Planning & Development Act, 2000 - 2020,
European Communities (Environmental Impact Assessment) Regulations 1989 (as amended), Planning & Development Regulations, 2001 (as amended)

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

APPENDICES

110kV transmission lines between permitted Coolderrig substation and the Grange Castle – Kilmahud Circuits, Grange Castle

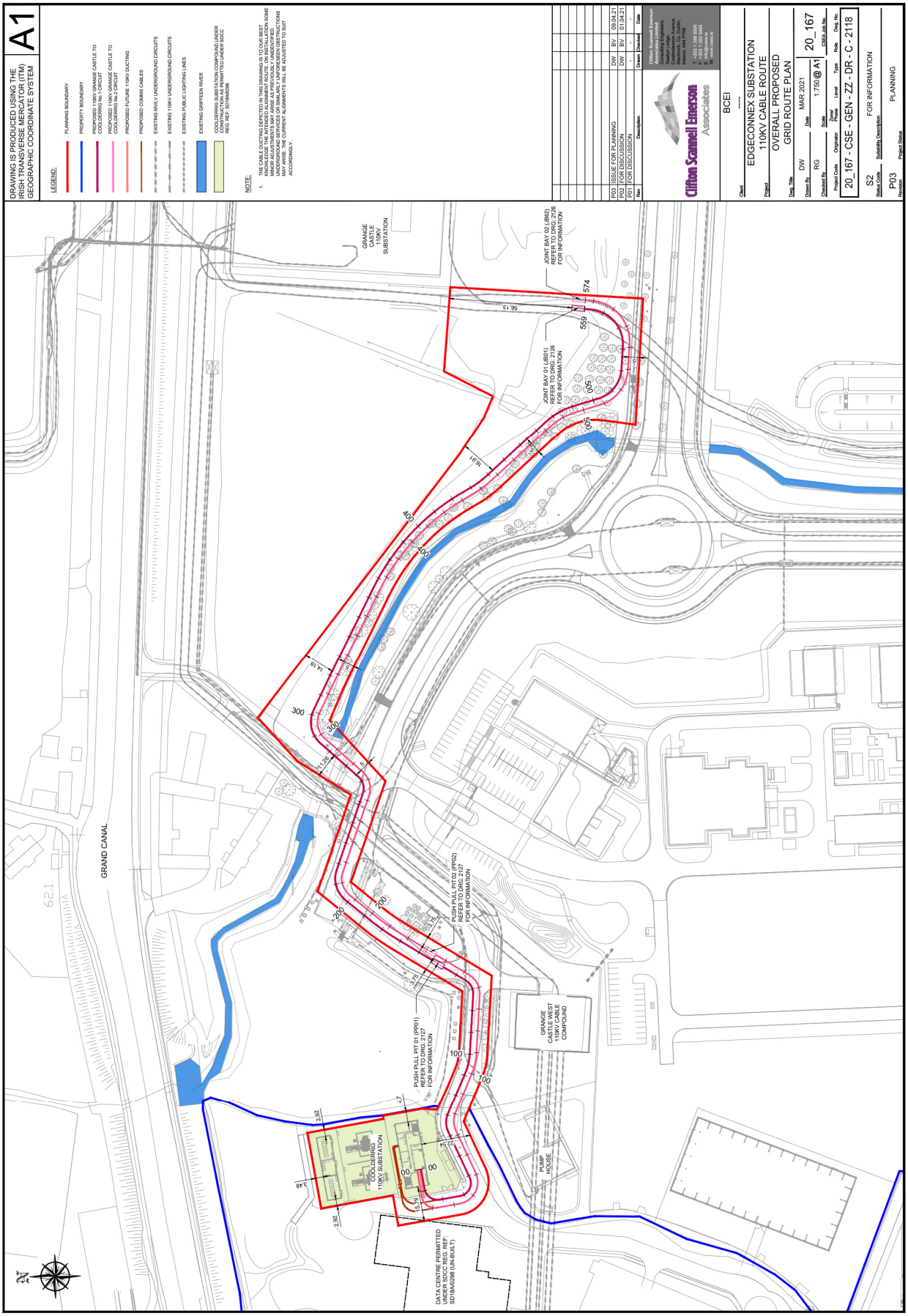
April 2021

MARSTON
PLANNING CONSULTANCY

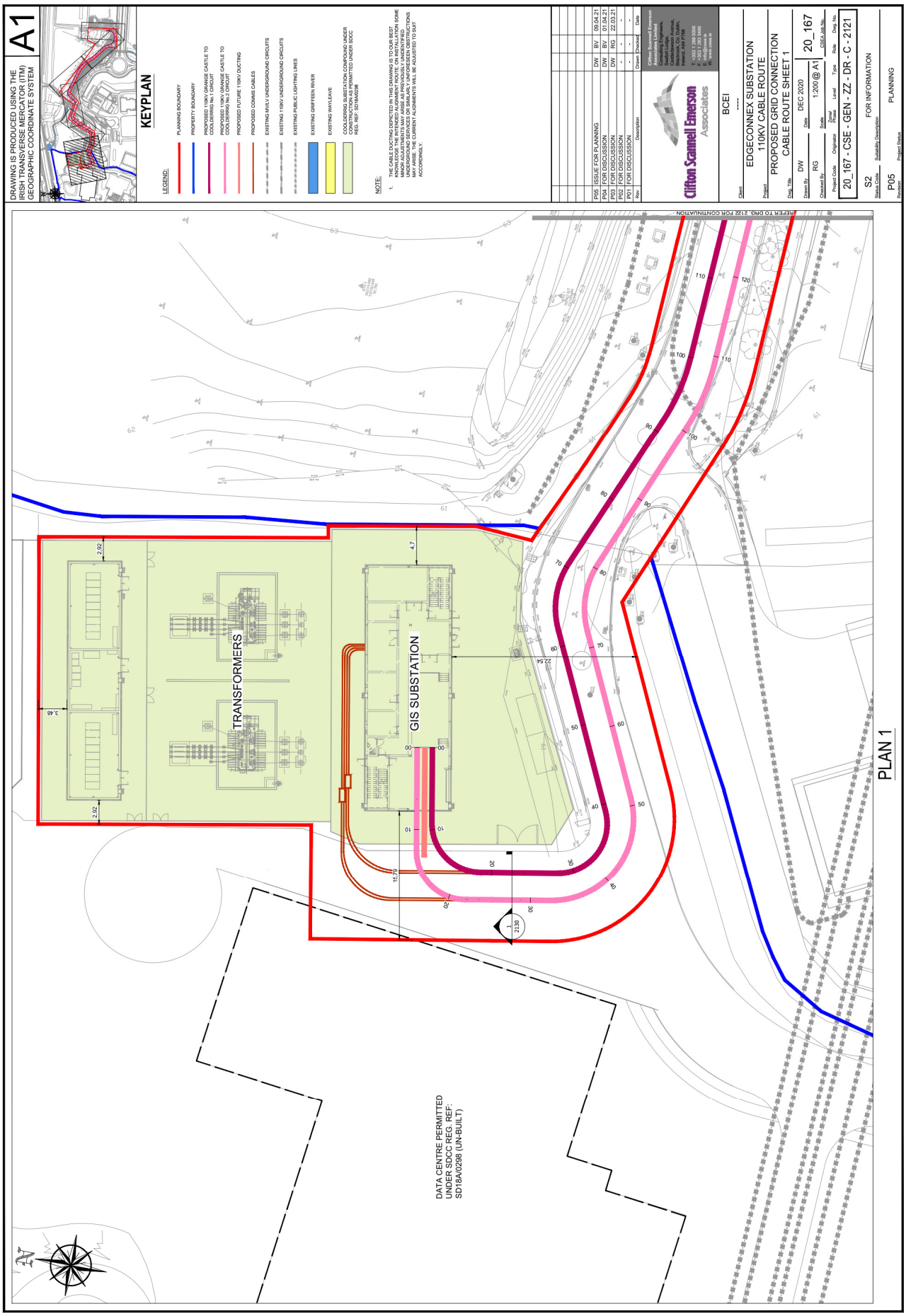
CONTENTS

CHAPTER 2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

Appendix 2.1 Proposed site layout plan (not to scale) indicating permitted substation development



Appendix 2.2 Permitted substation layout connection into the two no. 110kV transmission lines



Appendix 2.3 Schedule of mitigation measures

Project Phase	Mitigation Measures
	Biodiversity
Construction *- Terrestrial habitats*	None of the habitats within the proposed development site will be permanently lost, as the proposed landscape plans include re-planting of all affected treelines (WL2) and grasslands (only GA2 grassland will be affected and require re-planting, GS2/GS1 mosaic grassland will be unaffected) after underground construction is completed. The planted treelines will mainly consist of *Pinus sylvestris, Acer campestre* and *Betula pendula*. The planted grassland will be re-planted with *Festuca rubra, Festuca ovina, Poa pratensis* and *Trifolium repens*. An annual mowing regime (once per year in September/October) is also recommended for the dry meadows and grassy verges (GS2)/dry calcareous and neutral grassland (GS1) mosaic which occurs on the banks of the Griffeen River, in order to enhance the quality of this habitat. Although this grassland mosaic will not be lost due to the development and therefore mitigation measures to compensate for its loss is not required, this measure will help to improve the local biodiversity of the river banks. The Griffeen River will be left entirely undisturbed during the construction stage of the development.
Construction *- water quality*	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 depositing/lowland river habitat (FW2, *i.e.* the Griffeen River) within the proposed development site: • 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 or 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 refueling 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: - 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 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. • 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.
Construction *- birds*	The following mitigation measures are proposed to comply with the legal protection afforded to breeding birds and their nests under the Wildlife Acts: • 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, grasslands or the demolition of the structure will be undertaken outside of the nesting season (i.e. 1 March to 31 August inclusive) Or where this seasonal restriction cannot be observed then: • A breeding bird survey will be undertaken by a suitably experienced ecologist 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 until after the nesting season (i.e. 1 March to 31 August inclusive).
Construction *- Bats*	*Lighting* 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, Griffeen River) and light pollution in general should be avoided. Lighting of the site during construction is designed in accordance with the following guidance: • 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 2008). *Vegetation Clearance* Although no potential roost features were observed during the survey, as a precautionary measure the following mitigation measures are proposed in relation to trees which will be removed within the site, as bats could occupy suitable roosting features within the trees at any time prior to the commencement of works. Therefore, there is an inherent risk that bats could be affected by tree removal works. The following mitigation procedures will be followed: • Removal of trees will be undertaken (outside the bat breeding and hibernation seasons)

	during the periods of April to May, or September to October, as during this period bats are capable of flight and may avoid the risks from tree felling if proper measures are undertaken, such as leaving felled trees on the ground overnight to allow them to leave if they are present. • Where it is safe and appropriate to do so for both bats and humans, such trees may be felled using heavy plant to push over the tree. In order to ensure the optimum warning for any roosting bats that may still be present, the tree will be pushed lightly two to three times, with a pause of approximately 30 seconds between each nudge to allow bats to become active. The tree should then be pushed to the ground slowly and should remain in place until it is inspected by a bat specialist • Trees should only be felled "in section" where the sections can be rigged to avoid sudden movements or jarring of the sections • Where remedial works (e.g. pruning of limbs) are to be undertaken to trees deemed to be suitable for bats, the affected sections of the tree will be checked by a bat specialist (using endoscope under a separate derogation licence held by that individual) for potential roost features before removal. For limbs containing potential roost features high in the tree canopy, this will necessitate the rigging and lowering of the limb to the ground (with the potential roost feature intact) for inspection by the bat specialist before it is cut up or mulched. If bats are found to be present, they will be removed by a bat specialist licenced to handle bats and released in the area in the evening following capture • If any bat tree roosts are confirmed, and will be removed by the proposed felling works, then a derogation licence will be required from the NPWS and appropriate alternative roosting sites will be provided in the form of bat boxes.
Construction phase *– fish, otter and white clawed crayfish*	Mitigation measures outlined for the protection of water quality in the depositing/lowland river (FW2) habitat (*i.e.* the Griffeen River) and its immediate environs will mitigate against impacts of water pollution on fish, otter and white-clawed crayfish during construction stage.
Construction phase *– badgers*	Before works to clear any of the habitat features suitable to supporting badgers commence, a pre-construction survey will be undertaken to determine whether badgers are present on site. 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.
Operational	None of the habitats within the proposed development site will be permanently lost, as the proposed landscape plans include re-planting of all affected treelines and grasslands after underground construction is completed. The planted treelines will mainly consist of *Pinus sylvestris*, *Acer campestre* and *Betula pendula*. The planted grassland will be re-planted with *Festuca rubra*, *Festuca ovina, Poa pratensis* and *Trifolium repens.* An annual mowing regime (once per year in September/October) is also recommended for the dry meadows and grassy verges (GS2)/dry calcareous and neutral grassland (GS1) mosaic which occurs on the banks of the Griffeen River, in order to enhance the quality of this habitat. Although this grassland mosaic will not be lost due to the development and therefore mitigation measures to compensate for its loss is not required, this measure will help to improve the local biodiversity of the river banks. The Griffeen River will be left entirely undisturbed during the operational stage of the development.
	Land, Soil and Geology
Construction - *CEMP*	An Outline Construction Environmental Management Plan (CEMP) has been prepared by Clifton Scannell Emerson Associates for the proposed development and is included with the planning documentation. In advance of work starting on site, the works Contractor will prepare a detailed Construction Environmental Management Plan (CEMP). The detailed CEMP will set out the overarching vision of how the construction of the proposed development will be managed in a safe and organised manner by the Contractor. The CEMP will be a live document and it will go through a number of iterations before works commence and during the works. It will set out requirements and standards which must be met during the construction

	stage and will include the relevant mitigation measures outlined in the EIA Report and any subsequent planning conditions relevant to the proposed development. As a minimum, the CEMP will be formulated in accordance with best international practice including but not limited to: • 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.
Construction – *Control of soil excavation*	Suitable soils and stones will be reused on site as backfill in the grassed areas, where possible. However, it is currently envisaged that majority of the excavated material will require removal offsite. According to the GSI database the bedrock vulnerability is already extreme due to the thin cover of overburden on the site. Removal and reinstatement of subsoil cover will not alter the vulnerability category of the underlying bedrock. However due to levelling works imported fill will need to be deposited over a sizable proportion of the proposed development area. 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. 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. Site investigations classified the subsoils as 'non-hazardous'; however, low levels of petroleum hydrocarbons were detected. 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. Stockpiles have the potential to cause negative impacts on air and water quality. The effects of soil stripping and stockpiling will be mitigated against through the implementation of appropriate earthworks handling protocol during construction. It is anticipated that any stockpiles will be formed within the boundary of the site and there will be no direct link or pathway from this area to any surface water body.
Construction – *Export of material from site*	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. 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. 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.

	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.
Construction – *Control of water during construction*	Care will be taken to ensure that exposed soil surfaces are stable to minimise erosion. All exposed soil surfaces will be within the main excavation site which limits the potential for any offsite impacts. No significant dewatering will be required during the construction phase which would result in the localised lowering of the water table. No discharge of construction water is anticipated during the construction of the proposed underground circuits 110kV and transmission cable installation. There may be localised pumping of surface run-off from the excavations (up to 3m) during and after heavy rainfall events to ensure that the trenches are kept relatively dry. Due to the very low permeability of the Dublin Boulder Clay and the relative shallow nature for excavations, infiltration to the underlying aquifer is not anticipated. Should any discharge of construction water be required during the construction phase, discharge will be to foul sewer. Pre-treatment and silt reduction measures on site will include a combination of silt fencing, settlement measures (silt traps, 20m buffer zone between machinery and watercourses, refuelling of machinery off site) and hydrocarbon interceptors.
Operational	No remedial or mitigation measures have been considered during the operational phase, since no impacts on the geological and hydrogeological environment are projected.
	Hydrology
Construction - *CEMP*	An Outline Construction Environmental Management Plan (CEMP) has been prepared by Clifton Scannell Emerson for the proposed development and is included with the planning documentation. In advance of work starting on site, the works Contractor will prepare a detailed CEMP. The detailed CEMP will set out the overarching vision of how the construction of the proposed development will be managed in a safe and organised manner by the Contractor. The CEMP will be a live document and it will go through a number of iterations before works commence and during the works. It will set out requirements and standards which must be met during the construction stage and will include the relevant mitigation measures outlined in the EIA Report and any subsequent planning conditions relevant to the proposed development. As a minimum, the CEMP will be formulated in accordance with best international practice including but not limited to: • 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.
Construction - *Control of sediment loading and water quality*	As there is potential for run-off to enter current stormwater systems and indirectly discharge to a watercourse, mitigations will be put in place to manage run-off during the construction phase. Run-off into excavations/earthworks cannot be prevented entirely and is largely a function of prevailing weather conditions. Earthwork operations will be carried out such that surfaces, as they are being raised, shall be designed with adequate drainage, falls and profile to control run-off and prevent ponding and flowing. Correct management will ensure that there will be minimal inflow of shallow/perched groundwater into any excavation. Due to the very low permeability of the Dublin Boulder Clay and the relative shallow nature for excavations, infiltration to the underlying aquifer is not anticipated. Care will be taken to ensure that exposed soil surfaces are stable to minimise erosion. All exposed soil surfaces will be within the main excavation site which limits the potential for any offsite impacts. No significant dewatering will be required during the construction phase which would result in the localised lowering of the water table. No discharge of construction water is anticipated during the construction of the proposed underground transmission cable

	installation. There may be localised pumping of surface run-off from the excavations (up to 3m) during and after heavy rainfall events. Run-off water containing silt will be contained on site via settlement tanks and treated to ensure adequate silt removal. Silt reduction measures on site will include a combination of silt fencing and settlement measures (silt traps, silt sacks and settlement tanks/ponds). The temporary storage of soil will be carefully managed. Stockpiles will be tightly compacted to reduce runoff and graded to aid in runoff collection. This will prevent any potential negative impact on the stormwater drainage and the material will be stored away from any surface water drains. Movement of material will be minimised to reduce the degradation of soil structure and generation of dust. Excavations will remain open for as little time as possible before the placement of fill. This will help to minimise the potential for water ingress into excavations. Soil from works will be stored away from existing drainage features to remove any potential impact. 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 potential contaminants 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 segregated and appropriately disposed of by a suitably permitted/licensed waste disposal contractor. Should any discharge of construction water be required during the construction phase, discharge will be to foul sewer. Pre-treatment and silt reduction measures on site will include a combination of silt fencing, settlement measures (silt traps, 20m buffer zone between machinery and watercourses, refuelling of machinery off site) and hydrocarbon interceptors. Weather conditions will be considered when planning construction activities to minimise the risk of run-off from the site and the suitable distance of topsoil piles from surface water drains will be maintained.
Construction *– Fuel and chemical handling*	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. 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. 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. 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.
Operational	No remedial or mitigation measures have been considered during the operational phase, since no impacts on the hydrological environment are projected.
	Noise and vibration
Construction *– Noise and vibration*	With regard to construction activities, reference has been made to BS5228 Parts 1 and 2, which offer detailed guidance on the control of noise and vibration from demolition and construction activities. Various mitigation measures will be considered and applied during the construction of the proposed development. As an example, the following measures will be

	implemented on site: • 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 critical sensitive locations; and • all site access roads will be kept even so as to mitigate the potential for vibration from lorries. Furthermore, a variety of practicable noise control measures will be employed, such as: • 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. The vibration from construction activities to off-site residences will be limited to the values set out in Table 9.7. It should be noted that these limits are not absolute rather they 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%. Appendix 9.3 presents an indicative construction noise and vibration management plan that will be implemented in terms of the day-to-day operation of the site. This will focus on opening and maintaining lines of communication with the local community to address issues in relation to noise and/or vibration and to advise the community of periods where specific activities take place that have an increased potential in giving rise to issues off site.
Operational *- Additional vehicular traffic on public roads*	The noise impact assessment outlined previously has demonstrated that mitigation measures are not required.
	Air quality and climate
Construction *– Dust control*	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, the UK and the USA based on the following publications: • 'Guidance on the Assessment of Dust from Demolition and Construction' (IAQM, 2014); • 'Planning Advice Note PAN50 Annex B: Controlling The Environmental Effects Of Surface Mineral Workings Annex B: The Control of Dust at Surface Mineral Workings' (The Scottish Office, 1996); • 'Controlling the Environmental Effects of Recycled and Secondary Aggregates Production Good Practice Guidance' (UK Office of Deputy Prime Minister, 2002); • 'Controlling Particles, Vapours & Noise Pollution From Construction Sites' (BRE, 2003); • 'Fugitive Dust Technical Information Document for the Best Available Control Measures' and the USA (USEPA, 1997). ; and • 'Compilation of Air Pollutant Emission Factors, AP-42, Fifth Edition' (periodically updated) (USEPA, 1986). In advance of work starting on site, the works contractor will prepare a detailed Construction Environmental Management Plan (CEMP). The CEMP will set out the overarching vision of how the construction of the proposed development will be managed in a safe and organised manner by the Contractor. The CEMP will be a live document. It will set out requirements and standards which must be met during the construction stage and will include the relevant mitigation measures outlined in the EIA Report and any subsequent planning conditions relevant to the proposed development.
Construction *– site management*	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.

	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. As the prevailing wind is predominantly westerly to south-westerly, locating construction compounds and storage piles downwind (to the east or north-east) of sensitive receptors will minimise the potential for dust nuisance to occur at sensitive receptors. 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 0.2mm/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 shall be taken in order to avoid dust nuisance occurring under unfavourable meteorological conditions: • 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. 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.
Construction *– site roads / haulage routes*	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). • 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 will be located at least 10m from sensitive receptors where possible; • Bowsers or suitable watering equipment will be available during periods of dry weather throughout the construction period. Research has found that watering can reduce dust emissions by 50% (USEPA, 1997). Watering will 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; • 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.
Construction *– Land*	Land clearing / earth-moving works during periods of high winds and dry weather conditions

clearing / earth moving	can be a significant source of dust. • During dry and windy periods, and when there is a likelihood of dust nuisance, watering will be conducted to ensure moisture content of materials being moved is high enough to increase the stability of the soil and thus suppress dust; • During periods of very high winds (gales), activities likely to generate significant dust emissions will be postponed until the gale has subsided.
Construction *– storage piles*	The location and moisture content of storage piles are important factors which determine their potential for dust emissions. • Overburden material will be protected from exposure to wind by storing the material in sheltered regions of the site. Where possible storage piles will 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.
Construction *– Site traffic on public roads*	Spillage and blow-off of debris, aggregates and fine material onto public roads will be reduced to a minimum by employing the following measures: • 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; • At the main site traffic exits, a wheel wash facility will be installed. All trucks leaving the site must pass through the wheel wash. In addition, public roads outside the site shall be regularly inspected for cleanliness, as a minimum on a daily basis, and cleaned as necessary.
Construction *– Dust mitigation*	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: • 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; and • The specification of effective measures to deal with any complaints received.
Operational	No mitigation is proposed for the operational phase of the proposed development as there are no predicted impacts to air quality or climate.
	Landscape and visual assessment
Construction	The retention of a number of existing trees protected by appropriate tree protection fencing. It is also proposed to reinstate existing parkland and woodland trees, shrubs, riverside vegetation which has to be removed to accommodate the cable lines. As construction works of the alignment progress it is also proposed to reinstate grass verges, green buffers and roadways which are disturbed due to construction works.
Operational	There are no mitigation measures associated with the proposed operational phase. However, the maturing of the reinstatement planting of semi-mature parkland and woodland trees, shrub planting and re-seeding of any disturbed ground with amenity grass lawn will aid the visual integration of the proposed alignment into the Business Park.
	Traffic and transportation
Construction	To minimise disruption to the surrounding environment, the following mitigation measures will be implemented: • 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. • 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. All construction related parking will be provided on site. Construction traffic will consist of the following two principal categories: • Private vehicles owned and driven by site construction staff and by full time supervisory staff; and • Excavation plant and dumper trucks involved in site development works and material delivery vehicles for the following: granular fill materials, ducting, access chambers, ready mix concrete and mortar, concrete blocks, miscellaneous building materials, etc. 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. A Construction Traffic Management Plan (CTMP) would be prepared by the appointed contractor in order to minimise the potential impact of the construction phase of the proposed development on the safety and amenity of other users of the public road.
Operational *– traffic and transportation*	No remedial or reductive measures required for this phase.
	Cultural heritage
Construction *– Cultural heritage*	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. 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. 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. 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 Gealtacht.

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*	A project specific outline C&D WMP has been prepared in line with the requirements of the *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* guidance document issued by the Department of Environment, Heritage and Local Government (DoEHLG). Adherence to the high-level strategy presented in the C&D WMP enclosed in Appendix 14.1 will ensure effective waste management and minimisation, reuse, recycling, recovery and disposal of waste material generated during the construction phase of the proposed development. Prior to commencement of construction, the contractor(s) will be required to refine/update this document to detail specific measures to minimise waste generation and resource consumption and provide details of the proposed waste contractors and destinations of each waste stream. It has been estimated that along the route that up to a maximum of 1,213m^3 of excavated material will be generated including tarmac, made ground, soils/stones. Suitable soils and stones will be reused on site as backfill in the grassed areas, where possible. However, it is currently envisaged that majority of this material will require removal offsite. It will be reused offsite where practical and where it cannot be reused, it will be recycled/recovered. In addition, the following mitigation measures will be implemented: • 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; - Made ground - Soils and stones - Trees/shrubbery - In addition, the following wastes will be segregated at the site compound: ▪ Organic (food) waste ▪ Packaging (paper/card/plastic) ▪ Mixed dry recyclables ▪ Mixed non-recyclable waste • All excavations will be carefully monitored by a suitably qualified person to ensure that potentially contaminated soil is identified and segregated, if encountered. In the event that any potentially contaminated material is encountered, it will be segregated from clean/inert material, tested and classified as either non-hazardous or hazardous and further classified as clean, inert, non-hazardous or hazardous in accordance with the EC Council Decision 2003/33/EC, which establishes the criteria for the acceptance of waste at landfills; • Waste materials generated at the site compound will be stored in suitable receptacles in designated areas of the site compound; • 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 waste manager will be appointed by the main contractor 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 licenced facilities; and • All waste leaving the site will be recorded and copies of relevant documentation maintained. Nearby sites requiring clean fill material will be contacted to investigate reuse opportunities for clean and inert material, which requires removal off-site. 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 Article 27 of the *EC (Waste Directive) Regulations (2011)* as previously referred to and detailed in the C&D WMP (Appendix 14.1). These mitigation measures will ensure that the waste arising from the construction phase of the development is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, the *Litter Pollution Act 1997 to 2009* 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 encourage sustainable consumption of resources.
Operational - *Waste*	Any small volumes of waste materials generated will be segregated into appropriate categories and removed by maintenance contractors. Wastes will be collected by a suitably permitted contractor(s) and be transferred to suitably registered/permitted/licenced waste facilities for processing and segregation, reuse, recycling, recovery and/or disposal. These mitigation measures will ensure the waste arising from the development is dealt with in compliance with the provisions of the *Waste Management Act 1996*, as amended, associated Regulations, 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.
	Material assets
Construction – *Service providers*	Construction of the 110kV transmission lines will not require any power, telecommunications, drainage infrastructure and water supply from existing services. Completed surveys have identified where short term diversion of any services will be required. Ongoing consultation with EirGrid, ESB Networks, SDCC, Irish Water and other relevant utility providers within the locality and compliance with any requirements or guidelines they may have will ensure a smooth construction schedule without disruption to the local and business community. Such diversions are common practice.
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 wider site, and there will therefore be no 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 the construction of the Proposed Development is completed, ESB Networks will be mobilised to complete the commissioning in accordance with the ESB Network requirements. As stated in Chapter 2, there is no requirement for chemicals usage and minimal access to the route by personnel and there is no likely environmental effect as a result of commissioning.
Construction - *Telecommunications*	No remedial or mitigation measures are required in relation to telecommunications.
Construction - *Surface water and foul water infrastructure*	Welfare facilities (canteens, toilets etc.) will be available within the construction compound of the Permitted Development and it is proposed that this will be in place for the construction of the Proposed Development. No remedial or mitigation measures are required in relation to foul drainage infrastructure and water supply. Surface water run-off water containing silt will be contained on site and treated (using a siltbuster or temporary on-site settlement ponds/tanks) to ensure adequate silt removal. The construction works will not require any interruptions to service in existing surface water sewers.
Operational *– Power and electricity supply*	The Proposed Development has been designed in accordance with ESB Networks requirements. Eirgrid has confirmed that there is sufficient power available from the existing area network for the Proposed Development. The nature of the Proposed Development ensures that it will facilitate continuity of supply of electricity to the permitted Edgeconnex data centre development. No remedial or mitigation measures are required in relation to power and electricity supply.
Operational - *Telecommunications*	As there are no potential effects on telecommunications during the operational phase of the Proposed Development, no remedial or mitigation measures are required.
Operational - *surface water and foul water infrastructure*	There are no potential effects associated with surface water and foul drainage infrastructure or water supply for the Proposed Development for the operational phase and as such no remedial or mitigation measures are deemed necessary.

CHAPTER 6 - BIODIVERSITY

Appendix 6.1 – Legislation, policy and Guidelines

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.

Table 1: European sites in the vicinity 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**
Special Area of Conservation (SAC)	
Rye Water Valley/Carton SAC [001398] [7220] Petrifying springs with tufa formation (*Cratoneurion*)* [1014] Narrow-mouthed Whorl Snail *Vertigo angustior* [1016] Desmoulin's Whorl Snail *Vertigo moulinsiana* NPWS (2020) Conservation objectives for Rye Water Valley/Carton SAC [001398]. Generic Version 7.0. Department of Culture, Heritage and the Gaeltacht.1	*c.* 4.4km north-west of the proposed development
Glenasmole Valley SAC [001209] [6210] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6410] Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) [7220] Petrifying springs with tufa formation (*Cratoneurion*) NPWS (2018) *Conservation objectives for Glenasmole Valley SAC [001209].* Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.	*c.* 9.4km south-east of the proposed development
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 *Erica tetralix* [4030] European dry heaths [4060] Alpine and Boreal heaths [6130] *Calaminarian* grasslands of the *Violetalia calaminariae* [6230] Species-rich Nardus 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 *Ilex* and *Blechnum* in the British Isles [1355] Otter *Lutra lutra* NPWS (2017) *Conservation Objectives: Wicklow Mountains SAC 002122.*	*c.* 11.2km south-east of the proposed development

[1] The versions of the conservation objectives documents referenced in this table are the most recent published versions at the time of writing

European Site Name [Code] and its Qualifying interest(s) / Special Conservation Interest(s) (*Priority Annex I Habitats)	Location Relative to the Proposed Development Site
Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.	
North Dublin Bay SAC [000206] 1140 Mudflats and sandflats not covered by seawater at low tide 1210 Annual vegetation of drift lines 1310 Salicornia and other annuals colonising mud and sand 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) 1395 Petalwort *Petalophyllum ralfsii* 1410 Mediterranean salt meadows (*Juncetalia maritimi*) 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) 2190 Humid dune slacks NPWS (2013) *Conservation Objectives: North Dublin Bay SAC 000206*. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	*c.* 18km east of the proposed development
South Dublin Bay SAC [000210] 1140 Mudflats and sandflats not covered by seawater at low tide 1210 Annual vegetation of drift lines 1310 Salicornia and other annuals colonising mud and sand 2110 Embryonic shifting dunes NPWS (2013) *Conservation Objectives: South Dublin Bay SAC 000210*. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	*c.* 15.6km east of the proposed development
Special Protected Area (SPA)	
North Bull Island SPA [004006] A046 Light-bellied Brent Goose *Branta bernicla hrota* A048 Shelduck *Tadorna tadorna* A052 Teal *Anas crecca* A054 Pintail *Anas acuta* A056 Shoveler *Anas clypeata* A130 Oystercatcher *Haematopus ostralegus* A140 Golden Plover *Pluvialis apricaria* A141 Grey Plover *Pluvialis squatarola* A143 Knot *Calidris canutus* A144 Sanderling *Calidris alba* A149 Dunlin *Calidris alpina* A156 Black-tailed Godwit *Limosa limosa* A157 Bar-tailed Godwit *Limosa lapponica* A160 Curlew *Numenius arquata* A162 Redshank *Tringa totanus* A169 Turnstone *Arenaria interpres* A179 Black-headed Gull *Croicocephalus ridibundus* A999 Wetlands & Waterbirds NPWS (2015) *Conservation Objectives: North Bull Island SPA 004006*. Version	*c.* 14.9km east from 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
1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.	
Wicklow Mountains SPA [004040] [A098] Merlin *Falco columbarius* [A103] Peregrine *Falco peregrinus* NPWS (2018) *Conservation objectives for Wicklow Mountains SPA [004040].* Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.	*c.* 14.1km south-east of the proposed development
South Dublin Bay and River Tolka Estuary SPA [004024] A046 Light-bellied Brent Goose *Branta bernicla hrota* A130 Oystercatcher *Haematopus ostralegus* A137 Ringed Plover *Charadrius hiaticula* A141 Grey Plover *Pluvialis squatarola* A143 Knot *Calidris canutus* A144 Sanderling *Calidris alba* A149 Dunlin *Calidris alpina* A157 Bar-tailed Godwit *Limosa lapponica* A162 Redshank *Tringa totanus* A179 Black-headed Gull *Croicocephalus ridibundus* A192 Roseate Tern *Sterna dougallii* A193 Common Tern *Sterna hirundo* A194 Arctic Tern *Sterna paradisaea* A999 Wetland and Waterbirds 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.	*c.* 15.6km east of the proposed development

Table 2: Nationally protected 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)	
Grand Canal pNHA [002104] Diversity of flora species the canal ecosystem supports and the presence of legally protected plant species, opposite-leaved pondweed *Groenlandia densa*.	c. 50m north of the proposed development site
Liffey Valley pNHA [000128] 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 *Scrophularia umbrosa*, *Hypericum hirsutum* and *Lamiastrum caleobdolon* have been recorded from the site.	*c.* 3.5km north of the proposed development site
Rye Water Valley/Carton pNHA [001398] Diversity of flora and fauna species the river ecosystem supports – see also Rye Water Valley/Carton SAC in Table 1 above.	*c.* 4.5km north-west of the proposed development
Royal Canal pNHA [002103] Diversity of flora species the canal ecosystem supports and the presence of legally protected plant species, opposite-leaved pondweed *Groenlandia densa*.	*c.* 4.5km north of the proposed development
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 *Lamiastrum galeobdolon*.	*c.* 6.9km south of the proposed development site
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.* 8.3km south-east of the proposed development site
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.* 7.1km south of the proposed development site
Glenasmole Valley pNHA [001209] Listed under similar conservation objectives as its SAC designation.	*c.* 9.4km south-east of the proposed development site
Kilteel Wood pNHA [001394] The site is a fine example of a largely deciduous wood. Its elevated position gives it scenic value.	*c.* 11.5km south-west of the proposed development site
South Dublin Bay pNHA [000210] Listed under similar conservation objectives as its SAC and SPA designations.	*c.* 15.5km east of the proposed development site
Booterstown Marsh pNHA [001205] The site is designated for its tidal habitats, rare flora and wintering bird populations.	*c.* 16.5km east of the proposed development site
Dolphins, Dublin Docks pNHA [000201] Listed for similar objectives as the South Dublin Bay and River Tolka Estuary SPA.	*c.* 16.7km east of the proposed development site

Appendix 6.2 Desk Study Flora and Fauna Records

Desktop records of protected, rare, or other notable plant species within c.2km of the proposed development site are listed below in Table 1. These are plant species which are legally protected under the Flora (Protection) Order, 2015 and/or are listed as Critically Endangered, Endangered or Vulnerable on the relevant national Red Data list for Ireland[2].

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

Common Name/ Scientific name	Legal Status[3]	Red List Status	Source
Basil thyme *Clinopodium acinos (Acinos arvensis)*	FPO	none	NPWS database record
Betony *Betonica officinalis* (*Stachys officinalis*)	FPO	none	NPWS database record
Green figwort *Scrophularia umbrosa*	None	Endangered	NBDC online database record NPWS database record
Hairy St. John's-wort *Hypericum hirsutum*	FPO	Vulnerable	NPWS database record
Hairy violet *Viola hirta*	FPO	Vulnerable	NPWS database record
Lance-leaved pottia *Tortula lanceola*	None	Critically Endangered	NBDC online database record
Many-seasoned thread-moss *Bryum intermedium*	FPO	Endangered	NBDC online database record
Rigid Aloe-moss *Aloina rigida*	None	Regionally Extinct	NBDC online database record
Lamellate Pottia *Pterygoneurum lamellatum*	None	Regionally Extinct	NBDC online database record
Starke's Pottia *Microbryum starckeanum*	None	Regionally Extinct	NBDC online database record
Screw-moss *Tortula vahliana*	None	Regionally Extinct	NBDC online database record
Meadow barley *Hordeum secalinum*	FPO	Vulnerable	NPWS database record
Opposite-leaved pondweed *Groenlandia densa*	FPO	Endangered	NBDC online database record NPWS database record
Red-hemp nettle *Galeopsis angustifolia*	FPO	Vulnerable	NPWS database record
Ribbonwort *Pallavicinia lyellii*	FPO	Endangered	NBDC online database record
Twisting thread-moss *Bryum torquescens*	None	Vulnerable	NBDC online database record
Weissia longifolia var. *angustifolia*	None	Vulnerable	NBDC online database record

[2] 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.
Bryophytes from Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) *Ireland Red List No.8: Bryophytes*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

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

Desktop records of protected, rare, or other notable fauna species within c.2km of the proposed development site 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.

Table 2: Records of protected, red-listed or notable fauna from the desktop study in the vicinity of the study area.

Common Name/ Scientific Name	**Legal Status[4]**	**Red List Status[5]**	**Source**
Amphibians and Reptiles			
Common frog *Rana temporaria*	HD_V, WA	Least concern	NBDC online database record NPWS database record
Smooth newt *Lissotriton vulgaris*	WA	Least concern	NBDC online database record NPWS database record
Mammals (Terrestrial)			
Badger *Meles meles*	WA	Least concern	NBDC online database record NPWS database record
Brown long-eared bat *Plecotus auritus*	HD_IV, WA	Least concern	NBDC online database record
Common pipistrelle *Pipistrellus pipistrellus*	HD_IV, WA	Least concern	NBDC online database record
Daubenton's bat *Myotis daubentonii*	HD_IV, WA	Least concern	NBDC online database record
Hedgehog *Erinaceus europaeus*	WA	Least concern	NBDC online database record NPWS database record
Leisler's bat *Nyctalus leisleri*	HD_IV, WA	Least concern	NBDC online database record
Pygmy shrew *Sorex minutus*	WA	Least concern	NBDC online database record
Red deer *Cervus elaphus*	WA	Least concern	NBDC online database record
Soprano pipistrelle *Pipistrellus pygmaeus*	HD_IV, WA	Least concern	NBDC online database record
Birds			
Barn owl *Tyto alba*	WA	Red	NBDC online database record

[4] 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

[5] 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 Colhoun, K. & Cummins, S. (2013) *Birds of Conservation Concern in Ireland 2014-2019*. Irish Birds 9:523-544.
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.*
Butterflies from Regan, E.C., Nelson, B., Aldwell, B., Bertrand, C., Bond, K., Harding, J., Nash, D., Nixon, D., & Wilson, C.J. (2010) *Ireland Red List No. 4: Butterflies*.
Moths from Allen, D., O'Donnell, M., Nelson, B., Tyner, A., Bond, K.G.M., Bryant, T., Crory, A., Mellon, C., O'Boyle, J., O'Donnell, E., Rolston, T., Sheppard, R., Strickland, P., Fitzpatrick, U., & Regan, E. (2016) *Ireland Red List No. 9: Macro-moths (Lepidoptera).*
Damselflies and dragonflies from Nelson, B., Ronayne, C. & Thompson, R. (2011) *Ireland Red List No.6: Damselflies & Dragonflies (Odonata).*
Water beetles from Foster, G. N., Nelson, B. H. & O Connor, Á. (2009) *Ireland Red List No. 1: Water beetles*.

Common Name/ Scientific Name	Legal Status[4]	Red List Status[5]	Source
Barn swallow *Hirundo rustica*	WA	Amber	NBDC online database record
Black-headed gull *Chroicocephalus ridibundus*	WA	Red	NBDC online database record
Common coot *Fulica atra*	WA	Red	NBDC online database record
Common kestrel *Falco tinnunculus*	WA	Amber	NBDC online database record
Common kingfisher *Alcedo atthis*	BD_I, WA	Amber	NBDC online database record
Common linnet *Carduelis cannabina*	WA	Amber	NBDC online database record
Common pochard *Aythya ferina*	BD_II (I), III (II), WA	Amber	NBDC online database record
Common redshank *Tringa totanus*	WA	Red	NBDC online database record
Common snipe *Gallinago gallinago*	BD_II (I), III (III), WA	Amber	NBDC online database record
Common starling *Sturnus vulgaris*	WA	Amber	NBDC online database record
Common swift *Apus apus*	WA	Amber	NBDC online database record
Corn crake *Crex crex*	BD_I, WA	Red	NBDC online database record
Eurasian curlew *Numenius arquata*	BD_II, WA	Red	NBDC online database record
Eurasian oystercatcher *Haematopus ostralegus*	WA	Amber	NBDC online database record
Eurasian sparrowhawk *Accipiter nisus*	WA	Amber	NBDC online database record
Eurasian teal *Anas crecca*	BD_II (I), III (II), WA	Amber	NBDC online database record
Eurasian tree sparrow *Passer montanus*	WA	Amber	NBDC online database record
Eurasian wigeon *Anas penelope*	BD_II (I), III (II), WA	Amber	NBDC online database record
Eurasian woodcock *Scolopax rusticola*	BD_II (I), III (II), WA	Amber	NBDC online database record
European golden plover *Pluvialis apricaria*	BD_I, II (II), III (III), WA	Red	NBDC online database record
European robin *Erithacus rubecula*	WA	Amber	NBDC online database record
Gadwall *Anas strepera*	BD_II (I), WA	Amber	NBDC online database record
Goldcrest *Regulus regulus*	WA	Amber	NBDC online database record

Common Name/ Scientific Name	Legal Status[4]	Red List Status[5]	Source
Goosander *Mergus merganser*	BD_II (II), WA	Amber	NBDC online database record
Great black-backed gull *Larus marinus*	WA	Amber	NBDC online database record
Great cormorant *Phalacrocorax carbo*	WA	Amber	NBDC online database record
Greenfinch *Carduelis chloris*	WA	Amber	NBDC online database record
Great crested grebe *Podices cristatus*	WA	Amber	NBDC online database record
Grey partridge *Perdix perdix*	BD_II (I), III (I), WA	Red	NBDC online database record
Herring gull *Larus argentatus*	WA	Red	NBDC online database record
House martin *Delichon urbicum*	WA	Amber	NBDC online database record
House sparrow *Passer domesticus*	WA	Amber	NBDC online database record
Lesser black-backed gull *Larus fuscus*	WA	Amber	NBDC online database record
Little egret *Egretta garzetta*	BD_I, WA	Green	NBDC online database record
Little grebe *Tachybaptus ruficollis*	WA	Amber	NBDC online database record
Meadow pipit *Anthus pratensis*	WA	Red	NBDC online database record
Merlin *Falco columbarius*	BD_I, WA	Amber	NBDC online database record
Mew gull *Larus canus*	WA	Amber	NBDC online database record
Mistle thrush *Turdus viscivorus*	WA	Amber	NBDC online database record
Mute swan *Cygnus olor*	WA	Amber	NBDC online database record
Northern lapwing *Vanellus vanellus*	BD_II (II), WA	Red	NBDC online database record
Northern pintail *Anas acuta*	BD_II (I), III (II), WA	Red	NBDC online database record
Peregrine falcon *Falco peregrinus*	BD_I, WA	Red	NBDC online database record
Red grouse *Lagopus lagopus*	BD_II (I), III (I), WA	Red	NBDC online database record
Rock pigeon *Columba livia*	BD_I, WA	Green	NBDC online database record
Sand martin *Riparia riparia*	WA	Amber	NBDC online database record

Common Name/ Scientific Name	Legal Status[4]	Red List Status[5]	Source
Sky lark *Alauda arvensis*	BD_I, WA	Amber	NBDC online database record
Spotted flycatcher *Muscicapa striata*	WA	Amber	NBDC online database record
Stock Pigeon *Columba oenas*	BD_I, WA	Amber	NBDC online database record
Stonechat *Saxicola torquata*	WA	Amber	NBDC online database record
Tufted duck *Aythya fuligula*	BD_II (I), III (I), WA	Amber	NBDC online database record
Whooper swan *Cygnus cygnus*	BD_I, WA	Amber	NBDC online database record
Yellowhammer *Emberiza citrinella*	WA	Red	NBDC online database record
Invertebrates			
Marsh fritillary butterfly *Euphydryas aurinia*	HD_II	Vulnerable	NBDC online database record
Buffish mining bee *Andrena (Melandrena) nigroaenea*	none	Vulnerable	NBDC online database record
Small blue butterfly *Cupido minimus*	none	Endangered	NBDC online database record
Trimmer's mining bee *Andrena (Hoplandrena) trimmerana*	none	Critically Endangered	NBDC online database record
Wall butterfly *Lasiommata megera*	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:

[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*)

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

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

[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.

[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.

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.

Appendix 6.4 Flora Species List by Habitat

Dry meadows and grassy verges (GS2)/Dry calcareous and neutral grassland (GS1) mosaic		Depositing/lowland rivers (FW2)		Treelines (WL2)	
Scientific Name	**DAFOR**	**Scientific Name**	**DAFOR**	**Scientific Name**	**DAFOR**
Leucanthemum vulgare	O	*Apium nodiflorum*	O	*Acer pseudoplatanus*	F
Festuca pratensis	F	*Phalaris arundinacea*	O	*Rubus fruticosus* agg.	R
Agrostis capillaris	O	*Epilobium hirsutum*	O	*Hedera helix*	R
Origanum vulgare	O	*Juncus effusus*	R	*Prunus* species	O
Anthoxanthum odoratum	O			*Sambucus nigra*	O
Achillea millefolium	F			*Urtica dioica*	O
Vicia sepium	R			*Betula pendula*	O
Brachythecium rutabulum	O			*Alnus glutinosa*	F
Plantago lanceolata	R			*Salix* species	O
Knautia arvensis	R			*Rosa canina* agg.	R
Daucus carota	O				
Senecio jacobaea	R				
Thuidium tamariscinum	R				
Festuca rubra agg.	O				
Pseudoscleropodium purum	R				
Deschampsia cespitosa	R				
Dactylis glomerata	D				
Arrhenatherum elatius	O				
Dipsacus fullonum	R				
Rubus fruticosus agg.	O				
Galium aparine	R				
Ranunculus acris	O				
Cirsium arvense	R				
Arctium minus	R				

Drainage Ditches (FW4)		Amenity grassland (improved) (GA2)		Ornamental/non-native shrub (WS3)	
Scientific Name	**Scientific Name**	**Scientific Name**	**DAFOR**	**Scientific Name**	**DAFOR**
Agrostis stolonifera	*Agrostis stolonifera*	*Poa annua*	O	*Cornus sericea*	D
Ranunculus repens	*Ranunculus repens*	*Festuca rubra* agg.	A	*Hedera helix*	O
Urtica dioica	*Urtica dioica*	*Ranunculus acris*	A		

Drainage Ditches (FW4)		Amenity grassland (improved) (GA2)		Ornamental/non-native shrub (WS3)	
Epilobium hirsutum	*Epilobium hirsutum*	*Trifolium repens*	O		
		Calliergonella cuspidata	O		
		Lolium perenne	D		

Scattered trees and parkland (WD5)		Scrub (WS1)	
Scientific Name	**DAFOR**	**Scientific Name**	**DAFOR**
Betula pendula	A	*Rubus fruticosus agg.*	D
Acer pseudoplatanus	F	*Dactylis glomerata*	O
Poa annua	O	*Epilobium hirsutum*	R
Festuca rubra agg.	D	*Lonicera periclymenum*	O
Lolium perenne	D		
Ranunculus acris	A		
Trifolium repens	O		
Calliergonella cuspidata	O		

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 2016-2022, 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 South Dublin County Development Plan 2016-2022, on European sites and water quality within Dublin Bay.

Table 1: Relevant land use plan policies/objectives within South Dublin County Development Plan 2016-2022 relating to the protection of designated sites, water quality and biodiversity.

South Dublin County Development Plan 2016-2022
G Policy 1 Green Infrastructure It is the policy of the Council to protect, enhance and further develop a multifunctional Green Infrastructure network by building an interconnected network of parks, open spaces, hedgerows, grasslands, protected areas, and rivers and streams that provide a shared space for amenity and recreation, biodiversity protection, flood management and adaptation to climate change. **G1 Objective 1** To establish a coherent, integrated and evolving Green Infrastructure network across South Dublin County with parks, open spaces, hedgerows, grasslands, protected areas, and rivers and streams forming the strategic links and to integrate the objectives of the Green Infrastructure Strategy throughout all relevant Council plans, such as Local Area Plans and other approved plans. **G2 Objective 1** To reduce fragmentation of the Green Infrastructure network and strengthen ecological links between urban areas, Natura 2000 sites, proposed Natural Heritage Areas, parks and open spaces and the wider regional Green Infrastructure network. **G2 Objective 9** To preserve, protect and augment trees, groups of trees, woodlands and hedgerows within the County by increasing tree canopy coverage using locally native species and by incorporating them within design proposals and supporting their integration into the Green Infrastructure network. **G Policy 3 Watercourses Network** It is the policy of the Council to promote the natural, historical and amenity value of the County's watercourses; to address the long-term management and protection of these corridors and to strengthen links at a regional level. **G3 Objective 1** To promote the natural, historical and amenity value of the County's watercourses and address the long-term management and protection of these corridors in the South Dublin Green Infrastructure Strategy. **G3 Objective 2** To maintain a biodiversity protection zone of not less than 10 metres from the top of the bank of all watercourses in the County, with the full extent of the protection zone to be determined on a case by case basis by the Planning Authority, based on site specific characteristics and sensitivities. Strategic Green Routes and Trails identified in the South Dublin Tourism Strategy, 2015; the Greater Dublin Area Strategic Cycle Network; and other government plans or programmes will be open for consideration within the biodiversity protection zone, subject to appropriate safeguards and assessments, as these routes increase the accessibility of the Green Infrastructure network. **G3 Objective 5** To restrict the encroachment of development on watercourses, and provide for protection measures to watercourses and their banks, including but not limited to: the prevention of pollution of the watercourse, the protection of the river bank from erosion, the retention and/or provision of wildlife corridors and the protection from light spill in sensitive locations, including during construction of permitted development. **G6 Objective 1** To protect and enhance existing ecological features including tree stands, woodlands, hedgerows and watercourses in all new developments as an essential part of the design process. **HCL12 Objective 1** To 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.

