

**Planning & Development Act, 2000 - 2022,
European Communities (Environmental Impact Assessment) Regulations 1989 (as
amended), Planning & Development Regulations, 2001 (as amended)**

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

APPENDICES

**EdgeConneX Ireland Ltd.
Data Centre (DUB06)
Ballymakaily**

August 2022

MARSTON

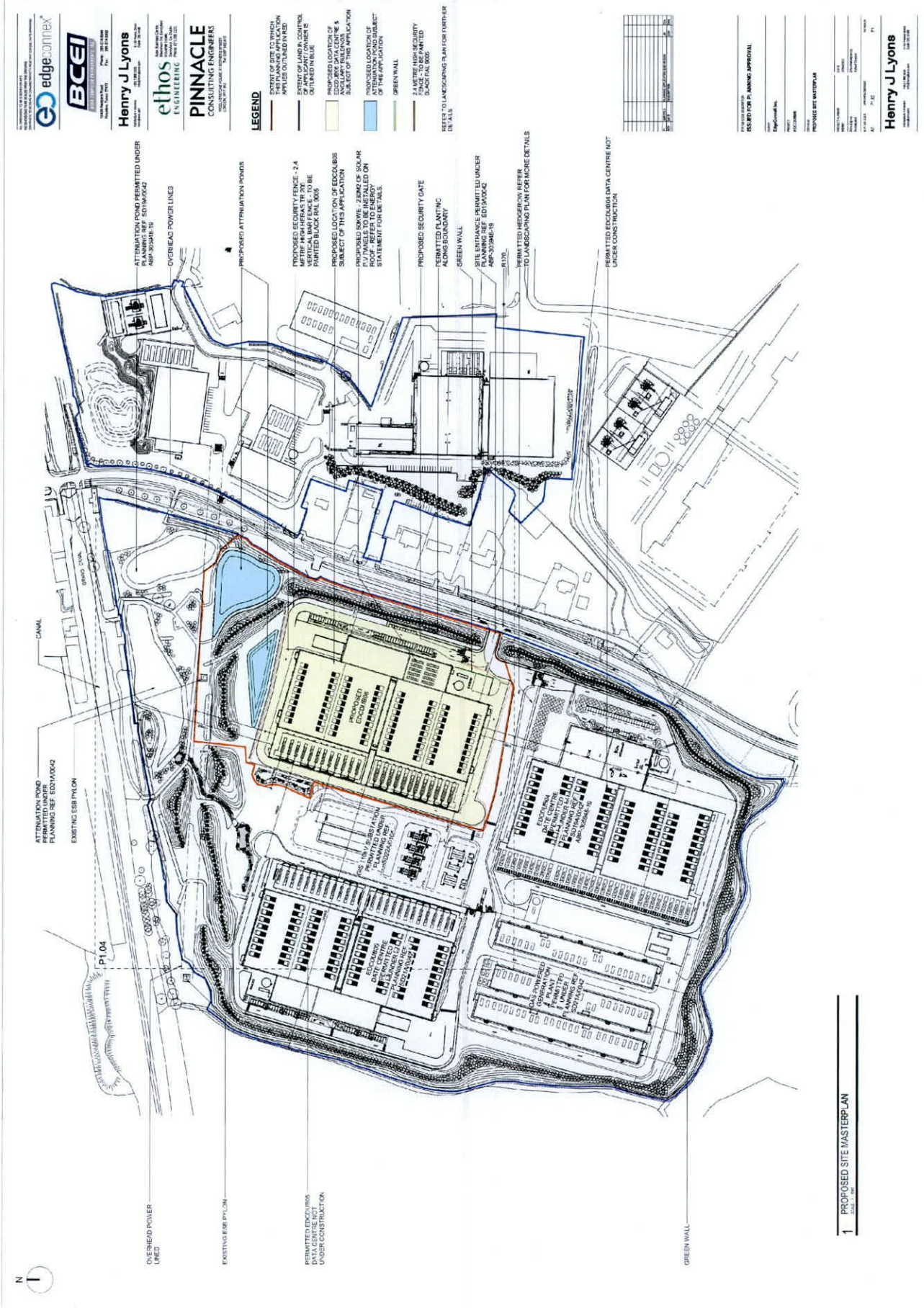
PLANNING CONSULTANCY

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CHAPTER 2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

Appendix 2.1 Proposed site layout plan (not to scale)



Appendix 2.2 Schedule of mitigation measures

Project Phase	Mitigation Measures
Construction phase- Habitats and Flora – Water Quality Non- native invasive species	Biodiversity
	<p>The following mitigation measures will ensure there are no impacts on water quality in the immediate vicinity of the Proposed Development from release of hydrocarbons, polluting chemicals, sediment/silt and contaminated waters control during the construction stage of the Proposed Development and therefore no potential impacts on the downstream receiving water courses, <i>i.e.</i> the Griffeen River:</p> <ul style="list-style-type: none"> • Specific measures to prevent the release of sediment over baseline conditions to the existing surface water drainage network, during the construction work, which will be implemented as the need arises. These measures include, but are not limited to, the use of silt fences, silt curtains, settlement lagoons and filter materials. • Provision of exclusion zones and barriers (e.g. silt fences) between earthworks, stockpiles and temporary surfaces to prevent sediment washing into the existing drainage systems and hence the downstream receiving water environment. • Provision of temporary construction surface drainage and sediment control measures to be in place before earthworks commence. • Weather conditions will be taken into account when planning construction activities to minimise risk of run-off from the site. • Prevailing weather and environmental conditions will be taken into account prior to the pouring of cementitious materials for the works adjacent to any surface water drainage features, or drainage features connected to same. Pumped concrete will be monitored to ensure no accidental discharge. Mixer washings and excess concrete will not be discharged to existing surface water drainage systems. Concrete washout areas will be located remote any surface water drainage features, where feasible, to avoid accidental discharge to watercourses. Washing out of any concrete trucks on site will be avoided (dry brush shoots will be used instead). • Any fuels of chemicals (including hydrocarbons or any polluting chemicals) will be stored in a designated, secure bunded area(s) to prevent any seepage of potential pollutants into the local surface water network. These designated areas will be clearly sign-posted and all personnel on site will be made aware of their locations and associated risks. • All mobile fuel bowsers shall carry a spill kit and operatives must have spill response training. All fuel containing equipment such as portable generators shall be placed on drip trays. All fuels and chemicals required to be stored on-site will be clearly marked. Care and attention should be taken during refuelling and maintenance operations. Particular attention should be paid to gradient and ground conditions, which could increase risk of discharge to waters. • A register of all hazardous substances, which will either be used on site or expected to be present (in the form of soil and/or groundwater contamination) will be established and maintained. This register will be available at all times and shall include as a minimum: <ul style="list-style-type: none"> - Valid Safety Data Sheets; - Health & Safety, Environmental controls to be implemented when storing, handling, using and in the event of spillage of materials; - Emergency response procedures/precautions for each material; and, - The Personal Protective Equipment (PPE) required when using the material. - Implementation of response measures to potential pollution incidents. • Robust and appropriate Spill Response Plan and Environmental Emergency Plan will be prepared prior to works commencing and they will be communicated, resourced and implemented for the duration of the works. Emergency procedures/precautions and spillage kits will be available and construction staff will be trained and experienced in emergency procedures in the event of accidental fuel spillages. • All trucks will have a built-on tarpaulin that will cover excavated material as it is being hauled off-site and wheel wash facilities will be provided at all site egress points. • Water supplies shall be recycled for use in the wheel wash. All waters shall be drained through appropriate filter material prior to discharge from the construction sites. • The removal of any made ground material, which may be contaminated, from the construction site and transportation to an appropriate licenced facility shall be carried out in accordance with the Waste Management Act, best practice and guidelines for same. • A discovery procedure for contaminated material will be prepared and adopted by the

	<p>appointed contractor prior to excavation works commencing on site. These documents will detail how potentially contaminated material will be dealt with during the excavation phase.</p> <ul style="list-style-type: none"> • Implementation of measures to minimise waste and ensure correct handling, storage and disposal of waste (most notably wet concrete, pile arisings and asphalt). • All of the above measures implemented on site will be monitored throughout the duration of construction to ensure that they are working effectively, to implement maintenance measures if required and applicable, and to address any potential issues that may arise.
<p>Construction phase – Vegetation clearance</p>	<p>The landscape plans prepared for the EdgeConneX masterplan site (refer to Chapter 11 of Marston Planning Consultancy, 2021) which includes the current Proposed Development site will implement appropriate measures such as using plants of native origin in planting/meadows and by leaving unmanaged and/or enhanced areas for biodiversity in the wider area of the plan. To offset the loss of habitats within the masterplan area, the proposed landscape plans include the planting of native treelines and woody hedgerow species to fill in gaps in existing hedgerows/treelines in the northern buffer area (i.e. along the Grand Canal) of the masterplan site, as well as the construction of a new pond wetland habitat in the north-eastern corner of the masterplan site with wetland planting (c. 1.7ha). The planted hedgerow species will mainly consist of <i>Corylus avellana</i>, <i>Crataegus monogyna</i> and <i>Prunus avium</i>, whilst the treelines will mainly consist of <i>Alnus glutinosa</i>, <i>Betula pendula</i>, <i>Pinus sylvestris</i> and <i>Quercus petraea</i>. The pond will be planted with <i>Phragmites australis</i>, <i>Sparganium erectum</i> and <i>Typha latifolia</i>, amongst other species. Any remaining hedgerows will be preserved, retained and protected in accordance with the arborist's report for the masterplan site and where feasible. Landscaping will also include extensive areas of wildflower hay meadow throughout the EdgeConnex masterplan site.</p>
<p>Construction phase – Badgers, habitat loss</p>	<p>Although no badger setts or signs of badger activity were recorded within the proposed development site, badger could potentially establish new setts within the Zol of the proposed development. Therefore, a confirmatory pre-construction check of all suitable badger habitat will be completed within 12 months prior to any construction works commencing by a suitably experienced and qualified ecologist.</p> <p>The presence of any new setts or significant badger activity will be treated and/or protected in accordance with the <i>Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes</i> (NRA, 2005).</p> <p>If required, a licence permitting their filming to assess locations of activity and their subsequent removal should be applied for from the NPWS. Any active badger setts located within the development or 30m from the development must be safely closed with the use of one-way badger gates and (infra-red camera) monitoring to ensure that all badgers have left the sett(s) and that it is no longer occupied, prior to sett removal. Any sett closing works shall be undertaken between the months of July to November inclusive (to avoid peak breeding season for this species and therefore avoid risk of disturbance to or mortality of cubs), in advance of site clearance and construction works commencing.</p>
<p>Construction phase – Otter, Water quality</p>	<p>Mitigation measures outlined above in "Mitigation Measures – Habitats and Flora" for the protection of water quality in the downstream receiving water courses, i.e. Griffeen River, and its immediate environs will mitigate against impacts of water pollution on the prey availability of otter during Construction Phase.</p>
<p>Construction phase – bats, lighting</p>	<p>During construction, any external lighting to be installed, including facilitating night-time working or security lighting, on the site shall be sensitive to the presence of bats in the area, downlighting, and time limited where possible. Lighting of sensitive wildlife areas and primary ecological corridors (e.g. Grand Canal and retained hedgerows in the immediate vicinity to the Proposed Development) and light pollution in general should be avoided. Lighting of the site during construction is designed in accordance with the following guidance:</p> <ul style="list-style-type: none"> • Guidance Notes for the Reduction of Obtrusive Light GN01 (Institute of Lighting Professionals, 2020) • Bats & Lighting - Guidance Notes for Planners, Engineers, Architects and Developers (Bat Conservation Ireland, December 2010) • Bats and Lighting in the UK – Bats and the Built Environment Series (Bat Conservation Trust UK, January 2018). <p>It will be ensured in liaison with the suitably experienced and qualified ecologist that lighting at</p>

	<p>the construction compound, and active work areas within and adjacent to the proposed development, will be designed to minimise light spill outside the footprint of the proposed development, and be cognisant of light-spill into previously unlit areas. Any light spill to commuting/foraging habitats of bats may exclude them from using these areas and therefore have a negative impact on them through reduced food resources and/or longer flight routes as they try to avoid flying through the lit-up area by flying around it.</p> <p>Mitigation measures to reduce light spill during construction will include the following:</p> <ul style="list-style-type: none"> • the use of sensor/timer triggered lighting; • LED luminaires to be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability; • column heights to be considered to minimise light spill; • accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only where needed; and, • Where night-time works are required the suitably experienced and qualified ecologist will be liaised with to implement measures to mitigate the impact of such works.
<p>Construction phase – Birds</p>	<p>The following mitigation measures are proposed to comply with the legal protection afforded to breeding birds and their nests under the Wildlife Acts:</p> <ul style="list-style-type: none"> • In order to avoid disturbance or harm to breeding birds, their nests, eggs and/or their unflown young, all works involving the removal of trees, hedgerows or grasslands will be undertaken outside of the nesting season (i.e. 1 March to 31 August inclusive); <p>or where this seasonal restriction cannot be observed then:</p> <ul style="list-style-type: none"> • A breeding bird survey will be undertaken by a suitably experienced ecologist in order to assess whether birds are nesting within suitable habitat affected by or immediately adjacent to the proposed works. Should nesting birds be encountered during surveys, it may be necessary to delay the removal of trees, hedgerows or grasslands until after the nesting season (i.e. 1 March to 31 August inclusive), or until the chicks have fully fledged.
<p>Construction phase – common frogs and lizards</p>	<p>No significant effects on common frogs or lizards are predicted during the Construction Stage of the proposed development, therefore no mitigation is required.</p>
<p>Construction phase – fish, fresh water white clawed crayfish and other aquatic species - water quality</p>	<p>Mitigation measures outlined above in “Mitigation Measures – Habitats and Flora” for the protection of water quality in the downstream receiving water courses, <i>i.e.</i> Griffeen River, and its immediate environs will mitigate against impacts of water pollution on fish and freshwater white-clawed crayfish and other aquatic species during Construction Phase.</p>
<p>Operational phase – surface water</p>	<p>The proposed drainage system for the site has been designed in accordance with Greater Dublin Strategic Design System (GDSDS) specifications. The drainage system will include a Stormtech attenuation system or similar. Roof water will be directed into an onsite reticulation system which will drain, along with road run-off, into the attenuation ponds which are to be located to the north of the site. A Hydrobrake will also be installed at the outflow to reduce the ultimate discharge.</p> <p>Pinnacle have identified that the above storm water drainage systems will accommodate a 1:2 year storm frequency. The attenuation system is also designed to accommodate a 1:100 year storm event accounting for a 20% increase with climate change.</p> <p>Due to a variety of measures such as the design of the attenuation system with hydrocarbon interceptors, the speed restrictions in place and the fact that no refuelling will be carried out on site (when practicable), the likelihood of any spills entering the water environment from vehicles on site is negligible.</p> <p>Run-off from the car park areas and access roads/delivery areas will be drained following these options:</p> <ul style="list-style-type: none"> • A series of on-site gullies and channels draining into a separate system of below ground gravity storm water sewers; and,

	<ul style="list-style-type: none"> • A Duraflow (or similar approved), porous asphalt product. <p>To minimise any impact from material spillages, all oils, solvents, paints and fuels to be stored onsite will be stored within permanently bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) will be diverted for collection and safe disposal.</p>
Operational phase – foul water	In their Engineering Planning Report Pinnacle have proposed to discharge foul water from the proposed development, via a 225mm diameter gravity foul sewer outfall and discharge into the existing 450mm diameter connection. The increase in flow to the existing public foul sewer is not expected to have a negative effect on the foul drainage system in the area.
Operational phase – bats, lighting	<p>The Lighting design for the site during operation is designed in accordance with the following guidance:</p> <ul style="list-style-type: none"> • Guidance Notes for the Reduction of Obtrusive Light GN01 (Institute of Lighting Professionals, 2020) • Bats & Lighting - Guidance Notes for Planners, Engineers, Architects and Developers (Bat Conservation Ireland, December 2010) • Bats and Lighting in the UK – Bats and the Built Environment Series (Bat Conservation Trust UK, January 2018). <p>Adhering with these guidelines ensures sensitive siting and design of the lighting elements and will include careful consideration of light placement on buildings, column heights and luminaire design.</p> <p>The following recommendations based on the above guidance have been considered in relation to the detailed construction and operational lighting design, and have been reviewed by a suitably qualified and experienced ecologist:</p> <ul style="list-style-type: none"> • All pole mounted columns will be 5m high – located facing away from boundaries to minimise any light spill beyond the area to be illuminated; • The fittings have a sharp cut off with no upward light spill to minimise any resultant sky glow; and • All fittings selected will be LED selected with a lighting output spectrum which is appropriate for bat sensitive areas. <p>These are in adherence with the guidance presented in relation to bats and lighting previously in this Chapter.</p>
Operational phase – birds	No significant effects on breeding birds and/or wintering non-SCI birds are predicted during the Operational Phase of the proposed development, therefore no mitigation is required.
Operational phase - common frogs and lizards	No significant effects on common frog or lizards are predicted during the Operational Phase of the proposed development, therefore no mitigation is required.
Operational phase – fish, fresh water white clawed crayfish and other aquatic species - water quality	No significant effects on fish, fresh water white clawed crayfish terrestrial invertebrates are predicted during the Operational Stage of the proposed development, therefore no mitigation is required.
	<i>Land, soil, geology and hydrogeology</i>
Construction phase – Soil removal and compaction	Reuse of excavated soil on site and capping with hardstand will minimise any increase in aquifer vulnerability. Construction works will require local removal of soil cover where levelling of the site is required and its use for re-instatement elsewhere on site. According to the GSI database the bedrock vulnerability is already extreme due to the thin cover of overburden on the site, removal of soil cover will increase the vulnerability of the underlying bedrock. However

	<p>due to levelling works imported fill will need to be deposited over a sizable proportion of the proposed development area. Overall vulnerability would not alter across the site. It is envisaged that any soil excavated will be retained on site and reused as fill material or landscaping.</p> <p>Temporary storage of soil will be carefully managed in such a way as to prevent any potential negative impact on the receiving environment and the material will be stored away from any open surface water drains. Movement of material will be minimised in order to reduce degradation of soil structure and generation of dust.</p> <p>Although there is no evidence of historical contamination in the proposed development area, all excavated materials will be visually assessed for signs of possible contamination such as staining or strong odours. Should any unusual staining or odour be noticed, samples of this soil will be analysed for the presence of possible contaminants in order to ensure that historical pollution of the soil has not occurred. Should it be determined that any of the soil excavated is contaminated, this will be disposed of by a licensed waste disposal contractor.</p>
<p>Construction phase – Fuel and chemical handling</p>	<p>To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within temporary bunded areas. Oil and fuel storage tanks shall be stored in designated areas, and these areas shall be bunded to a volume of 110% of the capacity of the largest tank/container within the bunded area(s) (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) shall be diverted for collection and safe disposal.</p> <p>Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles will take place in a designated area (or where possible off the site) which will be away from surface water gulleys or drains. In the event of a machine requiring refuelling outside of this area, fuel will be transported in a mobile double skinned tank. An adequate supply of spill kits and hydrocarbon adsorbent packs will be stored in this area. All relevant personnel will be fully trained in the use of this equipment. Guidelines such as "Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors" (CIRIA 532, 2001) will be complied with.</p> <p>Where feasible all ready-mixed concrete will be brought to site by truck. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to the underlying subsoil. Wash down and washout of concrete transporting vehicles will take place at an appropriate facility offsite.</p> <p>In the case of drummed fuel or other chemical which may be used during construction, containers should be stored in a dedicated internally bunded chemical storage cabinet and labelled clearly to allow appropriate remedial action in the event of a spillage.</p>
<p>Construction phase – CEMP</p>	<p>A Construction Environmental Management Plan (CEMP) has been developed by Winthrop Engineering and Contracting Limited and included with the application documentation. This will be refined by the Applicant and the construction contractor prior to commencement of construction. The CEMP will incorporate the mitigation measures outlined above as they relate to the construction phase. The CEMP will include emergency response procedures in the event of a spill, leak, fire or other environmental incident related to construction. This is an active document which is continuously updated to manage risk during the construction programme. All relevant personnel working on the site will be trained in the implementation of the procedures.</p> <p>As a minimum, the CEMP will be formulated in accordance with best international practice including but not limited to:</p> <ul style="list-style-type: none"> • CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors; • Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C650), 2005; • BPGCS005, Oil Storage Guidelines; • Eastern Regional Fisheries Board, (2006), Fisheries Protection Guidelines: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites; • CIRIA 697, The SUDS Manual, 2007; and • UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004.

<p>Operational phase – Fuel and chemical handling</p>	<p>In order to minimise any impact on the underlying subsurface strata from material spillages, each generator will be installed in an externally rated container with a self-contained belly tank (steel double wall type for leak containment and inner tank leak alarm system) with 48 hours diesel fuel storage capacity at full load.</p> <p>Any chemicals, oils, herbicides required for site maintenance will be stored in suitable contained areas. As the site will be paved any accidental emissions from fuel spills or contaminated runoff will be directed through the surface water drainage system through oil interceptors prior to discharge to the proposed attenuation tank onsite rather than infiltrate directly to ground.</p>
<p>Operational phase – Environmental Plan</p>	<p>An environmental management plan will be prepared and followed during the operational phase incorporating mitigation measures and emergency response measures.</p>
<p>Hydrology</p>	
<p>Construction phase - CEMP</p>	<p>The design of the proposed development has taken account of the potential impacts of the development and the risks to the water environment local to the area where construction is taking place. Measures have been developed to mitigate the potential effects on the local water environment. These measures seek to avoid or minimise potential effects in the main through the implementation of best practice construction methods and adherence to all relevant legislation.</p> <p>These measures are part of the requirements under the Greater Dublin Strategic Drainage Study and South Dublin County Council. They are not intended to avoid or reduce any potential harmful effects to any European sites, since there is no potential impact on Dublin Bay, given the potential contaminant load chemical and the distance from source to the bay (c. 20 km).</p> <p>A Construction Environmental Management Plan (CEMP) has been developed by Winthrop Engineering and Contracting Limited and included with the application documentation. This will be refined by the Applicant and the construction contractor prior to commencement of construction. The CEMP will incorporate the mitigation measures outlined above as they relate to the construction phase. The CEMP will include emergency response procedures in the event of a spill, leak, fire or other environmental incident related to construction. This is an active document which is continuously updated to manage risk during the construction programme. All relevant personnel working on the site will be trained in the implementation of the procedures.</p> <p>As a minimum, the CEMP will be formulated in accordance with best international practice including but not limited to:</p> <ul style="list-style-type: none"> • CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors; • Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C650), 2005; • BPGCS005, Oil Storage Guidelines; • Eastern Regional Fisheries Board, (2006), Fisheries Protection Guidelines: Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites; • CIRIA 697, The SUDS Manual, 2007; and • UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004. <p>Pinnacle Consulting Engineers have outlined mitigation measures for the site in their Engineering Planning Report. The following mitigation measures include, but are not limited to, those provided in that report and are designed to address the impacts associated with the construction and operational phase of the project. Due to the inter-relationship between this section and Chapter 7 (Land, Soils, Geology and Hydrogeology) the following mitigation measures discussed will be considered applicable to both.</p>
<p>Construction phase - Increased run-off and sediment loading</p>	<p>During the construction phase any drains carrying a high sediment load will be diverted through the settlement ponds. The settlement ponds will be located between the area of construction and the nearest field drain. Surface water runoff will not be discharged directly to local watercourses. The following mitigation measures will be adopted:</p> <ul style="list-style-type: none"> • the drainage system and settlement ponds will be constructed as a first step; • any excavations required will remain open for as little time as possible before the placement of fill. This will help to minimise potential for groundwater ingress into excavations; • silt traps will be placed in the existing drainage network around the site to minimise silt loss. These should be inspected and cleaned regularly.

	<ul style="list-style-type: none"> weather conditions will be considered when planning construction activities to minimise risk of run off from the site; and distance between topsoil piles etc. and streams will be maintained – to protect from dampening operations.
Construction phase – Contamination of local water courses	<p>To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents, paints and fuels used during construction will be stored within temporary bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (plus an allowance of 30 mm for rainwater ingress). Filling and draw-off points will be located entirely within the bunded area(s). Drainage from the bunded area(s) will be diverted for collection and safe disposal.</p> <p>Wet concrete operations adjacent to watercourses will be avoided where possible. A suitable risk assessment for wet concreting will be completed prior to works being carried out which will include measures to prevent discharge of alkaline wastewaters or contaminated storm water to groundwater.</p> <p>The contractor will be required to make provision for removal of any concrete wash waters, most likely by means of tankering off-site and no such wash waters will be discharged to groundwater. Any effluent generated by temporary onsite sanitary facilities will be taken off-site for appropriate treatment.</p> <p>Re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles/equipment will take place in designated bunded areas where possible. Re-fuelling will be avoided in so far as possible at the other work sites but where necessary will take place within appropriately bunded areas.</p> <p>If it is not possible to bring a machine to the refuelling point, fuel will be delivered in a double-skinned mobile fuel bowser. A drip tray will be used beneath the fill point during refuelling operations in order to contain any spillages that may occur. The vehicles and equipment will not be left unattended during refuelling. Spill kits and hydrocarbon absorbent packs will be stored in the cab of each vehicle and operators will be fully trained in the use of this equipment.</p> <p>The generation of runoff from stockpiles of soils, excavated during construction, will be prevented from entering watercourses by diverting runoff to the settlement ponds on site, and removing the material off-site as soon as possible to designated storage areas.</p>
Operational phase – Increased surface water run-off	<p>The proposed drainage system for the site is outlined in Pinnacle's Engineering Planning Report and has been designed in accordance with Greater Dublin Strategic Design System (GSDSDS) specifications. Roof water will be directed into an onsite reticulation system which will drain, along with road run-off, into the attenuation ponds which are to be located to the north of the proposed data centres. A hydrobrake will also be installed at the outflow to reduce the ultimate discharge. The attenuation system is designed to accommodate a 1:100 year storm event accounting for a 20% increase with climate change.</p>
Operational phase – Contamination of surface water	<p>Due to a variety of measures such as the design of the attenuation system with hydrocarbon interceptors, the speed restrictions in place and the fact that no refuelling will be carried out on site (when practicable), the likelihood of any spills entering the water environment from vehicles on site is negligible.</p> <p>Run-off from the car park areas and access roads / delivery areas will be drained following these options:</p> <ul style="list-style-type: none"> A series of on-site gullies and channels draining into a separate system of below ground gravity storm water sewers; A Duraflow (or similar approved), porous asphalt product. <p>To minimise any impact from material spillages, all oils, solvents, paints and fuels to be stored onsite will be stored within permanently bunded areas and each of these areas will be bunded to a volume of 110% of the capacity of the largest tank/container within it (plus an allowance of 30 mm for rainwater ingress). Drainage from the bunded area(s) will be diverted for collection and safe disposal.</p>
Operational phase – Foul water	<p>In their Engineering Planning Report Pinnacle have proposed to discharge foul water from the proposed development, via a 225mm diameter gravity foul sewer outfall and discharge into the existing 450mm diameter connection. The increase in flow to the existing public foul sewer is not expected to have a negative effect on the foul drainage system in the area.</p>
Operational phase – Water supply	<p>The water system will be metered to facilitate detection of leakage and the prevention of water loss. Dual & low flush toilets and water economy outlets and water saving measures will also</p>

	be proposed.
	Noise and vibration
Construction – Noise and vibration	<p>With regard to construction activities, reference will be made to BS5228 Parts 1 and 2, which offer detailed guidance on the control of noise and vibration from demolition and construction activities.</p> <p>Various mitigation measures will be considered and applied during the construction of the proposed development. Specific examples of such measures are:</p> <ul style="list-style-type: none"> • limiting the hours during which site activities likely to create high levels of noise or vibration are permitted; • establishing channels of communication between the contractor/developer, Local Authority and residents; • appointing a site representative responsible for matters relating to noise and vibration; • monitoring levels of noise and/or vibration during critical periods and at sensitive locations; and • all site access roads will be kept even so as to mitigate the potential for vibration from lorries. <p>Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:</p> <ul style="list-style-type: none"> • selection of plant with low inherent potential for generation of noise and/or vibration; • erection of barriers as necessary around items such as generators or high-duty compressors; • situate any noisy plant as far away from sensitive properties as permitted by site constraints and the use of vibration-isolated support structures where necessary. <p>It is recommended that vibration from construction activities to off-site residences be limited to the values set out in Table 9.6. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.</p>
Operational phase - Building services noise / emergency site operation	Noise from external plant will be minimised by purchasing low noise generating equipment and incorporating appropriately specified in line attenuators for stacks and exhausts where necessary. With due consideration as part of the detailed design process, this approach will result in the site operating well within the constraints of the best practice guidance noise limits that have been adopted as part of this detailed assessment.
Operational phase - Additional vehicular traffic on public roads	The noise impact assessment outlined previously has demonstrated that mitigation measures are not required.
Operational phase – Noise and human health	<i>Guidelines for construction and operational phase:</i> Noise criteria are provided by relevant bodies with consideration of the likely impact of noise on human health. The construction phase is short-term and therefore any elevated levels of noise will be of limited duration and, as a result, are not expected to pose any risk to human health. In terms of the noise exposure of construction workers and potential hearing damage that may be caused due to exposure to high levels of noise, the Safety, Health and Welfare at Work (General Application) Regulations 2007 (Statutory Instrument No. 299 of 2007) provides guidance in terms of allowable workplace noise exposure levels for employees. The Regulations specify two noise Action Levels at which the employer is legally obliged to reduce the risk of exposure to noise. The appointed contractor will be required to comply with the Regulations and provide appropriate noise exposure mitigation measures where necessary. No significant noise impacts are expected from the operational phase of the proposed development. As such, there is no anticipated risk of long-term exposure to noise on human health resulting from the proposed development.
	Air quality and climate
Construction phase –Climate	Construction vehicles, generators etc., may give rise to some CO ₂ and N ₂ O emissions. However, due to short-term and temporary nature of these works the impact on climate will not be significant .

<p>Construction phase – Air Quality</p>	<p>The objective of dust control at the site is to ensure that no significant nuisance occurs at nearby sensitive receptors. In order to develop a workable and transparent dust control strategy, the following management plan has been formulated by drawing on best practice guidance from Ireland and the UK (IAQM (2014), The Scottish Office (1996), UK Office of Deputy Prime Minister (2002) and BRE (2003)) and the USA (USEPA (1997)).</p>
<p>Construction phase – site management</p>	<p>The aim is to ensure good site management by avoiding dust becoming airborne at source. This will be done through good design and effective control strategies.</p> <p>At the construction planning stage, the siting of activities and storage piles will take note of the location of sensitive receptors and prevailing wind directions in order to minimise the potential for significant dust nuisance (see Figure 10.1 for the windrose for Casement Aerodrome). As the prevailing wind is predominantly south-westerly, locating construction compounds and storage piles downwind (to the north-east) of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors.</p> <p>Good site management will include the ability to respond to adverse weather conditions by either restricting operations on-site or quickly implementing effective control measures before the potential for nuisance occurs. When rainfall is greater than 0.2 mm/day, dust generation is generally suppressed (UK Office of Deputy Prime Minister (2002), BRE (2003)). The potential for significant dust generation is also reliant on threshold wind speeds of greater than 10 m/s (19.4 knots) (at 7m above ground) to release loose material from storage piles and other exposed materials (USEPA, 1986). Particular care should be taken during periods of high winds (gales) as these are periods where the potential for significant dust emissions are highest. The prevailing meteorological conditions in the vicinity of the site are favourable in general for the suppression of dust for a significant period of the year. Nevertheless, there will be infrequent periods where care will be needed to ensure that dust nuisance does not occur. The following measures should be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions:</p> <ul style="list-style-type: none"> • The Principal Contractor or equivalent must monitor the contractors' performance to ensure that the proposed mitigation measures are implemented and that dust impacts and nuisance are minimised; • During working hours, dust control methods will be monitored as appropriate, depending on the prevailing meteorological conditions; • The name and contact details of a person to contact regarding air quality and dust issues shall be displayed on the site boundary, this notice board should also include head/regional office contact details; • It is recommended that community engagement be undertaken before works commence on site explaining the nature and duration of the works to local residents and businesses; • A complaints register will be kept on site detailing all telephone calls and letters of complaint received in connection with dust nuisance or air quality concerns, together with details of any remedial actions carried out; • It is the responsibility of the contractor at all times to demonstrate full compliance with the dust control conditions herein; and • At all times, the procedures put in place will be strictly monitored and assessed. <p>The dust minimisation measures shall be reviewed at regular intervals during the works to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practice and procedures. In the event of dust nuisance occurring outside the site boundary, site activities will be reviewed and satisfactory procedures implemented to rectify the problem. Specific dust control measures to be employed are described below.</p>
<p>Construction – site roads / haulage routes</p>	<p>Movement of construction trucks along site roads (particularly unpaved roads) can be a significant source of fugitive dust if control measures are not in place. The most effective means of suppressing dust emissions from unpaved roads is to apply speed restrictions. Studies show that these measures can have a control efficiency ranging from 25 to 80% (UK Office of Deputy Prime Minister, 2002).</p> <ul style="list-style-type: none"> • A speed restriction of 20 km/hr will be applied as an effective control measure for dust for on-site vehicles using unpaved site roads; • Access gates to the site shall be located at least 10m from sensitive receptors where possible; • Bowsers or suitable watering equipment will be available during periods of dry weather

	<p>throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering shall be conducted during sustained dry periods to ensure that unpaved areas are kept moist. The required application frequency will vary according to soil type, weather conditions and vehicular use; and</p> <ul style="list-style-type: none"> Any hard surface roads will be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only.
<p>Construction phase – Land clearing / earth moving</p>	<p>Land clearing / earth-moving works during periods of high winds and dry weather conditions can be a significant source of dust.</p> <ul style="list-style-type: none"> During dry and windy periods, and when there is a likelihood of dust nuisance, watering shall be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust; and During periods of very high winds (gales), activities likely to generate significant dust emissions should be postponed until the gale has subsided.
<p>Construction phase – storage piles</p>	<p>The location and moisture content of storage piles are important factors which determine their potential for dust emissions.</p> <ul style="list-style-type: none"> Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles should be located downwind of sensitive receptors; Regular watering will take place to ensure the moisture content is high enough to increase the stability of the soil and thus suppress dust. The regular watering of stockpiles has been found to have an 80% control efficiency (UK Office of Deputy Prime Minister, 2002); and Where feasible, hoarding will be erected around site boundaries to reduce visual impact. This will also have an added benefit of preventing larger particles from impacting on nearby sensitive receptors.
<p>Construction phase – Site traffic on public roads</p>	<p>Spillage and blow-off of debris, aggregates and fine material onto public roads should be reduced to a minimum by employing the following measures:</p> <ul style="list-style-type: none"> Vehicles delivering or collecting material with potential for dust emissions shall be enclosed or covered with tarpaulin at all times to restrict the escape of dust; and In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.
<p>Construction phase – Dust mitigation</p>	<p>The pro-active control of fugitive dust will ensure that the prevention of significant emissions, rather than an inefficient attempt to control them once they have been released, will contribute towards the satisfactory performance of the contractor. The key features with respect to control of dust will be:</p> <ul style="list-style-type: none"> The specification of a site policy on dust and the identification of the site management responsibilities for dust issues; The development of a documented system for managing site practices with regard to dust control; The development of a means by which the performance of the dust minimisation plan can be regularly monitored and assessed; The specification of effective measures to deal with any complaints received.
<p>Operational phase – Air Quality</p>	<p>The standby diesel generators have been designed in an iterative fashion to ensure that an adequate height was selected to aid dispersion of the plume. Provided each standby diesel generator flue stack is built to a height of 25m above local ground level and based on the site layout modelled and hours of operation, the air impact assessment has demonstrated that mitigation measures are not required.</p> <p>Under the previous permission similarly the stack heights of the gas generators were designed in an iterative fashion to ensure that an adequate height was selected to aid dispersion of the plume. Provided each gas generator flue stack is built to a height of 25m above local ground level, as per its permission, and based on the site layout modelled, the air impact assessment has demonstrated that mitigation measures are not required.</p>
<p>Operational phase - Climate</p>	<p>On-site emissions of greenhouse gases will mainly derive from the permitted gas generators with infrequent standby emissions due to the diesel generators. However, the emissions from the gas generators will form part of the EU-wide Emission Trading Scheme (ETS) and thus</p>

	greenhouse gas emission from onsite electricity generation are not included when determining compliance with the targeted 42% reduction in the non-ETS sector. In addition, gas generators have the lowest greenhouse gas emission rate of any fossil fuel.
	Landscape and visual assessment
Operational – visual impact	<p>The mitigation of potential negative landscape and visual impacts has influenced the design and layout of the scheme from the beginning of the design process (refer to Landscape Mitigation Drawing). As a result, the following landscape design mitigation measures have been made:</p> <ul style="list-style-type: none"> • earth modelling and large tree planting reinforced with woodland whip planting in belts is proposed to provide a high level of visual screening of the most sensitive views of the development; • the creation of a wetland and woodland habitat in a buffer zone between the canal and the built development and provision of public access to some of these habitats; • the colour palette chosen for the building aims to further reduce any visual impact of the building; and • Green walls are proposed to the south and east that will enclose the water tower and pump house compound.
	Traffic and transportation
Construction – CMP	<p>The Construction Management Plan prepared by Winthrop incorporates a range of integrated control measures and associated management initiatives with the objective of mitigating the impact of the proposed developments on-site construction activities. To minimise disruption to the surrounding environment, the following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> • During the pre-construction phase, the site will be securely fenced off from adjacent properties, public footpaths and roads. • All road works will be adequately signposted and enclosed to ensure the safety of all road users and construction personnel. • A dedicated 'construction' site access / egress junction will be provided during all construction phases. This will coincide with the overall site access/ • Provision of sufficient on-site parking and compounding to ensure no potential overflow of construction generated traffic onto the local network. • Site offices and compound will be located within the site boundary. The site will be able to accommodate employee and visitor parking throughout the construction period through the construction of temporary hardstanding areas. • A material storage zone will also be provided in the compound area. This storage zone will include material recycling areas and facilities. • A series of 'way finding' signage will be provided to route staff / deliveries into the site and to designated compound / construction areas. • Dedicated construction haul routes will be identified and agreed with the local authority prior to the commencement of constructions activities on-site. • Truck wheel washes will be installed at construction entrances if deemed necessary and any specific recommendations with regard to construction traffic management made by the Local Authority will be adhered to. • On completion of the works all construction materials, debris, temporary hardstands etc. from the site compound will be removed off site and the site compound area reinstated in full on completion of the works. <p>All construction related parking will be provided on site. Construction traffic will consist of the following two principal categories:</p> <ul style="list-style-type: none"> • Private vehicles owned and driven by site construction staff and by full time supervisory staff; • Excavation plant and dumper trucks involved in site development works and material delivery vehicles for the following: granular fill materials, concrete pipes, manholes, reinforcement steel, ready mix concrete and mortar, concrete blocks, miscellaneous building materials, etc. <p>It is anticipated that the generation of HGV's during the construction period will be evenly spread throughout the day and as such will not impact significantly during the peak traffic periods.</p>
Operational – traffic	The Adamstown Road (R120) and Nangor Road (R134) Improvement Scheme provides

and transportation	<p>suitable infrastructure and transport services for travel by sustainable modes. A key barrier to modal shift towards sustainable modes of travel is often a lack of information about potential alternatives to the car. As such, it is proposed that staff at the data centre are made aware of potential alternatives including information on walking, cycle routes and public transport.</p> <p>The local area provides suitable infrastructure and transport services for travel by sustainable modes. A key barrier to modal shift towards sustainable modes of travel is often a lack of information about potential alternatives to the car. As such, it is proposed that staff and visitors of the proposed development are made aware of potential alternatives including information on walking, cycle routes and public transport.</p> <p>A number of walking and cycling connection points are proposed within the development. These connection points will provide access for pedestrians and cyclists onto the R120. These facilities will provide attractive, convenient and safe routes for staff & visitors. Therefore, there are good links proposed for staff to travel by more sustainable modes.</p> <p>It is proposed to provide car parking that will meet the expected-on site demand. The marketing of new pedestrian & cyclists routes along with public transport information will further reinforce the efforts been made towards a modal shift away from car-based trips.</p> <p>The local area provides suitable infrastructure and transport services for travel by sustainable modes. A key barrier to modal shift towards sustainable modes of travel is often a lack of information about potential alternatives to the car. As such, it is proposed that staff and visitors of the proposed development are made aware of potential alternatives including information on walking, cycle routes and public transport. A Mobility Management Plan will be developed and implemented within six months of the commencement of the operation of the proposed development. This should be undertaken collaboratively with the permitted data centres already granted on this site. It is anticipated that this measure may help to reduce the level of traffic at the proposed development, thus providing mitigation against the already minimal traffic and transport effects of the development.</p>
Cultural heritage	
Construction phase - Archaeology	<p>A programme of licensed archaeological monitoring will be agreed with the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht, for areas not previously subjected to archaeological testing.</p> <p>A report outlining the results of the programme of archaeological monitoring will be prepared and will include a detailed method statement for any archaeological excavation of features identified, agreed in advance with the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht. The report will include a schedule of works detailing timeframes, personnel and logistical requirements.</p> <p>Any areas that require archaeological excavation will be cordoned off to facilitate the archaeological team to carry out the excavations. A buffer zone will be agreed with National Monuments Service and no construction works will be undertaken in these areas until archaeological excavations have been completed.</p> <p>Provision has been made for all costs associated with archaeological testing, any required excavations and reporting of the results to the standards required by the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht. The remedial or reductive mitigation measures outlined here are subject to the approval of the National Monuments Service of the Department of Culture, Heritage and the Gaeltacht.</p>
Operational phase – cultural heritage	No remedial or reductive measures are considered necessary during the operational phase of the proposed development, as the operational phase will not give rise to any adverse impacts.
Waste management	
Construction – C&D WMP	As previously stated, a project specific RWMP has been prepared in line with the requirements of the requirements of the EPA, <i>Best Practice Guidelines for the Preparation of Resource and Waste Management Plans for Construction & Demolition Projects</i> (2021) and is included as Appendix 14.1. The mitigation measures outlined in the RWMP will be implemented in full and form part of mitigation strategy for the site. The mitigation measures presented in this RWMP will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the excavation and construction phases of the Proposed Development. Prior to commencement, the appointed Contractor(s) will be required to refine / update the RWMP (Appendix 14.1) in agreement with SDCC and in compliance with any planning conditions, or submit an addendum to the RWMP to SDCC, detailing specific measures to minimise waste generation and resource consumption, and provide details of the proposed waste contractors and destinations of each waste stream. The Contractor will implement the RWMP throughout the duration of the proposed excavation and construction

