Comhairle Contae Chill Dara
Kildare County Council
Planning Department

Date: 6th September 2018
Our ref: 02/1475

WO298-18 01.

An Bord Pleanála,
64 Marlborough Street,
Dublin 1,
D01 V902.

AN BORD PLEANÁLA
TIME _____ BY _____
06 SEP 2018
LTR DATE _____ FROM _____
PL _____

Re: Request for EIS relating to Kildare County Council Planning Reference 02/1475

Dear Leonard,

I refer to our conversation in connection with the above and I attach herewith the following for your information and attention. I have ordered the original file from storage should you require a colour copy.

Environmental Impact Statement **06/08/2002**

Please note that all of the above documents are forwarded to you in compliance with section 128 and section 37(1) (b) of the Planning& Development Act 2000.

Yours faithfully,

Deborah Crummey

Deborah Crummey
Kildare County Council
Planning Department

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NON - TECHNICAL SUMMARY

This document is a non-technical summary of the Environmental Impact Statement submitted as part of the planning application documentation.

Goode Concrete Ltd. is applying to Kildare County Council for permission for the extraction of sand and gravel over an area of 7.8 hectares, associated processing plant, access and access road, shipping office, weighing bridge, wheel wash, staff facilities, and all associated development and landscaping works on an overall site of approximately 13.9 hectares at Ballinderry Townland, Carbury, County Kildare.

Goode Concrete Ltd. operate a sand and gravel extraction and processing plant at Kilglass, Carbury, County Kildare, approximately 1 km south west of the subject site. The proposed development is intended as a replacement reserve for the Kilglass operation which will be exhausted at current rates of extraction in three to four years.

Prior to the exhaustion of the reserves at Kilglass, it is proposed to work the Ballinderry resource as a supplementary supply to the Kilglass operation. The output from the combined plants will be in the order of 600,000 tonnes per annum, which is equivalent to the existing output from the Kilglass operation. It is envisaged that some 200,000 tonnes per annum will be extracted at Ballinderry and c400,000 at Kilglass. Accordingly, there will be no net increase in the quantity of material extracted or the number of traffic movements on the local road network.

DESCRIPTION OF THE SITE

The subject site is located in the townland of Ballinderry, approximately 5 km north of Carbury and 3.5 km south of the N4 junction near Broadford. The total application site measures 13.9 ha (34.4 acres). The lands comprise of 2 no. fields in pasture, separated by a mature hedgerow aligned north to south through the centre of the site.

The lands are bounded to the south by agricultural lands. The eastern and most of the northern boundaries are formed by County Roads. The eastern boundary is also formed by a tributary of the River Glash flowing south to north, passing under the County Road on the northern boundary at Clonuff Bridge.

The site is bounded to the west by the landholding of an established extractive operation under the control of Roadstone Provinces (County Kildare Reg. Ref. 99/1200).

An electricity transmission line traverses the site from west south west to east north east. There is one pylon situated on the site

Killardrick House is situated to the north of the site, and Ballinderry House to the south . Ballinderry House is a protected Structure.

There are three private residences located near the northwest corner of the site and a new house is currently being built adjacent to the northwest corner. There are two houses located directly south of the site, one adjacent to the Carbury-Broadford road and the other located approximately 100m west of the road. There is a scattering of houses north and south of the junction at Clonuff Bridge adjacent the northeastern corner of the site, numbering nine in total.

DESCRIPTION OF THE PROJECT

It is proposed to extract the sand and gravel in five phases. The sand and gravel will be extracted initially to a level of 1 m above the level of the water table utilising interim extraction benches to a preferred height of 7.5m by a front end loader feeding articulated dump trucks for transport to the processing plant area. Thereafter, mineral will be removed by dragline from below watertable.

Soils and overburden will be stripped annually in advance of the main quarrying operation. Stripped soils and overburden will be placed in screening bunds around the site. Materials not required in the lateral screening bunds will be placed in the completed extraction void as each phase is subsequently stripped and the mineral faces are developed.

A minimum margin of 5m will be left to the site boundary before construction of noise and screening bunds. A 30m standoff between the site boundary and outer slope of the noise bund will be allowed to residential properties.

The processing plant to be provided on site includes a washing, screening and stockpiling plant. Water used in the washing plant is passed to a Silt Press, the Finlay Siltmaster, which allows for the continuous removal of silt from the waste water without the need for large settlement ponds.

It is proposed to provide a well on site for potable and process water. Water required for the wheelwash and to top up the washing plant will be provided from the bored well. Trucks leaving the site will pass through the wheelwash to prevent material being carried on to the public road.

The proposed hours of operation for extractive and processing activities are 0700 to 1900 hrs Monday to Friday, and 0800 to 1300 hrs Saturdays. It is not proposed to extract or process material on Sundays or Public Holidays. Material will be loaded and removed from site between the hours of 0700 to 1900 hrs only, Monday to Saturday.

HUMAN BEINGS

Broadford is the closest settlement to the site. It is a local service centre providing a limited range of retail services to the local hinterland population. The village is characterised by linear development fronting the Regional Road, with little in-depth development having occurred. There is a National School on the southern approach to the village.

There are residential dwellings addressing the eastern, north western and western boundaries. The protection of the amenities of these dwellings has been afforded primary consideration in the preparation of the Operational Plan and the Environmental Impact Statement.

No sensitive groups or communities that may be affected by the development have been identified. Due regard has been afforded to the residential amenities of dwellings in the area particularly on the County Road to the north of the site, in the design of the proposed development and provision of mitigation measures.

FLORA AND FAUNA

The site consists of ordinary farmland without features of ecological interest except for a small badger sett in one of the hedges. There is also a stream at the eastern end that could form feeding grounds for salmonid fish fry from the Boyne.

The excavation of gravel will obviously displace the existing communities within the site and create additional areas of disturbed ground. The badgers will be moved before site preparation but most of the hedges with their flora and fauna will be retained.

After the extraction period the site will be returned to farmland suitable for grazing animals.

WATER AND SOILS

The site is characterised by the presence of a hill elongated east-west, ranging in elevation from 81 m mOD on the east, to 94 mOD in the middle of the site.

The groundwater contour map for the sand and gravel aquifer shows a groundwater flow direction toward south east..

A water quality and quantity monitoring program of the wells located in the adjoining areas and mainly of those downgradient (east) from the site could be established if required by the local authority. Furthermore if the activities connected with the proposed development were found to have an adverse impact on the water wells present in the adjoining areas, the developer is prepared to replace the affected supply with an alternative source of water.

The proximity of these wells to the site and the high vulnerability rating for both the aquifers makes these wells possible targets of groundwater pollution originating from the site. However, we have been informed that most of the households in the area are signed on a proposed group water scheme which is expected to be organised in the near future.

It is planned to operate the proposed development with a closed system for mineral washing and a silt press for removal of fines. Moreover it is proposed to build a surface water settlement lagoon on the southern side of the site. These measures together with bunding of fuel tanks and provision of concrete paved machinery parking areas, are believed to significantly reduce the risk of release of pollutants into the adjoining stream.

Given the depth of the sand and gravel immediately beneath the topsoil, the soil can be described as well-drained. The land use is currently pasture, and there is no field evidence to indicate that these are high-grade productive agricultural soils.

AIR & CLIMATE

The principal air and climate impacts that the proposed development may have on the local environment will be from dust arising from site operations.

The following are the principal dust generating activities of the proposed development.

- Excavation of material from the site.
- Stripping of soil and construction of earth mounds around the perimeter of the site.

- Vehicle transport of materials from the site.
- Employee vehicle movements.
- Operation of sand and gravel screening plant.

Dust suppression methods designed to contain any site generated dusts within the site boundaries and therefore minimise the impact on the local environment include the following:

- The construction of earth mounds which will be planted with grass and native species will contribute to the shielding of local houses from dust generated by site activities.
- As the excavation works progress, they will occur further below ground level which will act to reduce windblown dusts.
- The nature of the excavated sand and gravel material which are relatively coarse materials, will reduce the likelihood of them being carried on the wind beyond the site boundaries.
- Regular wetting of material stockpiles, haul roads and other ground areas at the site during dry weather or whenever necessary, will minimise the potential for windblown dusts beyond the site boundaries.
- A wheel wash unit will ensure that all vehicles exiting the site will not carry residual dusty material onto local roads.

All aspects of air quality and in particular dust generation, from the proposed development and their effects on the surrounding environment have been studied. It has been concluded that the proposed mitigation measures will effectively minimise the potential for adverse air quality impacts and in particular from dusts, at residences in the vicinity of the proposed development.

NOISE

It was established during the course of completing the baseline ambient noise survey that the area has noise levels typical of a rural environment in which there is no dominant or continuous noise source. The closest industrial facilities to the proposed site are the existing extractive operation west of the site and the animal slaughtering facility which is located approximately 600m east of the site. From the results of the baseline noise survey it is clear that these existing industrial operations are not dominant sources of noise and do not generate significant noise levels in the area. The most significant source of noise at all the monitoring locations including at the noise sensitive locations, is the movement of traffic along the Third Class Roads and in particular the passing traffic on the Carbury-Ballinderry road.

The construction of screening banks around the periphery of the site is fundamental to the attenuation of noise generated by site operations and therefore the minimisation of noise impacts that may be experienced at nearest noise sensitive receptors.

Noise from the pit workings will be associated with the excavation, recovery, processing and transport of raw materials.

As there is no blasting to be carried out at the Ballinderry site there will be no significant sources of vibration as a result of site operations. It can be concluded that no adverse nuisance effects as a result of ground vibration are predicted for either human beings or for farm animals.

A comprehensive quantitative assessment of the potential noise impacts at nearby residences as a result of operation of the pit has shown that no adverse nuisance impacts will occur as a result of the development.

A minimum buffer zone of 30m between the site perimeter and the screening banks has been maintained to minimise the noise impact on the closest residences to the site from the construction of the screening banks.

Traffic associated with the development is minimal, involving a maximum of approximately 9 truck movements per hour. Approximately 10 car movements per day are also expected. Noise associated with this very low number of vehicle movements will not result in an increase in the existing noise levels in the area.

A comprehensive assessment of the potential noise impacts associated with this development has been completed. There are no adverse noise impacts predicted at noise sensitive receptors in the vicinity of the site as a result of this development.

LANDSCAPE AND RESTORATION

Due to the site's location within a broadly undulating study area there are a number of locations at which the surrounding landscape affords both open and enclosed views. Landform and the high level of mature field boundaries play a large part in screening views to the site. There are however a number of more local views where the site is evident and (due to its steep landform changes) breaks the skyline.

Due to the mixed nature of the study area the application site is evenly representative of areas of landscape found throughout the study zone. Other agricultural areas and woodland blocks build a landscape character of which the site is part. There are a number of elements of disjointed nature, which lower the sensitivity of the surrounding environment, including the overhead power lines and other extractive sites. Within this localised context the sites development for sand and gravel extraction would be of low significance.

Views from the North

Two lengths of grassed bund located on the internal edge of an existing hedge line will help mitigate impacts of the development from local dwellings. A small impact may occur from the construction of the bunds until seeding has become established. The existing hedgerow along the northern boundary length is well established and has been broadly left to develop naturally. The hedgeline is broken in a number of points but when combined with the proposed bunding will limit views into the site.

Views from the East

The existing rise in landform limits views into the site from the adjoining road. Mitigation bunds located internally from standoff boundaries have been created to mimic this effect. Skyline impacts may be evident but the bunding will greatly reduce any further visual effects.

Views from the South

Views to the site from the south and south east are the most prominent – looking into the site at the existing situation. From the east the steeply rising landform limits extensive views into the site. From the south due to broken hedgerows and topographic change a large percentage of the site is visible. In order to mitigate the visual effects of the development,

grassed bunds have been located along the internal boundary edge to the eastern corner of the site. At this point the hedgerow is at its poorest condition and the most expansive views of the site occur. The grassed bund will reduce the impacts of the site development, and will screen the site offices and buildings..

Views from the West

There are few points of sensitivity from the east. The primary impacts would be from the properties in the north eastern corner of the site. Mitigation in this region and along the remaining eastern boundary length consists of 3m grassed bunding. The bunds have been located with the appropriate standoff to the site boundary of 30m provided for acoustic mitigation, and due to this standoff will further mitigate any residual visual effects.

Following completion of the extraction, the site will be restored into a wetland and agricultural area. The stored material used to construct mitigation bunds along the boundary lengths will be re-graded onto the excavated slopes to allow for rapid establishment of grassland species. The rebound water level following extraction will fluctuate due to seasonal variations in groundwater.

MATERIAL ASSETS

The predominant landuses in the area are agriculture (primarily grazing), one off rural residential development, and extractive operations. There are scattered residential properties in the vicinity of the site, primarily one off dwellings on the county roads to the north and east of the site.

Impacts on the land uses and amenities of the area have been assessed in the relevant sections of this EIS. The Operational Plan has been designed to minimise impacts on the receiving environment particularly the protection of residential amenity. Taken in conjunction with the mitigation measures proposed to avoid or reduce potential adverse impacts, there should not be any potential significant long term adverse impacts on the amenities and land uses of the area.

Natural resources in economically workable reserves must be worked where they occur, subject to the satisfactory amelioration and minimisation of adverse impacts on adjoining land uses. In this regard, extraction is generally permitted in principle in rural areas, subject to compliance with environmental standards.

The proposed Operational Plan and mitigation measures should ameliorate environmental impacts to an acceptable standard, and impacts on adjoining land uses should not be significant.

The removal of 13.9 ha from agricultural use is not a significant impact on land use or agriculture in the area. The impact is temporary and short term as the lands will be progressively returned to agricultural use as extraction proceeds through the site.

TRAFFIC AND TRANSPORTATION

At present the site can be accessed from the N4 via local road L1002 (Broadford to Carbury) and L5004 (which makes the Northern boundary of the site). Access to the existing site is made via the L5004.

The M4 realignment is due to be finished by 2006. There will be no interchange between the M4 and the L1002 and therefore the only effect this development will have on the road network will be to reduce base traffic flows.

Projections made for the development indicate that when the Ballinderry site opens in mid-2004, there will be 35 loads (70 movements) transported off site per day, with a maximum load size of 26 tonnes. When the Kilglass reserve has been exhausted in mid-2006, the number of loads transported from the proposed site per day will increase to 105 loads (210 movements). It is not anticipated that there will be any significant increase in traffic movements in the area as the proposed development will essentially only be a staged relocation of the existing production at Kilglass.

In addition to this commercial traffic it is anticipated that there will be approximately 4 car movements per day from 2004 to 2006 and a total of 10 car movements from 2006 onwards.

The Traffic Impact Assessment has proven that the volumes of traffic generated by the proposed quarry at Ballinderry, Co. Kildare, will not have a significant impact on the surrounding road network. All junctions along the proposed haulage route have ample capacity to cater for the development traffic through the lifetime of the operation. The road geometry along the haulage route is also sufficient to allow for the two-way Heavy Goods Vehicular traffic. An important point to note is that there will not be any additional HGV traffic due to the proposed quarry passing any of the residential dwellings along the proposed haulage route.

The existing site access is deemed unsuitable to accommodate Heavy Goods Vehicles and as such a new site access has been proposed. This location was chosen for a variety of reasons. Firstly, to minimise the impact on the residential dwellings situated around Clonuff Bridge Crossroads; secondly, in order to open onto a road of sufficient geometry as to allow the turning of Heavy Goods Vehicles into and out of the Quarry Site; and, finally in order to maximise the sight distances in each direction.

In summary:

- The proposed sand and gravel quarry does not increase traffic movements on the study area road network or the number of Heavy Goods Vehicles passing nearby residential dwellings;
- All junctions along the haulage route operate within capacity;
- The proposed junction access to the site will provide for safe turning of HGVs into and out of the proposed quarry; and
- The proposed junction access is positioned so as to minimise the effect on nearby residential dwellings.

ARCHAEOLOGY AND THE CULTURAL HERITAGE

There are no recorded archaeological sites or monuments within the area proposed for development nor are there any items listed for protection under the existing County Development Plan for Kildare. A stream, which possibly fed a former millrace, and a possible former millpond are both located outside the eastern boundary of the site and

these will not be impacted by the proposals. Also outside the site to the north, on the opposite side of the road, is Kilcandrick House which appears to be of nineteenth-century date. This will not be physically affected by the proposals but there will be a potential visual impact to this house.

The field inspection revealed two primary features of archaeological potential that will require assessment in the form of test trenching prior to any ground disturbance on site. The first, located in the eastern portion of the site, is an east–west linear depression set into the east-facing slope of the gravel ridge. The second, also located in this area, is a very low linear platform or rampart flanking the stream with the occasional field stone on its surface. The east-facing slope of the gravel ridge also contains terracing and possible cultivation ridges which may require recording prior to removal.

In addition, there is potential for as yet unrecorded archaeological remains to exist within the remainder of the proposed development site. As developments involving ground disturbance can severely impact on archaeological remains and deposits, it will be recommended that all site preparation works involving clearance of vegetation, topsoil stripping, and ground reduction are monitored by a qualified archaeologist. This will ensure that any subsurface deposits which may be revealed are properly identified and that the appropriate measures are taken to fully resolve any archaeological issues which the site may present.

The final impact of the proposed development on unrecorded archaeological remains will not be known until the results of archaeological assessment and monitoring become available. These results will be considered in relation to the operational plan which was not available during the preparation of this report.

INTERACTION OF THE FOREGOING

An assessment of interactions between the foregoing aspects of the environment has been undertaken. The interactions identified relate to air quality, noise, water, landscape and traffic; and, flora, fauna, water and the landscape.

These interactions have been identified in the Scoping exercise in advance of the preparation of the EIS, and have been considered in detail in the respective reports included in the relevant Sections above.

1. INTRODUCTION

Goode Concrete Ltd. is applying to Kildare County Council for permission for the extraction of sand and gravel over an area of 7.8 hectares, associated processing plant, access and access road, shipping office, weighing bridge, wheel wash, staff facilities, and all associated development and landscaping works on an overall site of approximately 13.9 hectares at Ballinderry Townland, Carbury, County Kildare.

This Environmental Impact Statement is submitted as part of the planning application documentation.

1.1 Structure and Content Of The EIS

This EIS has been prepared in accordance with the requirements of the following Statutory Instruments:

- *European Communities (Environmental Impact Assessment) Regulations, 1989* (S.I. No. 349 of 1989)
- The *Local Government (Planning and Development) Regulations 2001* (SI No. 600 of 2001).

The content of the EIS has afforded due regard to the information requirements specified in the 1989 Regulations, as amended by the Fifth and Sixth Schedules of the 2001 Regulations, and the Environmental Protection Agency's *Guidelines On The Information To Be Contained In Environmental Impact Statements* and *Advice Notes On Current Practice In The Preparation Of Environmental Impact Statements* (March 2002).

The EIS has been prepared in the 'Grouped Format' structure, which examines each aspect of the environment as a separate section referring to the existing environment, the proposed development, likely impacts, and mitigation measures. The EIS has been systematically organised to provide the following Information:

Section 2	A description of the existing environment.
Section 3	A description of the project.
Sections 4 to 13	Identification of likely significant adverse impacts during construction and operation of the proposed development.
	A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse impacts.
	Alternatives examined by reference to locations, designs and processes, as appropriate.

Impacts arising from the existence of the proposed development, the use of natural resources, the emission of pollutants, the creation of nuisances and the elimination of waste are described as direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative, as appropriate.

An assessment of the environmental sensitivity of geographical areas likely to be affected, as set out in the Sixth Schedule of SI No. 600 of 2001, has also been undertaken. In this regard, no part of the site is situated in or adjacent to areas which would be defined or designated as wetlands; coastal zones; mountain and forest areas; nature reserves and parks; special protection areas; areas in which the environmental quality standards laid down in the legislation of the EU have already been exceeded; densely populated areas; or landscapes of historical, cultural or archaeological significance.

1.2 Difficulties in Compiling the Specified Information

No major difficulties were encountered in compiling the specified information as set out in Fifth and Sixth Schedules of SI No. 600 of 2001. Any relevant difficulties encountered have been identified in the respective sections of the EIS below, as appropriate.

1.3 Specialist Contributors

The preparation of the EIS has been co-ordinated by Declan Brassil & Company. Specialist inputs have been provided by the following Consultants:

Specialist Consultants	Aspect of Environment
Key GeoSolutions, Quarry Designers	Operational Plan/Pit Design
Brassil + Jarvis & Co. Ltd.	Operational Plan/Pit Design
Bernard Murphy & Associates	Landscape and Restoration
Roger Goodwillie & Associates	Water, Soils and Hydrogeology
TMS Environment Ltd.	Ecology
	Air & Climate
	Noise & Vibration
Archaeological Consultancy Services	Archaeology and Cultural Heritage
Oscar Faber	Traffic and Transportation

1.4 Need For The Proposed Development

Goode Concrete Ltd. operate a sand and gravel extraction and processing plant at Kilglass, Carbury, County Kildare, approximately 1 km south west of the subject site. The Kilglass operation comprises of an active sand and gravel pit, washing and screening plant, concrete batching plant and a concrete block plant. The site supplies the Company with approximately 600,000 tonnes per annum for supply of its Kildare and Dublin markets.

The estimated remaining reserve at the Kilglass pit is in the order of approximately 2,000,000 tonnes, providing approximately 3 to 4 years reserves at current output levels. The subject lands at Ballinderry were acquired as a natural extension of the Kilglass reserve, to supply the concrete and block plants on site and the Company's regional market. Goode Concrete attempted to acquire the lands between the Ballinderry site and the Kilglass operation to facilitate direct transportation over its own lands to the processing area by conveyor or dump truck. However, these intervening lands were acquired by Roadstone Provinces Ltd. and it will not be possible to acquire the necessary interest to convey the material by land to the processing area.

Prior to the exhaustion of the reserves at Kilglass, it is proposed to work the Ballinderry resource as a supplementary supply to the Kilglass operation. The output from the combined plants will be in the order of 600,000 tonnes per annum, which is equivalent to the existing output from the Kilglass operation. It is envisaged that some 200,000 tonnes per annum will be extracted at Ballinderry and c400,000 at Kilglass. Accordingly, there will be no net increase in the quantity of material extracted or the number of traffic movements on the local road network.

It is planned that the Ballinderry site, which is the subject of this application, will be operational by mid-2004, subject to the relevant grant of planning permission. On the basis that the Kilglass operation will produce 600,000 tonnes per annum to mid-2004, and 400,000 tonnes per annum thereafter, the reserve will be exhausted by mid-2006. There will be a maximum of two years in which extraction will occur at both sites, providing a suitable transitional period for establishment of the Ballinderry site.

Given the existing level of investment by the Company in the area, the local employment provision and employment and skills required to be retained, the requirement for a source of aggregate close to the existing plant and established markets, and the occurrence of workable reserves in the area, an additional site for extension of operations in the Carbury area was sought. The Ballinderry site was identified and considered to be suitable by reference to the above criteria and with regard to the relatively low density of one-off dwellings in the area, accessibility to the Regional Road network and the established plant, and with regard to the policies and designations contained in the Kildare County Development Plan.

1.5 Site Selection and Consideration of Alternatives

Sand and gravel reserves, must of necessity, be worked where they occur. They represent a significant rural resource. The Ballinderry site was identified and considered to be suitable with regard to the occurrence of workable reserves, its proximity to the site of the established Goode Concrete Ltd. operation at Kilglass, and the relatively low density of dwellings in the immediate area. An assessment was then undertaken with regard to the following criteria:

1. The relative density of dwellings in the area, with particular regard to the likely impact on residential amenities.

2. A review of the site in the context of the County Development Plan, with particular regard to areas, sites, structures or views on or in the vicinity of the site designated for protection or preservation which may preclude or affect the establishment of a sand and gravel extraction operation.

3. Accessibility to the Regional and National Road network.

4. The potential impacts on the visual and rural amenities of the area.

Having established that the site may be suitable for an extractive use, the site was then assessed by detailed site investigation techniques, including geophysics, boreholes and the installation of peizometers. An economically recoverable reserve was identified and it was decided to proceed with this application for permission.

Alternative designs and processes were also considered as part of the Scoping exercise undertaken. The location of the plant was selected to maximise the distance from residential properties and therefore mitigate potential noise, air and visual impacts. The extent of the extractive operations was also designed to retain a 30 m buffer between the visual screening and attenuation bunds and all residential properties. The location of the access was selected to maximise the distance of the access from residential properties to minimise noise impacts associated with accelerating and decelerating traffic, and to maximise the sight distances which can be achieved thereby minimising any traffic hazard.

1.6 Description of the Characteristics of the Proposed Development

In accordance with Article 2(a)(i) of the Sixth Schedule of SI No. 600 of 2001, a description of the physical characteristics of the whole proposed development and the land-use requirements during the construction and operational phases is provided in Section 3, below.

1.7 Characteristics of the Production Processes, Including Nature and Quantity of Materials

In accordance with the requirements of Section 2(a)(ii) of the Sixth Schedule of SI No. 600 of 2001, a description is provided in Section 3 of the main characteristics of the production process and the nature and quantity of materials to be used in the construction process. It is noted that the 'construction' phase of the development is generally limited to overburden removal and storage.

1.7.1 Main Characteristics of the Production Processes

The impacts of the production processes, including construction and operational phases, are addressed as appropriate in sections 3 to 12 below. The principal characteristics of the production process, which involves the extraction of sand and gravel, are described in detail in Section 3.0, below.

1.8 Estimated Type and Quantity of Expected Residues and Emissions (Including Water, Air and Soil Pollution, Noise, Vibration, Light, Heat, and Radiation) resulting when the Development is Operational

In accordance with the requirements of Section 2(a)(iii) of the Sixth Schedule of SI No. 600 of 2001, this EIS has addressed the estimated type and quantity of residues and emissions arising during the operational phase of the proposed development. These matters are addressed in Sections 5 to 9, below.