HCL12 Objective 2

To ensure that projects that give rise to significant direct, indirect or secondary impacts on Natura 2000 sites, either individually or in combination with other plans or projects, will not be permitted unless the following is robustly demonstrated in accordance with Article 6(4) of the Habitats Directive and S.177AA of the Planning and Development Act (2000 – 2010) or any superseding legislation:

1. There are no less damaging alternative solutions available; and

2. There are imperative reasons of overriding public interest (as defined in the Habitats Directive) requiring the project to proceed; and

3. Adequate compensatory measures have been identified that can be put in place.

HCL15 Objective 3

To protect existing trees, hedgerows, and woodlands which are of amenity or biodiversity value and/ or contribute to landscape character and ensure that proper provision is made for their protection and management in accordance with Living with Trees: South Dublin County Council's Tree Management Policy 2015-2020.

IE Policy 1 Water & Wastewater

It is the policy of the Council to work in conjunction with Irish Water to protect existing water and drainage infrastructure and to promote investment in the water and drainage network to support environmental protection and facilitate the sustainable growth of the County.

IE1 Objective 1

To work in conjunction with Irish Water to protect, manage and optimise water supply and foul drainage networks in the County.

IE1 Objective 2

To work in conjunction with Irish Water to facilitate the timely delivery of ongoing upgrades and the expansion of water supply and wastewater services to meet the future needs of the County and the Region.

IE Policy 2 Surface Water & Groundwater

It is the policy of the Council to manage surface water and to protect and enhance ground and surface water quality to meet the requirements of the EU Water Framework Directive.

IE2 Objective 1

To maintain, improve and enhance the environmental and ecological quality of our surface waters and groundwater by implementing the programme of measures set out in the Eastern River Basin District River Basin Management Plan.

IE2 Objective 3

To maintain and enhance existing surface water drainage systems in the County and promote and facilitate the development of Sustainable Urban Drainage Systems (SUDS), including integrated constructed wetlands, at a local, district and County level, to control surface water outfall and protect water quality.

IE2 Objective 4

To incorporate Sustainable Urban Drainage Systems (SUDS) as part of Local Area Plans, Planning Schemes, Framework Plans and Design Statements to address the potential for Sustainable Urban Drainage at a site and/or district scale, including the potential for wetland facilities.

IE2 Objective 5

To limit surface water run-off from new developments through the use of Sustainable Urban Drainage Systems (SUDS) and avoid the use of underground attenuation and storage tanks.

IE2 Objective 6

To promote and support the retrofitting of Sustainable Urban Drainage Systems (SUDS) in established urban areas, including integrated constructed wetlands.

IE2 Objective 9

To protect water bodies and watercourses, including rivers, streams, associated undeveloped riparian strips, wetlands and natural floodplains, within the County from inappropriate development. This will include protection buffers in riverine and wetland areas as appropriate (see also Objective G3 Objective 2 – Biodiversity Protection Zone).

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

Dún Laoghaire-Rathdown County Development Plan 2016-2022

Policy LHB19: Protection of Natural Heritage and the Environment

It is Council policy 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, candidate Special Areas of Conservation, proposed Natural Heritage Areas and Ramsar sites - as well as non-designated areas of high nature conservation value which serve as 'Stepping Stones' for the purposes of Article 10 of the Habitats Directive.

Policy LHB20: Habitats Directive

It is Council policy 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 LHB22: Designated Sites

It is Council policy to protect and preserve areas designated as proposed Natural Heritage Areas, candidate 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 EI2: Wastewater Treatment and Appropriate Assessment

It is Council policy to provide adequate wastewater treatment facilities to serve the existing and future population of the County, subject to complying with the Water Framework Directive and the associated River Basin Management Plan or any updated version of this document, 'Water Quality in Ireland 2007-2009' (EPA 2011) or any updated version of the document, Pollution Reduction Programmes for Designated Shellfish Areas, the Urban Waste Water Treatment Directive and the Habitats Directive.

Policy EI3: Surface Water Drainage and Appropriate Assessment

It is Council policy to require that a Sustainable Drainage System (SuDS) is applied to any development and that site specific solutions to surface water drainage systems are developed, which meet the requirements of the Water Framework Directive and the associated River Basin Management Plans and 'Water Quality in Ireland 2007-2009' (EPA 2011) or any updated version of the document.

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 200811.

- 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).

WI2

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.

WI12

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.

WI6

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.

WI7

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 area6 or Irish Water have confirmed there are no plans for a public system in the area;
- it can clearly 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.

Eastern & Midland Regional Assembly, Regional Spatial & Economic Strategy 2019-2031

Regional Policy Objective 3.4

Ensure that all plans, projects and activities requiring consent arising from the Regional Spatial and Economic Strategy are subject to the relevant environmental assessment requirements including SEA, EIA and AA as appropriate. In addition the future strategic development of settlements throughout the Region will have full cognisance of the legal requirements pertaining to sites of International Nature Conservation Interest.

Regional Policy Objective 7.2

To achieve and maintain 'Good Environmental Status' for marine waters and to ensure the sustainable use of shared marine resources in the Region, and to promote the development of a cross-boundary and cross-border strategic management and stakeholder engagement framework to protect the marine environment.

Regional Policy Objective 7.10

Support the implementation of the Water Framework Directive in achieving and maintaining at least good environmental status for all water bodies in the Region and to ensure alignment between the core objectives of the Water Framework Directive and other relevant Directives, River Basin Management plans and local authority land use plans.

Regional Policy Objective 7.11

For water bodies with 'high ecological status' objectives in the Region, local authorities shall incorporate measures for both their continued protection and to restore those water bodies that have fallen below high ecological status and areas 'At Risk' into the development of local planning policy and decision making any measures for the continued protection of areas with high ecological status in the Region and for mitigation of threats to waterbodies identified as 'At Risk' as part of a catchment based approach in consultation with the relevant agencies. This shall include recognition of the need to deliver efficient wastewater facilities with sufficient capacity and thus contribute to improved water quality in the Region.

Regional Policy Objective 7.12

Future statutory land use plans shall include Strategic Flood Risk Assessment (SFRA) and seek to avoid inappropriate land use zonings and development in areas at risk of flooding and to integrate sustainable water management solutions (such as SuDS, nonporous surfacing and green roofs) to create safe places in accordance with the Planning System and Flood Risk Assessment Guidelines for Local Authorities.

Regional Policy Objective 7.15

Local authorities shall take opportunities to enhance biodiversity and amenities and to ensure the protection of environmentally sensitive sites and habitats, including where flood risk management measures are planned.

Regional Policy Objective 7.16

Support the implementation of the Habitats Directives in achieving an improvement in the conservation status of protected species and habitats in the Region and to ensure alignment between the core objectives of the EU Birds and Habitats Directives and local authority development plans.

Regional Policy Objective 7.22

Local authority development plan and local area plans, shall identify, protect, enhance, provide and manage Green Infrastructure in an integrated and coherent manner and should also have regard to the required targets in relation to the conservation of European sites, other nature conservation sites, ecological networks and protected species.

Regional Policy Objective 10.6

Delivery and phasing of services shall be subject to the required appraisal, planning and environmental assessment processes and shall avoid adverse impacts on the integrity of the Natura 2000 network.

Regional Policy Objective 10.7

Local authority core strategies shall demonstrate compliance with DHPLG Water Services Guidelines for local authorities and demonstrate phased infrastructure – led growth that is commensurate with the carrying capacity of water services and prevent adverse impacts on the integrity of water dependent habitats and species within the Natura 2000 network.

Regional Policy Objective 10.10

Support Irish Water and the relevant local authorities in the Region to eliminate untreated discharges from settlements in the short term, while planning strategically for long term growth in tandem with Project Ireland 2040 and in increasing compliance with the requirements of the Urban Waste Water Treatment Directive from 39% today to 90% by the end of 2021, to 99% by 2027 and to 100% by 2040.

Regional Policy Objective 10.11

EMRA supports the delivery of the wastewater infrastructure set out in Table 10.2, subject to appropriate environmental assessment and the planning process.[14]

Regional Policy Objective 10.12

Development plans shall support strategic wastewater treatment infrastructure investment and provide for the separation of foul and surface water networks to accommodate the future growth of the Region.

Regional Policy Objective 10.15

Support the relevant local authorities (and Irish Water where relevant) in the Region to improve storm water infrastructure to improve sustainable drainage and reduce the risk of flooding in the urban environment and in the development and provision at a local level of Sustainable Urban Drainage solutions.

Regional Policy Objective 10.16

Implement policies contained in the Greater Dublin Strategic Drainage Study (GDSDS), including SuDS.

Regional Policy Objective 10.18

Local authorities shall ensure adequate surface water drainage systems are in place which meet the requirements of the Water Framework Directive and the associated River Basin Management Plans.

[14] The Greater Dublin Drainage Project, the Ringsend Wastewater Treatment Plant Project, the Athlone Main Drainage Project and the Upper Liffey Valley Sewerage Scheme

CHAPTER 7 - LAND, SOIL, GEOLOGY AND HYDROGEOLOGY

Appendix 7.1 NRA Criteria for Rating the Magnitude and Significance of Impacts at EIA Stage National Roads Authority (NRA, 2009)

Table 1 Criteria for Rating Site Attributes – Estimation of Importance of Soil and Geology Attributes (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 Site Attributes – Estimation of Importance of Hydrogeological Attributes (NRA)

Importance	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.
High	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 3 Criteria for Rating Impact Significance 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. Irreversible loss of high proportion of local high fertility soils. Removal of entirety of geological heritage feature. Requirement to excavate/remediate entire waste site. Requirement to excavate and replace high proportion of peat, organic soils and/or soft mineral soils beneath alignment.
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. Removal of part of geological heritage feature. Irreversible loss of moderate proportion of local high fertility soils. Requirement to excavate/remediate significant proportion of waste site. Requirement to excavate and replace moderate proportion of peat, organic soils and/or soft mineral soils beneath alignment.
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. Removal of small part of geological heritage feature. Irreversible loss of small proportion of local high fertility soils and/or high proportion of local low fertility soils. Requirement to excavate/remediate small proportion of waste site. Requirement to excavate and replace small proportion of peat, organic soils and/or soft mineral soils beneath alignment.
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

Table 4 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Hydrogeological 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 Site Investigation Report (Site Investigations Ltd, 2021)

S.I. Ltd Contract No: 5803

Client: BCEI
Engineer: Clifton Scannell Emerson Associates
Contractor: Site Investigations Ltd

Edgeconnex Substation 110kV Cable Route,
Grange Castle, Co. Dublin
Site Investigation Report

Prepared by:

.....
Stephen Letch

Issue Date:	26/03/2021
Status	Final
Revision	1

5803 – Edgeconnex
Grange Castle, Co. Dublin

Contents:

Appendices:

5803 – Edgeconnex
Grange Castle, Co. Dublin

1. Introduction

On the instructions of Clifton Scannell Emerson Associates, Site Investigations Ltd (SIL) was appointed to complete a ground investigation for the Edgeconnex Substation 11kV cable route. The investigation was completed on behalf of the Client, BCEI.

The fieldworks comprised a programme of slit trenches, rotary coreholes and thermal resistivity testing. All fieldwork was carried out in accordance with BS 5930:2015, Engineers Ireland GI Specification and Related Document 2nd Edition 2016 and Eurocode 7: Geotechnical Design.

This report presents the factual geotechnical data obtained from the field and laboratory testing with interpretation of the ground conditions discussed.

2. Fieldwork

The geotechnical fieldworks were started in January and completed in March 2021. The fieldworks consisted of the following:

- 43 No. slit trenches
- 3 No. rotary coreholes
- 2 No. thermal resistivity locations

2.1. Slit Trenches

Slit trenching was completed at 43 No. locations by hand digging with machine assistance where possible. The trenches were completed to check the location and depth of any services that were identified to be on site from service drawings. The trenches were logged and photographed before they were backfilled with the arisings.

The slit trench logs with photographs are presented in Appendix 1.

2.2. Rotary Coreholes

Rotary coreholes were completed at 3 No. locations to investigate the depth and type of bedrock. The rotary drilling was carried out using a Sondeq SS71 top drive rig. Open hole drilling techniques were used to advance through the overburden and bedrock was encountered at 2.50mbgl, 2.70mbgl and 3.40mbgl respectively. The bedrock was then cored and recovered in 1m long core boxes. RC01 collapsed after 3m of core was recovered so the location was abandoned. RC02 and RC03 were terminated at 12.00mbgl as per the schedule.

Once the coreholes were completed, the rock cores were returned to SIL, where they were logged and photographed by a SIL geotechnical engineer. Provided on the logs are engineering

geological descriptions of the rock cores with details of the bedding/discontinuities and mechanical indices for each core run, i.e., TCR, SCR, RQD and Fracture Index.
The rotary corehole logs and photographs are presented in Appendix 2.

2.3. Thermal Resistivity Testing

Initially 6 No. locations for thermal resistivity testing of the soils were scheduled but this was reduced to 2 No. locations as the investigation was being completed. Samples were recovered at 1.00mbgl before boulders terminated the pits and the recovery of any further samples. The samples were then packaged and sent to Soil Environment Services to complete the testing.

The thermal resistivity tests are presented in Appendix 3.

2.4. Surveying

As the investigation was progressing, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is supplied on each individual log and along with site plans in Appendix 6.

3. Laboratory Testing

Laboratory testing has been performed on representative rock core samples recovered from the coreholes and these were completed in accordance of BS1377: 1990 or the relevant specification. Testing included:

- 19 No. unconfined compressive strength tests
- 36 No. point loads

Environmental testing was completed by ALS Environmental Ltd. and consists of the following:

- 4 No. Suite I analysis

The geotechnical laboratory test results are presented in Appendix 4 and the environmental tests reported in Appendix 5 along with a Waste Classification report.

4. Ground Conditions

4.1. Bedrock

Bedrock was recovered from depths ranging from 2.50mbgl to 3.40mbgl and the core recovered shows that bedrock is strong to very strong light grey fine-grained muddy LIMESTONE interbedded with moderately weak to moderately strong dark grey calcareous MUDSTONE with

thin calcite veins and in BH02, occasional pyrite crystals. The weathering state is fresh to slightly weathered.

The discontinuities are generally smooth occasionally rough, planar, tight to open, sub-horizontal to sub-vertical dip with clean surfaces which are occasionally stained grey.

5.0. Recommendations and Conclusions

5.1. Contamination

Environmental testing was carried out on four samples from the investigation and the results are shown in Appendix 5. For material to be removed from site, Suite I testing was carried out to determine if the material is hazardous or non-hazardous and then the leachate results were compared with the published waste acceptance limits of BS EN 12457-2 to determine whether the material on the site could be accepted as 'inert material' by an Irish landfill.

The Waste Classification report created using HazWasteOnline™ software shows the samples tested can be classified as non-hazardous material. Three samples recorded Total Petroleum Hydrocarbons above the limit of detection but the levels were low and not in the liquid phase so the soils can be classified as non-hazardous.

Following this analysis of the solid test results, the leachate disposal suite results indicate most of the determinands are below the Inert threshold. However, three samples recorded elevated total dissolved solids and two samples recorded elevated sulphate levels. Therefore, if these soils are to be removed then additional testing and consultation with an Environmental Engineer is recommended.

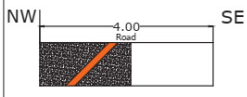
Four samples were tested for analysis; however, any localised contamination may have been missed. Any MADE GROUND excavated on site should be stockpiled separately to natural soils to avoid any potential cross contamination of the soils. Additional testing of these soils may be requested by the individual landfill before acceptance and a testing regime designed by an environmental engineer would be recommended to satisfy the landfill.

5803 – Edgeconnex
Grange Castle, Co. Dublin

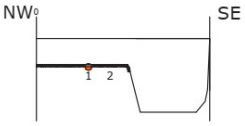
Appendix 1
Slit Trench Logs

ST01

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703098.784	732158.413	60.77
End	703102.644	732157.269	60.76

Length:	Width:	Depth:
4.00m	1.00m	1.70m

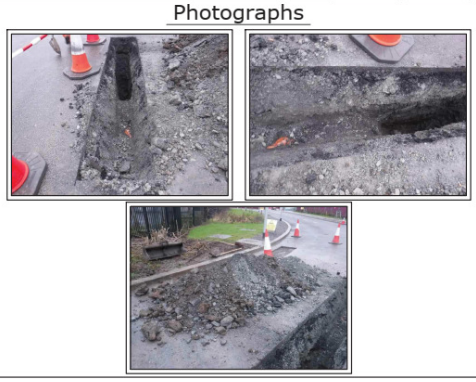
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	150mm	Orange	Water	1.20m	0.58m	135°
2	Lean mix	Concrete	Unknown	0.00 - 2.10m	0.60m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.10m	MADE GROUND: tarmacadam.
0.10m	0.30m	MADE GROUND: black silty sandy gravel (Cl. 804).
0.30m	1.10m	MADE GROUND: grey silty sandy gravel (Cl. 804 / 6F2).
1.10m	1.70m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs



SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

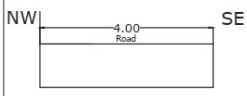
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	29/01/2021	29/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

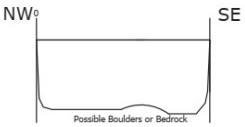
DEPTH ARE TO THE TOP OF SERVICES

ST02

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703107.652	732155.415	60.82
End	703111.401	732154.016	60.90

Length:	Width:	Depth:
4.00m	1.00m	1.70m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: tarmacadam.
0.20m	0.60m	MADE GROUND: black silty sandy gravel (Cl. 804).
0.60m	1.10m	MADE GROUND: grey silty sandy gravel (Cl. 804 / 6F2).
1.10m	1.70m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

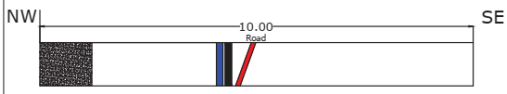
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	29/01/2021	29/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

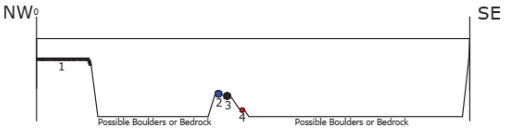
DEPTH ARE TO THE TOP OF SERVICES

ST03

Plan



Cross Section



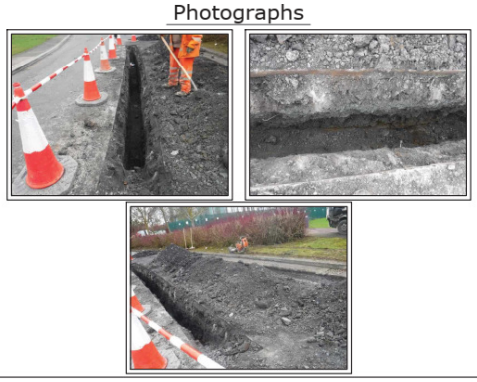
Point:	Easting:	Northing:	Level:
Start	703114.974	732152.682	60.97
End	703124.713	732149.740	61.20

Length:	Width:	Depth:
10.00m	1.00m	1.80m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	Poss. Telecoms	0.00 - 1.20m	0.45m	90°
2	150mm	Blue	Water	4.20m	1.20m	90°
3	150mm	Black	Telecoms	4.40m	1.25m	90°
4	100mm	Red	ESB	4.75m	1.60m	110°

Photographs



Ground Conditions

From:	To:	Description:
0.00m	0.30m	TOPSOIL.
0.30m	0.90m	MADE GROUND: grey silty sandy gravel (Cl. 804 / 6F2).
0.90m	1.60m	MADE GROUND: brown black slightly sandy slightly gravelly silty clay with medium cobble and boulder content.
1.60m	1.80m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	28/01/2021	28/01/2021	5803

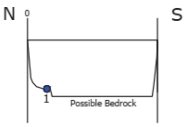
Scale: NOT TO SCALE, ALL DISTANCES IN m

DEPTH ARE TO THE TOP OF SERVICES

ST04

Plan

Cross Section



Point:	Easting:	Northing:	Level:
Start	703131.986	732153.252	61.32
End	703131.555	732150.309	61.38

Length:	Width:	Depth:
3.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	150mm	Blue	Water	0.45m	1.05m	90°

Photographs

Ground Conditions

From:	To:	Description:
0.00m	0.30m	MADE GROUND: tarmacadam.
0.30m	1.00m	MADE GROUND: grey silty sandy gravel (Cl. 804).
1.00m	1.30m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

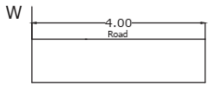
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	22/01/2021	22/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

DEPTH ARE TO THE TOP OF SERVICES

ST05

Plan



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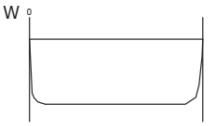


Point:	Easting:	Northing:	Level:
Start	703144.276	732149.880	61.72
End	703148.264	732149.488	61.83

Length:	Width:	Depth:
4.00m	1.00m	1.50m

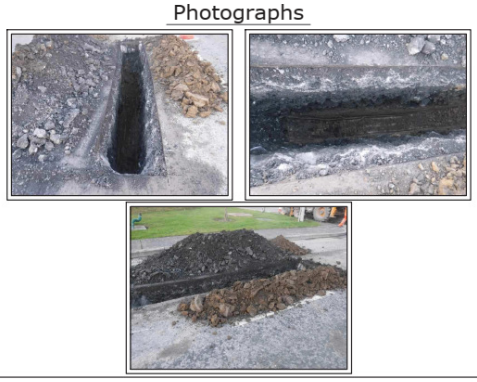
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Ground Conditions

From:	To:	Description:
0.00m	0.32m	MADE GROUND: tarmacadam.
0.32m	1.10m	MADE GROUND: grey silty sandy gravel (Cl. 804).
1.10m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

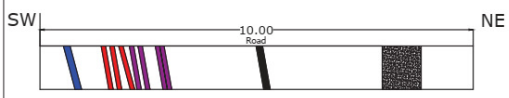


SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 21/01/2021	Excavation Finished: 21/01/2021
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m		CONTRACT NUMBER: 5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES		

ST06

Plan



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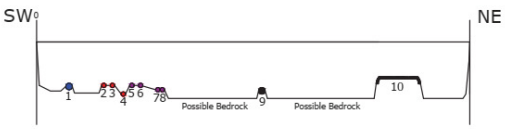


Point:	Easting:	Northing:	Level:
Start	703156.915	732150.576	61.98
End	703158.991	732160.083	62.07

Length:	Width:	Depth:
10.00m	1.00m	1.30m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	150mm	Blue	Water	0.75m	0.95m	75°
2	100mm	Red	ESB	1.55m	0.95m	80°
3	100mm	Red	ESB	1.75m	0.95m	80°
4	100mm	Red	ESB	2.00m	1.15m	75°
5	100mm	Purple	Telecoms	2.20m	0.95m	80°
6	100mm	Purple	Telecoms	2.40m	0.95m	80°
7	100mm	Purple	Telecoms	2.80m	1.05m	80°
8	100mm	Purple	Telecoms	2.90m	1.05m	80°
9	150mm	Black	Surface Water	5.20m	1.05m	80°
10	Lean mix	Concrete	Poss. Gas	7.90 - 8.80m	0.80m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: concrete.
0.20m	0.80m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.80m	1.30m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

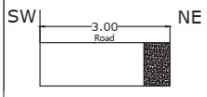
Photographs

SITE INVESTIGATIONS LTD

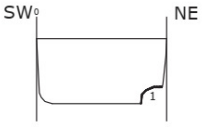
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 22/01/2021	Excavation Finished: 22/01/2021
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m		CONTRACT NUMBER: 5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES		

ST07

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703184.982	732198.015	62.73
End	703186.902	732200.407	62.76

Length:	Width:	Depth:
3.00m	1.00m	1.50m

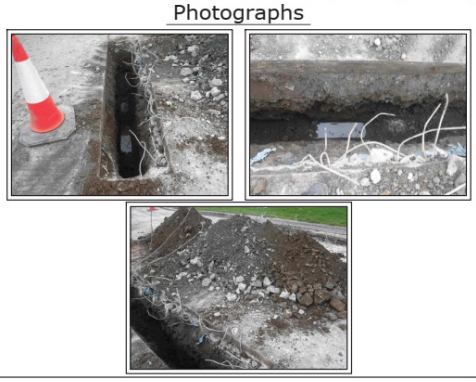
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	Unknown	2.40 - 3.00m	1.10m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: concrete.
0.20m	0.70m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.70m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

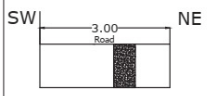


SITE INVESTIGATIONS LTD

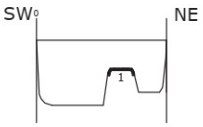
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 21/01/2021	Excavation Finished: 21/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST08

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703188.487	732202.316	62.77
End	703190.367	732204.673	62.80

Length:	Width:	Depth:
3.00m	1.00m	1.50m

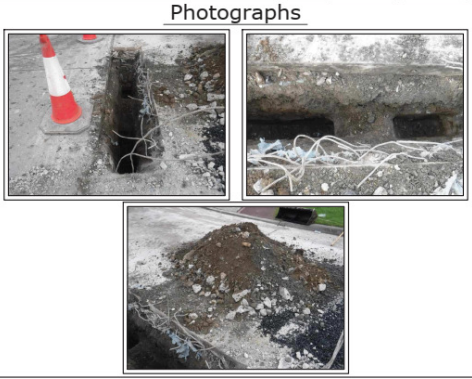
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	Unknown	1.70 - 2.20m	0.65m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: concrete.
0.20m	0.70m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.70m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

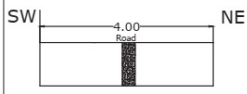


SITE INVESTIGATIONS LTD

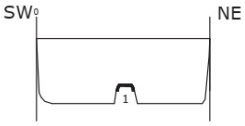
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 21/01/2021	Excavation Finished: 21/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST09

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703191.457	732206.061	62.82
End	703194.130	732209.119	62.85

Length:	Width:	Depth:
4.00m	1.00m	1.50m

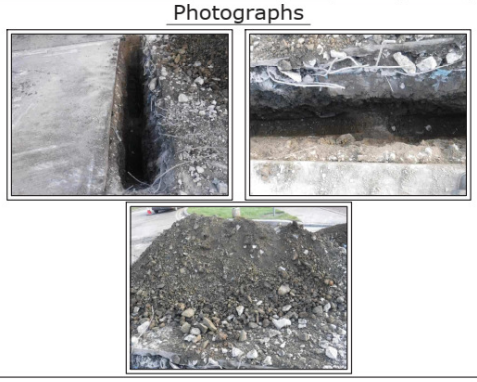
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	Unknown	1.90 - 2.20m	1.05m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: concrete.
0.20m	0.80m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.80m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs



SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	21/01/2021	21/01/2021	5803

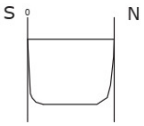
Scale: NOT TO SCALE, ALL DISTANCES IN m

DEPTH ARE TO THE TOP OF SERVICES

ST10

Plan

Cross Section



Point:	Easting:	Northing:	Level:
Start	703200.140	732210.762	62.96
End	703199.106	732212.531	62.95

Length:	Width:	Depth:
2.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Ground Conditions

From:	To:	Description:
0.00m	0.33m	MADE GROUND: tarmacadam.
0.33m	0.80m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.80m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble content.

Photographs

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

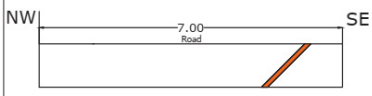
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	21/01/2021	21/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

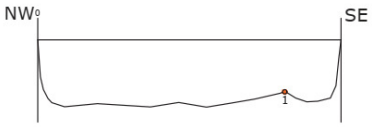
DEPTH ARE TO THE TOP OF SERVICES

ST11

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703218.463	732209.550	62.99
End	703225.126	732207.419	62.97

Length:	Width:	Depth:
7.00m	1.00m	1.50m

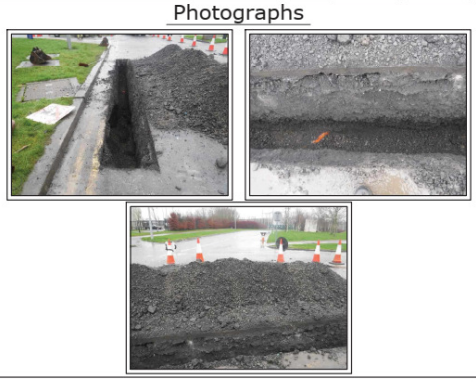
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	100mm	Orange	Lighting	5.70m	1.15m	135°

Ground Conditions

From:	To:	Description:
0.00m	0.30m	MADE GROUND: tarmacadam.
0.30m	1.30m	MADE GROUND: grey silty sandy gravel (Cl. 804).
1.30m	1.50m	MADE GROUND: brown silty sandy gravel (Cl. 6F2).

Photographs



SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	20/01/2021	20/01/2021	5803

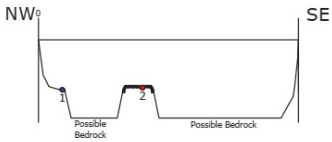
Scale: NOT TO SCALE, ALL DISTANCES IN m

DEPTH ARE TO THE TOP OF SERVICES

ST12

Plan

Cross Section



Point:	Easting:	Northing:	Level:
Start	703228.476	732206.224	62.99
End	703234.242	732204.507	62.97

Length:	Width:	Depth:
6.00m	1.00m	1.80m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	100mm	Blue	Water	0.55m	1.10m	110°
2	100mm	Red	ESB	2.40m	1.05m	110°
Service encased in concrete 2.00m to 2.60m - top of duct exposed						

Ground Conditions

From:	To:	Description:
0.00m	0.32m	MADE GROUND: tarmacadam.
0.32m	0.95m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.95m	1.80m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

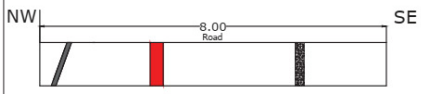
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	25/01/2021	25/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

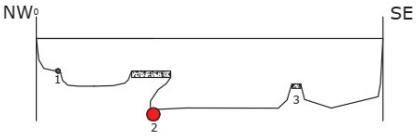
DEPTH ARE TO THE TOP OF SERVICES

ST13

Plan



Cross Section



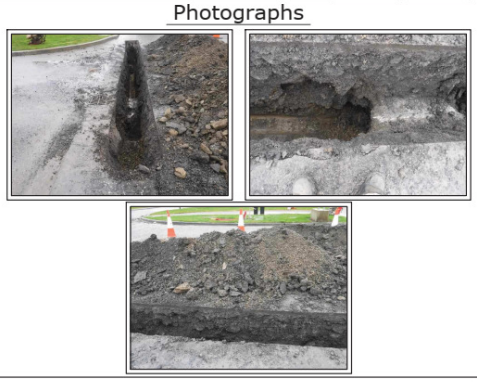
Point:	Easting:	Northing:	Level:
Start	703237.333	732203.386	62.89
End	703244.947	732201.083	62.94

Length:	Width:	Depth:
8.00m	1.00m	1.60m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	100mm	Grey	Empty	0.50m	0.70m	110°
2	300mm	Red	Sewer	2.70m	1.60m	90°
3	100mm	Yellow tape	Possible ESB	6.00m	1.05m	90°

Photographs



Ground Conditions

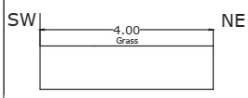
From:	To:	Description:
0.00m	0.32m	MADE GROUND: tarmacadam.
0.32m	1.25m	MADE GROUND: grey silty sandy gravel (Cl. 804).
1.25m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 20/01/2021	Excavation Finished: 20/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST14

Plan



Cross Section

Point:	Easting:	Northing:	Level:
Start	703249.090	732202.017	63.05
End	703250.321	732203.569	63.10

Length:	Width:	Depth:
2.00m	1.00m	1.20m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Photographs

Ground Conditions

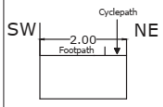
From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	1.20m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with medium cobble and low boulder content and some concrete fragments.
1.20m		Pit terminated due to concrete obstruction.

SITE INVESTIGATIONS LTD

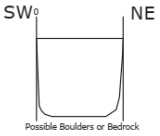
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 26/01/2021	Excavation Finished: 26/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST15

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703253.789	732206.772	63.26
End	703255.125	732208.257	63.30

Length:	Width:	Depth:
2.00m	1.00m	1.80m

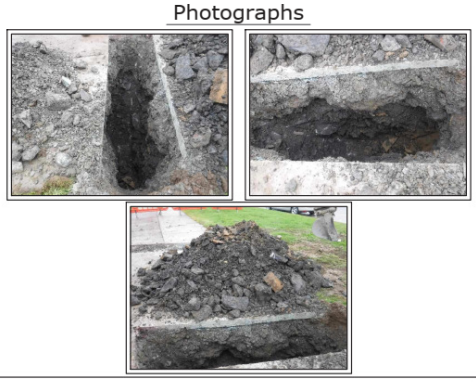
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: tarmacadam.
0.20m	1.70m	MADE GROUND: black slightly sandy slightly gravelly silty clay with high cobble and boulder content.
1.70m	1.80m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

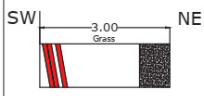


SITE INVESTIGATIONS LTD

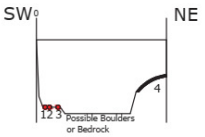
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 27/01/2021	Excavation Finished: 27/01/2021
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m		CONTRACT NUMBER: 5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES		

ST16

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703257.669	732211.643	63.45
End	703259.643	732213.838	63.57

Length:	Width:	Depth:
3.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	100mm	Red	ESB	0.20m	1.50m	80°
2	100mm	Red	ESB	0.30m	1.50m	80°
3	100mm	Red	ESB	0.50m	1.50m	80°
4	Lean mix	Concrete	Poss. Telecoms	2.30 - 3.00m	1.20 - 0.80m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	1.50m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with medium cobble and low boulder content and some concrete fragments.
1.50m	1.60m	MADE GROUND: pea gravel.
1.60m	1.70m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

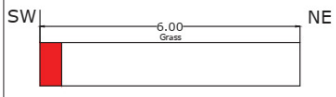
Photographs

SITE INVESTIGATIONS LTD

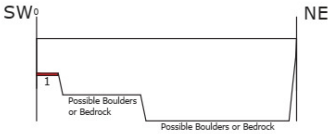
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 26/01/2021	Excavation Finished: 26/01/2021
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m		CONTRACT NUMBER: 5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES		

ST17

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703420.625	732081.525	66.04
End	703423.998	732086.598	66.13

Length:	Width:	Depth:
6.00m	1.00m	1.90m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Rubber mat	Red	ESB	0.00 - 0.50m	0.80m	90°

Ground Conditions

From:	To:	Description:
0.00m	1.30m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with some red brick fragments.
1.30m	1.90m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

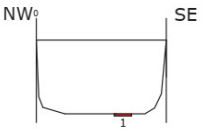
SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 26/01/2021	Excavation Finished: 26/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST18

Plan

Cross Section



Point:	Easting:	Northing:	Level:
Start	703451.429	732084.443	66.46
End	703454.521	732083.980	66.67

Length:	Width:	Depth:
3.00m	1.00m	1.70m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Rubber mat	Red	ESB	1.80 - 2.20m	1.70m	120°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	1.70m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with medium cobble and low boulder content and some concrete fragments.

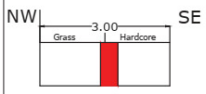
Photographs

SITE INVESTIGATIONS LTD

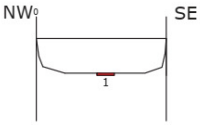
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 26/01/2021	Excavation Finished: 26/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST19

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703458.719	732099.563	65.98
End	703461.996	732098.385	65.65

Length:	Width:	Depth:
3.00m	1.00m	0.80m

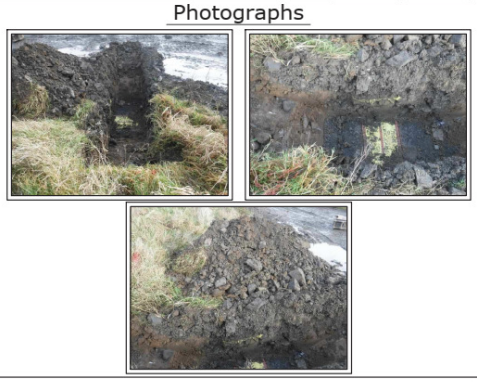
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Rubber mat	Red	ESB	1.40 - 1.80m	0.80m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.20m	0.80m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with medium cobble content and some concrete fragments.

Photographs

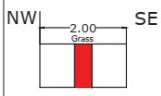


SITE INVESTIGATIONS LTD

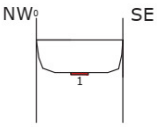
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 26/01/2021	Excavation Finished: 26/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST20

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703467.440	732106.001	65.77
End	703469.515	732105.612	65.89

Length:	Width:	Depth:
2.00m	1.00m	0.75m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Rubber mat	Red	ESB	0.80 - 1.20m	0.75m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	0.75m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with medium cobble content.

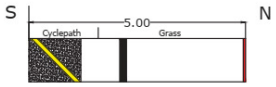
Photographs

SITE INVESTIGATIONS LTD

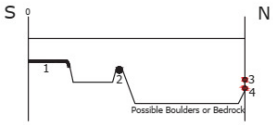
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 26/01/2021	Excavation Finished: 26/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST21

Plan



Cross Section



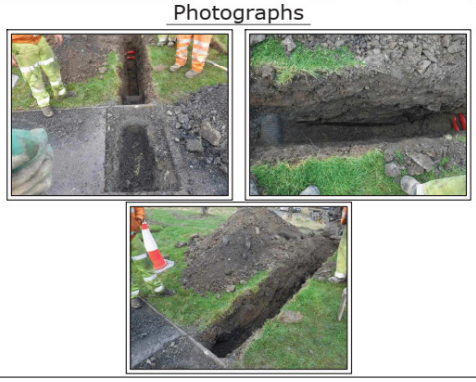
Point:	Easting:	Northing:	Level:
Start	703452.537	732075.255	66.61
End	703452.909	732080.304	67.02

Length:	Width:	Depth:
5.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Tape	Yellow	ESB	0.00 - 1.20m	0.50m	45°
2	150mm	Black	Telecoms	2.10m	0.65m	90°
3	100mm	Red	ESB	5.00m	0.90m	90°
4	100mm	Red	ESB	5.00m	1.10m	90°

Photographs



Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	0.90m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with some plastic fragments.
0.90m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

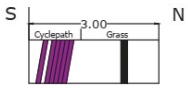
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	26/01/2021	26/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

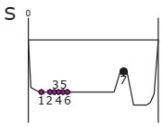
DEPTH ARE TO THE TOP OF SERVICES

ST22

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703446.784	732075.576	66.48
End	703446.735	732078.651	66.76

Length:	Width:	Depth:
3.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	100mm	Purple	Telecoms	0.30m	1.15m	100°
2	100mm	Purple	Telecoms	0.50m	1.15m	100°
3	100mm	Purple	Telecoms	0.60m	1.15m	100°
4	100mm	Purple	Telecoms	0.70m	1.15m	100°
5	100mm	Purple	Telecoms	0.80m	1.15m	100°
6	100mm	Purple	Telecoms	0.90m	1.15m	100°
7	150mm	Black	Telecoms	2.20m	0.65m	90°

Photographs

Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	0.90m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with some plastic fragments.
0.90m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

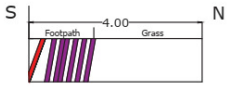
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	26/01/2021	26/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

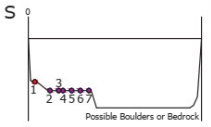
DEPTH ARE TO THE TOP OF SERVICES

ST23

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703429.612	732076.378	66.08
End	703429.816	732080.294	66.12

Length:	Width:	Depth:
4.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	100mm	Red	ESB	0.15m	0.95m	110°
2	100mm	Purple	Telecoms	0.50m	1.15m	100°
3	100mm	Purple	Telecoms	0.70m	1.15m	100°
4	100mm	Purple	Telecoms	0.80m	1.15m	100°
5	100mm	Purple	Telecoms	1.00m	1.15m	100°
6	100mm	Purple	Telecoms	1.20m	1.15m	100°
7	100mm	Purple	Telecoms	1.40m	1.15m	100°

Photographs

Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	1.20m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with some plastic fragments.
1.20m	1.60m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

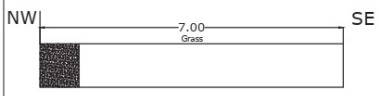
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	26/01/2021	26/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

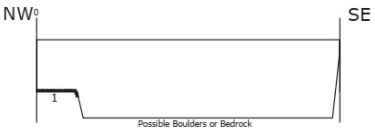
DEPTH ARE TO THE TOP OF SERVICES

ST24

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703260.654	732215.689	63.70
End	703267.266	732213.402	63.03

Length:	Width:	Depth:
7.00m	1.00m	1.80m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	ESB	0.00 - 0.90m	1.15m	90°

Photographs

Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	1.50m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with low cobble and some plastic fragments.
1.50m	1.80m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

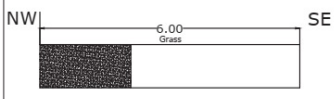
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	25/01/2021	25/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

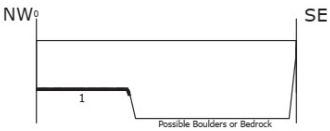
DEPTH ARE TO THE TOP OF SERVICES

ST25

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703260.710	732212.655	63.54
End	703266.471	732210.384	63.07

Length:	Width:	Depth:
6.00m	1.00m	1.80m

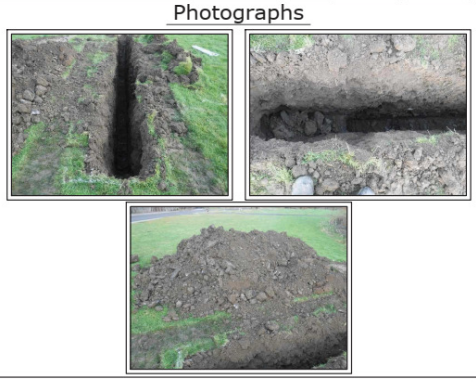
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	ESB	0.00 - 2.10m	1.10m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	1.60m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with low cobble and boulder content and some concrete, clay and plastic pipes.
1.60m	1.80m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

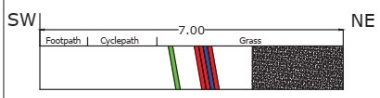


SITE INVESTIGATIONS LTD

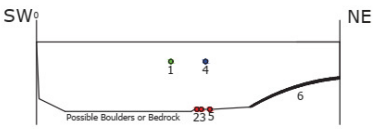
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 25/01/2021	Excavation Finished: 25/01/2021
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m		CONTRACT NUMBER: 5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES		

ST26

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703257.268	732205.675	63.27
End	703262.026	732210.667	63.42

Length:	Width:	Depth:
7.00m	1.00m	1.60m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	100mm	Green	Telecoms	3.10m	0.40m	80°
2	100mm	Red	ESB	3.70m	1.50m	80°
3	100mm	Red	ESB	3.80m	1.50m	80°
4	100mm	Blue	Telecoms	3.90m	0.40m	80°
5	100mm	Red	ESB	4.00m	1.50m	80°
6	Lean mix	Concrete	Poss. Telecoms	4.90 - 7.00m	1.50 - 0.80m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	1.60m	MADE GROUND: brown black slightly sandy slightly gravelly silty clay with high cobble and boulder content.

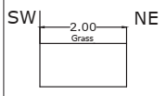
Photographs

SITE INVESTIGATIONS LTD

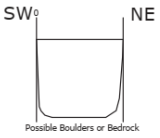
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 27/01/2021	Excavation Finished: 27/01/2021
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m		CONTRACT NUMBER: 5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES		

ST27

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703252.571	732201.127	62.99
End	703253.821	732202.733	63.08

Length:	Width:	Depth:
2.00m	1.00m	1.80m

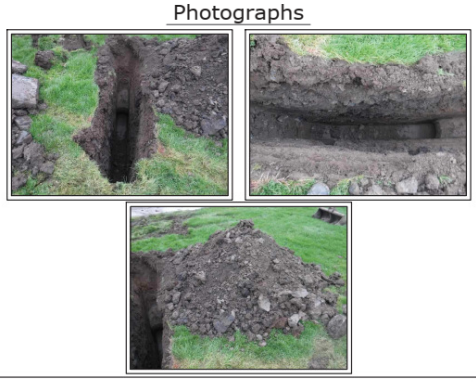
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Ground Conditions

From:	To:	Description:
0.00m	0.20m	TOPSOIL.
0.20m	1.30m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with low cobble and boulder content and some concrete fragments.
1.30m	1.80m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs



SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	20/01/2021	20/01/2021	5803

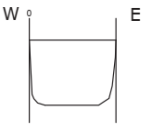
Scale: NOT TO SCALE, ALL DISTANCES IN m

DEPTH ARE TO THE TOP OF SERVICES

ST28

Plan

Cross Section



Point:	Easting:	Northing:	Level:
Start	703246.467	732196.915	63.00
End	703248.191	732197.756	62.98

Length:	Width:	Depth:
2.00m	1.00m	1.50m

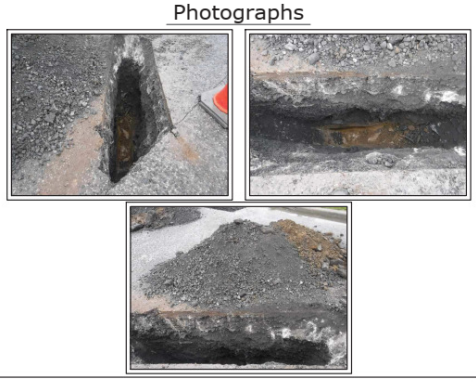
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Ground Conditions

From:	To:	Description:
0.00m	0.32m	MADE GROUND: tarmacadam.
0.32m	1.25m	MADE GROUND: grey silty sandy gravel (Cl. 804).
1.25m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs



SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	20/01/2021	20/01/2021	5803

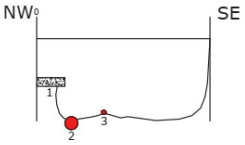
Scale: NOT TO SCALE, ALL DISTANCES IN m

DEPTH ARE TO THE TOP OF SERVICES

ST29

Plan

Cross Section



Point:	Easting:	Northing:	Level:
Start	703236.429	732199.571	63.02
End	703240.233	732198.189	63.00

Length:	Width:	Depth:
4.00m	1.00m	1.85m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	-	Concrete	-	0.00 - 0.65m	0.90m	90°
2	300mm	Red	Sewer	0.80m	1.80m	90°
3	100mm	Red	ESB	1.55m	1.65m	120°

Ground Conditions

From:	To:	Description:
0.00m	0.32m	MADE GROUND: tarmacadam.
0.32m	1.10m	MADE GROUND: grey silty sandy gravel (Cl. 804).
1.10m	1.85m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

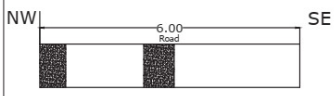
Photographs

SITE INVESTIGATIONS LTD

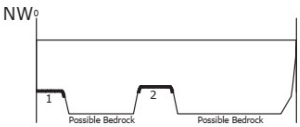
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 20/01/2021	Excavation Finished: 20/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST30

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703225.593	732203.000	63.09
End	703231.430	732201.184	63.07

Length:	Width:	Depth:
6.00m	1.00m	1.70m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	ESB	0.00 - 0.60m	1.15m	90°
2	Lean mix	Concrete	ESB	2.40 - 3.10m	1.05m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.32m	MADE GROUND: tarmacadam.
0.32m	1.00m	MADE GROUND: grey silty sandy gravel (Cl. 804).
1.00m	1.70m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

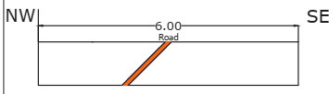
Photographs

SITE INVESTIGATIONS LTD

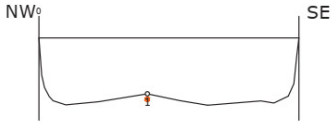
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 25/01/2021	Excavation Finished: 25/01/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST31

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703216.424	732205.936	63.09
End	703222.177	732204.091	63.07

Length:	Width:	Depth:
6.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	100mm	Orange	Lighting	2.50m	1.25m	135°

Ground Conditions

From:	To:	Description:
0.00m	0.30m	MADE GROUND: tarmacadam.
0.30m	1.20m	MADE GROUND: grey silty sandy gravel (Cl. 804).
1.20m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

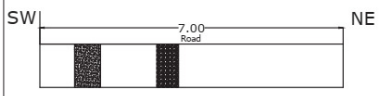
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	20/01/2021	20/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

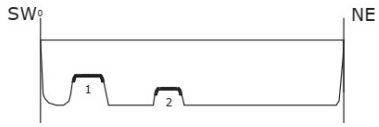
DEPTH ARE TO THE TOP OF SERVICES

ST32

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703192.992	732201.220	62.88
End	703197.503	732206.532	62.92

Length:	Width:	Depth:
7.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	Unknown	0.80 - 1.40m	0.80m	90°
2	Boulders	Grey	Unknown	2.70 - 3.20m	1.10m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: concrete.
0.20m	0.80m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.80m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Photographs

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

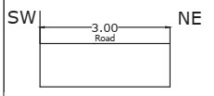
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	21/01/2021	21/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

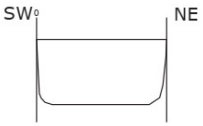
DEPTH ARE TO THE TOP OF SERVICES

ST33

Plan



Cross Section



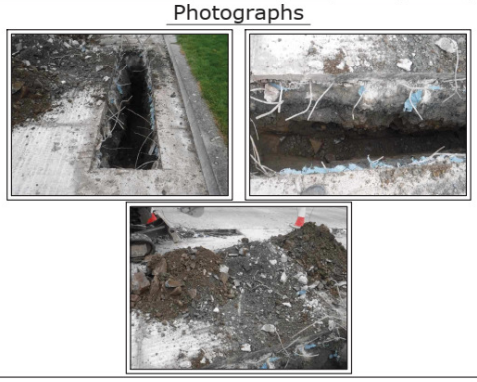
Point:	Easting:	Northing:	Level:
Start	703188.296	732195.534	62.85
End	703190.078	732197.835	62.87

Length:	Width:	Depth:
3.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Photographs



Ground Conditions

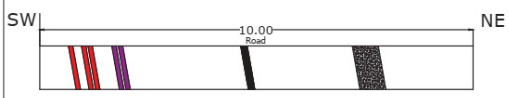
From:	To:	Description:
0.00m	0.20m	MADE GROUND: concrete.
0.20m	1.00m	MADE GROUND: grey silty sandy gravel (Cl. 804).
1.00m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

SITE INVESTIGATIONS LTD

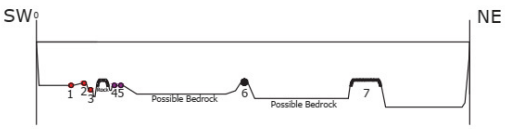
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 21/01/2021	Excavation Finished: 21/01/2021
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m		CONTRACT NUMBER: 5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES		

ST34

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703160.404	732150.890	62.08
End	703161.241	732160.579	62.21

Length:	Width:	Depth:
10.00m	1.00m	1.50m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	100mm	Red	ESB	0.80m	0.95m	80°
2	100mm	Red	ESB	1.10m	0.90m	80°
3	100mm	Red	ESB	1.25m	1.05m	80°
4	100mm	Purple	Telecoms	1.80m	0.95m	80°
5	100mm	Purple	Telecoms	1.95m	0.95m	80°
6	150mm	Black	Telecoms	4.80m	0.85m	80°
7	Lean mix	Concrete	Unknown	7.30 - 7.90m	0.85m	80°

Photographs

Ground Conditions

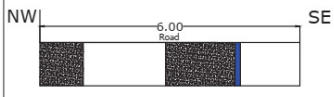
From:	To:	Description:
0.00m	0.20m	MADE GROUND: concrete.
0.20m	0.80m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.80m	1.50m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

SITE INVESTIGATIONS LTD

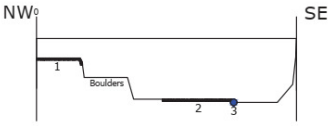
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 21/01/2021	Excavation Finished: 21/01/2021
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m		CONTRACT NUMBER: 5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES		

ST35

Plan



Cross Section



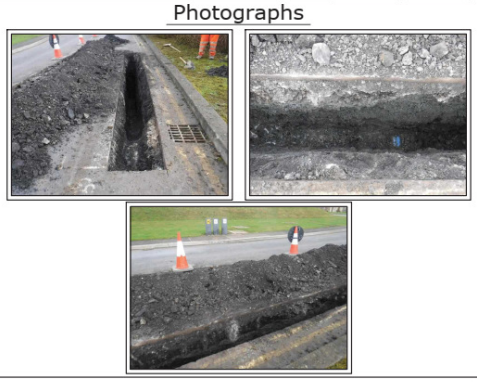
Point:	Easting:	Northing:	Level:
Start	703114.285	732149.967	60.94
End	703120.239	732148.627	61.10

Length:	Width:	Depth:
6.00m	1.00m	1.40m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	Unknown	0.00 - 1.00m	0.45m	90°
2	Lean mix	Concrete	Unknown	2.90 - 4.50m	1.40m	90°
3	150mm	Blue	Water	4.55m	1.40m	90°

Photographs



Ground Conditions

From:	To:	Description:
0.00m	0.30m	MADE GROUND: tarmacadam.
0.30m	0.90m	MADE GROUND: grey silty sandy gravel (Cl. 804 / 6F2).
0.90m	1.60m	MADE GROUND: brown black slightly sandy slightly gravelly silty clay with medium cobble and boulder content.