	<p>phases.</p> <p>The project engineers (Pinnacle) estimated that c. 11,300m³ of topsoil and 18,800m³ of subsoil will be excavated. It is currently proposed that all of this excavated material will be reused on site, wherever possible, for berms and other landscaping purposes. Surplus material that is not required for reuse onsite, will be reused or recovered off-site insofar as is reasonably practicable. Where there is no suitable reuse or recovery option available, it will be disposed of at an authorised facility.</p> <p>In addition, the following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> • Building materials will be chosen with an aim to 'design out waste'; • On-site segregation of waste materials will be carried out to increase opportunities for off-site reuse, recycling and recovery – it is anticipated that the following waste types, at a minimum, will be segregated: <ul style="list-style-type: none"> - Concrete rubble (including ceramics, tiles and bricks); - Plasterboard; - Metals; - Glass; and - Timber. • Left over materials (e.g. timber off-cuts, broken concrete blocks/bricks) and any suitable construction materials shall be re-used on-site, where possible; • All waste materials will be temporarily stored in skips or other suitable receptacles in designated areas of the site; • Any hazardous wastes generated (such as chemicals, solvents, glues, fuels, oils) will also be segregated and will be stored in appropriate receptacles (in suitably bunded areas, where required); • A person responsible for waste management will be appointed by the main contractor(s) to ensure effective management of waste during the excavation and construction works; • All construction staff will be provided with training regarding the waste management procedures; • All waste leaving site will be reused, recycled or recovered where possible to avoid material designated for disposal; • All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities; and • All waste leaving the site will be recorded and copies of relevant documentation maintained. <p>Nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, if required. If any of the material is to be reused on another site as by-product (and not as a waste), this will be done in accordance with regulation 15 (previously Article 27) of S.I. No. 323/2020 - European Union (Waste Directive) Regulations 2020. EPA approval will be obtained prior to moving material as a by-product.</p> <p>These mitigation measures will ensure that the waste arising from the construction phase of the Proposed Development is dealt with in compliance with the provisions of the Waste Management Act 1996, as amended, associated Regulations and the Litter Pollution Act 1997, and the EMR Waste Management Plan 2015 – 2021. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved and will promote more sustainable consumption of resources.</p>
<p>Operational - Waste</p>	<p>All waste materials will be segregated into appropriate categories and will be temporarily stored in appropriate bins or other suitable receptacles in a designated, easily accessible areas on the site. In addition, the following mitigation measures will be implemented:</p> <ul style="list-style-type: none"> • On-site segregation of all waste materials into appropriate categories including (but not limited to): <ul style="list-style-type: none"> - Dry Mixed Recyclables; - Organic food/green waste; - Mixed Non-Recyclable Waste; - Batteries (non-hazardous and hazardous); - Waste electrical and electronic equipment (WEEE) including computers, printers and other ICT equipment; and - Cleaning chemicals (solvents, pesticides, paints, adhesives, resins, detergents, etc.). • All waste materials will be stored in colour coded bins or other suitable receptacles in designated, easily accessible locations. Bins will be clearly labelled with the approved waste type to ensure there is no cross contamination of waste materials; • All waste collected from the development will be reused, recycled or recovered where possible, with the exception of those waste streams where appropriate facilities are

	<p>currently not available;</p> <ul style="list-style-type: none"> All waste leaving the site will be transported by suitable permitted contractors and taken to suitably registered, permitted or licensed facilities; and All waste leaving the site will be recorded and copies of relevant documentation maintained. <p>These mitigation measures will ensure the waste arising from the development is dealt with in compliance with the provisions of the <i>Waste Management Act 1996</i>, as amended, associated Regulations, the <i>Litter Pollution Act 1997</i> and the <i>EMR Waste Management Plan (2015 - 2021)</i>. It will also ensure optimum levels of waste reduction, reuse, recycling and recovery are achieved.</p>
	Material assets
Construction – Service providers	Construction of the Proposed Development will require connections to water supply and drainage infrastructure, power and telecommunications. Ongoing consultation with SDCC, Irish Water, Eirgrid, ESB and other relevant service providers within the locality and compliance with any requirements or guidelines they may have will ensure a smooth construction schedule without disruption to local and business community.
Construction – Power and Electricity supply	The power demand for the construction phase will be relatively minor and the temporary connection works are entirely within the Proposed Development site, so that this would not have any potential offsite impact. The excavation of trenches within the vicinity of existing electrical services will be carried out in consultation with ESB Networks to ensure there is no impact on existing users. Once completed, ESB Networks will be mobilised to complete the commissioning in accordance with the ESB Network requirements. No remedial or mitigation measures are required in relation to power supply for the construction phase.
Construction phase – Telecommunications	A fibre optic cable distribution network will be installed within the site for the Proposed Development. The connection into the wider telecommunications network will be undertaken by a statutory telecommunications operator. No remedial or mitigation measures are required in relation to telecommunications.
Construction phase – Water supply, surface water and foul water infrastructure	<p>Run-off water containing silt will be contained on site and treated to ensure adequate silt removal. The works contractor will be obliged to put best practice measures in place to ensure that there are no interruptions to service in existing surface water drainage network. There will not be any interruptions to service in existing surface water sewers. Should interruptions to surface water infrastructure be anticipated, they will be agreed in advance. Strict quality control measures as outlined under the CEMP of the contractor will be undertaken while laying pipes to minimise or eradicate infiltration (where existing water in the ground enters the surface water infrastructure) and ex-filtration (where water in the surface water infrastructure escapes into the ground).</p> <p><i>Foul drainage infrastructure</i></p> <p>A temporary connection to the foul water drainage network will be made and is required for the welfare facilities for the construction staff. The foul water drainage network has sufficient available capacity for the wastewater discharges from the welfare facilities for the short term construction phase.</p> <p>The works contractor will be obliged to put a number of measures as outlined in Chapter 2 of this EIA Report and will be detailed within the CEMP in place to ensure that there is no impact on the existing foul drainage network during the construction works.</p> <p>Foul drainage construction for the Proposed Development will be in accordance with the relevant standards for design and construction, including the Irish Water Code of Practice for Wastewater Infrastructure, The Building Regulations Technical Guidance Document 'Part H' & the Regional Code of Practice for Drainage Works. Strict quality control measures that will be outlined within the CEMP will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.</p> <p>Portable toilets will be provided for construction staff. The existing sewer will be extended into the site to facilitate the Proposed Development. As the construction works are entirely within the site boundary and business park, this would not have any offsite impact. The works contractor will be obliged to put a number of measures in place as outlined under the CEMP to ensure that there is no impact on the foul drainage network of the business park. Strict quality control measures as outlined under the CEMP will be undertaken while laying pipes to</p>

	<p>minimise or eradicate infiltration and ex-filtration.</p> <p><i>Water supply</i> Welfare facilities (canteens, toilets etc.) will be required for the construction staff. A temporary connection will be put in place for the construction phase. As the connection works are entirely within the Proposed Development site, and would therefore not have any potential offsite impact. The works contractor will be obliged to put best practice measures in place as outlined within the CEMP and elsewhere to ensure that there are no interruptions to service from the existing watermain. There will not be any interruptions to service from the existing water main, but should interruptions be required, they will be agreed in advance. Strict quality control measures as set out as best practice and as outlined under the CEMP will be undertaken while laying pipes to minimise or eradicate infiltration and ex-filtration.</p>
<p>Operational – Power and electricity supply</p>	<p>The applicants is already in receipt of a Connection Agreement from EirGrid to connect their permitted substation (known as Kishoge) into the national grid. This offer was made by EirGrid on the 21st August 2020 in the full knowledge of the constraints within the Greater Dublin area. Given this was made following both the EirGrid ‘Data Centre Connection Offer Process and Policy’ (“DCCOPP”) published initially in July 2019 and updated in July 2020 and the National Climate Action Plan 2019; it is only reasonable to conclude that the locational requirements and other criteria in place at the time, were considered to have been met. The nature of this offer is that it will facilitate the gas plants permitted under SDCC Planning Ref. SD21A/0042 to supply and reinforce the national grid.</p> <p>The policies and long term aims of Climate Action Plan 2021 are based on continuing to facilitate data centre development, subject to certain criteria, and future reviews, up to 2030. The Plan recognises, and takes account of the changes in demand for electricity over the next 10 years; and that this will alter the profile for demand and recognises that the forecast growth in data centres will represent a challenge to Ireland’s emissions targets.</p> <p>Government policy set out under the Climate Action Plan 2021, states that the strategy on data centres will be reviewed (section 11.1) to ensure that growth of such users can only happen in alignment with sectoral emission ceilings and renewable energy targets. Whilst the 2021 Plan identifies the potential for further regulatory measures to manage demand from data centres, in the context of climate targets and future network needs; these do not currently exist. We respectfully submit that the adopted Plan should reflect this and should require individual data centre applications to be considered on their merits having regard to Eirgrid and CRU policy.</p> <p>The CRU published on the 23rd November 2021 the “CRU Direction to the System Operators related to Data Centre grid connection processing” (CRU/21/124). This decision allows the data centre industry to continue to connect to the electricity grid, subject to certain conditions. New data centre connections are required to have on-site generation (and/or battery storage) that is sufficient to meet their own demand and, to assist in full decarbonisation of the power system, this generation should also be capable of running on renewably sourced fuels (such as renewable gas or hydrogen) when supplies become more readily available.</p> <p>The recently published ‘Government Statement on the Role of Data Centres in Ireland’s Enterprise Strategy’ (July 2022) seeks to enable the decarbonisation and digitalisation of the Irish economy and society.</p> <p>The Flexible Demand offer from Eirgrid requires an onsite energy generation solution for the site in the case where there are capacity issues on the National Grid. The permitted Power Plants, as well as providing short term permanent power will also provide mitigation back-up power supply in line with the Eirgrid offer for the site.</p> <p>The <i>Energy Statement</i> that accompanies this planning application also describes how waste heat associated with the facility has the capacity to connect with a future district heating scheme developed by others.</p>
<p>Operational - Telecommunications</p>	<p>There is sufficient capacity available in the area network for the Proposed Development. Therefore, no remedial or mitigation measures are required in relation to telecommunications.</p>
<p>Operational - water supply, surface water and foul water infrastructure</p>	<p><i>Surface water infrastructure</i> The surface water drainage system for the Proposed Development incorporates runoff control in the form of attenuation, which will restrict discharge from the Proposed Development to the allowable greenfield runoff rate. The attenuation storage and interceptors allows for any detritus material to be removed from the water and aids in particulate removal, increasing overall storm water quality prior to disposal.</p>

To limit the discharges from the attenuation zones to pre-development levels flow control devices are required. It is proposed to use 'Hydrobrake' flow control systems to achieve the required discharge rates. SuDS measures will prevent an increase in the rate of surface water runoff offsite. The allowable greenfield runoff rate has been established by the project engineers, Pinnacle, Consulting Engineers, using the methodology set out in the Water Services Report. A Class 1 Bypass Oil Separator will be used to treat runoff prior to discharging from site.

Foul drainage infrastructure

Foul drainage for the Proposed Development will be in accordance with the Building Regulations Technical Guidance Document H for design and construction and Irish Waters Code of Practice for Wastewater Infrastructure. The foul drainage network will be maintained by maintenance staff to ensure system is fit for purpose and to address any operational issues should they arise over the life time of the Proposed Development.

No additional remedial or mitigation measures are required in relation to foul drainage infrastructure.

Water supply

Cold water storage tanks will be provided as part of the Proposed Development; pumps will supply water to the Proposed Development from the storage tanks. The storage tanks will act as break tanks and buffer demand on the public watermain infrastructure. Further discussions are ongoing with Irish Water. No remedial or mitigation measures are required in relation to water supply.

CHAPTER 6 - BIODIVERSITY

Appendix 6.1 Protected sites for Nature Conservation in the Vicinity of the Proposed Development

European sites in the vicinity of the Proposed Development are listed below in Table 1, along with their Qualifying/Special Conservation Interests, reference to the most recent conservation objectives document, and their location relative to the Proposed Development site.

Other nationally protected sites for nature conservation in the vicinity of the Proposed Development are listed below in Table 2 along with the nature conservation interests for which they are designated, and their location relative to the Proposed Development site.

European Site Name [Code] and its Qualifying Interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	Location Relative to the Proposed Development Site
Special Area of Conservation (SAC)	
<p>Rye Water Valley/Carton SAC [001398] 7220 Petrifying springs with tufa formation (Cratoneurion)* 1014 Narrow-mouthed Whorl Snail <i>Vertigo angustior</i> 1016 Desmoulin's Whorl Snail <i>Vertigo moulinsiana</i></p> <p><i>S.I. No. 494/2018 - European Union Habitats (Rye Water Valley/Carton Special Area of Conservation 001398) Regulations 2018</i> NPWS (2021) <i>Conservation Objectives: Rye Water Valley/Carton SAC 001398</i>. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.</p>	c. 4.1km north-west of the Proposed Development
<p>Glenasmole Valley SAC [001209] 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) 6410 <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) 7220 Petrifying springs with tufa formation (Cratoneurion)*</p> <p><i>S.I. No. 345/22021 - European Union Habitats (Glenasmole valley special area of conservation 001209) regulations 2021</i> NPWS (2021) <i>Conservation Objectives: Glenasmole Valley SAC 001209</i>. Version 1. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage.</p>	c. 9.8km south-east of the Proposed Development
<p>Wicklow Mountains SAC [002122] 3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) 3160 Natural dystrophic lakes and ponds 4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> 4030 European dry heaths 4060 Alpine and Boreal heaths 6130 Calaminarian grasslands of the <i>Violetalia calaminariae</i> 6230 Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* 7130 Blanket bogs (* if active bog) 8110 Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) 8210 Calcareous rocky slopes with chasmophytic vegetation 8220 Siliceous rocky slopes with chasmophytic vegetation 91A0 Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles 1355 <i>Lutra lutra</i> (Otter)</p> <p>NPWS (2017) <i>Conservation Objectives: Wicklow Mountains SAC 002122</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.</p>	c. 11.4km south of the Proposed Development

European Site Name [Code] and its Qualifying Interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	Location Relative to the Proposed Development Site
<p>Red Bog, Kildare SAC [000397] 7140 Transition mires and quaking bogs</p> <p><i>S.I. No. 76/2018 - European Union Habitats (Red Bog, Kildare Special Area of Conservation 000397) Regulations 2018</i> NPWS (2019) <i>Conservation Objectives: Red Bog, Kildare SAC 000397</i>. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.</p>	c. 15km south of the Proposed Development
<p>South Dublin Bay SAC [000210] 1140 Mudflats and sandflats not covered by seawater at low tide 1210 Annual vegetation of drift lines 1310 <i>Salicornia</i> and other annuals colonising mud and sand 2110 Embryonic shifting dunes</p> <p><i>S.I. No. 525/2019 - European Union Habitats (South Dublin Bay Special Area of Conservation 000210) Regulations 2019</i> NPWS (2013) <i>Conservation Objectives: South Dublin Bay SAC 000210</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p>	c. 16.4km east of the Proposed Development
<p>North Dublin Bay SAC [000206] 1140 Mudflats and sandflats not covered by seawater at low tide 1210 Annual vegetation of drift lines 1310 <i>Salicornia</i> and other annuals colonising mud and sand 1330 Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) 1395 Petalwort <i>Petalophyllum ralfsii</i> 1410 Mediterranean salt meadows (<i>Juncetalia maritimi</i>) 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)* 2190 Humid dune slacks</p> <p><i>S.I. No. 524/2019 - European Union Habitats (North Dublin Bay Special Area of Conservation 000206) Regulations 2019</i> NPWS (2013) <i>Conservation Objectives: North Dublin Bay SAC 000206</i>. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p>	c. 18.8km east of the Proposed Development
Special Protection Area (SPA)	
<p>North Bull Island SPA [004006] A046 Light-bellied Brent Goose <i>Branta bernicla hrota</i> A048 Shelduck <i>Tadorna tadorna</i> A052 Teal <i>Anas crecca</i> A054 Pintail <i>Anas acuta</i> A056 Shoveler <i>Anas clypeata</i> A130 Oystercatcher <i>Haematopus ostralegus</i> A140 Golden Plover <i>Pluvialis apricaria</i> A141 Grey Plover <i>Pluvialis squatarola</i> A143 Knot <i>Calidris canutus</i> A144 Sanderling <i>Calidris alba</i> A149 Dunlin <i>Calidris alpina</i> A156 Black-tailed Godwit <i>Limosa limosa</i> A157 Bar-tailed Godwit <i>Limosa lapponica</i> A160 Curlew <i>Numenius arquata</i> A162 Redshank <i>Tringa totanus</i> A169 Turnstone <i>Arenaria interpres</i> A179 Black-headed Gull <i>Chroicocephalus ridibundus</i> A999 Wetlands & Waterbirds</p>	c. 15.7km east of the Proposed Development

European Site Name [Code] and its Qualifying Interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	Location Relative to the Proposed Development Site
<p>S.I. No. 211/2010 - European Communities (Conservation of Wild Birds (North Bull Island Special Protection Area 004006)) Regulations 2010. NPWS (2015) Conservation Objectives: North Bull Island SPA 004006. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p>	
<p>Wicklow Mountains SPA [004040] A098 Merlin <i>Falco columbarius</i> A103 Peregrine <i>Falco peregrinus</i></p> <p>S.I. No. 586/2012 - European Communities (Conservation of Wild Birds (Wicklow Mountains Special Protection Area 004040)) Regulations 2012. NPWS (2022) Conservation objectives for Wicklow Mountains SPA [004040]. Generic Version 9.0. Department of Housing, Local Government and Heritage.</p>	c. 12.3km south-east of the Proposed Development
<p>South Dublin Bay and River Tolka Estuary SPA [004024] A046 Light-bellied Brent Goose <i>Branta bernicla hrota</i> A130 Oystercatcher <i>Haematopus ostralegus</i> A137 Ringed Plover <i>Charadrius hiaticula</i> A141 Grey Plover <i>Pluvialis squatarola</i> A143 Knot <i>Calidris canutus</i> A144 Sanderling <i>Calidris alba</i> A149 Dunlin <i>Calidris alpina</i> A157 Bar-tailed Godwit <i>Limosa lapponica</i> A162 Redshank <i>Tringa totanus</i> A179 Black-headed Gull <i>Chroicocephalus ridibundus</i> A192 Roseate Tern <i>Sterna dougallii</i> A193 Common Tern <i>Sterna hirundo</i> A194 Arctic Tern <i>Sterna paradisaea</i> A999 Wetland and Waterbirds</p> <p>S.I. No. 212/2010 - European Communities (Conservation of Wild Birds (South Dublin Bay and River Tolka Estuary Special Protection Area 004024)) Regulations 2010 NPWS (2015) Conservation Objectives: South Dublin Bay and River Tolka Estuary SPA 004024. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.</p>	c. 16.4km east of the Proposed Development

Table 1: European sites in the vicinity of the Proposed Development.

Designated Site Name [Code] and its nature conservation features	Location Relative to the Proposed Development Site
proposed Natural Heritage Area (pNHA)	
<p>Grand Canal pNHA [002104]</p> <p>Diversity of flora species the canal ecosystem supports and the presence of legally protected plant species, opposite-leaved pondweed <i>Groenlandia densa</i>.</p>	c. 46m north of the Proposed Development
<p>Liffey Valley pNHA [000128]</p> <p>The site is important for its diversity of habitats within, ranging from terrestrial to aquatic. A number of rare and threatened plant species, such as <i>Scrophularia umbrosa</i>, <i>Hypericum hirsutum</i> and <i>Lamiastrum caleobdolon</i> have been recorded from the site.</p>	c. 2.8km north of the Proposed Development
<p>Rye Water Valley/Carton pNHA [001398]</p> <p>Diversity of flora and fauna species the river ecosystem supports – see also Rye Water Valley/Carton SAC in Table 1 above.</p>	c. 4.2km north-west of the Proposed Development
<p>Royal Canal pNHA [002103]</p>	c. 4.5km north of the Proposed Development

Designated Site Name [Code] and its nature conservation features	Location Relative to the Proposed Development Site
Diversity of flora species the canal ecosystem supports and the presence of legally protected plant species, opposite-leaved pondweed <i>Groenlandia densa</i> .	
Lugmore Glen pNHA [001212] The site is important as it is a fine example of wooded glen with a good representation of woodland flora. This type of habitat is scarce in Co. Dublin. The site also holds a Red Data Book species <i>Lamiastrum galeobdolon</i> .	c. 7km south of the Proposed Development
Dodder Valley pNHA [000991] The site represents the last remaining stretch of natural riverbank vegetation on the River Dodder in the built-up Greater Dublin Area. Includes a diversity of flora and bird species as well.	c. 8.8km south-east of the Proposed Development
Slade of Saggart and Crooksling Glen pNHA [000211] The site includes a good example of a wooded river valley and a small wetland system. The presence of a rare plant, a rare invertebrate and a variety of wildfowl species adds to the interest of the site.	c. 6.7km south of the Proposed Development
Glenasmole Valley pNHA [001209] Listed under similar conservation objectives as its SAC designation.	c. 9.5km south-east of the Proposed Development
Kilteel Wood pNHA [001394] The site is a fine example of a largely deciduous wood. Its elevated position gives it scenic value.	c. 10.8km south-west of the Proposed Development
Red Bog, Kildare pNHA [000397] Listed under similar conservation objectives as its SAC and SPA designations.	c. 15km south of the Proposed Development
South Dublin Bay pNHA [000210] Listed under similar conservation objectives as its SAC and SPA designations.	c. 16km east of the Proposed Development
North Dublin Bay pNHA [000210] Listed under similar conservation objectives as its SAC and SPA designations.	c. 15km east of the Proposed Development
Boosterstown Marsh pNHA [001205] The site is designated for its tidal habitats, rare flora and wintering bird populations.	c. 17.1km east of the Proposed Development
Dolphins, Dublin Docks pNHA [000201] Listed for breeding tern colonies.	c. 17.2km east of the Proposed Development

Table 2: Nationally protected sites in the vicinity of the Proposed Development.

Appendix 6.2 Desk study Flora and Fauna records

Desktop records of protected, rare, or other notable plant species, from the NPWS within the same 10km grid square, O03, in which the Proposed Development is located in, are listed below in Table 1. These are plant species which are legally protected under the Flora (Protection) Order, 2022 and/or are listed as Critically Endangered, Endangered or Vulnerable on the relevant national Red Data list for Ireland¹. The NBDC database search did not return any rare and/or protected flora for within c. 2km of the Proposed Development.

Common Name/ Scientific name	Legal Status ²	Red List Status	Source
Betony <i>Betonica officinalis</i>	FPO, 2022	None	NPWS database record
Hairy St John's-wort <i>Hypericum hirsutum</i>	FPO, 2022	None	NPWS database record
Hairy Violet <i>Viola hirta</i>	FPO, 2022	Vulnerable	NPWS database record
Meadow barley <i>Hordeum secalinum</i>	FPO, 2022	Vulnerable	NPWS database record
Opposite-leaved Pondweed <i>Groenlandia densa</i>	FPO, 2022	None	NPWS database record
Red Hemp-nettle <i>Galeopsis angustifolia</i>	FPO, 2022	Vulnerable	NPWS database record

Table 1: Records of protected, red-listed or notable flora recorded from the desk study in the vicinity of the study area.

Desktop records of protected, rare, or other notable fauna species are listed below in Table 2. In relation to amphibian, reptile and mammal species those which are protected under the Wildlife Acts, the Habitats Directive and/or are listed as threatened (Vulnerable to Critically Endangered) on the relevant national Red Lists are included. In the case of bird species, only those species listed in Annex I of the *Birds Directive* or on the *Birds of Conservation Concern in Ireland* (BoCCI) Red List are included in the table below. For invertebrate species, those which are listed as threatened (Vulnerable to Critically Endangered) on the relevant national Red List are included.

¹ Vascular flora from Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) *Ireland Red List No. 10: Vascular Plants*. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

² HDII/IV/V = Habitats Directive Annexes II/IV/V; FPO = Flora (Protection) Order, 2015; WA = Wildlife Acts

Common Name/ Scientific Name	Legal Status ³	Red List Status ⁴	Source
Amphibians and Reptiles			
Common frog <i>Rana temporaria</i>	HD_V, WA	Least concern	NPWS database record
Common lizard <i>Zootoca vivipara</i>	WA	Least concern	NPWS database record
Smooth newt <i>Lissotriton vulgaris</i>	WA	Least concern	NBDC online database record NPWS database record
Mammals (Terrestrial)			
Brown Long-eared Bat <i>Plecotus auritus</i>	HD_IV, WA	Least concern	NBDC online database record
Common pipistrelle <i>Pipistrellus pipistrellus</i>	HD_IV, WA	Least concern	NBDC online database record
Daubenton's Bat <i>Myotis daubentonii</i>	WA	Least concern	NBDC online database record
Leisler's bat <i>Nyctalus leisleri</i>	HD_IV, WA	Least concern	NBDC online database record NBDC online database record
Otter <i>Lutra lutra</i>	HD_II & IV, WA	Least concern	NBDC online database record NPWS database record
Pine Marten <i>Martes martes</i>	HD_V, WA	Least concern	NBDC online database record
Pygmy shrew <i>Sorex minutus</i>	WA	Least concern	NBDC online database record
Birds			
Barn swallow <i>Hirundo rustica</i>	WA	Amber	NBDC online database record
Black-headed gull <i>Chroicocephalus ridibundus</i>	WA	Amber	Scott Cawley Ltd. (2021) record ⁵
Common coot <i>Fulica atra</i>	WA	Amber	NBDC online database record
Common gull <i>Larus canus</i>	WA	Amber	Scott Cawley Ltd. (2021) record
Cormorant <i>Phalacrocorax carbo</i>	WA	Amber	Scott Cawley Ltd. (2021) record
Common starling <i>Sturnus vulgaris</i>	WA	Amber	NBDC online database record
Common woodpigeon <i>Columba palumbus</i>	WA, BD_II (I), III (I)	Green	NBDC online database record
Herring gull <i>Larus argentatus</i>	WA	Amber	Scott Cawley Ltd. (2021) record
House martin <i>Delichon urbicum</i>	WA	Amber	NBDC online database record
Grey heron <i>Ardea cinerea</i>	WA	Green	Scott Cawley Ltd. (2021) record
Northern Lapwing <i>Vanellus vanellus</i>	WA, BD Annex II (II)	Red	Scott Cawley Ltd. (2021) record
Lesser black-backed gull <i>Larus fuscus</i>	WA	Amber	Scott Cawley Ltd. (2021) record

³ HD_II/IV/V = Habitats Directive Annexes II/IV/V; WA = Wildlife Acts; BD_I/II/III = Birds Directive Annex I/II/III; OSPAR = Convention for the protection of the marine environment of the North-east Atlantic 1992

⁴ Mammals from Marnell, F., Looney, D. & Lawton, C. (2019) *Ireland Red List No. 12: Terrestrial Mammals*. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland.

Birds from Gilbert, G., Stanbury, A. & Lewis, L. (2021) *Birds of Conservation Concern in Ireland 4: 2020-2026*. Irish Birds 43: 1-22 (2021).

Amphibians, reptiles and fish from King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., Fitzpatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. (2011) *Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish*.

Non-Marine Molluscs from Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. & Regan, E.C. (2009) *Ireland Red List No. 2: Non-Marine Molluscs*.

⁵ Scott Cawley Ltd. (2021) *Wintering Bird Survey Report for Clonburris Strategic Development Zone at Clonburris, Co. Dublin*.

Common Name/ Scientific Name	Legal Status ³	Red List Status ⁴	Source
Little grebe <i>Tachybaptus ruficollis</i>	WA	Green	Scott Cawley Ltd. (2021) record
Mallard <i>Anas platyrhynchos</i>	WA, BD Annex II (I), III (I)	Amber	Scott Cawley Ltd. (2021) record
Tufted duck <i>Aythya fuligula</i>	WA, BD Annex II (II)	Amber	Scott Cawley Ltd. (2021) record
Invertebrates			
Globular Pea Mussel <i>Pisidium hibernicum</i>	none	Near threatened	NBDC online database record
Iridescent pea mussel <i>Pisidium pulchellum</i>	none	Endangered	NBDC online database record

Appendix 6.3 Examples of valuing important ecological features

International Importance:

'European Site' including Special Area of Conservation (SAC), Site of Community Importance (SCI), Special Protection Area (SPA) or proposed Special Area of Conservation.

Proposed Special Protection Area (pSPA).

Site that fulfils the criteria for designation as a 'European Site' (see Annex III of the Habitats Directive, as amended).

Features essential to maintaining the coherence of the Natura 2000 Network.⁶

Site containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive.

Resident or regularly occurring populations (assessed to be important at the national level)⁷ of the following:

Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive; and/or

Species of animal and plants listed in Annex II and/or IV of the Habitats Directive.

Ramsar Site (Convention on Wetlands of International Importance Especially Waterfowl Habitat 1971).

World Heritage Site (Convention for the Protection of World Cultural & Natural Heritage, 1972).

Biosphere Reserve (UNESCO Man & The Biosphere Programme).

Site hosting significant species populations under the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals, 1979).

Site hosting significant populations under the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 1979).

Biogenetic Reserve under the Council of Europe.

European Diploma Site under the Council of Europe.

Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 1988).⁸

National Importance:

Site designated or proposed as a Natural Heritage Area (NHA).

Statutory Nature Reserve.

Refuge for Fauna and Flora protected under the Wildlife Acts.

National Park.

Undesignated site fulfilling the criteria for designation as a Natural Heritage Area (NHA); Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act; and/or a National Park.

Resident or regularly occurring populations (assessed to be important at the national level)⁹ of the following:

Species protected under the Wildlife Acts; and/or

Species listed on the relevant Red Data list.

Site containing 'viable areas'¹⁰ of the habitat types listed in Annex I of the Habitats Directive

County Importance:

Area of Special Amenity.¹¹

Area subject to a Tree Preservation Order.

Area of High Amenity, or equivalent, designated under the County Development Plan.

Resident or regularly occurring populations (assessed to be important at the County level)¹² of the following:

Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;

Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;

Species protected under the Wildlife Acts; and/or

⁶ See Articles 3 and 10 of the Habitats Directive

⁷ It is suggested that, in general, 1% of the national population of such species qualifies as an internationally important population. However, a smaller population may qualify as internationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

⁸ Note that such waters are designated based on these waters' capabilities of supporting salmon (*Salmo salar*), trout (*Salmo trutta*), char (*Salvelinus*) and whitefish (*Coregonus*)

⁹ It is suggested that, in general, 1% of the national population of such species qualifies as a nationally important population. However, a smaller population may qualify as nationally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

¹⁰ A 'viable area' is defined as an area of a habitat that, given the particular characteristics of that habitat, was of a sufficient size and shape, such that its integrity (in terms of species composition, and ecological processes and function) would be maintained in the face of stochastic change (for example, as a result of climatic variation).

¹¹ It should be noted that whilst areas such as Areas of Special Amenity, areas subject to a Tree Preservation Order and Areas of High Amenity are often designated on the basis of their ecological value, they may also be designated for other reasons, such as their amenity or recreational value. Therefore, it should not be automatically assumed that such sites are of County importance from an ecological perspective.

¹² It is suggested that, in general, 1% of the County population of such species qualifies as a County important population. However, a smaller population may qualify as County important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

Species listed on the relevant Red Data list.

Site containing area or areas of the habitat types listed in Annex I of the Habitats Directive that do not fulfil the criteria for valuation as of International or National importance.

County important populations of species, or viable areas of semi-natural habitats or natural heritage features identified in the National or Local Biodiversity Action Plan, if this has been prepared.

Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county.

Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.

Local Importance (higher value):

Locally important populations of priority species or habitats or natural heritage features identified in the Local BAP, if this has been prepared;

Resident or regularly occurring populations (assessed to be important at the Local level)¹³ of the following:

Species of bird, listed in Annex I and/or referred to in Article 4(2) of the Birds Directive;

Species of animal and plants listed in Annex II and/or IV of the Habitats Directive;

Species protected under the Wildlife Acts; and/or

Species listed on the relevant Red Data list.

Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;

Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.

Local Importance (lower value):

Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;

Sites or features containing non-native species that are of some importance in maintaining habitat links.

¹³ It is suggested that, in general, 1% of the local population of such species qualifies as a locally important population. However, a smaller population may qualify as locally important where the population forms a critical part of a wider population or the species is at a critical phase of its life cycle.

Appendix 6.4 Flora Species List by Habitat

Dry meadows and grassy verges (GS2)	Hedgerows (WL1)	Recolonising bare ground (ED3)
Barren Brome <i>Anisantha sterilis</i>	Ash <i>Fraxinus excelsior</i>	Barren Brome <i>Anisantha sterilis</i>
Broad-leaved Dock <i>Rumex obtusifolius</i>	Barren Brome <i>Anisantha sterilis</i>	Cut-leaved Crane's-bill <i>Geranium dissectum</i>
Bush Vetch <i>Vicia sepium</i>	Bittersweet <i>Solanum dulcamara</i>	Fleabane species <i>Erigeron</i> sp
Cock's-foot <i>Dactylis glomerata</i>	Blackthorn <i>Prunus spinosa</i>	Hedge Mustard <i>Sisymbrium officinale</i>
Common Nettle <i>Urtica dioica</i>	Bramble <i>Rubus fruticosus</i> agg.	Lesser Trefoil <i>Trifolium dubium</i>
Cowslip <i>Primula veris</i>	Bush vetch <i>Vicia sativa</i>	Perennial Sow-thistle <i>Sonchus arvensis</i>
Creeping Bent <i>Agrostis stolonifera</i>	Cleavers <i>Galium aparine</i>	Procumbent Pearlwort <i>Sagina procumbens</i>
Creeping Buttercup <i>Ranunculus repens</i>	Common Field-speedwell <i>Veronica persica</i>	Red Clover <i>Trifolium pratense</i>
Creeping Thistle <i>Cirsium arvense</i>	Common Ivy <i>Hedera helix</i>	White Clover <i>Trifolium repens</i>
Curled Dock <i>Rumex crispus</i>	Common Nettle <i>Urtica dioica</i>	Yorkshire-fog <i>Holcus lanatus</i>
Cut-leaved Crane's-bill <i>Geranium dissectum</i>	Cowslip <i>Primula veris</i>	
Elder <i>Sambucus nigra</i>	Cut-leaved Crane's-bill <i>Geranium dissectum</i>	
False Oat-Grass <i>Arrhenatherum elatius</i>	Dog-rose <i>Rosa canina</i> agg.	
False-brome <i>Brachypodium sylvaticum</i>	Elder <i>Sambucus nigra</i>	
Hoary Willowherb <i>Epilobium parviflorum</i>	False-brome <i>Brachypodium sylvaticum</i>	
Hogweed <i>Heracleum sphondylium</i>	Ground-ivy <i>Glechoma hederacea</i>	
Perennial Rye-grass <i>Lolium perenne</i>	Hawthorn <i>Crataegus monogyna</i>	
Perennial Sow-thistle <i>Sonchus arvensis</i>	Hedge Bindweed <i>Calystegia sepium</i>	
Prickly Sow-thistle <i>Sonchus asper</i>	Hogweed <i>Heracleum sphondylium</i>	
Red Fescue <i>Festuca rubra</i> agg.	Lesser Burdock <i>Arctium minus</i>	
Ribwort Plantain <i>Plantago lanceolata</i>	Oak species <i>Quercus</i> sp	
Rosebay Willowherb <i>Chamaenerion angustifolium</i>	Wood Avens <i>Geum urbanum</i>	
Silverweed <i>Argentina anserina</i>		
Soft-brome <i>Bromus hordeaceus</i>		
Spear Thistle <i>Cirsium vulgare</i>		
White Clover <i>Trifolium repens</i>		
Yorkshire-fog <i>Holcus lanatus</i>		

Appendix 6.5 Relevant Policies and objectives

Policies and objectives relevant to the Proposed Development and referenced in the chapter are presented in the following tables. Table 1 covers relevant policies and objectives found in the South Dublin County Development Plan 2022-2028, and includes those covering designated sites, water quality and biodiversity. Table 2 covers additional land use plan policies and objectives that are relevant in the wider area, together with the Development Plan, on European sites and water quality within Dublin Bay.

South Dublin County Development Plan 2022-2028
<p>Policy NCBH3 Natura 2000 Sites Conserve and protect Natura 2000 sites and achieve and maintain favourable conservation status for habitats and species that are considered to be at risk through the protection of the Natura 2000 network from any plans or projects that are likely to have a significant effect on their coherence or integrity</p> <p>NCBH3 Objective 1 To prevent development and activities that would adversely affect the integrity of any Natura 2000 site located within or adjacent to the County and promote the favourable conservation status of the habitats and species integral to these sites.</p> <p>NCBH3 Objective 2 To ensure that plans, including land use plans, will only be adopted, if they either individually or in combination with existing and / or proposed plans or projects, will not have a significant adverse effect on a European Site, or where such a plan is likely or might have such a significant adverse effect (either alone or in combination), South Dublin County Council will, as required by law, carry out an appropriate assessment as per requirements of Article 6(3) of the Habitats Directive 92 / 43 / EEC of the 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, as transposed into Irish legislation. Only after having ascertained that the plan will not adversely affect the integrity of any European site, will South Dublin County Council adopt the plan, incorporating any necessary mitigation measures. A plan which could adversely affect the integrity of a European site may only be adopted in exceptional circumstances, as provided for in Article 6(4) of the Habitats Directive as transposed into Irish legislation.</p> <p>NCBH3 Objective 3 To ensure that planning permission will only be granted for a development proposal that, either individually or in combination with existing and / or proposed plans or projects, will not have a significant adverse effect on a European Site, or where such a development proposal is likely or might have such a significant adverse effect (either alone or in combination), the planning authority will, as required by law, carry out an appropriate assessment as per requirements of Article 6(3) of the Habitats Directive 92 / 43 / EEC of the 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, as transposed into Irish legislation. Only after having ascertained that the development proposal will not adversely affect the integrity of any European site, will the planning authority agree to the development and impose appropriate mitigation measures in the form of planning conditions. A development proposal which could adversely affect the integrity of a European site may only be permitted in exceptional circumstances, as provided for in Article 6(4) of the Habitats Directive as transposed into Irish legislation.</p> <p>G11 Objective 3 To facilitate the development and enhancement of sensitive access to and connectivity between areas of interest for residents, wildlife and biodiversity, and other distinctive landscapes as focal features for linkages between natural, semi natural and formalised green spaces where feasible and ensuring that there is no adverse impact (directly, indirectly or cumulatively) on the conservation objectives of Natura 2000 sites and protected habitats outside of Natura 2000 sites</p> <p>IE2 Objective 1 To work in conjunction with Irish Water to protect existing water and drainage infrastructure and to promote the ongoing upgrade and expansion of water supply and wastewater services to meet the future needs of the County and the Region.</p> <p>Policy IE3 Surface Water and Groundwater Manage surface water and protect and enhance ground and surface water quality to meet the requirements of the EU Water Framework Directive.</p> <p>IE3 Objective 1 To maintain, improve and enhance the environmental and ecological quality of our surface waters and groundwater by implementing the relevant programme of measures set out in the River Basin Management Plans.</p> <p>IE3 Objective 2 To maintain and enhance existing surface water drainage systems in the County and to require Sustainable Drainage Systems (SuDS) in new development in accordance with objectives set out in section 4.2.2 of this Plan including, where feasible, integrated constructed wetlands, at a local, district and County level, to control surface water outfall and protect water quality.</p>

Table 1: Relevant land use plan policies/objectives within South Dublin County Development Plan 2022-2028 relating to the protection of designated sites, water quality and biodiversity.

Dún Laoghaire-Rathdown County Development Plan 2022-2028**Policy Objective GIB18: Protection of Natural Heritage and the Environment**

It is a Policy Objective to protect and conserve the environment including, in particular, the natural heritage of the County and to conserve and manage Nationally and Internationally important and EU designated sites - such as Special Protection Areas (SPAs), Special Areas of Conservations (SACs), proposed Natural Heritage Areas (pNHAs) and Ramsar sites (wetlands) - as well as non-designated areas of high nature conservation value known as locally important areas which also serve as 'Stepping Stones' for the purposes of Article 10 of the Habitats Directive

Policy Objective GIB19: Habitats Directive

It is a Policy Objective to ensure the protection of natural heritage and biodiversity, including European Sites that form part of the Natura 2000 network, in accordance with relevant EU Environmental Directives and applicable National Legislation, Policies, Plans and Guidelines.

Policy Objective GIB21: Designated Sites

It is a Policy Objective to protect and preserve areas designated as proposed Natural Heritage Areas, Special Areas of Conservation, and Special Protection Areas. It is Council policy to promote the maintenance and as appropriate, delivery of 'favourable' conservation status of habitats and species within these areas.

Policy Objective GIB22: Non-Designated Areas of Biodiversity Importance

It is a Policy Objective to protect and promote the conservation of biodiversity in areas of natural heritage importance outside Designated Areas and to ensure that notable sites, habitats and features of biodiversity importance - including species protected under the Wildlife Acts 1976 and 2000, the Birds Directive 1979, the Habitats Directive 1992, Flora (Protection) Order, 2015, Annex I habitats, local important areas, wildlife corridors and rare species - are adequately protected. Ecological assessments will be carried out for all developments in areas that support, or have potential to support, features of biodiversity importance or rare and protected species and appropriate mitigation/ avoidance measures will be implemented. In implementing this policy, regard shall be had to the Ecological Network, including the forthcoming DLR Wildlife Corridor Plan, and the recommendations and objectives of the Green City Guidelines (2008) and 'Ecological Guidance Notes for Local Authorities and Developers' (Dún Laoghaire-Rathdown Version 2014)

Policy Objective GIB23: County-Wide Ecological Network

It is a Policy Objective to protect the Ecological Network which will be integrated into the updated Green Infrastructure Strategy and will align with the DLR County Biodiversity Action Plan. Creating this network throughout the County will also improve the ecological coherence of the Natura 2000 network in accordance with Article 10 of the Habitats Directive. The network will also include non-designated sites.

Policy Objective EI7: Water Supply and Wastewater treatment and Appropriate Assessment

It is a Policy Objective to require that all developments relating to water supply and wastewater treatment are subject to screening for Appropriate Assessment to ensure there are no likely significant effects on the integrity, defined by the structure and function, of any European sites and that the requirements of Article 6 of the EU Habitats Directive are met. (Consistent with RPO 10.7 of the RSES).

Policy Objective EI8: Groundwater Protection and Appropriate Assessment

It is a Policy Objective to ensure the protection of the groundwater resources in and around the County and associated habitats and species in accordance with the Groundwater Directive 2006/118/EC and the European Communities Environmental Objectives (Groundwater) Regulations, 2010. In this regard, the Council will support the implementation of Irish Water's Water Safety Plans to protect sources of public water supply and their contributing catchment.

Policy Objective EI2: Irish Water Enabling Policies Irish Water's Plans and Programmes

It is a Policy Objective - in conjunction with the Eastern and Midland Regional Authority, where appropriate - to work with and support Irish Water in the delivery of the strategic objectives and strategic water and wastewater projects and infrastructure as set out in the 'Water Services Strategic Plan' (2015), any subsequent plan, Irish Water's Capital Investment Plan 2020 – 2024, any subsequent Capital Investment Plans and the forthcoming National Water Resources Plan, so as to ensure provision of infrastructure to service settlements in accordance with the Core Strategy of this Plan, and the settlement strategy of the RSES. (Consistent with RPO 10.2, 10.3, 10.11, 10.16 of the RSES).

Policy Objective EI5: River Basin Management Plans (RMBPs)

It is a Policy Objective: To ensure the delivery of the relevant policies and objectives of the River Basin Management Plan for Ireland 2018 – 2021 and any subsequent plan, including those relating to protection of water status, improvement of water status, prevention of deterioration and meeting objectives for designated protected sites. To support Irish Water in its implementation of Water Quality Management Plans for ground, surface, coastal and estuarine waters as part of the implementation of the EU Water Framework Directive. To support Irish Water in the development of Drinking Water Protection Plans.

Policy Objective EI6: Sustainable Drainage Systems

It is a Policy Objective to ensure that all development proposals incorporate Sustainable Drainage Systems (SuDS).

Policy Objective EI17: Water Pollution

It is a Policy Objective to implement the provisions of water pollution abatement measures in accordance with national and EU Directives and other legislative requirements in conjunction with other agencies as appropriate.