1.9 Cumulative Impacts

The area in which the site is situated is characterised by extensive proven resources of sand and gravel. There are a number of established extractive operations in the vicinity of the site, including the Goode Concrete operation to the south west, the Roadstone Provinces

operation to the west, and the Kilsaran operation further west. The preparation of this EIS has afforded full regard to the cumulative impact of the established and proposed developments. Particular attention has been afforded to cumulative impacts with regard to dust, noise, traffic, landscape and water. All baseline studies contained in the EIS include for the operation of surrounding pits.

Figure 2.3 provides identifies the indicative location of all sand and gravel pits and quarries in the wider area.

2. DESCRIPTION OF THE SITE

2.1 Site Location

The subject site is located in the townland of Ballinderry, approximately 5 km north of Carbury and 3.5 km south of the N4 junction near Broadford. (Figures 2.1 and 2.2).

2.2 Site Context and Characteristics

The total application site measures 13.9 ha (34.4 acres). The lands comprise of 2 no. fields in pasture, separated by a mature hedgerow aligned north to south through the centre of the site.

The lands are bounded to the south by agricultural lands. The eastern and most of the northern boundaries are formed by County Roads. The eastern boundary is also formed by a tributary of the River Glash flowing south to north, passing under the County Road on the northern boundary at Clonuff Bridge. The watercourse diverges westward from the County Road on the eastern boundary leaving a wedge of land to the north eastern corner of the site which has been managed as a grassed area.

The site is bounded to the west by the landholding of an established extractive operation under the control of Roadstone Provinces (County Kildare Reg. Ref. 99/1200).

The topography of the site is glacial in origin and character, forming a dome rising from the southern and eastern boundaries (81 mAOD and 80 mAOD, respectively) to a high point close to the centre of the site at an elevation of 94.5 mAOD. Elevations on the northern boundary rise from 90 m AOD on the western side to 92 m AOD in the centre, falling to 81 m AOD on the eastern side.

A 220 Kv transmission line traverses the site from west south west to east north east. There is one pylon situated on the site, at an elevation of 84 m AOD. The requirements of the ESB with regard to these power lines have been ascertained and incorporated into the design of the proposed development. (Correspondence with the ESB is included in Appendix 3.1)

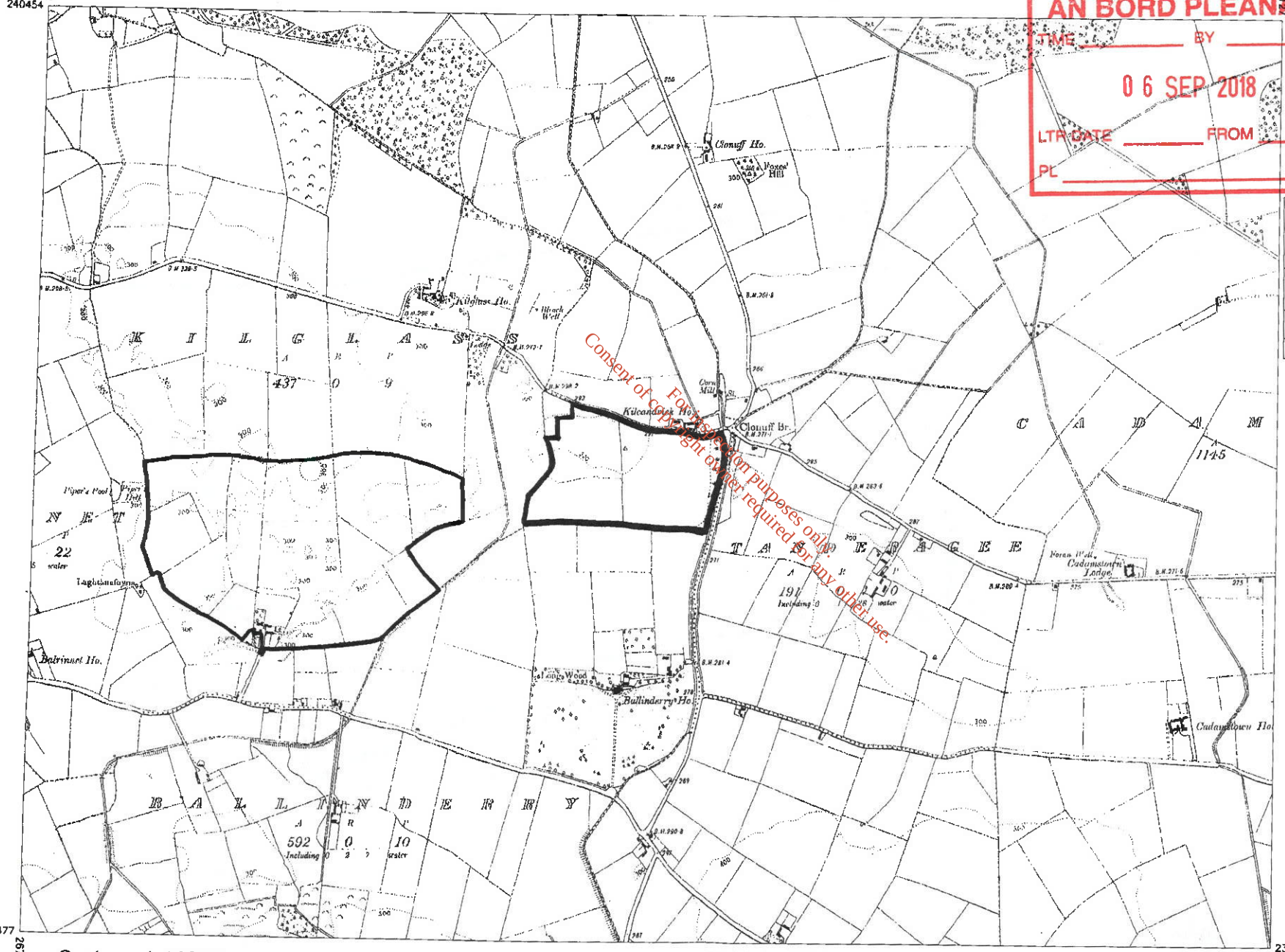
There are residential properties in the vicinity of the site, comprising primarily of one-off dwellings fronting to the County roads to the east and north of the site. There is currently an application for permission for a dwelling adjoining the north western boundary of the site. The preparation of the design of the extractive area and the placement of noise, dust and visual attenuation bunds has assumed that this dwelling will be developed.

Killcandrick House is situated to the north of the site, and Ballinderry House to the south . Ballinderry House is a Protected Structure.

There are three private residences located near the northwest corner of the site and a new house is currently being built adjacent to the northwest corner. There are two houses located directly south of the site, one adjacent to the Carbury-Broadford road and the other located approximately 100m west of the road. There is a scattering of houses north and south of the junction at Clonuff Bridge adjacent the northeastern corner of the site, numbering nine in total.

Surveyed 1836 – 1837
Revised 1909 – 1910
Levelled 0

Record PLACE Map



N

Declan Brassil & Co. Ltd.
Chartered Planning Consultants
4 Cloncourt, Main St., Clonee, Co Me
Tel 01 8013944 Fax 01 801 3945

Figure 2.1: Site Location Ma
OS Sheet No. KE003

Scale: 1:10,560

Client: Goode Concrete Ltd.

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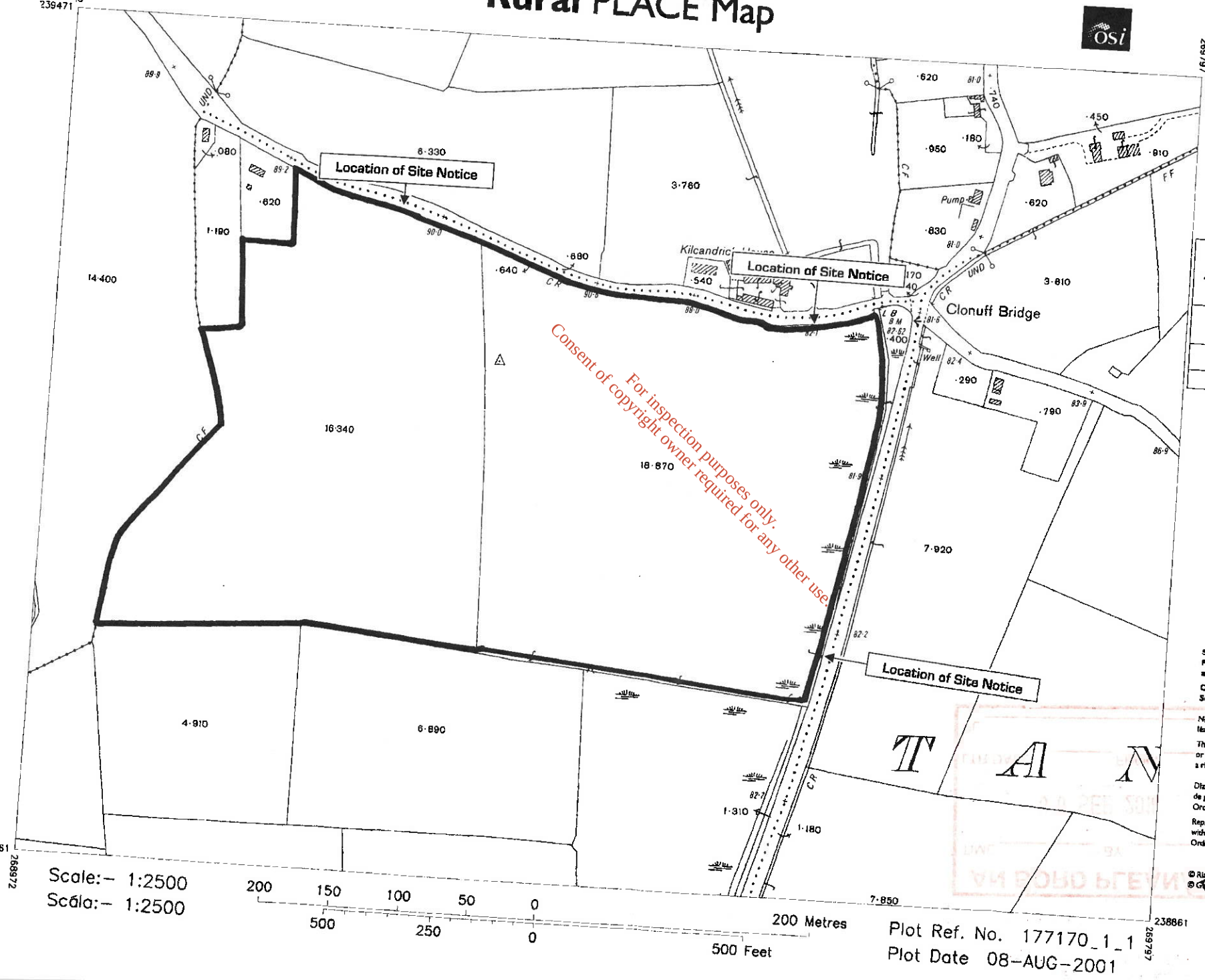
Scale:– 1:10560
Scála:– 1:10560

500 400 300 200 100 0 500 Metres
1000 500 0 1000 Feet

Plot Ref. No. 177170_1_7
Plot Date 08–AUG–2001

Surveyed 0
Revised 1990
Levelled 0

Rural PLACE Map



DESCRIPTION

N

Declan Brassil & Co. Ltd.
Chartered Planning Consultants
4 Cloncourt, Main St., Clonee, Co Me
Tel 01 8013944 Fax 01 801 3945

Figure 2.2: Site Context Ma
Ordnance Survey Nos. KE003-10

Scale: 1:2500

Client: Goode Concrete Ltd.

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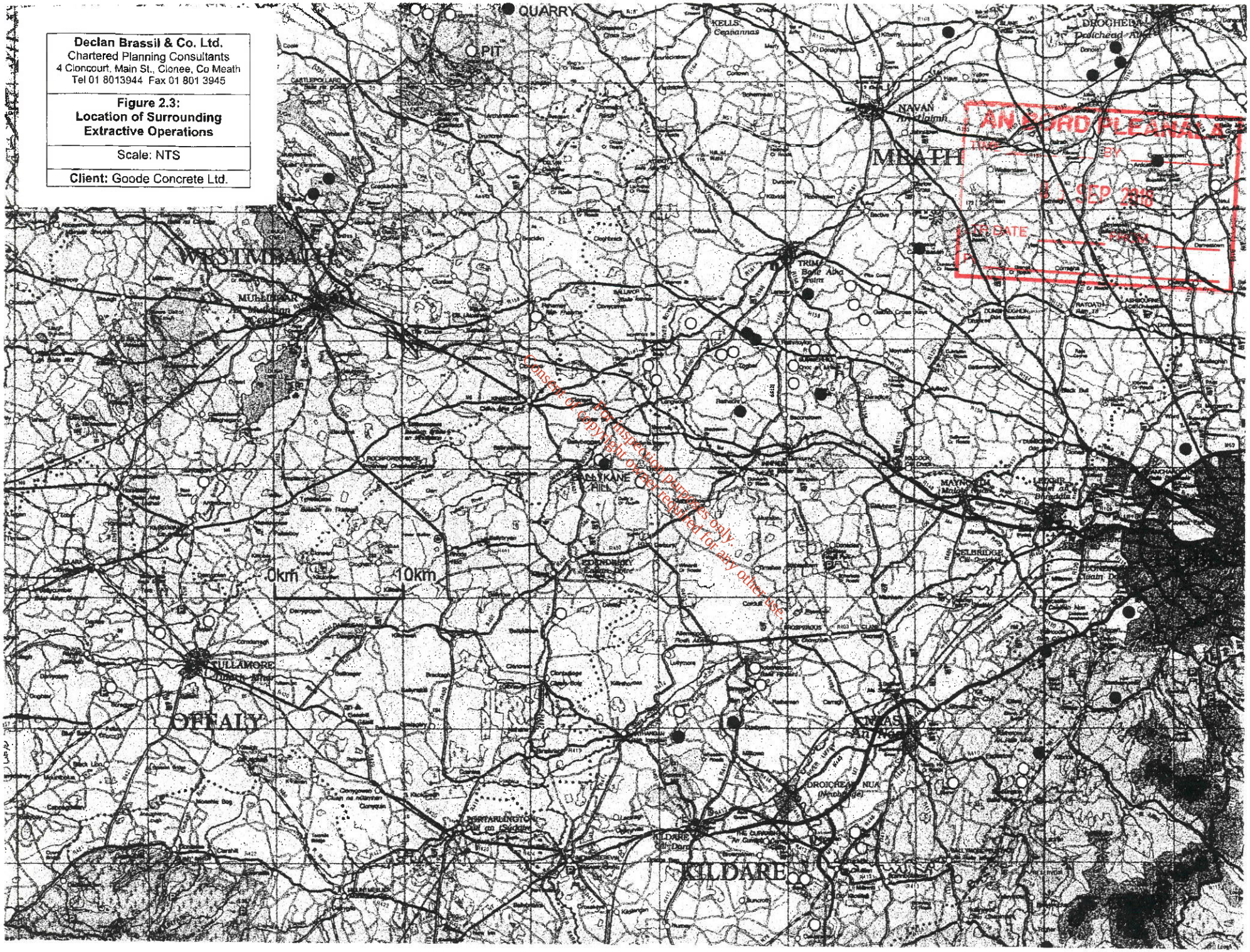
Plot Ref. No. 177170_1_1
Plot Date 08-AUG-2001



3. DESCRIPTION OF THE PROJECT

3.1 Pit Size And Life Span

Goode Concrete Ltd. operate a sand and gravel extraction and processing plant at Kilglass, Carbury, County Kildare, approximately 1 km south west of the subject site. The Kilglass operation comprises of an active sand and gravel pit, washing and screening plant, concrete batching plant and a concrete block plant. The site supplies the Company with approximately 600,000 tonnes per annum for supply of its Kildare and Dublin markets.

The estimated remaining reserve at the Kilglass pit is in the order of approximately 2,000,000 tonnes, providing approximately 3 to 4 years reserves at current output levels. The subject lands at Ballinderry were acquired as a natural extension of the Kilglass reserve, to supply the concrete and block plants on site and the Company's regional market

Prior to the exhaustion of the reserves at Kilglass, it is proposed to work the Ballinderry resource as a supplementary supply to the Kilglass operation. The output from the combined plants will be in the order of 600,000 tonnes per annum, which is equivalent to the existing output from the Kilglass operation. It is envisaged that some 200,000 tonnes per annum will be extracted from the site which is the subject of this application at Ballinderry, and c400,000 at Kilglass.

It is planned that the subject site at Ballinderry will be operational by mid-2004, subject to the relevant grant of planning permission. On the basis that the Kilglass operation will produce 600,000 tonnes per annum to mid-2004, and 400,000 tonnes per annum thereafter, the Kilglass reserve will be exhausted by mid-2006. There will be a maximum of two years in which extraction will occur at both sites, providing a suitable transitional period for establishment of the Ballinderry site.

The estimated reserve on the subject site is in the order of 2.2 million tonnes. On the basis of producing 200,000 tonnes per annum in for the first two years of operation, and 600,000 tonnes per annum thereafter, the estimated life of the reserve is five years. Accordingly, subject to a grant of permission and extractive operations commencing in 2004, the reserve will be exhausted by 2009.

3.2 General Scheme of Working

The total on-site reserve is estimated at approximately 2.2 million tonnes, taken to the maximum proven mineral depth at 70.5m AOD. The plant and stocking area will be initially excavated in mineral to a floor level at approximately 84m AOD before final removal during the final extraction phase.

The level of the permanent watertable beneath the proposed site has been identified as lying between 84 and 75m AOD. The final quarry floor level will be at circa 70.5m AOD, requiring wet working of the mineral below water table by dragline. The mineral above water table will be worked by benching using a front end loader with transport to the processing plant by articulated dump truck.

3.2.1 Site Survey and Geology

A detailed ground survey of the application area was carried out during August 2001 by Precise Control Ltd and has been reproduced as Drawing No. 3.1

The sand and gravel deposits at Ballinderry comprise a thick sequence of Quaternary aged glacial and fluvio-glacial sediments overlying Middle Carboniferous dark grey limestone and shales (Calp).

Four shell and auger exploration boreholes were drilled on site in order to install monitoring standpipes. The location of the boreholes are shown on Map 6.2.2 and the borehole logs are given in Appendix 6.1.

The drilling identified between 0.7 and 4.8m of overburden overlying between 13.1 & 14.1m of sand and gravel. The base of the sand and gravel and depth to bedrock was not proven by drilling.

3.3 Aspects of the Extraction Design

3.3.1 General Extraction Parameters

It is proposed to extract the sand and gravel to approximately 1m above the water table utilising interim extraction benches to a preferred height of 7.5m by a front end loader feeding articulated dump trucks for transport to the processing plant area.

Final production faces will be cut at 1v:2h to facilitate restoration. Main haulage ramps and roads will be 15m wide and cut at 1v:10h. Suitable edge protection for all quarry vehicles will be established.

Extraction below water table will be progressed by a dragline operation casting the excavated material onto a bench for drainage before removal to the processing plant.

Excess soils and overburden not required in the lateral screening bunds will be placed in the completed extraction void as each phase is subsequently stripped and the mineral faces are developed.

It is proposed to minimise water discharge off site by utilising a closed system for mineral washing and utilisation of a silt press for removal of fines. Where possible surface water from the processing plant and access roads will be captured as part of the closed system. A small surface water settlement lagoon (20m by 10m) is proposed on the southern boundary to treat any excess water with a facility for a discharge to the ditch on the southern boundary during peak storm flows.

A minimum margin of 5m will be left to the site boundary before construction of noise and screening bunds. A 30m standoff between the site boundary and outer slope of the noise bund will be allowed to residential properties.

Proposed screening and noise bunds will comprise stripped topsoil, subsoil and minimal overburden built in compacted layers. Soils will be removed from beneath all bunds and stored separately. Where site conditions require a basal drainage layer will be installed. General batters of 1v:3h have been specified for all screening bund slopes facing out of the

application area and 1v:2h slopes for inner facing slopes. All batters will be planted with grass to aid stability and facilitate visual amenity.

The intermediate tower 550 requires a 30x30m frustrum with a maximum 1v:1h extraction slopes. Two areas are defined on the Operational Plan where line sag defines a restriction area requiring prior agreement and supervision by ESB for any soil, overburden and mineral working.

The proposed final extraction profile and phasing arrangement is given on Drawing No. 3.1. Cross-sections through the proposed final extraction profile are given on Drawing No. 3.2

3.4 Operational Plan

The proposed development at Ballinderry can be divided into three broad operational phases:

- **Construction Phase** - establishment of site infrastructure, excavation of the plant and stocking area to circa 84m AOD, construction of initial noise and screening bunds and installation of fixed processing plant.
- **Operational Phase** – a five phase progression of the established development faces above water table by front end loader. Extraction of mineral below water table by dragline. Placement of excess overburden into the completed extraction void.
- **Restoration and Closure Phase** – post extraction restoration and removal of site infrastructure.

3.4.1 Soil and Overburden Stripping Operations

To establish the site infrastructure shown on Figure No. 3.1 soils and overburden will require stripping and placement into storage, noise and screening bunds. Topsoil and subsoil will be stripped from the quarry office, weighbridge, plant/stocking areas, access road and initial extraction area of Phase 1 & 2. It is anticipated some 19,000 m^3 of soils will be made available from this area for the construction of the western and part of the northern screening and noise bunds (see Phase 2-3 Figure No. 3.1). All screening bunds will be seeded with grass to aid stability and facilitate visual amenity.

Soils and overburden will be stripped annually in advance of the main quarrying operation. Overburden will be stripped from the initial phase 1 and 2 extraction areas, plant and stocking areas. It is anticipated that some 17,900 m^3 of overburden will be made available from this area with the excess overburden being stored in a temporary bund located in phases 3 and 4 (see Phase 2-3 Figure No. 3.1).

Prior to the completion of the mineral extraction in phase 2, the 18,000 m^3 in the temporary storage bund and an additional 43,000 m^3 of overburden from phase 3 will be placed in the completed extraction void of phase 2. The soils from phase 3 will be used to complete the northern / eastern screening bund (7,000 m^3) and the southern screening bund (7,400 m^3). Assuming an annual production of 200,000 tonnes it is anticipated the completion of the northern / eastern and southern bunds will be completed after two years.

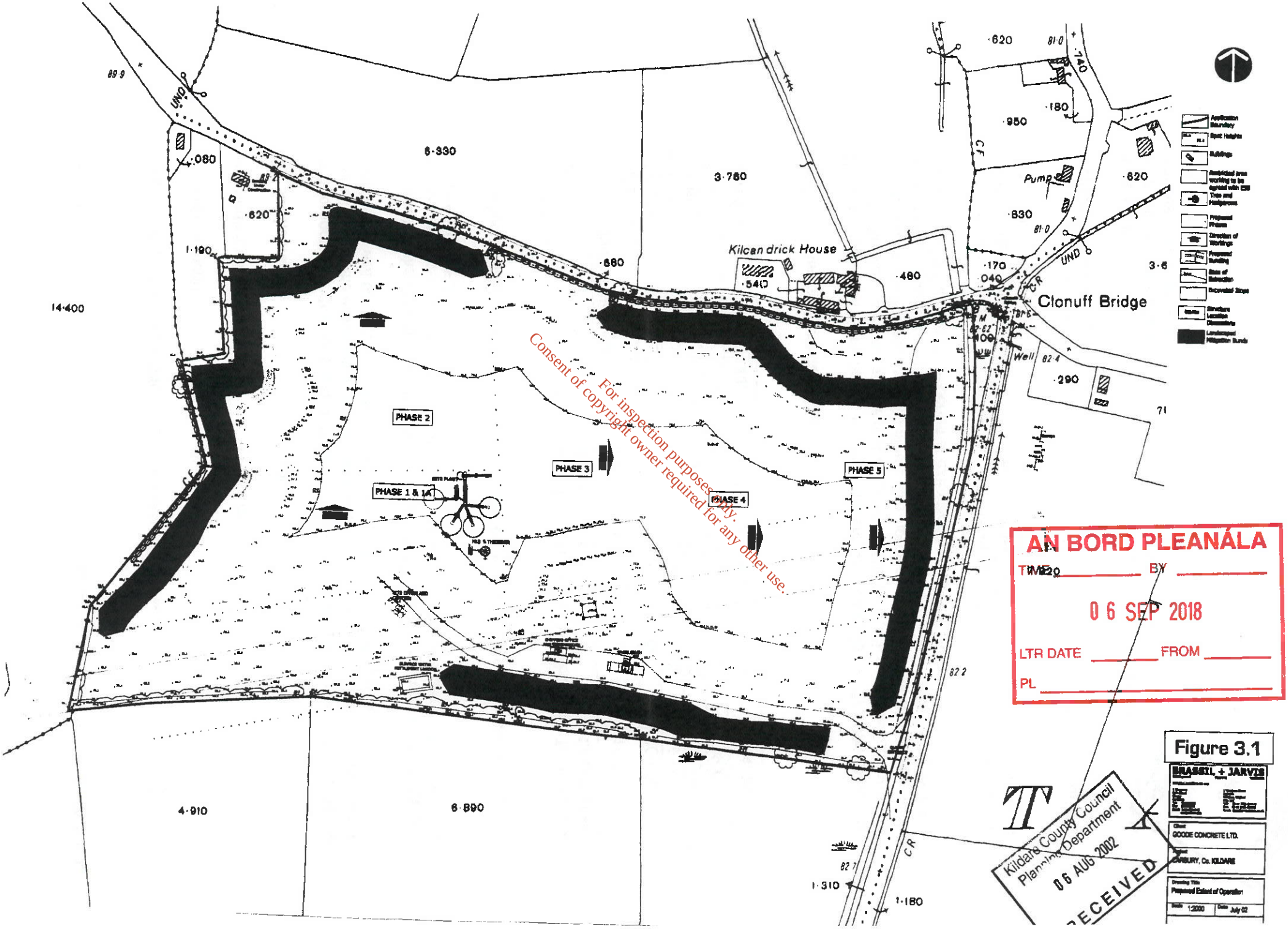


Figure 3.1

BRASSIL + JARVIS

GOODE CONCRETE LTD.