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

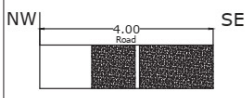
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	28/01/2021	28/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

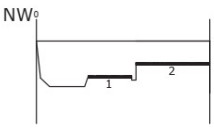
DEPTH ARE TO THE TOP OF SERVICES

ST36

Plan



Cross Section



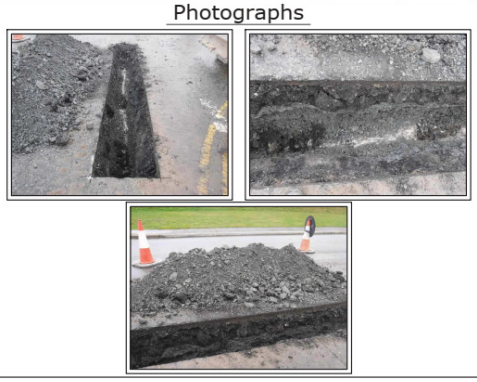
Point:	Easting:	Northing:	Level:
Start	703104.461	732153.972	60.72
End	703108.288	732152.543	60.78

Length:	Width:	Depth:
4.00m	1.00m	1.05m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Lean mix	Concrete	Unknown	1.20 - 2.20m	0.80m	90°
2	Lean mix	Concrete	Unknown	2.30 - 4.00m	0.50m	90°

Photographs



Ground Conditions

From:	To:	Description:
0.00m	0.10m	MADE GROUND: tarmacadam.
0.10m	0.30m	MADE GROUND: black silty sandy gravel (Cl. 804).
0.30m	0.50m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.50m	1.05m	MADE GROUND: brown grey slightly sandy slightly gravelly silty clay with medium cobble and boulder content.

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

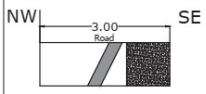
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	28/01/2021	28/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

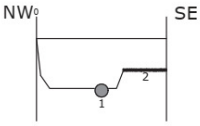
DEPTH ARE TO THE TOP OF SERVICES

ST37

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703095.707	732155.933	60.71
End	703098.692	732155.701	60.68

Length:	Width:	Depth:
3.00m	1.00m	1.10m

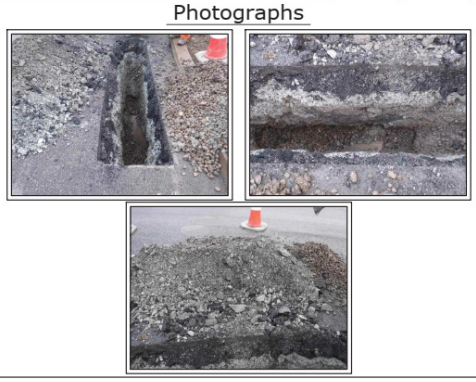
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	300mm	Grey	Foul sewer	1.50m	1.05m	110°
2	Lean mix	Concrete	Unknown	2.00 - 3.00m	0.70m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.10m	MADE GROUND: tarmacadam.
0.10m	0.30m	MADE GROUND: black silty sandy gravel (Cl. 804).
0.30m	0.50m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.50m	1.05m	MADE GROUND: brown grey slightly sandy slightly gravelly silty clay with medium cobble and boulder content.

Photographs



SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

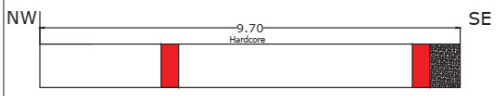
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	28/01/2021	28/01/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

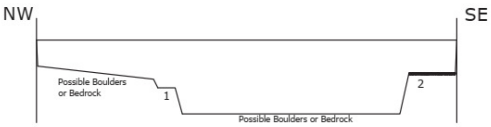
DEPTH ARE TO THE TOP OF SERVICES

ST38

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703456.057	732095.312	65.70
End	703464.135	732089.870	66.05

Length:	Width:	Depth:
9.70m	1.00m	1.70m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Rubber Matt	Red	ESB	3.00m	1.10m	90°
2	Rubber Matt	Red	ESB	8.80m	0.75m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: black silty sandy gravel (Cl. 804).
0.20m	0.80m	MADE GROUND: grey silty sandy gravel (Cl. 804 / 6F2).
0.80m	1.20m	MADE GROUND: brown silty sandy gravel.
1.20m	1.70m	Firm becoming stiff brown slightly sandy slightly gravelly silty CLAY with medium cobble content.

Photographs

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

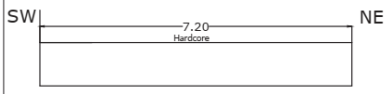
Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	11/02/2021	11/02/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

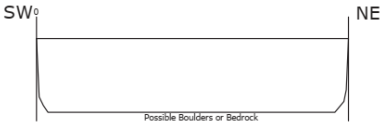
DEPTH ARE TO THE TOP OF SERVICES

ST39

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703458.765	732089.626	65.92
End	703462.347	732095.756	65.79

Length:	Width:	Depth:
7.20m	1.00m	1.70m

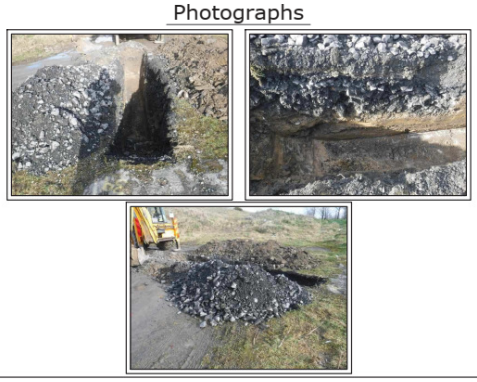
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Ground Conditions

From:	To:	Description:
0.00m	0.20m	MADE GROUND: black silty sandy gravel (Cl. 804).
0.20m	0.80m	MADE GROUND: grey silty sandy gravel (Cl. 804 / 6F2).
0.80m	1.20m	Firm becoming stiff brown slightly sandy gravelly silty CLAY with medium cobble content.
1.20m	1.70m	Stiff brown grey slightly sandy gravelly silty CLAY with medium cobble content.

Photographs

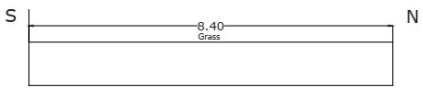


SITE INVESTIGATIONS LTD

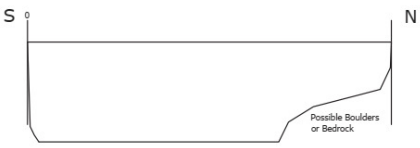
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 10/02/2021	Excavation Finished: 10/02/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST40

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703460.518	732111.870	65.97
End	703460.763	732119.531	65.58

Length:	Width:	Depth:
8.40m	1.00m	2.30m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
No Services Encountered						

Ground Conditions

From:	To:	Description:
0.00m	0.10m	TOPSOIL.
1.00m	2.30m	Firm becoming stiff brown grey slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

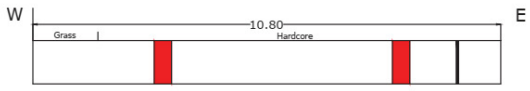
Photographs

SITE INVESTIGATIONS LTD

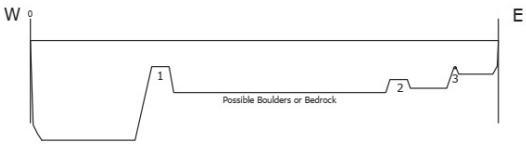
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 10/02/2021	Excavation Finished: 10/02/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST41

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703460.006	732114.444	65.86
End	703471.397	732114.057	65.85

Length:	Width:	Depth:
10.80m	1.00m	2.30m

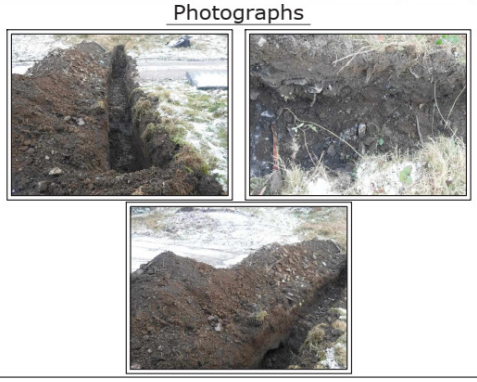
Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Rubber Matt	Red	ESB	3.00m	0.60m	90°
2	Rubber Matt	Red	ESB	8.50m	0.90m	90°
3	50mm	Black	Water	9.80m	0.60m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.10m	MADE GROUND: grey silty sandy gravel (Cl. 804).
0.10m	1.00m	Firm brown slightly sandy slightly gravelly silty CLAY.
1.00m	2.30m	Firm becoming stiff brown grey slightly sandy slightly gravelly silty CLAY with medium cobble content.

Photographs

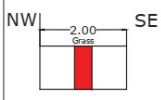


SITE INVESTIGATIONS LTD

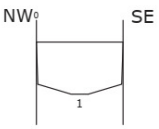
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 10/02/2021	Excavation Finished: 10/02/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST42

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703470.143	732092.876	66.39
End	703471.907	732091.415	66.67

Length:	Width:	Depth:
2.00m	1.00m	1.20m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Rubber Matt	Red	ESB	1.00m	1.20m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.10m	TOPSOIL.
0.10m	1.00m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with medium cobble content and some plastic and red brick fragments.

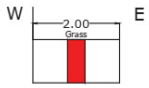
Photographs

SITE INVESTIGATIONS LTD

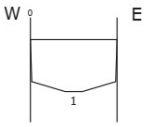
Project:	Edgeconnex Substation 110kV Cable Route	Logged by: P.McGonagle	Excavation Started: 26/03/2021	Excavation Finished: 26/03/2021	CONTRACT NUMBER
Client:	BCEI	Scale: NOT TO SCALE, ALL DISTANCES IN m			5803
Consultant:	Clifton Scannell Emerson Associates	DEPTH ARE TO THE TOP OF SERVICES			

ST43

Plan



Cross Section



Point:	Easting:	Northing:	Level:
Start	703473.421	732110.424	66.20
End	703475.543	732110.172	66.45

Length:	Width:	Depth:
2.00m	1.00m	1.20m

Services

No:	Diameter:	Colour:	Utility:	Distance:	Depth:	Alignment:
1	Rubber Matt	Red	ESB	1.00m	1.20m	90°

Ground Conditions

From:	To:	Description:
0.00m	0.10m	TOPSOIL.
0.10m	1.00m	MADE GROUND: brown slightly sandy slightly gravelly silty clay with medium cobble content and some plastic and red brick fragments.

Photographs

SITE INVESTIGATIONS LTD

Project:	Edgeconnex Substation 110kV Cable Route
Client:	BCEI
Consultant:	Clifton Scannell Emerson Associates

Logged by:	Excavation Started:	Excavation Finished:	CONTRACT NUMBER
P.McGonagle	26/03/2021	26/03/2021	5803

Scale: NOT TO SCALE, ALL DISTANCES IN m

DEPTH ARE TO THE TOP OF SERVICES

5803 – Edgeconnex
Grange Castle, Co. Dublin

Appendix 2
Rotary Corehole Logs and Photographs

Contract No: 5803	Rotary Corehole Log				Corehole No: BH01
Contract:	Edgeconnex	Easting:	703206.916	Date Started:	27/01/2021
Location:	Grange Castle, Co. Dublin	Northing:	732212.364	Date Completed:	27/01/2021
Client:	BCEI	Elevation:	62.97	Drilled By:	MEDL
Engineer:	Clifton Scannell Emerson Associates	Rig Type:	Sondeq	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples	Rock Indices TCR/%	SCR/%	RQD/%	FI/m	Backfill
0.5 1.0 1.5		Open hole drilling - driller reports returns of made ground.		62.5 62.0 61.5							
2.0 2.5	1.70	Open hole drilling - driller reports returns of black sandy gravelly silty clay with cobbles and boulders.		61.0 60.5	61.27						
3.0 3.5 4.0 4.5 5.0 5.5	2.50	Strong to very strong light grey fine grained muddy LIMESTONE interbedded with moderately strong dark grey calcareous MUDSTONE and thin calcite veins. Fresh to slightly weathered. *Discontinuities - smooth, planar to occasionally undulating, tight to open, sub-horizontal to 75° dip, occasionally sub-vertical, stained grey and brown.* *Discontinuities - smooth, planar, tight to open, 20 to 45° dip, occasionally sub-horizontal, clean and occasionally stained grey.*		60.0 59.5 59.0 58.5 58.0 57.5	60.47	2.50 - 3.50 3.50 - 4.50 4.50 - 5.50	96 94 95	90 94 88	66 48 65	7 10	
6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5	5.50	End of Corehole at 5.50m		57.0 56.5 56.0 55.5 55.0 54.5 54.0 53.5	57.47						

Installation: From:	To:	Pipe Type:	Backfill: From:	To:	Type:	Remarks:
			0.00	5.50	Bentonite	Core barrel removed and corehole collapsed.

Contract No: 5803	Rotary Corehole Log				Corehole No: BH02
Contract:	Edgeconnex	Easting:	703252.245	Date Started:	28/01/2021
Location:	Grange Castle, Co. Dublin	Northing:	732202.596	Date Completed:	28/01/2021
Client:	BCEI	Elevation:	63.05	Drilled By:	MEDL
Engineer:	Clifton Scannell Emerson Associates	Rig Type:	Sondeq	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples	Rock Indices TCR/%	SCR/%	RQD/%	FI/m	Backfill
0.5		Open hole drilling - driller reports returns of made ground.		62.5							
1.0				62.0							
1.5				61.5							
2.0	1.80	Open hole drilling - driller reports returns of black sandy gravelly silty clay with cobbles and boulders.		61.0	61.25						
2.5				60.5							
3.0	2.70	Strong to very strong light grey fine grained muddy LIMESTONE interbedded with moderately weak to moderately strong dark grey calcareous MUDSTONE with thin calcite veins and occasional pyrite crystals. Fresh to slightly weathered.		60.0	60.35	2.70 - 3.70	93	88	75	3	
3.5		*Discontinuities - smooth, planar, tight to open, 30 to 45° dip, clean and occasionally clay infill.*		59.5							
4.0		*Discontinuities - non-intact.*		59.0		3.70 - 4.70	95	48	30	Ni	
4.5				58.5							
5.0		*Discontinuities - smooth, planar to slightly undulating, tight to open, 30 to 45° dip, clean.*		58.0		4.70 - 5.70	93	65	22	17	
5.5				57.5							
6.0		*Discontinuities - smooth to rough, planar to slightly undulating, tight to open, sub-horizontal to 80° dip, clean with some clay infill.*		57.0		5.70 - 6.70	94	86	66	23 6	
6.5				56.5							
7.0		*Discontinuities - non-intact.*		56.0		6.70 - 7.70	93	54	39	17 Ni	
7.5		*Discontinuities - smooth, planar, occasionally stepped, tight to open, 20 to 45° dip, clean and occasionally stained grey.*		55.5						3	
8.0				55.0		7.70 - 8.70	93	78	14	16	
8.5				54.5							
9.0		*Discontinuities - smooth, planar and undulating, tight to open, 30 to 45° and sub-vertical dip, clean and occasionally stained grey.*		54.0		8.70 - 9.70	94	90	76	8	
9.5				53.5							
		Discontinuities - smooth, planar, tight to open, 20 to 30° and sub-horizontal dip,									

Continued on next page

Installation: From:	To:	Pipe Type:	Backfill: From:	To:	Type:	Remarks:
			0.00	12.00	Bentonite	-

Contract No: 5803	Rotary Corehole Log				Corehole No: BH02
Contract:	Edgeconnex	Easting:	703252.245	Date Started:	28/01/2021
Location:	Grange Castle, Co. Dublin	Northing:	732202.596	Date Completed:	28/01/2021
Client:	BCEI	Elevation:	63.05	Drilled By:	MEDL
Engineer:	Clifton Scannell Emerson Associates	Rig Type:	Sondeq	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples	Rock Indices TCR/%	SCR/%	RQD/%	FI/m	Backfill
10.5		*Discontinuities - smooth, planar, tight to open, 20 to 30° and sub-horizontal dip, clean and occasionally stained grey.*		52.5		9.70 - 10.70	95	95	88		
11.0				52.0		10.70 - 12.00	88	85	54	5	
11.5				51.5							
12.0	12.00	End of Corehole at 12.00m		51.0	51.05						
12.5				50.5							
13.0				50.0							
13.5				49.5							
14.0				49.0							
14.5				48.5							
15.0				48.0							
15.5				47.5							
16.0				47.0							
16.5				46.5							
17.0				46.0							
17.5				45.5							
18.0				45.0							
18.5				44.5							
19.0				44.0							
19.5				43.5							

Installation: From:	To:	Pipe Type:	Backfill: From:	To:	Type:	Remarks:
			0.00	12.00	Bentonite	-

Contract No: 5803	Rotary Corehole Log				Corehole No: BH03
Contract:	Edgeconnex	Easting:	703277.289	Date Started:	29/01/2021
Location:	Grange Castle, Co. Dublin	Northing:	732231.392	Date Completed:	29/01/2021
Client:	BCEI	Elevation:	63.50	Drilled By:	MEDL
Engineer:	Clifton Scannell Emerson Associates	Rig Type:	Sondeq	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples	Rock Indices TCR/%	SCR/%	RQD/%	FI/m	Backfill
0.5 1.0 1.5		Open hole drilling - driller reports returns of made ground.		63.0 62.5 62.0							
2.0 2.5 3.0	1.80	Open hole drilling - driller reports returns of black sandy gravelly silty clay with cobbles and boulders.		61.5 61.0 60.5	61.70						
3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5	3.40	Strong to very strong light grey fine grained muddy LIMESTONE interbedded with moderately weak dark grey calcareous MUDSTONE with thin calcite veins and occasional pyrite crystals. Fresh to slightly weathered. *Discontinuities - smooth, planar, tight to open, 30 to 45° dip, stained grey.* *Discontinuities - smooth occasionally rough, planar, tight to open, 30 to 45° and occasionally 70° dip, clean and occasionally stained grey.* *Discontinuities - smooth occasionally rough, planar, tight to open, 30 to 45° and occasionally 60 to 80° dip, clean and occasionally stained grey.* *Discontinuities - smooth to rough, planar to occasionally stepped, tight to open, 30 to 45° and occasionally sub-vertical dip, clean and occasionally stained grey.* *Discontinuities - smooth to rough, planar to undulating, tight to open, sub-horizontal to 50° dip, clean.* *Discontinuities - smooth, planar, tight to open, 30 to 45° and occasionally sub-horizontal dip, clean.*		60.0 59.5 59.0 58.5 58.0 57.5 57.0 56.5 56.0 55.5 55.0 54.5 54.0	60.10	3.40 - 4.40 4.40 - 5.40 5.40 - 6.40 6.40 - 7.40 7.40 - 8.40 8.40 - 9.40 9.40 - 10.40	94 94 85 95 86 65 93 93 66 93 93 66 92 92 88 95 95 75 92 80 55	3 13 9 8 3 11	

Continued on next page

Installation: From:	To:	Pipe Type:	Backfill: From:	To:	Type:	Remarks:
			0.00	12.00	Bentonite	-

Contract No: 5803	Rotary Corehole Log				Corehole No: BH03
Contract:	Edgeconnex	Easting:	703277.289	Date Started:	29/01/2021
Location:	Grange Castle, Co. Dublin	Northing:	732231.392	Date Completed:	29/01/2021
Client:	BCEI	Elevation:	63.50	Drilled By:	MEDL
Engineer:	Clifton Scannell Emerson Associates	Rig Type:	Sondeq	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples	Rock Indices TCR/%	SCR/%	RQD/%	Fl/m	Backfill
10.5		*Discontinuities - rough, planar to undulating, tight to open, sub-horizontal dip, clean.*		53.0						2	
11.0		*Discontinuities - smooth occasionally rough, planar, tight to open, 30 to 45° dip, clean and occasionally stained grey.*		52.5		10.40 - 11.40	95	95	58		
11.5				52.0		11.40 - 12.00	100	100	85	11	
12.0	12.00	End of Corehole at 12.00m		51.5	51.50						
12.5				51.0							
13.0				50.5							
13.5				50.0							
14.0				49.5							
14.5				49.0							
15.0				48.5							
15.5				48.0							
16.0				47.5							
16.5				47.0							
17.0				46.5							
17.5				46.0							
18.0				45.5							
18.5				45.0							
19.0				44.5							
19.5				44.0							

Installation: From:	To:	Pipe Type:	Backfill: From:	To:	Type:	Remarks:
			0.00	12.00	Bentonite	-

5803 – Edgeconnex
Rotary Core Photographs

BH01 Box 1 of 1

BH02 Box 1 of 3

BH02 Box 2 of 3

5803 – Edgeconnex
Rotary Core Photographs

BH02 Box 3 of 3

BH03 Box 1 of 3

5803 – Edgeconnex
Rotary Core Photographs

BH03 Box 2 of 3

BH03 Box 3 of 3

5803 – Edgeconnex
Grange Castle, Co. Dublin

Appendix 3
Thermal Resistivity Test Results

Soil Environment Services Ltd

UKAS TESTING
10768

LABORATORY TEST CERTIFICATE

Client:	Site Investigations Ltd The Grange 12th Lock Road Lucan Co. Dublin
Contact:	**Paddy McGonalge**
Client Job Ref.:	EdgeConneX
Samples Received:	23/02/2020
Analysis Completed:	15/03/2021
Certificate Issued:	15/03/2021
Material:	Natural Soils
Tests:	Thermal Resistivity Dry Out Curve

Notes:

1. Bulk samples disposed of 28 days from date of receipt unless otherwise instructed.
2. Unless otherwise stated, Soil Environment Services Ltd was not responsible for sampling.
3. This report shall not be reproduced, except in full, without written approval of Soil Environment Services Ltd.
4. Results reported relate only to the samples supplied.

Tested on behalf of ***Soil Environment Services*** by:

Rowan Davies BEng MSc AMIMechE
Consultant Engineer

Approved by:

Dr Robin S Davies BSc PhD (Soil Physics) MISoilSci
Managing Director

Quality and Standards

SES Ltd is UKAS accredited to ISO 17025 2017. (Lab No. 10768)

We test to the requirements of the following specifications.

ENA TS 97-1, Issue 2 2016
ASTM D5334 - 14
IEEE Std 442 – 2017
National Grid TS 3.05.07
BS 1377

All test equipment is calibrated to manufacturer's requirements.

Soil Environment Services Ltd

Unit 8, Stocksfield Hall, Stocksfield,
Northumberland, NE43 7TN
Tel: 01661 844827
Email: rowan@soilenvironmentservices.co.uk

www.soilenvironmentservices.co.uk

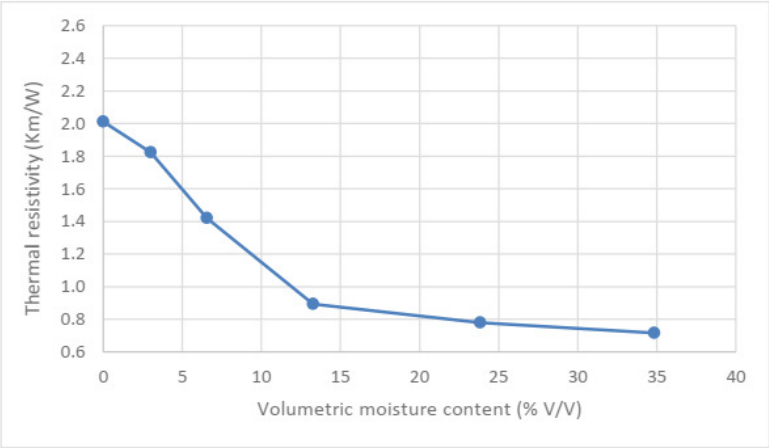
Company Registration Number 4538894 England and Wales
Directors: Dr R S Davies BSc PhD MISoilSci. Dr M T Davies BSc PhD MA

Soil Environment Services – Laboratory test results

Sample Ref	Strata Description
TR01: 1.0 m	Brown firm silty CLAY with some large stones
TR06: 1.0 m	Red Brown loose gravelly silty SAND

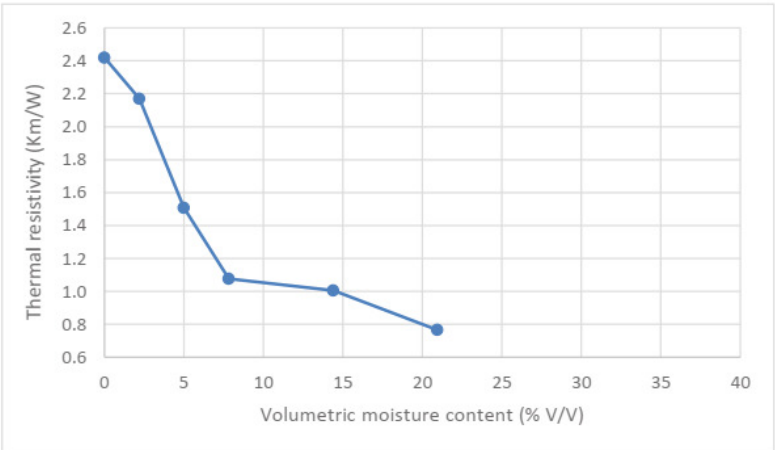
TR 01: 1.0 m

Vol MC (%)	TR (Km/W)
34.83	0.716
23.83	0.779
13.26	0.893
6.54	1.420
3.01	1.822
0.00	2.011



TR 06: 1.0 m

Vol MC (%)	TR (Km/W)
20.94	0.766
14.39	1.005
7.82	1.076
4.99	1.508
2.19	2.169
0.00	2.420



Notes: Samples re-compacted at as received moisture using 2.5 kg hammer.

Page 2 of 3

Soil Environment Services – Laboratory test results

A Test specifications

1. Thermal test method: *Standard Test Method for Determination of Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe Procedure. ASTM Designation D5334-14, 2015.*

B Test equipment

1. TEMPOS or similar Thermal analyser.
2. ELE Proctor ~1 litre mould with an ELE 2.5 kg hammer. Or ~80 mm dia aluminium cores.
3. Impact Test Equipment soil drying oven set at 105°C.

C Notes

1. The sample received was compacted to a uniform 'field density' prior to testing.
2. Drying was at ~ 20°C apart from final two points, at 60°C and finally at 105°C.

Page 3 of 3

5803 – Edgeconnex
Grange Castle, Co. Dublin

Appendix 4
Geotechnical Laboratory Test Results

Point Load Test Broch,E. & Franklin,J.A.,IRSM Point Load Test Method

Uniaxial Compressive Strength in accordance with BS1881

Client	EdgeConneX
Site	EdgeConneX, Grangecastle, Co. Dublin
S.I. File No	5803 / 21
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	9th February 2021

Hole ID	Depth (m)	Lab Ref No.	Sample Type	Diameter / Height (mm)	Test Type	Is (MN/m^2)	Compressive Strength (MPa)	Strength Designation	Approx. Equivalent UCS Value (MPa)	Remarks
BH02	8.90	21/113	C	64 / 100	UCS		61.5	Strong		Tested Axially
BH02	9.60	21/114	C	64	PL	4.88		Very Strong	123.0	Tested Diametrically
BH02	10.00	21/115	C	64	PL	5.13		Very Strong	129.0	Tested Diametrically
BH02	10.20	21/116	C	64 / 100	UCS		104.5	Very Strong		Tested Axially
BH02	10.60	21/117	C	64	PL	6.10		Very Strong	153.5	Tested Diametrically
BH02	10.80	21/118	C	64	PL	5.37		Very Strong	135.5	Tested Diametrically
BH02	11.50	21/119	C	64 / 100	UCS		166.0	Very Strong		Tested Axially
BH02	11.90	21/120	C	64	PL	1.22		Moderately Strong	30.5	Tested Diametrically
BH03	3.70	21/121	C	64	PL	4.15		Very Strong	104.5	Tested Diametrically
BH03	4.00	21/122	C	64 / 100	UCS		92.0	Very Strong		Tested Axially
BH03	4.60	21/123	C	64	PL	1.71		Moderately Strong	43.0	Tested Diametrically
BH03	5.00	21/124	C	64	PL	1.46		Moderately Strong	37.0	Tested Diametrically
BH03	5.40	21/125	C	64	PL	5.86		Very Strong	147.5	Tested Diametrically
BH03	5.70	21/126	C	64 / 100	UCS		141.5	Very Strong		Tested Axially
BH03	6.30	21/127	C	64	PL	4.64		Very Strong	117.0	Tested Diametrically
BH03	6.70	21/128	C	64	PL	2.44		Strong	61.5	Tested Diametrically
BH03	7.00	21/129	C	64 / 100	UCS		172.5	Very Strong		Tested Axially
BH03	7.60	21/130	C	64	PL	0.98		Moderately Weak	24.5	Tested Diametrically
BH03	7.80	21/131	C	64 / 100	UCS		30.5	Very Strong		Tested Axially
BH03	8.20	21/132	C	64	PL	2.44		Strong	61.5	Tested Diametrically
BH03	8.90	21/133	C	64 / 100	UCS		123.0	Very Strong		Tested Axially
BH03	9.20	21/134	C	64	PL	6.84		Very Strong	172.5	Tested Diametrically
BH03	9.60	21/135	C	64	PL	1.71		Very Strong	43.0	Tested Diametrically
BH03	10.00	21/136	C	64	PL	0.68		Moderately Weak	17.0	Tested Diametrically
BH03	10.20	21/137	C	64 / 100	UCS		55.5	Strong		Tested Axially

Printed 26/03/2021 Sheet 2 of 3

Paddy McGonagle
Site Investigations Ltd

Point Load Test Broch,E. & Franklin,J.A.,IRSM Point Load Test Method

Uniaxial Compressive Strength in accordance with BS1881

Client	EdgeConneX
Site	EdgeConneX, Grangecastle, Co. Dublin
S.I. File No	5803 / 21
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	9th February 2021

Hole ID	Depth (m)	Lab Ref No.	Sample Type	Diameter / Height (mm)	Test Type	Is (MN/m^2)	Compressive Strength (MPa)	Strength Designation	Approx. Equivalent UCS Value (MPa)	Remarks
BH03	10.50	21/138	C	64	PL	2.93		Very Strong	74.0	Tested Diametrically
BH03	11.00	21/139	C	64 / 100	UCS		135.5	Very Strong		Tested Axially
BH03	11.20	21/140	C	64	PL	0.98		Moderately Weak	24.5	Tested Diametrically
BH03	11.70	21/141	C	64	PL	0.73		Moderately Weak	18.5	Tested Diametrically
BH03	11.90	21/142	C	64 / 100	UCS		61.5	Strong		Tested Axially

Printed 26/03/2021 Sheet 3 of 3

Paddy McGonagle
Site Investigations Ltd

5803 – Edgeconnex
Grange Castle, Co. Dublin

Appendix 5
Environmental Laboratory Test Results

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: hawardencustomerservices@alsglobal.com
Website: www.alsenvironmental.co.uk

Site Investigations Ltd
The Grange
Carhugar
12th Lock Road
Lucan
Co. Dublin

Attention: Stephen Letch

CERTIFICATE OF ANALYSIS

Date of report Generation:	12 February 2021
Customer:	Site Investigations Ltd
Sample Delivery Group (SDG):	210203-95
Your Reference:	5803
Location:	Edgeconnex, Grangecastle
Report No:	586686

We received 4 samples on Wednesday February 03, 2021 and 4 of these samples were scheduled for analysis which was completed on Friday February 12, 2021. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.
Incorrect sampling dates and/or sample information will affect the validity of results.

Approved By:

Sonia McWhan
Operations Manager

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Version: 2.7 Version Issued: 12/02/2021

Validated

CERTIFICATE OF ANALYSIS

SDG:	210203-95	**Client Reference:**	5803	**Report Number:**	586686
Location:	Edgeconnex, Grangecastle	**Order Number:**	03/08/21	**Superseded Report:**	

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
23659680	ST01		0.50 - 0.50	01/02/2021
23659681	ST11		0.50 - 0.50	01/02/2021
23659689	ST15		0.50 - 0.50	01/02/2021
23659690	ST19		0.50 - 0.50	01/02/2021

Only received samples which have had analysis scheduled will be shown on the following pages.

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CERTIFICATE OF ANALYSIS

SDG:	210203-95	Client Reference:	5803	Report Number:	586686
Location:	Edgeconnex, Grangecastle	Order Number:	03/08/21	Superseded Report:	

Results Legend

- X Test
- N No Determination Possible

Sample Types -

- S - Soil/Solid
- UNS - Unspecified Solid
- GW - Ground Water
- SW - Surface Water
- LE - Land Leachate
- PL - Prepared Leachate
- PR - Process Water
- SA - Saline Water
- TE - Trade Effluent
- TS - Treated Sewage
- US - Untreated Sewage
- RE - Recreational Water
- DW - Drinking Water Non-regulatory
- UNL - Unspecified Liquid
- SL - Sludge
- G - Gas
- OTH - Other

Lab Sample No(s)			23659680			23659681			23659689			23659690		
Customer Sample Reference			ST01			ST11			ST15			ST19		
AGS Reference														
Depth (m)			0.50 - 0.50			0.50 - 0.50			0.50 - 0.50			0.50 - 0.50		
Container			1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)
Sample Type			S	S	S	S	S	S	S	S	S	S	S	S
Anions by Kone (w)	All	NDPs: 0 Tests: 4	X			X			X			X		
CEN Readings	All	NDPs: 0 Tests: 4	X			X			X			X		
Chromium III	All	NDPs: 0 Tests: 4		X			X			X			X	
Coronene	All	NDPs: 0 Tests: 4		X			X			X			X	
Dissolved Metals by ICP-MS	All	NDPs: 0 Tests: 4	X			X			X			X		
Dissolved Organic/Inorganic Carbon	All	NDPs: 0 Tests: 4	X			X			X			X		
EPH by GCxGC-FID	All	NDPs: 0 Tests: 4		X			X			X			X	
EPH CWG GC (S)	All	NDPs: 0 Tests: 4		X			X			X			X	
Fluoride	All	NDPs: 0 Tests: 4	X			X			X			X		
GRO by GC-FID (S)	All	NDPs: 0 Tests: 4			X			X			X			X
Hexavalent Chromium (s)	All	NDPs: 0 Tests: 4		X			X			X			X	
Loss on Ignition in soils	All	NDPs: 0 Tests: 4		X			X			X			X	
Mercury Dissolved	All	NDPs: 0 Tests: 4	X			X			X			X		
Metals in solid samples by OES	All	NDPs: 0 Tests: 4		X			X			X			X	
PAH by GCMS	All	NDPs: 0 Tests: 4		X			X			X			X	

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SDG:	210203-95	**Client Reference:**	5803	**Report Number:**	586686
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Results Legend

X Test

N No Determination Possible

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US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Lab Sample No(s)				23659680			23659681			23659689			23659690	
Customer Sample Reference				ST01			ST11			ST15			ST19	
AGS Reference														
Depth (m)				0.50 - 0.50			0.50 - 0.50			0.50 - 0.50			0.50 - 0.50	
Container				1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)	1kg TUB with Handle (ALE260)	250g Amber Jar (ALE210)	60g VOC (ALE215)
Sample Type				S	S	S	S	S	S	S	S	S	S	S	S
PCBs by GCMS	All	NDPs: 0 Tests: 4			X			X			X			X	
Phenols by HPLC (W)	All	NDPs: 0 Tests: 4		X			X			X			X		
Sample description	All	NDPs: 0 Tests: 4			X			X			X			X	
Total Dissolved Solids on Leachates	All	NDPs: 0 Tests: 4		X			X			X			X		
Total Organic Carbon	All	NDPs: 0 Tests: 4			X			X			X			X	
TPH CWG GC (S)	All	NDPs: 0 Tests: 4			X			X			X			X	
VOC MS (S)	All	NDPs: 0 Tests: 4				X			X			X			X

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Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
23659680	ST01	0.50 - 0.50	Light Brown	Loamy Sand	Stones	None
23659681	ST11	0.50 - 0.50	Dark Brown	Sandy Loam	Stones	None
23659689	ST15	0.50 - 0.50	Dark Brown	Sandy Clay Loam	Stones	None
23659690	ST19	0.50 - 0.50	Dark Brown	Sandy Loam	Stones	Vegetation

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally ocurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

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Results Legend

#	ISO17025 accredited.
M	mCERTS accredited.
aq	Aqueous / settled sample.
diss.filt	Dissolved / filtered sample.
tot.unfilt	Total / unfiltered sample.
*	Subcontracted - refer to subcontractor report for accreditation status.
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery
(F)	Trigger breach confirmed
1.4e3@	Sample deviation (see appendix)

Component	LOD/Units	Method	Customer Sample Ref.	ST01	ST11	ST15	ST19		
			Depth (m)	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50		
			Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)		
			Date Sampled	01/02/2021	01/02/2021	01/02/2021	01/02/2021		
			Sample Time	.	.	.	.		
			Date Received	03/02/2021	03/02/2021	03/02/2021	03/02/2021		
			SDG Ref	210203-95	210203-95	210203-95	210203-95		
			Lab Sample No.(s)	23659680	23659681	23659689	23659690		
			AGS Reference						
Moisture Content Ratio (% of as received sample)	%	PM024		9.4	4.3	11	25		
Loss on ignition	<0.7 %	TM018		2.12 M	2.12 M	2.33 M	6.44 M		
Organic Carbon, Total	<0.2 %	TM132		0.619 M	1.03 M	0.651 M	2.06 M		
Chromium, Hexavalent	<0.6 mg/kg	TM151		<0.6 #	<0.6 #	<0.6 #	<0.6 #		
PCB congener 28	<3 µg/kg	TM168		<15 M	<30 M	<3 M	<3 M		
PCB congener 52	<3 µg/kg	TM168		<15 M	<30 M	<3 M	<3 M		
PCB congener 101	<3 µg/kg	TM168		<15 M	<30 M	<3 M	<3 M		
PCB congener 118	<3 µg/kg	TM168		<15 M	<30 M	<3 M	<3 M		
PCB congener 138	<3 µg/kg	TM168		<15 M	<30 M	<3 M	<3 M		
PCB congener 153	<3 µg/kg	TM168		<15 M	<30 M	<3 M	<3 M		
PCB congener 180	<3 µg/kg	TM168		<15 M	<30 M	<3 M	<3 M		
Sum of detected PCB 7 Congeners	<21 µg/kg	TM168		<105	<210	<21	<21		
Chromium, Trivalent	<0.9 mg/kg	TM181		17.9	6.83	3.09	9.6		
Antimony	<0.6 mg/kg	TM181		<0.6 #	<0.6 #	<0.6 #	<0.6 #		
Arsenic	<0.6 mg/kg	TM181		47.5 M	4.25 M	7.1 M	10.8 M		
Barium	<0.6 mg/kg	TM181		108 #	34.2 #	26.4 #	76.1 #		
Cadmium	<0.02 mg/kg	TM181		1.29 M	0.629 M	0.705 M	1.26 M		
Chromium	<0.9 mg/kg	TM181		17.9 M	6.83 M	3.09 M	9.6 M		
Copper	<1.4 mg/kg	TM181		43 M	8.97 M	19.1 M	23.9 M		
Lead	<0.7 mg/kg	TM181		16.5 M	6.3 M	8.25 M	20.4 M		
Mercury	<0.1 mg/kg	TM181		<0.1 M	<0.1 M	<0.1 M	<0.1 M		
Molybdenum	<0.1 mg/kg	TM181		1.02 #	1.33 #	2.11 #	2.17 #		
Nickel	<0.2 mg/kg	TM181		34.4 M	14.7 M	37.3 M	37.4 M		
Selenium	<1 mg/kg	TM181		<1 #	1.23 #	1.44 #	<1 #		
Zinc	<1.9 mg/kg	TM181		174 M	98.9 M	45.2 M	94.5 M		
Coronene	<200 µg/kg	TM410		<200	<200	<200	<200		
Mineral Oil >C10-C40	<5 mg/kg	TM415		26.5	158	<5	<5		

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PAH by GCMS

Results Legend		Customer Sample Ref.	ST01	ST11	ST15	ST19		
#	ISO17025 accredited.							
M	mCERTS accredited.							
aq	Aqueous / settled sample.							
diss.filt	Dissolved / filtered sample.							
tot.unfilt	Total / unfiltered sample.							
*	Subcontracted - refer to subcontractor report for accreditation status.							
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery							
(F)	Trigger breach confirmed							
1.4e3@	Sample deviation (see appendix)	Depth (m)	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50		
		Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)		
		Date Sampled	01/02/2021	01/02/2021	01/02/2021	01/02/2021		
		Sample Time	.	.	.	.		
		Date Received	03/02/2021	03/02/2021	03/02/2021	03/02/2021		
		SDG Ref	210203-95	210203-95	210203-95	210203-95		
		Lab Sample No.(s)	23659680	23659681	23659689	23659690		
		AGS Reference						

Component	LOD/Units	Method						
Naphthalene	<9 µg/kg	TM218	<45 M	<90 M	<9 M	<9 M		
Acenaphthylene	<12 µg/kg	TM218	<60 M	<120 M	<12 M	<12 M		
Acenaphthene	<8 µg/kg	TM218	<40 M	<80 M	<8 M	<8 M		
Fluorene	<10 µg/kg	TM218	<50 M	<100 M	<10 M	<10 M		
Phenanthrene	<15 µg/kg	TM218	<75 M	<150 M	<15 M	<15 M		
Anthracene	<16 µg/kg	TM218	<80 M	<160 M	<16 M	<16 M		
Fluoranthene	<17 µg/kg	TM218	<85 M	<170 M	<17 M	<17 M		
Pyrene	<15 µg/kg	TM218	<75 M	<150 M	<15 M	<15 M		
Benz(a)anthracene	<14 µg/kg	TM218	<70 M	<140 M	<14 M	<14 M		
Chrysene	<10 µg/kg	TM218	<50 M	<100 M	<10 M	<10 M		
Benzo(b)fluoranthene	<15 µg/kg	TM218	<75 M	<150 M	<15 M	<15 M		
Benzo(k)fluoranthene	<14 µg/kg	TM218	<70 M	<140 M	<14 M	<14 M		
Benzo(a)pyrene	<15 µg/kg	TM218	<75 M	<150 M	<15 M	<15 M		
Indeno(1,2,3-cd)pyrene	<18 µg/kg	TM218	<90 M	<180 M	<18 M	<18 M		
Dibenzo(a,h)anthracene	<23 µg/kg	TM218	<115 M	<230 M	<23 M	<23 M		
Benzo(g,h,i)perylene	<24 µg/kg	TM218	<120 M	<240 M	<24 M	<24 M		
PAH, Total Detected USEPA 16	<118 µg/kg	TM218	<590	<1180	<118	<118		

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Location:	Edgeconnex, Grangecastle	**Order Number:**	03/08/21	**Superseded Report:**	

TPH CWG (S)

Results Legend			Customer Sample Ref.	ST01	ST11	ST15	ST19		
#	ISO17025 accredited.								
M	mCERTS accredited.								
aq	Aqueous / settled sample.								
diss.filt	Dissolved / filtered sample.								
tot.unfilt	Total / unfiltered sample.								
*	Subcontracted - refer to subcontractor report for accreditation status.		Depth (m)	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50		
**	% recovery of the surrogate standard to check the efficiency of the method. The results of individual compounds within samples aren't corrected for the recovery		Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)		
			Date Sampled	01/02/2021	01/02/2021	01/02/2021	01/02/2021		
			Sample Time	.	.	.	.		
			Date Received	03/02/2021	03/02/2021	03/02/2021	03/02/2021		
			SDG Ref	210203-95	210203-95	210203-95	210203-95		
(F)	Trigger breach confirmed		Lab Sample No.(s)	23659680	23659681	23659689	23659690		
1.4x[σ]	Sample deviation (see appendix)		AGS Reference						
Component		**LOD/Units**	**Method**						
GRO Surrogate % recovery**		%	TM089	93	43.8 4	24.5 4	86		
Aliphatics >C5-C6		<10 µg/kg	TM089	<10	<10 4	<10 4	<10		
Aliphatics >C6-C8		<10 µg/kg	TM089	30.8	<10 4	<10 4	<10		
Aliphatics >C8-C10		<10 µg/kg	TM089	25.3	<10 4	<10 4	<10		
Aliphatics >C10-C12		<1000 µg/kg	TM414	<1000	<1000	<1000	<1000		
Aliphatics >C12-C16		<1000 µg/kg	TM414	<1000	2180	<1000	<1000		
Aliphatics >C16-C21		<1000 µg/kg	TM414	<1000	6050	1040	<1000		
Aliphatics >C21-C35		<1000 µg/kg	TM414	9120	64200	<1000	6650		
Aliphatics >C35-C44		<1000 µg/kg	TM414	8430	121000	<1000	1120		
Total Aliphatics >C10-C44		<5000 µg/kg	TM414	18400	194000	<5000	8230		
Total Aliphatics & Aromatics >C10-C44		<10000 µg/kg	TM414	29900	333000	<10000	15900		
Aromatics >EC5-EC7		<10 µg/kg	TM089	<10	<10 4	<10 4	<10		
Aromatics >EC7-EC8		<10 µg/kg	TM089	<10	<10 4	<10 4	<10		
Aromatics >EC8-EC10		<10 µg/kg	TM089	16.5	<10 4	<10 4	<10		
Aromatics > EC10-EC12		<1000 µg/kg	TM414	<1000	<1000	<1000	<1000		
Aromatics > EC12-EC16		<1000 µg/kg	TM414	<1000	<1000	<1000	<1000		
Aromatics > EC16-EC21		<1000 µg/kg	TM414	<1000	1310	<1000	<1000		
Aromatics > EC21-EC35		<1000 µg/kg	TM414	9360	128000	<1000	5380		
Aromatics >EC35-EC44		<1000 µg/kg	TM414	2040	8810	<1000	1690		
Aromatics > EC40-EC44		<1000 µg/kg	TM414	<1000	2100	<1000	<1000		
Total Aromatics > EC10-EC44		<5000 µg/kg	TM414	11500	139000	<5000	7640		
Total Aliphatics & Aromatics >C5-C44		<10000 µg/kg	TM414	30000	333000	<10000	15900		
GRO >C5-C6		<20 µg/kg	TM089	<20	<20 4	<20 4	<20		
GRO >C6-C7		<20 µg/kg	TM089	24.2	<20 4	<20 4	<20		
GRO >C7-C8		<20 µg/kg	TM089	<20	<20 4	<20 4	<20		
GRO >C8-C10		<20 µg/kg	TM089	42.9	<20 4	<20 4	<20		
GRO >C10-C12		<20 µg/kg	TM089	23.1	<20 4	<20 4	<20		
Total Aliphatics >C5-C10		<50 µg/kg	TM089	56.1	<50 4	<50 4	<50		
Total Aromatics >EC5-EC10		<50 µg/kg	TM089	<50	<50 4	<50 4	<50		
GRO >C5-C10		<20 µg/kg	TM089	56.1	<20 4	<20 4	<20		