Fingal Development Plan 2017-2023**Objective NH10**

Ensure that the Council takes full account of the requirements of the Habitats and Birds Directives, as they apply both within and without European Sites in the performance of its functions.

Objective NH11

Ensure that the Council, in the performance of its functions, takes full account of the objectives and management practices proposed in any management or related plans for European Sites in and adjacent to Fingal published by the Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

Objective NH15

Strictly protect areas designated or proposed to be designated as Natura 2000 sites (i.e. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs); also known as European sites) including any areas that may be proposed for designation or designated during the period of this Plan.

Objective SW04

Require the use of sustainable drainage systems (SuDS) to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques where appropriate, for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flooding risks.

Objective WQ01

Strive to achieve 'good status' in all waterbodies in compliance with the Water Framework Directive, the Eastern River Basin District Management Plan 2009-2015 and the associated Programme of Measures (first cycle) and to cooperate with the development and implementation of the second cycle national River Basin Management Plan 2017-2021.

Objective WQ04

Protect existing riverine wetland and coastal habitats and where possible create new habitats to maintain naturally functioning ecosystems whilst ensuring they do not impact negatively on the conservation objectives of any European Sites.

Objective WT01

Liaise with and work in conjunction with Irish Water during the lifetime of the plan for the provision, extension and upgrading of waste water collection and treatment systems in all towns and villages of the County to serve existing populations and facilitate sustainable development of the County, in accordance with the requirements of the Settlement Strategy and associated Core Strategy.

Objective WT02

Liaise with Irish Water to ensure the provision of wastewater treatment systems in order to ensure compliance with existing licences, EU Water Framework Directive, River Basin Management Plans, the Urban Wastewater Directive and the EU Habitats Directive.

Wicklow County Development Plan 2016-2022**NH2**

No projects giving rise to significant cumulative, direct, indirect or secondary impacts on Natura 2000 sites arising from their size or scale, land take, proximity, resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or from any other effects shall be permitted on the basis of this plan (either individually or in combination with other plans or projects).

Except as provided for in Section 6(4) of the Habitats Directive, viz. There must be a) no alternative solution available, b) imperative reasons of overriding public interest for the project to proceed; and c) Adequate compensatory measures in place.

NH3

To contribute, as appropriate, towards the protection of designated ecological sites including candidate Special Areas of Conservation (cSACs) and Special Protection Areas (SPAs); Wildlife Sites (including proposed Natural Heritage Areas); Salmonid Waters; Flora Protection Order sites; Wildfowl Sanctuaries (see S.I. 192 of 1979); Freshwater Pearl Mussel catchments; and Tree Preservation Orders (TPOs). To contribute towards compliance with relevant EU Environmental Directives and applicable National Legislation, Policies, Plans and Guidelines, including the following and any updated/superseding documents:

- EU Directives, including the Habitats Directive (92/43/EEC, as amended)⁷, the Birds Directive (2009/147/EC)⁸, the Environmental Liability Directive (2004/35/EC)⁹, the Environmental Impact Assessment Directive (85/337/EEC, as amended), the Water Framework Directive (2000/60/EC) and the Strategic Environmental Assessment Directive (2001/42/EC).
- National legislation, including the Wildlife Act 1976¹⁰, the European Communities (Environmental Impact Assessment) Regulations 1989 (SI No. 349 of 1989) (as amended), the Wildlife (Amendment) Act 2000, the European Union (Water Policy) Regulations 2003 (as amended), the Planning and Development Act 2000 (as amended), the European Communities (Birds and Natural Habitats) Regulations 2011 (SI No. 477 of 2011) and

the European Communities (Environmental Liability) Regulations 2008/11.

- National policy guidelines (including any clarifying Circulars or superseding versions of same), including the Landscape and Landscape Assessment Draft Guidelines 2000, the Environmental Impact Assessment Sub-Threshold Development Guidelines 2003, Strategic Environmental Assessment Guidelines 2004 and the Appropriate Assessment Guidance 2010.
- Catchment and water resource management Plans, including Eastern and South Eastern River Basin Management Plan 2009-2015 (including any superseding versions of same).
- Biodiversity Plans and guidelines, including Actions for Biodiversity 2011-2016: Ireland's 2nd National Biodiversity Plan (including any superseding version of same).
- Ireland's Environment 2014 (EPA, 2014, including any superseding versions of same), and to make provision where appropriate to address the report's goals and challenges.

NH4

All projects and plans arising from this plan¹² (including any associated improvement works or associated infrastructure) will be screened for the need to undertake Appropriate Assessment under Article 6 of the Habitats Directive. A plan or project will only be authorised after the competent authority has ascertained, based on scientific evidence, Screening for Appropriate Assessment, and a Stage 2 Appropriate Assessment where necessary, that:

- 1) The Plan or project will not give rise to significant adverse direct, indirect or secondary effects on the integrity of any European site (either individually or in combination with other plans or projects); or
- 2) The Plan or project will have significant adverse effects on the integrity of any European site (that does not host a priority natural habitat type and / or a priority species) but there are no alternative solutions and the plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature. In this case, it will be a requirement to follow procedures set out in legislation and agree and undertake all compensatory measures necessary to ensure the protection of the overall coherence of Natura 2000; or
- 3) The Plan or project will have a significant adverse effect on the integrity of any European site (that hosts a natural habitat type and/or a priority species) but there are no alternative solutions and the plan or project must nevertheless be carried out for imperative reasons for overriding public interest, restricted to reasons of human health or public safety, to beneficial consequences of primary importance for the environment or, further to an opinion from the Commission, to other imperative reasons of overriding public interest. In this case, it will be a requirement to follow procedures set out in legislation and agree and undertake all compensatory measures necessary to ensure the protection of the overall coherence of Natura 2000.

NH5

To maintain the conservation value of all proposed and future Natural Heritage Areas (NHAs) and to protect other designated ecological sites in Wicklow.

Along with cSACs, SPAs and pNHA these include Salmonid Waters; Flora Protection Order sites; Wildfowl Sanctuaries (see S.I. 192 of 1979); Freshwater Pearl Mussel catchments; and Tree Preservation Orders (TPOs).

W12

To protect existing and potential water resources of the County, in accordance with the EU Water Framework Directive, the River Basin Management Plans, the Groundwater Protection Scheme and source protection plans for public water supplies.

W112

Ensure the implementation of Sustainable Urban Drainage Systems (SUDS) and in particular, to ensure that all surface water generated in a new development is disposed of on-site or is attenuated and treated prior to discharge to an approved surface water system.

W16

In order to fulfil the objectives of the Core Strategy, Wicklow County Council will work alongside and facilitate the delivery of Irish Water's Water Services Investment Programme, to ensure that all lands zoned for development are serviced by an adequate wastewater collection and treatment system and in particular, to endeavour to secure the delivery of regional and strategic wastewater schemes. In particular, to support and facilitate the development of a WWTP in Arklow, at an optimal location following detailed technical and environmental assessment and public consultation.

W17

Permission will be considered for private wastewater treatment plants for single rural houses where: · the specific ground conditions have been shown to be suitable for the construction of a treatment plant and any associated percolation area;

- the system will not give rise to unacceptable adverse impacts on ground waters / aquifers and the type of treatment proposed has been drawn up in accordance with the appropriate groundwater protection response set out in the Wicklow Groundwater Protection Scheme (2003);
- the proposed method of treatment and disposal complies with Wicklow County Council's Policy for Wastewater Treatment & Disposal Systems for Single Houses (PE ≤ 10) and the Environmental Protection Agency "Wastewater Treatment Manuals"; and
- in all cases the protection of ground and surface water quality shall remain the overriding priority and proposals must definitively demonstrate that the Proposed Development will not have an adverse impact on water quality

standards and requirements set out in EU and national legislation and guidance documents.

WI9

Private wastewater treatment plants for commercial / employment generating development will only be considered where:

- Irish Water has confirmed the site is due to be connected to a future public system in the area or Irish Water have confirmed there are no plans for a public system in the area;
- it can clearly be demonstrated that the proposed system can meet all EPA / Local Authority environmental criteria; and
- an annually renewed contract for the management and maintenance of the system is contracted with a reputable company / person, details of which shall be provided to the Local Authority.

Kildare County Development Plan 2017-2023**NH 4**

Support the conservation and enhancement of Natura 2000 Sites including any additional sites that may be proposed for designation during the period of this Plan and to protect the Natura 2000 network from any plans and projects that are likely to have a significant effect on the coherence or integrity of a Natura 2000 Site.

NH 5

Prevent development that would adversely affect the integrity of any Natura 2000 site located within and immediately adjacent to the county and promote favourable conservation status of habitats and protected species including those listed under the Birds Directive, the Wildlife Acts and the Habitats Directive.

NH 6

Ensure an Appropriate Assessment, in accordance with Article 6(3) and Article 6(4) of the Habitats Directive and with DEHLG guidance (2009), is carried out in respect of any plan or project not directly connected with or necessary to the management of a Natura 2000 site to determine the likelihood of the plan or project having a significant effect on a Natura 2000 site, either individually or in combination with other plans or projects and to ensure that projects which may give rise to significant cumulative, direct, indirect or secondary impacts on Natura 2000 sites will not be permitted (either individually or in combination with other plans or projects) unless for reasons of overriding public interest.

WQ 1

Co-operate with the EPA and other authorities in the continued implementation of the EU Water Framework Directive and assist and co-operate with the lead authority for the River Basin Management Plan(s).

WQ 2

Ensure, through the implementation of the River Basin Management Plan(s) and the associated Programmes of Measures and any other associated legislation, the protection and improvement of all drinking water, surface water and ground waters throughout the county.

WQ 6

Protect recognised salmonid water courses in conjunction with Inland Fisheries Ireland such as the Liffey catchment, which are recognised to be exceptional in supporting salmonid fish species.

WW 4

Ensure that adequate wastewater services will be available to service development prior to the granting of planning permission. Applicants who are proposing to connect to the public wastewater network should consult with Irish Water regarding available capacity prior to applying for planning permission.

WW 12

Ensure that existing and permitted private wastewater treatment plants are operated in compliance with their wastewater discharge license, in order to protect water quality.

Meath County Development Plan 2021-2027**HER POL 28**

To integrate in the development management process the protection and enhancement of biodiversity and landscape features wherever possible, by minimising adverse impacts on existing habitats (whether designated or not) and by including mitigation and/or compensation measures, as appropriate.

HER POL 31

To ensure that the ecological impact of all development proposals on habitats and species are appropriately assessed by suitably qualified professional(s) in accordance with best practice guidelines – e.g. the preparation of an Ecological Impact Assessment (EclA), Screening Statement for Appropriate Assessment, Environmental Impact Assessment, Natura Impact Statement (NIS), species surveys etc. (as appropriate).

HER POL 32

To permit development on or adjacent to designated Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas, Statutory Nature Reserves or those proposed to be designated over the period of the Plan, only where the development has been subject to the outcome of the Appropriate Assessment process and has been carried out to the satisfaction of the Planning Authority, in consultation with National Parks and Wildlife.

HER POL 33

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.

HER POL 34

To undertake appropriate surveys and collect data to provide an evidence-base to assist the Council in meeting its obligations under Article 6 of the Habitats Directives (92/43/EEC) as transposed into Irish Law, subject to available resources.

HER OBL 33

To ensure an Appropriate Assessment in accordance with Article 6(3) and Article 6(4) of the Habitats Directives (92/43/EEC) 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 for 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.

HER OBL 34

To protect and conserve the conservation value of candidate Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas and proposed Natural Heritage Areas as identified by the Minister for the Department of Culture, Heritage and the Gaeltacht and any other sites that may be proposed for designation during the lifetime of this Plan in accordance with the provisions of the Habitats and Birds Directives and to permit development in or affecting same only in accordance with the provisions of those Directives as transposed into Irish Law.

HER POL 35

To ensure, where appropriate, the protection and conservation of areas, sites, species and ecological/networks of biodiversity value outside designated sites and to require an appropriate level of ecological assessment by suitably qualified professional(s) to accompany development proposals likely to impact on such areas or species.

HER POL 36

To consult with the National Parks and Wildlife Service and take account of their views and any licensing requirements, when undertaking, approving or authorising development which is likely to affect plant, animal or bird species protected by law.

HER OBJ 35

To ensure that development does not have a significant adverse impact, incapable of satisfactory avoidance or mitigation, on plant, animal or bird species protected by law.

HER POL 45

To ensure that peatland areas which are designated (or proposed for designation) as NHAs, SACs or SPAs are conserved for their ecological, climate regulation, archaeological, cultural and educational significance.

HER OBJ 39

To work in partnership with relevant stakeholders on a suitable peatland site(s) to demonstrate best practice in sustainable peatland conservation, management and restoration techniques and to promote their heritage and educational value subject to Ecological Impact Assessment and Appropriate Assessment Screening, as appropriate, having regard to local and residential amenities.

HER POL 47

To protect the ecological, recreational, educational, amenity and flood alleviation potential of navigational and non-navigational waterways within the County, towpaths and adjacent wetlands.

HER OBJ 42

To undertake conservation works in accordance with best practice on the coastal dune systems subject to ecological impact assessment and Appropriate Assessment, as appropriate.

HER OBJ 60

To encourage, pursuant to Article 10 of the Habitats Directive (92/43/EEC), the management of features of the landscape, such as traditional field boundaries, important for the ecological coherence of the Natura 2000 network and essential for the migration, dispersal and genetic exchange of wild species

INF POL 9

To consider the potential for the provision of temporary water treatment facilities for new developments but only where a permanent solution has already been identified and committed to by Irish Water but has not yet been implemented. The provision of such temporary facilities shall only be considered where the solution is environmentally sustainable and would not affect the quality status of water sources. Adequate provision shall be made by the developer for the operation and maintenance of the proposed temporary facility for the duration of its required existence and thereafter for its decommissioning and removal from site.

INF OBJ 6

To liaise and work in conjunction with Irish Water in their implementation of water conservation measures.

INF OBJ 7

To promote the sustainable use of water and water conservation in existing and new development within the County and encourage demand management measures among all water users

INF OBJ 8

To protect both ground and surface water resources and work with Irish Water to develop and implement Water Safety Plans to protect sources of public water supply and their contributing catchment

INF POL 11

To liaise and work in conjunction with Irish Water during the lifetime of the Plan in the provision, upgrading or extension of wastewater collection and treatment systems in the County to serve existing and planned future populations and enterprise in accordance with the requirements of the Core and Settlement Strategies.

INF OBJ 12

The Planning Authority shall consider the provision of temporary wastewater treatment facilities for new developments only in circumstances where a permanent solution is identified and committed to by Irish Water. The temporary solution shall only be considered where it is deemed to be environmentally sustainable and would not affect the water quality status of receiving waters. Adequate provision shall be made by the developer for the operation and maintenance of the temporary facility for the duration of the operation of the required infrastructure.

INF POL 16

To ensure that all planning applications for new development have regard to the surface water management policies provided for in the GSDS.

INF OBJ 14

To require the use of SuDS within Local Authority Developments and other infrastructural projects in accordance with the Greater Dublin Regional Code of Practice for Drainage Works.

INF OBJ 15

To require the use of SuDS in accordance with the Greater Dublin Regional Code of Practice for Drainage Works for new developments (including extensions).

INF OBJ 19

To ensure that developments permitted by the Council which involve discharge of wastewater to surface waters or groundwaters comply with the requirements of the EU Environmental Objectives (Surface Waters) Regulations and EU Environmental Objectives (Groundwater) Regulations.

INF POL 29

To facilitate the provision of new, or the reinforcement of existing flood defences and protection measures where necessary and in particular to support the implementation of flood schemes being progressed through the planning process during the lifetime of the Plan. The provision of flood defences will be subject to the outcome of the Appropriate Assessment process.

INF OBJ 22

To ensure flood relief measures are suitably designed to protect the conservation objectives of Natura 2000 sites, and to avoid direct or indirect impacts upon qualifying interests or Natura 2000 sites.

INF OBJ 25

To require the use of Sustainable Urban Drainage Systems (SuDS) to minimise and limit the extent of hard surfacing and paving and require the use of sustainable drainage techniques where appropriate, for new development or for extensions to existing developments, in order to reduce the potential impact of existing and predicted flooding risks.

INF POL 33

To protect recognised salmonid water courses (in conjunction with Inland Fisheries Ireland) such as the Boyne and Blackwater catchments, which are recognised to be exceptional in supporting salmonid fish species.

INF OBJ 30

To ensure the County's natural coastal defences, such as beaches, sand dunes, salt marshes and estuary lands, are protected and are not compromised by inappropriate works or forms of development.

INF OBJ 36

To protect and develop, in a sustainable manner, the existing groundwater sources and aquifers in the County and manage development in a manner consistent with the sustainable management of these resources in conformity with the EU Environmental Objectives (Groundwater) Regulations 2010 and the second cycle National River Basin Management Plan 2018-2021, and any subsequent plan and the Groundwater Protection Scheme.

Table 2: Relevant land use plan policies/objectives relating to the protection of European sites and water quality in Dublin Bay.

CHAPTER 7 - LAND, SOIL, GEOLOGY AND HYDROGEOLOGY**Appendix 7.1 Criteria for Rating Site Attributes – Estimation of Importance of Hydrogeological Attributes (National Roads Authority (NRA, 2009))****Table 1 Criteria for rating site importance of Geological Features (NRA)**

Importance	Criteria	Typical Example
Very High	Attribute has a high quality, significance or value on a regional or national scale Degree or extent of soil contamination is significant on a national or regional scale Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale.	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource
High	Attribute has a high quality, significance or value on a local scale. Degree or extent of soil contamination is significant on a local scale. Volume of peat and/or soft organic soil underlying route is significant on a local scale.	Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site) Well drained and/or high fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource
Medium	Attribute has a medium quality, significance or value on a local scale Degree or extent of soil contamination is moderate on a local scale Volume of peat and/or soft organic soil underlying route is moderate on a local scale	Contaminated soil on site with previous light industrial usage Small recent landfill site for mixed wastes Moderately drained and/or moderate fertility soils Small existing quarry or pit Sub-economic extractable mineral resource
Low	Attribute has a low quality, significance or value on a local scale Degree or extent of soil contamination is minor on a local scale. Volume of peat and/or soft organic soil underlying route is small on a local scale	Large historical and/or recent site for construction and demolition wastes. Small historical and/or recent landfill site for construction and demolition wastes. Poorly drained and/or low fertility soils. Uneconomically extractable mineral resource.

Table 2 Criteria for rating impact magnitude at EIS stage – Estimation of magnitude of impact on soil / geology attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss of high proportion of future quarry or pit reserves
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Loss of moderate proportion of future quarry or pit reserves
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Loss of small proportion of future quarry or pit reserves
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	No measurable changes in attributes
Minor Beneficial	Results in minor improvement of attribute quality	Minor enhancement of geological heritage feature
Moderate Beneficial	Results in moderate improvement of attribute quality	Moderate enhancement of geological heritage feature
Major Beneficial	Results in major improvement of attribute quality	Major enhancement of geological heritage feature

The NRA criteria for estimation of the importance of hydrogeological attributes at the site during the EIA stage are summarised in [Table 4](#) below.

Table 3 Criteria for rating Site Attributes - Estimation of Importance of Hydrogeology Attributes (NRA)

Magnitude of Impact	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
Very High	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple well fields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source
	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes Outer source protection area for regionally important water source Inner source protection area for locally important water source
Medium	Attribute has a medium quality or value on a local scale	Locally Important Aquifer Potable water source supplying >50 homes Outer source protection area for locally important water source
Low	Attribute has a low quality or value on a local scale	Poor Bedrock Aquifer Potable water source supplying <50 homes


Table 4 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Hydrogeology Attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute and /or quality and integrity of attribute	Removal of large proportion of aquifer. Changes to aquifer or unsaturated zone resulting in extensive change to existing water supply springs and wells, river baseflow or ecosystems. Potential high risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >2% annually.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Removal of moderate proportion of aquifer. Changes to aquifer or unsaturated zone resulting in moderate change to existing water supply springs and wells, river baseflow or ecosystems. Potential medium risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >1% annually.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Removal of small proportion of aquifer. Changes to aquifer or unsaturated zone resulting in minor change to water supply springs and wells, river baseflow or ecosystems. Potential low risk of pollution to groundwater from routine run-off. Calculated risk of serious pollution incident >0.5% annually.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Calculated risk of serious pollution incident <0.5% annually.

Table 5: Rating of Significant Environmental Impacts at EIS Stage (NRA)

Importance of Attribute	Magnitude of Importance			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant/moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate


Appendix 7.2 Lands at Ballymakilly - Ground Investigations



Lands at Ballymakilly – Ground Investigation

Client: BCEI
Report No.: 18-0827
Date: August 2018
Status: Final for Issue

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**Lands at Ballymakilly
 Report No. 18-0827**

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APPENDICES

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Appendix C	Trial pit logs
Appendix D	Trial pit photographs
Appendix E	Dynamic probe logs
Appendix F	Indirect in-situ CBR test results
Appendix G	Geotechnical laboratory test results
Appendix H	Environmental laboratory test results
Appendix I	SPT hammer energy measurement report

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**Lands at Ballymakilly
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Document Control Sheet

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Revision:	A00	Status:	Final for Issue	Issue Date:	31 Aug 2018
Prepared by:	<i>Sean Ross</i>		Reviewed by:	<i>Stephen Franey</i>	
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The works were conducted in accordance with:

- UK Specification for Ground Investigation 2nd Edition, published by ICE Publishing (2012)
- British Standards Institute (2015) BS 5930:2015, Code of practice for site investigations.
- BS EN 1997-2: 2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.
- Geotechnical Society of Ireland (2016), Specification & Related Documents for Ground Investigation in Ireland

Laboratory testing was conducted in accordance with:

- British Standards Institute BS 1377:1990 parts 2, 4, 5, 7 and 9

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METHODS OF DESCRIBING SOILS AND ROCKS

Soil and rock descriptions are based on the guidance in BS5930:2015, The Code of Practice for Site Investigation.

Abbreviations used on exploratory hole logs	
U	Nominal 100mm diameter undisturbed open tube sample (thick walled sampler)
UT	Nominal 100mm diameter undisturbed open tube sample (thin walled sampler)
F	Nominal 100mm diameter undisturbed piston sample
B	Bulk disturbed sample
LB	Large bulk disturbed sample
D	Small disturbed sample
C	Core sub-sample (displayed in the Field Records column on the logs)
L	Lower sample from dynamic sampled borehole
W	Water sample
ES / EW	Soil sample for environmental testing / Water sample for environmental testing
SPT (s)	Standard penetration test using a split spoon sampler (small disturbed sample obtained)
SPT (c)	Standard penetration test using 60 degree solid cone
X ₁ /X ₂ /X ₃ /X ₄	Blows per increment during the standard penetration test. The initial two values relate to the seating drive (150mm) and the remaining four to the 75mm increments of the test length. The length achieved is stated (mm) for any test increment less than 75mm.
N-X	SPT blow count 'N' given by the summation of the blows 'X' required to drive the full test length (300mm).
N ₀ -X/Z	Incomplete standard penetration test where the full test length was not achieved. The blows 'X' represent the total blows for the given test length 'Z' (mm).
V	Shear vane test (borehole)
VR	Hand vane test (trial pit) Shear strength stated in kPa V: undisturbed vane shear strength VR: reconsolidated vane shear strength
d _d /mm/yy...-1.0 d _d /mm/yy: dry	Date & water level at the borehole depth at the end of shift and the start of the following shift
Abbreviations relating to rock core – reference Clause 36.4.4 of BS 5930: 2015	
TCR (%)	Total Core Recovery: Ratio of rock/soil core recovered (both solid and non-intact) to the total length of core run.
SCR (%)	Solid Core Recovery: Ratio of solid core to the total length of core run. Solid core has a full diameter, uninterrupted by natural discontinuities, but not necessarily a full circumference and is measured along the core axis between natural fractures.
RQD (%)	Rock Quality Designation: Ratio of total length of solid core pieces greater than 100mm to the total length of core run.
FI	Fracture Index: Number of natural discontinuities per metre over an indicated length of core of similar intensity of fracturing.
NI	Non Intact: Used where the rock material was recovered fragmented, for example as fine to coarse gravel size particles.
AZCL	Assessed zone of core loss: The estimated depth range where core was not recovered.
DIF	Drilling induced fracture: A fracture of non-geological origin brought about by the rock cutting.



Lands at Ballymakilly

1 AUTHORITY

On the instructions of BCEI, ("the Client"), a ground investigation was undertaken at the above location to provide geotechnical and environmental information for input to the design and construction of a proposed data centre.

This report details the work carried out both on site and in the geotechnical and chemical testing laboratories; it contains a description of the site and the works undertaken, the exploratory hole logs and the laboratory test results. A discussion on the recommendations for construction is also provided.

All information given in this report is based upon the ground conditions encountered during the site investigation works, and on the results of the laboratory and field tests performed. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata, contaminant concentrations, and water conditions between or below exploratory holes. It should be noted that groundwater levels usually vary due to seasonal and/or other effects and may at times differ to those recorded during the investigation. No responsibility can be taken for conditions not encountered through the scope of work commissioned, for example between exploratory hole points, or beneath the termination depths achieved.

This report was prepared by Causeway Geotech Ltd for the use of the Client in response to a particular set of instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

2 SCOPE

The extent of the investigation, as instructed by the Client, included boreholes, trial pits, dynamic probing, soil and rock core sampling, environmental sampling, in-situ and laboratory testing, and the preparation of a report on the findings including recommendations for construction.

3 DESCRIPTION OF SITE

As shown on the site location plan in Appendix A, the works were conducted on the site of agricultural lands in west Dublin, just north of Baldonnell Aerodrome. The site is bounded to the north by the Grand Canal, to the east by the R120 and to the south and west by agricultural fields. The site generally slopes downwards towards the north east.



4 SITE OPERATIONS

4.1 Summary of site works

Site operations, which were conducted between 23rd July and 21st August 2018, comprised:

- fifteen boreholes by dynamic sampling methods;
- a standpipe installation in six boreholes;
- nineteen dynamic probes;
- nineteen machine dug trial pits;
- indirect CBR tests at eighteen locations.

The exploratory holes and in-situ tests were located as instructed by the Client's Representative, as shown on the exploratory hole location plan in Appendix A.

4.2 Boreholes

Fifteen boreholes (BH01-BH15) were put down in completion by light percussion boring techniques using a Dando Terrier dynamic sampling rig. The boreholes were put down initially in 150mm diameter, reducing in diameter with depth as required, down to 50mm by use of the smallest sampler.

The boreholes were taken to depths ranging between 0.5m and 3.4m where they were terminated on encountering virtual refusal on obstructions above their scheduled depth.

Standard penetration tests were carried out in accordance with BS EN 22476-3: 2005 at standard depth intervals using the split spoon sampler (SPT₁₀₀) or solid cone attachment (SPT₁₀₀). The penetrations are stated for those tests for which the full 150mm seating drive or 300mm test drive was not possible. The N_v values provided on the borehole logs are uncorrected and no allowance has been made for energy ratio corrections. The SPT hammer energy measurement report is provided in Appendix I.

Disturbed (bulk and small lug) samples were taken within the encountered strata. Environmental samples were taken at standard intervals.

Any water strikes encountered during boring were recorded along with any changes in their levels as the borehole proceeded. Details of the water strikes are presented on the individual borehole logs.

Appendix B presents the borehole logs.



4.3 Standpipe installations

A groundwater monitoring standpipe was installed in boreholes BH05, BH09, BH10, BH11, BH14 and BH15.

Details of the installations, including the depth range of the response zone, are provided in Appendix B on the individual borehole logs.

4.4 Trial Pits

Nineteen trial pits (TP01-TP19) were excavated using an 8t tracked excavator fitted with a 600mm wide bucket, to depths ranging between 0.40m and 2.8m where they were terminated on obstructions.

Disturbed (small jar and bulk bag) samples were taken at standard depth intervals and at change of strata.

Environmental samples were taken at depths of 0.5m and 1.5m in each trial pit.

Any water strikes encountered during excavation were recorded along with any changes in their levels as the excavation proceeded. The stability of the trial pit walls was noted on completion.

Appendix C presents the trial pit logs with photographs of the pits and arising provided in Appendix D.

4.5 Dynamic Probes

Nineteen dynamic probes were conducted adjacent to trial pits using the DP5HB method as described in BS EN ISO 22476-2: 2005. The method entails a 63.5kg hammer falling 0.75m onto a 50.5mm diameter cone with an apex angle of 90°.

Appendix E provides the dynamic probe logs on the sheet following the relevant borehole log in the form of plots, against depth, of the number of blows per 100mm penetration.

4.6 Indirect CBR tests

An indirect CBR test was conducted at eighteen locations (TP02 – TP19) adjacent to the trial pits using a Dynamic Cone Penetrometer (DCP). The equipment was developed in conjunction with the UK Transport Research Laboratory, is used widely throughout the world, and is referred to in the UK Highway Agency Interim Advice Note 73/06. A DCP test was not undertaken at TP01 due to the presence of made ground.

The test results are presented in Appendix F in the form of plots of the variation with depth of the penetration per blow. Straight lines have been fitted to the plots and the CBR for each depth range estimated using the following relationship, as proposed by Kleyen & Van Heerden (1983).

$$\text{Log CBR} = 2.632 - 1.28 \text{ Log (mm/blow)}$$



The frequently elevated CBR values are a consequence of the coarse-grained content of the penetrated soils and are often not representative of the soil matrix.

4.7 Surveying

The as-built exploratory hole positions were surveyed following completion of site operations by a Site Engineer from Causeway Geotech. Surveying was carried out using a Trimble R6 GPS system employing VRS and real time kinetic (RTK) techniques.

The plan coordinates (Irish National Grid) and ground elevation (mOD Malin) at each location are recorded on the individual exploratory hole logs. The exploratory hole plan presented in Appendix A shows these as-built positions.

5 LABORATORY WORK

Upon their receipt in the laboratory, all disturbed samples were carefully examined and accurately described, and their descriptions incorporated into the borehole logs.

5.1 Geotechnical laboratory testing of soils

Laboratory testing of soils comprised:

- **soil classification:** moisture content measurement, Atterberg Limit tests and particle size distribution analysis.
- **soil chemistry:** pH and water-soluble sulphate content.

Laboratory testing of soils samples was carried out in accordance with British Standards Institute: BS 1377, Methods of test for soils for civil engineering purposes; Part 1 (2016), and Parts 2-9 (1990).

The test results are presented in Appendix G.

5.2 Environmental laboratory testing of soils

Environmental testing was conducted on selected environmental soil samples by Chemtest at its laboratory in Newmarket, Suffolk.

Testing was carried out for a range of determinants, including:

- Metals
- Speciated total petroleum hydrocarbons (TPH)



- Speciated polycyclic aromatic hydrocarbons (PAH)
- Cyanides
- Asbestos screen
- pH.

Results of environmental laboratory testing are presented in Appendix H.

6 GROUND CONDITIONS

6.1 General geology of the area

Published geological mapping indicate the superficial deposits underlying the site comprise Glacial Till. These deposits are underlain by limestones and shales of the Lucan Formation.

6.2 Ground types encountered during investigation of the site

A summary of the ground types encountered in the exploratory holes is listed below, in approximate stratigraphic order:

- **Topsoil:** encountered typically in 200-400mm thickness across the site.
- **Made Ground (fill):** reworked clay fill with fragments of red brick, plastic, steel, fabric and concrete. Encountered only in TP01 to a depth of 1.8m, close to the canal.
- **Glacial Till:** sandy gravelly clay, frequently with low cobble content, typically firm or stiff in upper horizons, becoming very stiff with increasing depth. Contains localised pockets of granular material, consisting of sandy clayey gravel.

6.3 Groundwater

Groundwater was encountered during percussion boring through soil and in trial pits as water strikes as shown in Table 1 below.

Table 1 Groundwater strikes encountered during ground investigation

GI Ref	Water strike [magl]	Comments
TP12	2.2	Seepage
TP14	2.1	Seepage
TP15	2.6	Seepage
TP16	1.9	Seepage



Details of the individual groundwater strikes, along with any relative changes in levels as works proceeded, are presented on the exploratory hole logs for each location.

Groundwater was not noted during drilling at any of the borehole locations. However, it should be noted that the casing used in supporting the borehole walls during drilling may have sealed out any groundwater strikes encountered and the possibility of encountering groundwater during excavation works should not be ruled out. Seasonal variation in groundwater levels should also be factored into design considerations.

Continued monitoring of the six installed standpipes will give an indication of the seasonal variation in groundwater level.

7 DISCUSSION

7.1 Proposed construction

It is proposed to construct a new data centre on the site.

No further details were available to Causeway Geotech at the time of preparing this report and any designs based on the recommendations or conclusions within this report should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory holes. Causeway Geotech were commissioned to provide a geotechnical report, and it is outwith our remit to advise on structure design.

7.2 Recommendations for construction

7.2.1 Summary

Based on the presence of stiff glacial till and possible bedrock at relatively shallow depths across the footprint of the proposed building, the implementation of traditional shallow (spread) foundations (strip/pad) are considered suitable.

7.2.2 Soil strength parameters

When estimating the shear strength of fine soils (silt/clay), reference is made to the results of Standard Penetration Tests (SPT's) carried out within the boreholes. The undrained shear strength of fine soils can be estimated using the correlation developed by Stroud & Butler:

$$C_u = f_1 \times N$$

where f_1 is typically in the range 4 to 6. A median f_1 value of 5 is adopted for this report.



For granular soils (sand/gravel), a graphical relationship between SPT 'N' value and angle of shearing resistance, ϕ , has been developed by Peck, Hanson and Thornburn. This is published in *Foundation Design and Construction* (Tomlinson, 2001) and is referenced in this report when deriving angles of shearing resistance for the gravel soils.

7.2.3 Bearing resistance

The ultimate bearing resistance for conventional strip or pad foundations can be obtained from Brinch Hansen's general equation:

$$q_n = cN_c s_c d_c i_c b_c + p_o N_q s_q d_q i_q b_q + \frac{1}{2} \gamma B N_s s_s d_s i_s b_s$$

where:

- q_n = ultimate bearing resistance
- c = undrained cohesion of soil
- B = foundation width
- p_o = effective overburden pressure at foundation level
- N_c, N_q, N_s = bearing capacity factors
- s_c, s_q, s_s = shape factors
- d_c, d_q, d_s = depth factors
- i_c, i_q, i_s = load inclination factors
- b_c, b_q, b_s = base inclination factors

For conventional strip and pad foundations constructed on fine soils, the general equation has been simplified by Terzaghi to:

$$\text{Net ultimate bearing resistance} = cN_c$$

where:

- c = undrained cohesion
- N_c = bearing capacity factor

For cohesionless soils (sand/gravel, $c=0$), the calculation of ultimate bearing resistance is generally required only for loose sands. This is because coarser gravel soils would not be expected to suffer a bearing capacity failure. However, limits are placed on the allowable bearing resistance in order to control settlement. For shallow conventional pad foundations on granular soils, Terzaghi's simplified equation can be used as follows:

$$q_n = p(N_c - 1) + 0.4BN + p$$



where:
 p = total overburden pressure

It is obvious from the equations 1 to 3 that some knowledge of the foundation width and depth is required before the ultimate bearing resistance can be calculated.

Table 1 provides an indication of minimum founding depth at each borehole location. Also shown are approximate soil strengths based on the Stroud and Butler (1975) correlations with SPT N-values and visual examination of recovered samples of the clay deposits.

The table also suggests allowable bearing resistance using Equations 2 and 3 for cohesive and cohesionless soils respectively.

This table does not take into account the variations in soil composition, and the effects of differential movement within a particular structure. Calculation of the design bearing resistance over the entire structure will entail a knowledge of the magnitude and distribution of the structural actions.

7.2.4 Foundations and ground floor construction

Foundations should transfer loading to below any Made Ground or subsoil. The recommended foundation construction and allowable bearing pressure (ABP) at the borehole locations are presented in Table 1

Table 1: Construction recommendations

Borehole	Depth below EGL* to suitable bearing stratum	Estimated ABP (kPa)	Strata description	Foundation type	Ground floor construction	Groundwater
BH01	1.0m	>250	Stiff Glacial Till/Possible bedrock	Strip & pad	Ground bearing	Not encountered
BH02	1.20m	>250	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH03	1.20m	>250	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH04	1.20m	230	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH05	1.20m	160	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH06	0.50m	>250	Possible bedrock	Strip & pad	Ground bearing	Not encountered

Borehole	Depth below EGL* to suitable bearing stratum	Estimated ABP (kPa)	Strata description	Foundation type	Ground floor construction	Groundwater
BH07	2.0m	>250	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH08	1.20m	220	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH09	1.20m	>250	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH10	1.20m	200	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH11	1.20m	>250	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH12	1.20m	>250	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH13	1.20m	>250	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered
BH14	1.20m	130	Firm Glacial Till	Strip & pad	Ground bearing	Not encountered
	2.0m	>250	Stiff Glacial Till			
BH15	1.20m	200	Stiff Glacial Till	Strip & pad	Ground bearing	Not encountered

*Existing Ground Level

Based on the findings of the site investigation, spread foundations (strip/pad) are considered suitable with estimated allowable bearing pressures between 130kPa and >250kPa at depths between 0.5m and 1.5m on stiff glacial till or possible bedrock. If foundations are designed to be constructed on bedrock, it is recommended that rotary drilling is undertaken determine rock strength across the site, as this will aid in design.

The base of foundation excavations should be thoroughly inspected; any soft soils should be removed with the resultant void backfilled with ST1 concrete. A consistent bearing stratum should be provided for any building unit to limit differential settlements.

Given the generally fine grained/cohesive nature of the soils throughout the proposed formation levels, excavations for foundations are likely to be relatively stable. However, any instability can be minimised by battering the side slopes at 2 vertical to 1 horizontal and by limiting the duration that the excavation is open. Groundwater control, where required, will be possible by pumping from sumps formed in the base of excavations.



7.2.5 Floor slabs

Floor slabs should not bear directly onto Made Ground or soft soils. The use of ground bearing floor slabs is only appropriate following the removal of any surface Made Ground and soft clay layers and their replacement using well-graded well-compacted granular fill. However, a suspended floor slab should be adopted where the difference in levels of the proposed floor and the base of Made Ground/soft soils is greater than 600mm.

7.2.6 Excavations for services

For the installation of services ducts/trenches, it is suggested that open trenching will be the most practicable construction method. Generally speaking, the ground conditions should render the use of open trenching by backhoe excavator possible. Localised rock breaking may be required depending on the invert level of services in the west of the site. This may be possible using a hydraulic rock breaker depending on the strength of the rock.

Where working in open trenches, it is thought that trench support systems, by way of a trench box may be required to maintain trench stability and safe working conditions. Groundwater control at these locations should be possible by means of sump pumping.

To preclude the eventuality of differential settlements in pipes, they should be laid on a consistent stratum of appropriate allowable bearing capacity and protected with appropriate fill cover.

Where ducts and chambers must be installed in areas where localised soft spots are encountered, the use of geogrid reinforcement along the base of the very soft/soft soil (e.g. peat) below the trench base is recommended. This will stiffen the base of the trench and help control longitudinal differential settlement.

Backfilling of trenches may be completed by using compacted CI 804 granular fill and reinstated as appropriate.

7.2.7 Soil aggressivity

An assessment of the Aggressive Chemical Environment for Concrete (ACEC) was undertaken through reference to the Building Research Establishment (BRE) Special Digest 1 (2017).

As noted by BRE Special Digest 1, sulphates in the soil and groundwater are the chemical agents most likely to attack concrete. The extent to which sulphates affect concrete is linked to their concentrations, the type of ground, the presence of groundwater, the type of concrete and the form of construction in which concrete is used.

BRE Special Digest 1 identifies four different categories of site which require specific procedures for investigation for aggressive ground conditions:



- Sites not subjected to previous industrial development and not perceived as containing pyrite;
- Sites not subjected to previous industrial development and perceived as containing pyrite;
- Brownfield sites not perceived as containing pyrite;
- Brownfield sites perceived as containing pyrite.

For the purposes of this report the site was classified as not having been subject to previous industrial development and perceived as potentially containing pyrite.

The results of chemical tests (pH and water-soluble sulphate contents) on soil samples indicate Design Sulphate Class DS-1 and ACEC Class AC-1 - reference Table C1 of BRE Special Digest 1 (Building Research Establishment, 2005). The Special Digest does not require any measures to protect underground concrete elements greater than 140mm thick.

7.2.8 Access roads, car parks and hard standing

Based on the strata descriptions and the results of in-situ indirect CBR tests (DCP), the following design CBR values are appropriate.

- less than 2% at locations where the sub-grade is formed in Made Ground, requiring a 600mm thick capping
- A value of 4% at depth of 1m, is appropriate where stiff Glacial Till is encountered at sub-formation level.

Although the CBR value increases with depth, with a value of above 5% below a depth of 300mm, the required construction thickness should be determined by the minimum long-term equilibrium CBR value of the Glacial Till. The value of 4% stated for a depth of 300mm is based on the soil plasticity, as per Table 2.1 of volume 7 section2 of the Design Manual for Roads and Bridges, assuming average construction conditions. A CBR of 4% requires a 300mm thick capping layer.

The use of geosynthetics in the construction of paved areas, will be beneficial, particularly in areas of Made Ground. These could include a geosynthetic (e.g. a geogrid) at subgrade level with further benefit gained by incorporating further layer(s) within the capping/sub-base layer.

7.3 Site contamination and waste disposal

Selected soil samples were analysed for a range of potential contaminants including:

- Metals;
- Speciated total petroleum hydrocarbons (TPH);
- Speciated polycyclic aromatic hydrocarbons (PAH);
- Cyanides;





- Sulphates and sulphide;
- Phenols; and
- Asbestos screening

Samples were also tested for a Waste Acceptance Criteria (WAC) suite to assess the potential categorisation of waste from the site.

In the initial examination of the potential risk of site contamination, the laboratory results have been compared to the following available assessment criteria relevant to the proposed land use:

- the Environment Agency Soil Guideline Values (SGVs) published, in 2009. These relate to arsenic, mercury, selenium, cadmium, benzene, toluene, ethylbenzene, xylenes, and phenol.

The results from theselected samples do not identify significantly elevated concentrations above the SGVs where criteria are available.

It should be noted that the above assessment is based on the results, of the tested soil samples against publicly available criteria. No further assessment has been undertaken where criteria are not available. Any potential contamination identified during site development by visual or olfactory means should be investigated, including further laboratory testing, and appropriate health & safety, waste disposal and remediation measures adopted.

In assessment of the disposal of waste, the test results have been compared with the European Union Directive limits for inert waste landfill, Stable, Non-reactive hazardous waste in non-hazardous landfill and hazardous waste landfill criteria.

From the thirty samples tested for WAC analysis, material from the site may potentially be classified as inert/non-hazardous. It is noted however that any material excavated for off-site disposal would a Waste Classification following the guidance in the National Hazardous Waste Management Plan (EPA, 2014)

8 REFERENCES

Geotechnical Society of Ireland (2016). Specification & Related Documents for Ground Investigation in Ireland

IS EN 1997-2:2007: Eurocode 7 - Geotechnical design - Part 2 Ground investigation and testing.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. British Standards Institution.

