate management of the Site during construction and operation. The potential for an increase in risk from flooding is the same for both of the schemes that are being considered within this ES. The residual effect of the impact of surface water flooding for a major accident has been determined to be negligible.

3.5.3 The effect on climate change from Proposed Development has also been considered and determined that both schemes have the capacity to generate 49.9MW. This would result in enough electricity generated each year to power 12,000 homes, which in turn would offset 20,690 tonnes of CO_2 each year. The residual effect on climate change from this development would be a moderate beneficial significant effect.