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Location:	Edgeconnex, Grangecastle	**Order Number:**	03/08/21	**Superseded Report:**	

VOC MS (S)

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(F)	Trigger breach confirmed							
1.4e[x]Q	Sample deviation (see appendix)							
		Customer Sample Ref.	ST01	ST11	ST15	ST19		
		Depth (m)	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50		
		Sample Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)		
		Date Sampled	01/02/2021	01/02/2021	01/02/2021	01/02/2021		
		Sample Time	.	.	.	.		
		Date Received	03/02/2021	03/02/2021	03/02/2021	03/02/2021		
		SDG Ref	210203-95	210203-95	210203-95	210203-95		
		Lab Sample No.(s)	23659680	23659681	23659689	23659690		
		AGS Reference						
Component	**LOD/Units**	**Method**						
Dibromofluoromethane**	%	TM116	127	110	110	109		
Toluene-d8**	%	TM116	94.1	99	98.6	99.8		
4-Bromofluorobenzene**	%	TM116	80.5	92	79.8	89.8		
Methyl Tertiary Butyl Ether	<10 µg/kg	TM116	<10 M	<200 M	<200 M	<200 M		
Benzene	<9 µg/kg	TM116	<9 M	<180 M	<180 M	<180 M		
Toluene	<7 µg/kg	TM116	<7 M	<140 M	<140 M	<140 M		
Ethylbenzene	<4 µg/kg	TM116	<4 M	<80 M	<80 M	<80 M		
p/m-Xylene	<10 µg/kg	TM116	<10 #	<200 #	<200 #	<200 #		
o-Xylene	<10 µg/kg	TM116	<10 M	<200 M	<200 M	<200 M		

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Location:	Edgeconnex, Grangecastle	Order Number:	03/08/21	Superseded Report:	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Edgeconnex, Grangecastle
Mass Sample taken (kg)	0.100	Natural Moisture Content (%)	11.7
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	89.5
Particle Size <4mm	>95%		

Case	
SDG	210203-95
Lab Sample Number(s)	23659680
Sampled Date	01-Feb-2021
Customer Sample Ref.	ST01
Depth (m)	0.50 - 0.50

Solid Waste Analysis	Result	Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	0.619	3	5	6
Loss on Ignition (%)	2.12	-	-	10
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	<0.105	1	-	-
Mineral Oil (mg/kg)	26.5	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	C_2 Conc^n in 10:1 eluate (mg/l)		A_2 10:1 conc^n leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	0.0121	<0.0005	0.121	<0.005	0.5	2	25
Barium	0.0271	<0.0002	0.271	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	0.0075	<0.001	0.075	<0.01	0.5	10	70
Copper	0.0549	<0.0003	0.549	<0.003	2	50	100
Mercury Dissolved (CVAF)	0.0000174	<0.00001	0.000174	<0.0001	0.01	0.2	2
Molybdenum	0.00565	<0.003	0.0565	<0.03	0.5	10	30
Nickel	0.016	<0.0004	0.16	<0.004	0.4	10	40
Lead	0.000308	<0.0002	0.00308	<0.002	0.5	10	50
Antimony	0.0018	<0.001	0.018	<0.01	0.06	0.7	5
Selenium	0.00249	<0.001	0.0249	<0.01	0.1	0.5	7
Zinc	0.00181	<0.001	0.0181	<0.01	4	50	200
Chloride	7.9	<2	79	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	10.5	<2	105	<20	1000	20000	50000
Total Dissolved Solids	428	<10	4280	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	9.31	<3	93.1	<30	500	800	1000

Leach Test Information

Date Prepared	05-Feb-2021
pH (pH Units)	11.17
Conductivity (µS/cm)	727.00
Temperature (°C)	19.50
Volume Leachant (Litres)	0.890

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation

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CERTIFICATE OF ANALYSIS

SDG:	210203-95	Client Reference:	5803	Report Number:	586686
Location:	Edgeconnex, Grangecastle	Order Number:	03/08/21	Superseded Report:	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Edgeconnex, Grangecastle
Mass Sample taken (kg)	0.095	Natural Moisture Content (%)	5.59
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	94.7
Particle Size <4mm	>95%		

Case	
SDG	210203-95
Lab Sample Number(s)	23659681
Sampled Date	01-Feb-2021
Customer Sample Ref.	ST11
Depth (m)	0.50 - 0.50

Solid Waste Analysis	Result	Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	1.03	3	5	6
Loss on Ignition (%)	2.12	-	-	10
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	<0.21	1	-	-
Mineral Oil (mg/kg)	158	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	C_2 Conc^n in 10:1 eluate (mg/l)		A_2 10:1 conc^n leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	<0.0005	<0.0005	<0.005	<0.005	0.5	2	25
Barium	0.0402	<0.0002	0.402	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.000697	<0.0003	0.00697	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.0091	<0.003	0.091	<0.03	0.5	10	30
Nickel	0.00106	<0.0004	0.0106	<0.004	0.4	10	40
Lead	<0.0002	<0.0002	<0.002	<0.002	0.5	10	50
Antimony	<0.001	<0.001	<0.01	<0.01	0.06	0.7	5
Selenium	0.00189	<0.001	0.0189	<0.01	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	4.6	<2	46	<20	800	15000	25000
Fluoride	<0.5	<0.5	<5	<5	10	150	500
Sulphate (soluble)	401	<2	4010	<20	1000	20000	50000
Total Dissolved Solids	588	<10	5880	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	05-Feb-2021
pH (pH Units)	7.85
Conductivity (µS/cm)	760.00
Temperature (°C)	20.10
Volume Leachant (Litres)	0.895

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
Stated limits are for guidance only and ALS Environmental cannot be held responsible for any discrepancies with current legislation

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CERTIFICATE OF ANALYSIS

SDG:	210203-95	Client Reference:	5803	Report Number:	586686
Location:	Edgeconnex, Grangecastle	Order Number:	03/08/21	Superseded Report:	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Edgeconnex, Grangecastle
Mass Sample taken (kg)	0.102	Natural Moisture Content (%)	13.9
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	87.8
Particle Size <4mm	>95%		

Case	
SDG	210203-95
Lab Sample Number(s)	23659689
Sampled Date	01-Feb-2021
Customer Sample Ref.	ST15
Depth (m)	0.50 - 0.50

Solid Waste Analysis	Result	Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	0.651	3	5	6
Loss on Ignition (%)	2.33	-	-	10
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	<5	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	C_2 Conc^n in 10:1 eluate (mg/l)		A_2 10:1 conc^n leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	<0.0005	<0.0005	<0.005	<0.005	0.5	2	25
Barium	0.025	<0.0002	0.25	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.000846	<0.0003	0.00846	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00576	<0.003	0.0576	<0.03	0.5	10	30
Nickel	0.00139	<0.0004	0.0139	<0.004	0.4	10	40
Lead	0.000732	<0.0002	0.00732	<0.002	0.5	10	50
Antimony	<0.001	<0.001	<0.01	<0.01	0.06	0.7	5
Selenium	0.00125	<0.001	0.0125	<0.01	0.1	0.5	7
Zinc	0.00213	<0.001	0.0213	<0.01	4	50	200
Chloride	2.3	<2	23	<20	800	15000	25000
Fluoride	0.696	<0.5	6.96	<5	10	150	500
Sulphate (soluble)	423	<2	4230	<20	1000	20000	50000
Total Dissolved Solids	611	<10	6110	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	<3	<3	<30	<30	500	800	1000

Leach Test Information

Date Prepared	05-Feb-2021
pH (pH Units)	7.80
Conductivity (µS/cm)	790.00
Temperature (°C)	20.10
Volume Leachant (Litres)	0.888

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
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CERTIFICATE OF ANALYSIS

SDG:	210203-95	Client Reference:	5803	Report Number:	586686
Location:	Edgeconnex, Grangecastle	Order Number:	03/08/21	Superseded Report:	

CEN 10:1 SINGLE STAGE LEACHATE TEST

WAC ANALYTICAL RESULTS

REF : BS EN 12457/2

Client Reference		Site Location	Edgeconnex, Grangecastle
Mass Sample taken (kg)	0.117	Natural Moisture Content (%)	29.5
Mass of dry sample (kg)	0.090	Dry Matter Content (%)	77.2
Particle Size <4mm	>95%		

Case	
SDG	210203-95
Lab Sample Number(s)	23659690
Sampled Date	01-Feb-2021
Customer Sample Ref.	ST19
Depth (m)	0.50 - 0.50

Solid Waste Analysis	Result	Landfill Waste Acceptance Criteria Limits: Inert Waste Landfill	Stable Non-reactive Hazardous Waste in Non-Hazardous Landfill	Hazardous Waste Landfill
Total Organic Carbon (%)	2.06	3	5	6
Loss on Ignition (%)	6.44	-	-	10
Sum of BTEX (mg/kg)	-	-	-	-
Sum of 7 PCBs (mg/kg)	<0.021	1	-	-
Mineral Oil (mg/kg)	<5	500	-	-
PAH Sum of 17 (mg/kg)	-	-	-	-
pH (pH Units)	-	-	-	-
ANC to pH 6 (mol/kg)	-	-	-	-
ANC to pH 4 (mol/kg)	-	-	-	-

Eluate Analysis	C_2 Conc^n in 10:1 eluate (mg/l)		A_2 10:1 conc^n leached (mg/kg)		Limit values for compliance leaching test using BS EN 12457-3 at L/S 10 l/kg		
	Result	Limit of Detection	Result	Limit of Detection			
Arsenic	<0.0005	<0.0005	<0.005	<0.005	0.5	2	25
Barium	0.00509	<0.0002	0.0509	<0.002	20	100	300
Cadmium	<0.00008	<0.00008	<0.0008	<0.0008	0.04	1	5
Chromium	<0.001	<0.001	<0.01	<0.01	0.5	10	70
Copper	0.00223	<0.0003	0.0223	<0.003	2	50	100
Mercury Dissolved (CVAF)	<0.00001	<0.00001	<0.0001	<0.0001	0.01	0.2	2
Molybdenum	0.00666	<0.003	0.0666	<0.03	0.5	10	30
Nickel	0.00156	<0.0004	0.0156	<0.004	0.4	10	40
Lead	0.00415	<0.0002	0.0415	<0.002	0.5	10	50
Antimony	<0.001	<0.001	<0.01	<0.01	0.06	0.7	5
Selenium	0.00106	<0.001	0.0106	<0.01	0.1	0.5	7
Zinc	<0.001	<0.001	<0.01	<0.01	4	50	200
Chloride	<2	<2	<20	<20	800	15000	25000
Fluoride	0.613	<0.5	6.13	<5	10	150	500
Sulphate (soluble)	5.5	<2	55	<20	1000	20000	50000
Total Dissolved Solids	128	<10	1280	<100	4000	60000	100000
Total Monohydric Phenols (W)	<0.016	<0.016	<0.16	<0.16	1	-	-
Dissolved Organic Carbon	5.14	<3	51.4	<30	500	800	1000

Leach Test Information

Date Prepared	05-Feb-2021
pH (pH Units)	8.96
Conductivity (µS/cm)	151.00
Temperature (°C)	19.90
Volume Leachant (Litres)	0.873

Solid Results are expressed on a dry weight basis, after correction for moisture content where applicable
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SDG:	210203-95	**Client Reference:**	5803	**Report Number:**	586686
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Table of Results - Appendix

Method No	Reference	Description
PM024	Modified BS 1377	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
PM115		Leaching Procedure for CEN One Stage Leach Test 2:1 & 10:1 1 Step
TM018	BS 1377: Part 3 1990	Determination of Loss on Ignition
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM090	Method 5310, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 415.1 & 9060	Determination of Total Organic Carbon/Total Inorganic Carbon in Water and Waste Water
TM104	Method 4500F, AWWA/APHA, 20th Ed., 1999	Determination of Fluoride using the Kone Analyser
TM116	Modified: US EPA Method 8260, 8120, 8020, 624, 610 & 602	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM123	BS 2690: Part 121:1981	The Determination of Total Dissolved Solids in Water
TM132	In - house Method	ELTRA CS800 Operators Guide
TM151	Method 3500D, AWWA/APHA, 20th Ed., 1999	Determination of Hexavalent Chromium using Kone analyser
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS
TM168	EPA Method 8082, Polychlorinated Biphenyls by Gas Chromatography	Determination of WHO12 and EC7 Polychlorinated Biphenyl Congeners by GC-MS in Soils
TM181	US EPA Method 6010B	Determination of Routine Metals in Soil by iCap 6500 Duo ICP-OES
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry
TM184	EPA Methods 325.1 & 325.2,	The Determination of Anions in Aqueous Matrices using the Kone Spectrophotometric Analysers
TM218	Shaker extraction - EPA method 3546.	The determination of PAH in soil samples by GC-MS
TM259	by HPLC	Determination of Phenols in Waters and Leachates by HPLC
TM410	Shaker extraction-In house coronene method	Determination of Coronene in soils by GCMS
TM414	Analysis of Petroleum Hydrocarbons in Environmental Media – Total Petroleum Hydrocarbon Criteria	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID
TM415	Analysis of Petroleum Hydrocarbons in Environmental Media.	Determination of Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Life Sciences Ltd Hawarden (Method codes TM) or ALS Life Sciences Ltd Aberdeen (Method codes S).

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CERTIFICATE OF ANALYSIS

SDG:	210203-95	**Client Reference:**	5803	**Report Number:**	586686
Location:	Edgeconnex, Grangecastle	**Order Number:**	03/08/21	**Superseded Report:**	

Test Completion Dates

Lab Sample No(s)	23659680	23659681	23659689	23659690
Customer Sample Ref.	ST01	ST11	ST15	ST19
AGS Ref.				
Depth	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50	0.50 - 0.50
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
Anions by Kone (w)	10-Feb-2021	10-Feb-2021	10-Feb-2021	10-Feb-2021
CEN 10:1 Leachate (1 Stage)	06-Feb-2021	06-Feb-2021	06-Feb-2021	06-Feb-2021
CEN Readings	09-Feb-2021	10-Feb-2021	10-Feb-2021	10-Feb-2021
Chromium III	10-Feb-2021	09-Feb-2021	09-Feb-2021	09-Feb-2021
Coronene	05-Feb-2021	05-Feb-2021	11-Feb-2021	05-Feb-2021
Dissolved Metals by ICP-MS	10-Feb-2021	10-Feb-2021	10-Feb-2021	09-Feb-2021
Dissolved Organic/Inorganic Carbon	10-Feb-2021	10-Feb-2021	10-Feb-2021	10-Feb-2021
EPH by GCxGC-FID	10-Feb-2021	10-Feb-2021	08-Feb-2021	10-Feb-2021
EPH CWG GC (S)	08-Feb-2021	08-Feb-2021	08-Feb-2021	08-Feb-2021
Fluoride	09-Feb-2021	09-Feb-2021	09-Feb-2021	09-Feb-2021
GRO by GC-FID (S)	12-Feb-2021	12-Feb-2021	12-Feb-2021	12-Feb-2021
Hexavalent Chromium (s)	09-Feb-2021	09-Feb-2021	09-Feb-2021	09-Feb-2021
Loss on Ignition in soils	08-Feb-2021	08-Feb-2021	08-Feb-2021	10-Feb-2021
Mercury Dissolved	10-Feb-2021	10-Feb-2021	10-Feb-2021	10-Feb-2021
Metals in solid samples by OES	10-Feb-2021	09-Feb-2021	09-Feb-2021	09-Feb-2021
Moisture at 105C	05-Feb-2021	05-Feb-2021	05-Feb-2021	05-Feb-2021
PAH by GCMS	05-Feb-2021	05-Feb-2021	12-Feb-2021	05-Feb-2021
PCBs by GCMS	08-Feb-2021	08-Feb-2021	11-Feb-2021	08-Feb-2021
Phenols by HPLC (W)	10-Feb-2021	11-Feb-2021	10-Feb-2021	11-Feb-2021
Sample description	04-Feb-2021	04-Feb-2021	04-Feb-2021	04-Feb-2021
Total Dissolved Solids on Leachates	10-Feb-2021	10-Feb-2021	10-Feb-2021	10-Feb-2021
Total Organic Carbon	11-Feb-2021	11-Feb-2021	11-Feb-2021	11-Feb-2021
TPH CWG GC (S)	12-Feb-2021	12-Feb-2021	12-Feb-2021	12-Feb-2021
VOC MS (S)	11-Feb-2021	12-Feb-2021	12-Feb-2021	12-Feb-2021

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SDG:	210203-95	Client Reference:	5803	Report Number:	586686
Location:	Edgeconnex, Grangecastle	Order Number:	03/08/21	Superseded Report:	

Appendix

General

1. Results are expressed on a dry weight basis (dried at 35ºC) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH4 by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

18. **Sample Deviations**

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

19. **Asbestos**

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2005), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials are obtained from supplied bulk materials which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2005).

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.
Standing Committee of Analysts, *The Quantification of Asbestos in Soil (2017).*

Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

HazWasteOnline™

Waste Classification Report

LJQJM-25ANG-R9T7K

Job name

5803

Description/Comments

Client: BCEI
Engineer: Clifton Scannell Emerson Associates

Project

Edgeconnex

Site

Grange Castle, Co. Dublin

Related Documents

#	Name	Description
1	210203-95.hwol	.hwol file used to create the Job

Waste Stream Template

Rilta Suite NEW

WAC Results

WAC Settings: samples in this job constitute a single population.

WAC limits used to evaluate the samples in this job: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

Classified by

Name:
Stephen Letch
Date:
17 Feb 2021 09:42 GMT
Telephone:
00353 86817 9449

Company:
Site Investigations Ltd

HazWasteOnline™ Training Record:

Course	Date
Hazardous Waste Classification	09 Apr 2019
Advanced Hazardous Waste Classification	09 Oct 2019

Report

Created by: Stephen Letch
Created date: 17 Feb 2021 09:42 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	WAC Results		Page
					Inert	Non Haz	
1	ST01-010221-0.50-0.50		Non Hazardous		Fail	Pass	3
2	ST11-010221-0.50-0.50		Non Hazardous		Fail	Pass	7

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Report created by Stephen Letch on 17 Feb 2021

#	Sample Name	Depth [m]	Classification Result	Hazard properties	WAC Results		Page
					Inert	Non Haz	
3	ST15-010221-0.50-0.50		Non Hazardous		Fail	Pass	11
4	ST19-010221-0.50-0.50		Non Hazardous		Pass	Pass	15

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Classification of sample: ST01-010221-0.50-0.50

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
ST01-010221-0.50-0.50
Moisture content:
9.4%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 9.4% Wet Weight Moisture Correction applied (MC)

#	Determinand (CLP index number / EC Number / CAS Number)	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	TPH (C6 to C40) petroleum group TPH		30 mg/kg		27.18 mg/kg	0.00272 %	✓	
2	confirm TPH has NOT arisen from diesel or petrol		☑					
3	antimony { antimony trioxide } 051-005-00-X / 215-175-0 / 1309-64-4		<0.6 mg/kg	1.197	<0.718 mg/kg	<0.0000718 %		<LOD
4	arsenic { arsenic pentoxide } 033-004-00-6 / 215-116-9 / 1303-28-2		47.5 mg/kg	1.534	66.01 mg/kg	0.0066 %	✓	
5	barium { barium sulphide } 016-002-00-X / 244-214-4 / 21109-95-5		108 mg/kg	1.233	120.695 mg/kg	0.0121 %	✓	
6	cadmium { cadmium sulfate } 048-009-00-9 / 233-331-6 / 10124-36-4		1.29 mg/kg	1.855	2.168 mg/kg	0.000217 %	✓	
7	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		43 mg/kg	1.126	43.862 mg/kg	0.00439 %	✓	
8	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) } 082-001-00-6	1	16.5 mg/kg		14.949 mg/kg	0.00149 %	✓	
9	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
10	molybdenum { molybdenum(VI) oxide } 042-001-00-9 / 215-204-7 / 1313-27-5		1.02 mg/kg	1.5	1.386 mg/kg	0.000139 %	✓	
11	nickel { nickel sulfate } 028-009-00-5 / 232-104-9 / 7786-81-4		34.4 mg/kg	2.637	82.176 mg/kg	0.00822 %	✓	
12	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		<1 mg/kg	1.405	<1.405 mg/kg	<0.000141 %		<LOD
13	zinc { zinc sulphate } 030-006-00-9 / 231-793-3 [1] 231-793-3 [2] / 7446-19-7 [1] 7733-02-0 [2]		174 mg/kg	2.469	389.27 mg/kg	0.0389 %	✓	
14	chromium in chromium(III) compounds { chromium(III) oxide (worst case) } 215-160-9 / 1308-38-9		17.9 mg/kg	1.462	23.703 mg/kg	0.00237 %	✓	

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Report created by Stephen Letch on 17 Feb 2021

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
15		chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		<LOD
		024-001-00-0	215-607-8	1333-82-0									
16		naphthalene				<0.045	mg/kg		<0.045	mg/kg	<0.0000045 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.06	mg/kg		<0.06	mg/kg	<0.000006 %		<LOD
			205-917-1	208-96-8									
18		acenaphthene				<0.04	mg/kg		<0.04	mg/kg	<0.000004 %		<LOD
			201-469-6	83-32-9									
19		fluorene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			201-695-5	86-73-7									
20		phenanthrene				<0.075	mg/kg		<0.075	mg/kg	<0.0000075 %		<LOD
			201-581-5	85-01-8									
21		anthracene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
			204-371-1	120-12-7									
22		fluoranthene				<0.085	mg/kg		<0.085	mg/kg	<0.0000085 %		<LOD
			205-912-4	206-44-0									
23		pyrene				<0.075	mg/kg		<0.075	mg/kg	<0.0000075 %		<LOD
			204-927-3	129-00-0									
24		benzo[a]anthracene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				<0.075	mg/kg		<0.075	mg/kg	<0.0000075 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				<0.07	mg/kg		<0.07	mg/kg	<0.000007 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				<0.075	mg/kg		<0.075	mg/kg	<0.0000075 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.09	mg/kg		<0.09	mg/kg	<0.000009 %		<LOD
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.115	mg/kg		<0.115	mg/kg	<0.0000115 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				<0.12	mg/kg		<0.12	mg/kg	<0.000012 %		<LOD
			205-883-8	191-24-2									
32		polychlorobiphenyls; PCB				<0.105	mg/kg		<0.105	mg/kg	<0.0000105 %		<LOD
		602-039-00-4	215-648-1	1336-36-3									
33		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
34		benzene				<0.009	mg/kg		<0.009	mg/kg	<0.0000009 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
35		toluene				<0.007	mg/kg		<0.007	mg/kg	<0.0000007 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
36		ethylbenzene				<0.004	mg/kg		<0.004	mg/kg	<0.0000004 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
37		coronene				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
			205-881-7	191-07-1									
38		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.02	mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.0776 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because HP 3 can be discounted as this is a solid waste without a free draining liquid phase.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00272%)

WAC Results for sample: ST01-010221-0.50-0.50

WAC Settings: samples in this job constitute a single population.

WAC limits used to evaluate this sample: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample FAILS the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	0.619	3	5
2	LOI (loss on ignition)	%	2.12	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.04	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.105	1	-
5	Mineral oil (C10 to C40)	mg/kg	26.5	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<0.59	100	-
7	pH	pH	11.2	-	>6
8	ANC (acid neutralisation capacity)	mol/kg		-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	0.121	0.5	2
10	barium	mg/kg	0.271	20	100
11	cadmium	mg/kg	<0.0008	0.04	1
12	chromium	mg/kg	0.075	0.5	10
13	copper	mg/kg	0.549	2	50
14	mercury	mg/kg	0.0001	0.01	0.2
15	molybdenum	mg/kg	0.0565	0.5	10
16	nickel	mg/kg	0.16	0.4	10
17	lead	mg/kg	0.003	0.5	10
18	antimony	mg/kg	0.018	0.06	0.7
19	selenium	mg/kg	0.0249	0.1	0.5
20	zinc	mg/kg	0.0181	4	50
21	chloride	mg/kg	79	800	15,000
22	fluoride	mg/kg	<5	10	150
23	sulphate	mg/kg	105	1,000	20,000
24	phenol index	mg/kg	<0.16	1	-
25	DOC (dissolved organic carbon)	mg/kg	93.1	500	800
26	TDS (total dissolved solids)	mg/kg	4280	4,000	60,000

Key

	User supplied data
	Inert WAC criteria fail

HazWasteOnline™
Report created by Stephen Letch on 17 Feb 2021

Classification of sample: ST11-010221-0.50-0.50

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
ST11-010221-0.50-0.50
Moisture content:
4.3%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 4.3% Wet Weight Moisture Correction applied (MC)

#	Determinand (CLP index number / EC Number / CAS Number)	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	TPH (C6 to C40) petroleum group TPH		333 mg/kg		318.681 mg/kg	0.0319 %	✓	
2	confirm TPH has NOT arisen from diesel or petrol		☑					
3	antimony { antimony trioxide } 051-005-00-X / 215-175-0 / 1309-64-4		<0.6 mg/kg	1.197	<0.718 mg/kg	<0.0000718 %		<LOD
4	arsenic { arsenic pentoxide } 033-004-00-6 / 215-116-9 / 1303-28-2		4.25 mg/kg	1.534	6.239 mg/kg	0.000624 %	✓	
5	barium { barium sulphide } 016-002-00-X / 244-214-4 / 21109-95-5		34.2 mg/kg	1.233	40.372 mg/kg	0.00404 %	✓	
6	cadmium { cadmium sulfate } 048-009-00-9 / 233-331-6 / 10124-36-4		0.629 mg/kg	1.855	1.116 mg/kg	0.000112 %	✓	
7	copper { dicopper oxide; copper (I) oxide } 029-002-00-X / 215-270-7 / 1317-39-1		8.97 mg/kg	1.126	9.665 mg/kg	0.000966 %	✓	
8	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) } 082-001-00-6	1	6.3 mg/kg		6.029 mg/kg	0.000603 %	✓	
9	mercury { mercury dichloride } 080-010-00-X / 231-299-8 / 7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
10	molybdenum { molybdenum(VI) oxide } 042-001-00-9 / 215-204-7 / 1313-27-5		1.33 mg/kg	1.5	1.909 mg/kg	0.000191 %	✓	
11	nickel { nickel sulfate } 028-009-00-5 / 232-104-9 / 7786-81-4		14.7 mg/kg	2.637	37.093 mg/kg	0.00371 %	✓	
12	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } 034-002-00-8		1.23 mg/kg	1.405	1.654 mg/kg	0.000165 %	✓	
13	zinc { zinc sulphate } 030-006-00-9 / 231-793-3 [1] 231-793-3 [2] / 7446-19-7 [1] 7733-02-0 [2]		98.9 mg/kg	2.469	233.712 mg/kg	0.0234 %	✓	
14	chromium in chromium(III) compounds { chromium(III) oxide (worst case) } 215-160-9 / 1308-38-9		6.83 mg/kg	1.462	9.553 mg/kg	0.000955 %	✓	

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Report created by Stephen Letch on 17 Feb 2021

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
15		chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		<LOD
		024-001-00-0	215-607-8	1333-82-0									
16		naphthalene				<0.09	mg/kg		<0.09	mg/kg	<0.000009 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.12	mg/kg		<0.12	mg/kg	<0.000012 %		<LOD
			205-917-1	208-96-8									
18		acenaphthene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
			201-469-6	83-32-9									
19		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
20		phenanthrene				<0.15	mg/kg		<0.15	mg/kg	<0.000015 %		<LOD
			201-581-5	85-01-8									
21		anthracene				<0.16	mg/kg		<0.16	mg/kg	<0.000016 %		<LOD
			204-371-1	120-12-7									
22		fluoranthene				<0.17	mg/kg		<0.17	mg/kg	<0.000017 %		<LOD
			205-912-4	206-44-0									
23		pyrene				<0.15	mg/kg		<0.15	mg/kg	<0.000015 %		<LOD
			204-927-3	129-00-0									
24		benzo[a]anthracene				<0.14	mg/kg		<0.14	mg/kg	<0.000014 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				<0.15	mg/kg		<0.15	mg/kg	<0.000015 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				<0.14	mg/kg		<0.14	mg/kg	<0.000014 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				<0.15	mg/kg		<0.15	mg/kg	<0.000015 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.18	mg/kg		<0.18	mg/kg	<0.000018 %		<LOD
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.23	mg/kg		<0.23	mg/kg	<0.000023 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				<0.24	mg/kg		<0.24	mg/kg	<0.000024 %		<LOD
			205-883-8	191-24-2									
32		polychlorobiphenyls; PCB				<0.21	mg/kg		<0.21	mg/kg	<0.000021 %		<LOD
		602-039-00-4	215-648-1	1336-36-3									
33		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
34		benzene				<0.18	mg/kg		<0.18	mg/kg	<0.000018 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
35		toluene				<0.14	mg/kg		<0.14	mg/kg	<0.000014 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
36		ethylbenzene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
37		coronene				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
			205-881-7	191-07-1									
38		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.4	mg/kg		<0.4	mg/kg	<0.00004 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.0672 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because HP 3 can be discounted as this is a solid waste without a free draining liquid phase.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0319%)

WAC Results for sample: ST11-010221-0.50-0.50

WAC Settings: samples in this job constitute a single population.

WAC limits used to evaluate this sample: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample FAILS the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	1.03	3	5
2	LOI (loss on ignition)	%	2.12	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.8	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.21	1	-
5	Mineral oil (C10 to C40)	mg/kg	158	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<1.18	100	-
7	pH	pH	7.85	-	>6
8	ANC (acid neutralisation capacity)	mol/kg		-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	<0.005	0.5	2
10	barium	mg/kg	0.402	20	100
11	cadmium	mg/kg	<0.0008	0.04	1
12	chromium	mg/kg	<0.01	0.5	10
13	copper	mg/kg	0.0069	2	50
14	mercury	mg/kg	<0.0001	0.01	0.2
15	molybdenum	mg/kg	0.091	0.5	10
16	nickel	mg/kg	0.0106	0.4	10
17	lead	mg/kg	<0.002	0.5	10
18	antimony	mg/kg	<0.01	0.06	0.7
19	selenium	mg/kg	0.0189	0.1	0.5
20	zinc	mg/kg	<0.01	4	50
21	chloride	mg/kg	46	800	15,000
22	fluoride	mg/kg	<5	10	150
23	sulphate	mg/kg	4010	1,000	20,000
24	phenol index	mg/kg	<0.16	1	-
25	DOC (dissolved organic carbon)	mg/kg	<30	500	800
26	TDS (total dissolved solids)	mg/kg	5880	4,000	60,000

Key

	User supplied data
	Inert WAC criteria fail

HazWasteOnline™
Report created by Stephen Letch on 17 Feb 2021

Classification of sample: ST15-010221-0.50-0.50

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
ST15-010221-0.50-0.50
Moisture content:
11%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 11% Wet Weight Moisture Correction applied (MC)

#	Determinand (CLP index number / EC Number / CAS Number)	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	TPH (C6 to C40) petroleum group / TPH		<10 mg/kg		<10 mg/kg	<0.001 %		<LOD
2	confirm TPH has NOT arisen from diesel or petrol		☑					
3	antimony { antimony trioxide } / 051-005-00-X / 215-175-0 / 1309-64-4		<0.6 mg/kg	1.197	<0.718 mg/kg	<0.0000718 %		<LOD
4	arsenic { arsenic pentoxide } / 033-004-00-6 / 215-116-9 / 1303-28-2		7.1 mg/kg	1.534	9.693 mg/kg	0.000969 %	✓	
5	barium { barium sulphide } / 016-002-00-X / 244-214-4 / 21109-95-5		26.4 mg/kg	1.233	28.982 mg/kg	0.0029 %	✓	
6	cadmium { cadmium sulfate } / 048-009-00-9 / 233-331-6 / 10124-36-4		0.705 mg/kg	1.855	1.164 mg/kg	0.000116 %	✓	
7	copper { dicopper oxide; copper (I) oxide } / 029-002-00-X / 215-270-7 / 1317-39-1		19.1 mg/kg	1.126	19.139 mg/kg	0.00191 %	✓	
8	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) } / 082-001-00-6	1	8.25 mg/kg		7.343 mg/kg	0.000734 %	✓	
9	mercury { mercury dichloride } / 080-010-00-X / 231-299-8 / 7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
10	molybdenum { molybdenum(VI) oxide } / 042-001-00-9 / 215-204-7 / 1313-27-5		2.11 mg/kg	1.5	2.817 mg/kg	0.000282 %	✓	
11	nickel { nickel sulfate } / 028-009-00-5 / 232-104-9 / 7786-81-4		37.3 mg/kg	2.637	87.53 mg/kg	0.00875 %	✓	
12	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } / 034-002-00-8		1.44 mg/kg	1.405	1.801 mg/kg	0.00018 %	✓	
13	zinc { zinc sulphate } / 030-006-00-9 / 231-793-3 [1] 231-793-3 [2] / 7446-19-7 [1] 7733-02-0 [2]		45.2 mg/kg	2.469	99.335 mg/kg	0.00993 %	✓	
14	chromium in chromium(III) compounds { chromium(III) oxide (worst case) } / 215-160-9 / 1308-38-9		3.09 mg/kg	1.462	4.019 mg/kg	0.000402 %	✓	

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Report created by Stephen Letch on 17 Feb 2021

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
15		chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		<LOD
		024-001-00-0	215-607-8	1333-82-0									
16		naphthalene				<0.009	mg/kg		<0.009	mg/kg	<0.0000009 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.012	mg/kg		<0.012	mg/kg	<0.0000012 %		<LOD
			205-917-1	208-96-8									
18		acenaphthene				<0.008	mg/kg		<0.008	mg/kg	<0.0000008 %		<LOD
			201-469-6	83-32-9									
19		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-695-5	86-73-7									
20		phenanthrene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		<LOD
			201-581-5	85-01-8									
21		anthracene				<0.016	mg/kg		<0.016	mg/kg	<0.0000016 %		<LOD
			204-371-1	120-12-7									
22		fluoranthene				<0.017	mg/kg		<0.017	mg/kg	<0.0000017 %		<LOD
			205-912-4	206-44-0									
23		pyrene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		<LOD
			204-927-3	129-00-0									
24		benzo[a]anthracene				<0.014	mg/kg		<0.014	mg/kg	<0.0000014 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				<0.014	mg/kg		<0.014	mg/kg	<0.0000014 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.018	mg/kg		<0.018	mg/kg	<0.0000018 %		<LOD
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.023	mg/kg		<0.023	mg/kg	<0.0000023 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				<0.024	mg/kg		<0.024	mg/kg	<0.0000024 %		<LOD
			205-883-8	191-24-2									
32		polychlorobiphenyls; PCB				<0.021	mg/kg		<0.021	mg/kg	<0.0000021 %		<LOD
		602-039-00-4	215-648-1	1336-36-3									
33		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
34		benzene				<0.18	mg/kg		<0.18	mg/kg	<0.000018 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
35		toluene				<0.14	mg/kg		<0.14	mg/kg	<0.000014 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
36		ethylbenzene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
37		coronene				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
			205-881-7	191-07-1									
38		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.4	mg/kg		<0.4	mg/kg	<0.00004 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.0275 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

WAC Results for sample: ST15-010221-0.50-0.50

WAC Settings: samples in this job constitute a single population.

WAC limits used to evaluate this sample: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample FAILS the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	0.651	3	5
2	LOI (loss on ignition)	%	2.33	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.8	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.021	1	-
5	Mineral oil (C10 to C40)	mg/kg	<5	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<0.118	100	-
7	pH	pH	7.8	-	>6
8	ANC (acid neutralisation capacity)	mol/kg		-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	<0.005	0.5	2
10	barium	mg/kg	0.25	20	100
11	cadmium	mg/kg	<0.0008	0.04	1
12	chromium	mg/kg	<0.01	0.5	10
13	copper	mg/kg	0.0084	2	50
14	mercury	mg/kg	<0.0001	0.01	0.2
15	molybdenum	mg/kg	0.0576	0.5	10
16	nickel	mg/kg	0.0139	0.4	10
17	lead	mg/kg	0.0073	0.5	10
18	antimony	mg/kg	<0.01	0.06	0.7
19	selenium	mg/kg	0.0125	0.1	0.5
20	zinc	mg/kg	0.0213	4	50
21	chloride	mg/kg	23	800	15,000
22	fluoride	mg/kg	6.96	10	150
23	sulphate	mg/kg	4230	1,000	20,000
24	phenol index	mg/kg	<0.16	1	-
25	DOC (dissolved organic carbon)	mg/kg	<30	500	800
26	TDS (total dissolved solids)	mg/kg	6110	4,000	60,000

Key

	User supplied data
	Inert WAC criteria fail

HazWasteOnline™
Report created by Stephen Letch on 17 Feb 2021

Classification of sample: ST19-010221-0.50-0.50

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
ST19-010221-0.50-0.50
Moisture content:
25%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 25% Wet Weight Moisture Correction applied (MC)

#	Determinand (CLP index number / EC Number / CAS Number)	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	TPH (C6 to C40) petroleum group / TPH		15.9 mg/kg		11.925 mg/kg	0.00119 %	✓	
2	confirm TPH has NOT arisen from diesel or petrol		☑					
3	antimony { antimony trioxide } / 051-005-00-X / 215-175-0 / 1309-64-4		<0.6 mg/kg	1.197	<0.718 mg/kg	<0.0000718 %		<LOD
4	arsenic { arsenic pentoxide } / 033-004-00-6 / 215-116-9 / 1303-28-2		10.8 mg/kg	1.534	12.424 mg/kg	0.00124 %	✓	
5	barium { barium sulphide } / 016-002-00-X / 244-214-4 / 21109-95-5		76.1 mg/kg	1.233	70.402 mg/kg	0.00704 %	✓	
6	cadmium { cadmium sulfate } / 048-009-00-9 / 233-331-6 / 10124-36-4		1.26 mg/kg	1.855	1.753 mg/kg	0.000175 %	✓	
7	copper { dicopper oxide; copper (I) oxide } / 029-002-00-X / 215-270-7 / 1317-39-1		23.9 mg/kg	1.126	20.182 mg/kg	0.00202 %	✓	
8	lead { lead compounds with the exception of those specified elsewhere in this Annex (worst case) } / 082-001-00-6	1	20.4 mg/kg		15.3 mg/kg	0.00153 %	✓	
9	mercury { mercury dichloride } / 080-010-00-X / 231-299-8 / 7487-94-7		<0.1 mg/kg	1.353	<0.135 mg/kg	<0.0000135 %		<LOD
10	molybdenum { molybdenum(VI) oxide } / 042-001-00-9 / 215-204-7 / 1313-27-5		2.17 mg/kg	1.5	2.442 mg/kg	0.000244 %	✓	
11	nickel { nickel sulfate } / 028-009-00-5 / 232-104-9 / 7786-81-4		37.4 mg/kg	2.637	73.959 mg/kg	0.0074 %	✓	
12	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex } / 034-002-00-8		<1 mg/kg	1.405	<1.405 mg/kg	<0.000141 %		<LOD
13	zinc { zinc sulphate } / 030-006-00-9 / 231-793-3 [1] 231-793-3 [2] / 7446-19-7 [1] 7733-02-0 [2]		94.5 mg/kg	2.469	175.011 mg/kg	0.0175 %	✓	
14	chromium in chromium(III) compounds { chromium(III) oxide (worst case) } / 215-160-9 / 1308-38-9		9.6 mg/kg	1.462	10.523 mg/kg	0.00105 %	✓	

HazWasteOnline™
Report created by Stephen Letch on 17 Feb 2021

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
15		chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.6	mg/kg	1.923	<1.154	mg/kg	<0.000115 %		<LOD
		024-001-00-0	215-607-8	1333-82-0									
16		naphthalene				<0.009	mg/kg		<0.009	mg/kg	<0.0000009 %		<LOD
		601-052-00-2	202-049-5	91-20-3									
17		acenaphthylene				<0.012	mg/kg		<0.012	mg/kg	<0.0000012 %		<LOD
			205-917-1	208-96-8									
18		acenaphthene				<0.008	mg/kg		<0.008	mg/kg	<0.0000008 %		<LOD
			201-469-6	83-32-9									
19		fluorene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
			201-695-5	86-73-7									
20		phenanthrene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		<LOD
			201-581-5	85-01-8									
21		anthracene				<0.016	mg/kg		<0.016	mg/kg	<0.0000016 %		<LOD
			204-371-1	120-12-7									
22		fluoranthene				<0.017	mg/kg		<0.017	mg/kg	<0.0000017 %		<LOD
			205-912-4	206-44-0									
23		pyrene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		<LOD
			204-927-3	129-00-0									
24		benzo[a]anthracene				<0.014	mg/kg		<0.014	mg/kg	<0.0000014 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
25		chrysene				<0.01	mg/kg		<0.01	mg/kg	<0.000001 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
26		benzo[b]fluoranthene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
27		benzo[k]fluoranthene				<0.014	mg/kg		<0.014	mg/kg	<0.0000014 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
28		benzo[a]pyrene; benzo[def]chrysene				<0.015	mg/kg		<0.015	mg/kg	<0.0000015 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
29		indeno[123-cd]pyrene				<0.018	mg/kg		<0.018	mg/kg	<0.0000018 %		<LOD
			205-893-2	193-39-5									
30		dibenz[a,h]anthracene				<0.023	mg/kg		<0.023	mg/kg	<0.0000023 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
31		benzo[ghi]perylene				<0.024	mg/kg		<0.024	mg/kg	<0.0000024 %		<LOD
			205-883-8	191-24-2									
32		polychlorobiphenyls; PCB				<0.021	mg/kg		<0.021	mg/kg	<0.0000021 %		<LOD
		602-039-00-4	215-648-1	1336-36-3									
33		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
		603-181-00-X	216-653-1	1634-04-4									
34		benzene				<0.18	mg/kg		<0.18	mg/kg	<0.000018 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
35		toluene				<0.14	mg/kg		<0.14	mg/kg	<0.000014 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
36		ethylbenzene				<0.08	mg/kg		<0.08	mg/kg	<0.000008 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
37		coronene				<0.2	mg/kg		<0.2	mg/kg	<0.00002 %		<LOD
			205-881-7	191-07-1									
38		o-xylene; [1] p-xylene; [2] m-xylene; [3] xylene [4]				<0.4	mg/kg		<0.4	mg/kg	<0.00004 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
										Total:	0.0399 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because HP 3 can be discounted as this is a solid waste without a free draining liquid phase.

Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00119%)

WAC Results for sample: ST19-010221-0.50-0.50

WAC Settings: samples in this job constitute a single population.

WAC limits used to evaluate this sample: "Ireland"
The WAC used in this report are the WAC defined for the inert and non-hazardous classes of landfill in the Republic of Ireland. You should check the actual acceptance criteria when the disposal site is identified as they may differ from the generic WAC used in this report.

The sample PASSES the Inert (Inert waste landfill) criteria.

The sample PASSES the Non Haz (Non hazardous waste landfill) criteria.

WAC Determinands

Solid Waste Analysis				Landfill Waste Acceptance Criteria Limits	
#	Determinand		User entered data	Inert waste landfill	Non hazardous waste landfill
1	TOC (total organic carbon)	%	2.06	3	5
2	LOI (loss on ignition)	%	6.44	-	-
3	BTEX (benzene, toluene, ethylbenzene and xylenes)	mg/kg	<0.8	6	-
4	PCBs (polychlorinated biphenyls, 7 congeners)	mg/kg	<0.021	1	-
5	Mineral oil (C10 to C40)	mg/kg	<5	500	-
6	PAHs (polycyclic aromatic hydrocarbons)	mg/kg	<0.118	100	-
7	pH	pH	8.96	-	>6
8	ANC (acid neutralisation capacity)	mol/kg		-	-
Eluate Analysis 10:1					
9	arsenic	mg/kg	<0.005	0.5	2
10	barium	mg/kg	0.0509	20	100
11	cadmium	mg/kg	<0.0008	0.04	1
12	chromium	mg/kg	<0.01	0.5	10
13	copper	mg/kg	0.0223	2	50
14	mercury	mg/kg	<0.0001	0.01	0.2
15	molybdenum	mg/kg	0.0666	0.5	10
16	nickel	mg/kg	0.0156	0.4	10
17	lead	mg/kg	0.0415	0.5	10
18	antimony	mg/kg	<0.01	0.06	0.7
19	selenium	mg/kg	0.0106	0.1	0.5
20	zinc	mg/kg	<0.01	4	50
21	chloride	mg/kg	<20	800	15,000
22	fluoride	mg/kg	6.13	10	150
23	sulphate	mg/kg	55	1,000	20,000
24	phenol index	mg/kg	<0.16	1	-
25	DOC (dissolved organic carbon)	mg/kg	51.4	500	800
26	TDS (total dissolved solids)	mg/kg	1280	4,000	60,000

Key
User supplied data

Appendix A: Classifier defined and non CLP determinands

TPH (C6 to C40) petroleum group (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3 H226 , Asp. Tox. 1 H304 , STOT RE 2 H373 , Muta. 1B H340 , Carc. 1B H350 , Repr. 2 H361d , Aquatic Chronic 2 H411

confirm TPH has NOT arisen from diesel or petrol

Description/Comments: Chapter 3, section 4b requires a positive confirmation for benzo[a]pyrene to be used as a marker in evaluating Carc. 1B; H350 (HP 7) and Muta. 1B; H340 (HP 11)
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

barium sulphide (EC Number: 244-214-4, CAS Number: 21109-95-5)

CLP index number: 016-002-00-X
Description/Comments:
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): EUH031 >= 0.8 %
Reason for additional Hazards Statement(s):
14 Dec 2015 - EUH031 >= 0.8 % hazard statement sourced from: WM3, Table C12.2

lead compounds with the exception of those specified elsewhere in this Annex (worst case)

CLP index number: 082-001-00-6
Description/Comments: Worst Case: IARC considers lead compounds Group 2A; Probably carcinogenic to humans; Lead REACH Consortium, following CLP protocols, considers lead compounds from smelting industries, flue dust and similar to be Carcinogenic category 1A
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html (worst case lead compounds). Review date 29/09/2015

chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H332 , Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Resp. Sens. 1 H334 , Skin Sens. 1 H317 , Repr. 1B H360FD , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H302 , Acute Tox. 1 H330 , Acute Tox. 1 H310 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Aquatic Chronic 2 H411

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Carc. 2 H351 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Skin Irrit. 2 H315

- **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **polychlorobiphenyls; PCB** (EC Number: 215-648-1, CAS Number: 1336-36-3)

CLP index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans; POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 1A H350
Reason for additional Hazards Statement(s):
29 Sep 2015 - Carc. 1A H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

- **coronene** (EC Number: 205-881-7, CAS Number: 191-07-1)

Description/Comments: Data from C&L Inventory Database; no entries in Registered Substances or Pesticides Properties databases; SDS: Sigma Aldrich, 1907/2006 compliant, dated 2012 - no entries; IARC – Group 3, not carcinogenic.
Data source:
http://clp-inventory.echa.europa.eu/SummaryOfClassAndLabelling.aspx?SubstanceID=17010&HarmOnly=no?fc=true&lang=en
Data source date: 16 Jun 2014
Hazard Statements: STOT SE 2 H371

Appendix B: Rationale for selection of metal species

antimony {antimony trioxide}

Worst case scenario.

arsenic {arsenic pentoxide}

Arsenic pentoxide used as most hazardous species.

barium {barium sulphide}

Chromium VII at limits of detection. Barium sulphide used as the next most hazardous species. No chromate present.

cadmium {cadmium sulfate}

Cadmium sulphate used as the most hazardous species.

copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected.

lead {lead compounds with the exception of those specified elsewhere in this Annex (worst case)}

Chromium VII at limits of detection. Lead compounds used as the next most hazardous species. No chromate present.

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight

molybdenum {molybdenum(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight.

nickel {nickel sulfate}

Chromium VII at limits of detection. Nickel sulphate used as the next most hazardous species. No chromate present.

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulphoselenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil.

zinc {zinc sulphate}

Chromium VII at limits of detection. Zinc sulphate used as the next most hazardous species. No chromate present.

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments.