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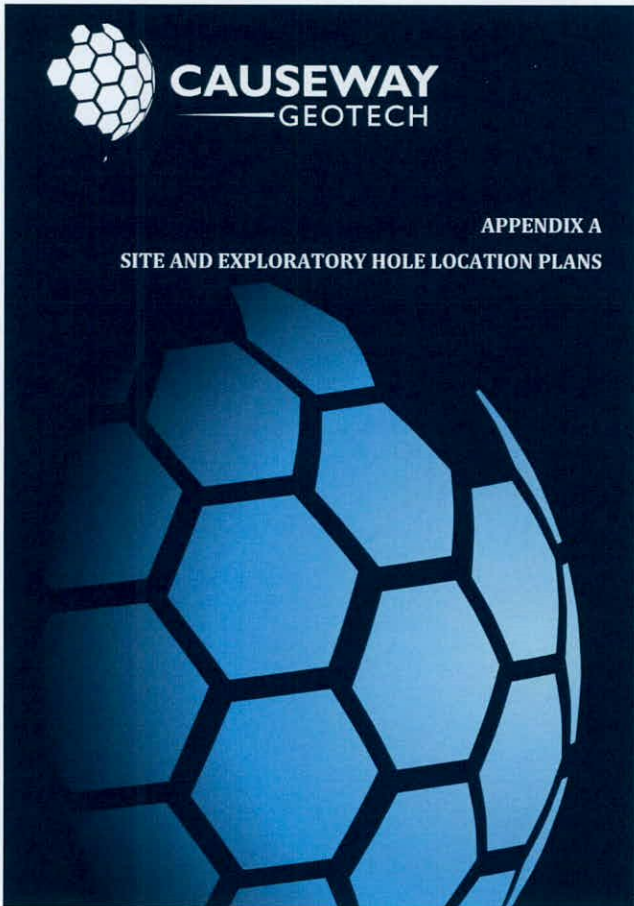
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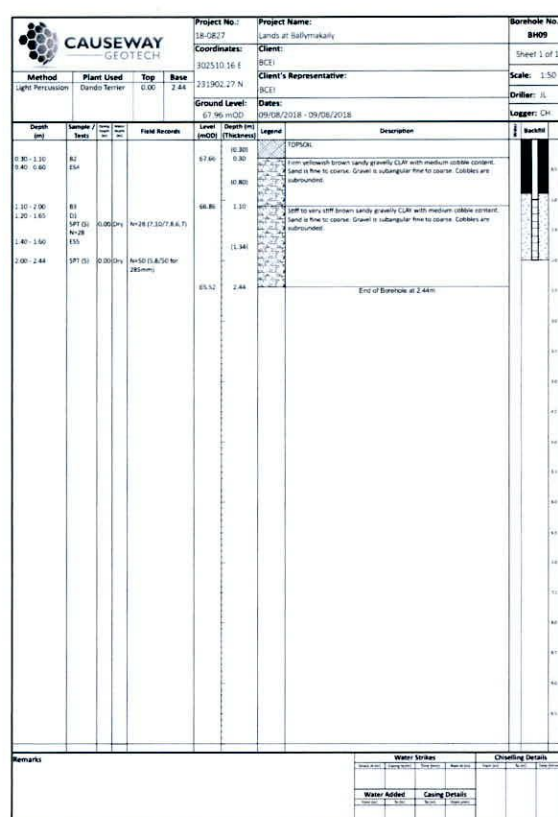
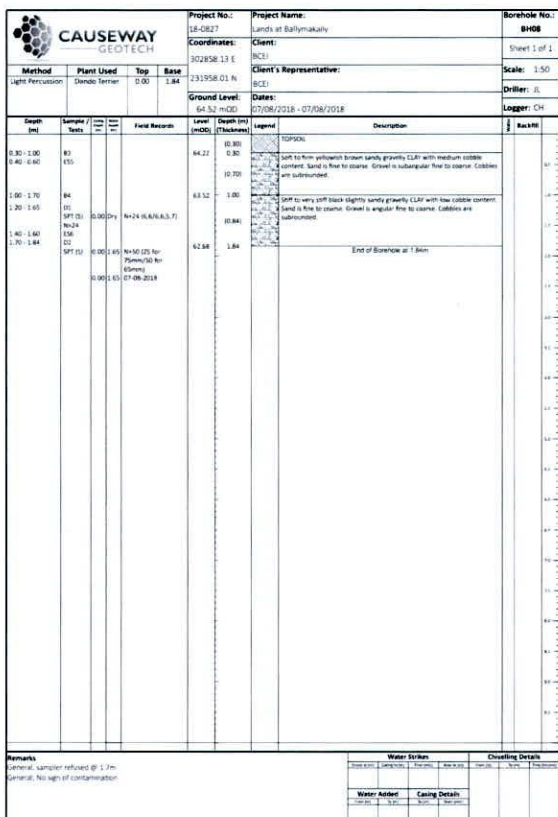
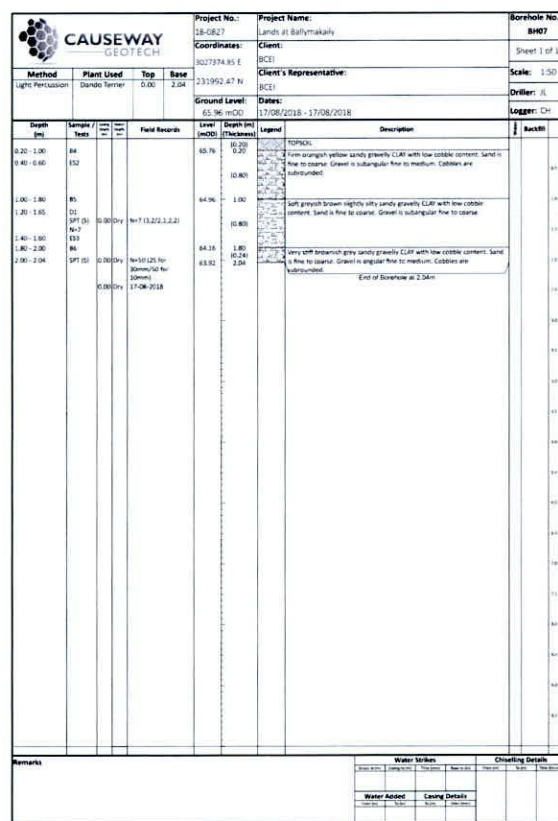
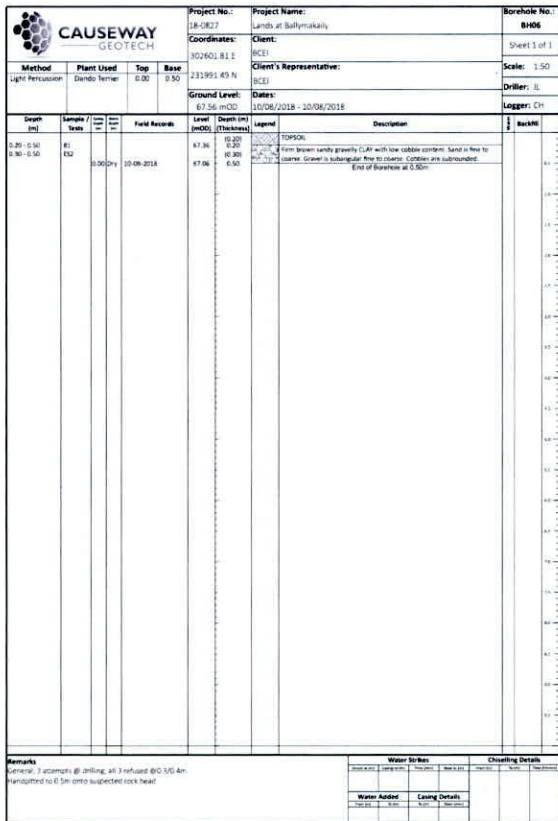


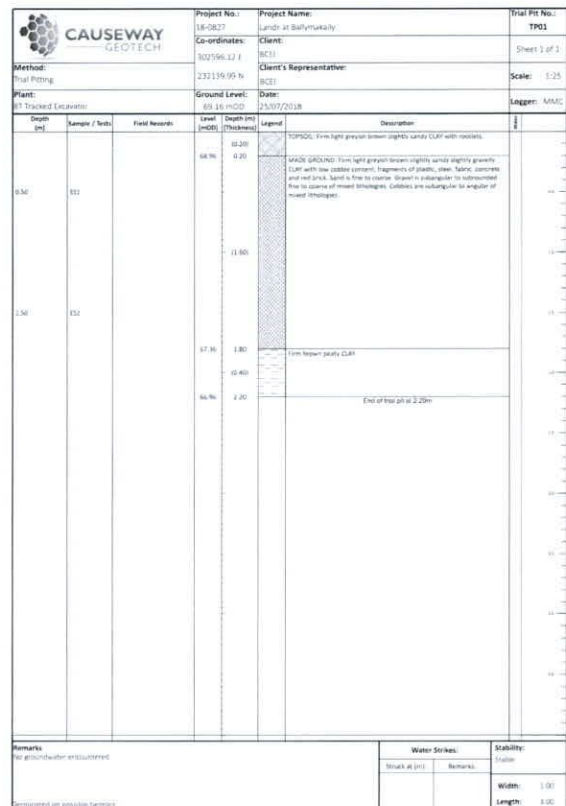
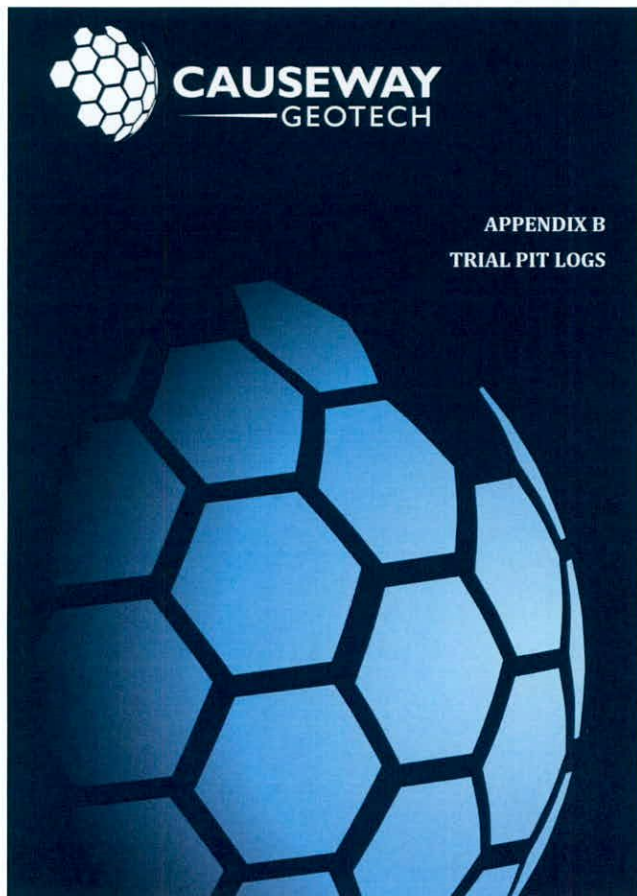
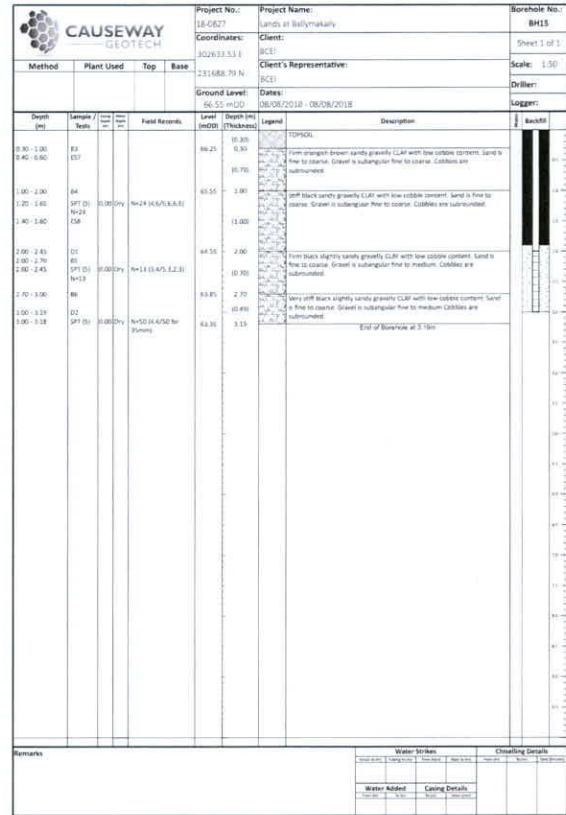
CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Borehole No.: BH02			
Coordinates: 302656.65 E		Client: BCEI		Sheet 1 of 1			
232061.69 N		Client's Representative: BCEI		Scale: 1:50			
Method: Light Percussion	Plant Used: Dando's Terner	Top: 0.00	Base: 2.45	Driller: JL			
Ground Level: 66.95 mOD		Dates: 09/08/2018 - 09/08/2018		Logger: CH			
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Backfill
0.00 - 0.80	B1		66.95	0.80	TOPSOIL		
0.80 - 1.00	B3		66.95	0.80		Fine to stiff yellowish brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subrounded.	
1.00 - 2.00	B4		65.95	1.00		Stiff brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subrounded.	
2.00 - 2.45	D1 SPT (D) N=30	N=30 (L, 7.6, 7.8, 9)	64.50	2.45		Very stiff brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subrounded.	
END OF BOREHOLE AT 2.45m							

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Borehole No.: BH03			
Coordinates: 302760.37 E		Client: BCEI		Sheet 1 of 1			
232076.72 N		Client's Representative: BCEI		Scale: 1:50			
Method: Light Percussion	Plant Used: Dando's Terner	Top: 0.00	Base: 1.78	Driller: JL			
Ground Level: 65.67 mOD		Dates: 17/08/2018 - 17/08/2018		Logger: CH			
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Backfill
0.00 - 0.80	B3		65.67	0.80	TOPSOIL		
0.80 - 1.00	B5		65.67	0.80		Fine brown sandy gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subrounded.	
1.00 - 1.70	B4		64.77	0.80		Very stiff dark brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subrounded.	
1.70 - 1.78	D1 SPT (D) N=27	N=27 (11.12, 11.32, 8.8)	63.89	1.78		END OF BOREHOLE AT 1.78m	

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Borehole No.: BH04			
Coordinates: 302721.87 E		Client: BCEI		Sheet 1 of 1			
232143.37 N		Client's Representative: BCEI		Scale: 1:50			
Method: Light Percussion	Plant Used: Dando's Terner	Top: 0.00	Base: 2.31	Driller: JL			
Ground Level: 66.76 mOD		Dates: 10/08/2018 - 10/08/2018		Logger: CH			
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Backfill
0.00 - 0.80	B1		66.76	0.80	TOPSOIL		
0.80 - 1.00	B3		66.76	0.80		Fine yellowish brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subrounded.	
1.00 - 1.70	B2		65.76	1.00		Stiff brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to medium. Cobbles are subrounded.	
1.70 - 2.00	B1		65.06	1.70		Very stiff brown sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to medium. Cobbles are subrounded.	
2.00 - 2.31	SPT (C) N=50	N=50 (3.22, 5.6 for 150mm)	64.45	2.31		END OF BOREHOLE AT 2.31m	

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Borehole No.: BH05			
Coordinates: 302886.76 E		Client: BCEI		Sheet 1 of 1			
232073.91 N		Client's Representative: BCEI		Scale: 1:50			
Method: Light Percussion	Plant Used: Dando's Terner	Top: 0.00	Base: 3.17	Driller: JL			
Ground Level: 64.12 mOD		Dates: 07/08/2018 - 07/08/2018		Logger: CH			
Depth (m)	Sample / Tests	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description	Backfill
0.00 - 1.00	B4		63.82	0.80		Stiff to firm orange yellow sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse. Cobbles are subrounded.	
1.00 - 1.80	B2		63.12	1.80		Stiff black slightly sandy very gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular fine to coarse. Cobbles are subrounded.	
1.80 - 1.80	B2		63.12	1.80		Medium firm to dense black slightly clayey slightly sandy angular fine to medium (GMS), with low cobble content. Sand is fine to coarse.	
1.80 - 2.00	B2		63.12	2.00			
2.00 - 2.45	SPT (C) N=27	N=27 (6.7, 6.7, 6.6)	62.47	2.45		Very stiff black slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to medium. Cobbles are subrounded.	
2.45 - 3.17	D3 SPT (C) N=50	N=50 (2.5 for 100mm/50 for 65mm)	60.95	3.17		END OF BOREHOLE AT 3.17m	





CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakally	Trial Pit No.: TPO2		
Co-ordinates: 302686.63 E		Client: BCEI	Client's Representative: BCEI	Sheet 1 of 1		
Method: Trial Pitting		232135.26 N	Date: 25/07/2018	Scale: 1:25		
Plant: BT Tracked Excavator		Ground Level: 67.33 mOD	Date: 25/07/2018	Logger: MMC		
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Legend	Description
0.30	E11		67.40	0.40	TOPSOIL	Firm light greyish brown slightly sandy CLAY with rootlets. Sand is fine to coarse.
			66.92	0.40		End of trial pit at 0.40m
Remarks: No groundwater encountered. Water Strikes: Stable. Struck at (m): . Width: 1.00. Length: 0.00. Terminated on possible bedrock.						

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakally	Trial Pit No.: TPO3		
Co-ordinates: 302813.23 E		Client: BCEI	Client's Representative: BCEI	Sheet 1 of 1		
Method: Trial Pitting		232087.26 N	Date: 23/07/2018	Scale: 1:25		
Plant: BT Tracked Excavator		Ground Level: 65.10 mOD	Date: 23/07/2018	Logger: MMC		
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Legend	Description
			65.20	0.20	TOPSOIL	Firm light greyish brown slightly sandy CLAY with rootlets.
			64.90	0.20		Light brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of limestone.
0.50	E1		64.40	0.40		
0.50	D2		64.50	0.60		Dark grey slightly sandy gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular of limestone. Possible weathered rock.
			64.10	1.00		Dark angular GRAVELS of limestone with dark clayey subangular to angular sand to coarse GRAVEL of limestone.
1.00	E1		64.10	1.00		
1.00	D4		64.00	0.10		End of trial pit at 1.10m
1.00	D5		64.00	0.10		
Remarks: No groundwater encountered. Water Strikes: Stable. Struck at (m): . Width: 0.50. Length: 0.00. Terminated on possible bedrock.						

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakally	Trial Pit No.: TPO4		
Co-ordinates: 302908.22 E		Client: BCEI	Client's Representative: BCEI	Sheet 1 of 1		
Method: Trial Pitting		232126.02 N	Date: 24/07/2018	Scale: 1:25		
Plant: BT Tracked Excavator		Ground Level: 64.16 mOD	Date: 24/07/2018	Logger: MMC		
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Legend	Description
			63.30	0.30	TOPSOIL	
0.50	E1		63.86	0.30		Brownish grey slightly sandy slightly gravelly SCL with low visible content. Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles are subangular to subrounded of limestone.
0.50	D2		63.50	0.30		
0.50	D3		63.36	0.80		Grey sandy clayey angular fine to coarse GRAVEL of limestone. Sand is fine to coarse (Possible weathered bedrock).
			63.50	0.80		
1.00	E4		63.86	1.30		End of trial pit at 1.30m
Remarks: No groundwater encountered. Water Strikes: Stable. Struck at (m): . Width: 0.80. Length: 3.00. Terminated on possible bedrock.						

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakally	Trial Pit No.: TPO5		
Co-ordinates: 302561.53 E		Client: BCEI	Client's Representative: BCEI	Sheet 1 of 1		
Method: Trial Pitting		232053.03 N	Date: 25/07/2018	Scale: 1:25		
Plant: BT Tracked Excavator		Ground Level: 68.74 mOD	Date: 25/07/2018	Logger: MMC		
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Legend	Description
			68.20	0.20	TOPSOIL	Firm brown slightly sandy CLAY with rootlets.
			68.14	0.20		Light grey sandy subangular fine to coarse GRAVEL with medium visible content. Sand is fine to coarse. Cobbles are subangular to subrounded of limestone.
			68.20	0.20		
			68.34	0.40		End of trial pit at 0.40m
Remarks: No groundwater encountered. Water Strikes: Stable. Struck at (m): . Width: 1.00. Length: 0.00. Terminated on possible bedrock.						

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP06	
Method: Trial Pitting		Co-ordinates: 802687.48 E	Client: BCEI	Sheet 1 of 1	
Plant: ST Tracked Excavator		Ground Level: 232063.81 N	Client's Representative: BCEI	Scale: 1:25	
		Date: 22/07/2018	Logger: MMC		
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Description
			0.20	0.20	TOPSOIL: Firm light brown sandy CLAY with roots.
			0.30	0.30	Grey slightly sandy slightly clayey fine to coarse GRAVEL with low cobble content, sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are angular of limestone.
0.30	R1		0.40	0.40	From to stiff dark brownish grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are subangular of limestone.
0.50	D2				
0.50	E3				
			1.70	1.70	
1.50	R4				
1.50	D5				
1.50	E6				
			2.30	2.30	Stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular fine to coarse of limestone. Cobbles are subangular of limestone.
2.50	R7				
2.50	D8				
			2.70	2.70	End of trial pit at 2.70m
Remarks: No groundwater encountered		Water Strikes:		Stability:	
		Struck at (m):		Scale:	
		Remarks:		Width: 0.50	
				Length: 3.00	
Terminated on possible bedrock					

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP07	
Method: Trial Pitting		Co-ordinates: 802767.78 E	Client: BCEI	Sheet 1 of 1	
Plant: ST Tracked Excavator		Ground Level: 232026.39 N	Client's Representative: BCEI	Scale: 1:25	
		Date: 22/07/2018	Logger: MMC		
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Description
			0.20	0.20	TOPSOIL: Firm greyish brown slightly sandy CLAY with roots. Sand is fine to coarse.
			0.43	0.43	Stiff light greyish brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded of limestone. Cobbles are subangular to well rounded of limestone.
0.30	R1		0.50	0.50	
0.50	D2				
0.50	E3				
			0.70	0.70	Stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of limestone. Cobbles are subangular of limestone.
			0.90	0.90	
1.10	R4				
1.10	D5				
			1.20	1.20	End of trial pit at 1.20m
Remarks: No groundwater encountered		Water Strikes:		Stability:	
		Struck at (m):		Scale:	
		Remarks:		Width: 0.50	
				Length: 3.50	
Terminated on possible bedrock					

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP08	
Method: Trial Pitting		Co-ordinates: 802679.48 E	Client: BCEI	Sheet 1 of 1	
Plant: ST Tracked Excavator		Ground Level: 232010.68 N	Client's Representative: BCEI	Scale: 1:25	
		Date: 22/07/2018	Logger: MMC		
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Description
			0.30	0.30	TOPSOIL: Firm light greyish brown slightly sandy CLAY with roots.
			0.53	0.53	Stiff light brown sandy slightly gravelly CLAY. Sand is fine to coarse.
			0.80	0.80	
			0.90	0.90	End of trial pit at 0.90m
Remarks: No groundwater encountered		Water Strikes:		Stability:	
		Struck at (m):		Scale:	
		Remarks:		Width: 0.50	
				Length: 3.00	
Terminated on possible large boulder bedrock					

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP09	
Method: Trial Pitting		Co-ordinates: 802522.08 E	Client: BCEI	Sheet 1 of 1	
Plant: ST Tracked Excavator		Ground Level: 231967.03 N	Client's Representative: BCEI	Scale: 1:25	
		Date: 22/07/2018	Logger: MMC		
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Description
			0.20	0.20	TOPSOIL: Firm light greyish brown slightly sandy CLAY with roots.
			0.72	0.72	Stiff brownish sandy clayey angular fine to coarse GRAVEL of limestone with medium cobble content. Sand is fine to coarse (possible weathered bedrock).
0.30	R1		0.70	0.70	
0.50	D2				
0.50	E3				
			0.90	0.90	End of trial pit at 0.90m
Remarks: No groundwater encountered		Water Strikes:		Stability:	
		Struck at (m):		Scale:	
		Remarks:		Width: 1.00	
				Length: 3.00	
Terminated on possible bedrock					

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP10		
Method: Trial Pitting		Co-ordinates: 302622.64 E 231938.93 N	Client: BCI Client's Representative: BCI	Sheet 1 of 1		
Plant: ST Tracked Excavator		Ground Level: 67.25 mOD	Date: 23/07/2018	Scale: 1:25		
Logger: MMC						
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.20			67.05	0.20	TOPSOIL	Firm light brown slightly sandy CLAY with rootlets.
0.50	B1		67.05	0.20		
0.50	D2					
0.50	E33					
0.80			66.25	1.00		Grey subangular to subrounded COBBLES with a fill of sandy clay.
1.50	B4		65.85	1.40		Dark greyish brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of mixed lithologies. Cobbles are subangular to subrounded of limestone.
1.50	D5					
1.50	E34					
1.30			64.55	2.70		End of trial pit at 2.70m
Remarks		Water Strikes:		Stability:		
No groundwater encountered		Struck at (m):		Stable		
Terminated on very stiff clay		Remarks:		Width: 0.50		
				Length: 3.50		

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP11		
Method: Trial Pitting		Co-ordinates: 302736.08 E 231938.58 N	Client: BCI Client's Representative: BCI	Sheet 1 of 1		
Plant: ST Tracked Excavator		Ground Level: 65.85 mOD	Date: 23/07/2018	Scale: 1:25		
Logger: MMC						
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.20			65.65	0.20	TOPSOIL	Firm greyish brown slightly sandy CLAY with rootlets.
0.50	B1		65.65	0.20		
0.50	D2					
0.50	E33					
0.60			65.25	0.60		SMP light yellowish brown sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of limestone.
1.00	B4		64.40	0.60		SMP dark grey very sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular of limestone. Possible weathered rock.
1.00	D5					
1.00	E34					
1.00			64.85	1.00		End of trial pit at 1.00m
Remarks		Water Strikes:		Stability:		
No groundwater encountered		Struck at (m):		Stable		
Terminated on possible bedrock		Remarks:		Width: 0.60		
				Length: 4.00		

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP12		
Method: Trial Pitting		Co-ordinates: 302853.34 E 231875.36 N	Client: BCI Client's Representative: BCI	Sheet 1 of 1		
Plant: ST Tracked Excavator		Ground Level: 64.93 mOD	Date: 20/08/2018	Scale: 1:25		
Logger: MMC						
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.30			64.63	0.30	TOPSOIL	Brownish grey sandy CLAY with rootlets.
0.50	B1		64.63	0.30		
0.50	D2					
0.50	E33					
0.80			63.83	0.80		Firm to stiff light brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is angular and tabular of limestone. Cobbles are tabular of limestone.
1.50	B4		63.83	1.10		SMP dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is tabular of limestone. Cobbles are tabular of limestone.
1.50	D5					
1.50	E34					
1.80	B4		63.33	1.80		Soft to firm dark grey slightly sandy very gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of limestone. Possible weathered bedrock.
1.80	D5					
1.80	E34					
2.00	B7		62.71	2.20		End of trial pit at 2.20m
2.00	D8					
Remarks		Water Strikes:		Stability:		
No groundwater encountered		Struck at (m):		Stable		
Terminated on possible bedrock		Remarks:		Width: 0.80		
				Length: 3.50		

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP13		
Method: Trial Pitting		Co-ordinates: 302498.69 E 231859.73 N	Client: BCI Client's Representative: BCI	Sheet 1 of 1		
Plant: ST Tracked Excavator		Ground Level: 67.45 mOD	Date: 24/07/2018	Scale: 1:25		
Logger: MMC						
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.30			67.15	0.30	TOPSOIL	
0.50	B1		67.15	0.30		
0.50	D2					
0.50	E33					
0.70			66.75	0.70		SMP light greyish brown slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to angular of limestone.
1.50	B4		64.75	0.70		SMP brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles are subangular to angular of limestone.
1.50	D5					
1.50	E34					
2.10	B4		63.95	2.10		Very stiff dark grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse. Cobbles are subrounded.
2.10	D5					
2.10	E34					
2.40	B7		64.65	2.40		End of trial pit at 2.40m
2.40	D8					
Remarks		Water Strikes:		Stability:		
No groundwater encountered		Struck at (m):		Stable		
Terminated on very stiff clay		Remarks:		Width: 0.80		
				Length: 3.50		

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP15		
Method: Trial Pitting		Co-ordinates: 302690.86 E 231754.82 N	Client: BCEI	Client's Representative: BCEI		
Plant: ST Tracked Excavator		Ground Level: 66.11 mOD	Date: 24/07/2018	Logger: MMC		
Scale: 1:25	Sheet 1 of 1					
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.30	B1		65.83	0.30	[Pattern]	TOPSOIL: Light brown sandy CLAY with some roots.
0.50	B2			0.30	[Pattern]	Firm to stiff light brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles are subangular of limestone.
0.50	B3			1.00	[Pattern]	
1.50	B4		64.91	1.30	[Pattern]	Firm dark grey slightly sandy slightly gravelly CLAY with low siltstone content. Sand is fine to coarse. Gravel is subangular to angular of limestone.
1.50	B5			1.20	[Pattern]	
1.50	B6			2.50	[Pattern]	Very dark grey angular to tabular COBBLES of limestone with sandy very gravelly (M). Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles are angular and tabular of limestone. (Possible weathered bedrock)
1.50	B7		63.33	0.30	[Pattern]	
1.50	B8		63.33	2.40	[Pattern]	End of trial pit at 2.90m
Remarks: Terminated on possible bedrock						
			Water Striker:		Stability:	
			Struck at (m): 2.90		Stable	
			Remarks: Sensitive at 2.90m		Width: 0.80	
					Length: 0.50	

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP14		
Method: Trial Pitting		Co-ordinates: 302693.77 E 231860.37 N	Client: BCEI	Client's Representative: BCEI		
Plant: ST Tracked Excavator		Ground Level: 66.92 mOD	Date: 23/07/2018	Logger: MMC		
Scale: 1:25	Sheet 1 of 1					
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.30	B1		66.72	0.20	[Pattern]	Firm light greyish brown slightly sandy CLAY with roots.
0.50	B2			0.20	[Pattern]	Light brown slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles are subangular of limestone.
0.50	B3			0.70	[Pattern]	
1.50	B4		66.02	0.50	[Pattern]	Grey slightly sandy slightly gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles are subangular of limestone.
1.50	B5			0.30	[Pattern]	
1.50	B6		65.72	1.20	[Pattern]	Firm dark grey slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles are subangular of limestone.
1.50	B7			0.40	[Pattern]	
1.50	B8		65.12	1.80	[Pattern]	Soft to firm dark grey slightly sandy slightly gravelly CLAY with low cobble content and high siltstone content. Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles and boulders are subangular of limestone.
1.50	B9			0.40	[Pattern]	
1.50	B10		64.72	2.20	[Pattern]	End of trial pit at 2.20m
Remarks: Terminated on possible bedrock						
			Water Striker:		Stability:	
			Struck at (m): 2.90		Stable	
			Remarks: Sensitive at 2.90m		Width: 0.50	
					Length: 0.50	

CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP16		
Method: Trial Pitting		Co-ordinates: 302809.71 E 231763.22 N	Client: BCEI	Client's Representative: BCEI		
Plant: ST Tracked Excavator		Ground Level: 65.56 mOD	Date: 24/07/2018	Logger: MMC		
Scale: 1:25	Sheet 1 of 1					
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.30	B1		65.26	0.30	[Pattern]	TOPSOIL: Light greyish brown sandy CLAY with roots. Sand is fine to coarse.
0.50	B2			0.30	[Pattern]	Firm to stiff light brown slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles are angular and tabular of limestone.
0.50	B3			0.90	[Pattern]	
1.50	B4		64.34	1.20	[Pattern]	Soft dark grey slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is angular to tabular fine to coarse of limestone. Cobbles are angular and tabular of limestone.
1.50	B5			0.70	[Pattern]	
1.50	B6		63.84	1.90	[Pattern]	End of trial pit at 1.90m
Remarks: Terminated on possible bedrock						
			Water Striker:		Stability:	
			Struck at (m): 2.90		Stable	
			Remarks: Groundwater encountered at 1.90m		Width: 0.80	
					Length: 0.50	

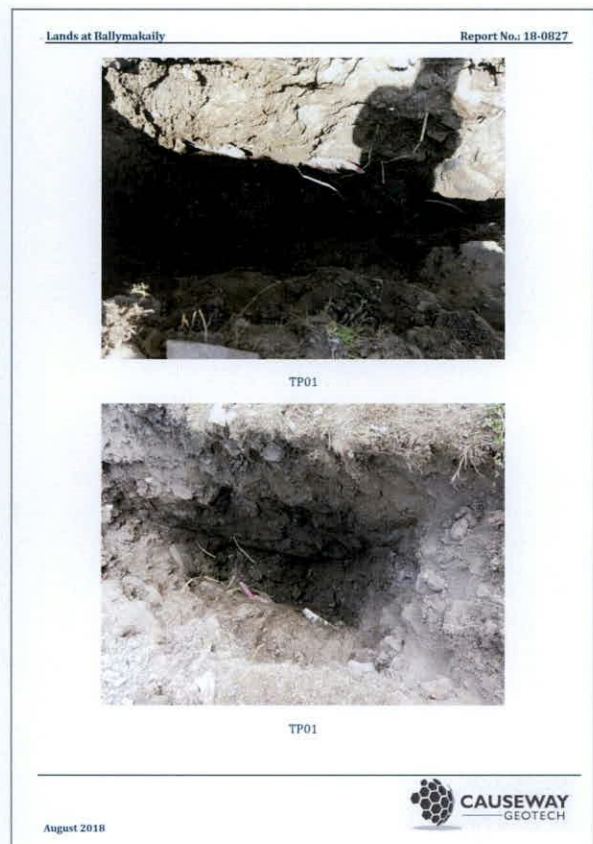
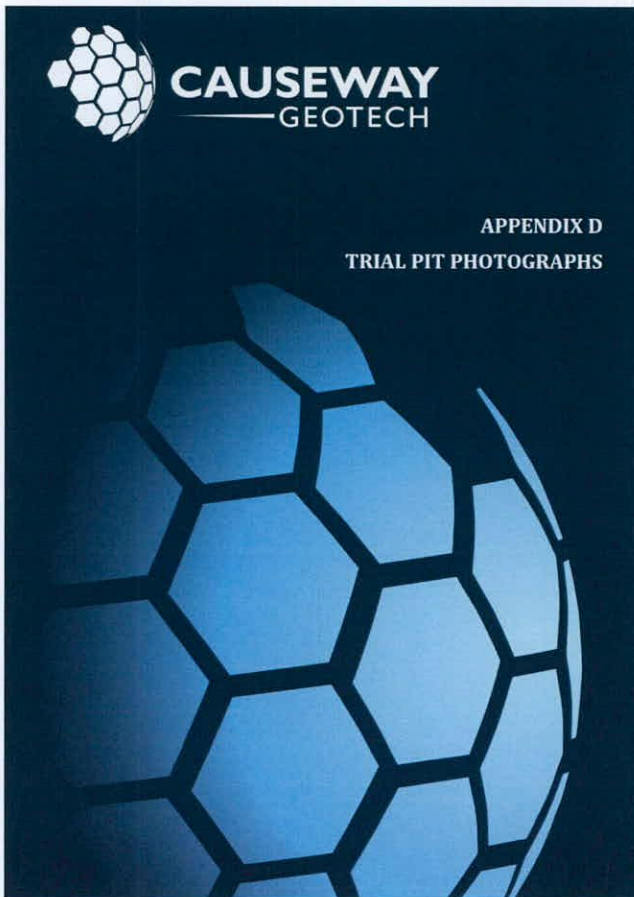
CAUSEWAY GEOTECH		Project No.: 18-0827	Project Name: Lands at Ballymakilly	Trial Pit No.: TP17		
Method: Trial Pitting		Co-ordinates: 302475.99 E 231724.45 N	Client: BCEI	Client's Representative: BCEI		
Plant: ST Tracked Excavator		Ground Level: 67.75 mOD	Date: 24/07/2018	Logger: MMC		
Scale: 1:25	Sheet 1 of 1					
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m) (Thickness)	Legend	Description
0.30	B1		67.43	0.30	[Pattern]	TOPSOIL: Firm light greyish brown sandy CLAY with some roots. Sand is fine to coarse.
0.50	B2			0.40	[Pattern]	Firm to stiff light brown slightly sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular of limestone.
0.50	B3			0.70	[Pattern]	Light grey gravelly angular COBBLES of limestone. Gravel is subangular to angular. Fine to coarse of limestone.
1.50	B4		66.45	1.30	[Pattern]	Firm to stiff greyish brown slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular fine to coarse of limestone. Cobbles are subangular to angular of limestone.
1.50	B5			1.10	[Pattern]	
1.50	B6		65.35	2.20	[Pattern]	Firm dark grey slightly sandy gravelly CLAY with low cobble content. Sand is fine to coarse. Gravel is subangular to angular of limestone. Cobbles are angular of limestone.
1.50	B7			0.30	[Pattern]	
1.50	B8		65.05	2.70	[Pattern]	End of trial pit at 2.70m
Remarks: No groundwater encountered						
			Water Striker:		Stability:	
			Struck at (m): 2.90		Stable	
					Width: 0.50	
					Length: 0.50	

CAUSEWAY GEOTECH		Project No.: 18-0627	Project Name: Lands at Ballymakilly	Trial Pit No.: TP18		
Method: Trial Pitting		Co-ordinates: 302575.82 E 331703.20 N	Client: BCEI Client's Representative: BCEI	Sheet: 1 of 3 Scale: 1:25 Logger: MMC		
Plant: BT Tracked Excavator		Ground Level: 67.00 mOD	Date: 24/07/2018			
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Legend	Description
0.00	B1		67.30	0.00	TOPSOIL	Light greyish brown slightly sandy CLAY with some roots.
0.50	B2		66.70	0.30		Light greenish brown slightly sandy slightly gravelly CLAY. Sand is finer to coarse. Gravel is angular fine to coarse of limestone.
1.50	B3		66.00	1.00		Dark brown slightly sandy slightly gravelly CLAY with medium cobble content. Sand is fine to coarse. Gravel is angular fine to coarse of limestone. Cobbles are angular of limestone.
1.50	B4		65.30	1.70		Dark grey slightly sandy CLAY with high bloulder content. Sand is fine to coarse. Boulder are angular of limestone. Possible weathered rock.
1.50			64.80	2.10		End of trial pit at 2.10m


Remarks: No groundwater encountered	Water Table: Stable	Struck at (m):	Remarks:	Width: 2.50	Length: 2.50
Terminated on possible bedrock					

CAUSEWAY GEOTECH		Project No.: 18-0627	Project Name: Lands at Ballymakilly	Trial Pit No.: TP19		
Method: Trial Pitting		Co-ordinates: 302717.93 E 231651.79 N	Client: BCEI Client's Representative: BCEI	Sheet: 1 of 3 Scale: 1:25 Logger: MMC		
Plant: BT Tracked Excavator		Ground Level: 66.55 mOD	Date: 24/07/2018			
Depth (m)	Sample / Test	Field Records	Level (mOD)	Depth (m)	Legend	Description
0.00	A1		66.25	0.30	TOPSOIL	Firm light brown sandy CLAY with roots.
0.50	A2		66.70	0.70		Light greenish brown slightly sandy very gravelly CLAY. Sand is fine to coarse. Gravel is subangular to angular fine to coarse of limestone.
1.20	A3		65.55	1.00		Dark grey slightly sandy very gravelly CLAY with fine cobble content. Sand is fine to coarse. Gravel is angular fine to coarse of limestone. Cobbles and boulders are angular of limestone.
1.50	A4		64.80	1.70		Grey angular COBBLES and BOLDERS of limestone with sandy gravelly clay with sand is fine to coarse. Gravel is angular fine to coarse of limestone. Possible weathered rock.
1.50			64.05	1.90		End of trial pit at 1.90m


Remarks: No groundwater encountered	Water Table: Stable	Struck at (m):	Remarks:	Width: 0.80	Length: 1.00
Terminated on possible bedrock					




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TP01




TP01


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TP01



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Lands at Ballymakailly Report No.: 18-0827



TP01




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 CAUSEWAY
GEOTECH

August 2018


Lands at Ballymakailly Report No.: 18-0827



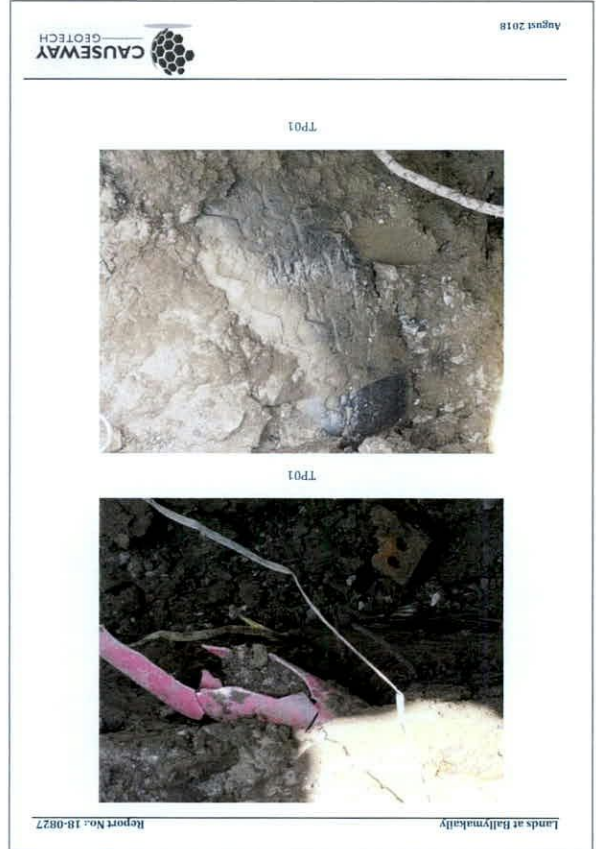
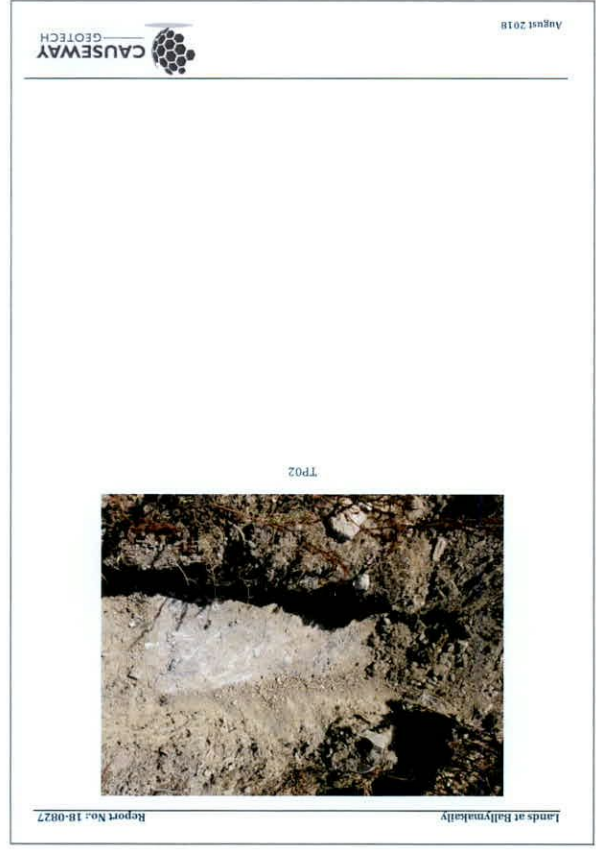
TP01



TP01

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GEOTECH

August 2018



Lands at Ballymakilly Report No.: 18-0827



TP03




TP03


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Lands at Ballymakilly Report No.: 18-0827




TP04




TP04

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Lands at Ballymakilly Report No.: 18-0827