CARBURY, Co. KILDARE

Proposed Extent of Operation

1:2000 July 02

The screening and noise bunds will accommodate the following volumes of material:

- Western bund 14,200 m^3
- Northern & Eastern bund 11,800 m^3
- Southern bund 7,400 m^3

It is proposed to strip soils and overburden progressively for phase 4 and 5 prior to the completion of the extraction from the previous phase to allow continuous production. The overburden will be placed into the completed extraction void of the previous phase.

Removal of the soils and overburden from the phase 4 and 5 powerline restricted area shown by cross-hatching on the Operational Plan, will require prior agreement and supervision by ESB.

The schedule of soils and overburden to be released from the site by phase are as follows:

Phase	Topsoil @ 0.3m	Subsoil @ 0.3m	Total Soils m 3	Overburden	Total Soils & Overburden
Phase 1 (plant & stocking area)	4,300	4,300	8,600	8,100	16,700
Phase 2	5,100	5,100	10,200	9,800	20,000
Phase 3	6,200	6,200	12,400	44,400	56,800
Phase 4	6,000	6,000	12,000	31,900	43,900
Phase 5	1,900	1,900	3,800	3,600	7,400
TOTALS	**23,500**	**23,500**	**47,000**	**97,800**	**144,800**

3.4.2 Mineral Extraction Phases

The initial extraction from phase 1 requires the removal of 28,500 m^3 (77,000t) of mineral to create the plant and stocking areas at circa 84m AOD level. Face progression following the plant area development will continue in a northerly direction into the progressively rising ground of phase 2. The majority of the hedgeline on the eastern side of phases 1 and 2 will be retained for the entire period of extraction from both phases.

Initially mineral will be removed over the entirety of phase 2 to 1m above the permanent water table by a series of stepped benches excavated by front end loader and articulated dump truck.

Final extraction of mineral to the nominal 70.5m AOD level will be achieved by use of a dragline for extraction of the mineral below water table.

Subsequent extraction of the mineral in phases 3, 4 and 5 will be progressed in an easterly direction. As with phase 2, mineral will be extracted progressively to 1m above the permanent water table by front end loader and articulated dump truck. Thereafter mineral will be removed by dragline from below watertable.

It is proposed to strip soils and overburden progressively for each phase prior to the completion of the extraction from the previous mineral phase to allow continuous production. The overburden will be placed into the completed extraction void of the previous phase.

Mineral extraction from the phase 4 and 5 powerline restricted area (shown by cross-hatching on the Operational Plan), will require prior agreement and supervision by ESB.

The final phase of extraction (phase 1A) will require the progressive removal of the stocking area and eventually the processing plant to release the remaining reserves. Approximately 128,000t of mineral from below watertable will be removed by bulk haul operations for processing at the Kilglass operation.

3.5 Phasing of Excavation and Rehabilitation

3.5.1 Processing Plant

The processing plant to be provided on site includes a washing, screening and stockpiling plant. Material is loaded by shovel from a surge stockpile into a hopper and hydrascreen which screens 20 to 100 mm material. Oversize material is removed by a grid on the hopper. Smaller material is passed to a second hydrascreen. Material over 5 mm is screened and passed to four stockpiles (0-5 mm, 5-10 mm, 10-14 mm and 15 to 20 mm). Oversize material from each stage of the washing and screening process is returned to the surge hopper for re-crushing before being returned to the washing and screening circuit.

Water used in the washing plant is passed to a Silt Press, which allows for the continuous removal of silt from the waste water without the need for large settlement ponds.

3.6 Washing and Handling of Silt

It is proposed to use a Finlay Siltmaster and CDE Silt Press as illustrated on Drawing Nos. 3121501 and MLE18-33, respectively. This plant facilitates the operation of a 'closed' stem, whereby all water used in the Finlay plant is fed to the Silt Press separates the silt from the water and returns the clean water to the washing plant.

The clean water which leaves the Siltmaster is gravity fed to a storage tank for re-use in the washing plant. A ballcock is installed on the freshwater line to the storage tank to compensate for water removed from the site in the sand and stone products.

Silt is discharged to storage bays. The silt is removed as required from the bays and will be used in the progressive restoration of the lands.

3.7 Water Supply

It is proposed to provide a well on site for top up of the washing plant, to supply the wheel wash and for potable supply. A water well with an anticipated demand of 1000 gallons per day will be required to meet these demands. The well will be located on the southern part of the site, close to the plant area. This is the lowest part of the site and the maximum distance from any producing wells in the area.

The well will be constructed with a 4 inch screen and 4 inch casing. The well screen will be placed over the whole length of the productive depth range. Clean gravel will be used to backfill the space around the screen. The top of the borehole will be sealed to prevent surface water entering the well and aquifer. The rate of proposed extraction is relatively low and the effect would not be considered to be highly significant.

3.8 Relationship of Extraction to the Water Table

It is proposed to extract material from below the level of the water table using a dragline, as described above. No dewatering of the site will be required.

Full details of site investigation works undertaken and impacts on hydrogeology are set out in Section 6.0, below.

3.9 Truck Wash Facilities

It is proposed to provide a wheelwash on site, at the location indicated on Figure 3.1.

Water required for the wheelwash will be provided from the bored well. Trucks leaving the site will pass through the wheelwash to prevent material being carried on to the public road.

3.10 Security

The site entrance will be secured by a 2 m high steel hinged gates supported on 2 m piers. A 1.5 m high capped wall will be constructed at the entrance. The gates will be locked outside of normal working hours.

The boundaries of the pit will be securely fenced, in accordance with the requirements of the Mines and Quarries Acts and Regulations. Signs will be posted at regular intervals to aid in preventing trespass on the site. Warning signs, notifying road users of the entrance, will be erected in conspicuous locations, agreed in advance with the Planning Authority.

3.11 Hours Of Operation

The proposed hours of operation for extractive and processing activities are 0700 to 1900 hrs Monday to Friday, and 0800 to 1300 hrs Saturdays. It is not proposed to extract or process material on Sundays or Public Holidays.

Material will be loaded and removed from site between the hours of 0700 to 1900 hrs only, Monday to Saturday.

4. HUMAN BEINGS

Human beings comprise the most important elements of the environment. In carrying out development one of the principal concerns is that people should experience no diminution in their quality of life as a consequence of the construction and operational phases of development. Ultimately, all the effects of a development on the environment impinge upon human beings, directly and indirectly, positively and negatively. Direct effects include such matters as safety, air and water quality, noise and landscape quality. Indirect effects pertain to such matters as flora, fauna and road traffic.

4.1 Receiving Environment

The subject site is located in the townland of Ballinderry, approximately 5 km north of Carbury and 3.5 km south of the N4 junction near Broadford. Broadford is the closest settlement to the site. It is a local service centre providing a limited range of retail services to the local hinterland population. The village is characterised by linear development fronting the Regional Road, with little in-depth development having occurred. There is a National School on the southern approach to the village.

There are residential dwellings addressing the eastern, north western and western boundaries. The protection of the amenities of these dwellings has been afforded primary consideration in the preparation of the Operational Plan and the Environmental Impact Statement.

Ballinderry House, a Protected Structure, is situated approximately 0.5 kms to the south of the site. The House appears to be currently unoccupied and in need of repair.

No sensitive groups or communities that may be affected by the development have been identified. Due regard has been afforded to the residential amenities of dwellings in the area, in the design of the proposed development and provision of mitigation measures, particularly on the County Road to the north of the site.

4.2 Potential Impacts

The likely significant direct effects on human beings associated with the proposed development relate to potential impacts on water and water supply, air quality, noise, landscape change, and public and employee health and safety. Indirect impacts relate to potential effects on flora and fauna.

A positive direct impact of the proposed development is the provision of an alternative secure source of employment for the rural workforce in the area.

4.2.1 Health And Safety

Potential impacts on the health and safety of the public and of employees relate primarily to concerns about humans and animals entering the extraction area, and the health and safety of employees on site.

4.2.2 Water, Air Quality, Noise and Landscape Impacts

The nature and extent of potential impacts envisaged in respect of water, air quality, noise and landscape are addressed in detail in Sections 6.0, 7.0, 8.0 and 9.0, below.

4.2.3 Flora and Fauna

The nature and extent of potential indirect impacts arising to flora and fauna are detailed in Section 5.0, below.

4.3 Mitigation Measures

4.3.1 Health And Safety

Extraction will be carried out in accordance with the best extractive practices and the site will be restored to agricultural use when extraction has been completed.

Fencing will be erected around the lands being excavated for the safety of the general public and to prevent livestock straying into the excavated areas.

It is the policy of the Applicant Company to ensure the health and welfare of employees by maintaining a safe working environment and safe systems of work. This policy is based on the requirements of employment legislation, including the provisions of the *Safety, Health and Welfare at Work Act, 1989*, and the relevant Mines and Quarries Regulations.

4.3.2 Water, Air Quality, Noise and Landscape

The potential direct impacts arising to water, air quality, noise and landscape and proposed measures, where necessary, to ameliorate any adverse effects are envisaged are addressed in detail in Sections 6.0, 7.0, 8.0 and 9.0, below.

4.3.3 Flora and Fauna

The potential indirect impacts and associated mitigation measures arising to flora and fauna are detailed in Section 5.0 below.

5. FLORA AND FAUNA

5.1 Introduction

The site at Ballinderry consists of the southern part of a ridge of glacial deposits which is aligned roughly E-W and included in two large fields. It is bounded by roads on the north and east and by low-lying fields on the other sides.

The area was visited in April 2002 when it was investigated by means of a Phase I Habitat Survey (JNCC 1991).

5.2 Habitats & Vegetation

The fields are in grass and the habitat best considered as improved agricultural grassland (GA1 in Fossitt 2000). There are places where nutrient input is less, for example on the steepest parts of the slopes and on the wet ground in the south-west corner and here traces of semi-natural grassland survive, either dry calcareous and neutral grassland (GS1) or wet grassland (GS4). These however are small and grade into the main field.

Hedgerows (WL1) are the only other habitat except for the eroding stream (FW1) at the eastern edge, along the roadside.

5.2.1 Grassland

The predominant vegetation in the fields is a mixture of ryegrass *Lolium perenne* and crested dogstail *Cynosurus cristatus* with some meadowgrass *Poa trivialis* and *P.pratensis*. Cocksfoot *Dactylis glomerata*, creeping bent *Agrostis stolonifera*, scutch *Elytrigia repens* and red fescue *Festuca rubra* occur around the edges. There are a few associated broad-leaved species, e.g.

Ranunculus repens	creeping buttercup
Trifolium repens	white clover
Bellis perennis	daisy
Cerastium fontanum	mouse-ear
Stellaria graminea	field stitchwort
Hypochaeris radicata	catsear

On the steeper slopes in the field, especially on the eastern side overlooking the road and in the south-west corner there is ground that cannot be fertilised. A greater level of diversity persists here, adding

Plantago lanceolata	ribwort plantain
Rumex acetosa	sorrel
Prunella vulgaris	self-heal
Ranunculus bulbosus	bulbous buttercup
Achillea millefolium	yarrow
Luzula campestris	woodrush
Lotus corniculatus	birdsfoot trefoil
Rhytidiadelphus squarrosus	a moss
Camptothecium lutescens	"

The extent of this latter vegetation is quite limited in the whole, covering perhaps 0.3 ha.

The ridge runs down to low-lying ground in the south-west corner where there is wet grassland on soft ground, poached by cattle. Creeping bent *Agrostis stolonifera* is dominant here with some Yorkshire fog *Holcus lanatus* and timothy *Phleum pratense* and a quantity of soft rush *Juncus effusus* and yellow flag *Iris pseudacorus*. Additional species indicate some nutrient enrichment, e.g. broad-leaved dock *Rumex obtusifolius*, curled dock *R.crispus* and creeping buttercup *Ranunculus repens*.

The last distinct stand of grass is at the eastern end of the site where an old floodplain, now probably never flooded, has a mixture of Yorkshire fog *Holcus lanatus*, sweet vernal grass *Anthoxanthum odoratum*, rough-stalked meadowgrass *Poa trivialis* and false oat *Arrhenatherum elatius*.

5.2.2 Hedgerows

Hedges surround both fields though the central one has lost its purpose and is gappy. Hawthorn *Crataegus monogyna* is the main species used though blackthorn *Prunus spinosa* is frequent along the northern boundary and elder *Sambucus nigra* scattered everywhere. The peripheral hedges contain small trees, usually ash *Fraxinus excelsior* of 8-10 m but with elm *Ulmus procera* and holly *Ilex aquifolium* opposite Kilcandrick House.

The hedges are set on a bank which is grazed and retains woodland or shade plants, for example

Geum urbanum	wood avens
Glechoma hederacea	ground ivy
Rumex sanguineus	wood dock
Anthriscus sylvestris	cow parsley
Viola riviniana	violet
Arum maculatum	lords-and-ladies
Primula vulgaris	primrose
Polystichum setiferum	shield fern
Veronica chamaedrys	germander speedwell
Geranium robertianum	herb robert
Ranunculus ficaria	lesser celandine
Vicia sepium	bush vetch
Cardamine flexuosa	wavy bittercress
Moehringia trinervia	three-nerved sandwort

The road hedge along the northern edge adds honeysuckle *Lonicera periclymenum*, gorse *Ulex europaeus*, wild rose *Rosa canina*, comfrey *Symphytum officinale*, hartstongue *Phyllitis scolopendrium*, male fern *Dryopteris filix-mas*, polypody *Polypodium vulgare* and wild strawberry *Fragaria vesca*.

5.2.3 Stream

The site extends to the stream along the road at the eastern end, which runs in a channel of about 2m wide. In general the stream is fringed by tall plants of great willowherb *Epilobium hirsutum*, meadowsweet *Filipendula ulmaria*, wild angelica *Angelica sylvestris*, hard rush *Juncus inflexus*, yellow flag *Iris pseudacorus* and tufted hairgrass *Deschampsia cespitosa* but there are some willow shrubs *Salix cinerea* and small alder trees *Alnus glutinosa* at the northern end. Additional species near the water include fool's watercress *Apium nodiflorum*, toad rush *Juncus bufonius* and brooklime *Veronica beccabunga*. The eastern side below the road has a noticeable density of wild strawberry *Fragaria vesca* as well as nipplewort *Lapsana commune*, hartstongue *Phyllitis scolopendrium* and the moss *Calliergon cuspidatum*.

An associated drain forming the southern boundary contains wet grass - sweet grass *Glyceria fluitans*, soft rush *Juncus effusus*, hard rush *J.inflexus* as well as red clover *Trifolium pratense* and cinquefoil *Potentilla reptans*.

5.2.4 Adjacent Habitats

The site is surrounded by farmland and there are no other habitats visible except hedges and tree lines.

5.3 Fauna

The mammal fauna includes badger, fox, rabbit and brown rat with the likelihood of hare and field mouse. There is a small badger sett on the central field boundary and many rabbit burrows also around the field edges. The sett was active in spring 2002 but its small size suggests that may be an outlying one in sporadic use.

The bird fauna is limited because of the general lack of cover but widespread 'field' species were recorded, i.e. woodpigeon, hooded crow, rook, jackdaw and starling. The hedges supported song thrush, blackbird, dunnock, wren, robin, blue tit, long-tailed tit, chaffinch and linnet and there are likely to be one of two whitethroats in summer.

In autumn this type of farmland is frequented by wintering thrushes (fieldfare and redwing) but regular flocks of waders - curlew or golden plover are unlikely due to the proximity of roads.

The stream has a stony bed and seems suitable for use as a salmonid nursery water. It is part of the Boyne system which has important populations of both salmon and trout.

5.4 Evaluation

The habitats on site are typical of the local countryside and are not of significant interest. Glacial deposits sometimes have species-rich grassland of interest but in this case the vegetation has been so fertilised and grazed that such diversity has been reduced. It is suggested by the vegetation on the steeper slopes at the eastern end but even here there are no species of particular interest.

The sandwort *Moehringia trinervia* is the least common plant seen but it is frequent in hedges in the limestone east midlands.

No features of the fauna are of particular interest though the occurrence of the badger should be noted.

5.4.1 Designations

The site is not included in any area with an ecological designation (pNHA, SAC, SPA) and is unlikely to be so. The nearest such area is the proposed Natural Heritage Area Carbury Bog (Code No 1388) which is to the south in the Barrow catchment. There is no ecological connection of Ballinderry with this area.

The Boyne is designated as a salmonid water under the EU Freshwater Fish Directive (78/659/EEC) but this extends only to the main channel.

5.5 Impacts of Development

Mineral extraction brings about the removal of existing habitat and the ecological communities that have developed there, the possibility of sediment loss to local streams, the creation of disturbed soils favouring ruderal or weed species and on rehabilitation, the potential for habitat development once more, either natural or hastened by planting.

In this case the peripheral (though not the central) hedge will be retained so that a proportion of the flora and fauna will survive during development. Storage of overburden will take place in marginal bunds which will develop a fringe of tall-growing agricultural weeds such as thistles *Cirsium* spp, docks *Rumex* spp, dyer's rocket *Reseda luteola*, mallow *Malva sylvestris* and false oat grass *Arrhenatherum elatius*. Annual plants of disturbed soils such as *Arenaria serpyllifolia* and pineapple weed *Matricaria discoidea* will colonise the rest of the site, being introduced by vehicles. The current bird fauna of the hedges will feed on adjacent land though there will be a small reduction in it.

The small settlement lagoon will provide a new temporary habitat for organisms but it is unlikely to be colonised by many species as long as extraction is carried on at a high level. Release of water to the stream on the eastern side will be regulated strictly to prevent the loss of suspended solids to the stream. There is adequate flat ground alongside it to allow for additional ponds if necessary.

Site rehabilitation will involve the restoration of some agricultural land in due course. There is not sufficient diversity in the local flora to create species-rich grassland.

Overall the extraction of gravel will modify the habitat for as long as it goes on but will not lead to significant loss in the flora and fauna of the locality. There will of course be local changes to the plants, birds and mammals of the site.

5.6 Mitigation Measures

The badgers will be removed by trapping in conjunction with Dúchas before soil stripping takes place.

Site clearance will be carried out outside the March-August period to prevent disturbance to nesting birds.

Arrangements for water release from the site to the stream will be discussed with the local Fisheries Board before the construction of facilities.

5.7 References

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

JNCC (Joint Nature Conservation Committee) 1991 *Handbook for Phase I habitat survey - a technique for environmental audit*. Peterborough.

6. WATER AND SOILS

6.1 Introduction & Background

Goode Concrete Ltd. is applying to Kildare County Council for the development of a sand and gravel quarry in the townland of Ballinderry, Carbury, Co. Kildare. An Environmental Impact Statement (EIS) is to be submitted as part of the Application. BMA GeoServices Ltd. was requested by Declan Brassil & Company Ltd., acting on behalf of the developer, to compile the Soil and Water section of the above-mentioned Environmental Impact Statement.

6.1.1 Objectives

The objective of this study was to:

- Review the geological and hydrogeological conditions at the site, assessing the impact of the proposed development on the hydrogeology and soils of the area;
- Advise on pit design and mitigation measures
- Determine the presence of sand and gravel resources;
- Estimate the thickness of the sand/gravel deposits and provide an estimate of the reserve.

6.1.2 Scope of work

The scope of work involved:

- A review of the existing data on the region;
- A walkover of the site;
- A well survey in a radius of 500 m from the proposed pit;
- Undertaking a Wenner Constant Separation survey and 2D-Resistivity profiles.
- An assessment of the hydrogeological characteristics of the area, and of the effect the proposed development is likely to have on the same;

6.1.3 Location and Description

The site is located on the south west of Clonuff Bridge, along the road from Carbury to Broadford, approximately 8 km north-east of Edenderry (see Map 6.1.3).

The site is characterised by the presence of a hill elongated east-west, ranging in elevation from 81 m mOD on the east, to 94 mOD in the middle of the site.
The present use of the site is for grazing cattle.

Legend

- Site Location
- CD Calp
- AWed Allenwood Formation, Edenderry Oolite Formation
- WA Waulsortian Limestones
- V Volcanics
- Stratigraphic Boundary
- Fault
- Strike and Dip of Bedding

From Ordnance Survey Map – Discovery Series 49, 1997

Drawn: Kevin Galvin Ver: 160920 Updated: April 2018 Checked: Davide Galazzi Signed: Dir	Title: MAP 6.1.3 SITE LOCATION AND REGIONAL GEOLOGY	Job: CARBURY SAND & GRAVEL	Client: GOODE CONCRETE	Dwg No: 897/1	BMA GeoServices Ltd. Ground Engineering Consultants Comhairleoirí Cré-Innealtóireachta BMA, GeoServices Ltd., Strawhall Business Park, Athy Road, Carlow, Ireland. Phone: 353-503-34488 Mobile: 087-2477923 Fax: 353-503-34490 E-mail: bmacarlow@bma.ie

6.2 Geology

6.2.1 Regional Geology

The study area is located in the "Portarlington Trough" (see Map 6.1.3), a geologically low area elongated NE-SW which possibly formed a depositional basin between the geologically highs of the Kildare Shelf to the west and the Edenderry Shelf to the east, which were both deposited in shallow water. Material coming from both the adjacent shelf areas is found in the thick sequences of muds and muddy limestones present in the "Portarlington Trough", indicating that this was a sedimentary as well as structural low.

The regional geological map for the area (GSI, 1995) indicates that the area is underlain by dark-grey to black limestone and shale (Calp) of Lower to Middle Carboniferous age.

Widespread Quaternary glaciation shaped the landscape of the area, leaving behind mainly non cohesive glacial and fluvio-glacial sediments, which constitute a thick blanket covering the Carboniferous rocks.

Intensive faulting is reported in the areas of the Kildare Shelf and Edenderry Shelf, with a main trend NE-SW, but with numerous faults with a NW-SE direction. Faults with a N-S direction are also presents in these areas.

No major faults are reported on the GSI map in the area adjacent to the site, with the exception of a fault with an East-West direction, which crosses the site in its north-west corner.

No evidence of mining activity is reported in the immediate vicinity of the area. The GSI geological map reports a prospect for Zinc located in the Allenwood area, ca. 17 km to the south east. Quarrying for extraction of sand and gravel is common in the area, with a quarry operated by Roadstone to the west side of the site. Goode Concrete operates another pit to the south west.

6.2.2 Local Geology and Soils

No bedrock outcrops are recorded on the 6" GSI field datasheets within the site. An outcrop of a bluish limestone dipping WSW is reported along the road from a field survey conducted prior to 1859. This record is consistent with the presence of Calp limestone underneath the Quaternary sediments. However this outcrop was not found in successive visits.

A total of 4 no. boreholes, each of 20 cm in diameter, were drilled on site between the 14th and the 28th of July 2001 by I.G.S.L. following instructions from Goode Concrete (BH1-3A)). A further borehole (BH4) was drilled on site by Dempsey, drilling contractors, following instruction by BMA GeoServices Ltd. The boreholes' logs (see Appendix 6.1) indicate the following lithological sequence:

Lithological unit	Thickness (m)
Clay and sandy silt with occasional lenses of sand	0.0-3.9
Grey-brown fine to coarse gravel with cobbles and boulders, with lenses of brown sand, silty at times.	5.2-14.0

It should be noted that none of the boreholes was drilled to bedrock, and therefore that that the thickness of the overburden is expected to be in excess of 20 m, as indicated by the geophysical survey (see Section 6.4 and Appendix 6.2).

Geophysical investigation carried out in the area (see Appendix 6.2) indicates the presence of ca.10 m of gravelly clay overlying approximately 10-25 m of sand and gravel. The thickness of the sand and gravel deposits reported to be quite consistent through the site, with the exception of the low area close to the southern boundary.

6.3 Hydrogeology

6.3.1 Regional Hydrogeology

As reported in section 6.2.1 of the present report, the site is underlined by the lithotypes of the Calp formation. This geological formation constitutes a very variable interval, dominated by fine grained and argillaceous limestones and shales. The permeability in these rocks depends almost entirely on fracturing (secondary permeability) and in further enhancement by karstification. The development of karst features in this lithotype in the area are not expected nor reported to be particularly significant and consequently this formation is generally classified as unproductive, except in fractured zones. However more permeable strata are reported to be present within this formation, which are sometimes thought to be responsible for well yields higher than expected. Furthermore the same geological formation is classified as Locally Important Aquifer in Co. Meath, where it constitutes the main aquifer used for public supply, with well yields reported to be up to 400 m^3/d (GSI, 1995).

Quaternary aquifers are known to be present in sand and gravel deposits in various part of country. They are generally of small dimension but sometimes can provide relatively high yields, and are therefore sometimes classified as Locally Important Aquifer. Groundwater flow in sand and gravel deposits is intergranular (primary permeability).

6.3.2 Hydrogeology of the Ballinderry Area

Water strikes were encountered during drilling operation in the sand and gravel, indicating the presence of groundwater in the Quaternary deposits, suggesting the possibility that these deposits could constitute a Locally Important Aquifer. It was consequently decided to complete the boreholes as groundwater monitoring wells.