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2021.43.4652.8963 (13 Feb 2021)
HazWasteOnline Database: 2021.43.4652.8963 (13 Feb 2021)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2019 - UK: 2019 No. 720 of 27th March 2019
The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020
The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020
POPs Regulation 2019 - Regulation (EU) 2019/1021 of 20 June 2019

5803 – Edgeconnex
Grange Castle, Co. Dublin

Appendix 6
Survey Data

Survey Data

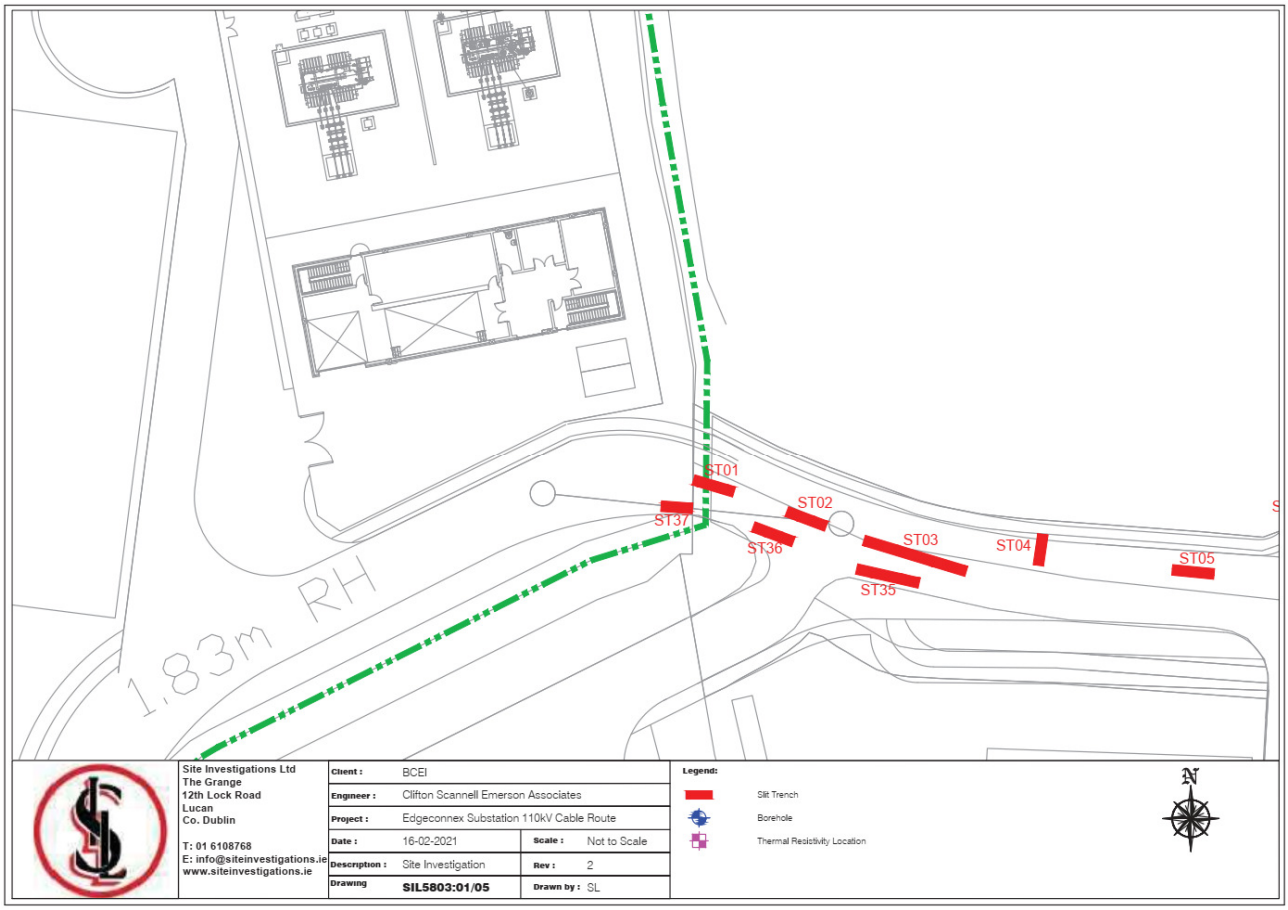
Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Slit Trenches					
ST01 Start	703098.784	732158.413	60.77	303170.446	232131.627
ST01 End	703102.644	732157.269	60.76	303174.306	232130.483
ST02 Start	703107.652	732155.415	60.82	303179.316	232128.628
ST02 End	703111.401	732154.016	60.90	303183.065	232127.229
ST03 Start	703114.974	732152.682	60.97	303186.639	232125.895
ST03 End	703124.713	732149.740	61.20	303196.380	232122.952
ST04 Start	703131.986	732153.252	61.32	303203.655	232126.465
ST04 End	703131.555	732150.309	61.38	303203.224	232123.521
ST05 Start	703144.276	732149.880	61.72	303215.948	232123.092
ST05 End	703148.264	732149.488	61.83	303219.936	232122.700
ST06 Start	703156.915	732150.576	61.98	303228.589	232123.789
ST06 End	703158.991	732160.083	62.07	303230.666	232133.298
ST07 Start	703184.982	732198.015	62.73	303256.662	232171.238
ST07 End	703186.902	732200.407	62.76	303258.582	232173.631
ST08 Start	703188.487	732202.316	62.77	303260.168	232175.540
ST08 End	703190.367	732204.673	62.80	303262.048	232177.897
ST09 Start	703191.457	732206.061	62.82	303263.138	232179.286
ST09 End	703194.130	732209.119	62.85	303265.812	232182.344
ST10 Start	703200.140	732210.762	62.96	303271.823	232183.988
ST10 End	703199.106	732212.531	62.95	303270.789	232185.757
ST11 Start	703218.463	732209.550	62.99	303290.150	232182.776
ST11 End	703225.126	732207.419	62.97	303296.814	232180.644
ST12 Start	703228.476	732206.224	62.99	303300.165	232179.449
ST12 End	703234.242	732204.507	62.97	303305.932	232177.732
ST13 Start	703237.333	732203.386	62.89	303309.024	232176.611
ST13 End	703244.947	732201.083	62.94	303316.640	232174.307
ST14 Start	703249.090	732202.017	63.05	303320.784	232175.241
ST14 End	703250.321	732203.569	63.10	303322.015	232176.794
ST15 Start	703253.789	732206.772	63.26	303325.484	232179.997
ST15 End	703255.125	732208.257	63.30	303326.820	232181.483
ST16 Start	703257.669	732211.643	63.45	303329.364	232184.869
ST16 End	703259.643	732213.838	63.57	303331.339	232187.065
ST17 Start	703420.625	732081.525	66.04	303492.357	232054.724
ST17 End	703423.998	732086.598	66.13	303495.730	232059.798

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Slit Trenches					
ST18 Start	703451.429	732084.443	66.46	303523.167	232057.643
ST18 End	703454.521	732083.980	66.67	303526.260	232057.180
ST19 Start	703458.719	732099.563	65.98	303530.459	232072.766
ST19 End	703461.996	732098.385	65.65	303533.736	232071.588
ST20 Start	703467.440	732106.001	65.77	303539.181	232079.206
ST20 End	703469.515	732105.612	65.89	303541.257	232078.817
ST21 Start	703452.537	732075.255	66.61	303524.275	232048.453
ST21 End	703452.909	732080.304	67.02	303524.647	232053.503
ST22 Start	703446.784	732075.576	66.48	303518.521	232048.774
ST22 End	703446.735	732078.651	66.76	303518.472	232051.850
ST23 Start	703429.612	732076.378	66.08	303501.345	232049.576
ST23 End	703429.816	732080.294	66.12	303501.550	232053.493
ST24 Start	703260.654	732215.689	63.70	303332.350	232188.916
ST24 End	703267.266	732213.402	63.03	303338.963	232186.629
ST25 Start	703260.710	732212.655	63.54	303332.406	232185.882
ST25 End	703266.471	732210.384	63.07	303338.168	232183.610
ST26 Start	703257.268	732205.675	63.27	303328.963	232178.900
ST26 End	703262.026	732210.667	63.42	303333.722	232183.893
ST27 Start	703252.571	732201.127	62.99	303324.265	232174.351
ST27 End	703253.821	732202.733	63.08	303325.516	232175.957
ST28 Start	703246.467	732196.915	63.00	303318.160	232170.138
ST28 End	703248.191	732197.756	62.98	303319.884	232170.979
ST29 Start	703236.429	732199.571	63.02	303308.120	232172.795
ST29 End	703240.233	732198.189	63.00	303311.925	232171.412
ST30 Start	703225.593	732203.000	63.09	303297.282	232176.224
ST30 End	703231.430	732201.184	63.07	303303.120	232174.408
ST31 Start	703216.424	732205.936	63.09	303288.111	232179.161
ST31 End	703222.177	732204.091	63.07	303293.865	232177.316
ST32 Start	703192.992	732201.220	62.88	303264.674	232174.444
ST32 End	703197.503	732206.532	62.92	303269.185	232179.757
ST33 Start	703188.296	732195.534	62.85	303259.977	232168.757
ST33 End	703190.078	732197.835	62.87	303261.759	232171.058
ST34 Start	703160.404	732150.890	62.08	303232.079	232124.103
ST34 End	703161.241	732160.579	62.21	303232.916	232133.794

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Slit Trenches					
ST35 Start	703114.285	732149.967	60.94	303185.950	232123.179
ST35 End	703120.239	732148.627	61.10	303191.905	232121.839
ST36 Start	703104.461	732153.972	60.72	303176.124	232127.185
ST36 End	703108.288	732152.543	60.78	303179.952	232125.756
ST37 Start	703095.707	732155.933	60.71	303167.368	232129.146
ST37 End	703098.692	732155.701	60.68	303170.354	232128.914
ST38 Start	703456.057	732095.312	65.70	303527.796	232068.514
ST38 End	703464.135	732089.870	66.05	303535.876	232063.071
ST39 Start	703458.765	732089.626	65.92	303530.505	232062.827
ST39 End	703462.347	732095.756	65.79	303534.087	232068.959
ST40 Start	703460.518	732111.870	65.97	303532.258	232085.076
ST40 End	703460.763	732119.531	65.58	303532.503	232092.739
ST41 Start	703460.006	732114.444	65.86	303531.746	232087.651
ST41 End	703471.397	732114.057	65.85	303543.139	232087.264
ST42 Start	703470.143	732092.876	66.39	303541.885	232066.078
ST42 End	703471.907	732091.415	66.67	303543.649	232064.617
ST43 Start	703473.421	732110.424	66.20	303545.164	232083.630
ST43 End	703475.543	732110.172	66.45	303547.286	232083.378
Rotary Coreholes					
BH01	703206.916	732212.364	62.97	303278.600	232185.590
BH02	703252.245	732202.596	63.05	303323.939	232175.820
BH03	703277.289	732231.392	63.50	303348.988	232204.623
Thermal Resistivity Locations					
TR01	703229.202	732208.133	63.09	303300.891	232181.358
TR06	703466.858	732123.809	65.41	303538.599	232097.018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ST36
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Site Investigations Ltd
The Grange
12th Lock Road
Lucan
Co. Dublin
T: 01 6108768
E: info@siteinvestigations.ie
www.siteinvestigations.ie
Client : BCEI
Engineer : Clifton Scannell Emerson Associates
Project : Edgeconnex Substation 110kV Cable Route
Date : 16-02-2021
Scale : Not to Scale
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Slit Trench
Borehole
Thermal Resistivity Location
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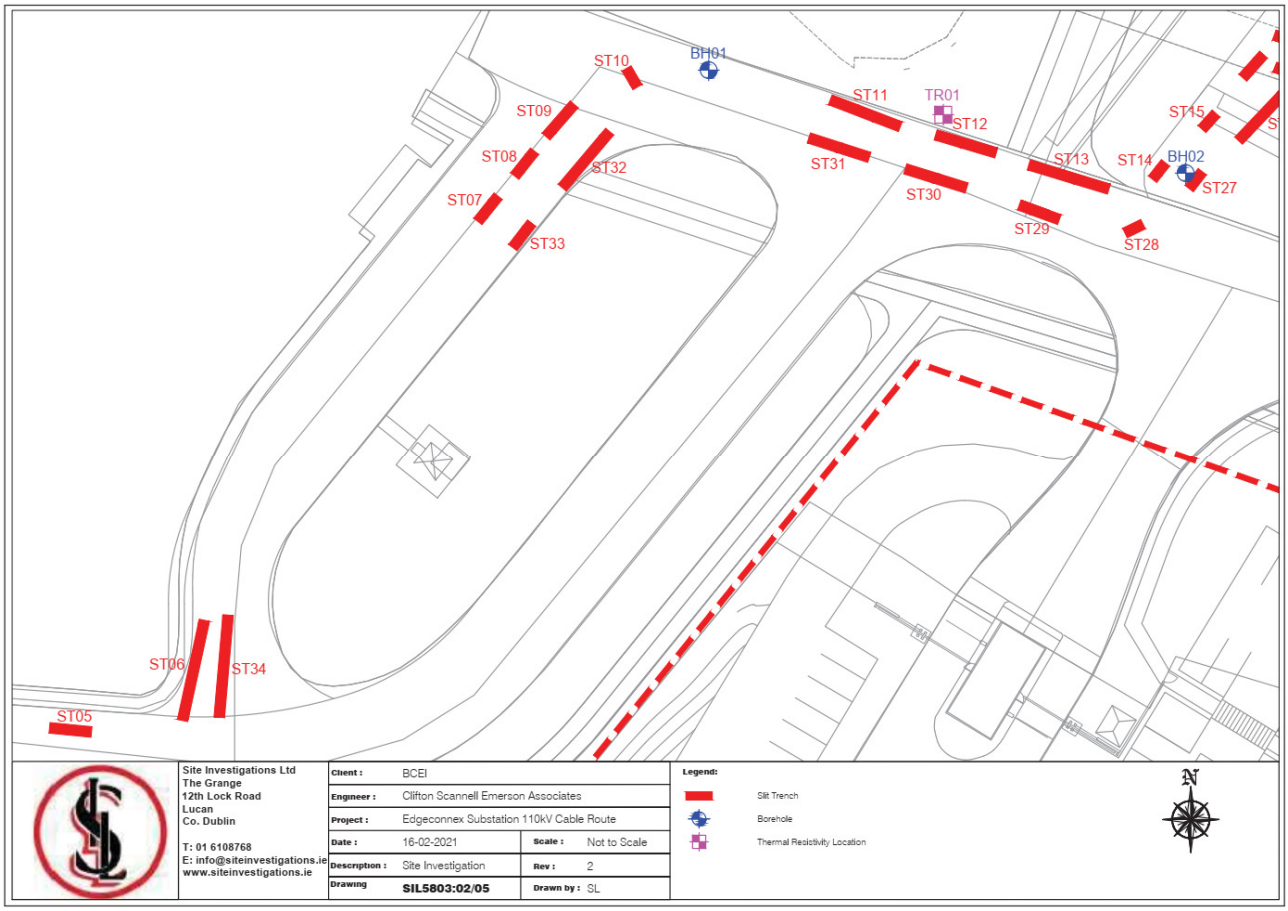
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ST34
ST05
Site Investigations Ltd
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T: 01 6108768
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www.siteinvestigations.ie
Client : BCEI
Engineer : Clifton Scannell Emerson Associates
Project : Edgeconnex Substation 110kV Cable Route
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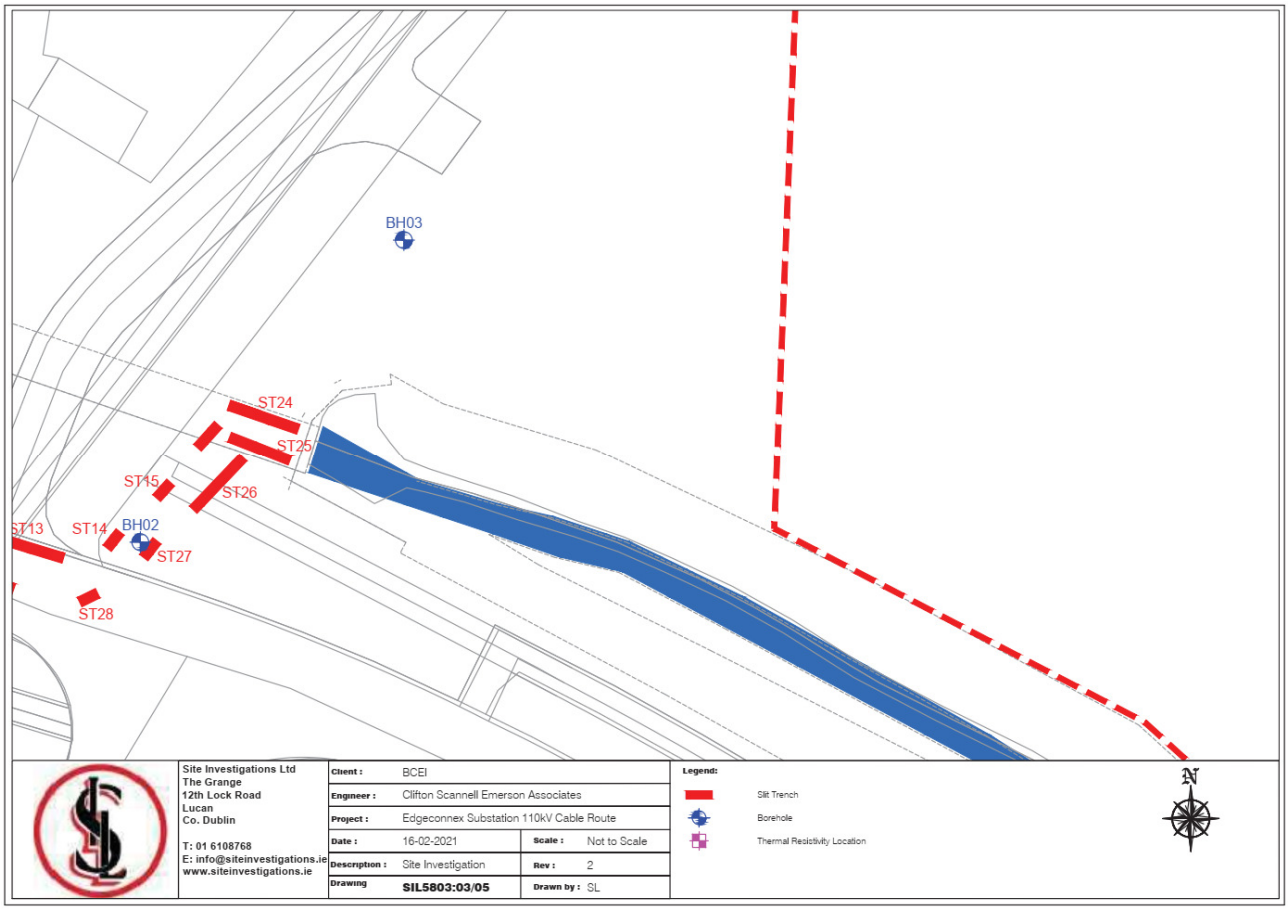
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Site Investigations Ltd
The Grange
12th Lock Road
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T: 01 6108768
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www.siteinvestigations.ie
Client : BCEI
Engineer : Clifton Scannell Emerson Associates
Project : Edgeconnex Substation 110kV Cable Route
Date : 16-02-2021
Scale : Not to Scale
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Drawn by : SL
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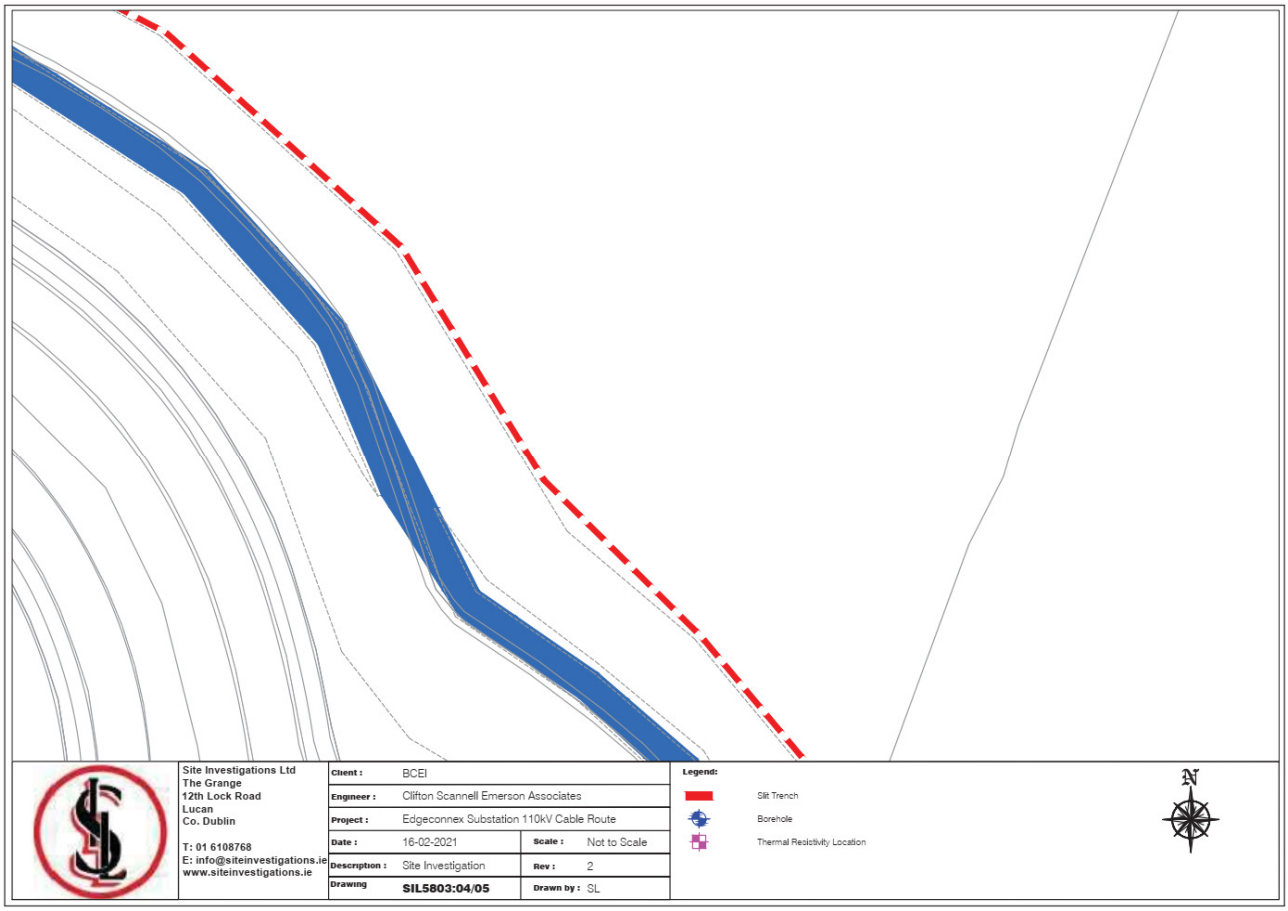
Borehole
Thermal Resistivity Location
N


Site Investigations Ltd
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T: 01 6108768
E: info@siteinvestigations.ie
www.siteinvestigations.ie
Client : BCEI
Engineer : Clifton Scannell Emerson Associates
Project : Edgeconnex Substation 110kV Cable Route
Date : 16-02-2021
Scale : Not to Scale
Description : Site Investigation
Rev : 2
Drawing SIL5803:04/05
Drawn by : SL
Legend:
Slit Trench
Borehole
Thermal Resistivity Location
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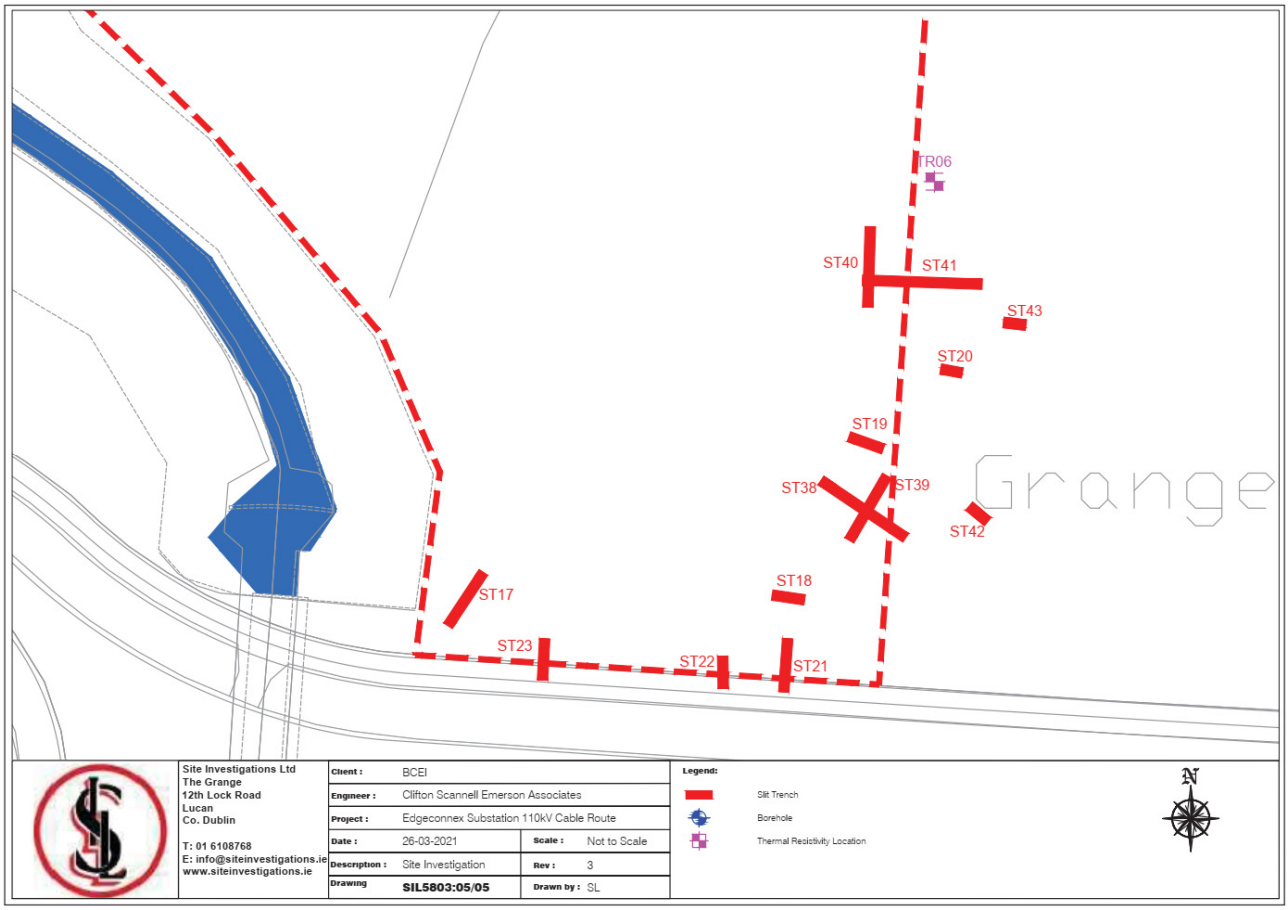
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ST23
ST22
ST21
Grange
Site Investigations Ltd
The Grange
12th Lock Road
Lucan
Co. Dublin
T: 01 6108768
E: info@siteinvestigations.ie
www.siteinvestigations.ie
Client : BCEI
Engineer : Clifton Scannell Emerson Associates
Project : Edgeconnex Substation 110kV Cable Route
Date : 26-03-2021
Scale : Not to Scale
Description : Site Investigation
Rev : 3
Drawing SIL5803:05/05
Drawn by : SL
Legend:
Slit Trench
Borehole
Thermal Resistivity Location
N

CHAPTER 8 – HYDROLOGY

Appendix 8.1 NRA Criteria for Rating the Magnitude and Significance of Impacts at EIA Stage National Roads Authority (NRA, 2009)

Table 1 Criteria for rating Site Attributes - Estimation of Importance of Hydrology Attributes (TII)

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

Table 2 Criteria for Rating Impact Significance at EIS Stage – Estimation of Magnitude of Impact on Hydrological 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

Table 3 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 µPa).

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_{fT}(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 $L_{Ar,T}$.

sound power level The logarithmic measure of sound power in comparison to a referenced sound intensity level of one picowatt (1pW) per m^2 where:

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

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:

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

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 Baseline noise monitoring

Prepared by AWN Consulting Limited

A series of environmental noise surveys was 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 two 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 A 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 B 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.

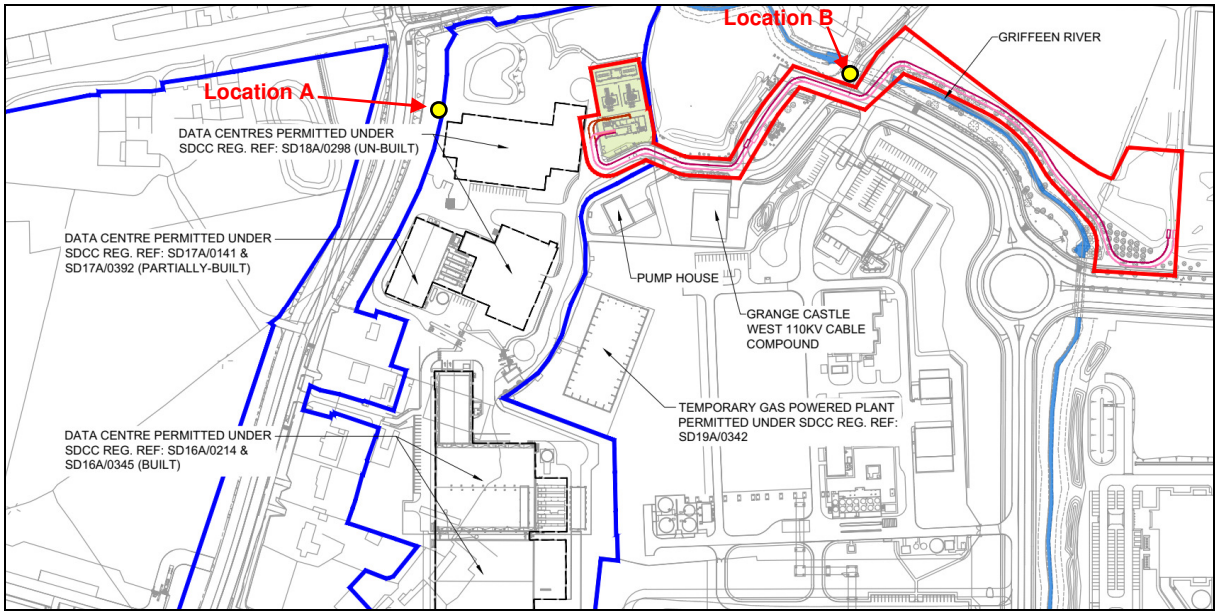


Figure A Noise monitoring locations

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
A, B	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

Personnel & Instrumentation

AWN Consulting 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..

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	
A	B
• 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.	• 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.

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}	$L_{A90,15min}$
A	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
B	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

Appendix 9.3 Indicative construction noise and vibration management plan

Prepared by AWN Consulting Limited

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 (EIA) 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.

Construction Noise Criteria

As referenced in the EIA Report prepared for the proposed development, appropriate criteria relating to permissible construction noise levels for a development of this scale may be found in the Transport Infrastructure Ireland (TII) publication *Guidelines for the Treatment of Noise and Vibration in National Road Schemes*[15] which indicates the following criteria and hours of operation.

Table 9.3.1 Construction Noise Limit Values

Days and Times	Noise Levels (dB re. 2^{x10-5} 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 13:00hrs	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.

Construction Vibration Criteria

It is recommended in this EIA Report that vibration from construction activities to off-site residences be limited to the values set out in Table 9.3.2. 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%.

Table 9.3.2 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 10Hz	**10 to 50Hz**	**50 to 100Hz (and above)**
8 mm/s	12.5 mm/s	20 mm/s

Hours of Work

The proposed general construction hours are 07:00 to 18:00hrs, Monday to Friday and 08:00 to 14:00 on Saturdays. However, weekday evening works may also be required from time to time.

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.

[15] *Guidelines for the Treatment of Noise and Vibration in National Road Schemes, Revision 1, 25 October 2004*, Transport Infrastructure Ireland

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/m^2 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: 2017: *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*.

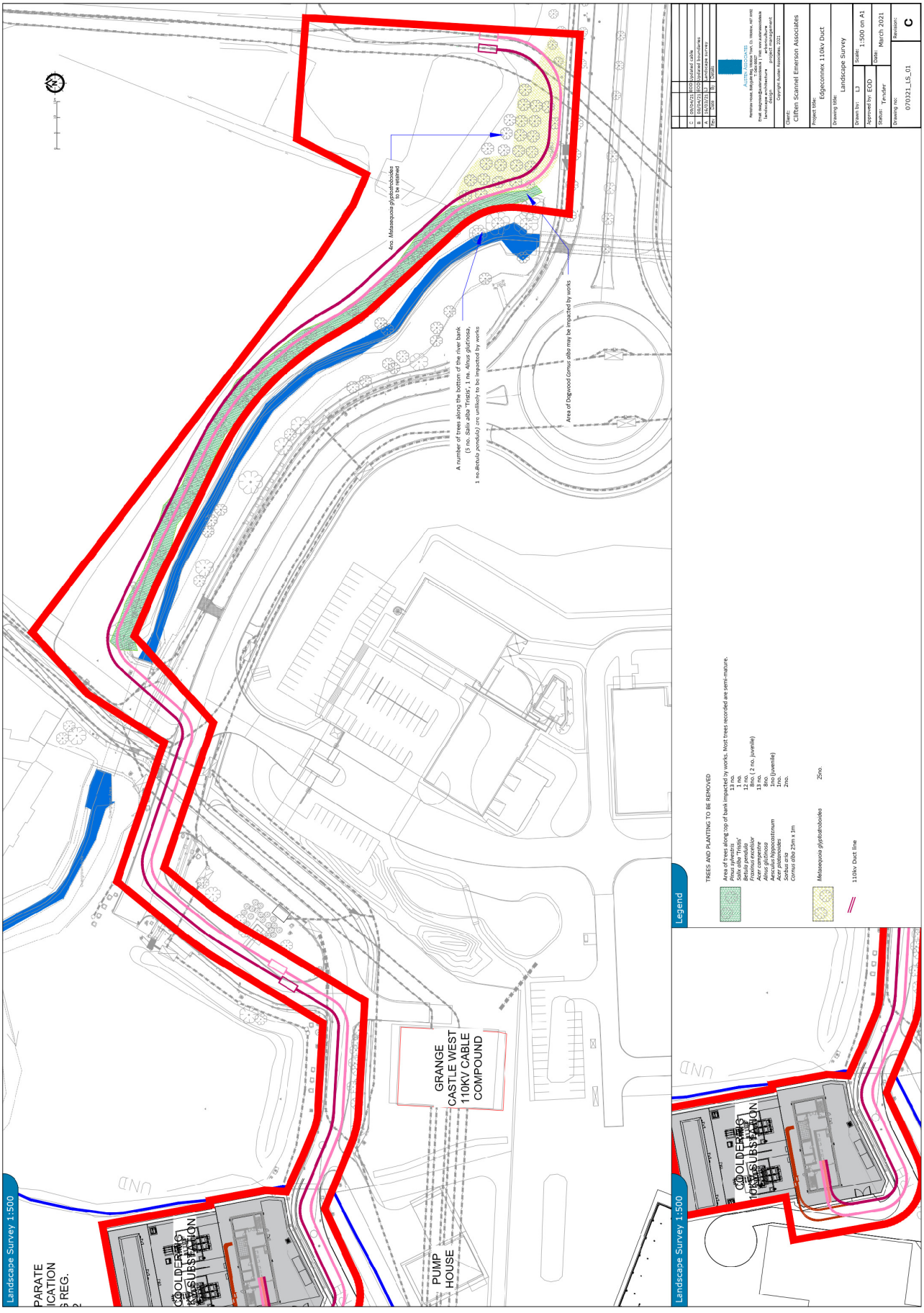
The mounting of the transducer to the vibrating structure should comply with BS ISO 5348:1998 *Mechanical vibration and shock – Mechanical mounting of accelerometers*. In summary, the following ideal mounting conditions apply:

- 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.

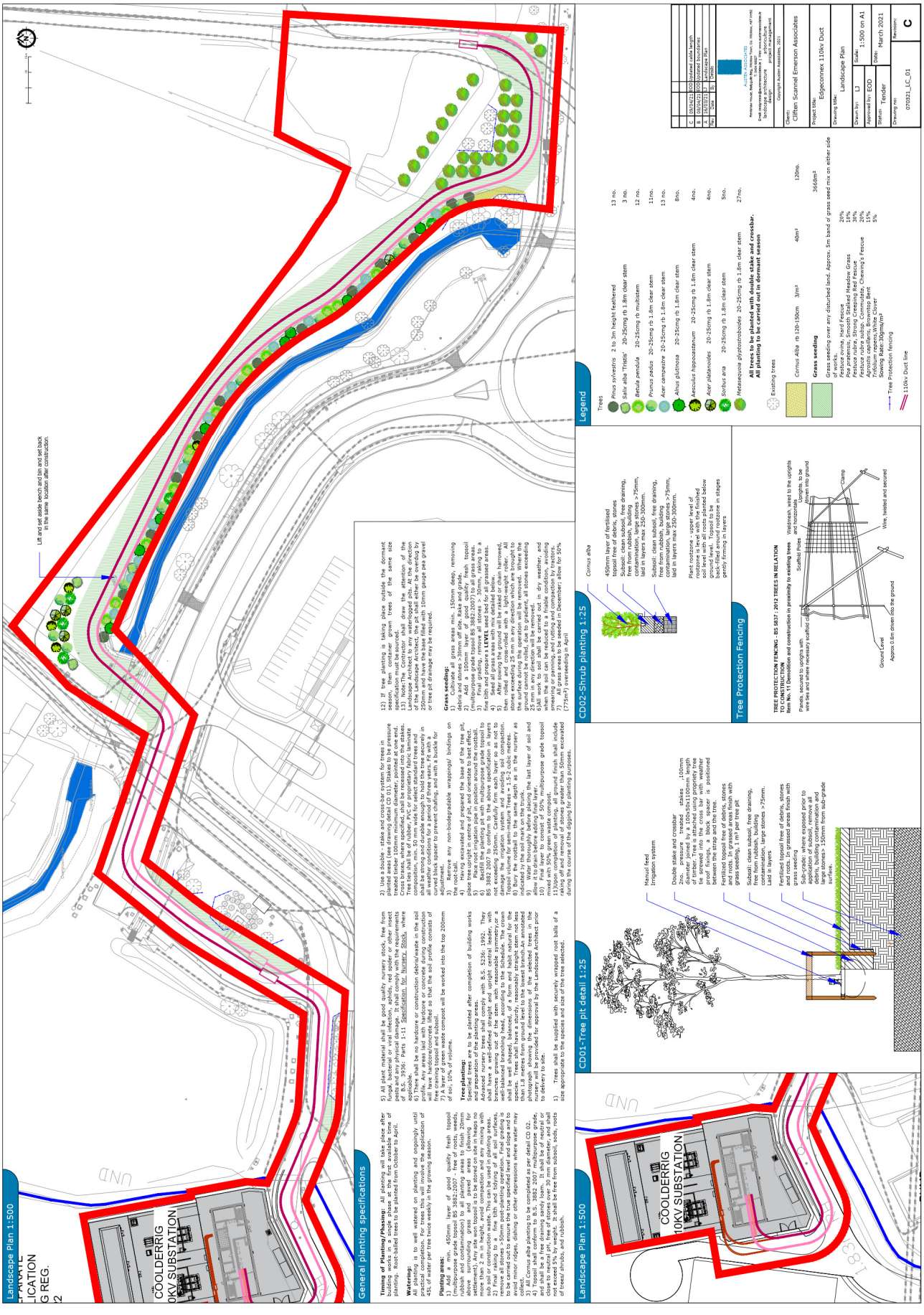
In general, the transducer will be fixed to the floor of a building or concrete base on the ground using expansion bolts. In instances where the vibration monitor will be placed outside of a building a flat and level concrete base with dimensions of approximately 1m x 1m x 0.1m will be required.

CHAPTER 11 - LANDSCAPE AND VISUAL IMPACT

Appendix 11.1 Landscape survey of route



Appendix 11.2 Proposed Landscape plan



CHAPTER 13 CULTURAL HERITAGE

Appendix 13.1 Record of Monuments and Places

The recorded archaeological sites within c. 1km of the development are listed below, all noted in the Record of Monuments and Places for Co. Dublin.

RMP No.	**DU017-029----**
Townland	Adamstown (Newcastle By.)
Site Type	Castle - tower house
NGR	702836, 732705
Description	Located on flat ground between the canal and the railway. A three-storey tower house, which was oblong in plan with a projecting turret and stepped crenellations. Demolished in the 1960s. No visible at ground level (Compiled by: Geraldine Stout, Date of upload: 26 August 2011, Date of last visit: 23 July 1993.
Sources	RMP Healy, P. 1974 Report on Monuments and Sites of Archaeological Interest in County Dublin, p. 22 Ball, F. E. 1906 Parish of Arderrig Part 4, 58-60; Dix, E. R. 1897 The lesser castles of Co. Dublin, in Irish Builder, p. 12.

RMP No.	**DU017-034----**
Townland	Grange (Newcastle By.)
Site Type	Castle - tower house
NGR	703857, 731879
Description	Attached to a farmhouse in flat, low-lying ground. Shown as a castle on the Down Survey (1655-6) map. This is a rectangular tower house with a square tower that's projects to the N in the NE corner. The tower house is three storeys high. The walls are plastered but where stonework is visible it is coursed limestone with roughly dressed quoins. The windows are all later insertions. Entrance is in the N wall through a round-headed doorway. There is a murder hole over the entrance lobby which leads into a vaulted ground floor (int. dims. L 7.08m; Wth.5.2m). Access to stair turret is off the lobby through a round-headed doorway. First floor not accessible. Second floor is accessed through a two-centred arched doorway. There is a garderobe chute in the SE corner which is supported by corbels and entered through a narrow round-headed door to a small circular chamber lit by a single ope. The jambs are hammer-dressed. There is a square stair tower or cap house which rises above parapet level (Healy 1974, 22; Mc Dix 1897, XXXIX, 22). A drawing by Beranger in 1773 shows stepped crenellations at parapet level (Harbison 1998, 168-9). In 1997 monitoring and excavation were undertaken in the vicinity of the castle, in advance of the construction of an access road and the excavation of foul sewers for a Business Park at Grange Castle. A curving ditch was identified orientated north-east/south-west. It was 30m in length, 0.8-0.9m deep, and 1.2-2.4m wide. The upper fills contained charcoal, mortar, flint and animal bones, and were aceramic. A decorated bone comb, stick-pin and knife gave the later ditch phase a terminus ante quem of from the 12th to the 13th century AD. A stone causeway, 0.5-0.6m wide and 0.06-0.1m deep, crossed the ditch. The evidence suggests that extensive early medieval and post-medieval activity survives in this area; the ditches can be interpreted as medieval field boundaries (O'Brien, R. 1998, 26-7). (Compiled by: Geraldine Stout, Date of upload: 26 August 2011, Date of last visit: 03 October 1986)
Sources	RMP Healy, P. 1974 Report on Monuments and Sites of Archaeological Interest in County Dublin, p. 22. Ball, F. E. 1906 Parish of Arderrig Part 4, 65 Dix, E. R. 1897 The lesser castles of Co. Dublin, in Irish Builder, p. 22 Cooper, A. 1780 Down Survey.

RMP No.	DU017-080
Townland	KILMAHUDDRICK
Site Type	Barrow - ring-barrow
NGR	701891, 732600
Description	Geo-physical survey and test trenching in 2000 revealed a ring barrow. This was located in a slightly elevated position. It comprises a ditch (Wth 2.5m, D 1.6m) which encloses a maximum area of 13m. Fragments of a human skull was found in the upper fill of the ditch. A 'cist-like structure' was exposed in the northern quadrant of the ditch. Cremated bone associated with Early Bronze Age pottery and a bead were found within the interior of the enclosing ditch. Soil samples from the ditch contained remains of barley, wheat, oats and evidence for hazel, haw and sloe (Doyle 2002, 75-6). Compiled by: Geraldine Stout Date of upload: 26 August 2011
Sources	1. Doyle, I. 2002a 6 Mary's Abbey, Dublin. In I. Bennett (ed.), Excavations 2000: summary accounts of archaeological excavations in Ireland, 90-91. Bray. Wordwell. 2. Doyle, I. 2002b Davis Place, (off Francis St.) Dublin. In I. Bennett (ed.), Excavations 2000: summary accounts of archaeological excavations in Ireland, 84-5. Bray. Wordwell. 3. Doyle, I. 2002c Kilmahuddrick (Grange Castle International Business Park), Clondalkin. In I. Bennett (ed.), Excavations 2000: summary accounts of excavations in Ireland, 75-6. Bray. Wordwell

RMP No.	DU021-108
Townland	BALLYBANE
Site Type	Concentric enclosure
NGR	703060, 730985
Description	Not indicated on any OS map a large concentric enclosure is visible as a crop-mark on an aerial photo. A second enclosure (DU021-109----) is visible to the SW. The area of AH1 contains a recorded concentric enclosure (DU021-108). This site contains subsurface remains of a large double ditched enclosure and the morphology of this monument and its associated ditches suggest it is of possible early medieval date. However, 12th to 13th century pottery finds associated with the upper fills of both the internal and external ditch appear to suggest multiple periods of activity. Internal features and deposits within the enclosure are suggestive of settlement evidence. This monument has a diameter of approximately 60m (Stirland 2016, 10).
Sources	RMP Google Maps. Stirland, J. (ACS) 2016 Archaeological testing at Grange Castle South Business Park Ballybane, Clondalkin, Dublin 22 (16E0531).
Images	

RMP No.	DU021-109
Townland	BALLYBANE
Site Type	Enclosure
NGR	702937, 730716
Description	Not indicated on any OS map this enclosure is as a crop-mark on an aerial photo. A second larger enclosure (DU021-108----) is visible to the NE. AH5 – the archaeological test trenching confirmed the presence of a single-ditched circular enclosure (DU021-109), 44m in diameter with the ditch measuring 3m wide and 1.6m deep. The general appearance of this features is suggestive of a possible

	ringfort type enclosure. No internal features were recorded (Stirland 2016, 10).
Sources	RMP Google Maps. Stirland, J. (ACS) 2016 Archaeological testing at Grange Castle South Business Park Ballybane, Clondalkin, Dublin 22 (16E0531).
Images	

Appendix 13.2 Archaeological Finds

The recorded archaeological finds in the vicinity of the proposed development, are listed below, all noted in the National Museum of Ireland files, Kildare Street, Dublin 2, or in other published catalogues of prehistoric material: Raftery (1983 - iron age antiquities), Eogan (1965; 1993; 1994 - bronze swords, Bronze Age hoards and goldwork), Harbison (1968; 1969a; 1969b - bronze axes, halberds and daggers) and the Irish Stone Axe Project Database. The following townlands were assessed Adamstown, Aungierstown & Ballybane, Ballybane, Ballymakaily, Clutterland, Finnstown, Gollierstown, Grange, Kilmactalway, Kilmahuddrick, Kishoge, Milltown and Nangor.

NMI 1994:20 IA/28/1994	**Kishoge**
Bronze Flat Axe Possible Derryniggin type bronze flat axe. Bronze disease covering both surfaces. Found with metal detector.	

In addition to the above, a large number of archaeological artefacts have been recorded from excavations in the study area (see Appendix 13.3).

Finally, in the course of archaeological testing and excavations at the site in 2019 (License No. 19E0038), 115 archaeological finds were discovered. These predominantly comprised pottery, stone, iron and glass dating to the medieval period, but also included a stone axehead of Neolithic date.

Appendix 13.3 Previous excavations

Previously published archaeological excavations in the area from 1969 to 2018 (www.excavations.ie) are summarised below. The following townlands were assessed Adamstown, Aungierstown & Ballybane, Ballybane, Ballymakaily, Clutterland, Finnstown, Gollierstown, Grange, Kilmactalway, Kilmahuddrick, Kishoge, Milltown and Nangor.

Dublin
1996:068
Nangor Castle, Clondalkin
Medieval
O045312
96E273
Trial-trenching in the vicinity of the now-demolished castle and eighteenth-century house produced evidence for a substantial ditch and an associated shallower linear feature. Neither feature produced any datable artefacts but had silted up with a series of organic-rich clays with animal bone, shell and matted grass-possibly bedding material.
Trial-trenching continued in the field bounding the castle site to its south, after an extensive geophysical survey had been carried out. Results from these cuttings suggest widespread archaeology surviving below the ploughsoil. Several lignite cores and slivers, early medieval pottery and metal slag were all retrieved both from the trenches and from field-walking, suggesting a date in at least the early medieval period-twelfth/thirteenth century. Several trenches cut through a large ditch located on both the east and west of the field, which apparently substantiated the impression, given from the overall lie of the land, that the field had contained a ploughed-our rath or ring-ditch. Human skeletal remains were also uncovered, as were numerous charcoal-flecked irregular features. Other than some cutting into the ditch, the trench went no deeper once in situ archaeology was reached.
Cia McConway, Archaeological Development Services Ltd. Power House, Pigeon House Harbour, Dublin 4.

Dublin
1997:086
NANGOR CASTLE/GRANGE CASTLE, KILMAHUDDRICK, CLONDALKIN
Medieval?
O045312
SMR 17:34 and 17:37
97E0116
Test-trenching was carried out along the line of a proposed road leading northwards from the vicinity of the now-demolished Nangor Castle to Grange Castle, within the area of a proposed industrial park. This was the second phase of testing, the first phase having concentrated on the field to the immediate south of Nangor Castle and its general vicinity.
An intensive geophysical survey had been carried out along the line of the proposed road and several anomalies were identified. This testing specifically examined the areas of anomalies, as agreed on with the relevant authorities within the National Monuments Service. Trenching was carried out by machine, and halted once in situ archaeological deposits were encountered. However, as experienced before, only subsoil-cut features survived-years of ploughing the fairly shallow ploughsoil had completely removed any potential archaeological stratigraphy.
Seven trenches were opened. Of these, only three, all located in Grange Field 3, to the east of Grange Castle, produced any significant archaeology. Two linear features 0.5-0.8m wide, of unknown date and function, ran in a north-south direction. However, their proximity both to the 15th-century castle and to one another could suggest substantial archaeological potential. Some spreads of brown soil had 20th-century pottery inclusions in their upper surface, while other areas, a mix of brown soil and broken slate subsoil, were probably the result of the dragging action of the plough.
This licence was taken over by Richard O'Brien to carry out monitoring and excavation along the line of the road (No. 87 below).
Cia Mc Conway, Archaeological Development Services Ltd, Windsor House, 11 Fairview Strand, Fairview, Dublin 3.