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TP05




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TP05

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TP06




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TP06



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TP07



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TP07




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TP08


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TP09




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TP10



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TP11



TP11

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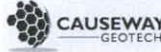
Lands at Ballymakilly Report No.: 18-0827



TP12




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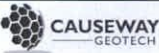
Lands at Ballymakilly Report No.: 18-0827



TP12




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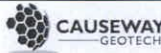


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Lands at Ballymakilly Report No.: 18-0827




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TP14



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TP16




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TP18




TP18


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Lands at Ballymakailly Report No.: 18-0827



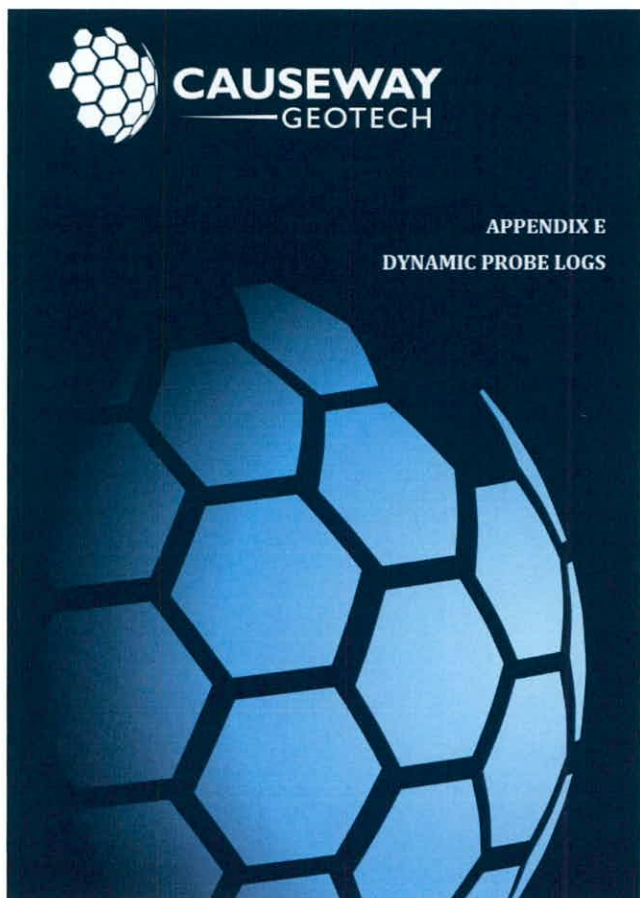
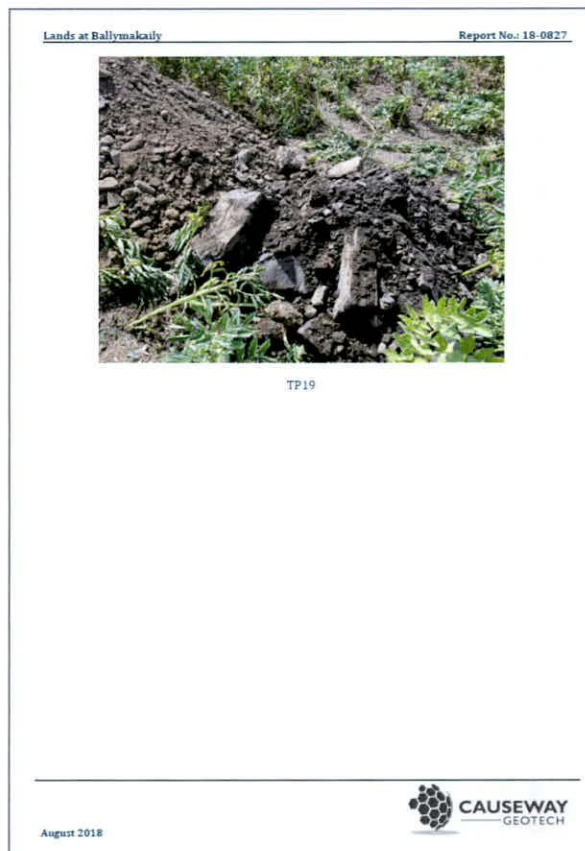
TP19



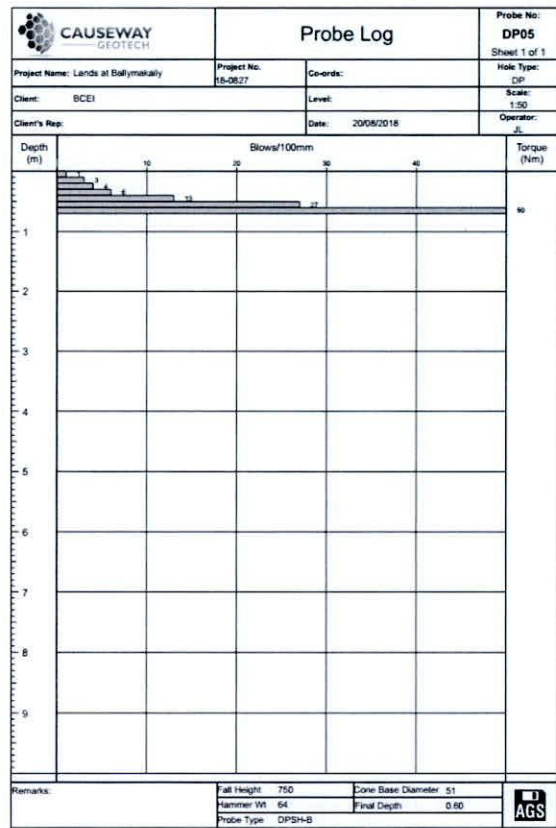
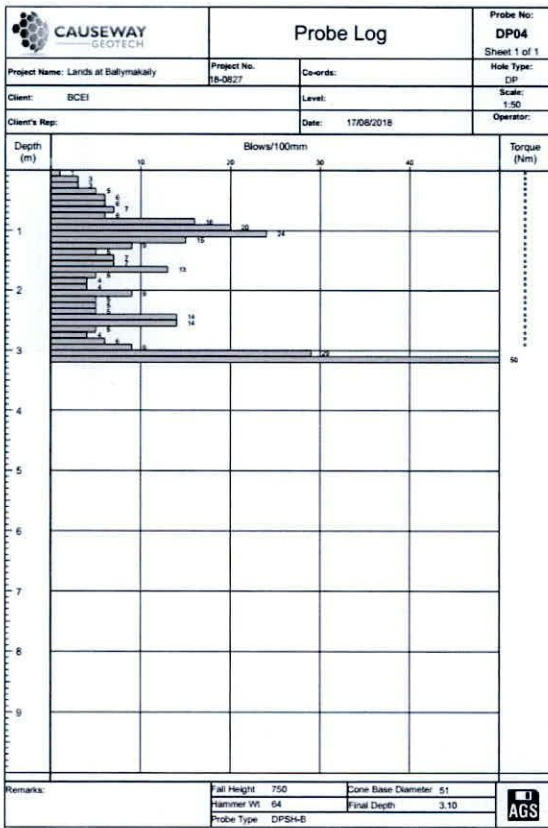
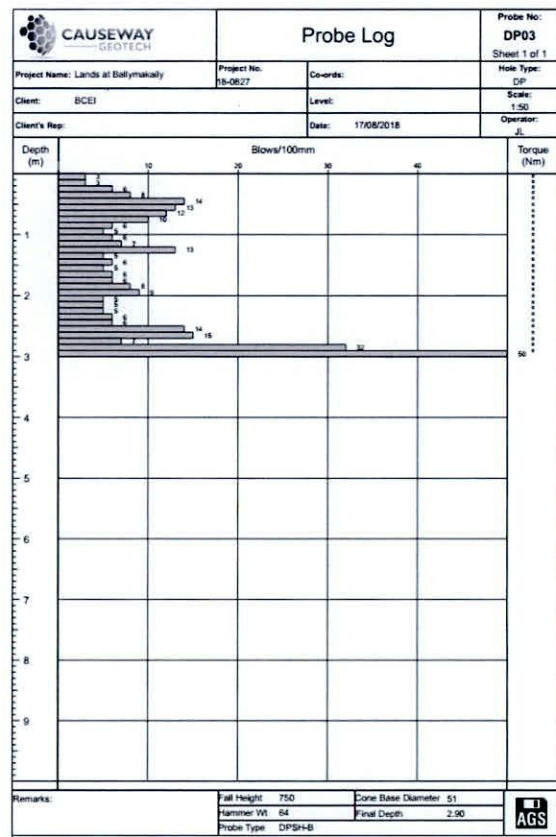
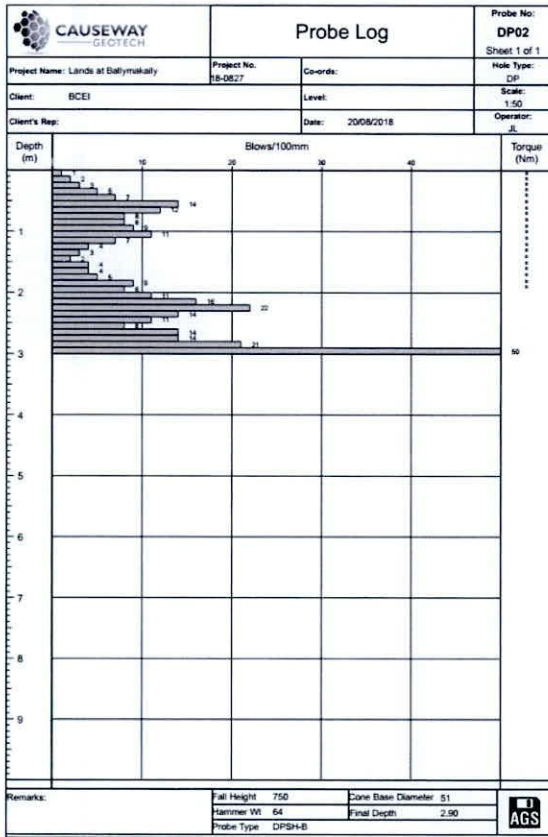
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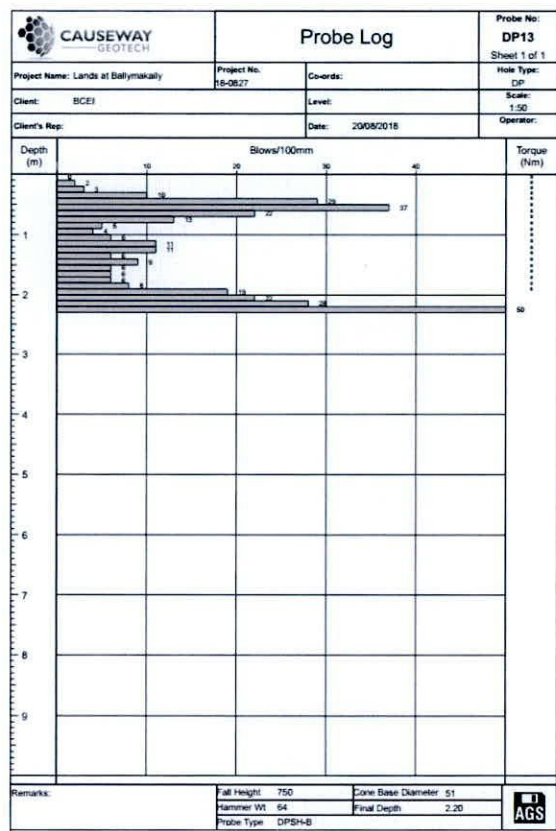
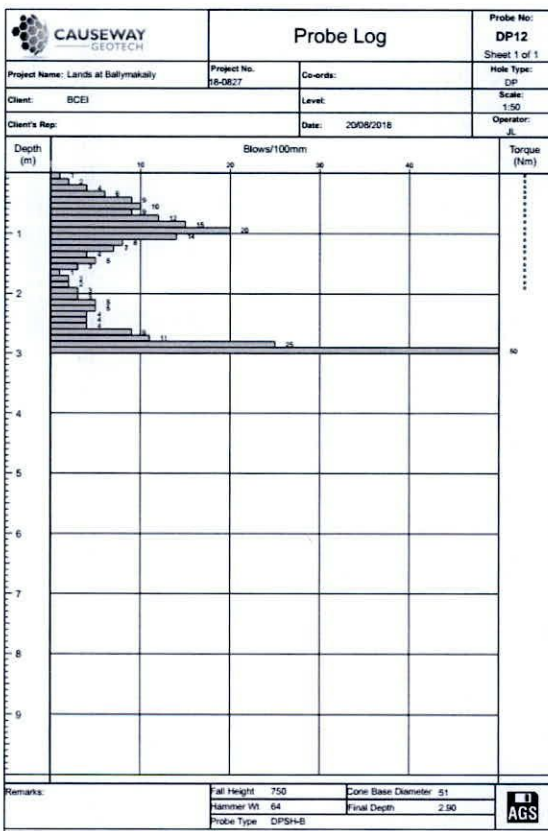
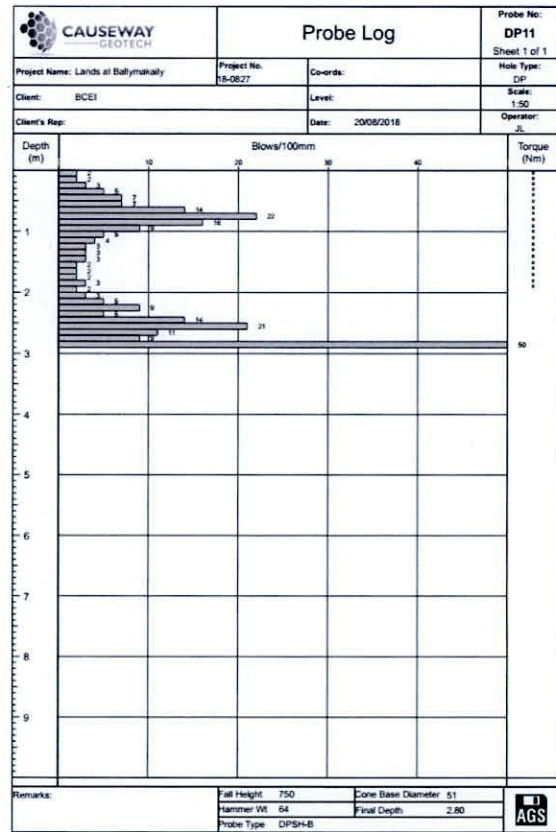
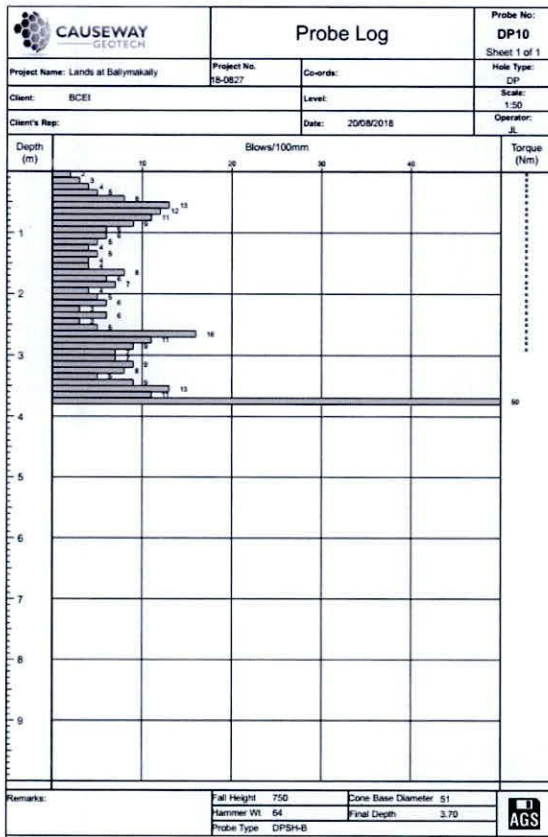
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GEOTECH

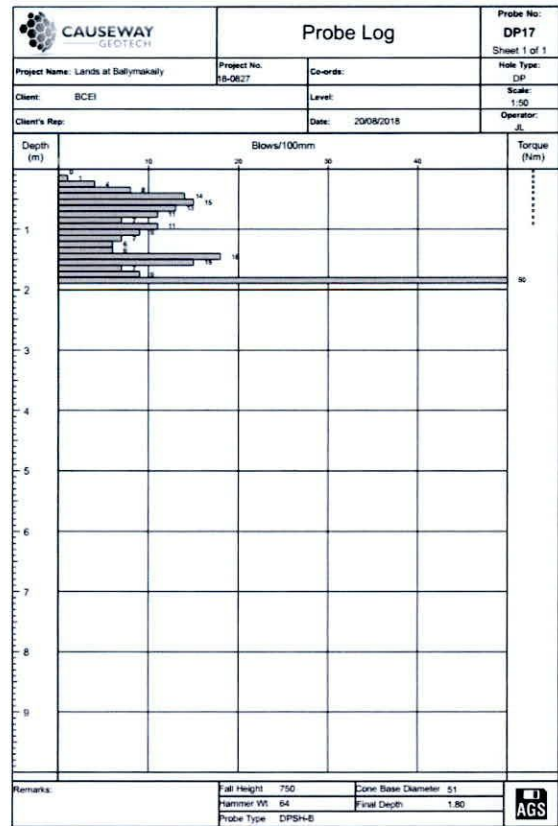
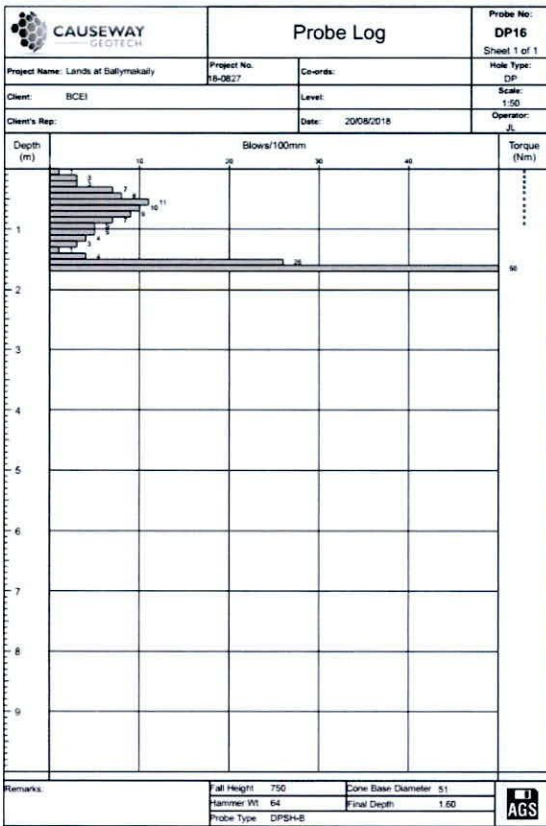
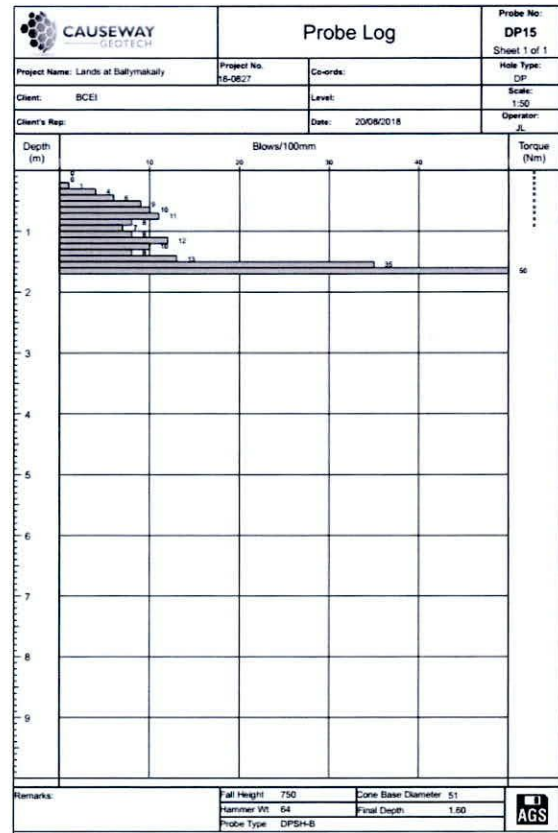
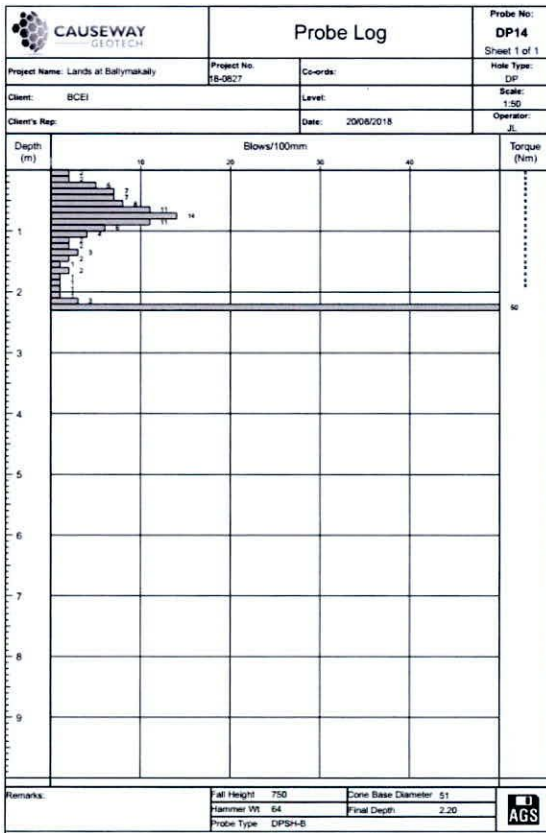
August 2018

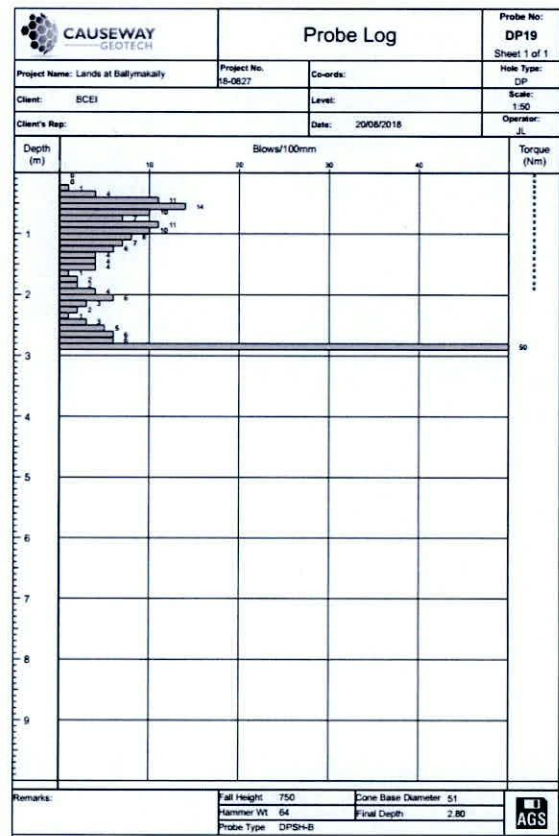
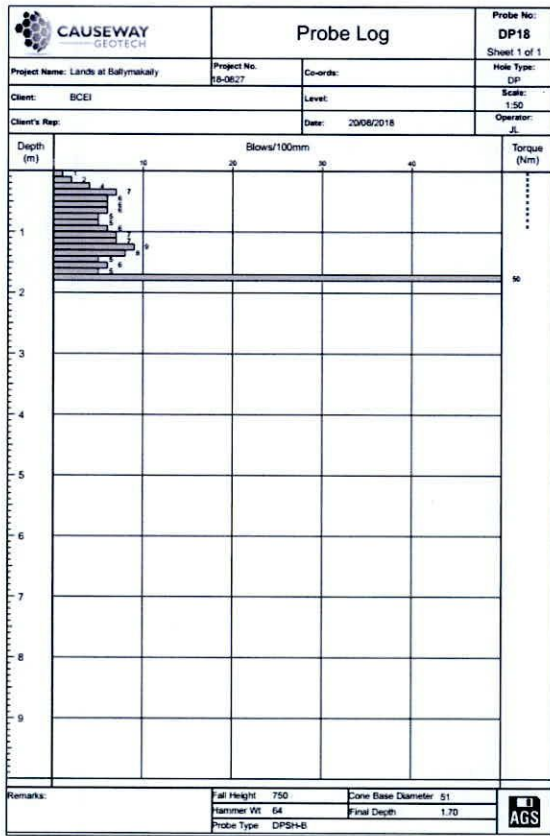


CAUSEWAY GEOTECH		Probe Log		Probe No: DP01
Project Name: Lands at Ballymakilly		Project No: 18-0827	Co-ords:	Sheet: 1 of 1
Client: BCEI		Level:		Hole Type: DP
Client's Rep:		Date: 20/08/2018		Scale: 1:50
				Operator: JL
Depth (m)	Blows/100mm			Torque (Nm)
0	0	10	20	30
1	4	13	18	70
2	8	16	16	50
3	8	13	13	50
4	8	13	13	50
5	8	13	13	50
6	8	13	13	50
7	8	13	13	50
8	8	13	13	50
9	8	13	13	50
Remarks:				
Ball Height: 750		Cone Base Diameter: 51		
Hammer Wt: 64		Final Depth: 2.70		
Probe Type: DP5H-B				



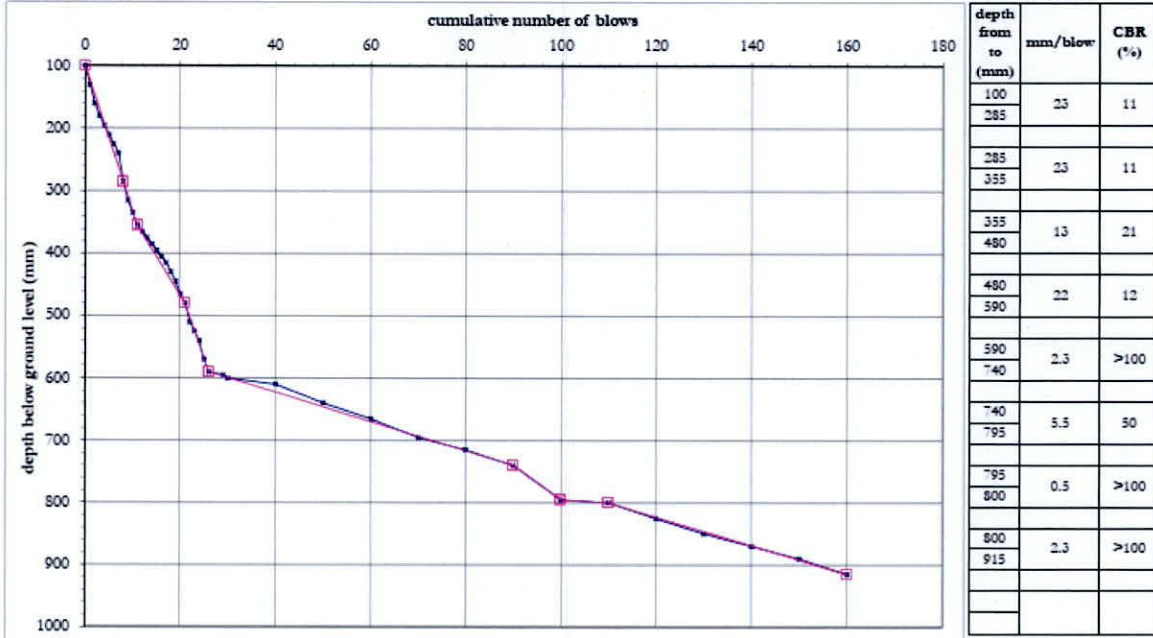






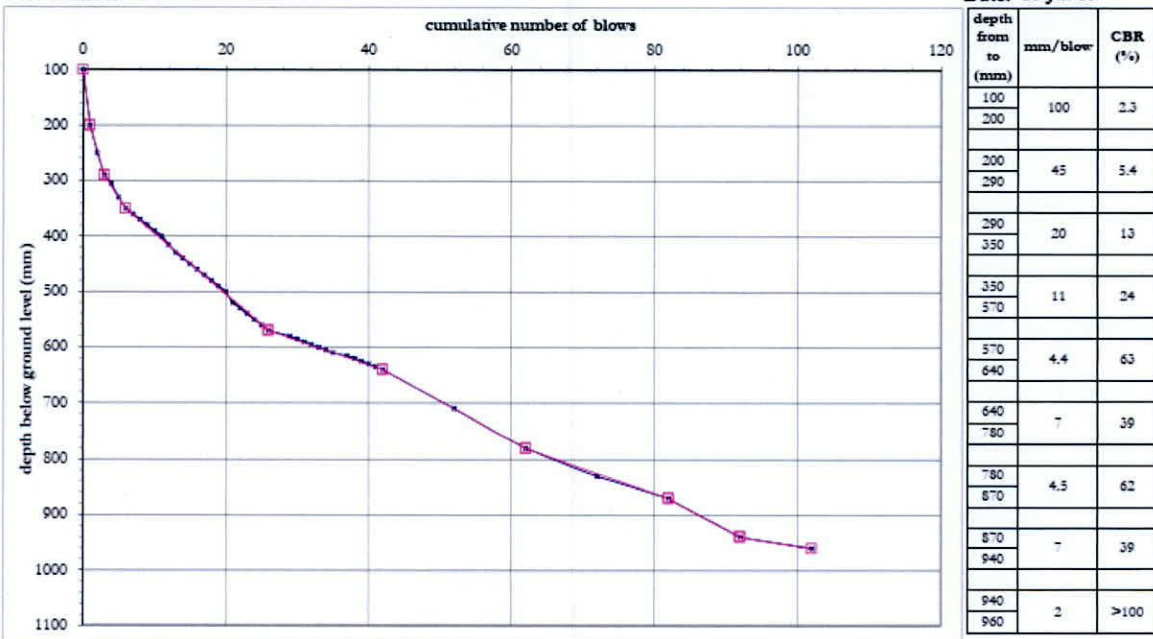
Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakaily
 Test Number: TP03

CBR estimated using TRL Road Note 8:
 Log CBR = 2.48-1.057 Log (mm/blow)
 Project No: 18-0827
 Date: 25-Jul-18



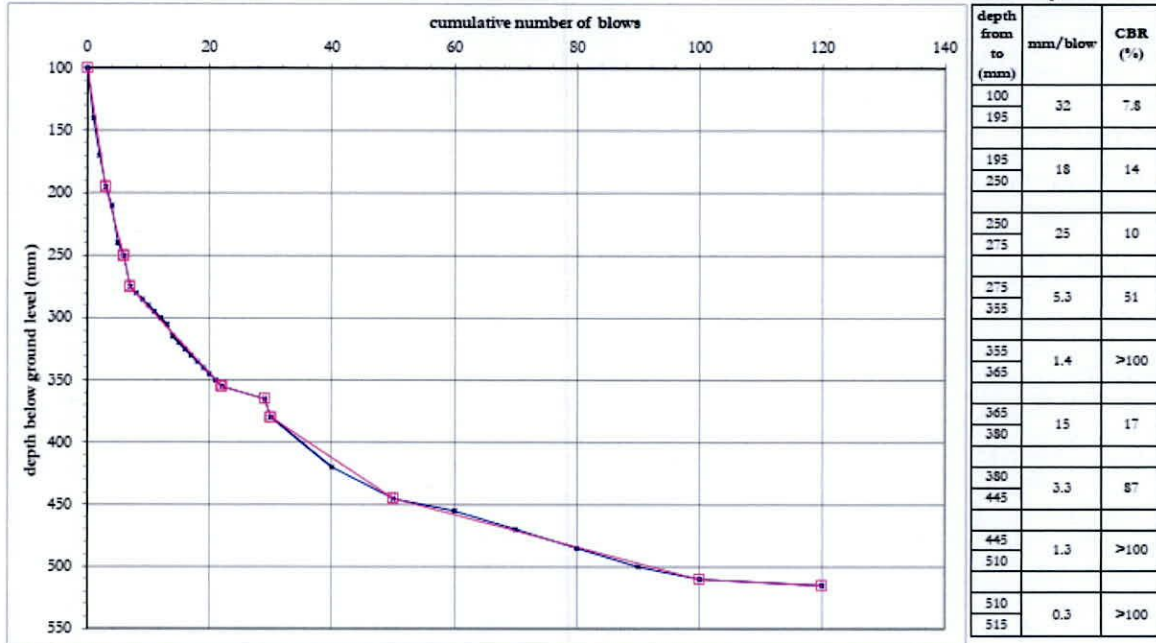
Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakaily
 Test Number: TP04

CBR estimated using TRL Road Note 8:
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 Project No: 18-0827
 Date: 25-Jul-18



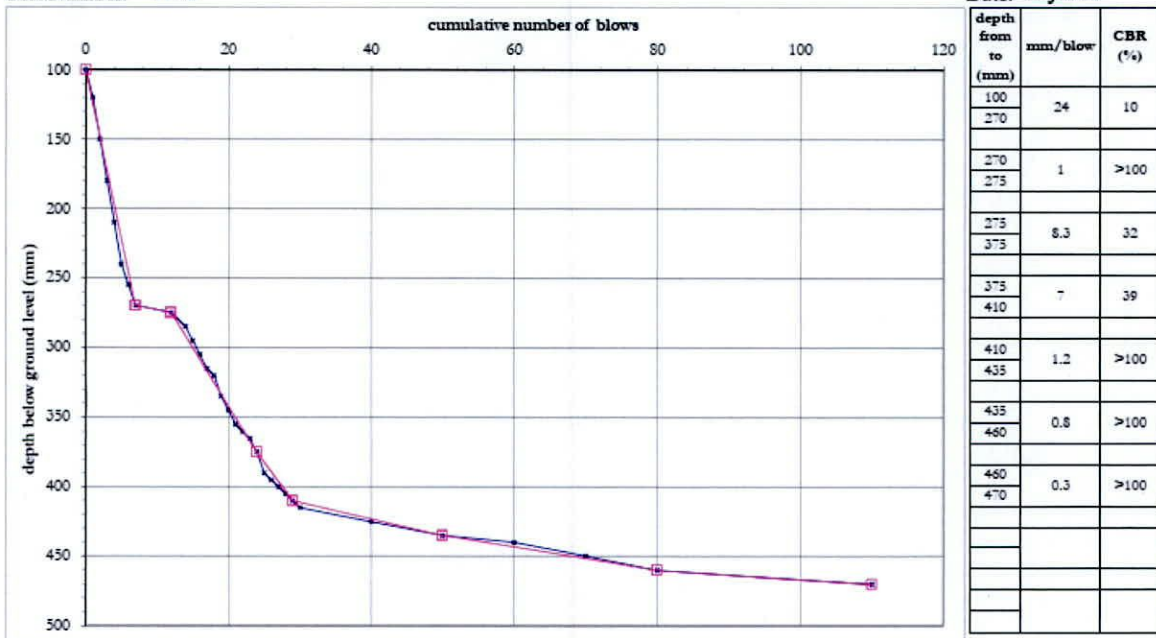
Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakaily
 Test Number: TP07

CBR estimated using TRL Road Note 8:
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 Project No: 18-0827
 Date: 25-Jul-18



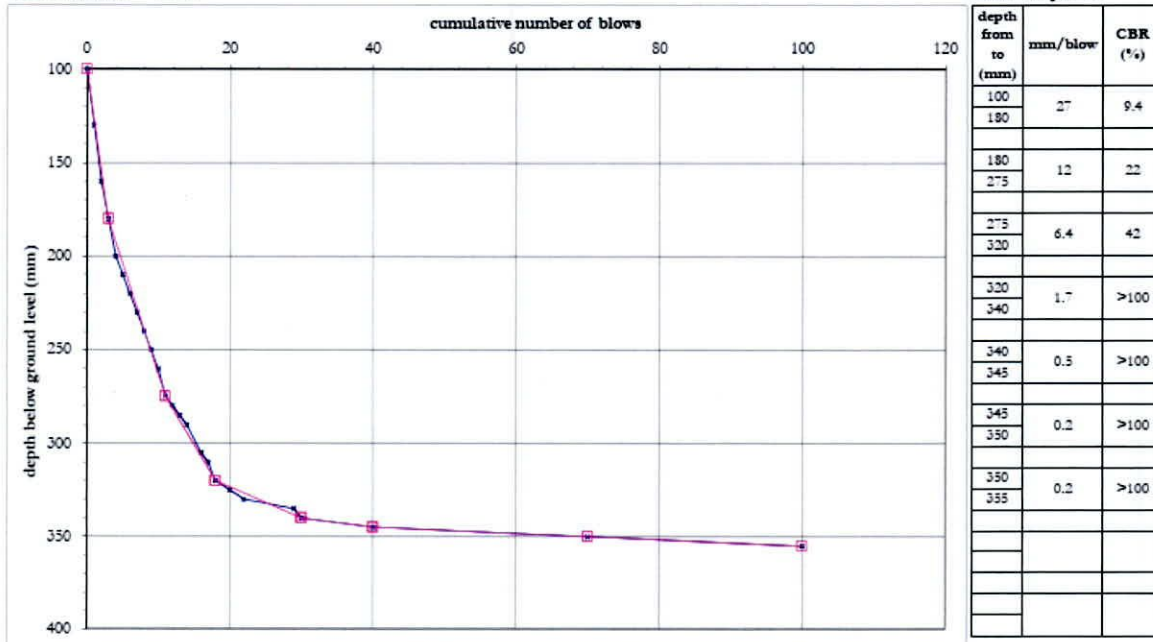
Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakaily
 Test Number: TP08

CBR estimated using TRL Road Note 8:
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 Project No: 18-0827
 Date: 25-Jul-18



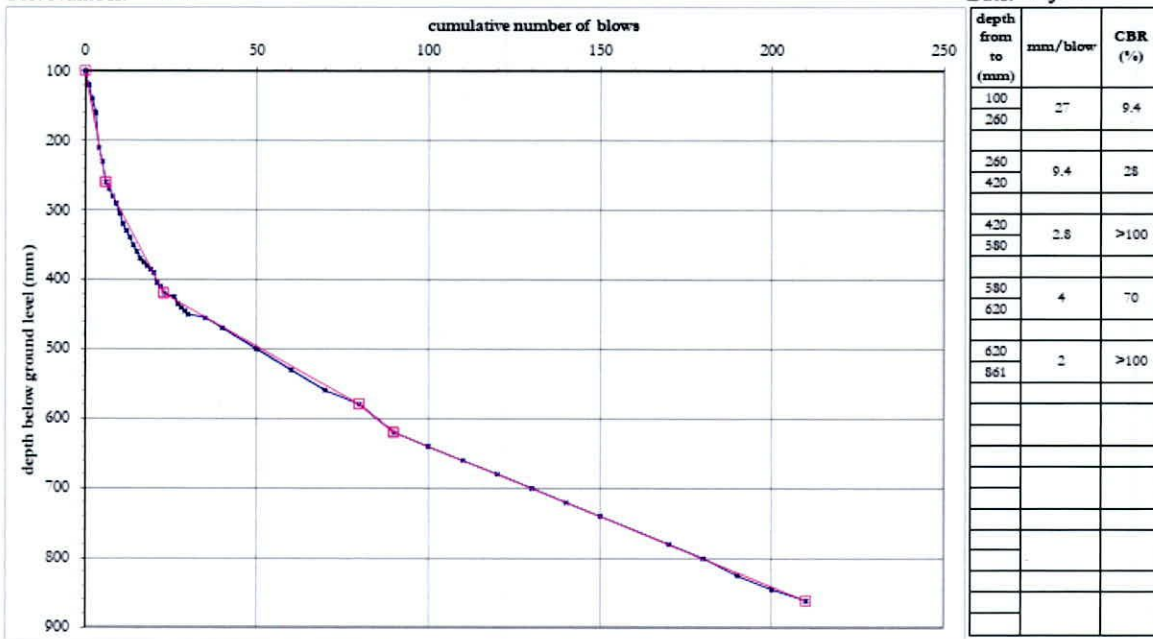
Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakailly
 Test Number: TP09

CBR estimated using TRL Road Note 8:
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 Project No: 18-0827
 Date: 25-Jul-18



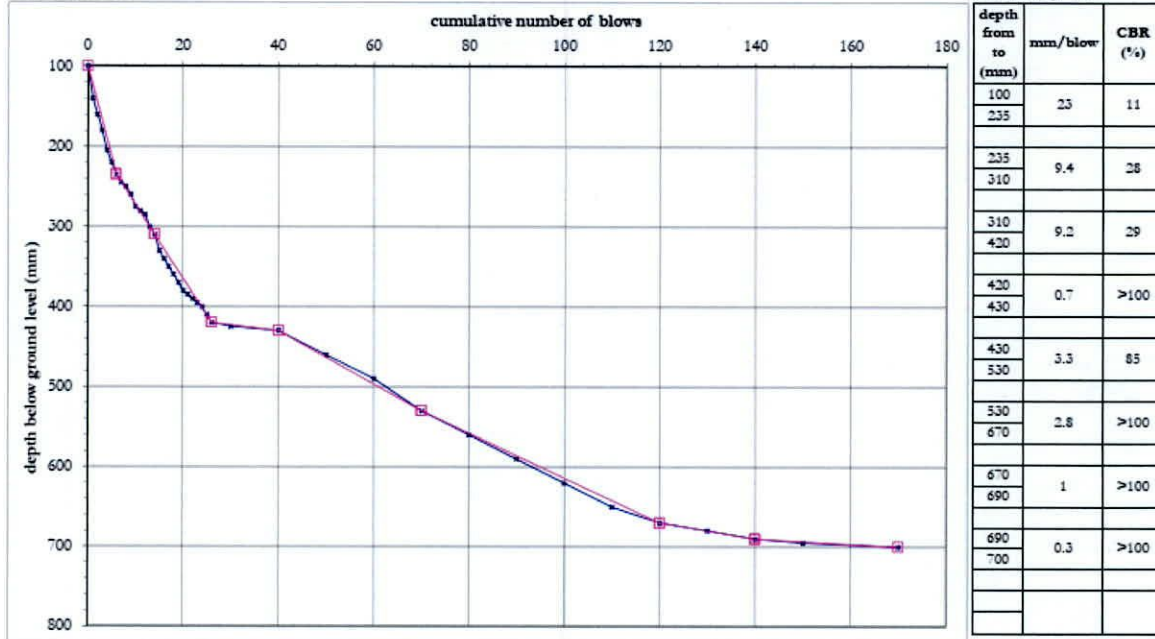
Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakailly
 Test Number: TP10

CBR estimated using TRL Road Note 8:
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 Project No: 18-0827
 Date: 25-Jul-18