A total of 3 no. monitoring wells have been installed on site by I.G.S.L. following Goode Concrete instructions (MW 1-3, see Map 6.2.2). Details of the monitoring wells completion are available only for MW1, which was completed with the installation of a 5 cm in diameter standpipe, screened from the end of the borehole (eob) to 4.00 m below ground level (bgl). No information is available on the installation of a gravel pack around the standpipes and/or of bentonite caps.

A fourth monitoring well (MW4) was installed on site by Dempsey, drilling contractors, following instructions by BMA GeoServices Ltd.

The construction details of all the monitoring wells are reported in Appendix 6.1 together with the boreholes' logs.

Groundwater levels were measured on 23rd April 2002 and are reported in Table 6.3.2§ 1.

Table 6.3.2§ 1 Groundwater Levels

Well ID	Ground Elevation	Measuring Pt Elevation (mp)	Water Levels	
	mOD	mOD	mbmp	mOD
MW1	93.73	94.09	9.68	84.41
MW2	94.22	94.62	14.81	79.81
MW3	89.31	89.59	14.32	75.27
MW4	91.67	92.02	12.22	79.80

The groundwater contour map for the sand and gravel aquifer (Map 6.2.3) shows a groundwater flow direction toward south east.

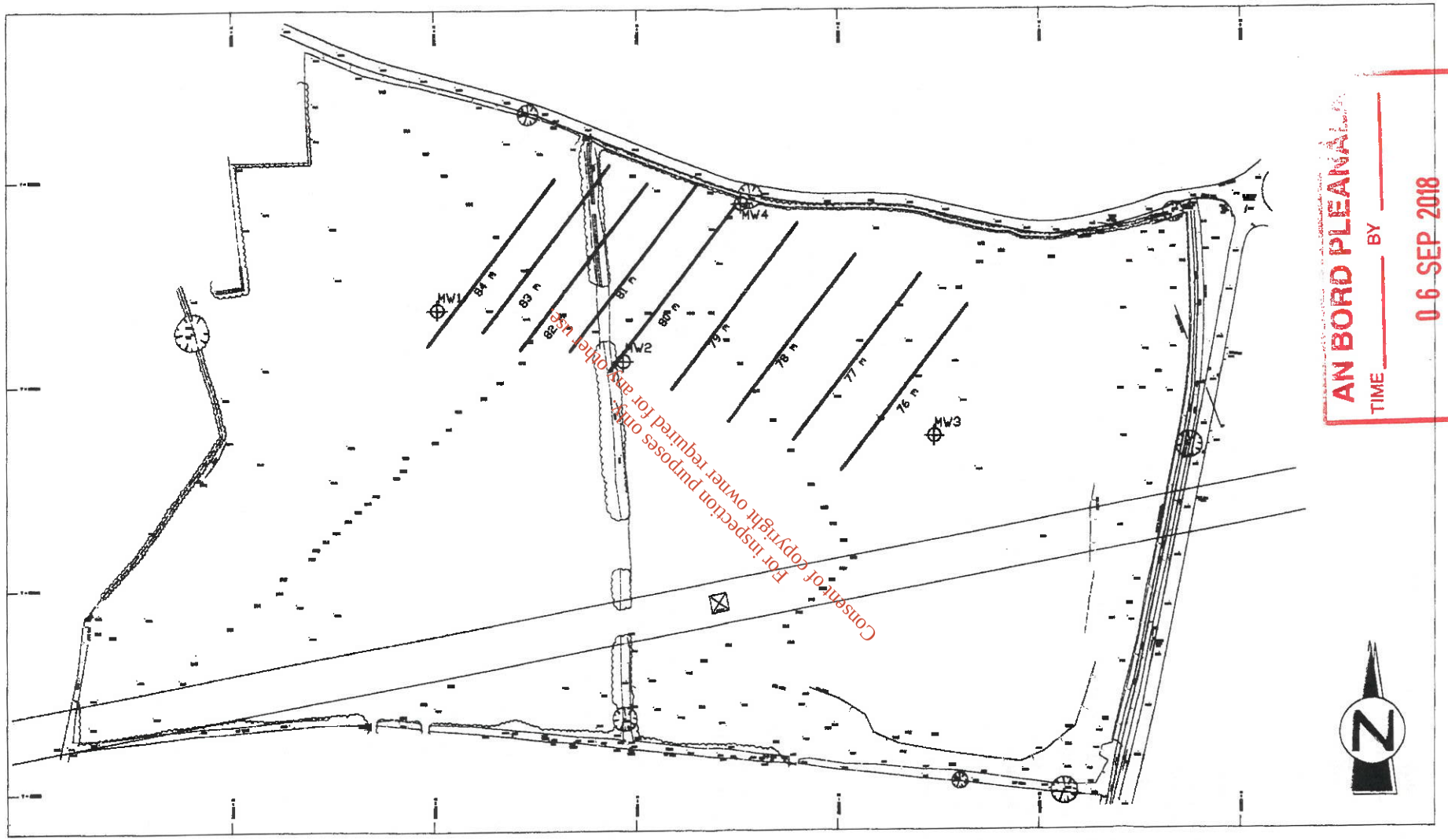
As reported in the previous section the bedrock in the area is generally considered to be an unproductive aquifer, with the exception of fractured zones. The presence of a fault in the north-west corner of the site could represent one of these areas of higher permeability. Well cards from the GSI database indicate the presence of four water wells in the area close to the fault. Three of these wells are reported to have a depth of ca. 15 m below ground level, and one of these is reported to have a yield of 98 m^3/d, which suggests a possible installation in bedrock.

6.3.3 Groundwater Vulnerability

As reported in Section 6.2.2 the highly permeable layer of sand and gravel is overlaid by a layer of moderately permeable silty sand or sandy silt (thickness up to ca. 5 m), which is covered in places by a layer of clay, with a maximum thickness of ca. 2.0 m. Consequently the vulnerability rating for the sand and gravel aquifer is "high" following the guidelines published by the Geological Survey of Ireland in their Groundwater Protection Schemes (1999). The vulnerability rating could rise to "extreme" if following excavation a total thickness < 3.0 m of sand and gravel were left above the groundwater table.

No information was collected during the ground investigations undertaken for this EIS in relation to the depth to bedrock. Boreholes' logs and geophysical profiles indicate the presence of a cover of highly permeable loose sediments (sand and gravel), with minor contribution of low permeability material (clay), with an overall thickness in excess of 20 m. Therefore, unless the presence at greater depths of a layer of low permeability material at least 5 m thick is shown by further investigations, the vulnerability rating for the bedrock aquifer is "high". The proposed excavation of the overlaying sand and gravel will not affect the vulnerability rating as long as a cover of a minimum of 3 m of high permeability material is maintained in place.

It should be noted that the possibility of an artesian or semi-artesian nature of the bedrock aquifer couldn't be excluded at this stage. This could represent a factor reducing the risk of ingress of suspended solids or other contaminants in the bedrock aquifer.



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Legend: Monitoring Well MW1

Drawn: Deirdre Gallard
Design: 1/ 2005
Date: Apr 2005
Checked: Deirdre Gallard

Title: MAP 6.2.3 Piezometric Map of the Quaternary Aquifer

Job: CARBURY SAND & GRAVEL

Client: Goode Concrete Ltd.

Dwg No:

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6.3.4 Well Survey

A well survey was conducted in the area with radius of ca. 500 m from the site. A total of 20 no. private wells was found to be present in the area, serving a total of 20 households, 5 farms and one abattoir. The water is used for both human and animal consumption as well as for the activities of the abattoir. From the information collected it is not clear if the water wells utilise water from the bedrock or from the sand and gravel deposits.

It is planned to extract sand and gravel to ca. 4 m below the present overburden groundwater table level with the use of a drag line. This is not believed to have a permanent significant detrimental effect on the quality of water from the wells present in the surrounding areas. Wet working of the site by dragline may have a detrimental effect on the yield of the surrounding wells. The impact of this aspect of the proposed development can not be estimated at this stage. It is recommended that a water quality and quantity monitoring program of the wells located in the adjoining areas and mainly of those downgradient (east) from the site should be established. If the activities connected with the proposed development are found to have an adverse impact on the water wells present in the adjoining areas, the developer is prepared to replace the affected supply with an alternative source of water.

The proximity of these wells to the site and the high vulnerability rating for both the aquifers makes these wells possible targets of groundwater pollution originating from the site. However we have been informed that most of the households in the area are signed on a proposed group water scheme which is expected to be organised in the near future.

We have also been informed of the presence of a spring in the northeastern corner of the site. According to the information reported this spring was covered with concrete slabs some years ago. However no spring was detected on site, nor is reported on the GSI database or on the Ordnance Survey of Ireland maps.

6.3.5 Surface Water

A drain is present along the southern boundary of the site. Inspections carried out during successive site visits revealed that this drain carried no water even during periods of intensive rainfall. However, the possibility of water being present in this drain as a consequence of significantly rise of groundwater level following prolonged heavy rainfalls could not be excluded. At the southeastern corner of the site this drain joins a stream, which runs along the road on the east of the site. The stream carries a quite significant amount of water and could be the receptor of groundwater from the sand and gravel deposit. This stream appears to discharge into the River Glash, a tributary of the River Boyne, to the north of the site. The River Glash has been monitored by the Environmental Protection Agency under the Surface Water Quality Monitoring Scheme (Station Code 07G020400) at the Clonuff Bridge, ca. 3.5 km NNW of the site). Chemical data are not available but the analysis of biological data results in this river been classified "Slightly Polluted".

It is planned to operate the proposed development with a closed system for mineral washing and a silt press for removal of fines. Moreover it is proposed to build a small surface water settlement lagoon on the southern side of the site. These measures together with bunding of fuel tanks and provision of concrete paved machinery parking areas, are believed to significantly reduce the risk of release of pollutants into the stream.

6.4 Geophysical Investigations

Geophysical investigation was undertaken on the area during the month of January 2002. The investigation consisted of Wenner Constant Separation and 2D Resistivity surveys. The investigation revealed the existence of 15-20 m of sand and gravel deposits over the majority of the site with the exception of the southern boundary. The estimated potential sand and gravel equals to 2,150,226 tonnes. The full report on the geophysical investigations is attached in Appendix 6.2.

6.4 Soils

As noted above, the soil type on the site can be characterised as 'clay and sandy silt with occasional lenses of sand'. Given the depth of the sand and gravel immediately beneath the topsoil, the soil can be described as well-drained. The land use is currently pasture, and there is no field evidence to indicate that these are high-grade productive agricultural soils. It has not been possible to establish if the soils are of a 'Class A' type as described in the 1999 County Development Plan, since this system of soil classification has been redundant for some years, and is no longer used by Teagasc or any other bodies. No records are available for the agricultural soil type in this location.

6.5 Conclusions

a) The site is underlain by the lithotypes (limestone with shales) of the Calp formation. The Calp formation in the area it is generally considered unproductive. However it should be noted that the same geological formation is classified as "Locally Important Aquifer" in Co. Meath.

b) Bedrock is covered by at least 5-15 m of sand and gravel and up to 4 m of sandy silt and clay. The sand and gravel deposit is a potential Locally Important Aquifer. However there are no clear indications of a local utilisation of this aquifer.

c) The presence of more than 3 m of high permeability subsoil above the overburden groundwater table results in vulnerability rating of "high". However, as it is proposed to extract material to 4 m below the level of the groundwater table in the overburden, the vulnerability rating will rise to "extreme".

d) In the absence of indication of the presence of a layer of low permeability material at greater depths, the provisional vulnerability rating for the bedrock aquifer is "high". This rating could change to "extreme" if a cover of less than 3 m in thickness of high permeability material is left in place following excavation.

e) A total of 20 no. water wells providing water for human consumption and industrial use are present in a radius of 500 m from the site. The proposed development is not believed to have a significant detrimental impact on the groundwater quality. Dewatering connected to quarrying is expected to have an adverse effect on the well yield. A groundwater quality and level monitoring program could be established in agreement with the local authority. We have been informed that most of the households in the area are signed on a proposed group water scheme, which is expected to be organised in the near future. However the developer is prepared to

replace the wells used for domestic or agricultural water supply, if these are found to have been subject to an adverse impact due to the proposed development.

f) A stream tributary of the River Glash runs along the eastern border of the site. The River Glash is classified "Slightly Polluted" by the EPA. Adequate measures to prevent release of suspended solids or other pollutants into the river, such as closed water system, suspended solids lagoon, bunding of fuel tanks, provision of concrete paved machinery parking areas with a run-off water collection system will be implemented.

g) Geophysical surveys carried out on site indicate the presence of ca. 2,150,226 tonnes of sand and gravel.

7. AIR, DUST AND CLIMATIC FACTORS

7.1 The Proposed Development

Goode Concrete Ltd propose to develop a sand and gravel extraction operation at Ballinderry, Carbury, Co. Kildare, as a supplementary supply to the nearby Kilglass sand and gravel processing plant. It is proposed to develop an extraction area of approximately 7.9 ha with an anticipated production rate of up to 200,000 tonnes per year initially, rising to 600,000 per annum for the last two years of operation. This section of the EIS deals with the impacts of the proposed development on air and climate in the vicinity of the proposed development.

7.2 The Existing Environment

7.2.1 Climate

The magnitude of potential impacts of emissions from the proposed development will be substantially influenced by the local meteorological conditions, in particular by wind speed and direction and also by precipitation rates, so an evaluation of climatological conditions at the site is important when completing an assessment of the type being undertaken in this study.

Ireland's climate is subject to strong maritime influences with the effects decreasing as distance from the Atlantic coast increases. Since the island is very small with no part of the country being further than 120 km from the sea, the range of mean temperatures across the country is narrow. Data from Met Éireann, the Irish Meteorological Service, who maintain monitoring stations at a number of locations around the country, indicates that January and February are generally the coldest months of the year, and most areas of the eastern half of the country have 750 – 1100 mm/annum rainfall.

The nearest continuous meteorological monitoring station to the site of the proposed development is at Casement Aerodrome, Baldonnel, which is approximately 38 km to the east of the development site. A comprehensive data set for Casement Aerodrome is available for the period 1992 – 1996. Comprehensive data is also available from Dublin Airport, which is approximately 40 km from the development site and also to the east. Both sets of meteorological data were obtained from Met Éireann and have been used to assess the climatological conditions at the site. There are no significant mountains or other geographical features between the meteorological stations and the proposed site that would alter the prevailing weather conditions between the two locations.

Analysis of the data from Casement Aerodrome shows that the dominant wind direction is from the S-SW-W quadrant with an annual incidence of about 60% as shown in the Windrose Plot, Appendix 7.1. The annual average wind speed is in excess of 5 m/s with wind speeds of < 3 m/s occurring for just 19% of the year. Wind speeds in excess of 5 m/s occur for 65% of the year. A summary of wind speed occurrences for the period 1992 - 1996 is presented in Table 7.1.

Table 7.1 Frequency of wind direction and wind speed for Casement Aerodrome (1992 – 1996)

Direction		Percentage Occurrence of Wind Speeds (m/s)						
		< 1.54	1.54 – 3.09	3.09 – 5.14	5.14 – 8.23	8.23 – 10.8	> 10.80	Total
N	0	0.944	0.822	0.736	0.171	0.005	< 0.001	2.678
	22.5	0.604	0.518	0.428	0.260	0.042	0.012	1.864
NE	45	0.631	0.583	0.641	0.469	0.122		2.446
	67.5	0.936	1.157	1.417	0.784	0.110	< 0.001	4.409
E	90	1.799	2.654	3.186	1.923	0.495	0.005	10.123
	112.5	0.789	1.070	0.871	0.615	0.155	0.066	3.603
SE	135	0.682	0.686	0.653	0.538	0.146	0.103	2.780
	157.5	0.619	0.622	0.643	0.519	0.162	0.075	2.699
S	180	0.901	1.170	1.496	1.475	0.801	0.134	6.808
	202.5	0.762	1.197	1.747	2.895	2.052	0.965	10.315
SW	225	0.881	1.859	2.984	4.792	3.050	1.662	15.529
	247.5	1.315	2.403	3.526	4.869	2.608	1.963	16.184
W	270	1.840	2.461	3.013	3.219	1.460	1.463	12.920
	292.5	0.863	0.819	0.801	0.608	0.120	0.927	3.232
NW	315.0	0.631	0.698	0.693	0.260	0.052	0.021	2.334
	337.5	0.650	0.566	0.554	0.272	0.026	< 0.001	2.092
							0.024	
TOTAL		14.8	19.3	23.4	23.7	11.4	7.4	100

Mean monthly temperatures and precipitation rates for Casement Aerodrome are given in Table 7.2. Mean monthly temperatures for the area are in the range 5.4 to 15.3 °C, with mean monthly precipitation rates in the range 49.6 mm in June to 80.6 mm in January. The mean annual precipitation rate for the area is 757 mm.

Table 7.2 Mean monthly temperature and rainfall for Casement Aerodrome (1992 – 1996)

Month	Mean Temperature, °C	Mean rainfall, mm
January	5.5	80.6
February	5.4	62.1
March	6.3	59.1
April	8.2	57.9
May	10.0	68.2
June	13.6	49.6
July	15.3	56.2
August	14.7	54.0
September	12.1	54.5
October	9.6	61.0
November	7.3	76.1
December	5.0	77.6

Analysis of the data from Dublin Airport for the period 1996 - 2000 shows that the dominant wind direction is from the SSW-SW-W quadrant with an annual incidence of about 37% as shown in the Windrose Plot, Appendix 7.2. The annual average wind speed is 5.3 m/s with wind speeds of < 3 m/s occurring for 28% of the year. Wind speeds in excess of 5 m/s occur for 44% of the year. A summary of wind speed occurrences for the period 1996 - 2000 is presented in Table 7.3.

Table 7.3 Frequency of wind speeds for Dublin Airport (1996 – 2000)

Direction	Percentage Occurrence of Wind Speeds (m/s)						
	< 1.54	1.54 – 3.09	3.09 – 5.14	5.14 – 8.23	8.23 – 10.8	> 10.80	Total
TOTAL	**8.0**	**19.6**	**28.7**	**29.5**	**10.3**	**3.9**	**100**

Mean monthly temperatures and precipitation rates for Dublin Airport are given in Table 7.4. Mean monthly temperatures for the area are in the range 5.0 to 15.1 °C, with mean monthly precipitation rates in the range 49.9 mm in July to 75.6 mm in December. The mean annual precipitation rate for the area is 733 mm.

Table 7.4 Mean monthly temperature and rainfall for Dublin Airport (1961 – 1990)

Month	Mean Temperature, °C	Mean rainfall, mm
January	5.0	69.4
February	5.0	50.4
March	6.3	53.8
April	7.9	50.7
May	10.5	55.1
June	13.4	56.0
July	15.1	49.9
August	14.9	70.5
September	13.1	66.7
October	10.6	69.7
November	7.0	64.7
December	5.9	75.6

The two sets of meteorological data evaluated are very similar, except that calm conditions appear to be more likely at Dublin Airport than at Casement Aerodrome. Due to the proximity of both measurement sites to Ballinderry, both data sets are expected to be broadly representative of conditions at the proposed development site.

7.2.2 Air Quality

The site of the proposed development is located in the townland of Ballinderry, approximately 5km north of the town of Carbury, Co. Kildare. Information on the environmental setting of the site was obtained from Ordnance Survey Ireland Maps and from site visits by TMS Environment Ltd. personnel. The area in the vicinity of the site is free from any significant industrial activities, however, there is an established extractive operation bounding the site to the west and there is an animal slaughtering facility approximately 600m to the east of the site. The surrounding lands are predominantly used for mixed agricultural purposes. The N4 National Primary Route passes to the north of the site at a distance of approximately 3.5km from the nearest site boundary. The site is bordered on the northern and western boundaries by Third Class Roads. The road running along the western boundary joins the villages of Broadford and Carbury and is the busier of the two roads.

There are three private residences located near the northwest corner of the site and a new house is currently being built adjacent to the northwest corner. There are two houses located directly south of the site, one adjacent to the Carbury-Broadford road and the other located approximately 100m west of the road. There is a scattering of houses north and south of the junction at Clonuff Bridge adjacent the northeastern corner of the site, numbering nine in total.

The site of the proposed development is located in a predominantly rural - agricultural area. The ambient air quality in the region is expected to be influenced primarily by emissions from domestic heating sources, vehicle exhaust emissions and some minor

contributions from agricultural activities. The existing extractive operation adjacent to the site is also expected to contribute to dust deposition rates in the area.

Ambient air quality in Ireland is monitored by the County Councils and Corporations and also by the EPA. There are 20 networks that monitor sulphur dioxide in Ireland and four sites monitoring smoke and SO_2 are located in Kildare. Data for SO_2 was available in the EPA Air Quality Monitoring Annual Report for 1999 and 2000. The annual median SO_2 concentration is reported as 13 $\mu g/m^3$ for 1999 and 12$\mu g/m^3$ for 2000.

Annual mean concentrations of sulphur dioxide in rural areas are expected to be in the range 3 - 6 $\mu g/m^3$ and 25 – 100 $\mu g/m^3$ in urban locations (World Health Organisation: Guidelines for Air Quality May 2000).

There are also 40 networks that monitor smoke in Ireland. Data for smoke was available in the EPA Air Quality Monitoring Annual Report for 1999 and 2000. The daily average concentrations of smoke (24-hour averaging period) at all monitoring locations did not exceed 150 $\mu g/m^3$ during the 2000/2001 monitoring period. The 98-percentile values for the networks were typically below 50 $\mu g/m^3$. Specific data from four monitoring locations in Kildare (Celbridge, Leixlip, Naas and Newbridge) returned daily mean values and 98-percentile values of 10 $\mu g/m^3$ and 38 $\mu g/m^3$ respectively.

Smoke levels in sparsely populated rural areas such as the area in the vicinity of the site of this development are expected to be significantly lower.

Air quality standards and guidelines are available from a number of sources. The guidelines and standards referenced in this report include those from the European Union, Ireland and WHO. Air quality standards are developed at different levels for different purposes. European legislation on air quality has been framed in terms of two categories, limit values and guide values. Limit values are concentrations that cannot be exceeded and are based on WHO guidelines for the protection of human health. Guide values are set as a long-term precautionary measure for the protection of human health and the environment. The existing ambient air quality is expected to meet the requirements of all relevant legislation.

The ambient air quality in the region is therefore expected to be influenced primarily by emissions from domestic heating sources, the adjacent extraction operation and some contributions from agricultural activities. Passing traffic on the adjoining Third Class Roads is also expected to contribute to the level of local ambient air pollution.

The terrain in the vicinity of the site is quite simple, with the site being located on relatively flat land. Due to the nature of the proposed development, the potential impact on air quality will be that of dust deposition. In order to assess this potential impact, it is first necessary to assess the existing levels of dust deposition in the vicinity of the site. A baseline study of dust deposition rates at the site of the proposed development area was completed and detailed results can be found in Appendix 7.2. A summary of this study is presented in Table 7.5.

Air quality at the site is representative of an unpolluted rural environment. Studies conducted by TMS Environment Ltd in similar rural environments typically give results of 30 – 100 mg/m^2-day which is consistent with the results obtained during the current survey. Clearly the existing extractive operation bordering the west of the proposed site is not adversely impacting on air quality in the area.

Table 7.5 Existing Dust Deposition Rates

Air quality parameter	Existing ambient air concentration	Air quality guideline
Dust deposition rate, mg/m^2-day	51 – 154[1]	350[2]

[1] The dust deposition survey was carried out over a 17-day period.

[2] There are no National Ambient Air Quality Standards, EU Standards or WHO guidelines for dust deposition rate; a level of 350 mg/m^2-day when measured using Bergerhoff Dust gauges, is a commonly applied nuisance threshold for this parameter.

Dust levels in rural atmospheres can be influenced by local activities such as cultivation and vehicle movements on unsealed access-ways. The deposited dust level will decrease with increasing distance from the source of the dust.

Typical dust deposition rates in rural environments are low and in the range 0 – 100 mg/m^2-day with values of up to 150 – 180 mg/m^2-day in urban environments when measured using Standard Method VDI 2119 (Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method) German Institute). There are no national or European Union air quality standards with which these levels of dust deposition can be compared. However, a figure of 350 mg/m^2-day is commonly applied to ensure that no nuisance effects will result from specified industrial activities.

Industrial activities such as this can generally be operated to ensure that there is no nuisance as a result of the activities. Mitigation measures are recommended to ensure that the effects-based threshold of no nuisance is complied with during the operational phase of the sand and gravel pit. The proposed mitigation measures are discussed in Section 7.5 of this report.

7.3 Impact Identification

7.3.1 Construction

The proposed development at the site will involve extraction and storage of extracted material. The development plan proposes to develop the area of extraction and use the extracted materials as a supplementary supply to the Kilglass sand and gravel operation.
The initial construction phase of the development is expected to extend over a short timeframe and will consist primarily of ground preparation activities and construction of screening banks. The construction works for the sand and gravel pit will involve activities that have the potential to release pollutants to the atmosphere. The main emission to atmosphere as a result of the construction activities will be particulate matter from the following sources:

- earthmoving operations during the overburden stripping phase;
- temporary storage of excavated materials;
- the transfer of materials to the storage and screening mounds;
- construction of mounds and bunds at the site perimeters for screening and/or storage of materials; and
- construction of site buildings and installation of screening plant.

Emissions from construction vehicle movements are considered separately in Section 7.3.4 of this report.

7.3.2 Extraction operation

The total area of the extended limestone quarry will be ca 7.8 ha with an anticipated production rate of up to 600,000 tonnes per year rising to 600,000 The pit depth will be 15 to 25m when fully developed. Blasting will not be required for the recovery of any raw materials. A screening deck will be located on the pit floor, at the southwestern corner of the site, close to the working face and material will be stockpiled in this location for transfer off-site. The most significant potential impacts arise from particulate matter emissions.