Dublin
1997:087
GRANGE CASTLE BUSINESS PARK, KILMAHUDDRICK, CLONDALKIN
Medieval
O045312
SMR 17:34 and 17:37
97E0116ext.
Monitoring and excavation were undertaken in advance of the construction of an access road and the excavation of foul sewers for a Business Park at Grange Castle. The excavation work continued until February 1998. Documentary evidence is scarce for Nangor Castle, but it is known that a castle stood on the site in the 16th century. Grange Castle is an upstanding 15th-century tower-house. It is proposed to develop an industrial park in this area.
Previous archaeological assessment by Cia Mc Conway (Excavations 1996, 17, 96E273, and above, No. 86) and geophysical survey by A. Mc Cleary, ADS Ltd, in February 1997 established that the area was archaeologically sensitive.
In advance of construction of a site access road topsoil was stripped from a 24m-wide area by mechanical excavator, under archaeological supervision, for a distance of 480m northwards from the Nangor Road. A further strip, 6m wide and 1300m long, was excavated for the sewers. The full 24m-wide strip was excavated in the field adjacent to Grange Castle.
All archaeological features uncovered had been truncated by deep ploughing, resulting in the removal of all but subsurface features cut into natural boulder clay.
A curving ditch was identified in Field 1; it terminated at Nangor Road, and was orientated north-east/south-west. It was 30m in length, 0.8-0.9m deep, and 1.2-2.4m wide. The eastern terminus continued beyond the limits of the excavation. The upper fills contained charcoal, mortar, flint and animal bones, and were aceramic. A decorated bone comb, stick-pin and knife gave the later ditch phase a terminus ante quem of from the 12th to the 13th century AD.
A stone causeway, 0.5-0.6m wide and 0.06-0.1m deep, crossed the ditch. The existence of this ditch had been shown in Mc Conway's assessment.
Field 7 is located between Grange Castle and the Kilmahuddrick Housing Estate. Two curving ditches were identified in this field. One was found under a post-medieval stone and brick trackway. It was 51m in length and varied in width from 1.1m to 1.4m, and in depth from 0.3m to 0.4m. A stone causeway, 0.6-0.84m wide, crossed it towards the western side of Field 7. No datable finds came from the primary fills of the ditch, but the secondary fills consisted of charcoal-rich clays with animal bones. It continued beyond the limits of the excavation at its western end.
A second ditch was found 1.6m east of the eastern terminus of the first. No archaeological features or deposits were found in this gap. The second ditch closely resembled the first; it was 22m long, 2m wide and 0.5-0.6m deep. The primary fills were sterile apart from some animal bone. The secondary fills consisted of charcoal-rich clays in which were found animal bones, mortar, two metal knives, and a fragment of worked lignite. An incomplete one-sided decorated bone comb and fragments of another in the upper fills gave a terminus ante quem of the 12th to 13th century AD. This ditch continued beyond the limits of excavation at its eastern end. The evidence from Field 7 suggests that extensive early medieval and post-medieval activity survives in this area; the ditches can be interpreted as medieval field boundaries.
A pit that contained a deposit of iron slag was found in Field 2, north of the site of Nangor Castle; it was associated with post-holes and stake-holes, though no structural pattern could be discerned.
Elsewhere various pits, hearths, furrows and field drains were recorded; some of the hearths may be prehistoric in date.
Richard N. O'Brien, Archaeological Development Services Ltd, Windsor House, 11 Fairview Strand, Fairview, Dublin 3.

Dublin
1998:129
KILCARBERRY DISTRIBUTION PARK, NANGOR, CLONDALKIN
Monitoring
98E0572
The development is for the provision of infrastructural works to serve an industrial distribution park. Monitoring was requested as a condition to any planning permission. Reference to the SMR reveals the presence of a number of recorded monuments within the general landscape, although there are no known sites within the proposed development area.
Monitoring, ongoing at time of writing, has failed to note any archaeological features on the site, with the exception of one 1m-wide north-south modern field drain. Finds have been restricted to the north-west corner of the site but include only sherds of post-medieval pottery along with several sherds of modern pottery, all recovered from the topsoil.

Removal of topsoil has revealed limestone bedrock across the site, with occasionally a natural layer of friable, mid-grey, fine, silty clay with moderate stone inclusions sealing the bedrock layer and sealed by topsoil.
Dermot Nelis, Irish Archaeological Consultancy Ltd, 8 Dungar Terrace, Dun Laoghaire, Co. Dublin.

Dublin
1999:170
KILCARBERRY DISTRIBUTION PARK, NANGOR, CLONDALKIN
Adjacent to monuments
SMR 17:37 (vicinity of)
98E0572
Archaeological monitoring at this site was ongoing when the summaries published in Excavations 1998 (42) were written. A further three days' monitoring was required in January 1999 to bring this project to completion.
The development is for the provision of roads, sewers, water mains and other ancillary infrastructural works to serve an Industrial Distribution Park. Because of the presence of recorded archaeological remains within the general landscape, Dúchas The Heritage Service recommended that archaeological monitoring be requested as a condition to any planning permission. Reference to the Sites and Monuments Record reveals the presence of a number of monuments within the general landscape, although there are no known archaeological sites within the proposed development area. A 15th-century tower-house (SMR 17:34), recorded on the Down Survey of c. 1655, is 600m north of the development site. Nangor Castle (SMR 17:37), a castle incorporated into a 19th-century mansion, is 500m east of the development area. All buildings on the site have now been demolished, however, leaving no surface trace of the earlier building. The site of Kilbride Castle (SMR 21:4) is 600m south of the proposed development, although again no visible surface remains are present. An unplastered wall is extant, but it does not contain any cut stone, although it was probably constructed using material from the castle. Slightly to the south-east of this are a church and graveyard (SMR 21:00501), a ringfort (21:00502) and earthworks (21:00503). The church is in ruins and stands in a circular raised graveyard at the edge of a broad-bottomed valley. It is possible that this is the site of an early ecclesiastical enclosure.
Monitoring has failed to reveal any archaeological features on the site, with the exception of one 1m-wide north-south modern field drain. Finds have been restricted to the north-west corner of the site, but these include only several small sherds of post-medieval pottery, along with several sherds of modern pottery, all recovered from the topsoil.
Removal of topsoil has revealed naturally deposited limestone bedrock across the site, with occasionally a c. 0.5m-thick natural layer of friable, mid-grey, fine, silty clay with moderate stone inclusions, 30-70mm, evenly distributed, sealing the bedrock layer and sealed by topsoil.
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Dublin
2000:0223
GRANGE/KILMAHUDDRICK/NANGOR (GRANGE CASTLE INTERNATIONAL BUSINESS PARK), CLONDALKIN
Various
O043318
00E0263
The Grange Castle International Business Park is located to the west of Clondalkin village and incorporates part of the townlands of Grange, Kilmahuddrick, and Nangor. Wyeth Medica Ireland intends to construct a biotechnology campus on this site. The area, of c. 100 acres (40ha), was used for agricultural purposes until recently. The site is bounded to the north by the Grand Canal, to the south by the New Nangor Road, to the east by a new housing estate and land reservation for the proposed Dublin Outer Ring Road (linking the N4 and N7 roads), and to the west by the Grange Castle International Business Park access road.
Two medieval occupation sites are adjacent to the boundary of the Business Park. Grange Castle (SMR 17:34) is a fine late medieval tower-house, while Nangor Castle (SMR 17:37), to the south of the development site, appears to have been demolished during the 1970s. Geophysical survey and excavation were previously carried out by Cia McConway and Richard N. O'Brien (Excavations 1996, 17, 96E0273; Excavations 1997, 26–7, 97E0116). This work revealed that plough-truncated medieval and prehistoric features do survive within the confines of the Business Park.
Archaeological assessment by the writer consisted of the excavation of test-trenches during April and May 2000 in Fields 105, 106, 109, 110 (EIS field reference numbers) and in the northern part of Field 111. This was followed by the test-trenching of anomalies detected through geophysical survey carried out by Geophysical Surveys Bradford (GSB) in Fields 104, 107, 108, 111 (southern part), 112, 113 and 114. This assessment took place during June and July 2000.

A ring-barrow was detected through geophysical survey and follow-up test-trenching in Kilmahuddrick townland (Field 108). The remains of field boundaries were revealed close to this ring-barrow. Approximately 50m to the east of the ring-barrow two cobbled surfaces, a charcoal spread and a series of linear features were revealed (see below No. 225).
Other truncated archaeological features were detected in Field 110 to the south of the Grange Castle tower-house. In the other areas that were tested a number of features were detected, the majority of which can be explained by ploughing or by the presence of spreads of dumped redbrick debris. Much of this redbrick debris appears to have been over-fired and reduced to a vitreous slag. There was no evidence for in situ burning or oxidation of the natural subsoil adjacent to these features. These redbrick features were only detected in Field 112.
To the south of Kilmahuddrick townland, in Nangor townland, several features of archaeological potential were detected. In Field 111 a small, undated, charcoal-rich pit was revealed. This contained a small quantity of cremated bone. In the central part of Field 111 a cluster of small, undated pits and charcoal stains was detected. A trench in the south-eastern corner of the field revealed a large cut into natural, containing 19th/20th-century cultural material. This cut corresponds with the location of an 'Old Gravel Pit' marked on the 1864 1:2500 OS map.
Field 112 is located to the north of Nangor Castle and is adjacent to the Business Park access road. In the south-eastern corner of this field a cluster of cobbled surfaces, pits and gullies, associated with medieval pottery, was revealed. Some 60m to the west of this complex a narrow ditch on a south-east/north-west axis was detected. No cultural material that could date this feature was retrieved (see below No. 226).
Further medieval material was uncovered in Field 113. Here, a trench contained a series of linear ditches directly associated with medieval ceramics (see below No. 226). A short stretch of ditch was also revealed in the north of Field 113. This length of ditch was undated but contained frequent inclusions of charcoal at the base. The ditch proved difficult to trace, but the location and orientation correspond with an anomaly detected in the geophysical survey carried out by GSB. Trenches excavated in the south-eastern portion of this field revealed a series of concrete yard surfaces and modern buildings associated with recent occupation of Nangor Castle. These remains had been covered over by spoil derived from nearby construction activity in the recent past.
Test-trenching in Field 114, a narrow field immediately north of Nangor Castle, revealed modern ground disturbance to a depth of 1.4m below the ground level. This field appears to have been associated with the Nangor Castle gardens.
None of the areas of archaeological potential have any visible, above-ground, expression. Archaeological features, where detected, were present in a truncated form, cut into subsoil and were only apparent when ploughsoil was removed.
Excavation of the ring-barrow and adjacent features commenced under licence 00E0448, while the medieval remains in Nangor townland were excavated under licence 00E0754. Topsoil-stripping during construction was monitored under licence 00E0718.
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Dublin
2000:0224
GRANGE/KILMAHUDDRICK/NANGOR (GRANGE CASTLE INTERNATIONAL BUSINESS PARK), CLONDALKIN
Monitoring
O043318
00E0718
Monitoring of topsoil-stripping commenced in early September 2000. In Nangor townland, in the northern part of Field 111, the remains of a small fulacht fiadh were revealed. This consisted of a small pit or trough, a spread of heat-cracked stone and a linear feature to the south-west of the trough.
The pit/trough consisted of a subcircular cut into natural, 0.56m by 1.25m. The cut was steep-sided, leading to a flat base. It was filled with a mix of silt and compact, stony clays.
A spread of heat-shattered sandstone was located some 0.9m to the west of the trough. This spread consisted of a moderately compact, dark grey, sandy clay with frequent inclusions of heat-shattered sandstone fragments, pieces of burnt clay and charcoal. This spread measured 1.92m north–south x 1.18m with a maximum depth of 0.05m.
Approximately 6m to the west of the spread a linear gully feature was revealed. This gully consisted of a cut into natural boulder clay measuring 2.57m north–south x 0.28–0.54m. This had a depth of 0.16m with sharply sloping sides and a flat base. The cut was filled with a moderately compact, mid-brown clay containing frequent pieces of oxidised clay and occasional flecks of charcoal. Infrequent fragments of burnt bone were noted in the fill. Some 4m to the south of the heat-shattered sandstone spread, a small linear gully feature was excavated. This measured c. 1m north-east/south-west x 0.12m with a depth of 0.14m. The fill of this comprised a mid-brown, sandy clay with frequent charcoal flecking. No archaeological objects were recovered.

To the south of the fulacht fiadh, a backfilled field boundary was revealed by topsoil-stripping. The alignment of this boundary possibly corresponds with a similar ditch encountered in Field 113 (see above No. 223). Topsoil-stripping is set to continue in 2001.

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Dublin
2000:0225
KILMAHUDDRICK (GRANGE CASTLE INTERNATIONAL BUSINESS PARK), CLONDALKIN
Ring barrow
304420 231665
00E0448

The initial detection of this ring-barrow by geophysical survey was confirmed by archaeological assessment under licence 00E0263 (See above No. 223). Excavation commenced in July for a period of eight weeks, during which time the ring-barrow and several adjacent features were excavated.

The ring-barrow was located in Field 108, a large field at the centre of the area designated for the biotechnology campus buildings. The topography is generally level at c. 68m OD. However, the south-eastern corner of the field contains a natural raised area measuring c. 60m east–west x 150m. This area is generally 2m higher than the surrounding topography. The ring-barrow was sited in this slightly elevated position.

The ring-barrow was not visible prior to the geophysical survey or archaeological testing. Following stripping, a dark, circular band of charcoal-rich, black, ditch fill was visible, with a spread of cremated bone in the interior. A series of linear features skirted the eastern side of the ditch. Excavation of the ditch fills revealed a well-stratified sequence of deposits in a ditch 2.5m wide at the top and 0.25–0.3m wide at the base. The ditch cut had a depth of 1.6m below the level of natural subsoil and measured c. 13m in external diameter.

The uppermost fills of the ditch, F4 and F5, contained occasional fragments of burnt bone, charcoal and mollusc shells. Although occasional fragments of burnt bone were recovered from these ditch fills, no coherent or discrete cremation deposits were detected. Fragments of a human skull were recovered from the upper fill. A central fill of mid-brown, silty clay in the ditch sealed a series of stone features. F15 and F16, in the western quadrant, were large limestone blocks resting in the base of the ditch. Charcoal deposits were present on the flat upper surfaces of these stones. Oxidised clay patches against the sides of the ditch, adjacent to these stones, indicate that fires had been lit on these boulders in the ditch.

In the northern quadrant of the ditch, at the base, a stone 'cist-like' structure with a capstone was revealed. This was composed of medium-to-large angular stones leaning inwards at an angle of c. 45o. A large, angular capstone was positioned at the apex of the inward-leaning stones. Several of the stones comprising this small structure were fire-reddened, though there were no indications of in situ burning. When excavated, this structure was empty. Some 2m to the east of this structure, at the base of the ditch, a limestone pillar was revealed. This stood upright to a height of 0.62m and had a width of 0.44m.

Within the circular area enclosed by the barrow ditch, several deposits of cremated bone were visible. A small spread of cremated bone was initially apparent, and this may indicate disturbance. Upon excavation this was found to seal a shallow depression filled with frequent inclusions of powdered cremated bone fragments. To the north-west of this, a pit measuring some 2.1m north–south x 0.6m was revealed. This pit contained occasional fragments of cremated bone and appeared to cut an irregularly shaped cremation pit (F87), which measured 1.3m east–west x 0.5m and had a depth of 0.8–0.9m. The upper fill of this was a hard, compact, grey clay with occasional stones. This fill sealed a layer of cremated bone and charcoal. A sherd of pottery was recovered from this material, the characteristics of which all point to an Early Bronze Age date for its manufacture, specifically a Beaker or Food Vessel background (Anna Brindley, pers. comm.). What appears to be a small black bead was retrieved, during sieving, from this deposit.

Two undated pits were excavated adjacent to the barrow. A series of linear features was also revealed in the area surrounding the ring-barrow. These are interpreted as the remains of field boundaries and were found to enclose the ring-barrow in a subrectangular field system. These remain undated. A geological seam was traced running from the north side of the barrow.

Some 50m to the east of the ring-barrow a trench was reopened in Field 109 to examine features originally detected during assessment 00E0263 (see above No. 223). A northern return of the field system found to enclose the ring-barrow was revealed. This places the ring-barrow in a rectangular enclosure measuring c. 50m east–west x 100m (minimum). A metalled surface was found to seal the field boundary in this trench. While the field boundary system remains undated at the time of writing, it is likely to post-date the ring-barrow. A hearth was also excavated.

Analysis of the soil samples from the ring-barrow has recovered evidence of cereal production. Charred remains of barley, wheat and oats were identified in the ditch fills and cremation deposits. Traces of hazel, haw and sloe were also found. Post-excavation analysis of the human remains, the faunal remains and the charcoal samples is ongoing.

A cluster of ring-barrows is located on the upland area of Saggart Hill and Verschoyles Hill, approximately 6km to the south of the Kilmahuddrick site. Within this group, the Lugg monument complex, which contained

a ring-barrow, was excavated by Kilbride-Jones in the late 1930s. The Kilmahuddrick barrow may be a northern element of this distributional cluster, or, alternatively, its presence in a heavily ploughed lowland area may indicate a greater survival rate and higher level of visibility in the upland areas.
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Dublin
2000:0226
NANGOR (GRANGE CASTLE INTERNATIONAL BUSINESS PARK), CLONDALKIN
Medieval field complex
30440 23117
00E0754
Excavations commenced in this area of the Grange Castle International Business Park in October 2000 and are continuing at the time of writing (January 2001). The site of Nangor Castle (SMR 17:37) is located immediately outside the southern boundary of the Wyeth Medica Ireland biotechnology campus. There are no upstanding remains of Nangor Castle—demolition appears to have happened in the 1970s. Cartographic evidence and test-trenching carried out close to this area (see above No. 223) indicate that a complex of agricultural buildings and concrete surfaces existed in the area. To the west of the Nangor Castle site, mid-19th-century OS maps depict a well-designed garden. The unkempt remains of this garden exist today to the south of the biotechnology campus.
The place name Nangor appears to be of old French origin. In 1307 there is a reference to the tenements of 'Kilbryde and the Naungre', which were held by Walter de Kenley from William, son of John de Galbarry, for a rent of 20 pounds (Mills 1914, 356). Test-trenching carried out by Cia McConway in 1996 at Nangor Castle revealed at least one substantial ditch and a shallow linear feature to the west of the castle site (Excavations 1996, 17, 96E0273).
The present phase of excavation was designed to resolve any archaeological material in Fields 112 and 113 within the southern boundary of the biotechnology campus. In addition to this, excavation is ongoing to the south of the boundary in a corridor through the Nangor Castle gardens (South Dublin County Council land) to enable a gas pipeline and access road to serve the Wyeth Medica Ireland site.
To date, a complex of intercutting medieval ditches and gullies has been excavated. Some 1500 sherds of locally manufactured medieval pottery (Dublin-type wares, Leinster cooking ware) have been recovered. A complete iron sickle was found in a ditch associated with sherds of medieval pottery. Further details will be provided for Excavations 2001.
Reference
Mills, J. (ed.) 1914 Calendar of the Justiciary Rolls or Proceedings in the Court of the Justiciar of Ireland, Edward I. Part 2. Dublin.
Ian W. Doyle, Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
2001:427
Grange Castle International Business Park, Grange and Kishoge
Various
204230 232120
00E0061
Test-trenching was carried out at Grange Castle International Business Park, Clondalkin, Dublin 22, on a site owned by South Dublin County Council, during February 2001. The greater part of this site is currently under development as a business park by Wyeth Medica Ireland.
The assessment was concerned with the area immediately south of the Grand Canal in Grange and Kishoge townlands. It is intended to construct an attenuation lake in this area, which will aid drainage. The lake structure will measure approximately 250m north-west/south-east by 90m. An underground 110kV electricity cable will run through this area and towards the west for a length of approximately 1.5km. The terrain in the areas to be affected is relatively low-lying and the land has been used for agricultural purposes. The centre of the area intended for the attenuation lake was subjected to ground disturbance in the recent past. This disturbance appears to have been associated with the diversion of a stream and ground was stripped to bedrock in places.
Sixteen trenches were opened by mechanical excavator. These were placed in the areas which would be subjected to disturbance by the attenuation lake and the electricity cable way-leave.
Trench 1 was located at the western end of the lake and associated roadway. It revealed a long linear feature cutting natural subsoil. Where sectioned, the cut for this feature, which measured 2.6m east–west by 16.5m with a depth of 0.35m, comprised a sloping-sided flat-bottomed gulley. The upper fill consisted of a moderately compact light brown clay silt with occasional inclusions of mollusc shells and small pebbles. The lower fill comprised a moderately compact grey clay with occasional mollusc shell inclusions. A small undated hearth was revealed in Trench 4, which was also located to the west of the lake.

Trench 13 was opened on the line of the electricity cable way-leave, at a point where a mound and masonry wall were observed in the extreme north-eastern corner of the field. What is likely to be a modern agricultural feature was revealed, comprised of a mound, a stone wall and a metalled surface. This is likely to represent a watering-hole for livestock formed by excavating a depression, placing the upcast to the west into a mound, which was then revetted with a low masonry wall. A metalled surface was then placed at the point of animal access.
Monitoring of topsoil-stripping was recommended and was later carried out (see below, No. 428).
Ian W. Doyle for Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
2001:428
Grange Castle International Business Park, Grange/Nangor/Kilmahuddrick
Monitoring
304420 231665
01E0718
Monitoring continued in the townlands of Grange, Nangor and Kilmahuddrick. Wyeth Medica Ireland commenced construction of a biotechnology campus in this area in September 2000.
The campus area is located west of Clondalkin village and incorporates parts of the townlands of Grange, Kishoge, Kilmahuddrick and Nangor. It is bounded to the north by the Grand Canal, to the south by New Nangor Road, to the east by a new housing estate and reservation for the South Dublin Outer Ring Road and, finally, to the west by the Grange Castle International Business Park access road. The Wyeth Medica Ireland site is approximately 90 acres in extent.
Previously, during 2000, excavation in Kilmahuddrick townland concentrated on a prehistoric ring-barrow, which was resolved in advance of construction (Excavations 2000, No. 225, 00E0448). Monitoring of topsoil-stripping in October 2000 led to the identification and excavation of a small fulacht fiadh in Nangor townland. The monitoring of topsoil-stripping within these townlands continued during January 2001. No additional archaeological material was detected.
Ian W. Doyle for Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
2001:429
Grange Castle International Business Park, Grange and Kishoge
Post-medieval
20423 23212
01E0718 ext.
The archaeological assessment carried out in this area during February 2001 (see below, No. 438) recommended that an archaeologist be present to monitor the stripping of topsoil.
The initial recognition of archaeological features was compromised somewhat by the contractor stripping a quantity of topsoil before informing the archaeologist. However, several metalled surfaces, field drains, pits and gullies of post-medieval and modern date were recognised during the stripping when an archaeological presence was maintained.
In Kishoge townland, to the south-west of the area intended for the attenuation lake, the remains of a subrectangular structure, which appears to have burnt down, were detected. This consisted of what appeared to be the remains of slot-trenches cut into natural boulder clay with a fill of oxidised clay and charcoal. The feature measured 5.8m east–west by 4.6m and appeared to have been truncated through intensive ploughing. Access to this area was not available at the time of the assessment owing to dumping and storage of building materials. This area was later excavated by Edmond O'Donovan (see below, No. 438).
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Dublin
2001:438
Kishoge
Prehistoric house
30423 23212
01E0061
The remains of a truncated burnt Neolithic wooden house were identified in Kishoge, Dublin 22, halfway between Clondalkin and Newcastle. Ploughing in antiquity had led to the truncation of the structure, and no occupation surfaces survived. However, cut features, such as post-holes, pits and foundation trenches, were identified at the site.

The house was originally roughly rectangular in shape, although the walls were slightly curved at the south-western end. The structure measured 6.05m (north-east/south-west) by 4.5m. The archaeological remains consisted of foundation trenches cut into the glacial boulder clay and bedrock. The house walls and the support for the building's superstructure were constructed from timber posts augmented by planking. All of the posts and planks identified in the house were of oak. The foundation trenches varied between 0.25m and 0.3m in width and were excavated to a depth of 0.08–0.21m. The foundation trenches at the north-eastern end of the house originally housed upright timber planks that formed the house walls. A break in one of these linear features (house wall) was visible in the north-eastern foundation trench; this was interpreted as an entrance. The south-western end of the house was predominantly post-built. The south-western house walls curved, with an open entrance at the southern end of the building.

Only two features were identified in the interior of the structure: the truncated remains of two internal timber roof supports, suggesting some kind of internal division within the house into two spaces at the north-east and south-west ends. The house appeared to have burnt down in antiquity, with little evidence for repair or reoccupation.

Pits and charcoal were identified both to the south and north-west of the house. These features are likely to represent contemporary domestic activity around the dwelling. A small number of artefacts were retrieved from these features, including a number of crude round scrapers, waste flint and a single poorly preserved fragment of prehistoric pottery.

Rough flint scraping tools and flint waste flakes were retrieved from the features excavated on the site, but none of these were obviously diagnostic. The complete absence of prehistoric pottery from the house is curious. The morphological comparison with other Neolithic houses excavated in Ireland suggests that the structure dates from this period. This was confirmed by the results of the radiocarbon dating programme. The Centrum voor Isotopen Onderzoek, Groningen, processed three samples to date the house (GrN-26770, 4880+40 BP; GrN-26771, 5020+40 BP; and GrN-26789, 4990+50 BP). The 2-sigma-calibrated results indicate that the house was built and occupied between 3941 and 3659 BC. A fourth Middle Bronze Age date (GrN-26772, 3120+75 BP) was obtained from a large pit to the south of the house (1595–1131 BC), suggesting that not all of the peripheral archaeological activity is contemporary with the structure.

Edmond O'Donovan, Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
2001:455
Grange Castle International Business Park, Nangor
Medieval field system
304400 231170
01E0754

Excavations were carried out in Nangor townland, west of Clondalkin, Dublin 22, during October 2000–January 2001. The excavations revealed a medieval ditch complex. The northern area of the site is presently under development as a biotechnology campus.

Construction of the campus commenced in September 2000. The area excavated in Nangor is south of the construction site and outside the immediate area of impact. No detailed development is presently intended for the greater part of this area. However, additional excavation was undertaken to mitigate the impact of a gas pipeline and associated access road in part of the area formerly occupied by the Nangor Castle gardens.

Nangor Castle (RMP 17:37) is located immediately outside the southern boundary of the Wyeth Medica Ireland site. References to a castle at this site date from the 15th–16th centuries. All buildings on the site were demolished during the 1970s, but an area of archaeological potential surrounds the site.

Trench 1, which measured 60m north–south by 33m, was located some 90m to the north-west of the castle site. Geophysical survey and subsequent test-trenching had suggested that the area of Trench 1 held archaeological potential. Excavation in Trench 1 commenced in October 2000 and continued until December 2000. Activity assigned to Phase I in this trench consisted of a linear feature and a pit, both of which cut natural subsoil. These features did not produce pottery or finds. The pit consisted of a rectangular cut into natural subsoil, which contained a series of ash deposits. Areas of oxidised or fire-reddened soil present on the north-east and south-west sides are indicative of in situ burning. This cut was filled with a series of sterile silty layers and dumps of ash.

The Phase I activity was succeeded by a medieval phase of activity which consisted of further linear features, pits and cobbled surfaces. These were assigned to a single general phase which is capable of further subdivision based on stratigraphic grounds. Finds retrieved from the fills of these features include approximately 1000 sherds of Leinster Cooking Ware and Dublin-type wares, and assorted iron finds including nails, an armour-piercing arrowhead, a buckle, a key and an intact iron sickle.

Trench 2, located to the east, detected a similar sequence of linear features, which contained sherds of medieval pottery in their fills. Trench 3, to the south of Trench 1, detected shallow linear features running on an east–west axis. These linear features were succeeded by a pit and a metalled surface, both of which were directly associated with medieval pottery.

Trench 4, located to the west, was excavated to examine a ditch encountered during an earlier assessment. A ditch orientated north-west/south-east with steep sloping sides and a rounded U-shaped base was revealed. It was 1.05m wide, narrowing to 0.3m at the base, with a maximum depth of 1.1m. Its fill contained occasional fragments of animal bone, from which a radiocarbon date of cal. AD 601–883 was obtained.
Trench 5, located to the south-east of Trench 4, uncovered further medieval linear features. A narrow ditch which ran across the trench on a south-east/north-west axis is likely to represent a continuation of a similar feature encountered in Trench A to the south. A series of post-medieval field boundaries was also detected in Trench 5.
Trench A was excavated to the south of Trench 5 on the line of the gas pipeline and associated roadway. Excavation in this area revealed an undated metalled surface and a series of ditches/gullies. Excavation of these commenced in January 2001. Although there were relatively few finds from these features, their stratigraphic relationship indicates that there were five phases of ditches and gullies in the trench dating from medieval to modern times.
The excavation of Trench B, an extension of Trench A, revealed one feature of interest, a substantial medieval ditch which cut into natural subsoil. This was found in the extreme eastern end of the trench. The ditch ran through Trench B, outside the northern and southern limits of excavation. The cut measured 10m north–south by 2.5m, with a depth of 1.1m as exposed, and had sloping sides and a rounded base. The ditch ran on a north–south axis with a slight curve towards the north-east. In overall plan the ditch appears to have been subcircular, enclosing an area to the east of Trench B. The fills of the ditch comprised black sticky silts with organic content. The lower and upper fills contained medieval pottery. No trace of an enclosing bank was detected in the area opened for examination; however, the depth of overburden, composed of cultivated soils, in this area may be in part composed of a levelled bank.
Trench C to the north-east of Trench B did not detect the ditch. No archaeological material was detected in Trench C, where it was found that modern disturbance had removed the old ground surface.
In total, some 1600 sherds of native medieval pottery were recovered from the Nangor excavations. It is of some interest that only two sherds of imported medieval pottery were recovered. The excavated linear features at Nangor may represent the remains of medieval field boundaries with associated water-management gullies. The presence of such linear features, which can be dated to the medieval period by the presence of Leinster Cooking Ware and Dublin-type wares, argues for land enclosure during the medieval period. That cereal production was the purpose of such enclosures may be suggested by evidence from pollen and macro-plant analysis. The examination of a wide range of medieval samples from the Nangor excavations has shown a predominance of wheat over other plant remains.
Ian W. Doyle for Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
2002:0448
Adamstown
No archaeological significance
ITM E 702819m, N 732976m
Latitude, Longitude (decimal degrees): 53.337018, -6.456151
01E1147
Test excavation before the construction of a housing development was carried out in the townland of Adamstown, adjacent to the Newcastle Road, west Dublin. The greenfield site measured c. 200m by 200m. Testing was required because of the proximity of the site to that of Adamstown Castle, SMR 17:29. Seven trenches, 30–50m long, were excavated by mechanical digger. In no trench were finds, features or structures of archaeological significance uncovered.
Georgina Scally, 81 Upper Leeson Street, Dublin 4, for Margaret Gowen & Co. Ltd.

Dublin
2002:0612
Kishoge
Monitoring
O042325
02E1808
Monitoring before the construction of a temporary haul road associated with the construction of the South Dublin Outer Ring Road was undertaken in November and December 2002. The temporary haul road is in the vicinity of Lynches Lane, in the townland of Kishoge, west Dublin. All subsurface works associated with the construction of the road were monitored, and no finds, features or structures of archaeological significance were uncovered. The licence has since been extended to include monitoring of the full length of the roadway, which will extend c. 5.7km from Kingwood in Tallaght to Lynche's Lane. This work will continue in 2003.
Georgina Scally, 81 Upper Leeson Street, Dublin 4, for Margaret Gowen & Co. Ltd.

Dublin
2003:0604
Grange
Mill
03E1210
The site was excavated because it was directly threatened by the realignment of the Griffeen River within the precincts of the Grange Industrial Park. Surface evidence for the mill was in the form of the north wall, surviving as part of the boundary fence separating the Beattie farm from the Grand Canal towpath. Some 19th-century pottery was found on the surface and some fragments of floor tiles from an industrial drying kiln. Testing and subsequent excavation revealed the extent of the building as a single block, 13m west–east by 8.5m. Wall thickness was between 0.8 and 0.9m. The wall structure was of coursed rubble with opes defined by brick dressings. The dressings allowed for the identification of two window opes in the north-east corner of the building. Flanking the main block to the west was a wheel pit, 2.2m in width and 1.6–1.7m in depth. The wheel pit is delimited on the west by a wall 0.85m thick, widening to 1.1m where the axle bearing was mounted. The wheel pit was partially lined with red brick. The upper courses, forming the downslope of the wheel pit, are formed of brick with headers presented, while the lower part of the pit and its base are lined with brick, stretchers presented.
The flanking walls show evidence for wheel wear in the stonework, and this suggests that the wheel had a diameter in the region of 3m. The wheel was breast shot fed from a headrace to the south. The headrace either emanated from a penstock to the south or was linked back to the Griffeen further upstream. There was no evidence for a race in the field south of the mill site. The confluence of the headrace and the wheel pit is again lined with red brick in a rough English bond pattern.
Within the mill structure, the pit for the pit wheel was identified. No machinery was present on the site. Artefacts within the mill structure were largely of 19th-century date, although some sherds of post-medieval imported ware were found in the topsoil but do not appear to be contemporary with the mill. It is possible that the mill has its origin in the later 18th century and served as a gristmill for flour milling. The general water supply would make such a mill difficult to operate. With the inauguration of the Grand Canal, a constant head of water became available and so the mill relocated to the Lock area at Adamstown. It is likely that the machinery was taken from the old mill and tweaked to function within the new mill. The old mill may well have served a later function as a cereal-drying kiln, as suggested by the quantities of kiln tiles found on the northern part of the site.
Red Tobin, Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
2003:0607
Grange Castle
Monitoring
030335 23200
SMR 17:29; 17:34; 17:37
03E0025
Monitoring of topsoil-stripping for a pharmaceutical plant and associated services located at Grange Castle International Business Park was carried out from 8 January to 2 February 2003. The development consisted of a 20-acre greenfield site, of which c. twelve acres were stripped of topsoil by a mechanical excavator equipped with a toothless bucket. The only subsoil cut features uncovered dated to recent times. These consisted of refuse pits, field drains and areas of burning. The field boundary and watercourse that were revealed had been backfilled in the 19th century. All the finds recovered were either post-medieval or modern in date.
John O'Connor, 2 Walnut Rise, Courtlands, Dublin 9, for Archaeological Development Services Ltd.

Dublin
2003:1918
Grange International Business Park, Dublin
No archaeological significance
SMR DU017-034
03E1846
Monitoring of works took place within the constraint area of Grange Castle, RMP 17:34, at Grange International Business Park, Clondalkin. South Dublin County Council required tat the site be cleared of debris and secured with a fence and ground-beams. The site was being vandalised and used as a dumping ground. A method statement was agreed with the client and with the National Monuments Service. This involved a low-impact solution involving lightweight plant, with the majority of the work being carried out in dry weather to further reduce the surface damage.
The clearance work was carried out without disturbing any archaeological deposits and without the recovery of any artefacts. The fencing required the excavation of a series of holes for the fence posts. These

excavations were monitored and no archaeological deposits were disturbed. The ground slab required some excavation but was secured within the depth of the topsoil and remaining debris field. The work has now been completed satisfactorily.

Red Tobin for Margaret Gowen & Co. Ltd, 2 Killiney View, Albert Road Lower, Glenageary, Co. Dublin.

Dublin
2004:0602
GRANGE INTERNATIONAL BUSINESS PARK, GRANGE
Burnt mounds
04E0299

Excavations were carried out during works on the Griffeen River realignment, part of ongoing infrastructure works within the precincts of the Grange International Business Park. The works are principally aesthetic in purpose, designed to enhance the appearance of the park and to highlight the river, which otherwise would have flowed behind the Takeda Pharmaceuticals complex. The area stripped will also accommodate the extended road network that will serve the business park when it is fully occupied.

Topsoil-stripping for this realignment commenced in early December 2003 and continued intermittently until May 2004. Topsoil-stripping revealed the locations of three burnt mounds. Of these three features, two were excavated, as the development was likely to have a total impact on them. The third mound was preserved in situ, as it was located outside the development area.

The first mound was excavated between 16 and 18 February 2004 and the second was excavated from 5 April 2004.

Burnt Mound 1, 303279.542 231522.602

During the monitoring of the topsoil removal this site was identified as an irregularly shaped deposit of firing material (heat-shattered stone and blackened soil). The burnt-mound material extended 28m east-west along the northern edge of the stripped corridor and extended to the south by 8m from the northern baulk. The feature lay c. 25m to the west of the Griffeen River on gently undulating pasture sloping to the south. The evidence from initial survey work and subsequent excavation suggests that the main spread of this site remains preserved in situ to the south of this location.

The nature and extent of the mound material was exaggerated by plough action, which had dragged it from its original focal point to extend over 28m in length. After the removal of topsoil, etc., the F2 mound of firing material extended little more than 0.5m from the limit of the excavation. From this southern extremity, the mound rose to the north to a maximum height of 0.65m at the northern limit of the excavation. No cut features were exposed during the excavation.

Burnt Mound 2, 303104.7 231270.2

The realigned Griffeen crosses the course of the old river at two locations. To allow for the excavation of the first of these crossings it was necessary to divert the Griffeen into a third channel. During stripping prior to this channel being dug the second burnt mound was found. During the topsoil removal this site was identified as an irregularly shaped deposit of firing material (heat-shattered stone and blackened soil).

The area of excavation measured 13m east-west by 17.5m. A silted-up streambed abutted the southern part of the mound. The stream appears originally to have flowed from east-north-east to south-west. It had a width of 3-5m, but the length could not be discerned as it extended beyond the limit of excavation. The stream fill contained water-rolled stones, pebbles and a dark-grey silt with a minimum depth of 0.1m. Wood residue, possibly alder, was in evidence here and was probably indicative of remnants of fen woodland. This stream system is likely to have been the reason for siting the burnt mound at this location.

One of the earliest features on the site was a grouping of stake-holes cut into the clayey peat. These formed a semicircular band. All were comparable in shape and size and all contained the same fill. They ranged in depth from 5mm to 2mm with a diameter of 6-12mm. Small amounts of heat-affected pebbles and small stones around the sides of the stake-holes may be evidence for packing material. The function of the complex is not clear. Some stake-holes are vertical, while others have been driven into the ground at an angle. They follow a vague northeast to south-west pattern, but the angled stakes do not appear to offer support to each other or to any possible structure.

The burnt mound was situated on the northern bank of the silted up stream. The bank was steepsided. The main concentration of firing material is in the west. No evidence for a trough was found and the only evidence of activity associated with the burnt mound appears to be the stake-hole complex. The mound measured 11m east-west by 4.5m. It is more likely that the original east-west dimensions were closer to being 6m, with a depth of 0.12-0.25m.

Covering and surrounding the burnt mound was a layer of peat measuring 4.64m from north to south by 14.7m, with a surviving depth of 0.2-0.45m. This was a moist dark-reddish-brown peat of moderate compaction that contained inclusions of sphagnum moss, plants and wood. It was most pronounced to the south of the burnt mound, sloping downwards to the stream. A third burnt mound was recorded during the course of the topsoil-strip. The site was not fully exposed but was identified by a number of concentrations of

the characteristic firing material. This site was not impacted on by the development and it was possible to preserve it in situ. It was first sealed using a double layer of geotextile material and then covered by a soil bund forming the boundary between the business park and the pitch-and-putt course.
Red Tobin, Margaret Gowen & Co. Ltd, 27 Merrion Square, Dublin 2.

Dublin
2004:0616
FINNSTOWN (Finnstown House, Newcastle Road, Lucan)
No archaeological significance
ITM: E
04E0522
An assessment including testing was carried out at Finnstown House, Lucan, Co. Dublin. The development plans included the demolition of a single-storey building and the erection of a two-storey building, with a pedestrian link at ground level and stairs/lift enclosure abutting an existing two-storey building. The plans also include the renovation of existing two-storey outbuildings/coach houses. A medieval tower-house was noted within Finnstown House during the course of this assessment. This tower-house will not be impacted upon by the development.
Testing was carried out in the walled garden area and within the footprint of the proposed new building. The north-eastern end of the trench comprised 1m of infill material. This material was dumped during recent construction work and was then levelled out. It comprised wood, stone, plastic and modern ceramics. This material lay on the natural subsoil, which was light-brown to yellow clay. The south-western extent of the trench comprised c. 0.3m of topsoil, which consisted of stony light-brown clay with a grey hue. Some red brick and willow-pattern pottery was noted in this topsoil layer. The natural subsoil lay under the topsoil and appeared to be consistent throughout the site. No features or finds or archaeological significance were uncovered in this trench.

Dublin
2005:379
ADAMSTOWN
Urban burial ground
ITM: E 703029m, N 732827m
Latitude, Longitude (decimal degrees): 53.335639, -6.453048
-
05E1295
Human remains were located within the road-take of the Adamstown link road (ALR) at the rear of the old Lucan train station adjacent to the Ascon compound in Adamstown, Dublin. The investigations involved the excavation of human remains uncovered during the course of topsoil-stripping in advance of the construction of the ALR. The excavations entailed the lifting of 36 full or partial skeletons and eight disarticulated skeletons. Two linear features and two deposits were also excavated at the site.
The skeletal remains were primarily orientated in a west–east direction, with heads to the west, but a number were aligned slightly along a south-west/north-east axis and two along a north-west/south-east axis. All were in simple graves, with no traces of any coffins or grave-markers. They appeared to represent 43 adults and one infant. A single find uncovered with a burial was a fragment of plastic rosary beads found in the pelvic region of Skeleton 10. This find may not suggest a modern date for the burials, as they were disturbed and truncated by the railway wall, which appears to date to the 1950s. It is possible that the rosary beads were interred when the burial was disturbed during the demolition of Lucan station or the construction of the wall that divided the site from the Dublin/Kildare railway line. Removal of the wall and build-up on its southern side revealed that skeletal remains did not extend over the northern side of the existing railway wall.
It is hoped that further post-excavation and osteoarchaeological analysis of the remains will indicate a possible date for the site.
Ellen O'Carroll, The Archaeology Company, 17 Castle Street, Dalkey, Co. Dublin.

Dublin
2006:581
New IAWS HQ, Grange Castle Business Park, Clondalkin
No archaeological significance.
30280 23110
06E1161
The Grange Castle Business Park has witnessed several archaeological investigations since 2000 (O'Donovan 2004; Doyle 2005). These investigations resulted in the discovery and excavation of several prehistoric sites in the area of the Grange Castle Business Park. The Record of Monuments and Places records two castles located within the grounds of Grange Castle Business Park, namely Grange Castle DU(017–134) and Nangor Castle DU(017–037). The new IAWS HQ has an area of 9.3ha and is located at

the south-west corner of Grange Castle Business Park, being bordered on the west by the R120 (Lucan road). The site was part of an extensive geophysical survey carried out by Margaret Gowen & Co. Ltd in October 2005, which revealed that the south-west corner of the site had a distinct magnetic disturbance indicative of a spread of material, possibly rubble.
All groundworks associated with the development were monitored during December 2006. The excavation of the site access road resulted in the discovery of a modern pit, a modern linear spread of angular stone, a small spread of red brick mixed with shells and several modern land drains. No features of archaeological significance were encountered during the stripping of topsoil. The programme for the monitored stripping of topsoil at the eastern portion of the site will resume in January 2007.
References
Doyle, I. 2005 Excavation of a prehistoric ring barrow at Kilmahuddrick, Clondalkin, Dublin 22. The Journal of Irish Archaeology 14, 43–75.
O'Donovan, E. 2004 A Neolithic house at Kishoge, Co. Dublin. The Journal of Irish Archaeology 12 and 13, 1–27.
Eoin Sullivan, for Margaret Gowen & Co. Ltd, 27 Merrion Square, Dublin 2.

Dublin
2006:659
Grange Castle Business Park (Grange, Milltown and Clutterland)
No archaeological significance
06E0777
Monitoring of ground-disturbance activities associated with the construction of a link road within Grange Castle Business Park was undertaken in July and August 2006. The link road was constructed in the west of the business park from the Takeda Factory to the Nangor Road; 1250m of single carriageway was constructed parallel to the course of the Griffeen River. The majority of the route of the link road was disturbed by the previous realignment of the Griffeen River (see Red Tobin in Excavations 2003, No. 604, 03E1210). No features or stratigraphy of an archaeological nature were identified.
Emer Dennehy, Margaret Gowen & Co. Ltd, 27 Merrion Square, Dublin 2.

Dublin
2007:515
Gollierstown, Dublin
No archaeological significance
SMR N/A
07E0671
Testing was carried out in compliance with a planning condition for enabling works to facilitate the construction of the district centre at Adamstown, Lucan, Co. Dublin. The proposed development lands were in use as a compound for the railway development and, as such, the topsoil had been stripped from some of the area. A bridge has also been constructed across the lands at the western side. There are no known monuments in the development lands for the district centre and cartographic research indicates that the development site was always laid out in open fields.
Eleven test-trenches were excavated across the development site with a 1.8m-wide toothless bucket. The stratigraphy consisted of c. 0.2m of topsoil underlying subsoil on to natural stony marly soils. Nothing of archaeological significance was recorded during the testing.
Ellen O'Carroll, 8 Cumberland Street, Dún Laoghaire, Co. Dublin.

Dublin
2007:530
NANGOR
Medieval, post-medieval
30459 23122
DU017–037
07E0588
Monitoring and testing took place between August and October 2007 within and adjacent to the Nangor Castle, Clondalkin, Co. Dublin.
The monitoring of a service trench, 400m in length, 1m in depth and 0.5–0.55m in width, revealed several archaeological features that have been tentatively identified as part of the landscaped gardens, located to the west of the RMP site and associated with the now demolished 18th-century Queen Anne house that was built on the site of the earlier Nangor Castle. The initial stage of the service trench, which was parallel to an existing access road to a gas pumping station, ran through heavily disturbed ground that contained redeposited topsoil, subsoil and road-making materials. As the monitoring trench approached the gas pumping station, a series of small stone walls, averaging 0.5m in width, separated in some instances by low banks of stone-free soil, were revealed. The walls, six in all, were located at a depth of 0.5m below the

present ground surface. They consisted of stones, c. 0.2m by 0.15m or smaller, bonded together in some instances with creamy gritty mortar with fragments of red brick. One wall, F9, lay at a depth of 1m; it was 0.5m in width and appeared to be bordered by narrow pieces of wood on each side. All the walls ran in a north-west to south-east direction across the monitoring trench.

As the service trench ran to the south of the pumping station it cut through concrete floors, possibly associated with farm and cattle yards. The foundation for the floors consisted of loose stone, stone blocks and mortar and lay directly on the subsoil. Two further stone walls were revealed at the extreme eastern portion of the service trench in this area. Both ran north–south across the service trench. The walls were just under 1m in width and were revealed 0.6m beneath disturbed topsoil and fill.

As the service trench turned southwards and ran parallel with the site boundary for 120m, there was a marked difference in the ground conditions. The ground here was undisturbed. However, nothing of any significance was revealed in this area.

It should be noted that, while the monitoring did reveal landscape features possibly associated with the Queen Anne house, the rubble foundation that underlay the concrete floors in the northern portion of the site contained a considerable amount of stonework, which may be related to the 18th-century house and possibly to Nangor Castle itself. The incidence of red brick and large blocks of stone may indicate this to be the case. Areas with the constraint zone for Nangor Castle are strewn with large rough-hewn limestone blocks, possibly relating to the castle structure, although the dumping of construction waste and other waste within the area masks this to quite a degree. There was no evidence for in situ remains of the Queen Anne house or Nangor Castle revealed during monitoring.

Two phases of testing took place on the site. The initial phase took place within the RMP site and one test-trench was located across the possible remains of the Queen Anne house and the castle. It had been hoped to insert a series of test-trenches over possible subsurface remains of the Queen Anne house and castle site, but, due to a very large and unstable overburden and the desire not to impact unnecessarily on the RMP site, only one test-trench was completed.

This test-trench, located across possible structural remains in the western portion of the site, was cut through a very large deposit of construction debris, general dumping and waste, averaging between 3m and 4m in places. This overburden was extremely loose and unsound. Consequently a test-trench 6m in width was cut through this overburden and battered back for safety. Within this a slightly narrower test-trench revealed the remains of a modern concrete building at the western end of the test-trench, 3m below the original overburden. The modern structural remains were abutted by a portion of a large stone structure, over 1m in height and 1.75m in width, with a rubble core, suggesting it may be associated with or be part of Nangor Castle. The true depth of the wall was not ascertained. It appeared to run in a southwards direction from the test-trench. Further to the east, possible remains associated with the Queen Anne house were revealed. These consisted of stone walls plastered on one side, walls of red brick and painted walls. They were revealed to be up to 1m or more in depth. Red brick from this area was identified as being very early in date. No further work was done in the area due to the instability of the overburden.

A second phase of testing took place to the south, south-east and south-west of the RMP site. A series of three test-trenches were excavated. This testing took place within a possible Early Christian 90m diameter enclosure previously identified. An area to the south-east of the RMP site and the Early Christian enclosure was also tested. The two test-trenches to the south-east revealed a redeposit of disturbed modern fill, within which lay garden features such as low banks of stone-free soil, for trees or shrubs, which may have been associated with the avenue which led up to the Queen Anne house, which was located to the immediate west. The third test-trench, which was 150m in length, ran across the previously identified Early Christian enclosure to the south-west of the RMP.

This long test-trench cut across the entire width of the enclosure, at the northern extremity, and confirmed the previous investigations and geophysical survey. The presence of a large enclosure with ditches up to 2.7m in width and over 0.7m in depth, with the possible remains of a second ditch in the western portion of the enclosure, were revealed. Previous investigations had revealed a cemetery and possible structures within the enclosure. There was considerable evidence for occupation levels, areas of burning within the test-trench and features such as pits and linear features. Finds from the original investigations by Cia McConway (Excavations 1996, No. 68, 96E0273; Excavations 1997, No. 86, 97E0116) included lignite slivers and cores, metal slag, animal bone, medieval pottery and human remains. Additional medieval pottery, green-glazed, was recovered from this second phase of testing, together with large quantities of animal bone.