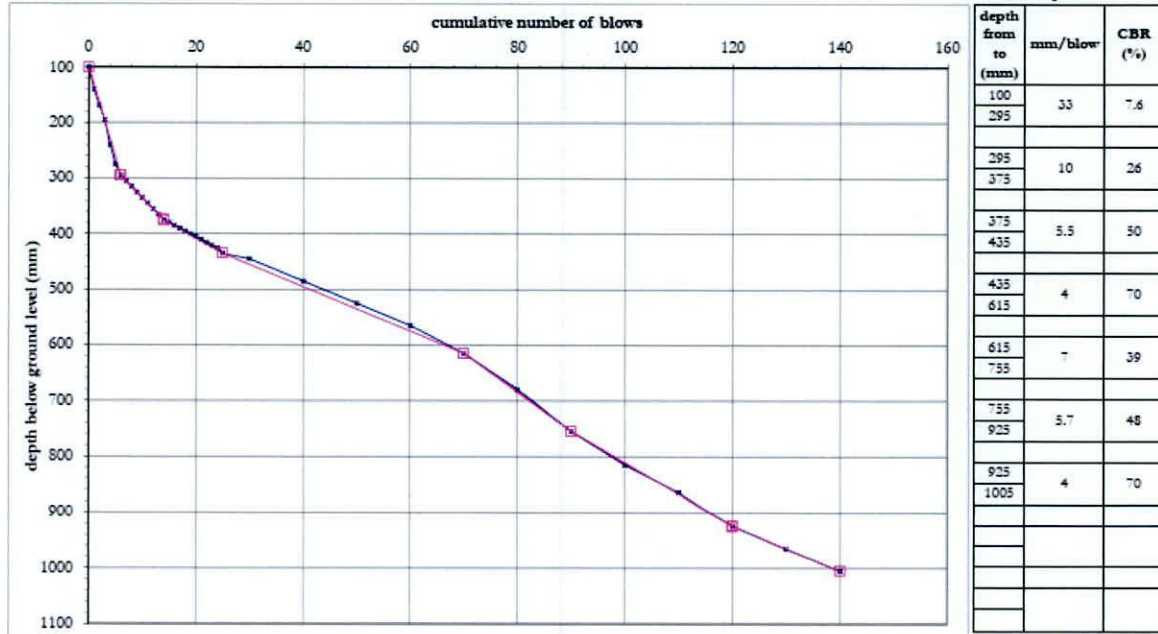
Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakaily
 Test Number: TP11

CBR estimated using TRL Road Note 8:
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 Project No: 18-0827
 Date: 25-Jul-18



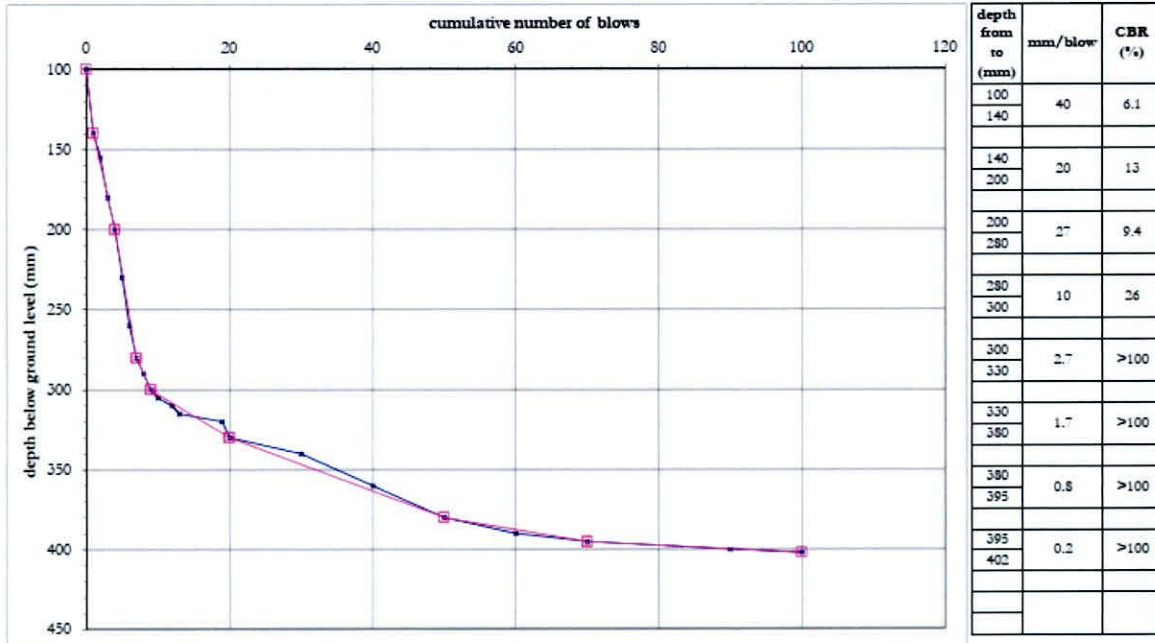
Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakaily
 Test Number: TP12

CBR estimated using TRL Road Note 8:
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 Project No: 18-0827
 Date: 25-Jul-18



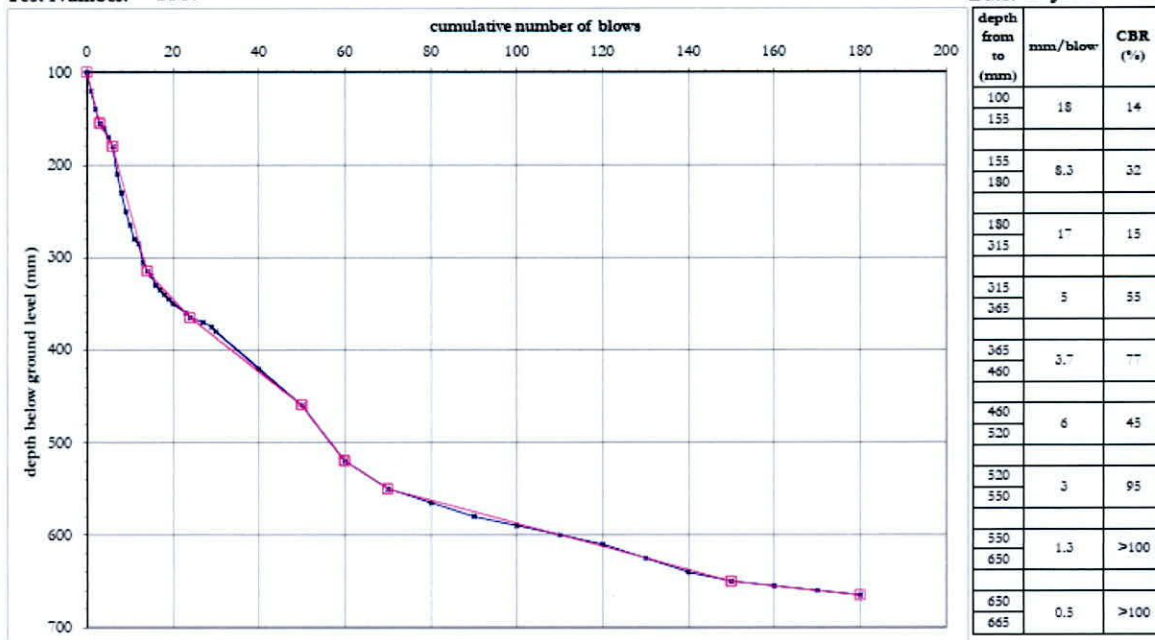
Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakailly
 Test Number: TP13

CBR estimated using TRL Road Note 8:
 Log CBR = 2.48-1.057 Log (mm/blow)
 Project No: 18-0827
 Date: 25-Jul-18



Causeway Geotech Ltd
 Dynamic Cone Penetrometer (DCP) test results and estimated CBR
 Project: Lands at Ballymakailly
 Test Number: TP14

CBR estimated using TRL Road Note 8:
 Log CBR = 2.48-1.057 Log (mm/blow)
 Project No: 18-0827
 Date: 25-Jul-18

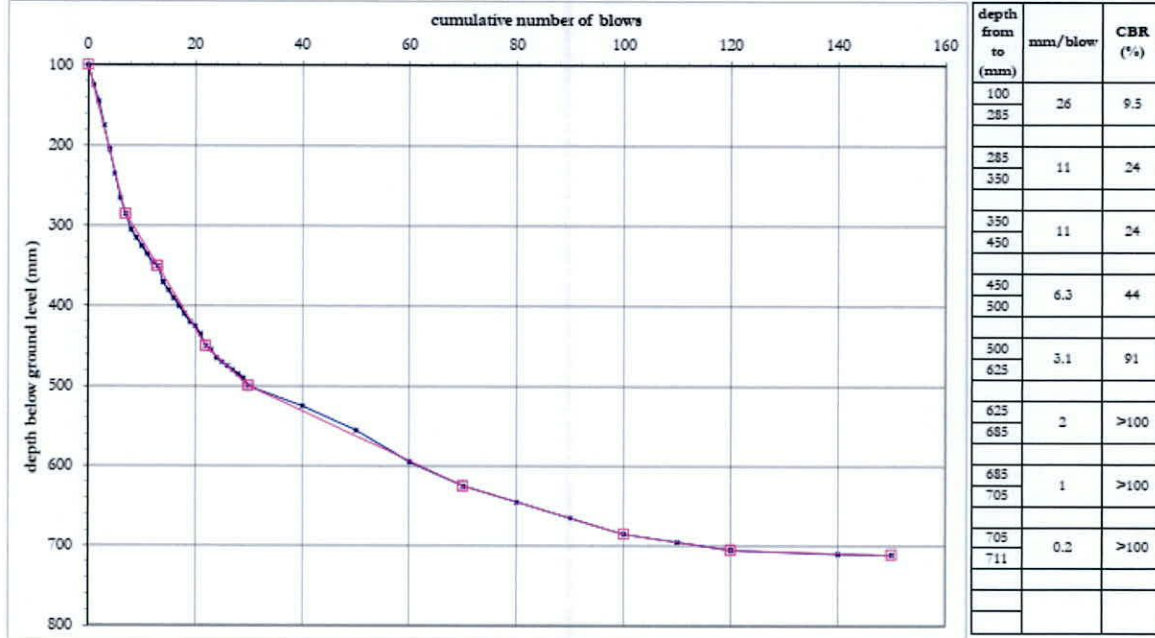


Causeway Geotech Ltd
Dynamic Cone Penetrometer (DCP) test results and estimated CBR

Project: Lands at Ballymakailly
Test Number: TP19

CBR estimated using TRL Road Note 8:
 $\text{Log CBR} = 2.48 - 1.037 \text{ Log (mm/blow)}$

Project No: 18-0827
Date: 25-Jul-18



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 www.causewaygeotech.com

SOIL AND ROCK SAMPLE ANALYSIS
LABORATORY TEST REPORT

Project Name:	Lands at Ballymakailly
Project No.:	18-0827
Client:	BCEI
Engineer:	BCEI
Date:	15/08/18

We are pleased to attach the results of laboratory testing carried out for the above project. This memo and its attachments constitute a report of the results of tests as detailed in the Contents page(s).

The attached results complete the testing requested and we would therefore wish to confirm that samples will be retained without charge for a period of 28 days from the above date after which they will be appropriately disposed of unless we receive written instructions to the contrary prior to that date.

We trust our report meets with your approval but if you have any queries or require additional information, please do not hesitate to contact the undersigned.

Approved Signatory

Stephen Watson
 Laboratory Manager

Signed for and on behalf of Causeway Geotech Ltd

Causeway Geotech Ltd
 8 Drumahiskey Road, Ballymoney
 Co. Antrim, N. Ireland, BT53 7QL
 Registered in Northern Ireland. Company Number: NI622796





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www.causewaygeotech.com

Project Name: Lands at Ballymakilly

Report Reference: 18-0827 – Soils Schedule 1

The table below details the tests carried out, the specifications used, and the number of tests included in this report.

Tests marked with * in this report are not United Kingdom Accreditation Service (UKAS) accredited and are not included in Causeway Geotech Limited's scope of UKAS Accreditation Schedule of Tests. Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL	Moisture Content of Soil	BS 1377-2: 1990: CI 3.2	16
SOIL	Liquid and Plastic Limits of soil-1 point cone penetrometer method	BS 1377-2: 1990: CI 4.4, 5.3 & 5.4	16
SOIL	Particle size distribution - wet sieving	BS 1377-2: 1990: CI 9.2	16
SOIL	Particle size distribution - sedimentation hydrometer method	BS 1377-2: 1990: CI 9.5	16

SUB-CONTRACTED TESTS

In agreement with Client, the following tests were conducted by an approved sub-contractor. All sub-contracting laboratories used are UKAS accredited.

Material tested	Type of test/Properties measured/Range of measurement	Standard specifications	No. of results included in the report
SOIL - Subcontracted to Chemtest Ltd (UKAS 2183)	pH Value of Soil		16
SOIL - Subcontracted to Chemtest Ltd (UKAS 2183)	Sulphate Content water extract		16

Causeway Geotech Ltd
8 Drumahaire Road, Ballymoney
Co. Antrim, N. Ireland, BT53 7GL

Registered in Northern Ireland, Company Number: NI62256



Project No:		Project Name:		Summary of Classification Test Results											
18-0827		Lands at Ballymakilly		Lands at Ballymakilly											
Hole No.	Sample			Soil Description	Density bulk dry Mg/m ³	w %	Plasticity Index %	LL %	PL %	PI %	Particle density Mg/m ³	Casagrande Classification			
	Ref	Top	Base										Type		
TP03	1	0.50	B	Light brown sandy slightly gravelly CLAY		9.8	60	38	-1pt	26	12	M			
TP04	1	0.50	B	Dark grey slightly sandy slightly gravelly CLAY		13	69	38	-1pt	26	12	M			
TP06	4	1.50	B	Dark brownish grey slightly sandy gravelly CLAY		11	67	29	-1pt	10	10	CL			
TP07	1	0.50	B	Light brown (brown slightly sandy) slightly gravelly CLAY		5.5	49	29	-1pt	10	10	CL			
TP10	1	0.50	B	Brown slightly sandy slightly gravelly CLAY		10	72	41	-1pt	21	20	CL			
TP10	4	1.50	B	Dark greyish brown slightly sandy gravelly CLAY		11	60	41	-1pt	21	20	CL			
TP11	1	0.50	B	Yellowish brown slightly sandy slightly gravelly CLAY		8.4	65	38	-1pt	26	13	MGO			
TP12	1	0.50	B	Light brown slightly sandy slightly gravelly CLAY		11	68	28	-1pt	19	9	CL			
TP13	1	0.50	B	Light greyish brown slightly sandy gravelly CLAY		7.2	64	35	-1pt	19	16	CLGO			
TP14	1	0.50	B	Dark grey slightly sandy slightly gravelly CLAY		11	70	35	-1pt	19	16	CLGO			
TP15	1	0.50	B	Light brown slightly sandy slightly gravelly CLAY		12	82	35	-1pt	18	17	CLGO			
TP15	4	1.50	B	Dark grey slightly sandy gravelly CLAY		11	58	27	-1pt	17	10	CL			

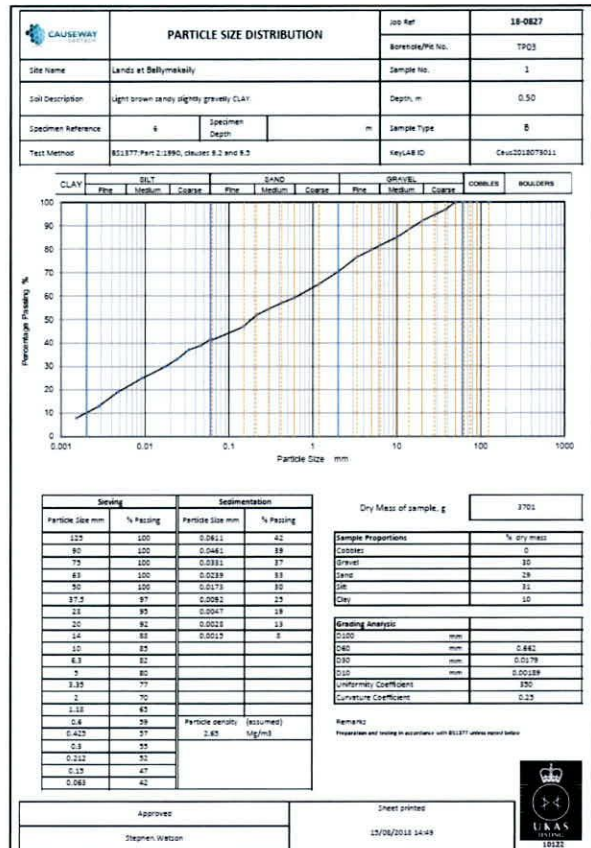
All tests performed in accordance with BS1377:1990 unless specified otherwise

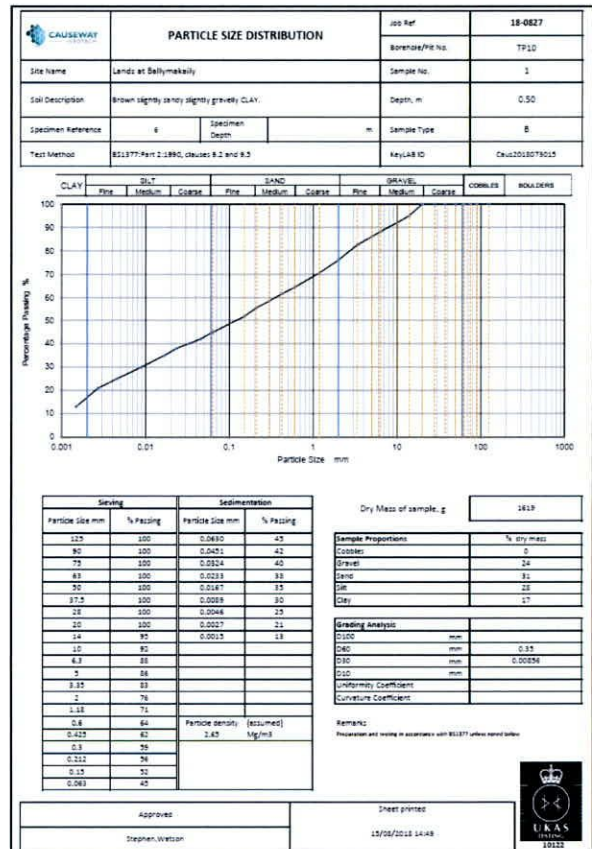
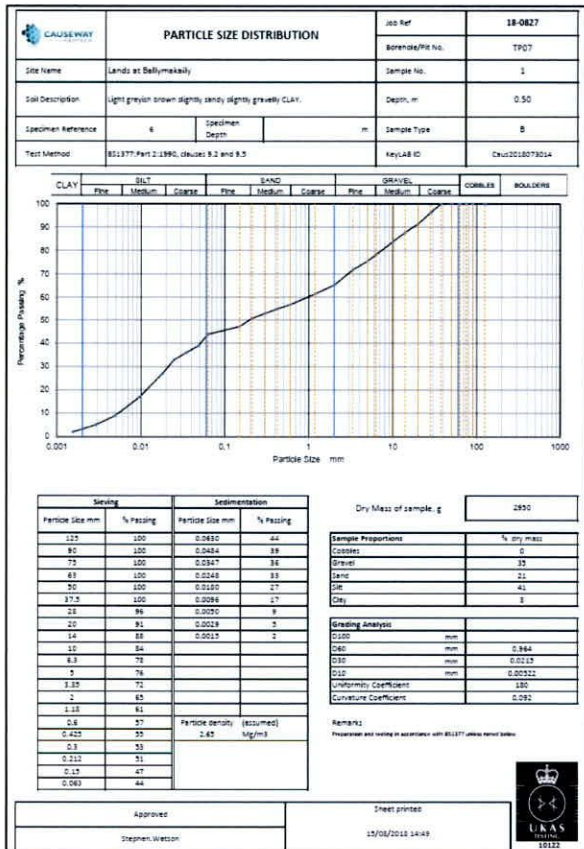
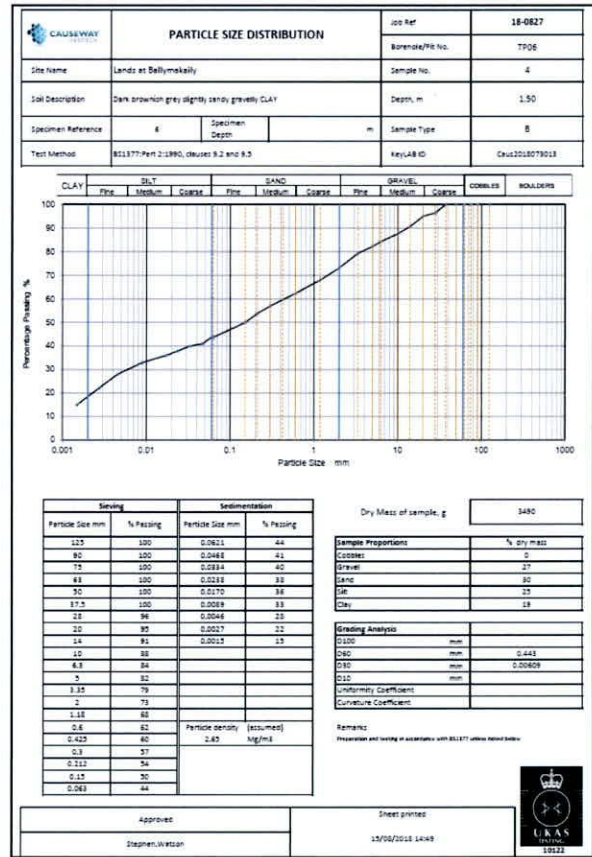
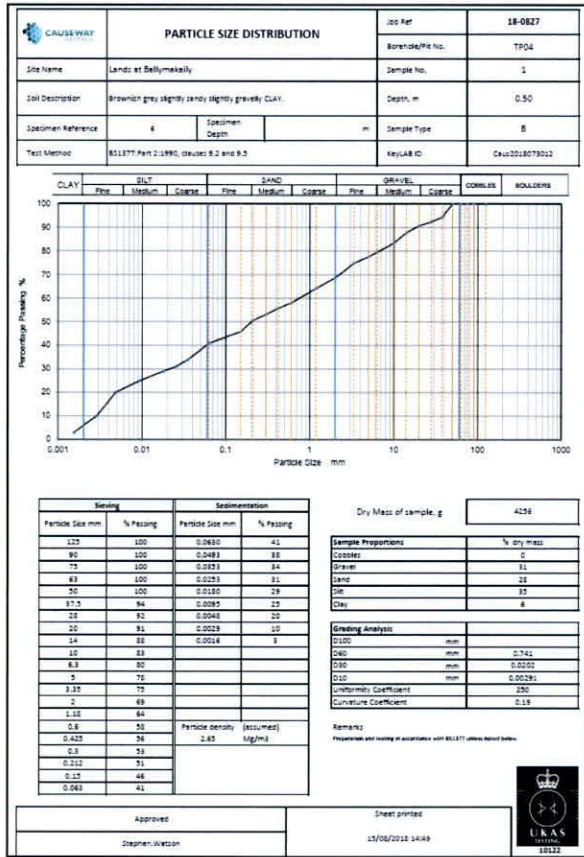
Key	Density test	Least Limit	Particle density	Date Printed	Approved By
	Linear measurement unless:	As per notes unless:	As per notes unless:	15/08/2018	Stephen Watson
	w: water displacement	see: Casagrande method	SI: g/cm ³		
	w: immersion in water	1st: single point test			

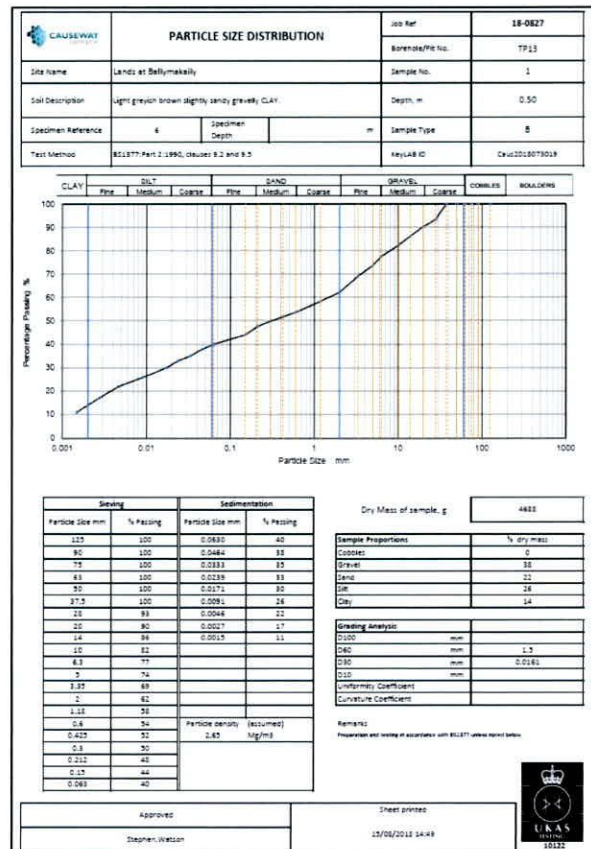
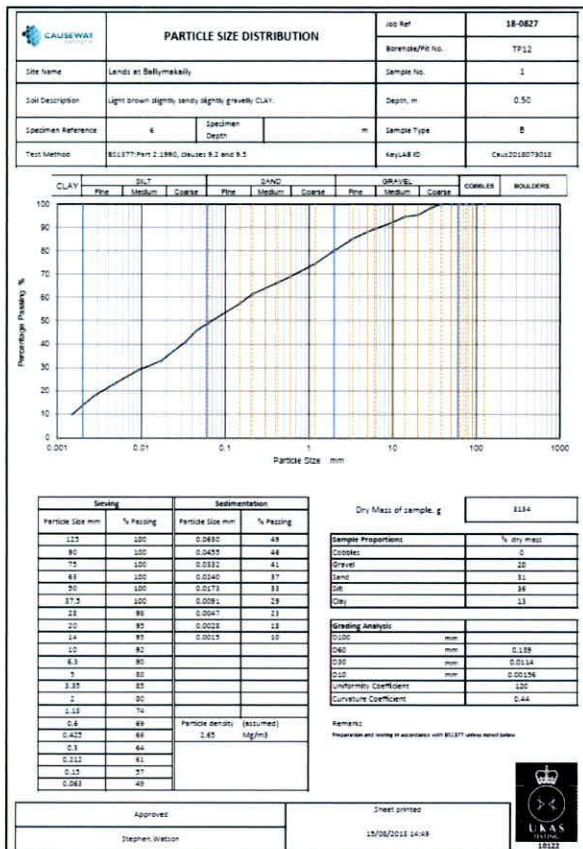
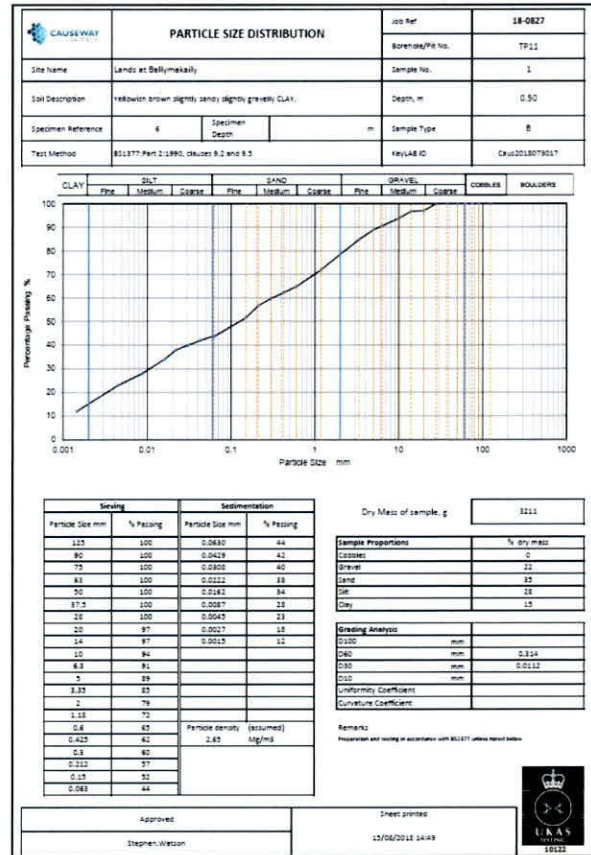
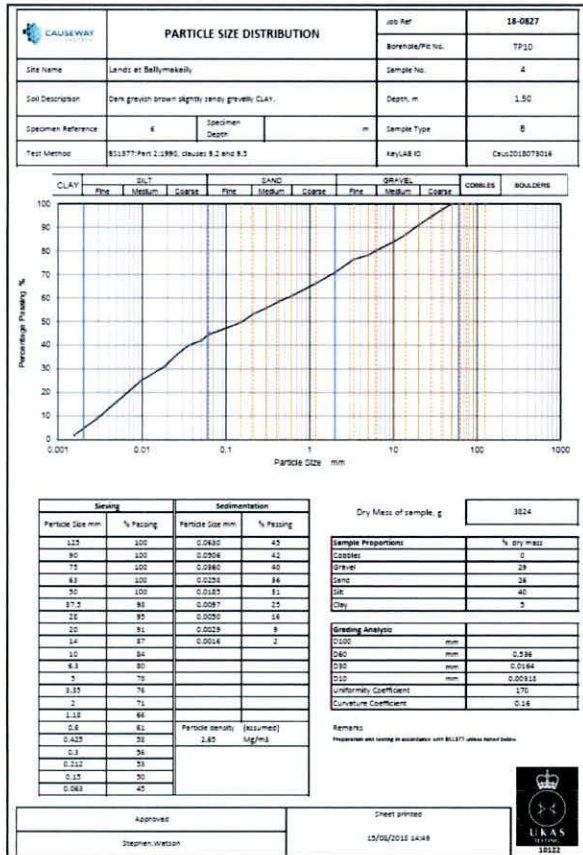
Project No:		Project Name:		Summary of Classification Test Results											
18-0827		Lands at Ballymakilly		Lands at Ballymakilly											
Hole No.	Sample			Soil Description	Density bulk dry Mg/m ³	w %	Plasticity Index %	LL %	PL %	PI %	Particle density Mg/m ³	Casagrande Classification			
	Ref	Top	Base										Type		
TP16	1	0.50	B	Light brown slightly sandy slightly gravelly CLAY		12	78	42	-1pt	28	14	M			
TP17	4	1.50	B	Dark grey slightly sandy gravelly CLAY		7.0	47	24	-1pt	14	10	CL			
TP18	3	1.50	B	Dark brown slightly sandy slightly gravelly CLAY		10	68	24	-1pt	10	8	CL			
TP19	4	1.50	B	Dark slightly sandy very gravelly CLAY		7.3	44	23	-1pt	15	8	CL			

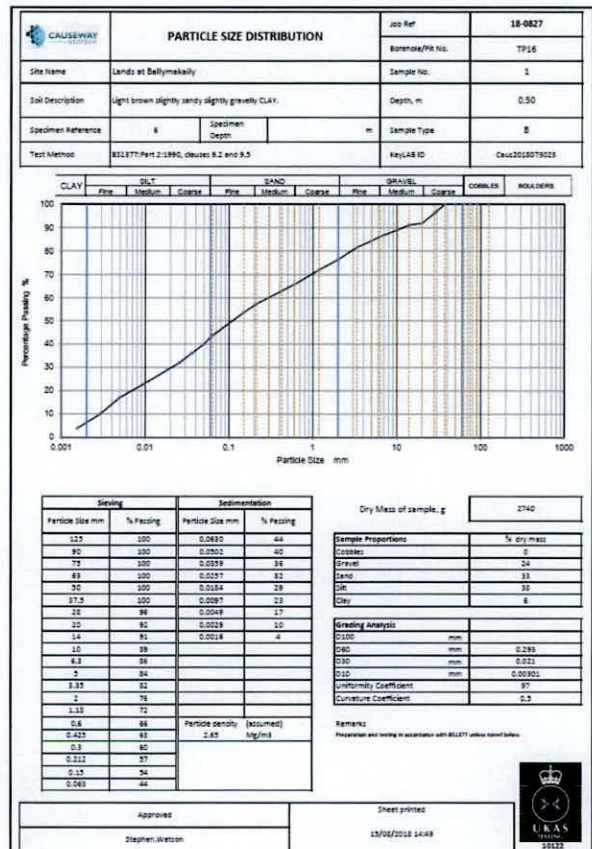
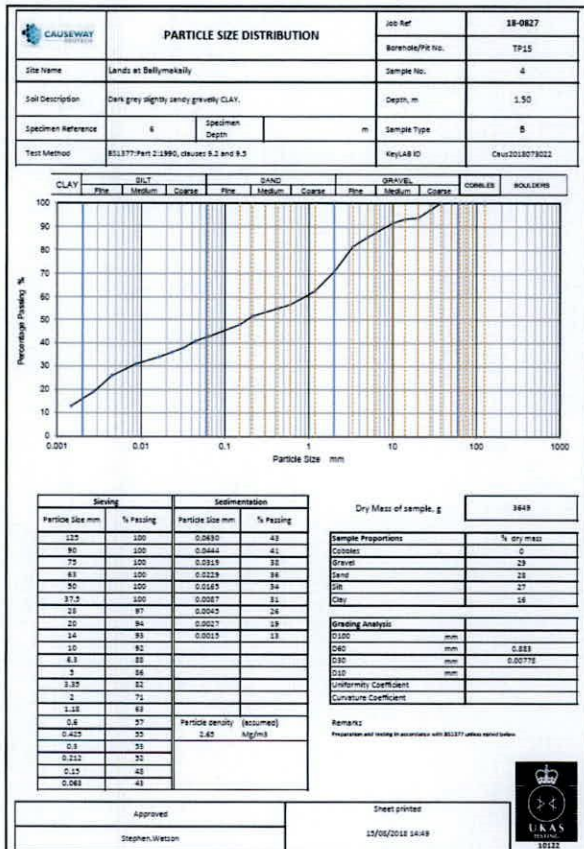
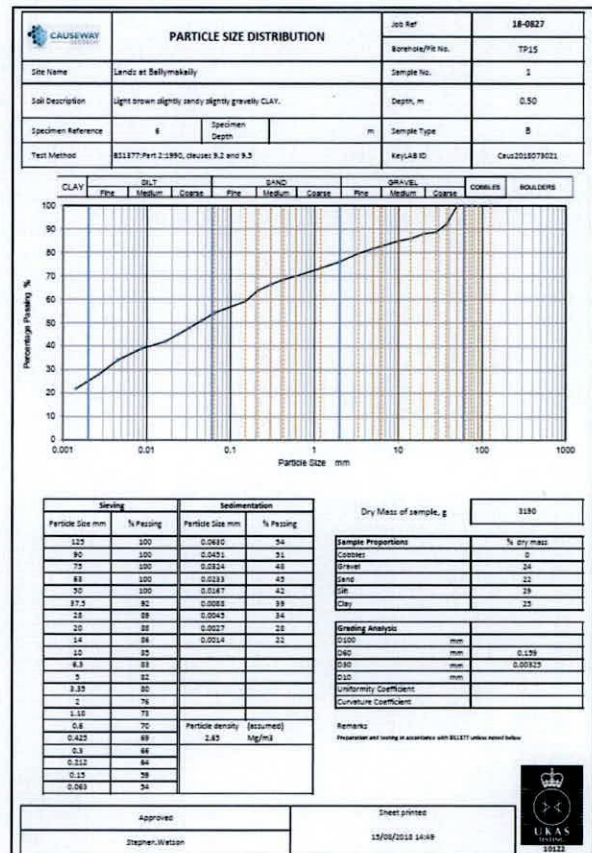
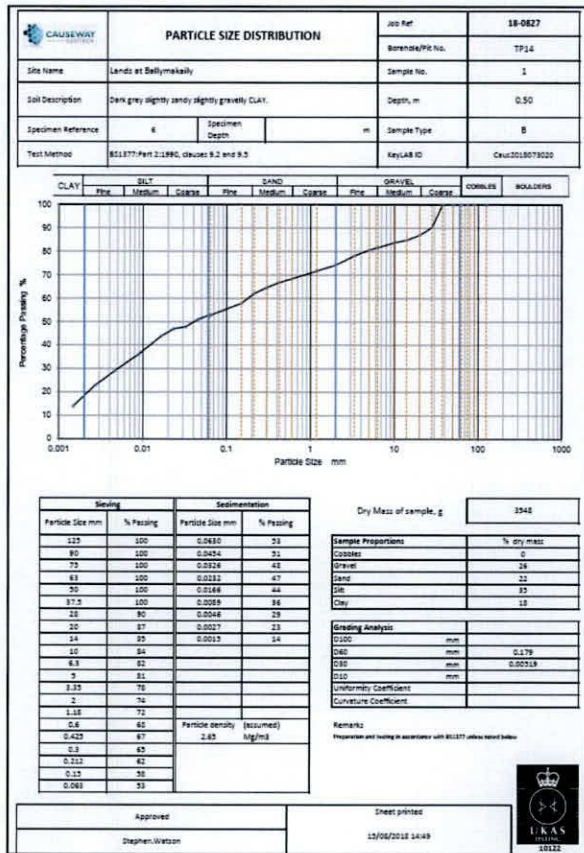
All tests performed in accordance with BS1377:1990 unless specified otherwise

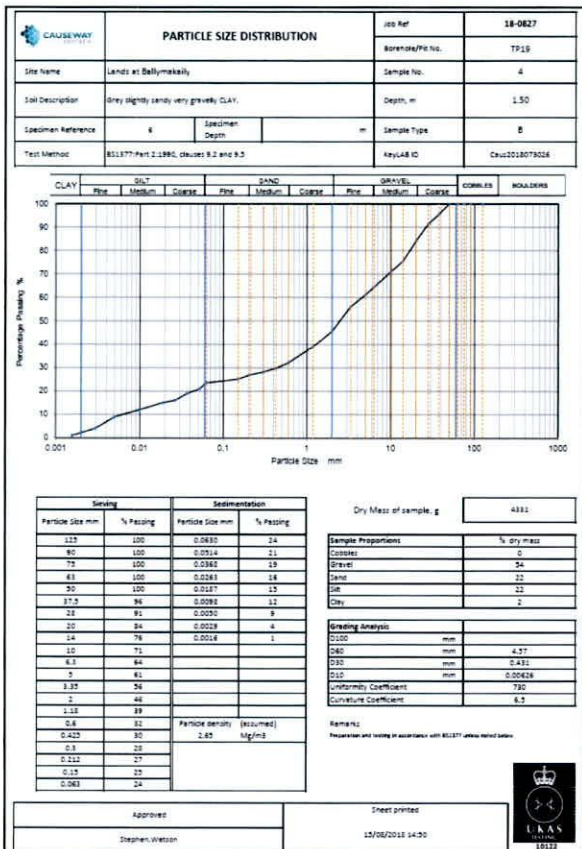
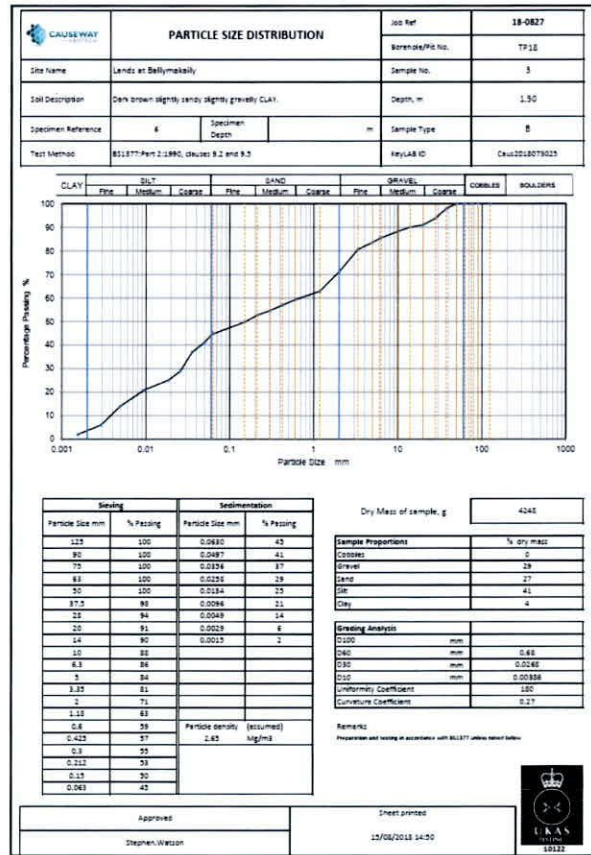
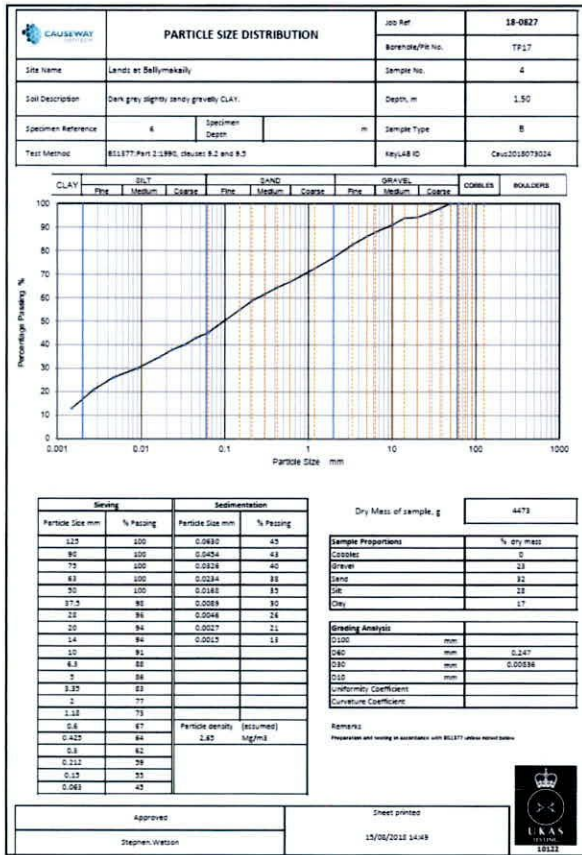
Key	Density test	Least Limit	Particle density	Date Printed	Approved By
	Linear measurement unless:	As per notes unless:	As per notes unless:	15/08/2018	Stephen Watson
	w: water displacement	see: Casagrande method	SI: g/cm ³		
	w: immersion in water	1st: single point test			













Final Report

Report No.: 18-23652-1
Initial Date of Issue: 10-Aug-2018
Client: Causeway Geotech Ltd
Client Address: 8 Drumahiskey Road, Balnamore, Ballymoney, County Antrim, BT53 7QL
Contact(s): Carin Cornwall, Colm Hurley, Darren O'Mahony, Gabriella Horan, John Cameron, Lucy Newland, Matthew Gilbert, Neil Haggan, Paul Dunlop, Paul McNamara, Sean Ross, Stephen Franey, Stephen Watson, Stuart Abraham
Project: 18-0827 Lands at Ballymakelly
Quotation No.: **Date Received:** 08-Aug-2018
Order No.: **Date Instructed:** 08-Aug-2018
No. of Samples: 16
Turnaround (Wkdays): 3 **Results Due:** 10-Aug-2018
Date Approved: 10-Aug-2018
Approved By:
Details: Martin Dyer, Laboratory Manager



Results - Soil

Project: 18-0827 Lands at Ballymakelly

Client: Causeway Geotech Ltd	Chemtest Job No.:	18-23652	18-23652	18-23652	18-23652	18-23652	18-23652	18-23652	18-23652	18-23652
Quotation No.:	Chemtest Sample ID.:	667901	667902	667903	667904	667905	667906	667907	667908	667909
Order No.:	Client Location ID.:	TP03	TP04	TP05	TP07	TP10	TP10	TP11	TP12	
	Client Sample Ref.:	2	2	5	2	2	5	2	2	
	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
	Top Depth (m):	0.50	0.50	1.50	0.50	0.50	1.50	0.50	0.50	
	Date Sampled:	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	
Determinand	Accred.	SOP	Units	LOD						
Molsture	N	2030	%	0.020	7.8	11	9.2	4.4	7.8	9.6
pH	U	2010		N/A	8.4	8.5	8.5	8.5	8.5	8.3
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