The main sources with the potential to give rise to emissions of particulate matter are summarised as follows:

- exposed surfaces such as material stockpiles;
- road and yard surfaces;
- excavation activities;
- material transfer operations and associated vehicle movements.

The main potential impact of emissions from quarry activities is the incremental contribution to airborne particulate matter concentrations and the dust deposition rate. The particulate emissions from the extraction activity are expected to be in the 10 – 75 µm size range, so the dominant impact of this activity will be the impact on dust deposition rates.

The most significant of the potential emission sources are associated with mechanical handling operations and material transfer operations. The entrainment of particulate matter from windblow across exposed sources is also potentially significant.

Management practices and mitigation measures planned for minimising the potential particulate matter emissions are presented in Section 7.5 of this report. These measures will effectively control dust emissions from the site during the operational phase.

7.3.3 Screening Plant

A mobile screening deck will be located on the pit floor in the south west corner of the site. The main potential for emissions from the screening plant will be that of particulate matter. Emissions of particulate matter are associated with:

- delivery of extracted raw materials to the plant;
- handling of raw materials and processed materials;
- screening operations; and
- spillage.

Appropriate control technologies and management practices for minimising the potential for particulate matter emission are discussed in Section 7.5. Similarly, management practices in relation to internal haul road and yard surfaces will minimise the potential for fugitive particulate emissions from these sources.

7.3.4 Traffic

The movement of Heavy Goods Vehicles (HGVs), internal movements of construction vehicles and vehicle movements associated with construction personnel will contribute to emissions of gaseous pollutants such as sulphur dioxide, nitrogen oxides, carbon monoxide and traces of VOCs. In addition, the HGVs will contribute to PM_{10} emissions from the diesel engines. The overall contribution of construction traffic to pollutant emissions is not expected to be significant in comparison to vehicle movements on local roads.

During the operational phase it is estimated that a maximum of approximately 9 trucks per hour will enter and leave the site as a result of transport of extracted material from the site per day. In addition there will be approximately 10 car movements associated with site personnel. Since the number of vehicle movements is relatively low, there are no adverse impacts on ambient air quality predicted as a result of the traffic movements associated with the operation of the pit.

The movement of vehicles over haul roads and the access road may generate dust emissions in dry, windy conditions. Appropriate control technologies and management practices for minimising the potential for particulate matter emission are discussed in Section 7.5. Similarly, management practices in relation to internal haul road and yard surfaces will minimise the potential for fugitive particulate emissions from these sources.

7.4 Impact Assessment

7.4.1 Construction

There is the potential for dust emissions to create a nuisance in terms of deposited particulate matter, especially during the construction phase of the proposed development. Finer soils that will be stripped during the excavation phase, temporary storage of materials and the construction of the screening and storage bunds at the limits of the extraction area are the most likely operations to create nuisance from deposited dust. This is because the nature of the materials in the overburden will include finer particulates, such as clay and soil, which have the potential to carry and deposit further than the particulate matter that will be generated in the operational phase of the pit.

The construction phase, in particular bund construction and overburden removal, will be the worst case in terms of potential nuisance because the excavation and construction activities will be closer to the neighbouring residences than activities during the operational phase. In particular the minimum distance between construction activities and the nearest residences will be 40 metres during bund construction along the western and northern boundaries of the site. Particulate matter deposition as a function of particle size and distance from the source is discussed in detail in Section 7.4.2 below.

Any effects as a result of construction will be relatively short-term and effective dust management practices will be followed in order to minimise the potential impacts from construction activities. The management practices recommended for the construction phase are discussed in Section 7.5.

7.4.2 Pit Operation

The main potential impact on ambient air quality from extraction activities will be that associated with deposition of dust generated by the extraction and transfer operations. It is noted that the contribution of the operations to ambient PM_{10} (particulate matter smaller than 10 microns in diameter) concentrations is predicted to be negligible because of the expected particle size of the dust that will be generated by the extracted material.

The assessment of the potential impact of the fugitive dust emissions is based on the impact of the dust deposition rates in the vicinity of the site. Particles in different size ranges are deposited at different distances from the emissions source. The US EPA has published guidelines on the deposition of dust according to particle size as shown in Table 7.6. Particles above 100 µm in size will be deposited on site close to the emission sources and hence need not be considered in an assessment of off-site impacts. Finer particulate matter has the potential to carry beyond the site boundaries.

Operation of the pit may generate dust emissions which carry off site during periods of prolonged dry and windy weather, particularly as a result of traffic movements and windblow across open surfaces. The potential impact of extraction operations on ambient air quality will however, be managed and controlled by the implementation of sound environmental management practices for all aspects of the operation. Wet suppression techniques together with physical screening of the activities will be provided and will limit the extent to which particulate matter can travel.

The mitigating factors in regard to the pit operations are described in Section 7.5 of this report. Provided the management practices are followed, there should be no nuisance impact on neighbours in the vicinity of the proposed development as a result of the pit operation and the associated activities.

Table 7.6 Fugitive dust deposition as a function of particle size [1,2]

SIZE OF PARTICLE	TRAVEL DISTANCE
> 100 µm	5 – 10 metres from source
30 – 100 µm	Within 100 metres from source "except for cases of high atmospheric turbulence"
15 – 30 µm	Transportable considerable distances downwind
< 15 µm	Likely to remain suspended

NOTE

[1] U.S. EPA, *Procedures for Conducting Air Pathway Analyses for Superfund Applications*, Vol III.

[2] U.S. EPA: *Superfund Exposure Assessment Manual*, Office of Emergency and Remedial Response, Washington D.C, April 1998.

7.4.3 Screening Plant

The main impact on ambient air quality from the processing plant will be that associated with deposition of dust generated by the extraction and transfer operations. It can be noted that the contribution of the operations to ambient PM_{10} (particulate matter smaller than 10 microns in diameter) concentrations is predicted to be negligible because of the expected particle size of the dust that will be generated by the screening operations.

The potential impact of processing operations on ambient air quality will be managed and controlled by the implementation of sound environmental management practices for all aspects of the operation. The mitigating factors in regard to the plant operation are described in Section 7.5 of this report. Provided the management practices are followed, there should be no nuisance impact on neighbours in the vicinity of the proposed development as a result of the operation of the processing plant and the associated activities.

7.4.4 Traffic

The predicted impact of traffic movements on ambient air quality in the vicinity of the proposed development is insignificant due to the relatively small numbers of vehicle movements that are predicted to occur as a result of the operation of the facility. Construction impacts are also insignificant since traffic movement predictions are again extremely low.

There are no adverse impacts on ambient air quality predicted as a result of traffic movements during construction and extraction at this site.

7.4.5 Air Emissions and Agricultural Impacts

The impact of dust deposition on adjacent agricultural land will not cause adverse impacts on surrounding agricultural lands and activities. The potential dust deposition rate on adjacent land which could arise as a result of the proposed development will be limited to a rate 350mg/m^2-day (when measured using Bergerhoff Dust Deposit gauges). This level is the internationally accepted standard for ensuring that adverse impacts on animal or human health, amenity or the environment do not occur as a result of dust emissions.

The dust which could be deposited on land adjoining the site of the proposed development will originate from fugitive losses associated with the extraction activity. Since the dominant impact of fugitive dust emissions from this activity will be the impact on dust deposition, the assessment of the potential impact of the fugitive dust emissions is based on the impact of the dust deposition rates in the vicinity of the site. Particles in different size ranges are deposited at different distances from the fugitive emissions source. The US EPA has published guidelines on the deposition of fugitive dust according to particle size, and because of the nature of the proposed operations, the dust particles will be in the size range which will ensure that deposition occurs within 100m of the source under most weather conditions.

Particles above 100 μm in size will be deposited on site close to the emission sources and hence need not be considered in an assessment of off-site impacts. Much of the fugitive

dust emissions will also be deposited on site since the main potential emission sources are located at distances of at least 40m away from the site activities.

The potential impact of extraction operations on ambient air quality will be managed and controlled by the implementation of sound environmental management practices for all aspects of the operation and by judicious selection of appropriate control technologies. These initiatives are described in Section 7.5 of the EIS. No adverse impact on ambient air quality in the vicinity of the proposed development is predicted as a result of the operation of the proposed development. Dust deposition associated with this development will not adversely affect herbage or grass growth, development or palatability on lands adjoining or adjacent to the proposed development. There will also be no adverse impact on animal health or welfare as a result of the development.

7.5 Mitigation Measures

7.5.1 Construction

In dry weather, particulate matter emissions generated as a result of removal of the overburden, excavations and construction of screening bunds will need to be controlled by water sprays. Stockpiles of excavated materials will also need to be sprayed to control dust emissions from these sources during dry weather. The stockpile of topsoil will be grassed and the screening bunds will be planted in native woodland species, which will prevent wind erosion.

The impacts of construction cannot be avoided altogether but the impacts will be small scale, intermittent and short-term in nature. The longer-term benefits to be gained from the bunds in terms of mitigating the potential operational impacts of noise, dust and the visual effects of the facility outweigh the potential for short-term dust nuisance from construction activities.

It is also proposed to install a wheel wash facility at the site entrance. All vehicles leaving the site will pass through the wheel wash which will very effectively minimise the transfer of material on to the access road.

Internal haul roads will be regularly wetted to suppress wind blown dusts that may occur in dry weather.

Once the pit becomes operational, the installation of dust deposit gauges at site boundary positions will ensure that dusts generated at the site are monitored and kept below acceptable standards.

7.5.2 Pit Operation

The main pit activities will be associated with the extraction of raw materials for processing and supply. Dust emissions from the extraction operations will be minimised by implementing effective environmental management practices.

The main processing and material transfer operations associated with extraction activities will occur ca 15 to 25m below the existing ground level, which will contribute towards containing dust emissions within the site. The screening and stand-off arrangements which

are incorporated in to the design of the pit will also be effective in minimising off-site nuisance potential associated with dust emissions arising from the operation of the pit.

Water sprays will be used to control dust emissions from material stockpiles and haul roads as required during dry weather. A dedicated wheel wash will be located at the entrance to the site which will minimise the potential transfer of dust beyond the site boundaries.

The distance between the pit excavation area and the nearest residential property will be at least 40 metres. The standoff distances to residential properties and the proposed dust mitigation measures combined with the screening measures described in Section 8, will effectively eliminate the potential for significantly elevated dust deposition rates at sensitive receptors in the vicinity of the pit.

The main potential impact on ambient air quality as a result of the sand and gravel extraction operation is the incremental contribution to dust deposition at sensitive receptors in the immediate vicinity of the site. Due to the expected size range of the particulate matter released into the atmosphere as a result of the activity and the standoff and screening arrangements any dust will be deposited close to the source and adverse impacts will not occur.

The following is a summary of the mitigating factors and specific mitigation measures that will be employed to ensure that particulate matter is contained so as not to cause off-site nuisance.

- Screening bunds of at least 3m in height;
- A minimum 40 m standoff distance to the nearest residence;
- The operating level of the pit will be at a depth of up to 15 to 25m lower than the surrounding land;
- Relatively coarse particle size;
- The use of a wheel wash facility;
- Regular wetting of internal haul roads, stockpiled material as required during dry weather.
- Installation of dust deposit gauges at site boundary positions to monitor dust deposition levels.

7.5.3 Screening Plant

The processing plant will include screening and stockpiling. Front end loaders will be used to load the extracted material into the screening deck. The material will be screened into a range of products to include various sizes and grades. Materials will then be stockpiled and transferred by front end loader to trucks for transport off-site.

The area around the screening plant will be appropriately surfaced to minimise the potential emissions from the movement of vehicles picking up products for transport off site. Water sprays will be used as required.

7.6 Conclusions

The potential impact of emissions to atmosphere associated with the extraction of sand and gravel have been evaluated. Short-term effects as a result of the construction phase of the

development may occur but will be minimised as far as practicable by the adoption of suitable management practices. The assessment has shown that the mitigation measures proposed will ensure that no adverse air quality impacts will result from operation of this facility.

8. NOISE

8.1 The Proposed Development

Goode Concrete Ltd propose to develop a sand and gravel extraction operation at Ballinderry, Carbury, Co. Kildare, as a supplementary supply to the nearby Kilglass sand and gravel processing plant. It is proposed to develop an extraction area of approximately 7.9 ha with an anticipated production rate of up to 200,000 tonnes per year, rising to 600,000 tonnes per annum over the last two years. There will be no blasting carried out at the proposed pit. This section of the EIS deals with the impacts of the proposed development on the noise climate in the vicinity of the site.

8.2 The Existing Environment

The site of the proposed development is situated in the townland of Ballinderry approximately 5km north of Carbury and 3.5km south of the N4 junction near Broadford. Information on the environmental setting of the site was obtained from Ordnance Survey Ireland Maps and from site visits by TMS Environment Ltd. personnel. The site is bordered on the northern and western boundaries by Third Class Roads. The road running along the western boundary joins the villages of Broadford and Carbury and is the busier of the two roads. The proposed site is bordered by agricultural land to the north, south and east. There is an established extractive operation bordering the site to the west and there is an animal slaughtering facility approximately 600m to the east of the site. There are three private residences located near the northwest corner of the site and a new house is currently being built adjacent to the northwest corner. There are two houses located directly south of the site, one adjacent to the Carbury-Broadford road and the other located approximately 100m west of the road. There is a scattering of houses north and south of the junction at Clonuff Bridge adjacent the northeastern corner of the site, numbering nine in total.

The existing noise environment has been characterised by a series of measurements completed at the boundaries of the site of the proposed development, of which two of the monitoring positions are adjacent to private houses and in addition, at two other noise sensitive locations which are located in close proximity to the site. The measurements were completed in accordance with the requirements of *ISO1996: Acoustics - Description and measurement of environmental noise*. In total, measurements were taken at six locations in the vicinity of the site. The receptors chosen for the monitoring programme, and their locations with respect to potential noise sources, are summarised in Table 8.1, with additional details presented in Appendix 8.1. The receptor locations are marked as N-1 to N-6 on a separate map, reproduced as Figure 1 in Appendix 8.1 to this report.

The detailed measurement methodologies and survey results are presented in Appendix 8.1, while the principal findings are summarised in Table 8.1.

It was established during the course of completing the baseline ambient noise survey that the area has noise levels typical of a rural environment in which there is no dominant or continuous noise source. The closest industrial facilities to the proposed site are the existing extractive operation west of the site and the animal slaughtering facility which is located approximately 600m east of the site. From the results of the baseline noise survey that are presented in Appendix 8.1, it is clear that these existing industrial operations are not dominant sources of noise and do not generate significant noise levels in the area. The

most significant source of noise at all the monitoring locations including at the noise sensitive locations, is the movement of traffic along the Third Class Roads and in particular the passing traffic on the Carbury-Ballinderry road.

According to EPA BATNEEC Guidance Notes for Noise, if the total noise level from all sources is taken into account, the daytime noise level at noise sensitive receptors should be kept below a decibel level of approximately 55dB(A) in order to avoid disturbance. The L_{Aeq} values measured at N-3 and N-4 were below the 55dB(A) guideline value measuring 50 and 51dB(A) respectively. These were the only two locations monitored where the L_{Aeq} values were below 55dB(A). This is due to the fact that N-3 and N-4 are not in close proximity to the passing traffic on the Broadford-Carbury road, which is approximately 450m east of these locations. Monitoring locations N-1, N-2 and N-6 are all close to the Broadford-Carbury road and the frequently passing traffic travelling at speeds in excess of 50mph causes the L_{Aeq} value to exceed the 55dB(A) guideline value. At the second Noise Sensitive Receptor N-5, a L_{Aeq} value of 59dB(A) was recorded. This is due to the passing traffic being in such close proximity to the noise meter, which was located at the roadside.

Table 8.1 Monitoring locations for noise survey in the vicinity of the site

MONITORING LOCATION	DESCRIPTION	APPROXIMATE DISTANCE FROM NOISE MONITORING LOCATION TO EXISTING TO NEAREST NOISE SENSITIVE RECEPTOR (m)	$L_{Aeq,60min}$ dB(A)	$L_{A90,60min}$ dB(A)	$L_{A10,60min}$ dB(A)
N-1	NORTH EASTERN CORNER OF THE SITE	80	55	42	57
N-2	SOUTH EASTERN CORNER OF SITE	350	60	43	64
N-3	SOUTH WESTERN CORNER OF SITE	250	50	43	53
N-4	NORTH WESTERN CORNER OF SITE	30	51	43	53
N-5	ON ROADSIDE IN FRONT OF KILGLASS HOUSE	75	59	44	55
N-6	ON ROADSIDE IN FRONT OF HOUSE SOUTH OF SITE	15	69	44	65

Key to noise measurement indices:

$L_{Aeq,T}$: the equivalent continuous sound level measured over a specified period of time.
$L_{A90,T}$: the sound level exceeded for 90% of the measurement time. This is commonly used to estimate background noise levels.
$L_{A10,T}$: the sound level exceeded for 10% of the time. This is commonly used to describe high energy, short duration noise events such as road traffic noise.

8.3 Impact of the Development

8.3.1 Introduction

The entire site measures approximately 13.9 ha and it is proposed to extract sand and gravel from the pit where it will be washed and screened. The removal of overburden from the sand and gravel pit area will facilitate the construction of screening banks that will surround the perimeter of the site. The construction of screening banks will be fundamental to the attenuation of noise generated by site operations and therefore the minimisation of noise impacts that may be experienced at nearest noise sensitive receptors.

The nearest noise sensitive receptors to the site of the proposed sand and gravel pit include a private residence (N-4) to the northwest of the site at a distance of approximately 10 metres from the closest boundary point. A residence (N-1) is located across the road forming the northern boundary of the site and is approximately 25m from the nearest boundary location. There is also a scattering of private residences located north and south of Clonuff Bridge, which is adjacent to monitoring location N-1. Kilglass House is a private residence situated approximately 500m northwest of the nearest site boundary (N-5). To the south of the site are two houses located approximately 350m from the nearest site boundary. The potential impact of the pit development is discussed in the following sections. Although predicted noise levels were not calculated at every house in the vicinity of the site, the noise predictions that were made are an accurate representation of the potential impact at the nearest houses and therefore the houses most likely to be affected by noise from site activities. A map of the site showing the noise sensitive receptors at which noise impacts were predicted is presented in Appendix 8.3.

8.3.2 Excavation Operations

8.3.2.1 Operational Noise Impacts

The pit development will see the excavation of sand and gravel progressing in a northerly direction in the western field and then working across in an easterly direction. The plant will be located in the southwestern corner of the proposed site. Development of the pit will result in the requirement to strip overburden in order to expose the sand and gravel for subsequent excavation.

Noise from the pit workings will be associated with the excavation, recovery, processing and transport of raw materials. The pit will be worked using a front-end loader and dragline. The extracted material will be processed through a screen and stock-piled temporarily before transport off-site. The product will be transported off-site using 26-tonne trucks. Ancillary plant on site will include a diesel driven generator.

The predicted noise levels that will be experienced at the nearest residences as a result of excavation activities have been calculated using the activity L_{Aeq} method outlined in BS 5228: Part 1: *Noise and vibration control on construction and open sites*. The equivalent continuous sound pressure levels at 10 metres for the individual items of plant to be used at the site operation are presented in Table 8.2. Calculations of predicted impacts at the noise sensitive locations N-1, N-4, N-5 and N-6 are presented in Appendix 8.2, Tables 1 to 4 respectively.

Table 8.2 Noise levels associated with quarry operation

PLANT	L_{Aeq} at 10m
Front end loader	79
Dump truck	76
Screening deck	80
Diesel generator	86

NOTE
[1] Sound pressure levels were estimated based on measurements at similar facilities

For the proposed pit development, the nearest distances between plant items and the noise sensitive locations have been used in the noise prediction calculations. These nearest distances ensure a worst case scenario is considered and will result in an over-estimation of the potential noise impacts. This conservative approach is considered prudent in order to ensure that noise emissions from the pit are minimised at all stages of the pit development, thereby ensuring that the likely noise impact at noise sensitive receptors is minimised. Due to the depth of overburden removed before excavation can take place, noise from all extraction operations will be shielded by the pit edge. Noise attenuation due to the presence of screening banks surrounding the site boundaries together with the shielding effect of pit excavations occurring below ground level will conservatively offer noise attenuation of at least 20dB(A). As the workings of the pit advance throughout the lifetime of the pit, additional noise attenuation will be offered as excavation activities occur further below ground level.

The noise limits which apply to industrial developments under the EPA Integrated Pollution Control Licencing system are defined in the EPA BATNEEC Guidance Note for noise as $L_{Aeq,1hr}$ = 55 dB(A) and $L_{Aeq,15\ min}$ = 45 dB(A) for daytime and night-time operation respectively. Although this activity is not subject to the IPC Licencing Regulations, these limits are widely recognised as representing BATNEEC for industrial developments. The UK Guidance notes, *MPG11: "The control of noise at surface mineral workings"*, recommends limits of 55 dB(A) and 42 dB(A), for daytime and night-time noise levels respectively, from mineral working operations. There is no night-time operation planned for future pit activities. A level of 55 dB(A) is therefore the main criterion considered in assessing the impact of the pit operations on the noise climate in the vicinity of the development.

The maximum predicted noise level associated with the development that will be experienced at the nearest residences (N-1 and N-4), is 48 dB(A). Table 8.3 presents the predicted $L_{Aeq,1hr}$ values at each of the four noise sensitive locations. The calculations have considered continuous operation of all items of plant at the boundary of the proposed pit. Thus, the calculated noise levels represent a worst-case impact of the pit operations on the noise environment at the chosen locations. In practice, all activities will not always occur at the extremities of the excavation area and hence the distance from the noise sources to the noise sensitive receptors will be greater for considerable time periods. As a result, the noise impact will be less significant when noise sources are further away from the noise sensitive receptors.

The maximum predicted $L_{Aeq,1hr}$ of 48 dB(A) at the nearest residence as a result of excavation operations is well below the BATNEEC limit of 55dB(A); therefore no adverse impacts on the noise environment in the vicinity of the site are predicted. Working of the pit will be restricted to 07:00 to 19:00 hours from Monday to Friday and 08:00 to 13:00 hours on Saturdays, with no working planned for Sundays or public holidays. Material will be loaded and removed from the site between 07:00 to 19:00 hours from Monday to Saturday. Night-time noise is therefore not an issue.

Table 8.3 Predicted noise levels at noise sensitive locations as a result of quarry operations.

NOISE SENSITIVE RECEPTOR	PREDICTED $L_{Aeq,1hr}$ dB(A)	DISTANCE FROM NSR TO BOUNDARY OF PIT (m)
N-1	48	50
N-4	48	50
N-5	32	500
N-6	35	350

8.3.2.2 Vibration

As there is no blasting to be carried out at the Ballinderry site the most significant potential vibration impact associated with the proposed development may arise from the movement of construction vehicles on the site during the excavation of overburden prior to extraction and the extraction of raw materials. Ground vibration at sensitive receptors is measured as peak particle velocity (PPV) in mm/sec. The acceptable vibration limits at sensitive receptors in Ireland is 12mm/sec (peak particle velocity, PPV) as defined in the Environmental Protection Agency BATNEEC *Guidance Note for Noise in respect of Scheduled Activities*. International Standards have determined that cosmetic damage to structures will not occur at peak particle velocities below 12.7mm/sec while the threshold for structural damage is 50mm/sec (*BS7385, Evaluation and measurement for vibration in buildings; Part 2: Guide to damage levels from groundborne vibration*).

With consideration to the relatively small size of the overall operation it is reasonable to conclude that construction activities generating ground vibrations will be minimal and of limited duration during the daytime period. The nearest residential property will be approximately 50m from the excavation activity and therefore, vibration associated with construction activities will not have the potential to cause disturbance or damage at this location.

There are no adverse vibration impacts associated with the ground preparation or extraction of raw materials at the site.

8.3.3 Noise Impacts from Other Works on Site

Noise impacts associated with the pit development workings will include noise from overburden removal, and construction of screening banks around the pit workings.

Construction noise impacts are assessed in terms of the requirements of *BS 5228:1997 – Noise and Vibration Control on Construction and Open Sites*. This Standard does not specify noise limits associated with construction activities but does recognise that since the activities are temporary, noise limits higher than those associated with permanent installations are generally acceptable in the community. International practice suggests that noise limits in the range $L_{Aeq,1hr}$ = 65 to 75dB(A) are generally acceptable in the community during daytime construction activities.

Plant items used for screening bank construction activities will include a crawler mounted backhoe, an articulated dump truck and a bulldozer. The Sound Levels, for these items of plant have been assessed and are summarised in Table 8.4.

Table 8.4 Predicted noise levels associated with overburden removal and screening bank construction.

Plant	L_{Aeq} dB(A)
Crawler mounted backhoe	80
Articulated dump truck	82
Dozer	81

NOTE

[1] Sound power levels for all plant items are predicted values, taken from BS 5228:Part 1:1997

The predicted noise level at the nearest noise sensitive locations as a result of overburden removal and screening bank construction activities have been calculated, using the individual sound levels for each plant item listed in Table 8.4, according to *"D3.4 Method for mobile plant in a defined area"* outlined in BS 5228: Part 1: *Noise and Vibration Control on Construction and Open Sites*. Details of the calculations are presented in Appendix 8.2.

A maximum noise level of 70dB(A) is predicted at the nearest noise sensitive receptors N-1 and N-4 as a result of screening bank construction at the boundary of the of the proposed sand and gravel pit. These values are below the acceptable limits of 65 – 75 dB(A) during daytime construction activities.