The monitoring of the service trench and the two phases of testing has confirmed that this is an area of considerable archaeological activity. The location of such a large enclosure, Early Christian in date, with evidence for a cemetery and interior occupation, may have given the site considerable importance, marking it out as a significant place in the landscape. The second phase of activity, to the north and north-east of the enclosure, that of the medieval Nangor Castle, also attests to the importance of this site, as does the erection of the later Queen Anne house. The layout of the Queen Anne gardens is still clearly visible on the ground, although heavily overgrown, and the testing has shown that subsurface features associated with the gardens still exist. Possible substantial remains of Nangor Castle itself and the Queen Anne house, under a

deep overburden of unstable construction fill, were also revealed, although further investigations would be necessitated to confirm this.
Sylvia Desmond, Margaret Gowen & Co. Ltd, 27 Merrion Square, Dublin 2.

Dublin
2008:363
Gollierstown, Adamstown
Urban
ITM: E 701516m, N 732303m
08E0197
An assessment and associated testing were in compliance with a planning condition for the construction of a post-primary school and a community centre. The proposed development is to be located to the south of the SDZ lands and adjoins the railway line. Previous testing was carried out by the author at the adjoining site for the Adamstown District Centre. There are no known monuments in the development lands for the District Centre and cartographic research indicates that the development site was always laid out in open fields.
The proposed development site is located on a brownfield site at the western edges of the Adamstown development. The lands were in use as a compound for the railway development and other developments in the surrounding area and therefore topsoil had been stripped from most of the site. Two large holding tanks at the north-west of the site, a small access road at the south and housing developments to the north-east had already been constructed in the part of the areas proposed for development prior to the author arriving on-site.
Seven test-trenches were excavated across the site with a 1.8m wide toothless bucket. The stratigraphy consisted of c. 0.2–0.4m of topsoil intermixed with debris and overlying subsoil onto natural stony marl soils at the western portion of the site where the proposed community centre is to be located. There was very little topsoil remaining at the eastern end of the development site and the stratigraphy comprised of orange/brown subsoil overlying natural marl subsoil with veins of stone/slate running south-east/north-west across the development lands.
Nothing of archaeological significance was recorded during testing.
Ellen O'Carroll, 8 Cumberland Street, Dun Laoghaire, Co. Dublin.

Dublin
2013:043
Grange/Ballybane/Nangor, Dublin
Furnace pit (monitoring)
ITM: E 703978. N 703391m
13E0435
Monitoring of a proposed central carriageway at Grange Castle Business Park, Co. Dublin was carried out from 1-8 November 2013. Monitoring followed an archaeological appraisal carried out in September 2013 and geophysical survey was previously carried out throughout the entire area of Grange Castle Business Park.
Two features of archaeological interest were identified during monitoring of topsoil stripping in the east of the development area in Nangor townland. These features comprised a small bowl furnace (0.36m x 0.33m x 0.15m) filled with charcoal-rich soil and slag, and a shallow oval pit (0.97m x 0.69m x 0.1m) filled with charcoal, thought to be a charcoal clamp. These features were located approximately 35m apart and may have been associated with each other.
It is anticipated that specialist analyses in the form of charcoal analysis, radiocarbon dating and metallurgical analysis will be carried out on the material retrieved from the features excavated at the site
Courtney Deery Heritage Consultancy, 65 Mountain View Drive, Boghall Road, Bray, Co. Wicklow

Dublin
2013:196
Grange, Dublin
No archaeology found
SMR N/A
13E0459
Testing was carried out at the site of a proposed biopharmaceutical plant in Grange Castle Industrial Park, Co. Dublin. The entire development site is approximately 11ha in size however the proposed plant will be built on the southern 7.5ha of the site, leaving the northern portion available for future expansion. Only the southern 7.5ha was subject to testing. A total of 15 trenches, measuring 2,585 linear metres, were excavated across the area of proposed development over the course of four days from 9 December 2013. Nothing of archaeological significance was identified during this programme of testing.
Fintan Walsh for IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Dublin
2013:521
Grange/Ballybade/Nangor, Co. Dublin
Iron Age smelting pit and early medieval charcoal clamp
ITM: E 703873m, N 731566m
13E0435
Archaeological monitoring of a proposed central carriageway at Grange Castle Business Park, Co. Dublin was carried out from 1-8 November 2013 (east of Pfizer Ireland). Monitoring followed an archaeological appraisal carried out in September 2013 and geophysical survey was previously carried out throughout the entire area of Grange Castle Business Park.
Two features of archaeological interest were identified during monitoring of topsoil stripping in the east of the development area in Nangor townland. These features comprised a small bowl furnace (0.36m x 0.33m x 0.15m) filled with charcoal rich soil and slag, and a shallow oval charcoal clamp (0.97m x 0.69m x 0.1m). These features were located approximately 35m apart and it was initially thought that they could have been associated, however the dating evidence has indicated otherwise.
The furnace pit contained 1.26kg of metalworking residues and constituted the base of a typical slag-pit furnace. A sample of oak charcoal from fill C3 of the furnace pit returned a radiocarbon date of 2403+/-30 BP (UBA 25347), which was calibrated to 732-400 BC (2 Sigma) dating this feature to the early Iron Age. This radiocarbon date is one of the earliest to come from an Irish iron smelting context to date (Rondelez, 2014). (ITM 703873E 731566N).
A sample of oak charcoal from fill C7 in the charcoal clamp returned a radiocarbon date of 1256+/-32 BP (UBA 25348). The 2 Sigma calibrated result for this was 671-867 AD dating this deposit to the early medieval period. (ITM 703843E 731580N).
The features discovered at the site have been excavated and “preserved by record” and as such no further mitigation measures are necessary in relation to this development, however future development of the adjacent areas have the potential for further isolated small features to be discovered.
Courtney Deery Heritage Consultancy, Lynwood House, Ballinteer Road, Dublin 16

Dublin
2015:268
Grange Castle Access Road, Grange Castle, Dublin
No archaeology found
SMR N/A
15E0392
An archaeological assessment was undertaken for a site at Grange Castle Access Road, Grange, Dublin 22, on a 2.02 ha site. The site was a green field area within an industrial estate off the Nangor Road. The site of a tower-house (Grange Castle) lies 400m to the south. No archaeological features were recorded in the course of the assessment.
Aidan O’Connell for Archer Heritage Planning Ltd, 8 Beat Centre, Stephenstown, Balbriggan, Co. Dublin

Dublin
2016:049
Gollierstown, Aungierstown, Ballybane, Dublin
No archaeology found
ITM: E 763222m, N 730681m
15E0551
MOORE GROUP undertook a programme of archaeological testing at two sites in West Dublin as part of the development of a 220/110 kV Substation in a green field site at Ballybane/Aungierstown and the development of an interface compound at nearby Kishoge, South County Dublin. Earthsound Archaeological Geophysics carried out surveys of the proposed development works at both sites in October 2015 (detection Device no. 15R0116). At the interface site in Kishoge dipolar anomalies detected suggested that the land has been used for the deposition of debris or imported soils, causing the magnetic interference. This interference appeared to be truncated by a number of possible ditches which, it was suggested, relate to underlying features or may be an artefact of the deposition of the debris or imported soils. At Ballybane, the proposed sub-station site, a series of circular and sub-circular trends were detected across the northern survey area. These were interpreted as representing archaeological ditches or geological trends. Testing involving the mechanical excavation of twelve trenches was carried out from 22-24 February 2016 in bright and dry conditions.
Ballybane Site
The proposed substation site was accessed via a new business park access road south of the New Nangor Road (R134). The site consists of an improved tillage field to the north, cut by a ditch to the south. The field was originally subdivided into a smaller sub-triangular plot, the boundary of which has in recent years been

cleared away. Due to regular ploughing the site was relatively even underfoot. The test trenches were excavated by a 15-tonne backhoe excavator using a 1.2m-wide ditching bucket. All the test trenches were deliberately sited to target sub-surface anomalies identified during the geo-physical survey. These anomalies were variously interpreted as possible pits, ditches or relict boundaries. Trench 1 was located in the north-west corner of the site in relativity even ground. The trench measured 24m in length and was dug to an average depth of 0.5m. The topsoil was a rich humic material and the subsoil contained a high inclusion of angular stones. The only notable feature was a drainage channel at the west of the trench and was orientated north to south.

Kishoge Site

The proposed interface compound at Kishoge is located to the south-east of a roundabout at the junction of the R136 and the Ninth Lock Road. The field contains a high voltage tower with power lines overhead; the ground is of rough pasture with evidence of previous infill. This infilling was confirmed by the geophysical results, frequent 'iron spikes' were interpreted as relating to the importation of soils/debris. Three trenches were excavated across this area. Groundworks exposed a disturbed stratigraphy of imported builders' rubble and topsoil that had been dumped on the site. Subsoil, a boulder clay, was exposed at 1m in depth. There were no finds or features of archaeological potential.

Moore Archaeological and Environmental Services Ltd. Corporate House, Ballybrit, Business Park, Ballybrit, Galway.

Dublin
2016:083
Dub06 Data Centre, Grange Castle Business Park, Ballybane, Dublin 22, Dublin
Bronze Age - Early Medieval
SMR N/A
13E0471

The initial excavation comprised extensive test trenches over a large area within Grange Castle Business Park, County Dublin, on behalf of Microsoft Operations (Ireland) Ltd, in advance of a Data Centre complex. Test trenching began in January 2014, confirming the results of a geophysical survey carried out in 2004, identifying a circular enclosure in one portion of the site, known as Area 11, and two burnt mounds in another portion, known as Area 9. The excavation of Area 11 began in May 2014 and additional, associated, enclosures came to light leading to a prolonged excavation continuing on an intermittent basis until January 2016. The excavations in Area 9 took place in July 2014. Monitoring continued elsewhere in lands impacted by the construction works, with the subsequent recovery of more isolated features.

Area 11

The excavation of Area 11 revealed a series of associated enclosures aligned north-south. The earliest enclosure, Site 3, comprised a circular penannular ditch, with a maximum diameter of 48m, and maximum depth of 1m. Finds within the ditch included iron knives, a pair of mismatched quernstones, and a cluster of cow skulls. An upended cow skull, with human femur, provided an AMS date 656-727 and 737-768 CAL AD.

The ditch was encircled by the penannular Site 4 ditch, maximum diameter 86m, which also contained cow skulls. Both Site 3 & 4 enclosures shared a south-western entrance way. The Site 4 ditch was preceded by a linear, and more shallow, east-west ditch running across the north end of the site for a distance of 86m. The large D-shaped Site 2 enclosure, 40m x 32m, attached itself to the southern arc of the Site 4 ditch. Much reworked and augmented, the ditch cut through the underlying limestone bedrock to a maximum of 0.9m.

A portion of the old ground surface was recovered within this enclosure as well as the burial of a male and female, within a shallow grave, aligned north-south. Other finds included an articulated sheep or goat within a shallow pit, and a complete horse pelvis and femur.

The smaller Site 1 enclosure comprises two concentric ditches, 14.7m diameter maximum. An occupation surface of redeposited clay set it apart from the larger ritual enclosures, as did the numerous stake-holes, post-holes, and kiln, within the interior. A wattle fence survived in what appears to be a later recut ditch within the enclosure. Much of the clay deposits were characterised by large amounts of charcoal, both in the fills of internal pits, and the ditches. Cremated bone was also recovered, raising the possibility of ritual feasting and / or a funeral pyre being situated here.

A significant feature of the enclosures is the deliberate linking of each ditch to one another. In the case of Sites 3 & 4, a shallow ditch provides the connection. Site 2 was then physically attached to the Site 4 ditch. In the case of Site 1, a ditch emanates from its outer enclosure almost to the lip of the Site 2 ditch.

The burial of two individuals within a shallow grave, the cluster of cow skulls, the deposition of a cow skull with human femur, as well as the insertion of mismatched quernstones, all indicate substantial ritual and ceremonial uses, probably including animal sacrifice. The continuation of pre-Christian rituals is not unprecedented but is stark in view of the nearby presence of Clondalkin monastic settlement.

Several post-1169 medieval ditches ran up to, aligned themselves to the enclosures.

Area 9

Two fulacht fiadh were situated in a waterlogged field. The remains to the west comprised a shallow unlined trough, a well and several pits, including a recut pit indicating a second phase of use, as well as a spread of heat-shattered stones. Finds included fragments of human bone in a deep pit.
Thirty metres to the east, another fulacht fiadh comprised troughs, pits, numerous stake-holes and an elongated gully. The stake-holes, and an associated deep trough, appear to belong to a second phase of use. The findings tend to support the hypothesis of intermittent communal feasting.
Other archaeological sites have since been excavated within the Data Centre complex, although none to the same scale as those described above. They include a Bronze Age structure, and a possible Neolithic structure. A summary will be submitted in due course.
Excavations were also carried out in an adjacent associated site under licence 14E0453 in the townland of Nangor revealing a corn-drying kiln, medieval field boundaries as well as two clusters of cremations pits.
Neil O'Flanagan, Botanic Court, 30-32 Botanic Road, Glasnevin

Dublin
2016:084
DSF, Grange Castle Business Park, Dublin 22, Dublin
Bronze Age cremation pits & medieval corn-drying kiln
SMR N/A
14E0453
Excavations were carried out on behalf of Sisk & Sons Ltd during the course of 2015-16, yielding a corn-drying kiln, medieval field boundaries, and two clusters of cremation pits.
The kiln was dumbbell shaped, 6.06m in length, 1.4m wide across its flue, and cut to a depth of 0.48m. The fill included clays that appear to have originally formed part of the roofing of the kiln, indicating that the roof collapsed after its use, to be followed by a gradual natural accumulation.
The kiln lay adjacent to a pair of parallel ditches, one of which extended to 38m within the monitored area, with a depth of 0.25m maximum.
Some distance to the south, a cluster of 5 cremation pits came to light, with burnt bone within the pits evident from the surface. The pits were cut to a depth of 0.32m maximum, and a diameter of 0.37m maximum. Further to the south, another cluster of 4 cremation pits, including a shallow oval-shaped pit, measuring 0.57m in length, and 0.07 in depth, and another circular pit 0.48m in diameter, and 0.14m in depth. Some of the pits appear to have been 'capped', or sealed.
Neil O'Flanagan, Botanic Court, 30-32 Botanic Road, Glasnevin, Dublin 9

Dublin
2016:094
Ballybane and Aungierstown, Dublin (South County), Dublin
No archaeology found
SMR 250m from 'the zones of notification' for RMP's DU021-108 & DU021-109 a concentric enclosure and an enclosure
16E0030
Archaeological testing at the site of a proposed substation site at Ballybane and an interface compound at Kishoge, Co. Dublin was undertaken between the 22nd and 24th of February 2016. The test trenches were purposely sited on both sites to provide coverage for the new development and to investigate geophysical anomalies identified in an earlier survey. The trenches exposed a number of modern drainage channels across the site and a natural sterile stratigraphy elsewhere. The anomalies can be accounted for by modern disturbance, drains and geology. There was no evidence for any features of archaeological potential.
Billy Quinn for Moore Archaeological and Environmental Services, 3 Gort na Ri, Athenry, Co. Galway

Dublin
2016:147
Grange Castle Business Park, Clondalkin, Dublin
Early modern agricultural activity
ITM: E 703773m, N 732160m
15E0394
Testing and monitoring were carried out at Grange Castle Business Park, Clondalkin, Dublin 22, on behalf of Interxion Ireland in advance of the construction of a new data centre. Testing (followed by monitoring as a extension to the existing licence in January 2016) was required as a condition to grant of planning (SD15A/0034: Condition 11 b) from South Dublin County Council.
The 7 test trenches (totaling 229m) were aligned to investigate a faint geophysical trend (c. 23m in diameter) that was identified during geophysical survey of the site in January 2015. The trenching did not reveal any features of considered archaeological significance but did identify a furrow, some oxidised soil, brick waste and evidence of modern ploughing.

The testing report recommended monitoring of the soil strip – due to the wider archaeological/historical significance of the surrounding landscape and the small percentage of the development's footprint that was assessed through the initial testing.
Monitoring was undertaken over two days in January 2016 and exposed evidence for agriculture (furrows) and land improvement (drains) on the site in the early modern to modern period; isolated spreads of burnt clay, brick and charcoal (which were also frequently contained in the backfill of the agricultural features) indicate contemporary light industrial in the vicinity of the site – the brick inferring such activity may have been associated with a brickfield/brick firing and/or the demolition of brick buildings. However, no features of considered archaeological significance were recorded. The site was fully reduced to the level of natural subsoil under archaeological supervision.
Number 1, Brendan Street, Birr, County Offaly

Dublin
2016:340
Adamstown Road (R120) and Nangor Road (R134) Improvement Scheme, Ballybane, Ballymakaily, Clutterland, Grange and Milltown townlands
Post-medieval structure
16E0520
702670, 731650
The development is intended to improve the standard of the existing carriageway on both the Adamstown Road and Nangor Road, and will provide footpaths, cycle tracks, pedestrian crossing facilities, public lighting and two new signalised junctions. The overall length of the scheme is 2.45km. The excavation of six test trenches located throughout the proposed development area failed to reveal any archaeological features or artefacts.
Test trenching in Milltown townland, immediately west of Adamstown Road, revealed two associated mortar-bonded stone walls. The walls appeared parallel, and were 25m apart, forming the gables of a structure that was orientated north-east/south-west. A concrete floor was continuous throughout the structure at a depth of 0.4m below the existing ground level. A structure is depicted in this location on the First Edition Ordnance Survey map.
Dermot Nelis, 36 Fingal Street, Dublin 8

Dublin
2016:464
Grange Castle South Business Park, Ballybane, Clondalkin, Dublin 22.
Early medieval/medieval enclosures
DU021:108 & DU021:109
16E0531
703029, 730829
The areas tested were identified initially from studies of aerial photography and geophysical survey results and a very close correlation between the test trenching results and the results of the geophysical survey was noted.
AH1 represented a recorded concentric enclosure (DU021-108) with an internal ditched enclosure measuring c.50m east to west and 60m north to south and an outer ditched enclosure measuring c.90m in diameter. The test trenching confirmed the presence of extensive and well preserved internal and external ditches measuring 4m wide and 1.80m in depth below the current ground level. Numerous internal features were identified which comprised a group of linear type features and pits all of which are suggestive of domestic activity within the enclosure. The enclosure is likely to represent an early medieval settlement site.
AH2 was located 100m to the south of AH1 and represented a probable circular enclosure measuring 25m in diameter. The test trenching clearly identified the presence of a single – ditched circular enclosure measuring between 20m to 25m in diameter, with the ditch averaging 3m in width. The ditch was present within three test trenches and probably represents a ringfort or similar enclosure.
AH3 was described in the geophysical survey as a negative band of data oriented southwest-northeast and extending into the adjacent field which may represent a former track-way. The test trenching of this feature recorded two linear parallel ditches both measuring 3m wide by 1.60m deep that appear to form an old abandoned road or track. Both ditches contained old terracotta land drainage pipes suggestive of a relatively modern date for these two features.
AH4 was located in the east of the northern most field and was identified in the geophysical survey as a cluster of isolated responses which may represent a spread of burnt material or cluster of small pits and larger, isolated pit-type features. Archaeological test trenching in this area failed to identify any features of an archaeological nature. The ground was quite disturbed in this part of the site and it would appear to have been subject to test trenching previously.
AH5 represented an enclosure (DU021-109) located in the southern field, measuring c.44m with a probable entranceway in the east. The archaeological test trenching confirmed the presence of a single-ditched

circular enclosure, 44m in diameter with the ditch measuring 3m wide and 1.60m deep. The general appearance of this feature is suggestive of a possible ringfort type enclosure. No internal features were recorded.
AH6 represented a circular internal ditched enclosure measuring c. 37m in diameter encompassed by a larger oval-shaped enclosure measuring c.75m x 42m. The test trenching confirmed the presence of the large elongated oval enclosure measuring approximately 75m north-south by 42m east-west with a smaller associated internal enclosure c. 37m in width containing features suggestive of occupation. The external ditch of this enclosure measured on average 2.60m wide and 1.60m deep. The site is likely to represent a multi-phased early medieval settlement site.
AH7 was identified in the geophysical survey as a series of circular and sub-circular trends and five possible pits which may be archaeological or agricultural in origin. The test trenching failed to identify any features of an archaeological nature. A field boundary was recorded containing old terracotta land drainage pipes suggestive of a relatively modern date.
AH8 was identified in the geophysical survey as a series of linear negative magnetic trends which were suggestive of archaeology. The test trenching of this area failed to identify any features of an archaeological nature. A field boundary was recorded containing old terracotta land drainage pipes suggestive of a relatively modern date.
Within Field 1, two sections of a possible linear double ditched type feature were recorded with curving u-shaped termini (AH 9-10). These two parallel ditches may form a linear boundary and one of the ditches was clearly identified by the geophysical survey. An archaeological section excavated through one of these ditches recorded its width as 2.5m and depth as 1.45m in depth. The deposits recorded within this section appear similar to that recorded within area AH1 and contain no modern materials suggestive of modern field boundaries.
The geophysical survey and the results of archaeological test trenching clearly indicate that the site contains significant archaeological remains including four separate enclosure sites, two of which are scheduled for inclusion in the next revision of the Record of Monuments & Places. Although preservation in situ of archaeological remains should always be the preferred option, where such can be accommodated within any proposed development, the present site is located with a partly developed business park and any future development here is likely to extend to the entirety of the two fields resulting in an inevitable impact on all identified archaeological features. Any proposed development of this site should take into account the surviving archaeological remains and where possible the development should be designed to avoid the archaeology.
Jon Stirland, Will O'Siorain, Robert Breen, Archaeological Consultancy Services Unit, Unit 21 Boyne Business Park, Greenhills, Drogheda, Co Louth

Dublin
2016:495
Grifols Phase 2 site #B201, Grange Castle Business Park, Grange
Testing, monitoring and excavation (Isolated pits)
13E0459
703500, 731930
Testing (Phase 2) was undertaken within the footprint of a proposed biopharmaceutical plant at Grange Castle Business Park, Nangor Road, Grange, Dublin 22 in 2016. This testing followed from a previous phase (Phase 1) of testing undertaken in the southern half of the development site (2013:196), under an extension to licence 13E0459. A total of 13 test trenches were excavated within the Phase 2 development area.
One archaeological feature (AA 1: a pit filled with charcoal-rich soils) was identified. Subsequent monitoring of the Phase 2 development area in late 2016 identified an additional six archaeological areas (AA 2–7) all of which are individual pits/spreads similar to AA1. These areas were excavated under an extension to 13E0459 in December 2016.
Fintan Walsh, IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Dublin
2016:530
Grange Castle
Tower-house
DU017-034
16E0510
703859, 731879
Site investigation works associated with a programme of conservation at Grange Castle, Clondalkin, Dublin 22 (OS Sheet 17) by South Dublin County Council took place in October 2016. IAC Ltd monitored these groundworks.
The original structure of Grange Castle (DU017-034) dates from c. 1580 and has an 18th-century, two-storey addition attached to its western elevation. The overall footprint is 6m x 16m. While the buildings were

inhabited until the 1970s, they are now in a state of dilapidation. There is significant build-up of vegetation including tree and shrub growth to the external walls of the castle as well as to the internal floors at ground floor level and at first floor level over a deep arch to the original castle.
Monitoring was carried out in October 2016 and a total of eight pits were excavated. The pits revealed that both the Georgian house and the earlier tower-house possess shallow foundations. Nothing of archaeological significance was identified within the pits surrounding the house and tower-house.
Paul Duffy, IAC Ltd, Unit G1, Network Enterprise Park, Kilcoole, Co. Wicklow

Dublin
2017:042
Adamstown Road (R120) and Nangor Road (R134) Improvement Scheme, Ballybane and Milltown townlands
No archaeology found
16E0520 Ext.
702620, 731140
The development is intended to improve the standard of the existing carriageway on both the Adamstown Road and Nangor Road, and will provide footpaths, cycle tracks, pedestrian crossing facilities, public lighting and two new signalised junctions. The overall length of the scheme is 2.45km. Test trenching in Milltown townland, immediately west of Adamstown Road, in 2016 (Licence No. 16E0520) revealed two associated mortar-bonded stone walls. The walls appeared parallel and were 25m apart, forming the gables of a structure that was orientated north-east/south-west. A concrete floor was continuous throughout the structure at a depth of 0.4m below the existing ground level. A structure is depicted in this location on the First Edition Ordnance Survey map.
Additional test trenching in April 2017 confirmed the structure to be built directly on geologically deposited strata, and no associated or earlier phases of activity were noted. A test trench was also excavated in Ballybane townland in April 2017, and no archaeological features or artefacts were noted.
Dermot Nelis, 36 Fingal Street, Dublin 8

Dublin
2017:411
Ballymakaily, Grange Castle Business Park
Urban monitoring
16E0471 ext
703002, 732209
Testing and monitoring was conducted in advance of a proposed development of a new Data Centre, and associated works, in Ballymakaily Townland, Clondalkin, Dublin 22. The site is in close proximity (800m) to Grange Castle (DU017-034—) as well as a range of other upstanding remains and sub-surface archaeological sites. This archaeological work followed a previous phase of testing undertaken by Finola O'Carroll in 2016 in the southern portion of the site. The licence was extended and transferred in January 2017.
Testing and monitoring were required as a condition of planning (Planning Ref. No. SD16A/0345; South Dublin County Council – Condition 12). Testing of the site was completed by mechanical excavator in February 2017. Seven trenches were positioned to investigate anomalies identified during a previous geophysical survey. Monitoring was also undertaken, under the same licence, in April 2017 in advance of a soil strip associated with the construction works (specifically an attenuation pond). No features of archaeological significance were recorded in either phase of works. However, considering the discovery of archaeological remains in the wider region (including Neolithic Houses, Bronze Age Settlement, Ring-Barrows and an Early Medieval Complex) monitoring was recommended for any and all future works.
Denis Shine, CRDS Ltd.

Dublin
2017:597
Grange
No archaeology found
17EO257
703293, 731784
Archaeological monitoring and testing were undertaken as a condition of planning prior to the construction of an extension to the existing Takeda Ireland pharmaceutical plant within Grange Castle International Business Park in south Co Dublin. Previous archaeological investigation in the vicinity of the development site exposed a Neolithic house, a Bronze Age ring barrow and numerous fulachta fiadh. Earlier archaeological monitoring and excavation in the vicinity of Grange Castle identified a curving ditch orientated NE/SW with the contents suggesting a date phase of 12th/ 13th century.
The overall site area was approximately 17 hectares and the location of the new production facility as well as

lands scheduled for the temporary construction compound and car park were tested in advance of the initial phase of the groundworks. A total of eight test trenches were mechanically excavated. Testing at the site compound and temporary car parking area at the western side of the development site revealed that the area had previously been stripped of topsoil and filled with modern inert material. Monitoring of topsoil removal on the footprint of the production building site exposed the partial remains of a nineteenth century building indicated in the 1st Edition OS map for the area. This survived as a localised spread (2m NS/1.7m EW) of red brick and fragmented limestone. No other features or finds of archaeological or cultural heritage value were exposed during topsoil stripping at the development site.
Margaret McCarthy, Rostellan, Midleton, Co. Cork

Dublin
2019:252
Ballymakaily
Enclosures and other features
19E0038E
702480, 731800
Archaeological excavations were undertaken by Archaeological Management Solutions in collaboration with Cultural Resource Development Services at Ballymakaily townland, Grange Park Business Park, Co. Dublin, over a 16-week period, from May to August 2019. The excavation was conducted in advance of proposed industrial development and followed on from geophysical survey and test investigations at the site in early 2019. This work revealed the buried remains of a significant archaeological complex that was thought to comprise a long-running ditch suggested to form part of an ancient field system (Area 1); a small spread of burnt stones of potential prehistoric date (Area 2); and a large, circular enclosure, possibly defined by two, widely-spaced concentric ditches (Area 3).
Full excavation of these areas revealed an impressive array of features associated with multi-phase settlement and agricultural activity, possibly extending from prehistoric to modern times. The principal remains were identified in Area 3 and comprised two successive phases of enclosure. Potentially the earliest was a large, roughly circular enclosure seemingly defined by two widely-spaced ditches, set c.15–20m apart. It had an overall (north–south) diameter of about 70m, with the inner boundary reaching a maximum diameter of c.30m. The area between the enclosing elements was traversed by a number of possible radial ditches that may delineate the footprint of several small fields or paddocks. This phase of enclosure appears to have been followed by the construction at the same location of a large, sub-circular ditched enclosure, with maximum overall dimensions of 50m north–south by 52m. It overlapped with the Phase 1 inner enclosure ditch on the south and east, and the Phase 1 outer enclosure ditch on the north and west, thereby erasing all trace of the earlier cuts and deposits. Both phases of enclosures produced evidence for internal occupation in the form of several possible circular structures/buildings, as well as pits, post-holes, spreads, etc., while their defining ditches were likely originally accompanied by internal earthen banks. The enclosures are probably early medieval raths, though this interpretation is tentative pending the results of post-excavation analyses.
A number of possible ancillary features were identified immediately outside the main enclosures, on the north and north-west. This included a small sub-circular enclosure defined by ditch that measured approximately c.18m in diameter. The ditch, which splayed outwards on the north-east and produced tentative evidence to indicate the former presence of an external bank, was breached by three gaps on the north, north-west and south-east, one or more of which may represent an original entrance. A small pit containing a few fragments of burnt bone was the only feature discovered within the interior of the enclosure. A small, C-shaped ditch (length of chord c.16m) was also discovered a short distance to the north-east of the main enclosures and was found to contain three discrete deposits of charcoal-rich soil. These external features cannot readily be assigned to any particular phase in the site's history and further work is required to determine their precise dating and significance.
The investigations did, however, produce limited evidence for potential pre-enclosure (prehistoric?) activity in Areas 2 and 3, where a series of pits containing charcoal-rich soil and burnt stone were identified. These features may be indicative of cooking and/or other related activities. An array of linear and curvilinear ditches and drains were also identified across the site and appear to be associated with post-enclosure (medieval/post-medieval) agricultural practices. The long-running linear ditch identified in Area 3 may likewise relate to post-medieval agriculture.
Ger Dowling, AMS Consultancy, Unit 1, Hector Street Mills, Kilrush, Co. Clare.

Appendix 13.4 National Inventory of Architectural Heritage

The recorded archaeological sites within c. 1km of the development are listed below, all noted in the National Inventory of Architectural Heritage (NIAH) for Co. Dublin (www.archaeology.ie; www.buildingsofireland.ie).

Milltown, South Dublin County

Reg. No.	**11208006**
Date	1840 - 1860
Previous Name	N/A
Townland	MILLTOWN (NE. BY.)
County	South Dublin County
Coordinates	302518, 230958
Categories of Special Interest	ARCHITECTURAL
Rating	Regional
Original Use	outbuilding
In Use As	outbuilding

Description

Detached two-storey farm outbuilding, c.1850, with two-bay gable ends. Rendered walls. Blind wall to street with chamfered corners. Timber sash and casement windows. Corrugated aluminium pitched roof. Adjoining rubble stone walls of demolished outbuildings to south-east and ruinous cottages to north-east.

Appraisal

The chamfered corners of this outbuilding indicate the volume of horse-drawn traffic originally passing into the farm complex. Such buildings following the road line sheltered the farm yard and were a characteristic feature of Irish agriculture. This farm was associated with the now-demolished Milltown House.

Milltown, South Dublin County

Reg. No.	**11208008**
Date	1840 - 1870
Previous Name	N/A
Townland	GRANGE (BA. W BY.)
County	South Dublin County
Coordinates	302752, 231546
Categories of Special Interest	ARCHITECTURAL

Rating	Regional
Original Use	farm house
In Use As	farm house

Description

Detached four-bay two-storey farm house, c.1850. Roughcast rendered walls. uPVC door and casement windows. Replacement pitched slate roof with terracotta ridge tiles and gable coping. Two central brick chimney stacks. Later drip moulding over northern front window. Lean-to extension to the rere, and shed to side.

Appraisal

A tidy detached farm house which retains its original form and an unusually formal front garden, still serving the farm to the rere.

Grange Castle, GRANGE (BA. W BY.), Milltown, DUBLIN

Reg No	**11208013**
Rating	Regional
Categories of Special Interest	Archaeological, Architectural, Historical
Original Use	Castle/fortified house
Date	1740 - 1760
Coordinates	303928, 231851
Date Recorded	12/06/2002
Date Updated	--/--/--

Description

Ruinous remains of detached multiple-bay three-storey over vaulted basement former tower house, remodelled c. 1750 by addition of two-bay two-storey domestic wing attached to the west, with large supporting wall buttresses to the south. All openings blocked in roughcast walls leading to partially roofless wallheads. Earlier house, built c.1580, retains slender projecting square tower and garderobe. Large chimneybreast exposed where buildings have been demolished in the east.

Appraisal

Despite its ruinous state, many features of the two building phases can be clearly discerned, and the building remains a prominent landmark in the area.

Milltown, South Dublin County

Reg. No.	**11208015**
Date	1750 - 1770
Previous Name	N/A

Townland	MILLTOWN (NE. BY.)
County	South Dublin County
Coordinates	302520, 231041
Categories of Special Interest	ARCHITECTURAL
Rating	Regional
Original Use	farm house
In Use As	farm house

Description

Detached four-bay two-storey farm house, c.1760, with attached outbuildings. Rendered rubble stone walls. Glazed timber door in gabled porch. Timber sash windows. Some openings blocked. Possible traces of carriage arch to central bay. Pitched slate roof with two rendered chimney stacks. House possibly originally single-storey. Adjoining outbuildings to north with hayloft, and enlarged openings inserted recently. Partial tubular iron sunburst gate. Original fir tree stand to south.

Appraisal

A fine example of an eighteenth-century farm cottage and barn, demonstrating a classic sequence of vernacular evolution. Retains many period features.

Polly Hop's, Milltown, South Dublin County

Reg. No.	**11208016**
Date	1780 - 1810
Previous Name	N/A
Townland	MILLTOWN (NE. BY.)
County	South Dublin County
Coordinates	302591, 231012
Categories of Special Interest	ARCHITECTURAL SOCIAL
Rating	Regional
Original Use	house
In Use As	public house

Description

Formerly detached four-bay two-storey former house, c.1790, in use as public house. Roughcast rendered walls with parallel render quoins. Timber casement windows. Timber door with iron fittings. Pitched slate roof with single rendered chimney stack. Series of nineteenth- and twentieth-century extensions to south and west.

Appraisal

This site has long been in use as a public house as shown by the extensions surrounding the original modest rural house. Its presence gives a focus to this important and formerly more developed junction.

R120, ADAMSTOWN (NE. BY.), DUBLIN

Reg No	**11204051**
Rating	Regional
Categories of Special Interest	Architectural, Technical
Original Use	Bridge
In Use As	Bridge
Date	1900 - 1930
Coordinates	303016, 232768
Date Recorded	16/05/2002
Date Updated	--/--/--

Description

Single-arch road bridge over railway, c.1915. Three-centred arch with dressed voussoir stones. Coursed limestone parapets with granite coping at road level. Coursed limestone retaining walls either side of bridge.

Appraisal

This handsome road bridge is an integral part of the railway network, built to a standard design with well-executed stonework and a graceful arch.

12th Lock Bridge, R120, BALLYMAKAILY, DUBLIN

Reg No	**11204052**
Rating	Regional
Categories of Special Interest	Architectural, Technical
Original Use	Bridge
In Use As	Bridge
Date	1760 - 1780
Coordinates	302981, 232234
Date Recorded	16/05/2002
Date Updated	--/--/--

Description

Single-arch road bridge over canal, c.1770. Segmental arch with painted dressed voussoir stones set into smooth rendered west elevation. Roughcast rendered parapet with semi-circular coping stones and roughcast rendered pier faced with dressed granite blocks to each end. Bridge widened and refurbished, 1932.

Appraisal
This bridge, though widened, retains much original fabric and remains a valuable element in this group of canal structures including the lock gates and mill buildings.

12th Lock, R120, BALLYMAKAILY, DUBLIN


Reg No	**1204053**
Rating	Regional
Categories of Special Interest	Architectural, Technical
Original Use	Lock
In Use As	Lock
Date	1760 - 1780
Coordinates	302957, 232232
Date Recorded	16/05/2002
Date Updated	--/--/--

Description
Single-stage canal lock, c.1770. Lock gates are of timber and iron construction with coursed granite inner walls. Painted timber mooring post at intervals between gates.
Appraisal
A good example of a standard-type eighteenth-century canal lock, enhanced by its setting among such a rich group of canal structures.

BALLYMAKAILY, DUBLIN

Reg No	**11204054**
Rating	Regional
Categories of Special Interest	Architectural, Technical
Original Use	Mill (water)
In Use As	Office
Date	1850 - 1870
Coordinates	302938, 232247
Date Recorded	16/05/2002
Date Updated	--/--/--

Description
Detached seven-bay two-storey over basement former mill building, c.1860, now in use as offices. Random coursed rubble stone walls with roughly dressed limestone quoins. Replacement timber windows. Ground

floor windows have a modern concrete surround with the original red brick relieving arches still visible. Seven large oval cast-iron building ties are located on the south front. Segmental profile corrugated iron roof.

Appraisal

Despite alteration and conversion, this former mill building associated with the Flour Mill still retains its elegance and dominance over the Twelfth Lock and bridge, and is a valuable reminder of the former variety of functions associated with the canal network.

BALLYMAKAILY, DUBLIN

Reg No	**11204055**
Rating	Regional
Categories of Special Interest	Architectural, Technical
Original Use	Mill (water)
Date	1850 - 1870
Coordinates	302907, 232242
Date Recorded	16/05/2002
Date Updated	--/--/--

Description

Detached multiple-bay three-storey over basement former mill building, c.1860, now derelict. Roughcast rendered walls. Smooth render to the centre bays on the ground floor showing outline of former extension, now removed. A mix of boarded-up and steel-framed windows. Large door openings to ground floor of front elevation and west gable. Pitched corrugated asbestos roof.

Appraisal

This substantial former mill building fronting onto the canal, though in poor condition, retains its imposing volume and some materials, and is a valuable document of the diversity of building functions and types associated with the canal network.

Lock Keeper's Cottage, BALLYMAKAILY, DUBLIN

Reg No	**11204056**
Rating	Regional
Categories of Special Interest	Architectural, Social, Technical
Original Use	Lock keeper's house
In Use As	House
Date	1750 - 1780

Coordinates	302847, 232228
Date Recorded	16/05/2002
Date Updated	--/--/--

Description

Detached three-bay two-storey gable-fronted classical style former lock keeper's house, c.1765, now in use as a detached house. Timber sash windows. Roughcast rendered walls with cut stone architrave and string courses, with a round-arched blind recess to the gable front. Pitched slate roof with red brick chimney stacks to each gable. Annexe to east has a hipped slate roof, timber sash windows and timber panelled door with overlight.

Appraisal

This attractive former lock-keeper's house of a standard design retains much of its original architectural impact and style. The plain string courses and classical detail contrast with the roughcast walls to a very pleasing effect. Possibly designed by Thomas Omer, it is a fine addition to the varied group surrounding the twelfth lock.

Grange Cottage, GRANGE (BA. W BY.), DUBLIN

Reg No	**11204057**
Rating	Regional
Categories of Special Interest	Architectural
Original Use	Farm house
In Use As	Farm house
Date	1800 - 1830
Coordinates	303291, 232228
Date Recorded	16/05/2002
Date Updated	-/--/--

Description

Detached six-bay single-storey farm house, c.1810. Roughcast rendered walls with smooth rendered base course. Timber sash windows. Two projecting canted bays with hipped roofs to the front elevation flanking an enclosed glazed porch with a lean-to roof of corrugated iron. Pitched slate roof with four brick chimney stacks. Corrugated iron shed with a lean-to roof and another small modern flat-roofed extension attached to rear.

Appraisal

This house, though appearing initially quite modest, possesses an elegant and balanced design which lends it a grander air than is usual for houses of this size. It is beautifully sited along the canal towpath and retains many original materials.

GRANGE (BA. W BY.), DUBLIN

Reg No	**11204058**
Rating	Regional
Categories of Special Interest	Architectural
Original Use	Outbuilding
In Use As	Outbuilding
Date	1800 - 1830
Coordinates	303302, 232257
Date Recorded	16/05/2002
Date Updated	--/--/--

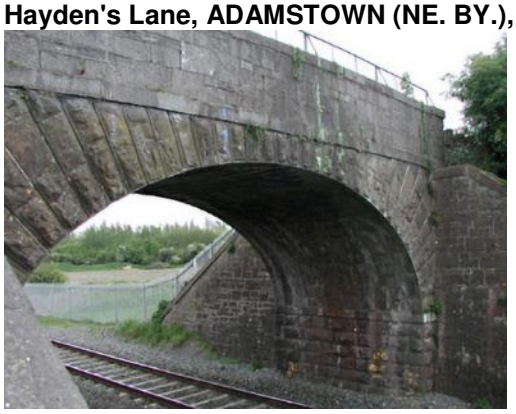
Description

Detached multiple-bay single-storey farm buildings set around a courtyard, c.1820, now in a dilapidated site. Random coursed stone rubble construction with large corrugated iron doors. Pitched roof of corrugated iron and slate. Breeze-block wall to south.

Appraisal

A simple range of farm outbuildings which enhances the setting and history of the nearby house, and adds further variety of type to this stretch of canal.

Hayden's Lane, ADAMSTOWN (NE. BY.), DUBLIN



Reg No	**11204059**
Rating	Regional
Categories of Special Interest	Architectural, Technical
Original Use	Bridge
In Use As	Bridge
Date	1900 - 1930
Coordinates	303406, 232767
Date Recorded	16/05/2002
Date Updated	--/--/--

Description

Single-arch road bridge over railway, c.1915. Three-centred arch with dressed voussoir stones. Coursed limestone parapets with granite coping at road level. Coursed limestone retaining walls either side of bridge. Long embankments to each approach to bridge with walls of limestone rubble having vertically set stone coping.

Appraisal

This handsome road bridge is an integral part of the railway network, built to a standard design with well-executed stonework and a graceful arch. The embankment approaches necessitated by the level ground in the vicinity make this a very prominent feature in the landscape.

Appendix 13.5 Archaeological figures

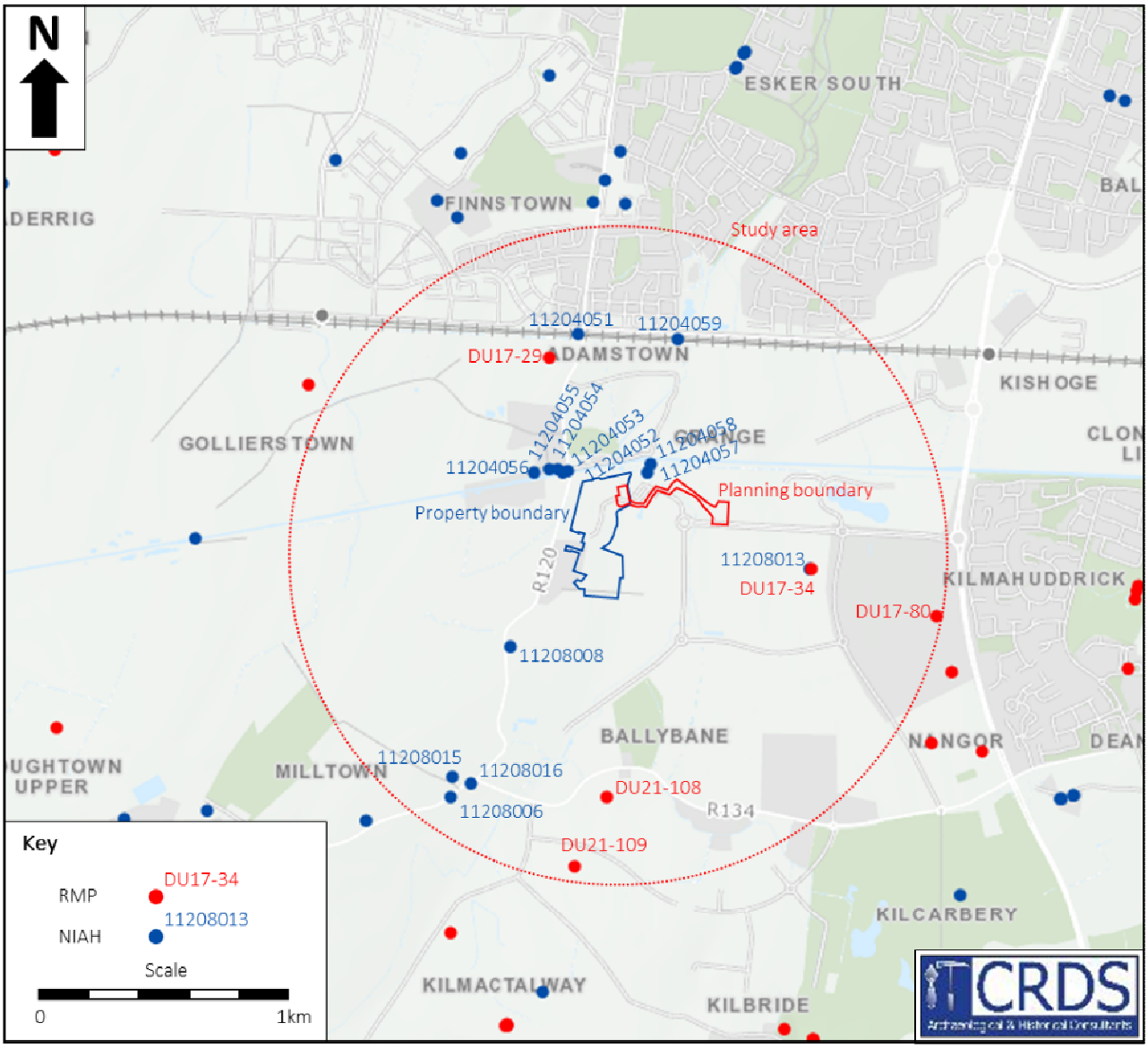


Figure 1 Recorded archaeological monuments and architectural heritage sites within c. 1km of the proposed development (source http://archaeology.ie).

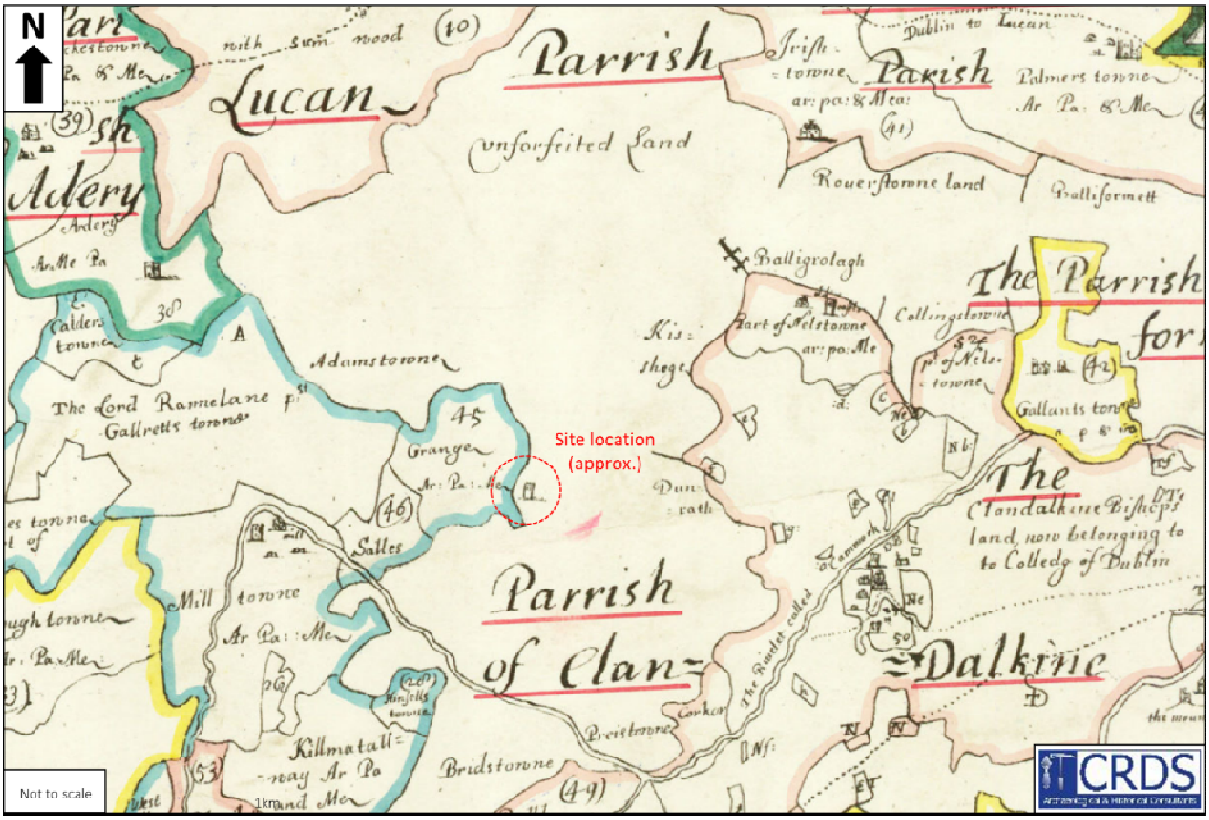


Figure 2 Down Survey Barony map showing Grange Castle, 1656 (http://downsurvey.tcd.ie/down-survey-maps.php).