**Results - Soil**

Client: Causeway Geotech Ltd		Chemtest Job No.:	18-23652	18-23652	18-23652	18-23652	18-23652	18-23652	18-23652	18-23652
Quotation No.:	Chemtest Sample ID.:	667909	667910	667911	667912	667913	667914	667915	667916	667916
Order No.:	Client Location ID.:	TP13	TP14	TP15	TP15	TP16	TP17	TP18	TP19	TP19
	Client Sample Ref.:	2	2	2	4	2	5	4	5	5
	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):	0.50	0.50	0.50	1.50	0.50	1.50	1.50	1.50	1.50
	Date Sampled:	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018	07-Aug-2018
Determinand	Accred.	SOP	Units	LOD						
Moisture	N	2030	%	0.020	5.7	6.7	8.0	11	10	8.5
pH	U	2010		N/A	8.5	8.5	8.4	8.7	8.2	8.8
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010

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**Report Information****Key**

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SNV This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- IS Insufficient Sample
- UIS Unsuitable Sample
- NE not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

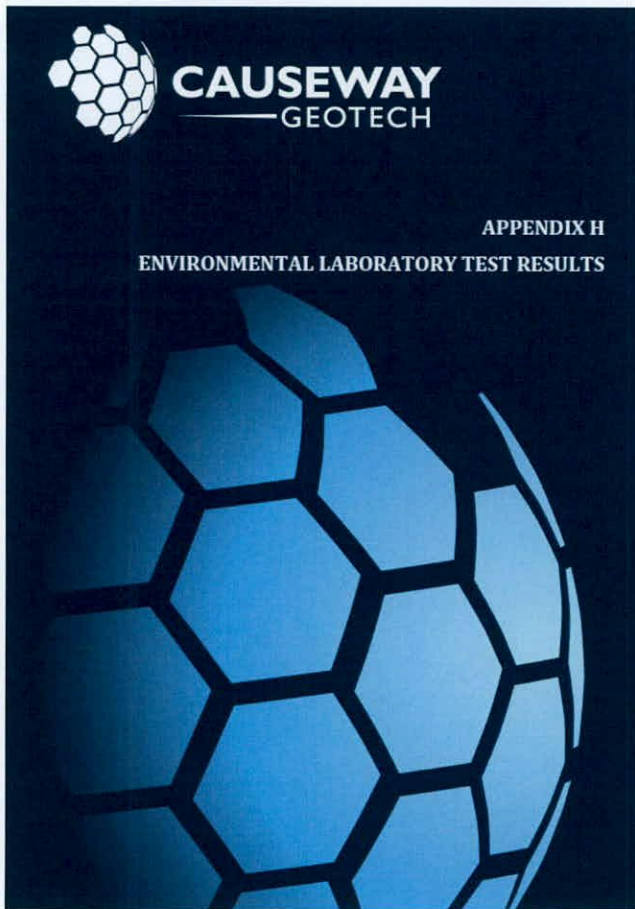
All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk

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Final Report

Report No.: 18-22446-1
 Initial Date of Issue: 03-Aug-2018
 Client: Causeway Geotech Ltd
 Client Address: 8 Drumahiskey Road, Ballymore, Ballymoney, County Antrim, BT53 7QL
 Contact(s): Aisling O'Kane, Colm Hurley, Darren O'Mahony, Gabriella Horan, John Cameron, Lucy Newland, Matthew Gilbert, Neil Haggan, Paul Dunlop, Paul McNamara, Stephen Franey, Stephen Watson, Sean Ross
 Project: 16-0827 Ballymakally
 Quotation No.: Date Received: 30-Jul-2018
 Order No.: Date Instructed: 30-Jul-2018
 No. of Samples: 14
 Turnaround (Wkdays): 3 Results Due: 01-Aug-2018
 Date Approved: 03-Aug-2018
 Approved By: *[Signature]*
 Details: Robert Monk, Technical Manager



Results - Soil

Client: Causeway Geotech Ltd	Chemtest Job No.:	18-22446	18-22446	18-22446	18-22446	18-22446	18-22446	18-22446	18-22446	18-22446	18-22446
Quotation No.:	Chemtest Sample ID.:	661593	661595	661597	661599	661601	661602	661603	661604	661606	661608
Order No.:	Client Location ID.:	TP03	TP06	TP10	TP11	TP01	TP02	TP04	TP09	TP12	
Client Sample Ref.:		1	2	1	1	2	1	1	1	2	
Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
Top Depth (m):		1.00	1.50	0.50	0.50	1.50	0.30	0.50	0.50	1.50	
Date Sampled:		23-Jul-2018	23-Jul-2018	23-Jul-2018	23-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018	
Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	
Determinand	Accred.	SQP	Units	LOD							
ACM Type	U	2192	N/A	-	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	12	9.2	6.2	5.7	14	5.7	7.8
pH	U	2010	N/A	8.4	8.4	8.4	8.4	8.5	9.0	8.5	8.5
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.52	< 0.40	< 0.40	< 0.40	0.55	0.74	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.095	< 0.010	< 0.010
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	0.80	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Thiocyanate	U	2300	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	15	35	6.3	12	6.2	8.1	22
Sulphate (Total)	U	2430	%	0.010	0.098	0.094	0.043	0.029	0.16	0.23	0.047
Arsenic	U	2450	mg/kg	1.0	28	29	33	26	31	21	25
Cadmium	U	2450	mg/kg	0.10	1.5	1.5	2.7	0.83	0.74	1.6	0.87
Chromium	U	2450	mg/kg	1.0	19	12	16	21	14	16	19
Copper	U	2450	mg/kg	0.50	25	22	32	17	30	38	28
Mercury	U	2450	mg/kg	0.10	0.11	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	49	48	53	37	55	41	37
Lead	U	2450	mg/kg	0.50	26	14	20	16	38	42	18
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20	0.31	0.43	< 0.20	< 0.20
Zinc	U	2450	mg/kg	0.50	80	56	74	56	73	110	60
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	1.5	0.52	3.8	0.84	1.9	5.2	0.86
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0



Results - Soil

Project: 18-0627 Ballymakally

Client: Causeway Geotech Ltd	Chemtest Job No.:	18-22446	18-22446	18-22446	18-22446	18-22446	18-22446	18-22446	18-22446	18-22446
Quotation No.:	Chemtest Sample ID.:	661593	661595	661597	661599	661601	661602	661603	661604	661606
Order No.:	Client Location ID.:	TP03	TP06	TP10	TP11	TP01	TP02	TP04	TP09	TP12
	Client Sample Ref.:	1	2	1	1	2	1	1	1	2
	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):	1.00	1.50	0.50	0.50	1.50	0.30	0.50	0.50	1.50
	Date Sampled:	23-Jul-2018	23-Jul-2018	23-Jul-2018	23-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018
	Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD						
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	< 10	< 10
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz[a,h]Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Resorcinol	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Phenol	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Cresols	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Xylenols	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
1-Naphtinol	N	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Trimethylphenols	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30



Results - Soil

Project: 18-0627 Ballymakally

Client: Causeway Geotech Ltd	Chemtest Job No.:	18-22446	18-22446	18-22446	18-22446	18-22446
Quotation No.:	Chemtest Sample ID.:	661605	661609	661611	661614	661616
Order No.:	Client Location ID.:	TP13	TP15	TP16	TP17	TP19
	Client Sample Ref.:	2	1	1	2	2
	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):	1.50	0.50	0.50	1.50	1.50
	Date Sampled:	25-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018
	Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD		
ACM Type	U	2192	N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	11	9.7
pH	U	2010	N/A	N/A	6.5	6.2
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40	0.54
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50
Thiocyanate	U	2300	mg/kg	5.0	< 5.0	< 5.0
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	12	6.3
Sulphate (Total)	U	2430	%	0.010	0.063	0.083
Arsenic	U	2450	mg/kg	1.0	28	26
Cadmium	U	2450	mg/kg	0.10	1.7	1.4
Chromium	U	2450	mg/kg	1.0	14	24
Copper	U	2450	mg/kg	0.50	34	24
Mercury	U	2450	mg/kg	0.10	< 0.10	0.11
Nickel	U	2450	mg/kg	0.50	49	44
Lead	U	2450	mg/kg	0.50	20	27
Selenium	U	2450	mg/kg	0.20	0.73	0.48
Zinc	U	2450	mg/kg	0.50	87	83
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	0.79	2.1
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0



Results - Soil

The right chemistry to deliver results
Project: 18-0827 Ballymakelly

Client: Causeway Geotech Ltd	Chemtest Job No.:	18-22446	18-22446	18-22446	18-22446	18-22446		
Quotation No.:	Chemtest Sample ID.:	661608	661609	661611	661614	661616		
Order No.:	Client Location ID.:	TP13	TP15	TP16	TP17	TP19		
	Client Sample Ref.:	2	1	1	2	2		
	Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL		
	Top Depth (m):	1.50	0.50	0.50	1.50	1.50		
	Date Sampled:	25-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018	25-Jul-2018		
	Asbestos Lab:	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY		
Determinand	Accred.	SOP	Units	LOD				
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[e]pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno[1,2,3-c,d]Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz[a,h]Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAHs	U	2700	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Resorcinol	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050
Phenol	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050
Cresols	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050
Xylenols	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050
1-Naphthol	N	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050
Trimethylphenols	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30



Report Information

- Key**
- U UKAS accredited
 - M MCERTS and UKAS accredited
 - N Unaccredited
 - S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
 - SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
 - T This analysis has been subcontracted to an unaccredited laboratory
 - IS Insufficient Sample
 - US Unsuitable Sample
 - NE not evaluated
 - < "less than"
 - > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.co.uk



Final Report

Report No.: 18-24061-1

Initial Date of Issue: 16-Aug-2018

Client: Causeway Geotech Ltd

Client Address: 8 Drumahiskey Road
Balmore
Ballymoney
County Antrim
BT53 7QL

Contact(s): Carin Cornwall
Colm Hurley
Darren O'Mahony
Gabriella Horan
John Cameron
Lucy Newland
Matthew Gilbert
Nell Haggan
Paul Dunlop
Paul McManara
Sean Ross
Stephen Franey
Stephen Watson
Stuart Abraham

Project: 18-0827 Lands at Ballymakelly

Quotation No.: **Date Received:** 10-Aug-2018

Order No.: **Date Instructed:** 13-Aug-2018

No. of Samples: 10

Turnaround (Wkdays): 3 **Results Due:** 15-Aug-2018

Date Approved: 16-Aug-2018

Approved By:

Robert Monk

Details: Robert Monk, Technical Manager



Results - Soil

Client: Causeway Geotech Ltd		Chemtest Job No.:	18-24061	18-24061	18-24061	18-24061	18-24061	18-24061	18-24061	18-24061	18-24061
Chemtest Sample ID.:		669633	669634	669635	669636	669637	669638	669639	669640		
Client Location ID.:		BH08	BH08	BH11	BH11	BH13	BH13	BH14	BH14		
Client Sample Ref.:		ES1	ES2	ES2	ES1	ES1	ES2	ES1	ES2		
Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Top Depth (m):		0.5	1.5	1.50	0.50	0.5	1.5	0.5	1.5		
Date Sampled:		09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018		
Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY		
Determinand	Accred.	SOP	Units	LOD							
ACM Type	U	2192	%	N/A	-	-	-	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	7.6	8.8	13	12	6.9	7.8	14
pH	U	2010	N/A		8.6	8.6	8.4	8.4	8.6	8.6	8.2
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40	< 0.40	0.61	< 0.40	< 0.40	< 0.40	< 0.40
Sulfate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Thiocyanate	U	2300	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Sulfide (Easily Liberatable)	N	2325	mg/kg	0.50	7.9	24	17	5.1	4.3	21	1.6
Sulfate (Total)	U	2430	%	0.010	0.077	0.10	0.17	0.031	0.041	0.83	0.072
Arsenic	U	2450	mg/kg	1.0	17	22	20	19	22	28	23
Caesium	U	2450	mg/kg	0.10	0.76	1.6	1.3	0.81	2.0	1.4	2.6
Chromium	U	2450	mg/kg	1.0	18	12	16	24	14	12	25
Copper	U	2450	mg/kg	0.50	11	25	25	13	24	20	23
Mercury	U	2450	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	30	45	41	48	51	48	50
Lead	U	2450	mg/kg	0.50	14	11	31	18	15	11	24
Selenium	U	2450	mg/kg	0.20	< 0.20	0.83	2.0	0.30	< 0.20	0.60	0.84
Zinc	U	2450	mg/kg	0.50	49	53	69	73	54	50	96
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	U	2625	%	0.40	1.1	1.2	2.9	0.72	0.76	1.5	1.9
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	16	65	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	16	65	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0



Results - Soil

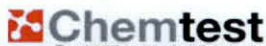
Client: Causeway Geotech Ltd		Chemtest Job No.:	18-24061	18-24061	18-24061	18-24061	18-24061	18-24061	18-24061	18-24061	18-24061
Chemtest Sample ID.:		669633	669634	669635	669636	669637	669638	669639	669640		
Client Location ID.:		BH08	BH08	BH11	BH11	BH13	BH13	BH14	BH14		
Client Sample Ref.:		ES1	ES2	ES2	ES1	ES1	ES2	ES1	ES2		
Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL		
Top Depth (m):		0.5	1.5	1.50	0.50	0.5	1.5	0.5	1.5		
Date Sampled:		09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018	09-Aug-2018		
Asbestos Lab:		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY		
Determinand	Accred.	SOP	Units	LOD							
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	25	97	< 1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	25	97	< 5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	41	160	< 10	< 10	< 10	< 10
Naphthalene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.32	< 0.10
Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.66	< 0.10
Benzo[a]anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[a]pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-c,g)Pyrene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz[a,h]Anthracene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Total Of 16 PAH's	U	2700	µg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Resorcinol	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Phenol	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Cresols	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Xylenols	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
1-Naphthol	N	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Trimethylphenols	U	2920	mg/kg	0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Total Phenols	U	2920	mg/kg	0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30



Results - Soil

The right chemistry to deliver results
 Project: 18-0827 Lands at Ballymakelly

Client: Causeway Geotech Ltd		Chemtest Job No.:		18-24061	18-24061
Quotation No.:		Chemtest Sample ID.:		669841	669842
Order No.:		Client Location ID.:		BH15	BH15
		Client Sample Ref.:		ES1	ES2
		Sample Type:		SOIL	SOIL
		Top Depth (m):		0.5	1.5
		Date Sampled:		09-Aug-2018	09-Aug-2018
		Asbestos Lab:		COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD	
ACM Type	U	2192		N/A	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected
Molsture	N	2030	%	0.020	9.8
pH	U	2010		N/A	8.4
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	< 0.40
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	< 0.010
Cyanide (Free)	U	2300	mg/kg	0.50	< 0.50
Cyanide (Total)	U	2300	mg/kg	0.50	< 0.50
Thiocyanate	U	2300	mg/kg	5.0	< 5.0
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	2.1
Sulphate (Total)	U	2430	%	0.010	0.024
Arsenic	U	2450	mg/kg	1.0	44
Cadmium	U	2450	mg/kg	0.10	1.2
Chromium	U	2450	mg/kg	1.0	20
Copper	U	2450	mg/kg	0.50	23
Mercury	U	2450	mg/kg	0.10	< 0.10
Nickel	U	2450	mg/kg	0.50	54
Lead	U	2450	mg/kg	0.50	16
Selenium	U	2450	mg/kg	0.20	0.73
Zinc	U	2450	mg/kg	0.50	58
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50
Organic Matter	U	2625	%	0.40	0.86
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0



Results - Soil

The right chemistry to deliver results
 Project: 18-0827 Lands at Ballymakelly

Client: Causeway Geotech Ltd		Chemtest Job No.:		18-24061	18-24061
Quotation No.:		Chemtest Sample ID.:		669841	669842
Order No.:		Client Location ID.:		BH15	BH15
		Client Sample Ref.:		ES1	ES2
		Sample Type:		SOIL	SOIL
		Top Depth (m):		0.5	1.5
		Date Sampled:		09-Aug-2018	09-Aug-2018
		Asbestos Lab:		COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD	
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10
Naphthalene	U	2700	mg/kg	0.10	< 0.10
Acenaphthylene	U	2700	mg/kg	0.10	< 0.10
Acenaphthene	U	2700	mg/kg	0.10	< 0.10
Fluorene	U	2700	mg/kg	0.10	< 0.10
Phenanthrene	U	2700	mg/kg	0.10	< 0.10
Anthracene	U	2700	mg/kg	0.10	< 0.10
Fluoranthene	U	2700	mg/kg	0.10	< 0.10
Pyrene	U	2700	mg/kg	0.10	< 0.10
Benzo(a)anthracene	U	2700	mg/kg	0.10	< 0.10
Chrysene	U	2700	mg/kg	0.10	< 0.10
Benzo(b)fluoranthene	U	2700	mg/kg	0.10	< 0.10
Benzo(k)fluoranthene	U	2700	mg/kg	0.10	< 0.10
Benzo(a)pyrene	U	2700	mg/kg	0.10	< 0.10
Indeno(1,2,3-c,d)pyrene	U	2700	mg/kg	0.10	< 0.10
Dibenz(a,h)anthracene	U	2700	mg/kg	0.10	< 0.10
Benzo(g,h)perylene	U	2700	mg/kg	0.10	< 0.10
Total Of 16 PAHs	U	2700	mg/kg	2.0	< 2.0
Benzene	U	2760	µg/kg	1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0
Resorcinol	U	2920	mg/kg	0.050	< 0.050
Phenol	U	2920	mg/kg	0.050	< 0.050
Cresols	U	2920	mg/kg	0.050	< 0.050
Xylenols	U	2920	mg/kg	0.050	< 0.050
1-Naphthol	N	2920	mg/kg	0.050	< 0.050
Trimethylphenols	U	2920	mg/kg	0.050	< 0.050
Total Phenols	U	2920	mg/kg	0.30	< 0.30



Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- IS Insufficient Sample
- US Unusable Sample
- NE not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
 The results relate only to the items tested
 Uncertainty of measurement for the determinands tested are available upon request
 None of the results in this report have been recovery corrected
 All results are expressed on a dry weight basis
 The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
 For all other tests the samples were dried at < 37°C prior to analysis
 All Asbestos testing is performed at the indicated laboratory
 Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

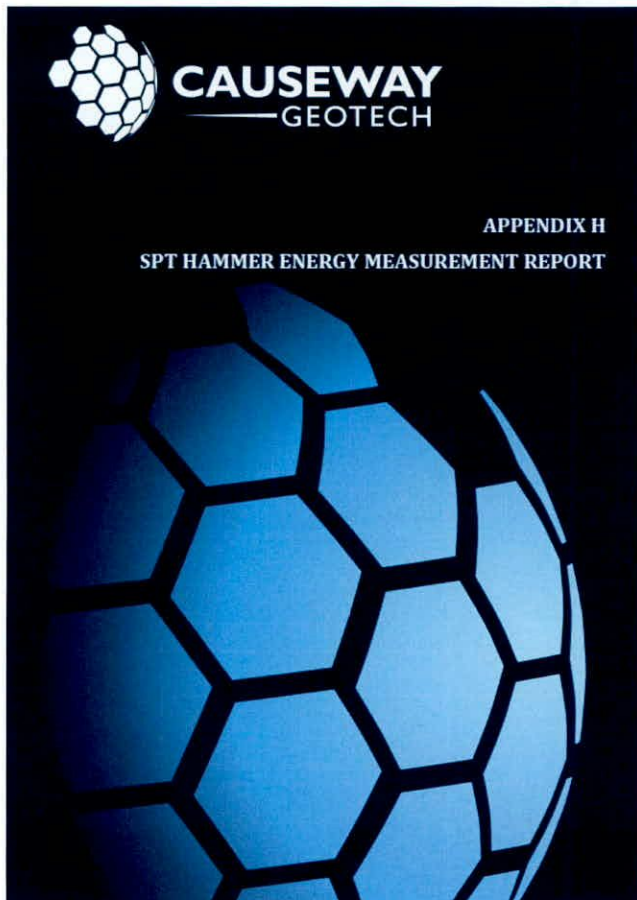
Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
 All water samples will be retained for 14 days from the date of receipt
 Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to: customerservices@chemtest.co.uk



SPT Hammer Energy Test Report
 in accordance with BS EN ISO 22476-3:2005

Neil Burrows
 Southern Testing Laboratories
 Unit 11
 Charlwoods Road
 East Grinstead
 RH19 2HU

SPT Hammer Ref: T10267
 Test Date: 14/04/2018
 Report Date: 15/04/2018
 File Name: T10267.spt
 Test Operator: CAUSEWAY

Instrumented Rod Data

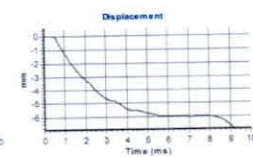
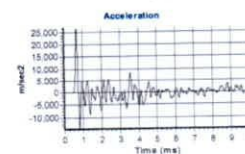
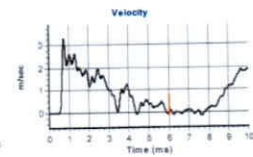
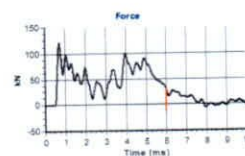
Diameter d_r (mm): 54
 Wall Thickness t_r (mm): 6.0
 Assumed Modulus E_s (GPa): 200
 Accelerometer No.1: 6458
 Accelerometer No.2: 9607

SPT Hammer Information

Hammer Mass m (kg): 63.5
 Falling Height h (mm): 760
 SPT String Length L (m): 10.5

Comments / Location

Causeway Yard



Calculations

Area of Rod A (mm²): 905
 Theoretical Energy E_{theor} (J): 473
 Measured Energy E_{meas} (J): 351

Energy Ratio E_r (%): **74**

N.P. Burrows
 Signed: N.P. Burrows
 Title: Field Operations Manager

The recommended calibration interval is 12 months

Appendix 7.3 Soil chemical test analysis results



Element Materials Technology P: +44 (0) 1244 833780
 Unit 3 Deeside Point F: +44 (0) 1244 833781
 Zone 3
 Deeside Industrial Park W: www.element.com
 Deeside
 CH5 2JA

AWN Consulting
 Tecpro Building
 Clonshaugh Business & Technology Park
 Dublin
 Dublin 17
 Ireland



Attention : Colm Driver
Date : 4th December, 2020
Your reference :
Our reference : Test Report 20/16584 Batch 1
Location : Edgeconnex, Grangecastle
Date samples received : 26th November, 2020
Status : Final report
Issue : 1

Four samples were received for analysis on 26th November, 2020 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied. All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Phil Sommerton BSc
 Senior Project Manager

Please include all sections of this report if it is reproduced

Element Materials Technology Environmental UK Limited
 Registered in England and Wales
 Registered Office: 10 Lower Grosvenor Place, London, SW1W 0EN
 Company Registration No: 11371415

1 of 10

Element Materials Technology

Client Name: AWN Consulting
Reference:
Location: Edgeconnex, Grangecastle
Contact: Colm Driver
EMT Job No: 20/16584

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
 H=H₂SO₄, Z=ZnAc, N=NaOH, HN=HNO₃

EMT Sample No.	1-6		7-12		13-18		19-24		LOD/LOR	Units	Method No.
	Sample ID	Depth	COC No / misc	Containers	Sample Date	Sample Type	Batch Number	Date of Receipt			
	BH05	BH10	BH11	BH15							
	V H H N P G	V H H N P G	V H H N P G	V H H N P G							
	25/11/2020 10:00	25/11/2020 10:20	25/11/2020 10:30	25/11/2020 11:00							
	Ground Water	Ground Water	Ground Water	Ground Water							
	1	1	1	1							
	26/11/2020	26/11/2020	26/11/2020	26/11/2020							
Dissolved Arsenic*	<2.5	<2.5	<2.5	<2.5					<2.5	ug/l	TM30/PM14
Dissolved Boron	13	<12	13	14					<12	ug/l	TM30/PM14
Dissolved Cadmium*	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM30/PM14
Total Dissolved Chromium*	<1.5	<1.5	<1.5	<1.5					<1.5	ug/l	TM30/PM14
Dissolved Copper*	<7	<7	<7	<7					<7	ug/l	TM30/PM14
Dissolved Lead*	<5	<5	<5	<5					<5	ug/l	TM30/PM14
Dissolved Mercury*	<1	<1	<1	<1					<1	ug/l	TM30/PM14
Dissolved Nickel*	4	<2	3	4					<2	ug/l	TM30/PM14
Dissolved Selenium*	<3	<3	<3	<3					<3	ug/l	TM30/PM14
Dissolved Zinc*	<3	<3	<3	7					<3	ug/l	TM30/PM14
PAH MS											
Naphthalene*	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM4/PM30
Acenaphthylene*	<0.013	<0.013	<0.013	<0.013					<0.013	ug/l	TM4/PM30
Acenaphthene*	<0.013	<0.013	<0.013	<0.013					<0.013	ug/l	TM4/PM30
Fluorene*	<0.014	<0.014	<0.014	<0.014					<0.014	ug/l	TM4/PM30
Phenanthrene*	<0.011	<0.011	<0.011	<0.011					<0.011	ug/l	TM4/PM30
Anthracene*	<0.013	<0.013	<0.013	<0.013					<0.013	ug/l	TM4/PM30
Fluoranthene*	<0.012	<0.012	<0.012	<0.012					<0.012	ug/l	TM4/PM30
Pyrene*	<0.013	<0.013	<0.013	<0.013					<0.013	ug/l	TM4/PM30
Benzo(a)anthracene*	<0.015	<0.015	<0.015	<0.015					<0.015	ug/l	TM4/PM30
Chrysene*	<0.011	<0.011	<0.011	<0.011					<0.011	ug/l	TM4/PM30
Benzo(b)fluoranthene*	<0.018	<0.018	<0.018	<0.018					<0.018	ug/l	TM4/PM30
Benzo(a)pyrene*	<0.016	<0.016	<0.016	<0.016					<0.016	ug/l	TM4/PM30
Indeno(123cd)pyrene*	<0.011	<0.011	<0.011	<0.011					<0.011	ug/l	TM4/PM30
Dibenzo(ah)anthracene*	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Benzo(ghi)perylene*	<0.011	<0.011	<0.011	<0.011					<0.011	ug/l	TM4/PM30
PAH 16 Total*	<0.195	<0.195	<0.195	<0.195					<0.195	ug/l	TM4/PM30
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01					<0.01	ug/l	TM4/PM30
PAH Surrogate % Recovery	86	85	88	77					<0	%	TM4/PM30
Methyl Tertiary Butyl Ether*	<0.1	<0.1	<0.1	<0.1					<0.1	ug/l	TM15/PM10
Benzene*	<0.5	<0.5	<0.5	<0.5					<0.5	ug/l	TM15/PM10
Toluene*	<5	<5	<5	<5					<5	ug/l	TM15/PM10
Ethylbenzene*	<1	<1	<1	<1					<1	ug/l	TM15/PM10
m/p-Xylene*	<2	<2	<2	<2					<2	ug/l	TM15/PM10
o-Xylene*	<1	<1	<1	<1					<1	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	97	96	96	96					<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	94	96	95	95					<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Notification of Deviating Samples

Client Name: AWN Consulting
Reference:
Location: Edgeconnex, Grangecastle
Contact: Colm Driver

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/16584						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/16584

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overestimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

EMT Job No.: 20/16584

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

Element Materials Technology

Method Code Appendix

EMT Job No: 20/16584

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK subs only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM4	Modified USEPA 8270D v5.2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM4	Modified USEPA 8270D v5.2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified 8015B v2.1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GC/FID. For waters the solvent extracts dissolved phase plus a shen if present.	PM16/PM30	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE/Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	please refer to TM5 and TM36 for method details	PM12/PM16/PM30	please refer to PM16/PM30 and PM12 for method details	Yes			
TM15	Modified USEPA 8260B v2.1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2.2014. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260B v2.1996. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021A v2.2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270D v5.2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270D v5.2014. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM17	Modified US EPA method 8270D v5.2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry). WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 8010B, Rev. 2, Dec. 1996; Modified BS EN ISO 11885:2009; SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			

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Element Materials Technology

Method Code Appendix

EMT Job No: 20/16584

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/ANAS)	MCERTS (UK subs only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry). WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 8010B, Rev. 2, Dec. 1996; Modified BS EN ISO 11885:2009; SOILS by Modified USEP	PM14	Preparation of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for Dissolved metals, and remain unfiltered for Total metals then acidified	Yes			
TM36	Modified US EPA method 8015B v2.1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GC/FID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2.2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulfate 375.4 (Rev 2 1993), o-Phosphate 365.2 (Rev 2 1993), TON 363.1 (Rev 2 1993), Nitrate 354.1 (1971), Hex Cr 7195A (1992), NH4+ 350.1 (Rev 2 1993 (comparab)	PM0	No preparation is required.	Yes			
TM38/TM125	Total Nitrogen/Organic Nitrogen by calculation	PM0	No preparation is required.				
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 – 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1 (1982). Determination of Specific Conductance by Metrohm automated probe analyser	PM0	No preparation is required.	Yes			

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CHAPTER 8 - HYDROLOGY**Appendix 8.1 Criteria for rating Site Attributes - Estimation of Importance of Hydrology Attributes (NRA)**

Importance	Criteria	Typical Examples
Extremely High	Attribute has a high quality or value on an international scale	River, wetland or surface water body ecosystem protected by EU legislation e.g. 'European sites' designated under the Habitats Regulations or 'Salmonid waters' designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988.
Very High	Attribute has a high quality or value on a regional or national scale	River, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Quality Class A (Biotic Index Q4, Q5) Flood plain protecting more than 50 residential or commercial properties from flooding Nationally important amenity site for wide range of leisure activities
High	Attribute has a high quality or value on a local scale	Salmon fishery Locally important potable water source supplying >1000 homes Quality Class B (Biotic Index Q3-4) Flood plain protecting between 5 and 50 residential or commercial properties from flooding Locally important amenity site for wide range of leisure activities
Medium	Attribute has a medium quality or value on a local scale	Coarse fishery Local potable water source supplying >50 homes Quality Class C (Biotic Index Q3, Q2- 3) Flood plain protecting between 1 and 5 residential or commercial properties from flooding
Low	Attribute has a low quality or value on a local scale	Locally important amenity site for small range of leisure activities Local potable water source supplying <50 homes Quality Class D (Biotic Index Q2, Q1) Flood plain protecting 1 residential or commercial property from flooding Amenity site used by small numbers of local people

Estimation of magnitude of impact on hydrology attribute (NRA)

Magnitude of Impact	Criteria	Typical Examples
Large Adverse	Results in loss of attribute	Loss or extensive change to a waterbody or water dependent habitat. Increase in predicted peak flood level >100mm. Extensive loss of fishery. Calculated risk of serious pollution incident >2% annually. Extensive reduction in amenity value.
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	Increase in predicted peak flood level >50mm. Partial loss of fishery. Calculated risk of serious pollution incident >1% annually. Partial reduction in amenity value.
Small Adverse	Results in minor impact on integrity of attribute or loss of small part of attribute	Increase in predicted peak flood level >10mm. Minor loss of fishery. Calculated risk of serious pollution incident >0.5% annually. Slight reduction in amenity value.
Negligible	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity	Negligible change in predicted peak flood level. Calculated risk of serious pollution incident <0.5% annually.
Minor Beneficial	Results in minor improvement of attribute quality	Reduction in predicted peak flood level >10mm. Calculated reduction in pollution risk of 50% or more where existing risk is <1% annually.
Moderate Beneficial	Results in moderate improvement of attribute quality	Reduction in predicted peak flood level >50mm. Calculated reduction in pollution risk of 50% or more where existing risk is >1% annually.
Major Beneficial	Results in major improvement of attribute quality	Reduction in predicted peak flood level >100mm

Rating of Significant Environmental Impacts at EIS Stage (NRA)

Importance of Attribute	Magnitude of Importance			
	Negligible	Small Adverse	Moderate Adverse	Large Adverse
Extremely High	Imperceptible	Significant	Profound	Profound
Very High	Imperceptible	Significant/moderate	Profound/Significant	Profound
High	Imperceptible	Moderate/Slight	Significant/moderate	Profound/Significant
Medium	Imperceptible	Slight	Moderate	Significant
Low	Imperceptible	Imperceptible	Slight	Slight/Moderate

CHAPTER 9 - NOISE AND VIBRATION**Appendix 9.1 Glossary of acoustic terminology (prepared by AWN Consulting Ltd.)**

ambient noise	The totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, near and far.
background noise	The steady existing noise level present without contribution from any intermittent sources. The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90 per cent of a given time interval, T ($L_{AF90,T}$).
broadband	Sounds that contain energy distributed across a wide range of frequencies.
dB	Decibel - The scale in which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the RMS pressure of the sound field and the reference pressure of 20 micro-pascals (20 μ Pa).
dB L_{pA}	An 'A-weighted decibel' - a measure of the overall noise level of sound across the audible frequency range (20 Hz – 20 kHz) with A-frequency weighting (i.e. 'A'-weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Hertz (Hz)	The unit of sound frequency in cycles per second.
impulsive noise	A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background.
$L_{Aeq,T}$	This is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period (T). The closer the L_{Aeq} value is to either the L_{AF10} or L_{AF90} value indicates the relative impact of the intermittent sources and their contribution. The relative spread between the values determines the impact of intermittent sources such as traffic on the background.
L_{AFN}	The A-weighted noise level exceeded for N% of the sampling interval. Measured using the "Fast" time weighting.
L_{AFmax}	is the instantaneous slow time weighted maximum sound level measured during the sample period (usually referred to in relation to construction noise levels).
$L_{Ar,T}$	The Rated Noise Level, equal to the L_{Aeq} during a specified time interval (T), plus specified adjustments for tonal character and impulsiveness of the sound.
L_{AF90}	Refers to those A-weighted noise levels in the lower 90 percentile of the sampling interval; it is the level which is exceeded for 90% of the measurement period. It will therefore exclude the intermittent features of traffic and is used to estimate a background level. Measured using the "Fast" time weighting.
$L_{AT}(DW)$	equivalent continuous downwind sound pressure level.
$L_{IT}(DW)$	equivalent continuous downwind octave-band sound pressure level.
L_{day}	L_{day} is the average noise level during the daytime period of 07:00hrs to 19:00hrs
L_{night}	L_{night} is the average noise level during the night-time period of 23:00hrs to 07:00hrs.
low frequency noise	LFN - noise which is dominated by frequency components towards the lower end of the frequency spectrum.
noise	Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a person exposed to it, or any sound that could cause

actual physiological harm to a person exposed to it, or physical damage to any structure exposed to it, is known as noise.

noise sensitive location NSL – Any dwelling house, hotel or hostel, health building, educational establishment, place of worship or entertainment, or any other facility or other area of high amenity which for its proper enjoyment requires the absence of noise at nuisance levels.

octave band A frequency interval, the upper limit of which is twice that of the lower limit. For example, the 1,000Hz octave band contains acoustical energy between 707Hz and 1,414Hz. The centre frequencies used for the designation of octave bands are defined in ISO and ANSI standards.

rating level See $L_{A,r,T}$.

sound power level The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m² where:

$$L_w = 10 \text{Log} \frac{P}{P_0} \text{ dB}$$

Where: p is the rms value of sound power in pascals; and P_0 is 1 pW.

sound pressure level The sound pressure level at a point is defined as:

$$L_p = 20 \text{Log} \frac{P}{P_0} \text{ dB}$$

specific noise level A component of the ambient noise which can be specifically identified by acoustical means and may be associated with a specific source. In BS 4142, there is a more precise definition as follows: 'the equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval ($L_{Aeq, T}$)'.

tonal Sounds which cover a range of only a few Hz which contains a clearly audible tone i.e. distinguishable, discrete or continuous noise (whine, hiss, screech, or hum etc.) are referred to as being 'tonal'.

1/3 octave analysis Frequency analysis of sound such that the frequency spectrum is subdivided into bands of one-third of an octave each.

Appendix 9.2 Noise monitoring details (AWN Consulting Ltd.)

A series of environmental noise surveys were conducted in order to quantify the existing noise environment. The survey was conducted in accordance with *ISO/DIS 1996-2 Acoustics - Description, measurement and assessment of environmental noise -- Part 2: Determination of sound pressure levels (2015)*. Specific details are set out below.

Choice of noise monitoring locations

Noise measurements were conducted at three positions on the site boundary that are reflective of noise levels at the nearest noise sensitive locations and the common boundary with the Cuisine de France facility to the west. Details for the particular locations are outlined below:

Location S01 Located in the north western corner of the site in line with the common boundary of the nearest noise sensitive locations at the junction of the R102 and the Grand Canal.

Location S02 Located on the south western corner of the site along with the common boundary of a nearby noise sensitive location. The location is representative of the row of noise sensitive locations that along the R102 beyond the western boundary of the proposed development.

Location S03 Located in the vicinity of the nearest residential location to the north east of the proposed development site. The property is located on the boundary of the Grangecastle Business Park and is immediately adjacent a number of commercial activities.

Location S04 Located in the north eastern concern of the development lands. This location is considered to be representative of noise levels currently experienced in the vicinity of the residential properties on the Royal Canal to the north.

Location S05 Located in the south western concern of the development lands. The location is considered to be representative of noise levels currently experienced in the vicinity of the halting site located to the south west at some 200 m distance.

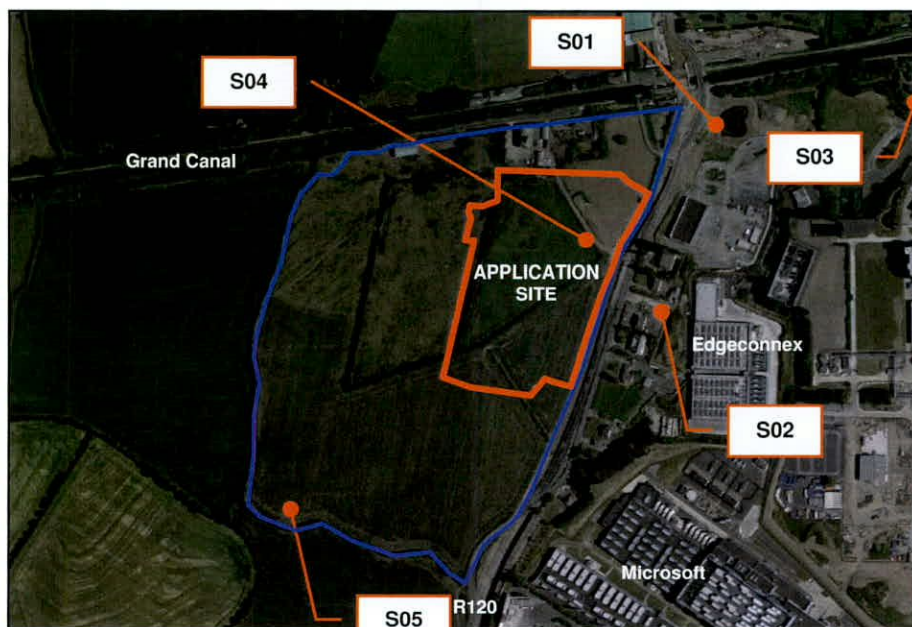


Figure A Noise monitoring locations (Source: Bing Maps)

Survey periods

Measurements were conducted over the course of the following survey periods:

Table A Noise monitoring periods

Locations	Period	Start Time/Date	End Time/Date
S01, S02, S03	Day	09:50hrs 9 April 2016	12:40hrs 9 April 2016
	Evening	21:40hrs 9 April 2016	22:50hrs 9 April 2016

	Night	23:00hrs 9 April 2016	01:40hrs 10 April 2016
S04, S05	Unattended	15:00hrs 4 November 2020	11:45hrs 10 November 2020

Personnel & Instrumentation

AWN conducted the noise level measurements during the various survey periods. The measurements were performed using Brüel & Kjær Type 2260 Modular Precision Sound Analysers. Before and after the survey the measurement apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator. Donogh Casey installed and removed the noise meters on site in the 2020 unattended survey.

Table B Instrumentation details

Meter	Serial Number
Brüel & Kjær 2260	2248262
Rion NL-42	575802
Rion NL-52	186670

Procedure

During each of the daytime, evening and night-time periods, measurements were conducted on a continuous basis over the stated time periods. Sample periods were 15 minutes during all surveys. The results were saved to the instrument memory for later analysis where appropriate. Survey personnel noted all primary noise sources contributing to noise build-up. In terms of the various locations the following significant noise sources (in subjective order of influence) were noted:

Table C Significant noise sources

Location	
S01	S02
<ul style="list-style-type: none"> R120 road traffic noise. Water running in a nearby canal in absence of traffic. Site work and plant noise associated with existing sites. During evening period noise dominated by traffic and water noise associated with the canal. During night time plant noise from existing facilities (to the East and South) is the dominant background source. 	<ul style="list-style-type: none"> Plant noise from facility to the south. Noise from existing site including impulsive noise (bangs) and reverse alarms. Dogs barking and birdsong. During the evening distant traffic noise and plant noise noted. During night time existing plant noise from southern existing facilities is the dominant source. Distant traffic also noted.
Location	
S03	S04
<ul style="list-style-type: none"> Noise dominated by existing plant noise from adjacent facility. Occasional bus passing by. Water flow from nearby watercourse. Reverse alarms and construction noise from nearby site. As above for evening period with the exception of construction noise. During night time plant noise from the adjacent facility and water flow from nearby watercourse. 	<ul style="list-style-type: none"> R120 road traffic noise. Water flow from nearby watercourse. During night time plant noise from the adjacent facility and water flow from nearby watercourse noted.
Location	
S05	
<ul style="list-style-type: none"> R120 road traffic noise. Water flow from nearby watercourse. During night time plant noise from the adjacent facility and water flow from nearby watercourse noted. 	

Noise Monitoring Results

The noise data collated during the current noise survey is extensive in nature. It is not produced in full here however is available on request.

Table D presents average daytime and night time noise levels measured at the monitoring location over the period of the noise monitoring programme.