It must be noted that work on the screening banks will take place only intermittently and for short time intervals, during the life time of the pit. Even under continuous operation, noise levels at all of the noise sensitive locations as a result of such operations have been shown to be below the acceptable limits of 65 – 75 dB(A) for daytime construction activities; thus significant adverse impacts are not expected.

8.3.4 Traffic

Traffic movements associated with the development are limited to the movement of trucks carrying excavated material away from the site, and returning to the site. At peak operation, approximately 9 trucks per hour enter and leave the site as a result of transport of extracted material from the site.

The predicted noise level at the nearest noise sensitive receptors as a result of HGV movements on the site has been calculated using a standard international acoustical formula as described below.

$$L_{Aeq,\,T} = SEL + 10\log_{10}(N) - 10\log_{10}(T) + 20\log_{10}(r_1/r_2)\ dB$$

where $L_{Aeq,\,T}$ is the equivalent continuous sound level over time period (T) (sec);
SEL is the A weighted Sound Exposure Level of the noise event (dB);
N is the number of events over the time period T;
r1 is the distance at which SEL is assessed
r2 is the distance to the receptor

The calculation assumed a worst case scenario of 6 truck movements per hour, a maximum Sound Exposure Level of 78dB(A) for the trucks and the *minimum* distance between the site road and the nearest noise sensitive receptors. The maximum predicted $L_{Aeq,\,1hr}$ values as a result of the traffic movements at the nearest noise sensitive receptors to the site, is 20dB(A) at N1, 21dB(A) at N4, 14dB(A) at N5 and 18dB(A) at N6. These low values will clearly not result in an increase in the existing noise climates at each receptor even when combined with both predicted and current noise levels at the proposed site.

Employee traffic movements associated with the pit will account for approximately 10 vehicle movements per day. This very low volume of additional traffic will not alter the existing noise climates at noise sensitive receptors in the vicinity of the site.

8.3.5 Combined Impact of All On-site Operations

Noise levels associated with extraction activities together with noise levels associated with traffic associated with site activities have been assessed and are presented below in Table 8.5. The combined noise levels experienced at the noise sensitive locations (N-1, N-4, N-5 and N-6) as a result of all operations have been calculated. As background noise measurements were only recorded for noise sensitive receptors N-1, N-4, N-5 and N-6, the combined impact was only assessed at these locations. However, considering that these locations are representative of the nearest receptors to the site, the impact assessment at these receptors is indicative of the maximum noise levels that would be experienced at any other receptor in the vicinity of the site. The predicted noise levels in Table 8.5 are likely to overestimate the actual noise experienced, since the maximum noise levels associated with each item of plant were used, and simultaneous operation of all plant items were assumed.

The maximum predicted noise levels associated with the operation of the pit are shown to be 48dB(A) L_{Aeq} at the nearest noise sensitive receptors N-1 and N-4 which is well below the BATNEEC limit of 55dB(A); therefore no adverse impacts on the noise environment in the vicinity of the site are predicted.

Table 8.5 Noise levels predicted as a result of the proposed development.

NOISE SENSITIVE LOCATION	L_{A90} [1] dB(A)	NOISE LEVEL CONTRIBUTIONS		
		Excavation dB(A)	Traffic dB(A)	Total combined noise levels dB(A)
N-1	42	48	20	50
N-4	43	48	21	50
N-5	44	32	14	32
N-6	44	35	18	35

NOTE

[1] L_{A90} is the background noise level as measured, Appendix 8.I

8.3.6 Noise and Vibration Impacts On Agriculture

The site of the proposed development is located in a predominantly agricultural area that is principally comprised of grazing lands. The distances from noise sources to the nearest adjoining agricultural lands are sufficient to ensure that there will be no adverse impacts on any livestock as a result of the proposed development.

During the construction phase, ground excavation activities may result in minor vibrations extending beyond the site boundaries and into adjoining lands in which grazing livestock may be present. With consideration to the limited duration and the relatively small scale of such activities, it is extremely unlikely that these operations would cause disturbance to animals.

As there is no blasting to be carried out at the Ballinderry site there will be no significant sources of vibration as a result of site operations. It can be concluded that no adverse nuisance effects as a result of ground vibration are predicted for either human beings or for farm animals.

8.4 Mitigation Measures

A comprehensive quantitative assessment of the potential noise impacts at nearby residences as a result of operation of the pit has shown that no adverse nuisance impacts will occur as a result of the development.

Screening from extraction activities occurring below ground level together with sound attenuation due to distance between source and receptor result in significant noise

attenuation. Screening banks should be constructed from highly compacted soil at the outset of the pit development in order to minimise the potential noise impact in the vicinity of the site. It is recommended that screening banks of at least 3m in height are constructed around the perimeter of the site boundaries, in particular along the northwestern, northern and northeastern boundaries of the site as the nearest noise sensitive receptors are located in close proximity to these locations.

A minimum buffer zone of 30m between the site perimeter and the screening banks has been maintained to minimise the noise impact on the closest residences to the site from the construction of the screening banks.

The proposed hours of operation for extractive activities are 07:00 to 19:00 Monday to Friday and 08:00 to 13:00 on Saturdays. Potential impacts on the noise environment in the vicinity of the site are therefore limited to daytime. Site activities will not occur outside these hours or on Sundays or on Public holidays.

Traffic associated with the development is minimal, involving a maximum of approximately 9 truck movements per hour. Approximately 10 car movements per day are also expected. Noise associated with this very low number of vehicle movements will not result in an increase in the existing noise levels in the area.

8.5 Conclusions

A comprehensive assessment of the potential noise impacts associated with this development has been completed. There are no adverse noise impacts predicted at noise sensitive receptors in the vicinity of the site as a result of this development.

9. LANDSCAPE AND RESTORATION

9.1 Introduction

An assessment of the landscape and visual impacts arising from the proposed development was carried out in January 2002 by Brassil Jarvis & Co Ltd. Brassil Jarvis & Co Ltd incorporates over twenty years' accumulated experience in the planning, environmental assessment and restoration of major mineral and industrial sites undertaken by David Jarvis Associates Ltd in the UK, and in Ireland and mainland Europe.

The objectives of the study were:

- To describe and evaluate the landscape of the site and surrounding area, thereby establishing a baseline condition.
- To identify and describe the potential landscape and visual effects and the resulting changes to the baseline condition during site formation, operation and restoration.
- To assess the significance of these changes to the baseline condition.
- To develop mitigation measures to avoid, reduce or remedy adverse effects of the development.

Baseline surveys were carried out in accordance with guidelines published by the Environmental Protection Agency, the UK Landscape Institute and Countryside Commission publication CCP 423, "Landscape Assessment Guidance".

9.2 Method Of Assessment

The method used to achieve the study objectives was as follows:

Desk studies to define the likely area of visual influence and the landscape character of the locality. OS of Ireland maps at 1:50,000, 10'560 and 2500 were used to define a likely study area based on relief, settlement patterns and land use. The use of Development Plans was used to show the location and extent of landscape, heritage and historical designations and protected areas.

From all the above, a primary study area of approximately 5km radius was established, around the application site.

Site visits to discuss layouts and quarry plans for the proposal on site, in order to minimise visual intrusion. Photographic studies of the site and surrounding environment were used to determine the likely visibility of structures, stockpiles and working faces. These were undertaken during January 2002, when weather conditions were poor, due to persistent rain and altering light conditions. Following visits saw improvements in conditions where intermittent dry spells occurred. Due to the time of year when the study was carried out deciduous cover was at a minimum. As a result of the visits, the following additional information was obtained:

- Changes to local development pattern.

- The detail of local visual cut-offs and screening effects provided by hedgerows and woodland etc.
- The existence and significance of natural and man-made features.

Analysis of results from these stages the selection of 17 representative viewpoints were taken to characterise the existing landscape and assess the likely changes to the baseline condition caused by the development of the site.

Assessment of the significance of the predicted changes, and the identification of elements to be incorporated into the project design in order to reduce or remedy potential landscape and visual impacts.

A summary of the results of the study to record the principal impacts arising during construction, operation and restoration of the site. These are presented in tabular form.

9.3 Project Description

Goode Concrete Ltd. is applying to Kildare County Council to develop a sand and gravel extraction operation on a site of 13.9 hectares at Ballinderry, Carbury, Co. Kildare. The extraction area will extend to some 7.8 ha and will involve working below the level of the water table.

The highest plant elements on site are the Finlay washing plant and the CDE Silt Press, which both measure 6.35 at the highest point. Both of these plant elements are to be located on the lowest point of the site, well removed from public roads and surrounding dwellings.

9.4 The Existing Landscape

The application site falls within the Kildare County Development Plan (currently 1999 version), and is not directly affected by any of the following environmental and landscape designations:

- National Heritage Areas
- Special Areas of Conservation
- Area of Scientific Interest

9.4.1 Landform

Figure 9.1 shows the site location in relation to the proposed study area, and includes identifiable landscape elements within the study area. From this Figure the high level of man-made elements are clearly visible, including three sets of power lines, one of which transects the site. The landscape within the study area comprises largely undulating agricultural land and areas of flatter land to the south. The landform rises that exist are generally small but numerous and would appear to be glacial deposits.

Extract from Ordinance Survey Ireland Discovery Map Series No. 49

BRASSIL + JARVIS

Client: GOODE CONCRETE LTD.

Project: BALLINDERRY CARBURY, Co. KILDARE

Drawing Title: Site Location

Scale: 1:50'000 | Date: MAY 02

Drawing No.: FIG 9.1

9.4.2 Land Use and Land Cover

The existing land use across the study area is typically agricultural grassland across a varying field pattern. Although there are a low number of single dwellings along local roads, in general the settlement pattern is made up of small clusters of dwellings. In proximity to the site there are a number of extractive operations and are shown on figure 9.3 A dispersal of relatively small woodland regions are also evident. Vegetative cover across the study area typically consists of mature hedgerow belts along field boundaries.

9.4.3 Landscape Character

Contained within Appendix 9.1 are 17 views of the site and study area, which have been identified for the visual impact assessment and to visually summarise the landscape character of the study area. Below are recorded a series of objective and subjective statements based on these views, which together provide a brief description of the local landscape character. The location and sensitivity of these views is shown on Fig 9.5 Summary statements based on these views are as follows:

A. Objective

'A rural landscape dominated by pastoral fields in a variety of scales, generally of irregular shape, and enclosed by mixed hedges; landform consists of undulating rises, affording to both open and enclosed views.

B. Subjective

'A mixed-scale, varied landscape of simple composition and generally quiet character. A number of features exist that are out of character to the broad environment. Due to the site's rising landform there are a number of places at which the site is visible and breaks the skyline. There are a number of dwellings located along local roads which are likely to have adverse views of site workings, unless suitable mitigation is applied.'

9.4.4 The Application Site

9.4.4.1 Landform

The landform of the application site consists of two broad planes of land, an upper and lower. Separating these planes is a steeply rising bank which runs in an elongated 'L' shape along two of the four boundaries. The landform across the other boundary lengths is much softer and tapers into the surrounding lands.

9.4.4.2 Land Use and Land Cover

The application site can be seen in context to the surrounding environment on figure 9.3. The site consists two agricultural fields enclosed by mixed hedge lines of various quality. Also located within the site boundary is an overhead electricity pylon carrying an electricity transmission line. Running along the lower Eastern boundary is a small stream. There is slight evidence of wetland character at the eastern end of the southern boundary,

Extract from Ordnance Survey Ireland Discovery Map Series No. 49

Application Boundary

Study Area Boundary

Views And Prospects

32
Teelough Cross Roads to Junction with R402- views of Carbury Castle & hill

33
Views From County Road upland area at Mylerstown of Carbury Castle- views of Carbury Castle

The Plainlands West Central Lowland

Note;
all other land inside study area is classed as The Plainlands, North West Kildare

National Heritage Area

BRASSIL + JARVIS

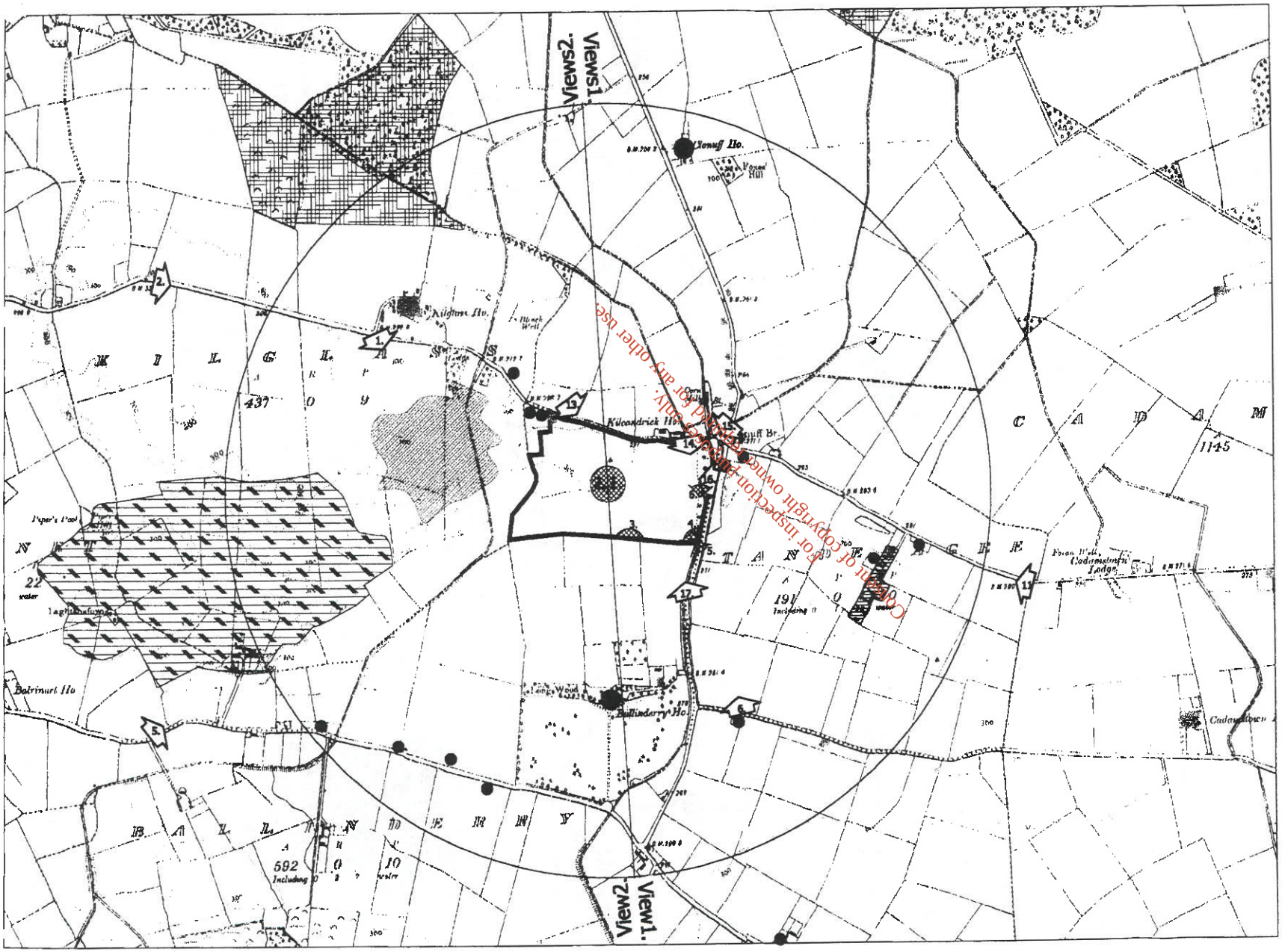
Client
GOODE CONCRETE LTD.

Project
BALLINDERRY
CARBURY, Co. KILDARE

Drawing Title
Development Plan Factors

Scale 1:50'000 Date MAY 02

Drawing No. FIG 9.2



Base Plan from Ordinance Survey Ireland Plot Reference No. 177170_1_1

BRASSIL + JARVIS

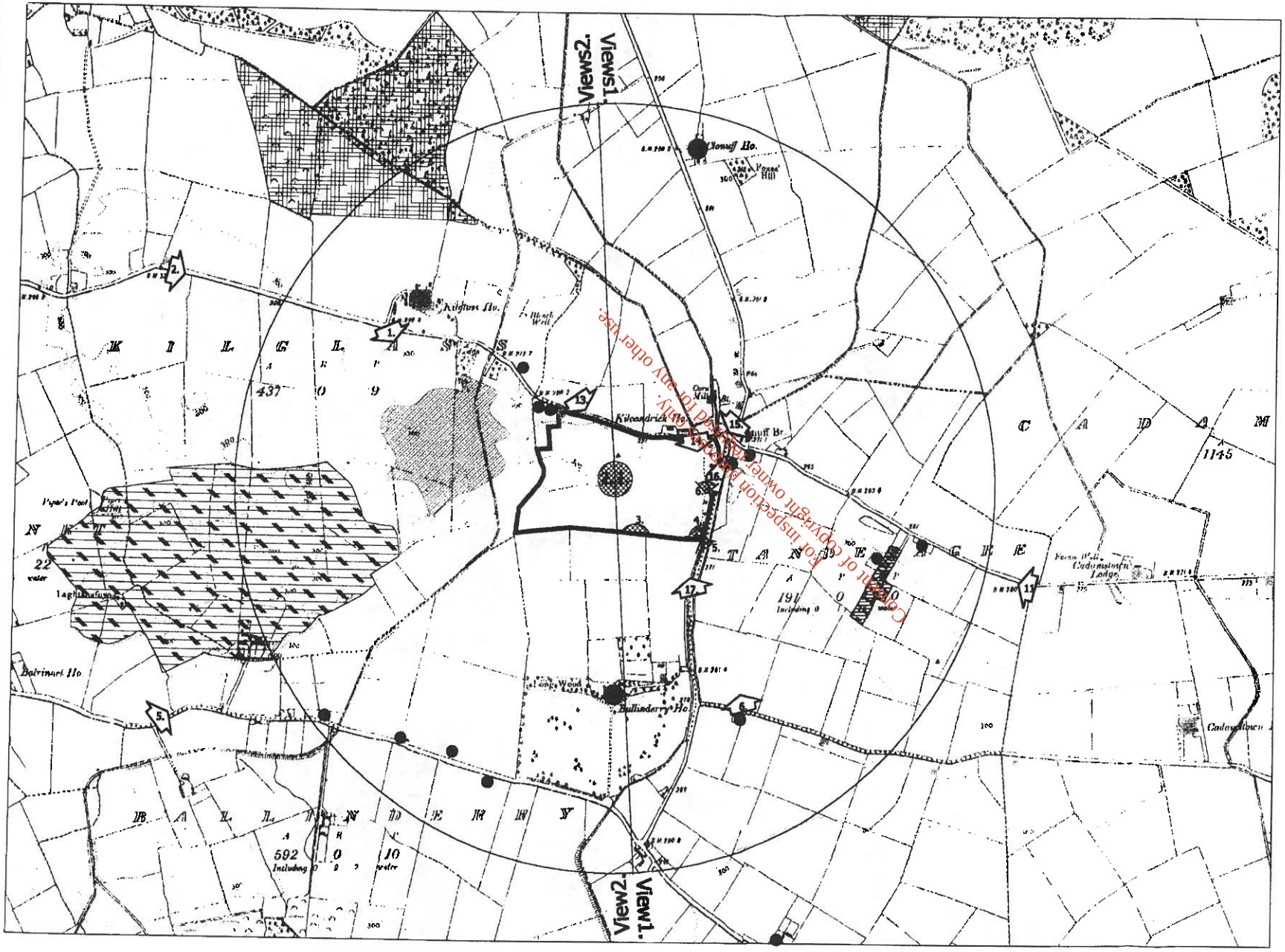
Client: GOODE CONCRETE LTD.

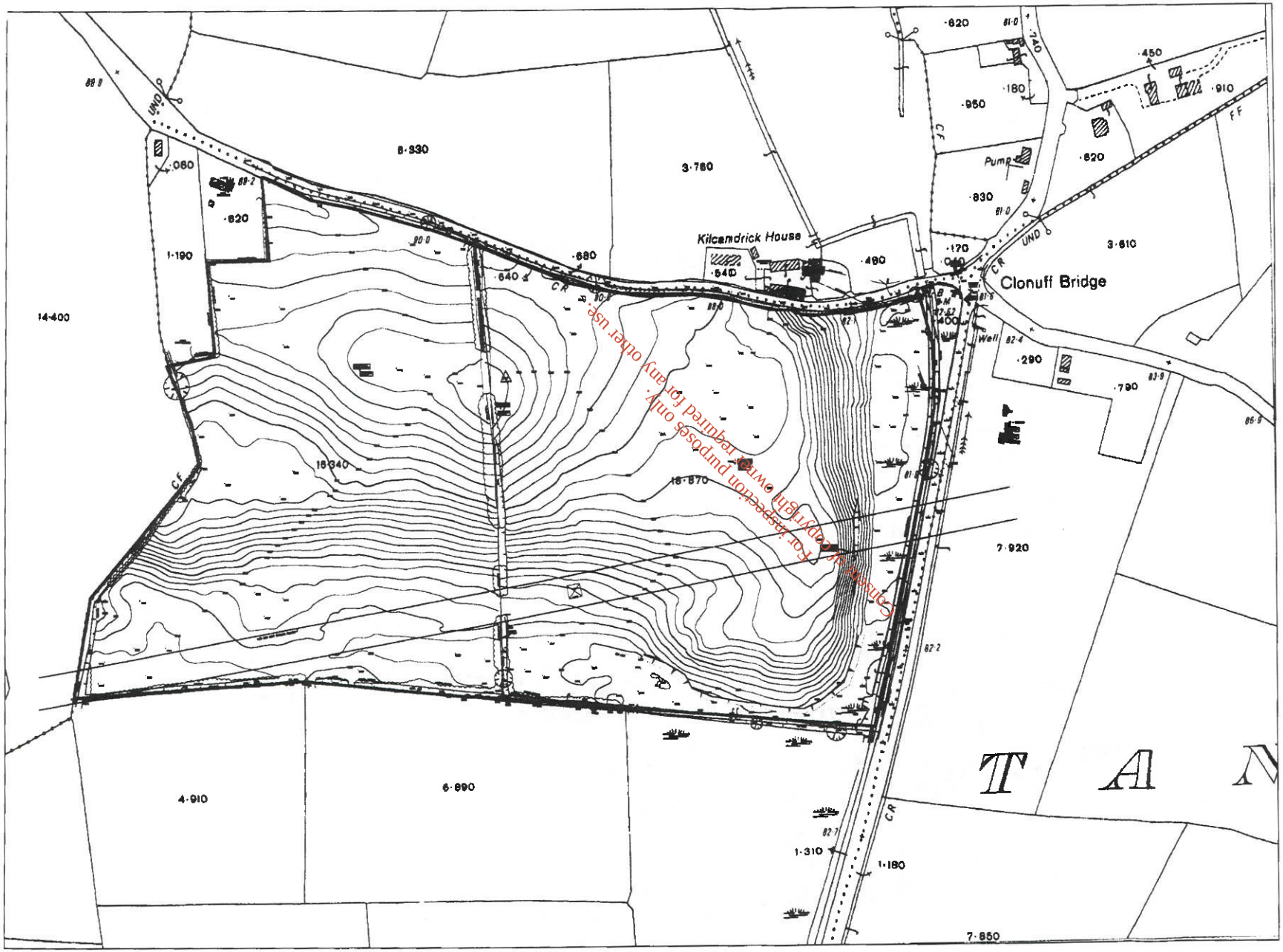
Project: BALLINDERRY CARBURY, Co. KILDARE

Drawing Title: Landscape Analysis Diagram

Scale: 1:10560 Date: MAY 02

Drawing No.: FIG 9.3





Do not Scale this Drawing, use given dimensions only.
Survey Information provided by Precise Control Ltd.
Base Plan from Ordnance Survey Ireland Plot Reference No. 177170_1_7

BRASSIL + JARVIS

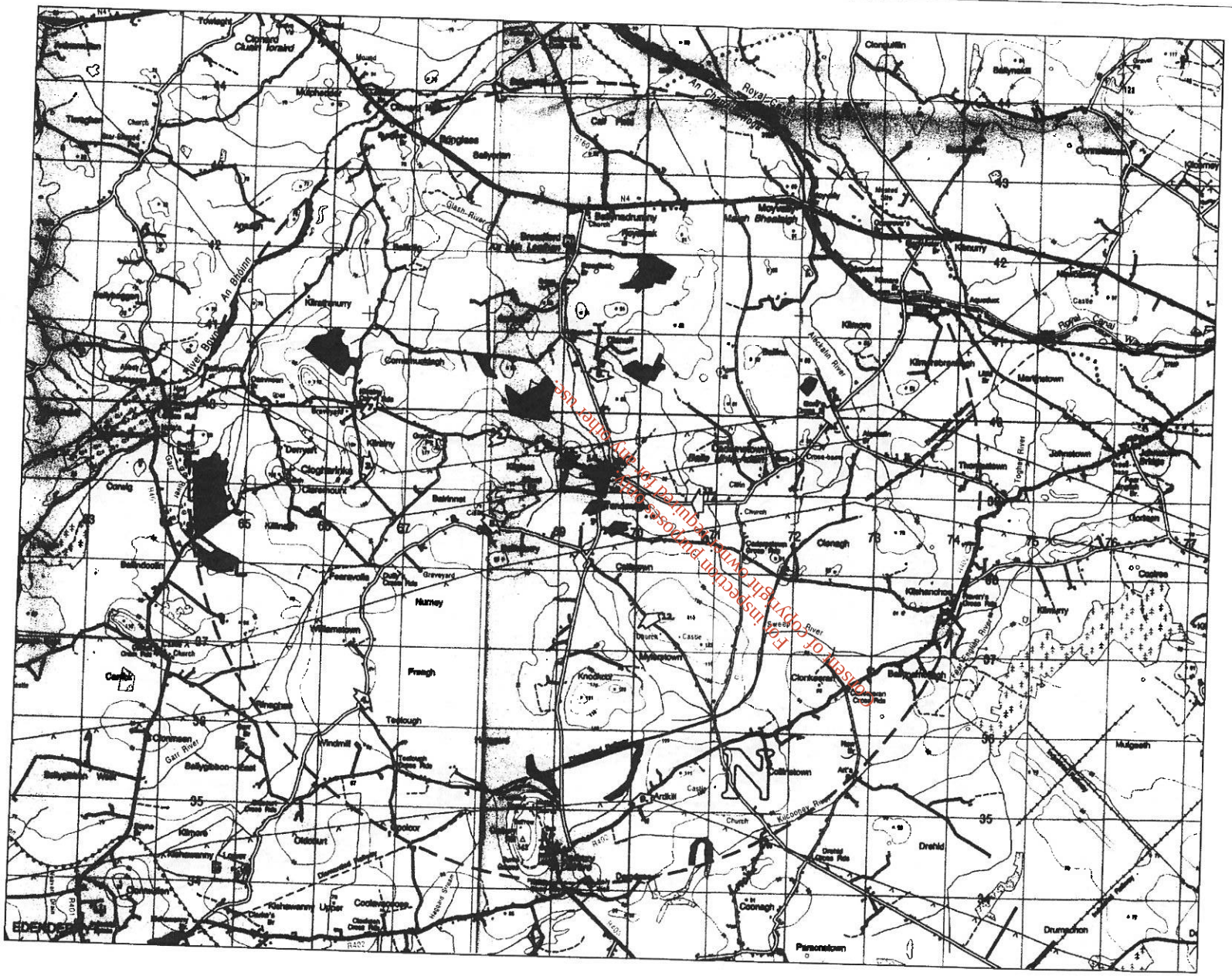
Client: GOODE CONCRETE LTD.