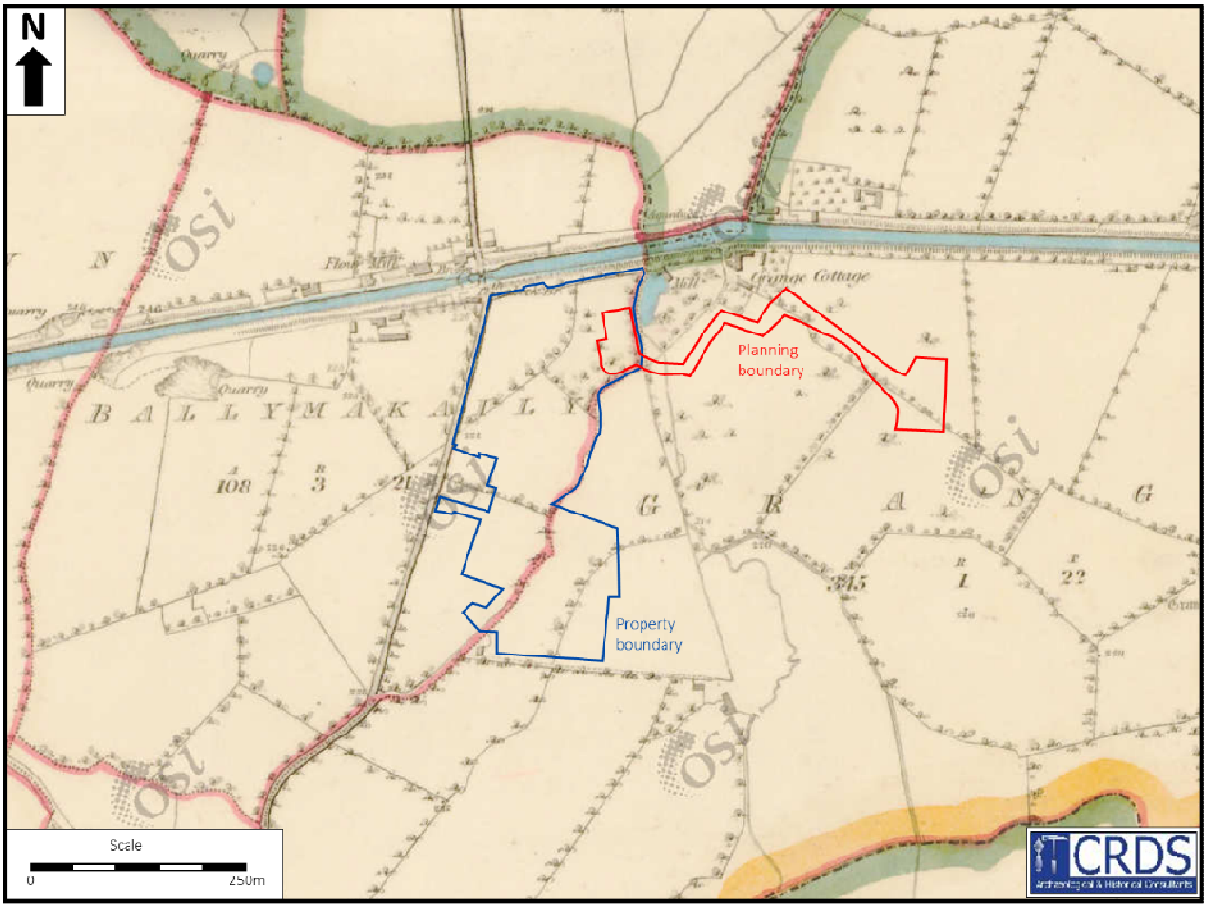


Figure 3 Extract from Ordnance Survey First Edition map (source http://map.geohive.ie/)

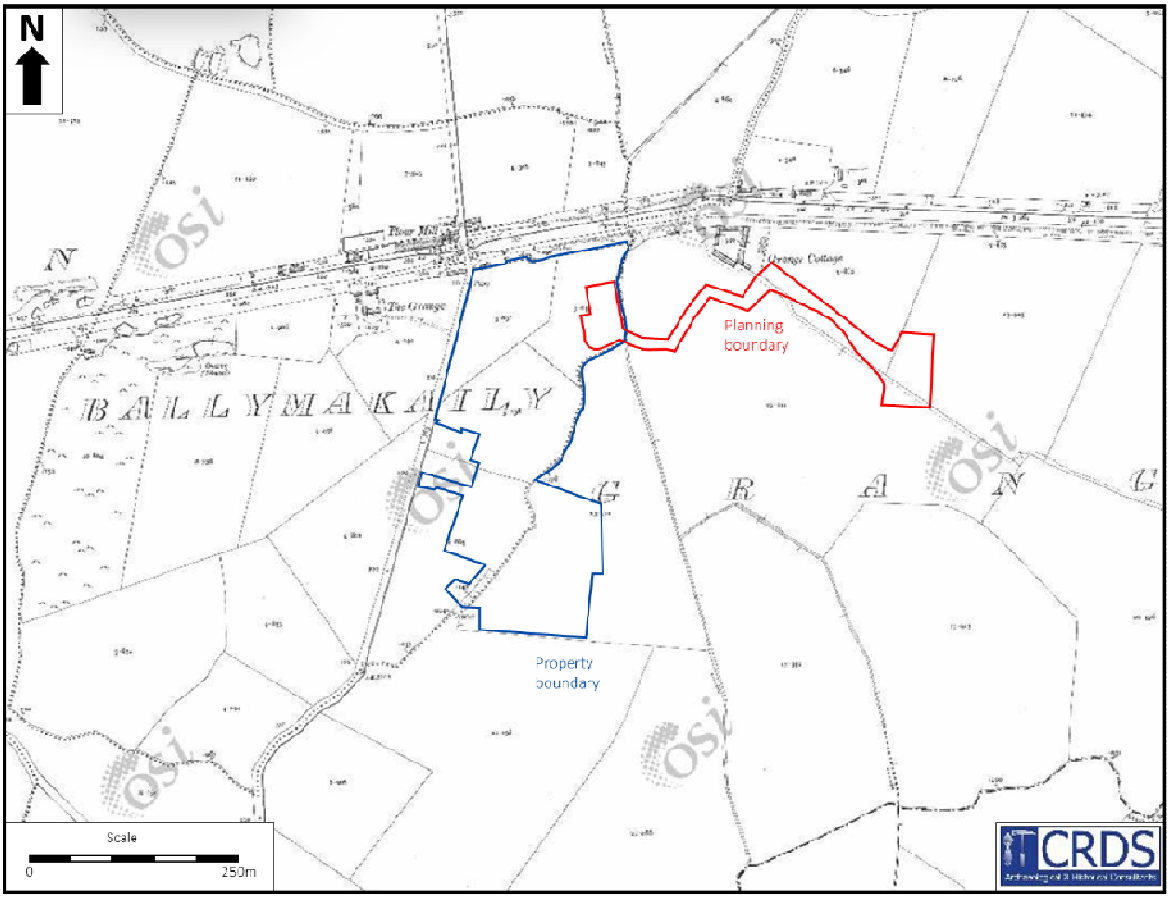


Figure 4 Extract from Ordnance Survey Second Edition map (source http://map.geohive.ie/)

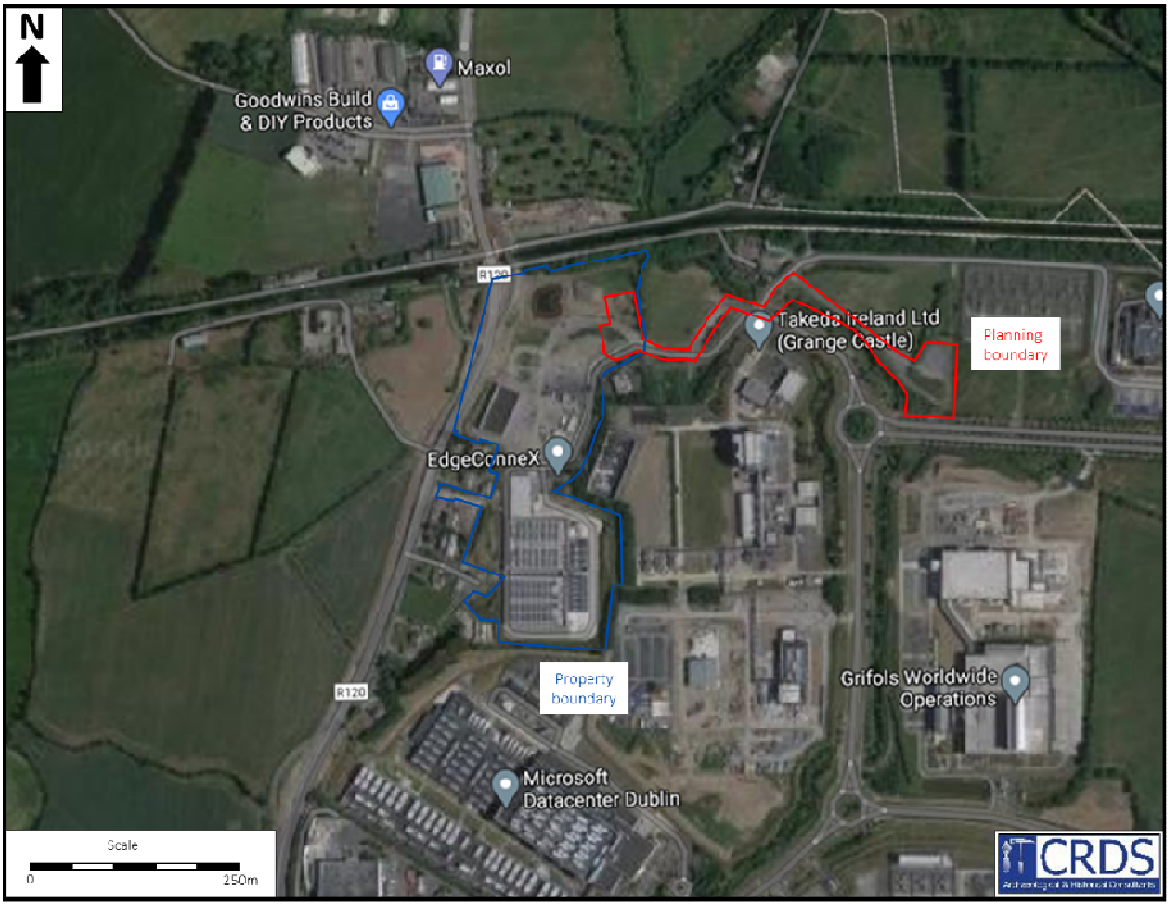


Figure 5 Aerial Photographic of the site dating to 2011/2013 (source Google maps.

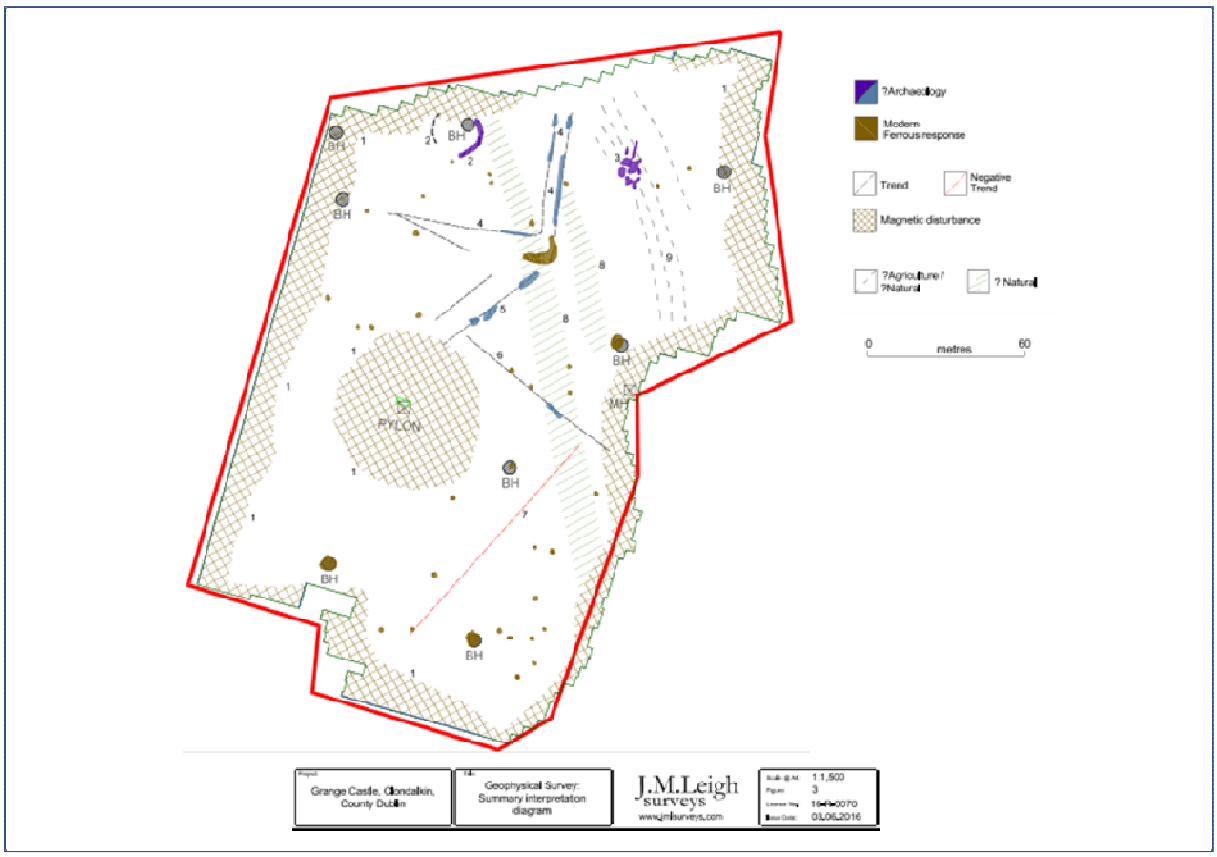


Figure 6 Extract from Geophysical Survey Report by JM Leigh (16R0070; Figure 3)

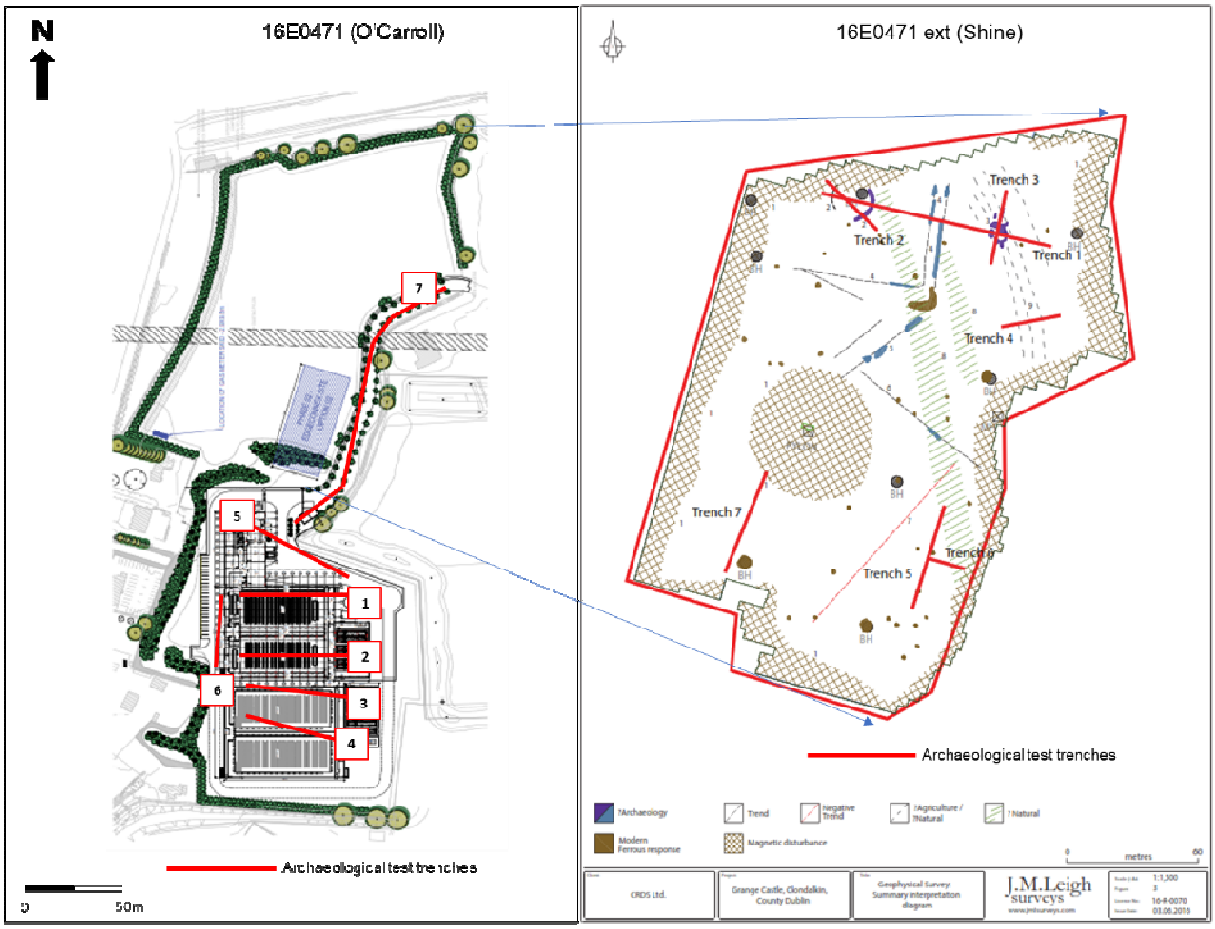


Figure 7 Extracts from Testing and Monitoring Reports by CRDS Ltd (16E0471 & 16E0471ext)

CHAPTER 14 – WASTE MANAGEMENT

Appendix14.1 Outline Construction and Demolition Waste Management Plan

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APPENDIX 14.1 CONSTRUCTION & DEMOLITION WASTE MANAGEMENT PLAN

Technical Report Prepared For

EdgeConneX Ireland Limited

Report Prepared By

Jonathan Gauntlett, Environmental Consultant

Our Reference

JG/21/12085WMR01

Date of Issue

19 March 2021

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Details	Written by	Approved by
Signature		
Name	Jonathan Gauntlett	Chonaill Bradley
Title	Environmental Consultant	Senior Environmental Consultant
Date	19 March 2021	19 March 2021

Contents **Page**

1.0 INTRODUCTION

AWN Consulting Ltd (AWN) has prepared this Construction and Demolition (C&D) Waste Management Plan (WMP) for the proposed information and communication technology (ICT) development which comprises two proposed underground single circuit 110kV transmission lines will connect the permitted Coolderrig 110kV GIS Substation to an existing circuit to the east within the townland of Grange, Dublin 22.

This C&D WMP includes information on the legal and policy framework for C&D waste management in Ireland, estimates of the type and quantity of waste to be generated by the proposed development and makes recommendations for management of different waste streams.

The purpose of this report is to provide information necessary to ensure that the management of C&D waste at the site is undertaken in accordance with current legal and industry standards including the *Waste Management Acts 1996-2011* and associated Regulations[1], *Protection of the Environment Act 2003* as amended[2], *Litter Pollution Act 1997* as amended[3] and the *Eastern-Midlands Region Waste Management Plan 2015-2021*[4]. In particular, this report aims to ensure maximum recycling, re-use and recovery of waste with diversion from landfill, where possible. It also seeks to provide guidance on the appropriate collection and transport of waste to prevent issues associated with litter or more serious environmental pollution (e.g. contamination of soil or water resources).

In the preparation of this report consideration has been given to the requirements of National and Regional waste policy, legislation, and other guidelines (referred to in Section 2.0). However, in determining the structure and content of the document, the following two publications have been referenced in particular:

- Department of the Environment, Heritage and Local Government (DoEHLG), Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (2006)5.
- FÁS and the Construction Industry Federation (CIF), Construction and Demolition Waste Management – a handbook for Contractors and Site Managers, (2002)6.

The above guidance documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

2.0 CONSTRUCTION & DEMOLITION WASTE MANAGEMENT IN IRELAND

2.1 National Level

The Irish Government issued a policy statement in September 1998 titled as *'Changing Our Ways*[7] which identified objectives for the prevention, minimisation, reuse, recycling, recovery and disposal of waste in Ireland. The target for C&D waste in this Strategy was to recycle at least 50% of C&D waste within a five-year period (by 2003), with a progressive increase to at least 85% over fifteen years (by 2013).

In response to the *Changing Our Ways* report, a task force (Task Force B4) representing the waste sector of the already established Forum for the Construction Industry, released a report titled *Recycling of Construction and Demolition Waste*[8] concerning the development and implementation of a voluntary construction industry programme to meet the governments objectives for the recovery of construction and demolition waste.

In September 2020 the government released a new policy document outlining a new action plan for Ireland to cover the period of 2020-2025. This plan *'A Waste Action Plan for a Circular Economy'*[9] was prepared in response to the 'European Green Deal' which sets a roadmap for a transition to a new economy, where climate and environmental challenges are turned into opportunities. Replacing the previous national waste management plan "A Resource Opportunity 2012[10].".

It aims to fulfil the commitment in the Programme for Government to publish and start implementing a new National Waste Action Plan. It is intended that this new national waste policy will inform and give direction to waste planning and management in Ireland over the coming years. It will be followed later this year by an All of Government Circular Economy Strategy. The policy document shifts focus away from waste disposal and moves it back up the production chain. To support the policy, regulation is already being used (Circular Economy Legislative Package) or in the pipeline (Single Use Plastics Directive). The policy document contains over 200 measures across various waste areas including Circular Economy, Municipal Waste, Consumer Protection & Citizen Engagement, Plastics and Packaging, Construction and Demolition, Textiles, Green Public Procurement and Waste Enforcement.

The National Construction and Demolition Waste Council (NCDWC) was launched in June 2002, as one of the recommendations of the Forum for the Construction Industry, in the Task Force B4 final report. The NCDWC subsequently produced *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects* in July 2006 in conjunction with the Department of the Environment, Heritage and Local Government (DoEHLG).

The guidelines outline the issues that need to be addressed at the pre-planning stage of a development all the way through to its completion. These guidelines have been followed in the preparation of this document and include the following elements:

- Predicted construction and demolition wastes;
- Procedures to prevent and minimise wastes;
- Options for reuse/recycling/recovery/disposal of construction and demolition wastes;
- Provision of training for Waste Manager and site crew;
- Details of proposed record keeping system;
- Details of waste audit procedures and plan; and
- Details of proposed consultation with relevant bodies i.e. waste recycling companies, Local Authority, etc.

Section 3 of the Guidelines identifies thresholds above which there is a requirement for the preparation of a C&D Waste Management Plan for developments. This development requires a C&D WMP under the following criterion:

- Demolition/renovation/refurbishment projects generating in excess of 100 m^3 in volume, of C&D waste

Other guidelines followed in the preparation of this report include *'Construction and Demolition Waste Management – a handbook for Contractors and Site Managers'* published by FÁS and the Construction Industry Federation in 2002.

These guidance documents are considered to define best practice for C&D projects in Ireland and describe how C&D projects are to be undertaken such that environmental impacts and risks are minimised and maximum levels of waste recycling are achieved.

2.2 Regional Level

The proposed development is located in the Local Authority area of South Dublin County Council (SDCC).

The *EMR Waste Management Plan 2015 – 2021* is the regional waste management plan for the SDCC area published in May 2015. The regional plan sets out the following strategic targets for waste management in the region:

- A 1% reduction per annum in the quantity of household waste generated per capita over the period of the plan;
- Achieve a recycling rate of 50% of managed municipal waste by 2020; and
- Reduce to 0% the direct disposal of unprocessed residual municipal waste to landfill (from 2016 onwards) in favour of higher value pre-treatment processes and indigenous recovery practices.

Municipal landfill charges in Ireland are based on the weight of waste disposed. In the Leinster Region, charges are approximately €130 - €150 per tonne of waste which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015.*

The *South Dublin County Council Development Plan 2016 – 2022*[11] sets out a number of objectives and actions for the South Dublin area in line with the objectives of the waste management plan.

Waste objectives and actions with a particular relevance to the proposed development are as follows:

Objectives:

- **IE5 Objective 1:** To support the implementation of the Eastern–Midlands Region Waste Management Plan 2015-2021 by adhering to overarching performance targets, policies and policy actions.
- **IE5 Objective 2:** To support waste prevention through behavioural change activities to de-couple economic growth and resource use.
- **IE5 Objective 3:** To encourage the transition from a waste management economy to a green circular economy to enhance employment and increase the value recovery and recirculation of resources.

- **IE5 Objective 8:** To secure appropriate provision for the sustainable management of waste within developments, including the provision of facilities for the storage, separation and collection of such waste.

Actions:

Support and facilitate the separation of waste at source into organic and non-organic streams or other waste management systems that divert waste from landfill and maximise the potential for each waste type to be re-used and recycled or composted and divert organic waste from landfill, in accordance with the National Strategy on Biodegradable Waste (2006).

- Implement the objectives of the National Waste Prevention Programme at a local level with businesses, schools, householders, community groups and within the Council's own activities.
- Promote an increase in the amount of waste re-used and recycled consistent with the Regional Waste Management Plan and Waste Hierarchy and facilitate recycling of waste through adequate provision of facilities and good design in new developments.
- Implement the South Dublin Litter Management Plan 2015 - 2019.

In terms of physical waste infrastructure, three municipal solid waste landfills remain operational in the Eastern Midlands Region (EMR) and are all operated by the private sector. There are a number of other licensed and permitted facilities in operation in the EMR including waste transfer stations, hazardous waste facilities and integrated waste management facilities. There are two existing thermal treatment facilities, one in Duleek, Co. Meath and a second facility in Poolbeg in Dublin.

2.3 Legislative Requirements

The primary legislative instruments that govern waste management in Ireland and applicable to the project are:

- Waste Management Act 1996 (No. 10 of 1996) as amended, as well as sub-ordinate legislation[1].
- Environmental Protection Act 1992 (No. 7 of 1992) as amended[2].
- Litter Pollution Act 1997 (No. 12 of 1997) as amended[3].
- Planning and Development Act 2000 (No. 30 of 2000) as amended.

These Acts and subordinate Regulations enable the transposition of relevant European Union Policy and Directives into Irish law.

One of the guiding principles of European waste legislation, which has in turn been incorporated into the Waste Management Acts 1996 – 2011 and subsequent Irish legislation, is the principle of *"Duty of Care"*. This implies that the waste producer is responsible for waste from the time it is generated through until its legal reuse, recycling, recovery and/or disposal (including its method of reuse, recycling, recovery and/or disposal). As it is not practical in most cases for the waste producer to physically transfer all waste from where it is produced to the final destination, waste contractors will be employed to physically transport waste to the final waste reuse, recycling, recovery and/or

disposal site. Following on from this is the concept of *"Polluter Pays"* whereby the waste producer is liable to be prosecuted for pollution incidents, which may arise from the incorrect management of waste produced, including the actions of any contractors engaged (e.g. for transportation and disposal/recovery/recycling of waste).

It is therefore imperative that the appointed construction contractor(s) are legally compliant with respect to waste transportation, reuse, recycling, recovery and disposal. This includes the requirement that a contractor handle, transport and reuse/recycle/recover/dispose of waste in a manner that ensures that no adverse environmental impacts occur as a result of any of these activities.

A collection permit to transport waste must be held by each waste contractor which is issued by the National Waste Collection Permit Office (NWCPO). Waste receiving facilities must also be appropriately permitted or licensed. Operators of such facilities cannot receive any waste, unless in possession of a Certificate of Registration (COR) or waste permit granted by the relevant Local Authority under the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended, or a waste or Industrial Emissions (IE) licence granted by the EPA. The COR/permit/licence held will specify the type and quantity of waste able to be received, stored, sorted, recycled, recovered and/or disposed of at the specified site.

3.0 DESCRIPTION OF THE PROJECT

3.1 Location, Size and Scale Of The Development

A detailed description of the development is provided in Chapter 2 (Characteristics of the Proposed Development) of the EIA Report. The Proposed Development consists of two proposed underground single circuit 110kV transmission lines will connect the permitted Coolderrig 110kV GIS Substation to the existing Grange Castle - Kilmahud Circuits to the east. The proposed parallel transmission lines cover a distance of approximately 580m within the townland of Grange, Dublin 22. They will pass outside of the site and along and under the internal road infrastructure within the Edgeconnex site and Grange Castle Business Park; above the culverted Griffeen River and along a wayleave to the north of the Griffeen River to the joint bays where it will connect into the Kilmahud Circuit.

A description of the characteristics of the development relevant to waste are described in Chapter 14 (Waste Management).

3.2 Overview of The Non-Hazardous Wastes To Be Produced

Site preparation, excavations and levelling works will be required to facilitate construction of foundations, access roads and the installation of services will generate c. 1,213m^3 of tarmac, made ground, soils/stones. Suitable soils and stones will be reused on site as backfill in the grassed areas, where possible. However, it is currently envisaged that the majority of the excavated material will require removal offsite.

It is expected that throughout the construction phase, waste will be produced from off-cuts, waste from packaging (cardboard, plastic, timber) and oversupply of materials are also likely to be generated. The contractor will be required to ensure that oversupply of

materials is kept to a minimum and opportunities for reuse of suitable materials is maximised.

Waste will also be generated from construction workers e.g. organic/food waste, dry mixed recyclables (wastepaper, newspaper, plastic bottles, packaging, aluminium cans, tins and Tetra Pak cartons), mixed non-recyclables and potentially sewage sludge from temporary welfare facilities provided onsite during the construction phase. Waste printer/toner cartridges, waste electrical and electronic equipment (WEEE) and waste batteries may also be generated infrequently from site offices.

3.3 Potential Hazardous Wastes Arising

3.3.1 Contaminated Soil

Site-specific investigations were undertaken by Site Investigations Ltd (SIL) (January 2021). The ground investigation report shows there was no evidence of significant subsurface contamination encountered during the site investigation works.

Environmental analysis was carried out soil samples three samples recorded Total Petroleum Hydrocarbons above the limit of detection but the levels were low and not in the liquid phase so the soils can be classified as non-hazardous as per Waste Acceptance Criteria (WAC) specified in the *European Communities (EC) Council Decision 2003/33/EC)*[12] which establishes the criteria for the acceptance of waste at landfills. This is discussed further in Chapter 7 of the EIAR (Land, Soils, Geology and Hydrogeology). It is not anticipated that significant subsurface contamination will be encountered along the proposed services routes.

No asbestos was identified in the soil samples collected. If, however asbestos or asbestos containing material (ACMs) are identified in any further soil samples or during excavation, the removal will only be carried out by a suitably permitted waste contractor, in accordance with *S.I. No. 386 of 2006 Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006-2010.* All asbestos will be taken to a suitably licensed or permitted facility.

All excavations should still be carefully monitored by a suitably qualified person to ensure that, if encountered, potentially contaminated soil is identified and segregated from clean/inert material. In the event that any potentially contaminated material is encountered, it will need to be tested and classified as either non-hazardous or hazardous in accordance with the EPA publication entitled *'Waste Classification: List of Waste & Determining if Waste is Hazardous or Non-Hazardous'*[13] using the *HazWasteOnline* application (or similar approved classification method). The material will then need to be classified as clean, inert, non-hazardous or hazardous in accordance with the *Decision 2003/33/EC*.

Excavation works will be carefully monitored by a suitably qualified person to ensure any potentially contaminated soil is identified and segregated in accordance with the above procedure.

3.3.2 Fuel/Oils

As fuels and oils are classed as hazardous materials, any on-site storage of fuel/oil, all storage tanks and all draw-off points will be bunded and located in a dedicated, secure

area of the site. Provided that these requirements are adhered to and the site crew are trained in the appropriate refuelling techniques, it is not expected that there will be any fuel/oil waste generated at the site.

3.3.3 Invasive Species

Ecological site surveys have been undertaken by Scott Cawley (SC) at this site and in the surrounding area as part of the site ecological assessment. This included walkover surveys of the entire site and the perimeter of the site. There were no Schedule 3 non-native invasive species were recorded during baseline surveys within the application site.

3.3.4 Other Known Hazardous Substances

Paints, glues, adhesives and other known hazardous substances will be stored in designated areas. They will generally be present in small volumes only and associated waste volumes generated will be kept to a minimum. Wastes will be stored in appropriate receptacles pending collection by an authorised waste contractor.

In addition, waste electrical and electronic equipment (WEEE) containing hazardous components, printer/toner cartridges and batteries (Lead, Ni-Cd or Mercury) may be generated from the temporary site offices during construction works. These wastes will be stored in appropriate receptacles in designated areas of the site pending collection by an authorised waste contractor.

3.4 Main Construction Waste Categories

The main non-hazardous and hazardous waste streams that may typically be generated by the construction activities at the proposed site are presented in Table 1. The List of Waste code (also referred to as the European Waste code or EWC) for each waste stream is also shown.

Table 3.1 *Typical waste types generated and LoW codes (individual waste types may contain hazardous substances)*

Main Waste Material	**List of Waste Code**
Soil and stones	17 05
Biodegradable/Green Waste	20 02 01
Bituminous mixtures*	17 03 01/02
Other Waste Types (*which may be generated*)	**List of Waste Code**
Electrical and electronic components	20 01 35 & 36
Paper and cardboard	20 01 01
Mixed municipal waste	23 03 01
Mixed C&D waste	17 09 04
Batteries and accumulators*	20 01 33 & 34
Liquid fuels*	13 07 01, 02 & 03
Electrical and electronic components	20 01 35 & 36
Paper and cardboard	20 01 01
Mixed municipal waste	23 03 01
Chemicals (solvents, pesticides, paints, adhesives, detergents etc.)	20 01 13, 19, 27-30

Organic (food) waste	20 01 08

** individual waste type may contain hazardous substances*

4.0 ESTIMATED WASTE ARISINGS

4.1 Demolition Waste Generation

No demolition will be required to facilitate the construction of the proposed development.

4.2 Construction Waste Generation

The quantity of excavated material that will be generated has been estimated to be c. 1,231m^3. It anticipated that the majority of the material will be removed off site for reuse and recycle/recovery, with some being reused as backfill in the grassed areas, where possible.

It is expected that wastes generated (other than excavated material and trees/shrubbery) from other construction activities will be negligible and will generally comprise waste generated from construction workers.

The welfare facilities and site office for the proposed development will be located in the site compound.

It should be noted that until final materials and detailed construction methodologies have been confirmed, it is difficult to predict with a high level of accuracy the construction waste that will be generated from the proposed works as the exact materials and quantities may be subject to some degree of change and variation during the construction process.

An outline Construction Environmental Management Plan (CEMP) has been prepared by CSEA to accompany the planning application. The appointed main contractor will be required to prepare a detailed CEMP prior to commencement of construction which may refine the above waste estimates.

4.3 Proposed Waste Management Options

4.3.1 Waste Management Options for Excavated Materials

The Waste Management Hierarchy states that the preferred option for waste management is prevention and minimisation of waste, followed by preparing for reuse and recycling/recovery, energy recovery (i.e. incineration) and, least favoured of all, disposal. Any excavations carried out will be required to facilitate construction works. However, it is currently proposed that all the excavated material will be reused on site and therefore will not require removal from site and therefore the preferred option of waste prevention is proposed for the excavated material.

In the event that any excavated material is removed off-site for reuse as a by-product (and not as a waste), it will be done in accordance with Article 27 of the *European Communities (Waste Directive) Regulations 2011*. Article 27 requires that certain conditions are met and

that by-product decisions are made to the EPA via their online notification form. However, it is not currently anticipated that any excavated material will be removed offsite for reuse as a by-product. Similarly, if any soils/stones are imported onto the site from another construction site as a by-product, this will also be done in accordance with Article 27.

If any excavated material requires removal from site and is deemed to be a waste, then removal and reuse/recycling/ recovery/disposal of the material will be carried out in accordance with the *Waste Management Acts 1996 – 2011* as amended, the *Waste Management (Collection Permit) Regulations 2007* as amended and the *Waste Management (Facility Permit & Registration) Regulations 2007* as amended. The volume of waste removed will dictate whether a COR, permit or licence is required by the receiving waste facility. Once all available beneficial reuse options have been exhausted, the options of recycling and recovery at waste permitted and licensed sites will be considered.

In the unlikely event that contaminated material is encountered and subsequently classified as hazardous, this material will be stored separately to any non-hazardous material. It will require off-site treatment at a suitable facility or disposal abroad via Transfrontier Shipment of Wastes (TFS).

4.3.2 Waste Management Options for other Construction Wastes

Waste materials generated will be segregated on-site, where it is practical. Where the on-site segregation of certain wastes types is not practical, off-site segregation will be carried out. There will be skips and receptacles provided to facilitate segregation at source. All waste receptacles leaving site will be covered or enclosed. The appointed waste contractor will collect and transfer the wastes as receptacles are filled.

All waste arisings will be handled by an approved waste contractor holding a current waste collection permit. All waste arisings requiring reuse, recycling, recovery or disposal off-site will be transferred to a facility holding the appropriate COR, permit or licence, as required.

Mixed C&D waste (classified under the List of Waste code 17 09 04) is permitted for acceptance at a number of waste facilities in the region including Integrated Material Solutions landfill in north Dublin and a number of waste transfer stations.

Written records will be maintained by the contractor detailing the waste arising throughout the construction phase, the classification of each waste type, the contact details and waste collection permit number of all waste contractors who collect waste from the site and the end destination details for all waste removed and disposed offsite.

Dedicated storage containers will be provided for hazardous wastes which may arise such as batteries, paints, oils, chemicals etc., as required. The containers used for storing hazardous liquids will be appropriately bunded or will be stored on suitably sized spill pallets.

It should be noted that until the main contractor is appointed, it is not possible to provide information on the specific destinations of each waste stream. Prior to commencement construction of the proposed development and removal of any waste off-site, details of the proposed destination of each waste stream will be provided to the local authority.

The management of the main construction waste streams are detailed as follows:

Biodegradable/Green Waste

Trees and shrubbery removed will be transferred off site for appropriate reuse and/or recovery.

Waste Electrical and Electronic Equipment

Waste electrical and electronic equipment (WEEE) will be stored in dedicated covered cages/receptacles/pallets pending collection for recycling off site.

Batteries

Any waste batteries generated in the site office will be stored in a dedicated container in the site office pending collection for recycling.

Other Recyclables

Where any other recyclable wastes such as cardboard and soft plastic are generated, these will be segregated at source into dedicated skips and removed offsite.

Non-Recyclable Waste

Construction waste which is not suitable for reuse or recovery, such as polystyrene, some plastics and some cardboards, will be placed in separate skips or other receptacles. Prior to removal from site, the non-recyclable waste skip/receptacle will be examined by a member of the waste team (see Section 6.0) to determine if recyclable materials have been placed in there by mistake. If this is the case, efforts will be made to determine the cause of the waste not being segregated correctly and recyclable waste will be removed and placed into the appropriate receptacle.

Hazardous Wastes

On-site storage of any hazardous wastes produced (i.e. contaminated soil in the unlikely event that it is encountered and/or waste fuels) will be kept to a minimum, with removal off-site organised on a regular basis. Storage of all hazardous wastes on-site will be undertaken so as to minimise exposure to on-site personnel and the public and to also minimise potential for environmental impacts. Hazardous wastes will be recovered, wherever possible, and failing this, disposed of appropriately.

4.4 Tracking and Documentation Procedures for Off-Site Waste

All waste will be documented prior to leaving the site. Waste will be weighed by the waste contractor, either by weighing mechanism on the truck or at the receiving facility. These waste records will be maintained on site by the contractor.

All movement of waste and the use of waste contractors will be undertaken in accordance with the Waste Management Acts 1996 – 2011 as amended, Waste Management (Collection Permit) Regulations 2007 as amended and Waste Management (Facility Permit & Registration) Regulations 2007 as amended. This includes the requirement for all waste contractors to have a waste collection permit issued by the NWCPO. The

nominated project Waste Manager will maintain a copy of all waste collection permits on-site.

If the waste is being transported to another site, a copy of the Local Authority COR, waste permit or EPA Waste/IE Licence for that site will be provided to the nominated project Waste Manager. If the waste is being shipped abroad, a copy of the TFS document will be obtained from Dublin City Council (as the relevant authority on behalf of all local authorities in Ireland) and kept on-site along with details of the final destination (permits, licences etc.). A receipt from the final destination of the material will be kept as part of the on-site waste management records.

If any surplus soil or stone is being removed from the site for reuse on another construction site as a by-product, this will need to be done in accordance with Article 27 of the *EC (Waste Directive) Regulations, 2011*. Similarly, if any soil or stone are imported onto the site from another construction site as a by-product, this will also be done in accordance with Article 27. It is not currently envisaged the Article 27 will be used for this development.

All information will be entered in a waste management recording system to be maintained on site.

5.0 ESTIMATED COST OF WASTE MANAGEMENT

An outline of the costs associated with different aspects of waste management is provided below. The total cost of construction waste management will be measured and will take into account handling costs, storage costs, transportation costs, revenue from rebates and disposal costs.

5.1 Reuse

By reusing materials on site, there will be a reduction in the transport and offsite recycling/recovery/disposal costs associated with the requirement for a waste contractor to take the material away to landfill.

Clean and inert excavated material which cannot be reused on site may be used as capping material for landfill sites, or for the reinstatement of quarries, etc. as previously discussed. This material is often taken free of charge for such purposes, reducing final waste disposal costs. However, it is not currently anticipated that there will be surplus excavated material.

5.2 Recycling

Salvageable metals will earn a rebate which can be offset against the costs of collection and transportation of the skips. Clean uncontaminated cardboard and certain hard plastics can also be recycled. Waste contractors will typically charge less to take segregated wastes, such as recyclable waste, from a site than mixed waste streams.

5.3 Disposal

Landfill charges in the Eastern-Midlands region are currently at around €130-150 per tonne (which includes a €75 per tonne landfill levy specified in the *Waste Management (Landfill Levy) Regulations 2015*. In addition to disposal costs, waste contractors will also charge a fee for provision and collection of skips.

Collection of segregated construction waste usually costs less than municipal waste. Specific C&D waste contractors take the waste off-site to a registered, permitted or licensed facility and, where possible, remove salvageable items from the waste stream before disposing of the remainder to landfill.

6.0 TRAINING PROVISIONS

A member of the construction team will be appointed as the Waste Manager to ensure commitment, operational efficiency and accountability during the construction phase of the project.

6.1 Waste Manager Training and Responsibilities

The nominated Waste Manager will be given responsibility and authority to select a waste team if required, i.e. members of the site crew that will aid him/her in the organisation, operation and recording of the waste management system implemented on site. The Waste Manager will have overall responsibility to oversee, record and provide feedback to the Project Manager on everyday waste management at the site. Authority will be given to the Waste Manager to delegate responsibility to subcontractors, where necessary, and to coordinate with suppliers, service providers and sub-contractors to prioritise waste prevention and material salvage.

The Waste Manager will be trained in how to set up and maintain a record keeping system, how to perform an audit and how to establish targets for waste management on site. The Waste Manager will also be trained in the best methods for segregation and storage of recyclable materials, have information on the materials that can be reused on site and be knowledgeable in how to implement this C&D WMP.

6.2 Site Crew Training

Training of the site crew is the responsibility of the Waste Manager and, as such, a waste training program should be organised. A basic awareness course will be held for all site crew to outline the C&D WMP and to detail the segregation of waste materials at source. This may be incorporated with other site training needs such as general site induction, health and safety awareness and manual handling.

This basic course will describe the materials to be segregated, the storage methods and the location of the waste storage areas. A sub-section on hazardous wastes will be incorporated into the training program and the particular dangers of each hazardous waste will be explained.

7.0 RECORD KEEPING

Records should be kept for all waste material which leaves the site, either for reuse on another site, recycling or disposal. A recording system will be put in place to record the waste arising's on site.

A waste tracking log should be used to track each waste movement from the site. On exit from the site the waste collection vehicle driver should stop at the site office and sign out as a visitor and provide the security personnel or waste manager with a waste docket (or WTF for hazardous waste) for the waste load collected. At this time, the security personnel should complete and sign the Waste Tracking Register with the following information:

- Date
- Time
- Waste Contractor
- Company waste contractor appointed by e.g. Contractor or subcontractor name
- Collection Permit No.
- Vehicle Reg.
- Driver Name
- Docket No.
- Waste Type
- EWC/LoW

The waste transfer dockets will be transferred to the site waste manager on a weekly basis and can be placed in the Waste Tracking Log file. This information will be forwarded onto the SDCC Waste Regulation Unit when requested.

Alternatively, each subcontractor that has engaged their own waste contractor will be required to maintain a similar waste tracking log with the waste dockets/WTF maintained on file and available for inspection on site by the main contractor as required.

A copy of the Waste Collection Permits, CORs, Waste Facility Permits and Waste Licences will be maintained on site at all times. Subcontractors who have engaged their own waste contractors, should provide the main contractor with a copy of the waste collection permits and COR/permit/licence for the receiving waste facilities and maintain a copy on file available for inspection on site as required.

8.0 OUTLINE WASTE AUDIT PROCEDURE

8.1 Responsibility for Waste Audit

The appointed waste manager will be responsible for conducting a waste audit at the site during the C&D phase of the development.

8.2 Review of Records and Identification of Corrective Actions

A review of all the records for the waste generated and transported off-site should be undertaken mid-way through the project. If waste movements are not accounted for, the reasons for this should be established in order to see if and why the record keeping system

has not been maintained. The waste records will be compared with the established recovery/reuse/recycling targets for the site.

Each material type will be examined, in order to see where the largest percentage waste generation is occurring. The waste management methods for each material type will be reviewed in order to highlight how the targets can be achieved.

Upon completion of the C&D phase, a final report will be prepared, summarising the outcomes of waste management processes adopted and the total recycling/reuse/recovery figures for the development.

9.0 CONSULTATION WITH RELEVANT BODIES

9.1 Local Authority

Once the main contractor has been appointed and prior to removal of any waste materials offsite, details of the proposed destination of each waste stream will be provided to the local authority for their approval.

The local authority will also be consulted, as required, throughout the construction phase in order to ensure that all available waste reduction, reuse and recycling opportunities are identified and utilised and that compliant waste management practices are carried out.

9.2 Recycling/Salvage Companies

Companies that specialise in C&D waste management will be contacted to determine their suitability for engagement. Where a waste contractor is engaged, each company will be audited in order to ensure that relevant and up-to-date waste collection permits and facility COR/permits/licences are held. In addition, information regarding individual construction materials will be obtained, including the feasibility of recycling each material, the costs of recycling/reclamation, the means by which the wastes will be collected and transported off-site and the recycling/reclamation process each material will undergo off site.

10.0 REFERENCES

1 Waste Management Act 1996 (No. 10 of 1996) as amended 2001 (No. 36 of 2001), 2003 (No. 27 of 2003) and 2011 (No. 20 of 2011). Subordinate and associated legislation includes:

- European Communities (Waste Directive) Regulations 2011 (S.I. No. 126 of 2011) as amended 2011 (S.I. No. 323 of 2011)
- Waste Management (Collection Permit) Regulations 2007 (S.I No. 820 of 2007) as amended 2008 (S.I. No. 87 of 2008) and 2016 (S.I. No. 24 of 2016)
- Waste Management (Facility Permit and Registration) Regulations 2007 (S.I. No. 821 of 2007) as amended 2008 (S.I. No. 86 of 2008), 2014 (S.I. No. 310 and S.I. No. 546 of 2014) and 2015 (S.I. No. 198 of 2015)
- Waste Management (Licensing) Regulations 2000 (S.I. No. 185 of 2000) as amended 2004 (S.I. No. 395 of 2004) and 2010 (S.I. No. 350 of 2010)
- Waste Management (Planning) Regulations 1997 (S.I. No. 137 of 1997) as amended 1998 (S.I. No. 164 of 1998), 2001 (S.I. No. 356 of 2002) and 2011 (S.I. No. 126 and No. 192 of 2011)
- Waste Management (Landfill Levy) Regulations 2015 (S.I. No. 189 of 2015)
- European Communities (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
- Waste Management (Food Waste) Regulations 2009 (S.I. No. 508 of 2009) as amended 2015 (S.I. No. 190 of 2015)
- European Union (Household Food Waste and Bio-waste) Regulations 2015 (S.I. No. 191 of 2015)
- European Union (Packaging) Regulations 2014 (S.I. No. 282 of 2014) as amended 2015 (S.I. No. 542 of 2015)
- European Union (Waste Electrical and Electronic Equipment) Regulations 2014 (S.I. No. 149 of 2014)
- European Union (Batteries and Accumulators) Regulations 2014 (S.I. No. 283 of 2014) as amended 2014 (S.I. No. 349 of 2014) and 2015 (S.I. No. 347 of 2015)
- Waste Management (Hazardous Waste) Regulations 1998 (S.I. No. 163 of 1998) as amended 2000 (S.I. No. 73 of 2000)
- Waste Management (Shipments of Waste) Regulations 2007 (S.I. No. 419 of 2007) as amended by European Communities (Shipments of Hazardous Waste exclusively within Ireland) Regulations 2011 (S.I. No. 324 of 2011)
- The European Communities (Trans frontier Shipment of Hazardous Waste) Regulations 1988 (S.I. No. 248 of 1988) o European Union (Properties of Waste Which Render It Hazardous) Regulations 2015 (S.I. No. 233 of 2015)

2 Environmental Protection Act 1992 (Act No. 7 of 1992) as amended by the Protection of the Environment Act 2003 (Act No. 27 and S.I. No. 413 of 2003) and amended by the Planning and Development Act 2000 (Act No. 30 of 2000) as amended.

3 Litter Pollution Act 1997 (Act No. 12 of 1997) as amended by the Litter Pollution Regulations 1999 (S.I. No. 359 of 1999) and Protection of the Environment Act 2003, as amended.

4 Eastern-Midlands Waste Region, Eastern-Midlands Region Waste Management Plan 2015 – 2021 (2015).

5 Department of the Environment, Heritage and Local Government (DoEHLG), Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, (2006).

6 FÁS and the Construction Industry Federation (CIF), Construction and Demolition Waste Management – a handbook for Contractors and Site Managers, (2002).

7 Department of Environment and Local Government (DoELG) Waste Management – Changing Our Ways, A Policy Statement (1998).

8 Forum for the Construction Industry, Recycling of Construction and Demolition Waste (1999).

9 Department of Communications, Climate Action and Environment (DCCAE), Waste Action Plan for the Circular Economy - Ireland's National Waste Policy 2020-2025 (Sept 2020).

11 South Dublin County Council (SDCC), Development Plan 2016-2022 (2016)

12 Council Decision 2003/33/EC, establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC.

13 EPA, Waste Classification – List of Waste & Determining if Waste is Hazardous or Non-Hazardous (2015)