Table D Noise monitoring results

Location	Date	Period	Start Time	Measured Noise Levels (dB re. 2x10 ⁻⁵ Pa)		
				L _{Aeq,15min}	L _{AFMax}	L _{A90,15min}
S01	9 April	Day	09:51	58	71	44
	9 April	Day	11:15	61	76	47
	9 April	Evening	21:46	53	63	45
	10 April	Night	00:01	48	61	42
	10 April	Night	00:58	49	67	43
S02	9 April	Day	10:23	48	65	42
	9 April	Day	11:37	48	73	41
	9 April	Day	12:47	49	65	43
	9 April	Evening	22:04	44	61	41
	9 April	Night	23:38	41	63	39
	10 April	Night	01:20	40	61	38
S03	9 April	Day	10:50	53	76	47
	9 April	Day	12:05	53	73	48
	9 April	Day	12:21	52	72	48
	9 April	Evening	22:35	51	68	49
	9 April	Night	23:00	51	70	48
	9 April	Night	23:16	49	54	48

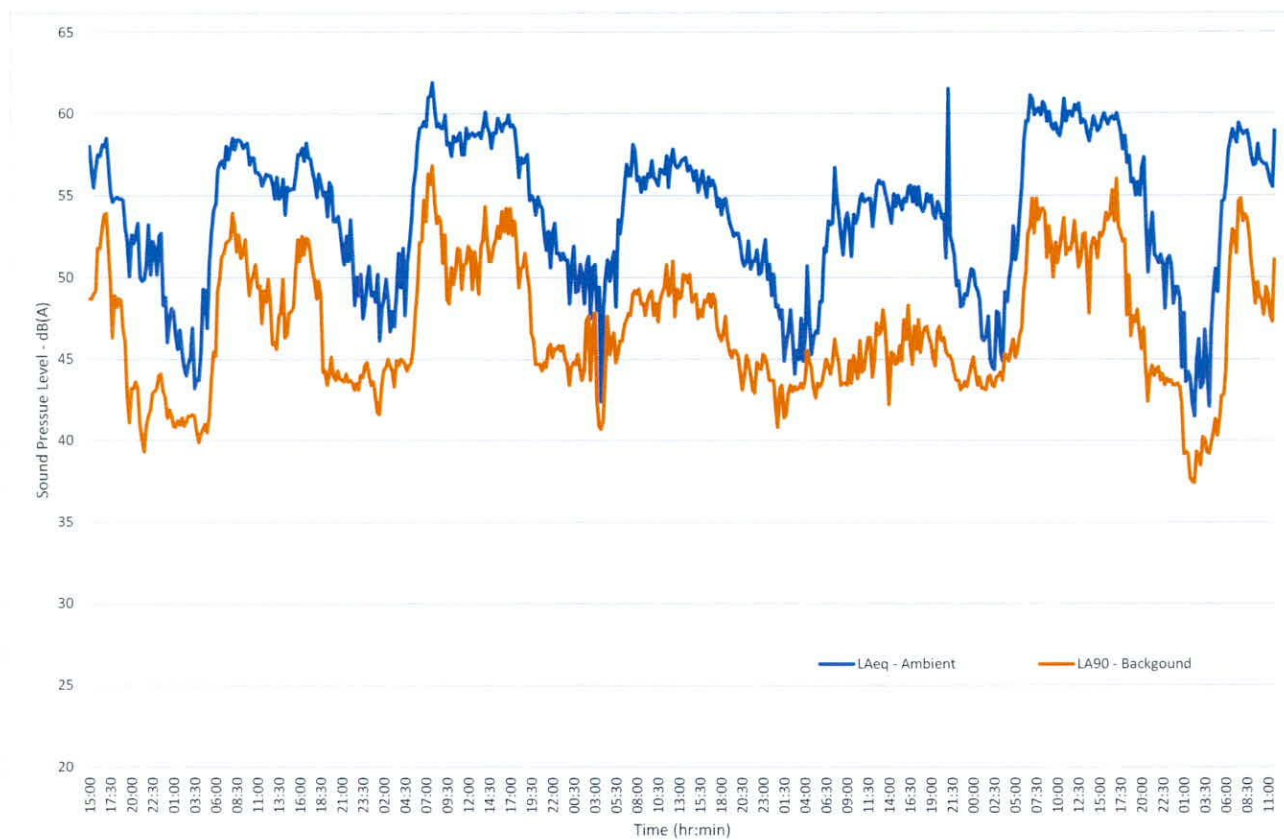


Figure B Unattended Noise Monitoring – Location S04

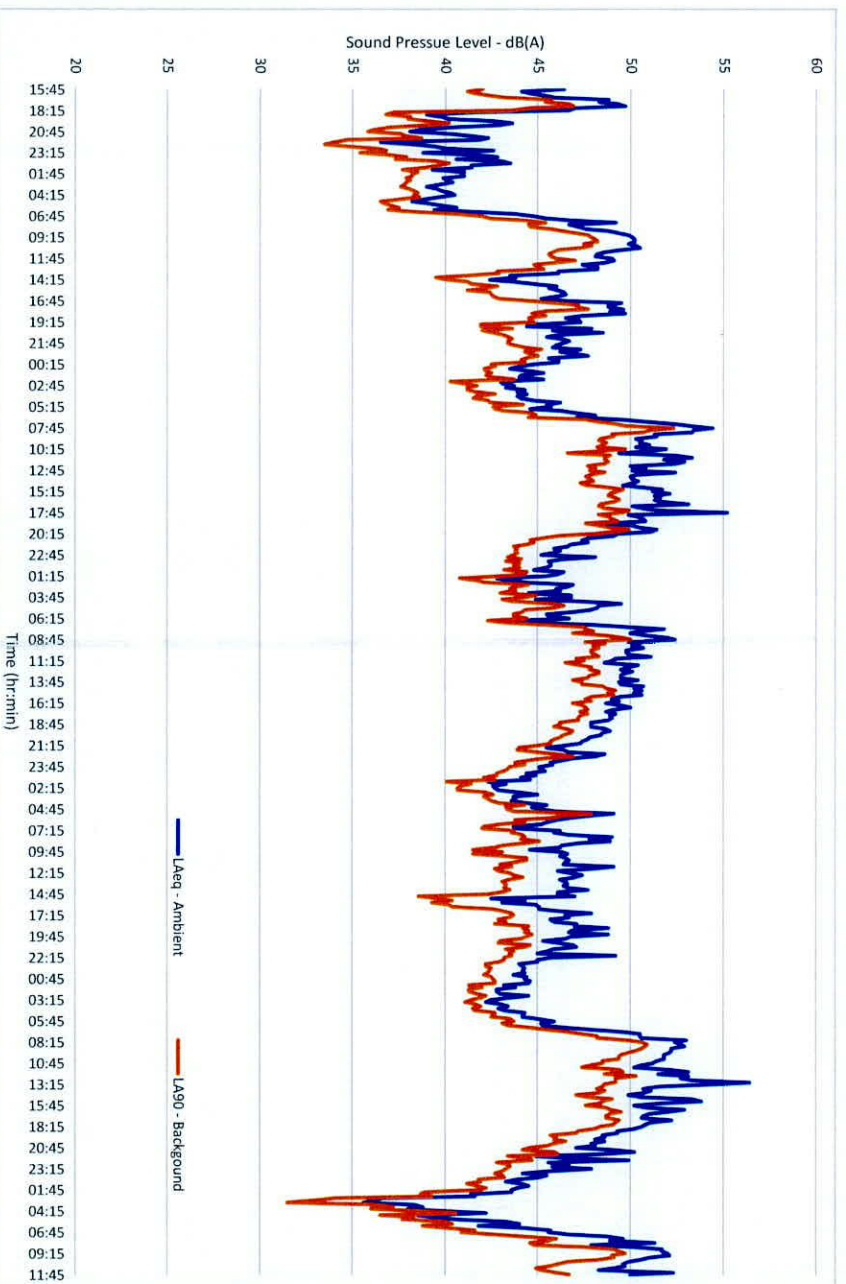


Figure C Unattended Noise Monitoring – Location S05

Appendix 9.3 Indicative construction noise & vibration management plan

This Noise and Vibration Management Plan (NVMP) details a 'Best Practice' approach to dealing with potential noise and vibration emissions during the construction phase of the development. The Plan should be adopted by all contractors and sub-contractors involved in construction activities on the site. The Site Manager should ensure that adequate instruction is provided to contractors regarding the noise and vibration control measures contained within this document.

The environmental impact assessment report conducted for the construction activity has highlighted that the construction noise and vibration levels can be controlled to within the adopted criteria. However, mitigation measures should be implemented, where necessary, in order to control impacts to nearby sensitive areas within acceptable levels.

Nearby sensitive properties in the vicinity of the proposed development are summarised in Figure A below:

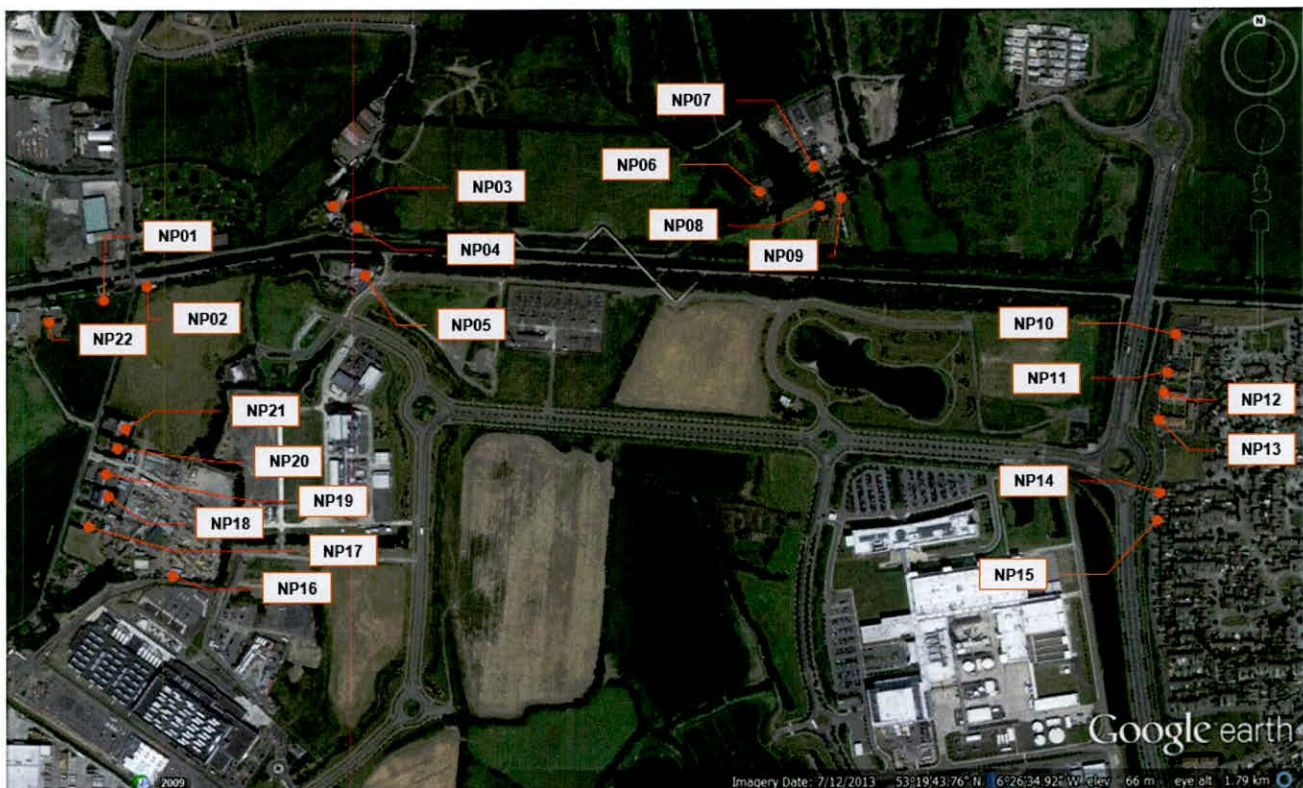


Figure A Sensitive receptors

Construction Noise Criteria

As referenced in the EIS prepared for the site, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the National Roads Authority (NRA) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*¹⁴ which indicates the following criteria and hours of operation.

Table A Construction noise limit values

Days and Times	Noise Levels (dB re. 2x10 ⁻⁵ Pa)	
	L _{Aeq} (1hr)	L _{Amax}
Monday to Friday 07:00hrs to 19:00hrs	70	80
Monday to Friday 19:00 to 22:00hrs	60*	65*
Saturdays 08:00hrs to 14:00hrs	65	75

Note * Construction activity at these times, other than that required for emergency works, will normally require the explicit permission of the relevant local authority.

¹⁴ *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1, 25 October 2004*, National Roads Authority.

Construction Vibration Criteria

It is recommended in the EIS that vibration from construction activities to off-site residences be limited to the values set out in Table B. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage these limits may need to be reduced by up to 50%.

Table B Construction vibration limit values

Allowable vibration (in terms of peak particle velocity) at the closest part of sensitive property to the source of vibration, at a frequency of		
Less than 10 Hz	10 to 50 Hz	50 to 100 Hz (and above)
8 mm/s	12.5 mm/s	20 mm/s

Hours of Work

The proposed general construction hours are 07:00 to 19:00hrs, Monday to Friday and 08:00 to 13:00 on Saturdays. However, there are also weekday evening works proposed (19:00 to 23:00hrs).

Weekday evening activities should be significantly reduced and generally only involve internal activities and concrete pouring which will be required during certain phases of the development. As a result, noise emissions from evening activities are expected to be significantly lower than for other general daytime activities.

Best Practice Guidelines for the Control of Noise & Vibration

BS5228 includes guidance on several aspects of construction site mitigation measures, including, but not limited to:

- selection of quiet plant;
- control of noise sources;
- screening;
- hours of work;
- liaison with the public, and;
- monitoring.

Detailed comment is offered on these items in the following paragraphs. Noise and vibration control measures that will be considered include the selection of suitable plant, enclosures and screens around noise sources, limiting the hours of work and monitoring.

Selection of Quiet Plant

This practice is recommended in relation to sites with static plant such as compressors and generators. It is recommended that these units be supplied with manufacturers' proprietary acoustic enclosures where possible. The potential for any item of plant to generate noise will be assessed prior to the item being brought onto the site. The least noisy item should be selected wherever possible. Should a particular item of plant already on the site be found to generate high noise levels, the first action should be to identify whether or not said item can be replaced with a quieter alternative.

General Comments on Noise Control at Source

If replacing a noisy item of plant is not a viable or practical option, consideration should be given to noise control "at source". This refers to the modification of an item of plant or the application of improved sound reduction methods in consultation with the supplier. For example, resonance effects in panel work or cover plates can be reduced through stiffening or application of damping compounds; rattling and grinding noises can often be controlled by fixing resilient materials in between the surfaces in contact.

BS5228 states that "*as far as reasonably practicable sources of significant noise should be enclosed*". In applying this guidance, constraints such as mobility, ventilation, access and safety must be taken into account. Items suitable for enclosure include pumps and generators. Demountable enclosures will also be used to screen operatives using hand tools and will be moved around site as necessary.

In practice, a balance may need to be struck between the use of all available techniques and the resulting costs of doing so. As with Ireland's Environmental Protection Act legislation, we propose that the concept of

“best available techniques not entailing excessive cost” (BATNEEC) be adopted. Furthermore, proposed noise control techniques should be evaluated in light of their potential effect on occupational safety etc. BS5228 makes a number of recommendations in relation to “use and siting of equipment”. These are all directly relevant and hence are reproduced in full. These recommendations will be adopted on site.

“Plant should always be used in accordance with manufacturers’ instructions. Care should be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading should also be carried out away from such areas. Special care will be necessary when work has to be carried out at night.

Circumstances can arise when night-time working is unavoidable. Bearing in mind the special constraints under which such work has to be carried out, steps should be taken to minimise disturbance to occupants of nearby premises.

Machines such as cranes that may be in intermittent use should be shut down between work periods or should be throttled down to a minimum. Machines should not be left running unnecessarily, as this can be noisy and waste energy.

Plant known to emit noise strongly in one direction should, when possible, be orientated so that the noise is directed away from noise-sensitive areas. Attendant operators of the plant can also benefit from this acoustical phenomenon by sheltering, when possible, in the area with reduced noise levels.

Acoustic covers to engines should be kept closed when the engines are in use and idling. The use of compressors that have effective acoustic enclosures and are designed to operate when their access panels are closed is recommended.

Materials should be lowered whenever practicable and should not be dropped. The surfaces on to which the materials are being moved could be covered by resilient material.”

All items of plant should be subject to regular maintenance. Such maintenance can prevent unnecessary increases in plant noise and can serve to prolong the effectiveness of noise control measures.

Screening

Typically screening is an effective method of reducing the noise level at a receiver location and can be used successfully as an additional measure to all other forms of noise control. The effectiveness of a noise screen will depend on the height and length of the screen and its position relative to both the source and receiver.

The length of the screen should in practice be at least five times the height, however, if shorter sections are necessary then the ends of the screen should be bent around the source. The height of any screen should be such that there is no direct line of sight between the source and the receiver.

BS5228 states that on level sites the screen should be placed as close as possible to either the source or the receiver. The construction of the barrier should be such that there are no gaps or openings at joints in the screen material. In most practical situations the effectiveness of the screen is limited by the sound transmission over the top of the barrier rather than the transmission through the barrier itself. In practice screens constructed of materials with a mass per unit of surface area greater than 7 kg/m² will give adequate sound insulation performance.

In addition, careful planning of the site layout should also be considered. The placement of site buildings such as offices and stores and in some instances materials such as topsoil or aggregate can provide a degree of noise screening if placed between the source and the receiver.

Vibration

The vibration from construction activities will be limited to the values set out in Table 2. It should be noted that these limits are not absolute, but provide guidance as to magnitudes of vibration that are very unlikely to cause cosmetic damage. Magnitudes of vibration slightly greater than those in the table are normally unlikely to cause cosmetic damage, but construction work creating such magnitudes should proceed with caution. Where there is existing damage, these limits may need to be reduced by up to 50%.

Liaison with the Public

The Contractor will provide proactive community relations and will notify the public and sensitive premises before the commencement of any works forecast to generate appreciable levels of noise or vibration, explaining the nature and duration of the works. The Contractor will distribute information circulars informing people of the progress of works and any likely periods of significant noise and vibration.

A designated noise liaison should be appointed to site during construction works. Any complaints should be logged and followed up in a prompt fashion. In addition, prior to particularly noisy construction activity, e.g. rock breaking, piling, etc., the site contact should inform the nearest noise sensitive locations of the time and expected duration of the works.

Noise Monitoring

During the construction phase consideration should be given to noise monitoring at the nearest sensitive locations.

Noise monitoring should be conducted in accordance with the International Standard ISO 1996: 2007: *Acoustics – Description, measurement and assessment of environmental noise* and be located a distance of greater than 3.5m away from any reflective surfaces, e.g. walls, in order to ensure a free-field measurement without any influence from reflected noise sources.

Vibration Monitoring

During the construction phase consideration should be given to vibration monitoring at the nearest sensitive locations.

Vibration monitoring should be conducted in accordance with BS7385-1 (1990) *Evaluation and measurement for vibration in buildings — Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings* or BS6841 (1987) *Guide to measurement and evaluation of human exposure to whole-body mechanical vibration and repeated shock*.

The mounting of the transducer to the vibrating structure should comply with BS ISO 5348:1998 *Mechanical vibration and shock – Mechanical mounting of accelerometers*. In summary, the following ideal mounting conditions apply:

- the transducer and its mountings are as rigid as possible;
- the mounting surfaces should be as clean and flat as possible;
- simple symmetric mountings are best, and;
- the mass of the mounting should be small in comparison to that of the structure under test.

In general the transducer will be fixed to the floor of a building or concrete base on the ground using expansion bolts. In instances where the vibration monitor will be placed outside of a building a flat and level concrete base with dimensions of approximately 1m x 1m x 0.1m will be required.

Appendix 9.4 Noise modelling details

Noise model

A 3D computer-based prediction model has been prepared in order to quantify the noise level associated with the operation of the proposed building. This section discusses the methodology behind the noise modelling process.

DGMR iNoise

Proprietary noise calculation software has been used for the purposes of this modelling exercise. The selected software, DGMR iNoise, calculates noise levels in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*.

DGMR iNoise is a proprietary noise calculation package for computing noise levels in the vicinity of noise sources. Predictor calculates noise levels in different ways depending on the selected prediction standard. In general, however, the resultant noise level is calculated taking into account a range of factors affecting the propagation of sound, including:

- the magnitude of the noise source in terms of A weighted sound power levels (L_{WA});
- the distance between the source and receiver;
- the presence of obstacles such as screens or barriers in the propagation path;
- the presence of reflecting surfaces;
- the hardness of the ground between the source and receiver;
- Attenuation due to atmospheric absorption; and
- Meteorological effects such as wind gradient, temperature gradient and humidity (these have significant impact at distances greater than approximately 400m).

Brief description of ISO9613-2: 1996

ISO9613-2:1996 calculates the noise level based on each of the factors discussed previously. However, the effect of meteorological conditions is significantly simplified by calculating the average downwind sound pressure level, $L_{AT}(DW)$, for the following conditions:

- wind direction at an angle of $\pm 45^\circ$ to the direction connecting the centre of the dominant sound source and the centre of the specified receiver region with the wind blowing from source to receiver, and;
- wind speed between approximately 1 ms^{-1} and 5 ms^{-1} , measured at a height of 3 m to 11 m above the ground.

The equations and calculations also hold for average propagation under a well-developed moderate ground based temperature inversion, such as commonly occurs on clear calm nights.

The basic formula for calculating $L_{AT}(DW)$ from any point source at any receiver location is given by:

$$L_{AT}(DW) = L_W + D_c - A \quad \text{Eqn. A}$$

Where:

$L_{AT}(DW)$ is an octave band centre frequency component of $L_{AT}(DW)$ in dB relative to $2 \times 10^{-5} \text{ Pa}$;

L_W is the octave band sound power of the point source;

D_c is the directivity correction for the point source;

A is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The estimated accuracy associated with this methodology is shown in Table A below:

Table A Estimated accuracy for broadband noise of $L_{AT}(DW)$

Height, h^*	Distance, d^\dagger	
	$0 < d < 100$ m	$100 \text{ m} < d < 1,000$ m
$0 < h < 5$ m	± 3 dB	± 3 dB
$5 \text{ m} < h < 30$ m	± 1 dB	± 3 dB

* h is the mean height of the source and receiver. $\dagger d$ is the mean distance between the source and receiver.

N.B. These estimates have been made from situations where there are no effects due to reflections or attenuation due to screening.

Input data and assumptions

The noise model has been constructed using data from various source as follows:

<i>Site Layout</i>	The general site layout has been obtained from the drawings forwarded by Henry J Lyons Architects.
<i>Local Area</i>	The location of noise sensitive locations has been obtained from a combination of site drawings provided by Henry J Lyons Architects and others obtained from Ordnance Survey Ireland (OSI).
<i>Heights</i>	The heights of buildings on site have been obtained from site drawings forwarded by Henry J Lyons Architects. Off-site buildings have been assumed to be 6m high with the exception of industrial buildings where a default height of 15 m has been assumed.
<i>Contours</i>	Site ground contours/heights have been obtained from site drawings forwarded by Henry J Lyons Architects where available.

The final critical aspect of the noise model development is the inclusion of the various plant noise sources. Details are presented in the following section.

Source sound power data

BCEI Engineering has provided noise emission data for the significant external mechanical plant and emergency generators. The information provided is review in Table B below.

Table B Source noise data assumed for assessment (DUB06)

Item	Sound Power Levels dB								dB(A)
	63	125	250	500	1000	2000	4000	8000	
Condenser Left Side	86	83	74	70	64	62	61	55	73
Condenser Right Side	86	83	74	70	64	62	61	55	73
Condenser Front (Evaporator)	84	81	72	68	62	60	59	53	71
Condenser Rear (Condenser)	86	83	74	70	65	62	61	55	73
Condenser Top	90	87	78	74	69	66	65	59	77
Gen. Front ^{Note B}	100.8	108.7	92.4	90.2	78.9	73	73.7	67.8	64
Gen. Rear ^{Note B}	99	107	90.7	88.5	77.2	71.3	72	66.1	62.3
Gen. Sides ^{Note B}	102.5	105.3	89	86.8	75.5	69.6	70.3	64.4	60.6
Gen. Exhaust ^{Note B}	86	103	86.7	84.5	73.2	67.3	68	62.1	58.3
Transformer ^{Note C}	72	40	70	63	66	50	39	36	36

Note A Maximum permissible Sound Power Level Per unit.

Note B Dub 05 generators are assumed to be attenuated to achieve max. 75dB(A) at 1m.

Note C Transformer noise level advised by Ethos Engineering and typical transformer spectrum from AWN database has been assumed for assessment purposes.

It has been advised that significant noise emissions are not associated with the proposed substations related to the development.

Figure A presents a 3D render of the developed site noise model.

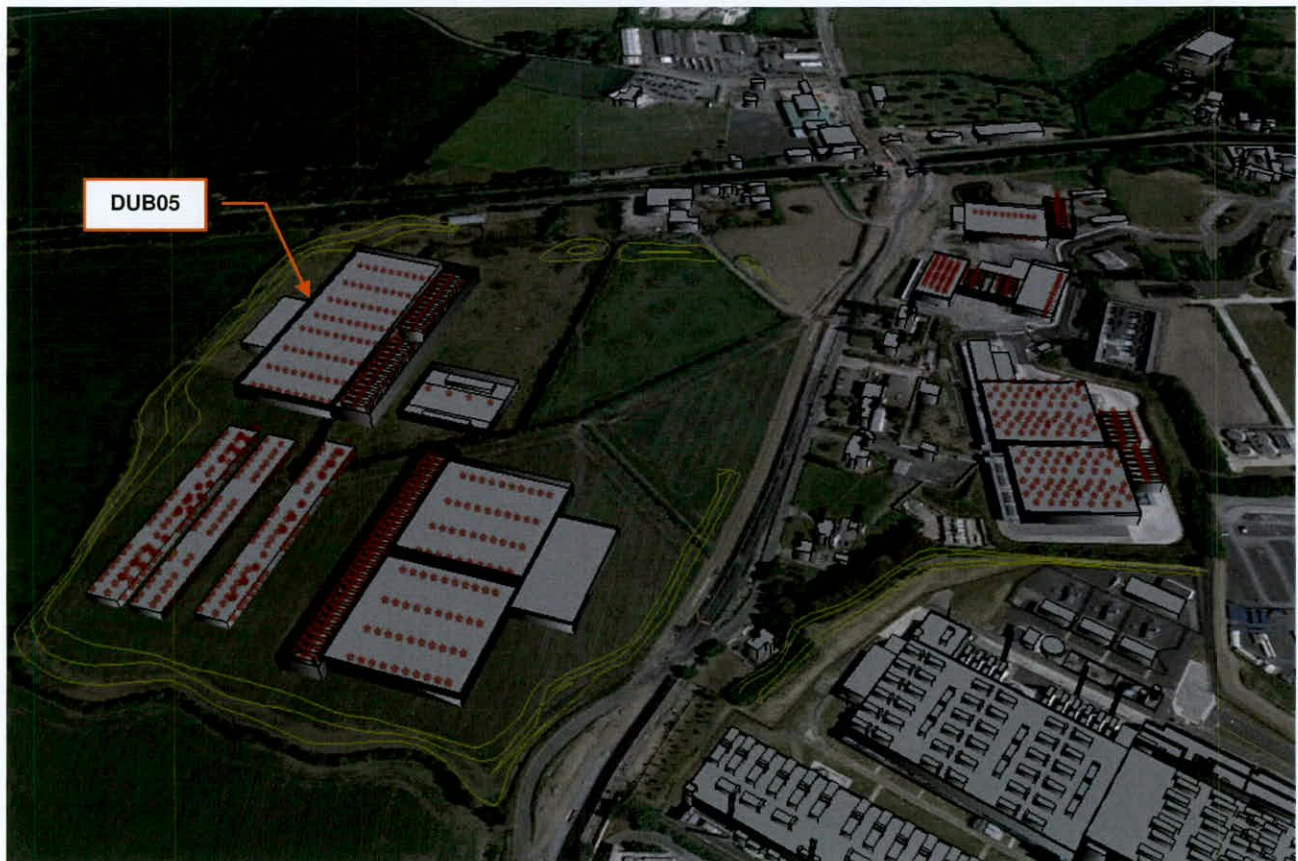


Figure A Images of Developed Noise Model – View of model prior to DUB06 being inserted for context

Note in relation to the emergency diesel generators screening to these elements of plant are to be formed from an acoustic louvre which offers the following sound insertion loss. The height of the screen is at least 0.5m above the top of the generator installations to be located to their north, west and south.

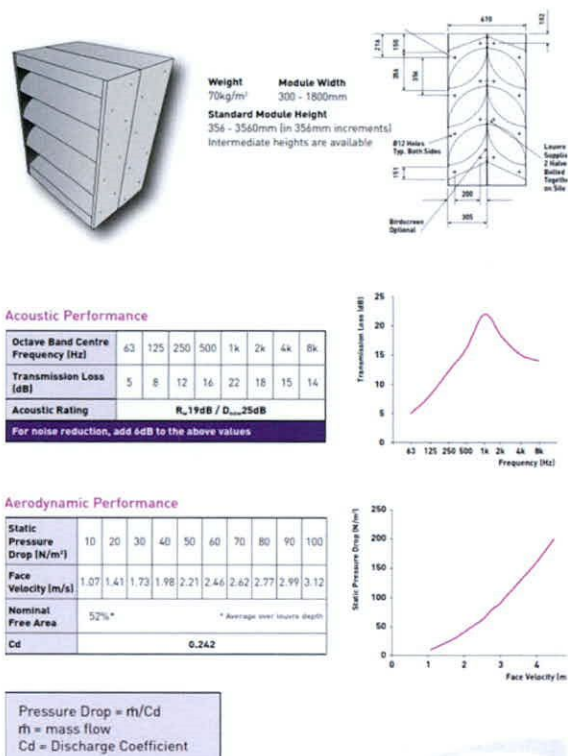


Figure B Diesel Generators Screen

It has been advised that intake and exhaust louvres to the building will be some 3.5 m wide and 5 m high (i.e. some 15 m²). Based on this knowledge and the extent of the buildings shown on masterplan drawings developed to date the following maximum sound power levels for the louvres opes have been estimated:

Table C Assumed Louvre Sound Power Level

Source	L _{WA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Intake / Exhaust per Louvre	71	76	66	58	59	60	64	65	78

The above noise level equates to a sound pressure level of some **50dB(A) at a distance of 10m.**

In terms of the walls and roof of the generator halls, is assumed that detailed design will result in sound power levels per m² of the element as detailed in Table D.

Table D Assumed Louvre Sound Power Level – Walls & Roof per m²

Source	L _{WA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Wall / Roof per m ²	52	50	50	40	30	20	20	20	45

A radiator is located 1.5 m above the roof of the building with the following noise rating associated with it as extracted from the supplied data sheet¹⁵:

Table E Assumed Radiator L_{WA} Level – Gas Generation (Cummings Data)

Source	L _{pA} - Octave Band Centre Frequency								dB (A)
	63	125	250	500	1k	2k	4k	8k	
Radiators	62	69	72	78	80	76	70	61	83

It is advised generator exhaust stacks will need to be attenuated to achieve a sound pressure level of no more than 65 dB(A) at 1 m. Based on this we have assumed a sound power level of some 76 dB(A) in relation to these sources.

¹⁵ Radiator Technical Information – Finning/CAT – 25°C ambient level

Appendix 9.5 – Modelling calculation parameters

Prediction calculations for noise emissions have been conducted in accordance with *ISO 9613: Acoustics – Attenuation of sound during propagation outdoors, Part 2: General method of calculation, 1996*. The following are the main aspects that have been considered in terms of the noise predictions presented in this instance.

Directivity Factor:

The directivity factor (D) allows for an adjustment to be made where the sound radiated in the direction of interest is higher than that for which the sound power level is specified. In this case the sound power level is measured in a down wind direction, corresponding to the worst case propagation conditions and needs no further adjustment.

Ground Effect:

Ground effect is the result of sound reflected by the ground interfering with the sound propagating directly from source to receiver. The prediction of ground effects is inherently complex and depend on source height receiver height propagation height between the source and receiver and the ground conditions. The ground conditions are described according to a variable defined as G, which varies between 0.0 for hard ground (including paving, ice concrete) and 1.0 for soft ground (includes ground covered by grass trees or other vegetation) Our predictions have been carried out using various source height specific to each plant item, a receiver heights of 1.6m for single storey properties and 4m for double. An assumed ground factor of $G = 0.8$ has been applied off site. Noise contours presented in the assessment have been predicted to a height of 4m in all instances.

Geometrical Divergence

This term relates to the spherical spreading in the free-field from a point sound source resulting in attenuation depending on distance according to the following equation:

$$A_{\text{geo}} = 20 \times \log(\text{distance from source in meters}) + 11$$

Atmospheric Absorption

Sound propagation through the atmosphere is attenuated by the conversion of the sound energy into heat. This attenuation is dependent on the temperature and relative humidity of the air through which the sound is travelling and is frequency dependent with increasing attenuation towards higher frequencies. In these predictions a temperature of 10°C and a relative humidity of 70% have been used, which give relatively low levels of atmosphere attenuation and corresponding worst case noise predictions.

Table A Atmospheric Attenuation Assumed for Noise Calculations (dB per km)

Temp (°C)	% Humidity	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10	70	0.12	0.41	1.04	1.92	3.66	9.70	33.06	118.4

Barrier Attenuation

The effect of any barrier between the noise source and the receiver position is that noise will be reduced according to the relative heights of the source, receiver and barrier and the frequency spectrum of the noise.

CHAPTER 10 – AIR QUALITY AND CLIMATE

Appendix 10.1 Description of the AERMOD model

The AERMOD dispersion model has been developed in part by the U.S. Environmental Protection Agency (USEPA, 2021). The model is a steady-state Gaussian model used to assess pollutant concentrations associated with industrial sources. The model is an enhancement on the Industrial Source Complex-Short Term 3 (ISCST3) model which has been widely used for emissions from industrial sources.

Improvements over the ISCST3 model include the treatment of the vertical distribution of concentration within the plume. ISCST3 assumes a Gaussian distribution in both the horizontal and vertical direction under all weather conditions. AERMOD with PRIME, however, treats the vertical distribution as non-Gaussian under convective (unstable) conditions while maintaining a Gaussian distribution in both the horizontal and vertical direction during stable conditions. This treatment reflects the fact that the plume is skewed upwards under convective conditions due to the greater intensity of turbulence above the plume than below. The result is a more accurate portrayal of actual conditions using the AERMOD model. AERMOD also enhances the turbulence of night-time urban boundary layers thus simulating the influence of the urban heat island.

In contrast to ISCST3, AERMOD is widely applicable in all types of terrain. Differentiation of the simple versus complex terrain is unnecessary with AERMOD. In complex terrain, AERMOD employs the dividing-streamline concept in a simplified simulation of the effects of plume-terrain interactions. In the dividing-streamline concept, flow below this height remains horizontal, and flow above this height tends to rise up and over terrain. Extensive validation studies have found that AERMOD (precursor to AERMOD with PRIME) performs better than ISCST3 for many applications and as well or better than CTDMPPLUS for several complex terrain data sets (USEPA, 1999).

Due to the proximity to surrounding buildings, the PRIME (Plume Rise Model Enhancements) building downwash algorithm has been incorporated into the model to determine the influence (wake effects) of these buildings on dispersion in each direction considered. The PRIME algorithm takes into account the position of the stack relative to the building in calculating building downwash. In the absence of the building, the plume from the stack will rise due to momentum and/or buoyancy forces. Wind streamlines act on the plume leads to the bending over of the plume as it disperses. However, due to the presence of the building, wind streamlines are disrupted leading to a lowering of the plume centreline.

When there are multiple buildings, the building tier leading to the largest cavity height is used to determine building downwash. The cavity height calculation is an empirical formula based on building height, the length scale (which is a factor of building height & width) and the cavity length (which is based on building width, length and height). As the direction of the wind will lead to the identification of differing dominant tiers, calculations are carried out in intervals of 10 degrees.

In PRIME, the nature of the wind streamline disruption as it passes over the dominant building tier is a function of the exact dimensions of the building and the angle at which the wind approaches the building. Once the streamline encounters the zone of influence of the building, two forces act on the plume. Firstly, the disruption caused by the building leads to increased turbulence and enhances horizontal and vertical dispersion. Secondly, the streamline descends in the lee of the building due to the reduced pressure and drags the plume (or part of) nearer to the ground, leading to higher ground level concentrations. The model calculates the descent of the plume as a function of the building shape and, using a numerical plume rise model, calculates the change in the plume centreline location with distance downwind.

The immediate zone in the lee of the building is termed the cavity or near wake and is characterised by high intensity turbulence and an area of uniform low pressure. Plume mass captured by the cavity region is re-emitted to the far wake as a ground-level volume source. The volume source is located at the base of the lee wall of the building, but is only evaluated near the end of the near wake and beyond. In this region, the disruption caused by the building downwash gradually fades with distance to ambient values downwind of the building.

AERMOD has made substantial improvements in the area of plume growth rates in comparison to ISCST3 (USEPA, 2004a, 2009). ISCST3 approximates turbulence using six Pasquill-Gifford-Turner Stability Classes and bases the resulting dispersion curves upon surface release experiments. This treatment, however, cannot explicitly account for turbulence in the formulation. AERMOD is based on the more realistic modern planetary boundary layer (PBL) theory which allows turbulence to vary with height. This use of turbulence-based plume growth with height leads to a substantial advancement over the ISCST3 treatment.

Improvements have also been made in relation to mixing height (USEPA, 2004a, 2009). The treatment of mixing height by ISCST3 is based on a single morning upper air sounding each day. AERMOD, however, calculates mixing height on an hourly basis based on the morning upper air sounding and the surface energy balance, accounting for the solar radiation, cloud cover, reflectivity of the ground and the latent heat due to evaporation from the ground cover. This more advanced formulation provides a more realistic sequence of the diurnal mixing height changes.

AERMOD also has the capability of modelling both unstable (convective) conditions and stable (inversion) conditions. The stability of the atmosphere is defined by the sign of the sensible heat flux. Where the sensible heat flux is positive, the atmosphere is unstable whereas when the sensible heat flux is negative the atmosphere is defined as stable. The sensible heat flux is dependent on the net radiation and the available surface moisture (Bowen Ratio). Under stable (inversion) conditions, AERMOD has specific algorithms to account for plume rise under stable conditions, mechanical mixing heights under stable conditions and vertical and lateral dispersion in the stable boundary layer.

AERMOD also contains improved algorithms for dealing with low wind speed (near calm) conditions. As a result, AERMOD can produce model estimates for conditions when the wind speed may be less than 1 m/s, but still greater than the instrument threshold.

Appendix 10.2 Description of AERMET

AERMOD incorporates a meteorological pre-processor AERMET PRO (USEPA 2021). AERMET PRO allows AERMOD to account for changes in the plume behaviour with height. AERMET PRO calculates hourly boundary layer parameters for use by AERMOD, including friction velocity, Monin-Obukhov length, convective velocity scale, convective (CBL) and stable boundary layer (SBL) height and surface heat flux. AERMOD uses this information to calculate concentrations in a manner that accounts for changes in dispersion rate with height, allows for a non-Gaussian plume in convective conditions, and accounts for a dispersion rate that is a continuous function of meteorology.

The AERMET PRO meteorological pre-processor requires the input of surface characteristics, including surface roughness (z_0), Bowen Ratio and albedo by sector and season, as well as hourly observations of wind speed, wind direction, cloud cover, and temperature. A morning sounding from a representative upper air station, latitude, longitude, time zone, and wind speed threshold are also required.

Two files are produced by AERMET PRO for input to the AERMOD dispersion model. The surface file contains observed and calculated surface variables, one record per hour. The profile file contains the observations made at each level of a meteorological tower, if available, or the one-level observations taken from other representative data, one record level per hour.

From the surface characteristics (i.e. surface roughness, albedo and amount of moisture available (Bowen Ratio)) AERMET PRO calculates several boundary layer parameters that are important in the evolution of the boundary layer, which, in turn, influences the dispersion of pollutants. These parameters include the surface friction velocity, which is a measure of the vertical transport of horizontal momentum; the sensible heat flux, which is the vertical transport of heat to/from the surface; the Monin-Obukhov length which is a stability parameter relating the surface friction velocity to the sensible heat flux; the daytime mixed layer height; the nocturnal surface layer height and the convective velocity scale which combines the daytime mixed layer height and the sensible heat flux. These parameters all depend on the underlying surface.

The values of albedo, Bowen Ratio and surface roughness depend on land-use type (e.g., urban, water, cultivated land etc) and vary with seasons and wind direction. The assessment of appropriate land-use type was carried out to a distance of 10km from the location of the meteorological station in line with USEPA recommendations (USEPA 2005) for albedo and Bowen ratio with a 1km geometric determination undertaken for the surface roughness. In relation to wind direction, a minimum sector arc of 30 degrees is recommended.

Surface roughness

Surface roughness length is the height above the ground at which the wind speed goes to zero. Surface roughness length is defined by the individual elements on the landscape such as trees and buildings. In order to determine surface roughness length, the USEPA recommends that a representative length be defined for each sector, based on geometric mean of the inverse distance area-weighted land use within the sector, by using the eight land use categories outlined by the USEPA. The area-weighted surface roughness length derived from the land use classification within a radius of 1km from Casement Aerodrome is shown in Table A10.1.

Table A10.1 Surface Roughness based on an inverse distance area-weighted average of the land use within a 1km radius of Casement Aerodrome.

Sector	Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter ^{Note 1}
0-360	100% Grassland	0.050	0.100	0.010	0.010

Note 1: Winter defined as periods when surfaces covered permanently by snow whereas autumn is defined as periods when freezing conditions are common, deciduous trees are leafless and no snow is present (Iqbal (1983)). Thus for the current location autumn more accurately defines "winter" conditions at the proposed facility.

Albedo

Noon-time Albedo is the fraction of the incoming solar radiation that is reflected from the ground when the sun is directly overhead. Albedo is used in calculating the hourly net heat balance at the surface for calculating hourly values of Monin-Obuklov length. The area-weighted arithmetic mean albedo derived from the land use classification over a 10km x 10km area centred on Casement Aerodrome is shown in Table A10.2.

Table A10.2 Albedo based on an area-weighted arithmetic mean of the land use over a 10km x 10km area centred on Casement Aerodrome.

Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter ^{Note1}
0.5% Water, 30% Urban, 0.5% Coniferous Forest 38% Grassland, 19% Cultivated Land	0.155	0.180	0.187	0.187

Note 1: For the current location autumn more accurately defines “winter” conditions at the proposed facility.

Bowen Ratio

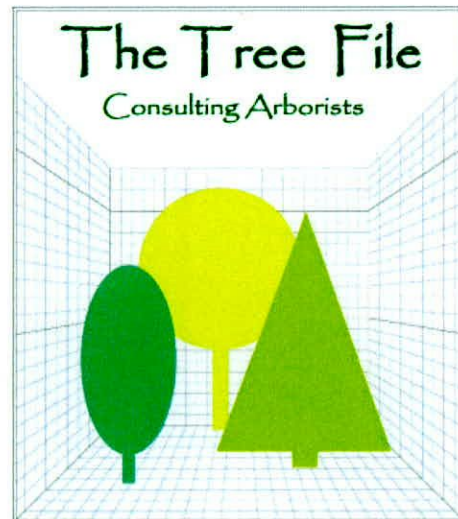
The Bowen ratio is a measure of the amount of moisture at the surface of the earth. The presence of moisture affects the heat balance resulting from evaporative cooling which, in turn, affects the Monin-Obukhov length which is used in the formulation of the boundary layer. The area-weighted geometric mean Bowen ratio derived from the land use classification over a 10km x 10km area centered on Casement Aerodrome is shown in Table A10.3

Table A10.3 Bowen ratio based on an area-weighted geometric mean of the land use over a 10km x 10km area centred on Casement Aerodrome.

Area Weighted Land Use Classification	Spring	Summer	Autumn	Winter ^{Note1}
0.5% Water, 30% Urban, 0.5% Coniferous Forest 38% Grassland, 19% Cultivated Land	0.549	1.06	1.202	1.202

Note 1: For the current location autumn more accurately defines “winter” conditions at the proposed facility.

Appendix 11.2 Tree survey



Arboricultural Report
Trees at Proposed Site
EdgeConneX
within the townland of Ballymakailly,
West of Newcastle Road (R120),
Lucan
Co. Dublin
August 2022

The Tree File Ltd
Consulting Arborists
Ashgrove House
26 Foxrock Court
Dublin 18
D18 R2K1
086-3819011

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Associated Drawings

This report is for reading in conjunction with the drawings noted below

<u>Drawing Title</u>	<u>Drawing Subject</u>
1) EdgeConneX Tree Constraints Plan	Tree Constraints Plan A plan depicting the predevelopment location, size, calculated constraints, and simplified tree quality category system
2) EdgeConneX Tree Impacts Plan	Tree Impacts Plan This plan represents the effects of the proposed development works on the above tree population and depicts trees to be retained and removed.
3) EdgeConneX Tree Protection Plan	Tree Protection Plan This plan depicts the nature, location and extent of tree protection measures required for sustainable tree retention.