Project: BALLINDERRY CARBURY, Co. KILDARE

Drawing Title: Landscape Analysis Diagram

Scale: 1:10560 | Date: MAY 02

Drawing No.: FIG 9.4



BRASSIL + JARVIS

Client: GOODE CONCRETE LTD.

Project: BALLINDERRY CARBURY, Co. KILDARE

Drawing Title: Viewpoint Location and Sensitivity

Scale: 1:50000 Date: MAY 02

Drawing No. FIG 9.6

though no water was present at the time of study. This zone is also located at approximately 1m above the stream level, so the character is likely to be caused by puddling.

9.4.5 Site Visibility

9.4.5.1 From Settlements

From the desktop study there would appear to be a moderate number of properties in the locality of the site, and a high number in the immediate proximity. These can be seen on figure 9.3. Photographs in Appendix 9.2 (site based photographs) clearly indicate any properties which are evident in a reverse view situation (from within the site looking out). The properties visible in this view are those likely to be impacted on.

9.4.5.2 From Historic and Amenity Sites

As stated above, the site is not directly affected by any landscape, heritage or scientific designations, nor does it intrude on any designated views. Ballinderry House is situated to the south of the site. The setting of the House will not be affected by the proposed development.

9.4.5.3 Skyline Effect and Visual Foci

Due to the site's location within a broadly undulating study area there are a number of locations at which the surrounding landscape affords both open and enclosed views. Landform and the high level of mature field boundaries play a large part in screening views to the site. There are however a number of more local views where the site is evident and (due to its steep landform changes) breaks the skyline. The electricity pylon located within the site is one of a series and though it forms a prominent visual element within the landscape in local views it is difficult to determine which pylon is located within the site on initial viewing from more distant locations.

9.4.5.4 Site Significance and Sensitivity

Due to the mixed nature of the study area the application site is evenly representative of areas of landscape found throughout the study zone. Other agricultural areas and woodland blocks build a landscape character of which the site is part. There are a number of elements of disjointed nature, which lower the sensitivity of the surrounding environment, including the overhead power lines and other extractive sites. Within this localised context the development of the site for sand and gravel extraction would be of low significance.

9.5 Prediction Of Impacts

9.5.1 Existing Trends (The "Do Nothing" Scenario)

The existing pattern of development in the area is likely to remain relatively unchanged in the short to medium term. A limited amount of additional one-off residential development may be permitted in the wider area. The site would be likely to remain in agricultural use.

9.5.2 Landscape Impact Assessment

9.5.2.1 Landform Impact

The landform impact would alter the existing situation by 24.1m height at the maximum extent of difference, changing the landform from +94.6m to +70.5m AOD. Additional changes that will occur are based on a series of 3m bunds being constructed as part of the mitigation process.

Works to mitigate the impact of landform impacts are described below in Section 9.6.

9.5.2.2 Land-use Impact

The proposed restoration landuses are described on Figure 9.8 and quantified below in comparison to the existing condition (Table 9.1).

Table 9.1

Land use	Existing		Proposed	
	acres	%	acres	%
Grassland pasture	30.5128	88.7	21.0768	61.27
Water courses / bodies	1.032	0.3	10.8464	31.53
Trees/woodland/ hedgerows	3.784	11	2.4768	7.2
Unmanaged grassland and scrub / heath.	0	0	0	0
Bare ground and hard surfaces	0	0	0	0
Total	34.4	100	34.4	100

9.5.3 Visual Impact Assessment

The significance of any visual impact is consequent upon the sensitivity of any receptor and the magnitude of the predicted changes to the landscape.

Receptors do not just include viewers but also areas of valued landscape, skyline impacts etc.

(i) *Viewpoint Selection*

Figure 9.5 defines the sensitivity of the seventeen recorded viewpoints taken from outside the site. These were determined by analysing the presence of the application site in the

view, quality of view, quality of site in view, duration of working and numbers of receptors.

TABLE 9.2. Viewpoint sensitivity assessment

VP No.	Presence of site in view	Quality of view	Quality of site in view	Duration of impacts	Receptor numbers	Score	VP sensitivity
1	0	1	0	0	2	3	LOW
2	0	1	0	0	3	4	LOW
3	0	3	0	0	3	6	LOW
4	0	1	0	0	2	3	LOW
5	0	2	0	0	3	5	LOW
6	4	2	4	5	4	19	HIGH
7	0	3	0	0	2	5	LOW
8	0	2	0	0	2	4	LOW
9	0	2	0	0	4	6	LOW
10	0	1	0	0	3	4	LOW
11	0	2	0	0	2	4	LOW
12	0	3	0	0	3	6	LOW
13	4	3	2	5	4	18	HIGH
14	5	1	4	5	4	19	HIGH
15	4	2	4	5	4	19	HIGH
16	5	1	4	5	3	18	HIGH
17	4	3	4	5	3	19	HIGH

In the above assessment, broad scores are given in the range 1 = low to 5 = high.
0 = site not visible / no impact.

Notes:

1. Scores 0 – 8 indicate LOW sensitivity
   Scores 9 – 16 indicate MEDIUM sensitivity
   Scores 18 – 25 indicate HIGH sensitivity.

Viewpoints were categorised as High, Medium or Low sensitivity to change. The results of the sensitivity test indicate a clear division between local and more distant views, where, due to landform and land cover the site is not visible. Changes to the existing situation will only be evident in those views where the site is visible, it has been decided to base the Landscape and visual assessment on the local views (as per figure 9.3, 9.9 and 9.10) where changes to the site can be clearly assessed.

A summary justification for the selected views to be used within the visual impact assessment is recorded below in Table 9.3. A number of views remain in the assessment though no site visibility is evident, these are retained in order to compare all viewpoint sensitivities and impacts within the locality of the site.

Table 9.3

Viewpoint Ref:	Location	Summary Receptor Sensitivity
1.	0.25 km north west of site	• LOW
2.	0.75 km north west of site	• LOW
5.	0.75 km south west of site	• LOW
6.	0.5 km south of site	• HIGH
11.	1.0 km east of site	• LOW
13.	By property under construction at north west corner of site.	• HIGH
14.	By Killcandrick house, by northern boundary of the site.	• HIGH
15.	By properties north east of site	• HIGH
16.	By property on eastern boundary of site	• HIGH
17.	From road south east of site	• HIGH

The predicted potential visual impacts are described with and without mitigation in the following Tables, in relation to the viewpoints identified above. For clarity the predicted impacts from these assessment tables are also shown on figures 9.9 and 9.10. In both instances impacts are described as of minor, moderate or major significance

9.6 Mitigation Of Impacts

9.6.1 Mitigation Measures

From the initial design team meeting (on site) clear proposals for limiting the visual impact of the development were determined. The mitigating measures to be incorporated within the scheme to reduce potential landscape and visual impacts are described below and are summarised on figure 9.7:

Views from the North

Two lengths of grassed bund located on the internal edge of an existing hedge line will help mitigate impacts of the development from local dwellings. A small impact may occur from the construction of the bunds until seeding has become established. The existing hedgerow along the northern boundary length is well established and has been left to develop naturally. The hedgeline is broken in a number of points but when combined with the proposed bunding will limit views into the site.

Views from the East

The existing rise in landform limits views into the site from the adjoining road. Mitigation bunds located internally from standoff boundaries have been created to mimic this effect. Skyline impacts may be evident but the bunding will greatly reduce any further visual effects.

Views from the South

Views to the site from the south and south east are the most prominent – looking into the site at the existing situation. From the east the steeply rising landform limits extensive views into the site. From the south, a large proportion of the site is visible due to broken hedgerows and topographic change. In order to mitigate the visual effects of the development, grassed bunds have been located along the internal boundary edge to the eastern corner of the site. At this point the hedgerow is at its poorest condition and the most expansive views of the site occur. The grassed bund will reduce the impacts of the site development, and will screen the site offices and buildings. The bunding will also reduce the visual implications of the traffic along the internal access road.

Views from the West

There are few points of sensitivity from the east, due mainly to other extractive operations located in this direction. The primary impacts would be from the properties in the north eastern corner of the site. Mitigation in this area and along the remaining eastern boundary length consists of 3m grassed bunding. The bunds have been located with the appropriate standoff to the site boundary of 30m provided for acoustic mitigation, and due to this standoff will further mitigate any residual visual effects.

9.6.2 Summary For Visual Impacts With Mitigation

Due to the nature of the existing vegetation which occurs around the sites boundary, mitigation measures play only a part in screening of the extraction process from most views.

Typically the mitigation bunding will screen out any vision through gaps in the existing vegetation. The bunds are likely to assist in mitigating site plant. When constructed the bunding will be of negative impact of short-term nature, until seeding develops.

Viewpoint 16 shows the mitigation measures in greatest effect. Initially, the site from this view would be a major impact due to the visibility of worked faces. When mitigation is applied the construction of the bunding becomes a short term major impact due to its proximity to the road boundary. Once seeding has become established along the bund the impact is immediately lowered. The bund then screens the site workings and any further adverse affects. Comparison of table 9.4 and 9.5 indicate the effect of the mitigation measures. These affects can also be seen by comparison of figures 9.9 and 9.10 (which summarise the impacts found through tables 9.4 and 9.5).

9.6.3 Residual Landscape and Visual Impacts

On completion of the extraction and restoration of the proposed quarry, the site would be left as shown on figure 9.8. Landscape and visual effects on the area would then be as follows:

Landscape effects

- The introduction of a 10 acre waterbody

- Topographic alteration of the site

Visual effects

- a significantly lowered skyline effect
- views to a new waterbody
- the removal of skyline vegetation

9.7 Restoration

Following completion of the extraction, the site will be restored into a wetland and agricultural area, as shown on figure 9.8. The stored material used to construct mitigation bunds along the boundary lengths will be re-graded onto the excavated slopes to allow for rapid establishment of grassland species. The rebound water level following extraction will fluctuate considerably due to seasonal variations in groundwater.

The flooded area will be allowed to developed into a locally significant waterbody which due to the gradient of the slopes will be naturally colonised by local species. Areas of hard standing and buildings will be deconstructed and removed from site. The subsequent areas of land will be restored to agriculture.

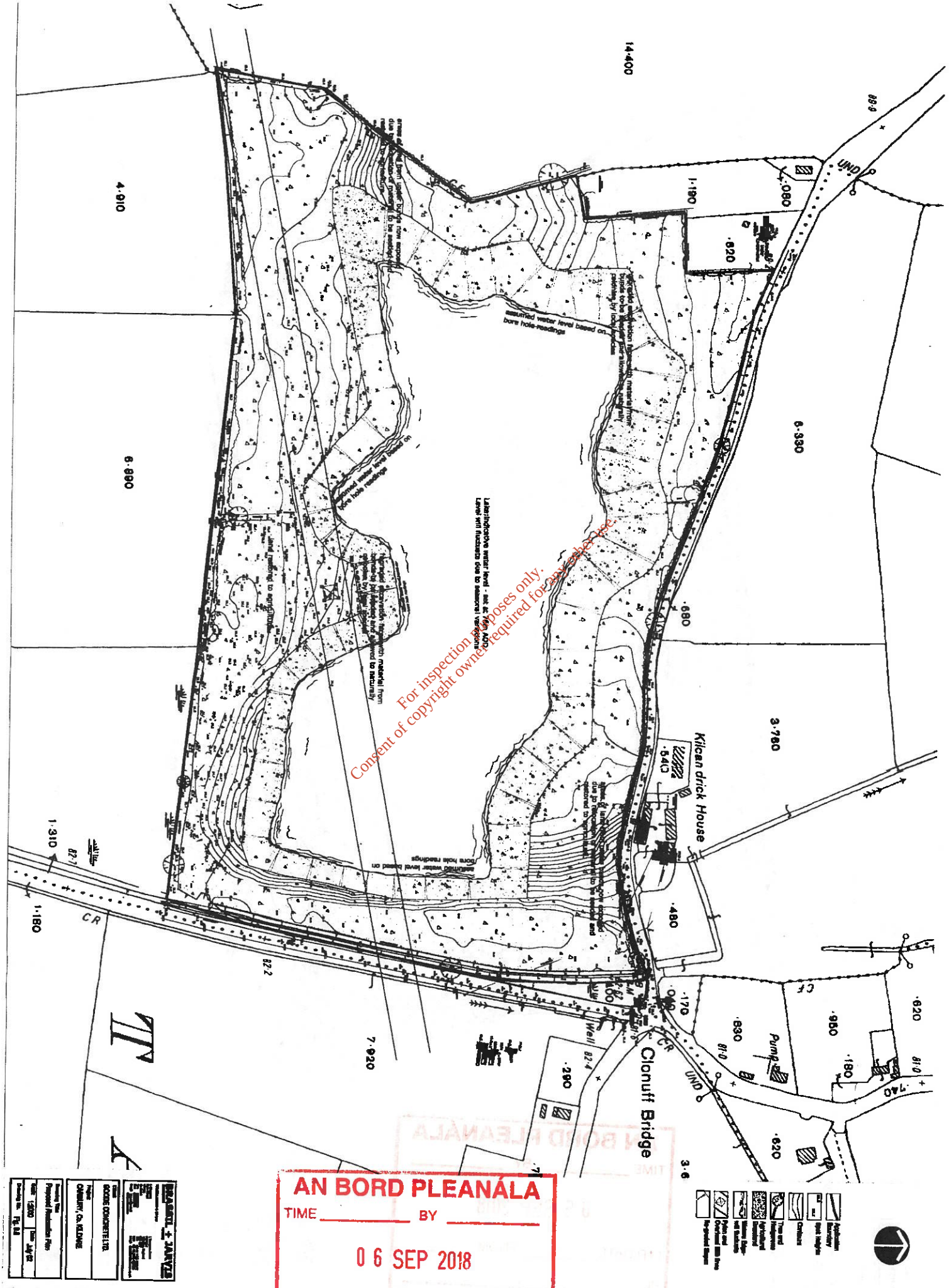
9.8 Conclusions

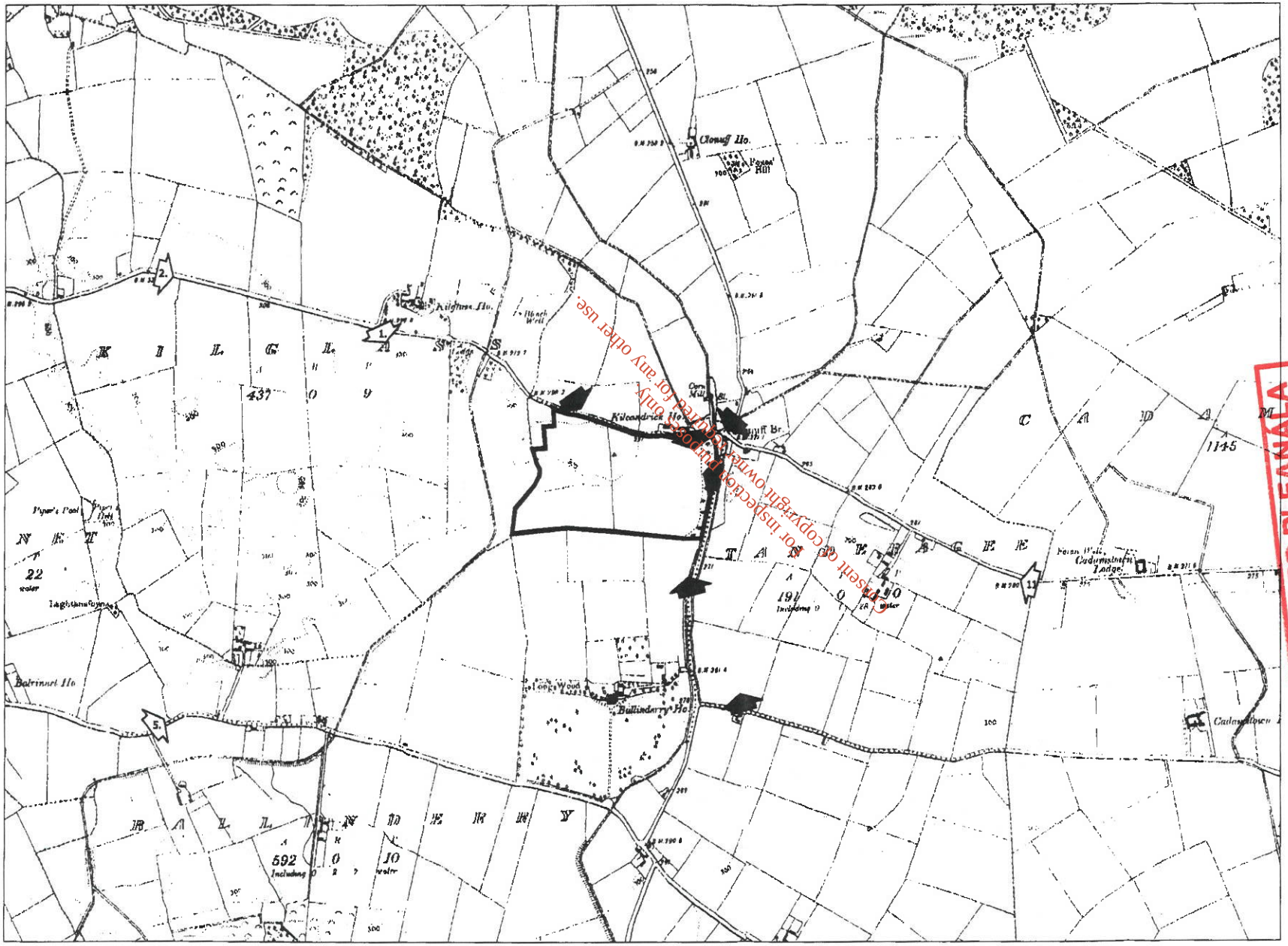
The site is a glacial deposit which is largely characteristic of the surrounding area.

Existing ESB lines and dwelling stand off's limit the area of extraction away from the more exposed and sensitive areas of the adjoining landscape.

The development will significantly alter the landform and land use of the site.

The proposed restoration scheme will significantly increase the ecological diversity of the site through the natural introduction of wetland species





BRASSIL + JARVIS

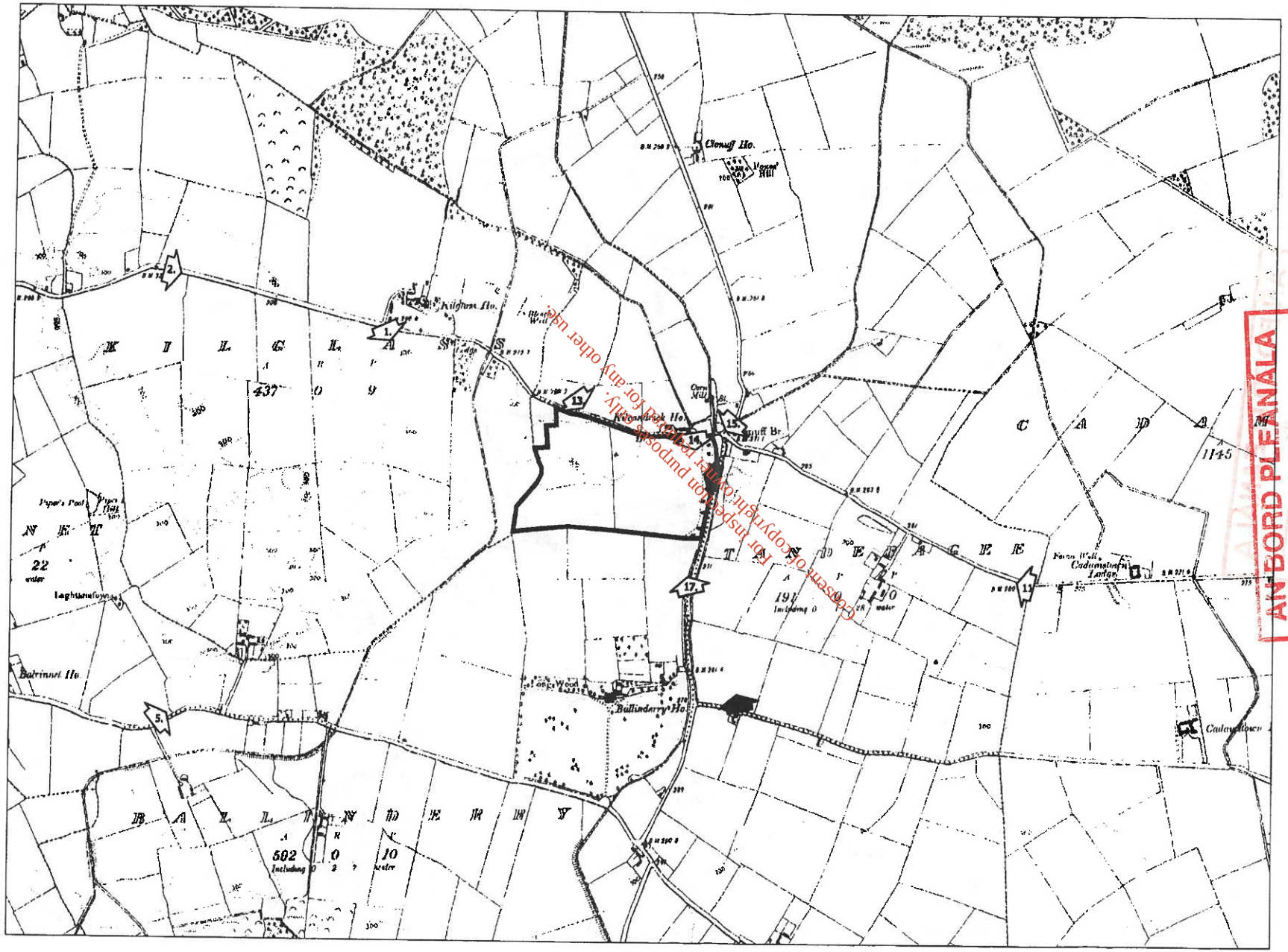
Client: GOODE CONCRETE LTD.

Project: BALLINDERRY CARBURY, Co. KILDARE

Drawing Title: Viewpoint Impact, without mitigation

Scale: 1:10560 | Date: MAY 02

Drawing No. FIG 9.9



Base Plan from Ordnance Survey Ireland Plot Reference No. 177170_1_1

BRASSIL + JARVIS

Client: GOODE CONCRETE LTD.

Project: BALLINDERRY CARBURY, Co. KILDARE

Drawing Title: Viewpoint Impact, with mitigation

Scale: 1:10560 | Date: MAY 02

Drawing No. FIG 9.10

TABLE 9.4 : PREDICTED VISUAL IMPACTS WITHOUT MITIGATION

NATURE OF IMPACT										PREDICTED IMPACT										SIGNIF.		
VIEWPOINT REF:	LOCATION	DESCRIPTION	LEVEL OF IMPORTANCE					DURATION OR LIFESPAN	RECEPTOR SENSITIVITY	ADVERSE	NEUTRAL	BENEFICIAL	CUMULATIVE	SHORTTERM	MEDIUMTERM	LONGTERM	REVERSIBLE	IRREVERSIBLE	MINOR	MODERATE	MAJOR
			I	N	R	D	L															
1.	0.25 km north west of site						•	-	LOW	-	-	-	-	-	-	-	-	-	-	-	-
2.	0.75 km north west of site						•	-	LOW	-	-	-	-	-	-	-	-	-	-	-	-
5.	0.75 km south west of site						•	-	LOW	-	-	-	-	-	-	-	-	-	-	-	-
6.	0.5 km south of site	Removal of vegetation					•	10+	HIGH	•				•				•	•		
		Lowering of skyline					•	10+	HIGH	•			•		•			•		•	
		Quarry / Excavation slopes					•	10+	HIGH	•			•			•		•			•
		Plant area					•	10+	HIGH	•						•	•			•	
11.	1.0 km east of site						•	-	LOW	-	-	-	-	-	-	-	-	-	-	-	-
13.	By property under construction at north west corner of site.	Removal of vegetation					•	10+	HIGH	•				•				•	•		
		Machinery					•	10+	HIGH		•		•	•			•		•		
14.	By Killandrick house, by northern	Skyline alterations					•	10+	HIGH	•			•			•		•			•
		Excavated slopes					•	10+	HIGH	•			•			•		•		•	

15.	By properties north east of site	Lowering of skyline					•	10+	HIGH	•			•			•		•			•
		Excavation area					•	10+	HIGH	•			•			•		•			•
16.	By property on eastern boundary of site	Lowering of skyline					•	10+	HIGH	•			•			•		•			•
		Excavated slopes					•	10+	HIGH	•			•			•		•			•
		Extraction area					•	10+	HIGH	•			•			•		•			•
		Site haul road					•	10+	HIGH	•						•	•			•	
		Machinery					•	10+	HIGH	•						•	•			•	
17.	From road south east of site	Removal of vegetation					•	10+	HIGH	•				•				•		•	
		Lowering of skyline					•	10+	HIGH	•			•			•		•			•
		Site buildings					•	10+	HIGH	•						•	•		•		
		Site machinery					•	10+	HIGH	•						•	•			•	
		Worked faces					•	10+	HIGH	•			•			•		•			•

KEY: PREDICTED IMPACT: A = Adverse, N = Neutral, B = Beneficial
LEVEL OF IMPORTANCE: I = International, N = National, R = Regional, D = District, L = Local
NATURE OF IMPACT: ST = Short Term, LT = Long Term, R = Reversible, IR = Irreversible

TABLE 9.5 : PREDICTED VISUAL IMPACTS WITH MITIGATION

NATURE OF IMPACT									PREDICTED IMPACT									SIGNIF.		
VIEWPOINT REF:	LOCATION	DESCRIPTION	LEVEL OF IMPORTANCE					DURATION OR LIFESPAN	RECEPTOR SENSITIVITY	ADVERSE	NEUTRAL	BENEFICIAL	CUMULATIVE	SHORT TERM	MEDIUM TERM	LONG TERM	REVERSIBLE	IRREVERSIBLE	MINOR	MODERATE	MAJOR
			I	N	R	D	L														
1.	0.25 km north west of site						•	-	LOW	-	-	-	-	-	-	-	-	-	-	-	-
2.	0.75 km north west of site						•	-	LOW	-	-	-	-	-	-	-	-	-	-	-	-
5.	0.75 km south west of site						•	-	LOW	-	-	-	-	-	-	-	-	-	-	-	-
6.	0.5 km south of site	Removal of vegetation					•	10+	HIGH	•				•				•	•		
		Lowering of skyline					•	10+	HIGH	•			•		•			•		•	
		Construction of earth bunding					•	1	HIGH	•			•	•			•		•		
		Seeding and establishment of bunding					•	1	HIGH			•	•		•			•		•	
		Quarry / Excavation slopes					•	10+	HIGH	•			•			•		•		•	
		Plant area					•	10+	HIGH	•						•	•			•	
11.	1.0 km east of site						•	-	LOW	-	-	-	-	-	-	-	-	-	-	-	-
13.	By property under construction at north west corner of site.	Removal of vegetation					•	10+	HIGH	•				•				•	•		
		Construction of mitigation bunds					•	1	HIGH	•				•			•			•	
		Seeding and establishment of bunding					•	1	HIGH			•	•		•			•		•	

		Machinery used in quarrying process and in bund construction					•	10+	HIGH		•		•	•			•		•		
14.	By Killandrick house, by northern boundary of site.	Construction of mitigation bunds					•	1	HIGH	•				•			•			•	
		Seeding and establishment of mitigation bunds					•	1	HIGH			•	•		•			•		•	
		Skyline alterations					•	10+	HIGH	•			•			•		•		•	
15.	By properties north east of site	Construction of mitigation bunds					•	1	HIGH	•				•			•			•	
		Seeding and establishment of mitigation bunds					•	1	HIGH			•	•		•			•		•	
		Lowering of skyline					•	10+	HIGH	•			•			•		•		•	
		Excavation area					•	10+	HIGH	•			•			•		•		•	
16.	By property on eastern boundary of site	Construction of mitigation bunds					•	1	HIGH	•				•			•				•
		Seeding and establishment of mitigation bunds					•	1	HIGH			•	•		•			•			•
		Lowering of skyline					•	10+	HIGH	•			•			•		•	•		
17.	From road south east of site	Removal of vegetation					•	10+	HIGH	•				•				•		•	
		Lowering of skyline					•	10+	HIGH	•			•			•		•		•	
		Construction of mitigation bunds					•	1	HIGH	•				•			•		•		
		Seeding and establishment of mitigation bunds					•	1	HIGH			•	•		•			•	•		

KEY: PREDICTED IMPACT: A = Adverse, N = Neutral, B = Beneficial
LEVEL OF IMPORTANCE: I = International, N = National, R = Regional, D = District, L = Local
NATURE OF IMPACT: ST = Short Term, LT = Long Term, R = Reversible, IR = Irreversible

10. MATERIAL ASSETS

The Material Assets of the area which may be affected by the proposed development are the local road network and land use. These material assets are addressed in the following Sections

Section 10.1: Land Use

Section 11.0: Traffic and Transportation

Other material assets include water, soil, air, human beings, landscape and the cultural heritage. These aspects of the environment are addressed in detail in the relevant sections of this EIS.

10.1 LAND USE

The predominant landuses in the area are agriculture (primarily grazing), one off rural residential development, and extractive operations. There are scattered residential properties in the vicinity of the site, primarily one off dwellings on the county roads to the north and east of the site.

Impacts on the land uses and amenities of the area have been assessed in the relevant sections of this EIS. The Operational Plan has been designed to minimise impacts on the receiving environment particularly the protection of residential amenity. Taken in conjunction with the mitigation measures proposed to avoid or reduce potential adverse impacts, there should not be any potential significant long term adverse impacts on the amenities and land uses of the area.

Natural resources in economically workable reserves must be worked where they occur, subject to the satisfactory amelioration and minimisation of adverse impacts on adjoining land uses. In this regard, extraction is generally permitted in principle in rural areas, subject to compliance with environmental standards.

The proposed Operational Plan and mitigation measures should ameliorate environmental impacts to an acceptable standard, and impacts on adjoining land uses should not be significant.

The removal of 13.9 ha from agricultural use is not a significant impact on land use or agriculture in the area. The impact is temporary and short term as the lands will be progressively returned to agricultural use as extraction proceeds through the site.

11. TRAFFIC AND TRANSPORTATION

11.1 Introduction

FaberMaunsell have been commissioned by Declan Brassil & Company to carry out a Traffic Impact Assessment (TIA) as part of an Environmental Impact Statement for a proposed sand and gravel extraction site in Ballinderry, Carbury, Co Kildare. A site location plan is presented in Figure 11.1.

The Ballinderry resource is proposed to work as a supplementary supply to another site held by Goode Concrete Ltd, which is situated approximately 1 km South West of the subject site, in Kilglass.

This Kilglass operation comprises of an active sand and gravel pit, washing and screening plant, concrete batching plant and a concrete block plant. This site supplies the company with approximately 600,000 tonnes per annum for supply to its Kildare and Dublin markets.

11.2 Objectives

A summary of the main aims and objectives of this study are as follows:

- To assess the cumulative impact of the proposed quarry on the nearby road network, in particular the junction between L1002 and L5004, as shown on Figure 11.2.
- To describe any measures required to minimise the impact of the quarry development on the dwellings near junction of L1002 and L5004.
- To advise on the optimum location for the site access and to provide a detailed design of the access.

11.3 Study Methodology

The methodology adopted for this study is summarised as follows:

- Traffic Surveys – Classified junction turning counts were carried out at a series of key locations (Junctions 1, 2 and 3; as marked on Figure 11.2) throughout the study area to provide information on the existing traffic patterns. This information was also used as the basis for the prediction of future traffic volumes.
- Road Network Inventory – The study area's road network was examined to identify any problems which may exist at present. Junction geometry was measured for inclusion in a simple spreadsheet model tool to be developed for the study.
- Existing Traffic Conditions Assessment – An Excel Spreadsheet model was developed containing the traffic survey data collected above. This model was used in parallel with junction capacity assessment models developed to examine the existing traffic conditions.

- Future Year Network Assessment – The estimated future year traffic volumes on the study area road network were calculated to assess the operation of the junctions in the study area. The results of this assessment were used to determine the appropriate remedial measures, which may be required at each junction.

11.3.1 Structure of Report

This report is divided into the following segments:

(i) Section 11.2 describes the existing environment with regard to traffic;

(ii) Section 11.3 outlines the proposed development;

(iii) Section 11.4 estimates the traffic generated by the proposed development and identifies the assessment period;

(iv) Section 11.5 provides the junction analysis;

(v) Section 11.6 describes the current public transport provision in the area and the way in which it may be linked into the development site, along with the parking provision;

(vi) Section 11.7 describes all necessary mitigation measures, required as a result of the development proposals;

(vii) Section 11.8 concludes the report by summarising the main points.

11.4 Existing Conditions

11.4.1 Site Location

The 13.9 ha site is located in the townland of Ballinderry, approximately 5km north of Carbury and 3.5km South of the N4 junction near Broadford. The local road network is the haul route of existing and proposed operators in the area.

The site is bound to the south by agricultural land. The eastern and most of the northern boundaries of the site are formed by County Roads. The eastern boundary is also formed by a stream flowing south to north, passing under the County Road on the northern boundary at Clonuff Bridge. The stream diverges westward from the eastern boundary leaving a wedge of land to the north-eastern corner of the site, which has been managed as a local amenity area.

There are residential properties in the vicinity of the site, comprising primarily of one-off dwellings fronting the County Roads to the east and north of the site.

11.4.2 Existing Road Network

The location of the existing plant and the proposed site in relation to the existing road network are shown in Figure 11.1.

At present the site can be accessed from the N4 via local road L1002 (Broadford to Carbury) and L5004 (which makes the Northern boundary of the site). Access to the existing site is made via the L5004 and this road has an average width of 5.2m.

The road from the junction at Clonuff Bridge along the eastern boundary of the site towards the Kilglass operation has a minimum width of 6m.

There are two main junctions along the proposed haulage route: Junction 1 (N4 at Broadford) and Junction 2 (Clonuff Bridge). It is proposed to provide a new site access, situated off the Southern arm of Junction 2, on the Eastern boundary of the site. This will be discussed in further detail in Section 11.7

The road leading from Junction 2 (Clonuff Bridge) to Junction 1 (N4 at Broadford) has an average width of 6.3m.

Each of these junctions can be seen in Figure 11.2.

11.4.3 Traffic Surveys

In order to quantify the traffic volumes on the road network surrounding the site, traffic surveys were carried out at the junctions deemed relevant to this assessment:

- Junction 1 (N4 junction at Broadford)
- Junction 2 (Clonuff Bridge)
- Junction 3 (Between Kilglass and Ballinderry)

These three junctions are marked on Figure 11.2. The traffic surveys were carried out on Thursday, the 14 of February 2002.

11.5 Proposed Developments

11.5.1 General

Goode Concrete Ltd proposes to extend their Kilglass operation by developing the 13.9 ha site shown in Figure 11.1 for the extraction of sand and gravel. There will also be a washing and screening plant on site with an output capacity of approximately 250,000 tonnes per annum. The following site infrastructure will be provided on site:

- Washing and screening plant;
- Shipping Office
- Canteen;
- Weighbridge;
- Wheel wash facilities;
- Fuel Storage and bunding;
- Car parking;

The capacity of the combined plants will be in the order of 600,000 tonnes per annum, which is equivalent to the existing output of the Kilglass operation. It is envisaged that some 200,000 tonnes per annum will be extracted from the Ballinderry site and c400,000 at Kilglass up to 2006. Accordingly there will be no net increase in the quantity extracted or the traffic movements on the local road network.

As the proposed extraction area has a reserve in the order of 2,200,000 tonnes it is envisaged that the proposed quarry will have exhausted it's supply by 2009 if it operates at the proposed production rate of 600,000 tonnes per annum after the Kilglass reserve has been exhausted.

The site entrance will be located on the eastern boundary of the site and a detailed layout is illustrated in drawing 28938-001.

The proposed hours of operation for extractive and processing activities are 07:00 to 19:00 hrs Monday to Friday, and 08:00 to 13:00 hrs Saturdays. It is not proposed to extract or process material on Sundays or Public Holidays. Material will be loaded and removed from site between the hours of 07:00 to 19:00 hrs only, Monday to Saturday.

11.5.2 Committed Developments

The M4 realignment, which is due to be finished by 2006, will follow the route shown in Fig. 11.3. There will be no interchange between the M4 and the L1002 and therefore the only effect this development will have on the road network will be to reduce base traffic flows. The effect of the M4 realignment was not incorporated into the assessment of future traffic flows on the surrounding road network. As a result the assessment made is conservative due to the fact that it does not include the reduction in traffic flows on the main haulage routes.

11.6 Traffic Forecasts

11.6.1 General

It is planned that the Ballinderry site will be operational by mid-2004, subject to the granting of planning permission. The Kilglass operation will produce 600,000 tonnes per annum until mid-2004 and 400,000 tonnes thereafter. The remaining 200,00 tonnes will be produced by the Ballinderry site. This will mean that the Kilglass reserve will be exhausted by mid-2006. There will be a maximum of two years during which extraction will occur at both sites. From mid-2006 onwards, 600,000 tonnes are to be extracted from the Ballinderry site.

Projections made for the development indicate that when the Ballinderry site opens in mid-2004, there will be 35 loads (70 movements) transported off site per day, with a maximum load size of 26 tonnes. When the Kilglass reserve has been exhausted in mid-2006, the number of loads transported from the proposed site per day will increase to 105 loads (210 movements). It is not anticipated that there will be any significant increase in traffic movements in the area as the proposed development will essentially only be a staged relocation of the existing production at Kilglass.

In addition to this commercial traffic it is anticipated that there will be approximately 4 car movements per day from 2004 to 2006 and a total of 10 car movements from 2006 onwards.

11.6.2 Generated Traffic Distribution

The haulage route for the proposed quarry, shown in Figure 11.4 and 11.5, is essentially the same as that used at present by the existing quarry at Kilglass. The only difference is that trucks will be on the road for a shorter distance. Between the years of 2004 and 2006 an estimated 90% of the trucks will turn left out of the site and these will then all turn right at Junction 1, towards, Dublin. The other 10% of commercial traffic will turn right from the site to travel to the Kilglass to supply the concrete batching plant. From 2006 onwards there will be 50% travelling towards the N4 and 50% will travel to the Kilglass operation.

Information obtained from the planning consultants and the quarry operator indicate that at present the Kilglass quarry transports 105 loads per day (210 movements), and that in mid-2004, this will be reduced to 70 loads (140 movements). From mid-2006, the Kilglass quarry will no longer have any sand or gravel loads transported from its site. However from mid-2004 until mid-2006, 7 loads a day (14 movements) will be transported from the proposed Ballinderry site to the Kilglass site. After this period this number will increase to 52 loads per day (104 loads per day).

Figure 11.6 shows the existing traffic flows for the AM peak traffic volumes in the year 2002.

11.6.3 Assessment Period

The assessment period is that time period when the development traffic, in combination with the traffic on the existing network, produces the highest overall traffic flows. To identify the time period with the greatest overall traffic flows the generated traffic was added to the existing traffic flows. An assessment of the daily flows on the network the AM and PM peak hours were identified and the PM peak was found to be the critical period. The PM peak occurs at 17:00-18:00.

11.6.4 Design Year

The opening of the Ballinderry site is due to take place in mid-2004. It is anticipated that the proposed extraction area will have a life span of approximately five years. Hence 2008 is the design year for the site.

11.6.5 Forecast Traffic Levels

According to the NRA's 'National Road Needs Study', the recommended growth factors for the road types relevant to this network are as follows:

- National Primary Route (N4)

  2000-2010 = 4%

- Regional, National Secondary Toads (County Roads)

  2000-2010 = 2.5%

It was considered that these growth factors would ensure a conservative estimation of the future traffic flows and hence these growth factors were adopted.

The 2004, 2006 and 2008 forecast traffic flows for the existing road network are shown in figure 11.7, 11.9, 11.11 respectively. The 2004 (when the Ballinderry site comes into operation), 2006 (when the Ballinderry site takes over total and gravel production) and 2008 (the design year) forecast traffic with the proposed development traffic included are shown in Figures 11.8, 11.10,11.12 respectively.

11.7 Junction Analysis

11.7.1 Introduction

The IHT (Institute of Highways and Transport) Guidelines for undertaking Traffic Impact Assessments require a detailed junction assessment where one or other of the following thresholds are exceeded:

- Traffic to and from the development exceeds 10% of the two-way traffic flow on the adjoining highway; and,
- The development traffic exceeds 5% of the existing two-way traffic flow on the adjoining highway where traffic congestion exists or will exist within the assessment period or will exist within the assessment period or other sensitive locations.

This assessment has clearly shown that the traffic generated by the proposed development is under 10% so according to the first criteria above a junction analysis is not necessary.

However in order to ensure that the proposed geometry of the new site access will be sufficient to carry the traffic flows to/from the quarry safely, a junction analysis was carried out using the VPICADY4 program. The results of this program are expressed in terms of Ratio to Flow Capacity (RFC) and queue length (vehicles).

In addition, a junction analysis was carried out on the Clonuff Bridge junction (Junction 2), to ensure that the present road geometry at this junction will be capable of accommodating the predicted future traffic flows safely.

11.7.2 Proposed Site Access

The analysis was carried out for 2004 (the opening year), 2006 (the year in which the Kilglass quarry closes) and 2008 (the design year) for the PM peak. The results for the analysis for the worst-case scenario (2008) are given in Table 11.1 below. The RFC provides a measure of the spare capacity of a particular approach. An RFC of 0.85 is generally accepted as the desired practical capacity limit for a priority controlled junction.

The flows used are those shown in Figure 1.10, taken from surveys that were carried out at the junction. The PICADY results from the existing conditions were examined and found

to replicate approximately the queue lengths observed throughout the survey. From these it can be seen that the junction will operate satisfactorily in 2004, 2006 and 2008, with minimal queuing on all arms.

Table 11.1 PICADY Results for 2008 Forecast Traffic Flows at the Proposed Site Access (PM Peak) with the Ballinderry Quarry in Operation

Movement	2004	
	RFC	Queue
Site Access to the N4 or Kilglass	0.210	0.3
N4 to Site Access	0.017	0.0

This analysis shows clearly that the junction operates satisfactorily in the worst case, 2008. The PICADY output file for the 2008 forecast traffic flow with development at the Proposed Site Access is shown in Appendix 11.1.

11.7.3 Junction 2 (Clonuff Bridge Junction)

Junction 2 has been analysed using the VPICADY4 program.

The results of the analysis for the forecast traffic (for 2004, 2006 and 2008) for Junction 2 with the Ballinderry development are summarised in Table 1.2. From these it can be seen that the junction will operate satisfactorily in 2004, 2006 and 2008, with minimal queuing on all arms.

Table 11.2 PICADY Results for 2008 Forecast Traffic Flows at Junction 2 (PM Peak) with the Ballinderry Quarry in Operation

Movement	2008	
	RFC	Queue
From the arm that leads to the Roadstone Site	0.048	0.0
From Kilglass Direction	0.040	0.1
From Cadamstown	0.072	0.1
From the N4	0.018	0.0

The PICADY output file for the 2008 forecast traffic flow with development at Junction 2 (Clonuff Bridge Junction) is shown in Appendix 11.1

11.8 Parking Provision And Public Transport Facilities

11.8.1 Parking

The Kildare County Development Plan 1999 does not contain a recommended car parking provision of a development of this type. A provision of 14 car parking spaces has been made, which is deemed more than adequate to cater for the staff at this site as well as visitors.

11.8.2 Public Transport Facilities

Due to the nature and location of the proposed quarry and the number of employees on this site, the provision of public transport facilities has not been considered.

11.9 Mitigation Measures

11.9.1 Traffic Volumes

By comparing the traffic flows for future years 2004, 2006 and 2008 for both cases (with and without the Ballinderry Quarry), as shown in figures 1.7-1.12, it is clear that overall the implementation of the proposed Ballinderry Quarry will result in no extra traffic movements on the network. In fact the quarry were to go ahead it would result in less traffic movements at Junction 3 and an equal amount of traffic movements at Junction 1 (N4 to Broadford) and Junction 2 (Clonuff Bridge) for each of these years.

In short, this Traffic Impact Assessment has proven that the volumes of traffic generated by the proposed quarry at Ballinderry, Co. Kildare, will not have a significant impact on the surrounding road network. All junctions along the proposed haulage route have ample capacity to cater for the development traffic through the lifetime of the operation. The road geometry along the haulage route is also sufficient to allow for the two-way Heavy Goods Vehicular traffic. An important point to note is that there will not be any additional HGV traffic due to the proposed quarry passing any of the residential dwellings along the proposed haulage route.

11.9.2 Site Access Arrangements

The existing site access is deemed unsuitable to accommodate Heavy Goods Vehicles and as such a new site access has been proposed. The location of this is shown in Figure 11.4. This location was chosen for a variety of reasons. Firstly, to minimise the impact on the residential dwellings situated around Clonuff Bridge Crossroads; secondly, in order to open onto a road of sufficient geometry as to allow the turning of Heavy Goods Vehicles into and out of the Quarry Site; and, finally in order to maximise the sight distances in each direction.

The site access was designed in accordance with the National Roads Authority 'Road Geometry Handbook'. The proposed design is given in Drawing 28938-001, as attached.

The design includes a carriageway of 7m with an allowance for a hard shoulder 3m either side. A radius of 15m is required for the flare on each side. This will mean that Heavy Goods Vehicles will be able to enter and exit the site safely.

It is recommended that the visibility be improved by trimming back hedgerows, which are situated within the required visibility envelope that extends 215m in each direction from the centre of the site access and is indicated on the drawing attached. Another safety measure that is recommended is the introduction of a single solid line along the road outside the site access, to prevent overtaking along with road markings and signage shown on the drawing.

It is recommended that this situation be monitored for the first two years after the opening of the Site to ensure that the traffic flows are in line with the estimations made in this report

11.10 Conclusion

The conclusions of this TIA are as follows:

- The proposed sand and gravel quarry does not increase traffic movements on the study area road network or the number of Heavy Goods Vehicles passing nearby residential dwellings;
- All junctions along the haulage route operate within capacity;
- The proposed junction access to the site will provide for safe turning of HGVs into and out of the proposed quarry; and
- The proposed junction access is positioned so as to minimise the effect on nearby residential dwellings.

New Access to site will be from the road from Clonuff Bridge to Carbury, which in general is a wider road than the L5004 onto which the existing access joins.

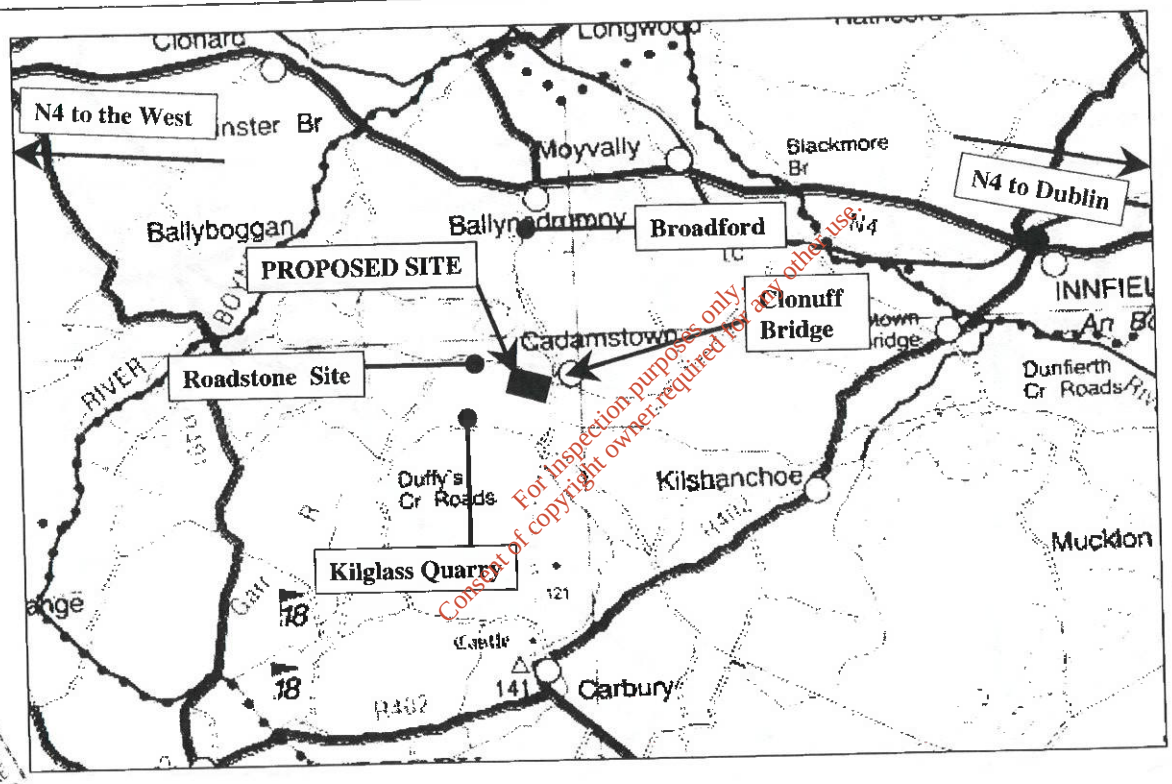


FIGURE 1.1 Site Location Plan

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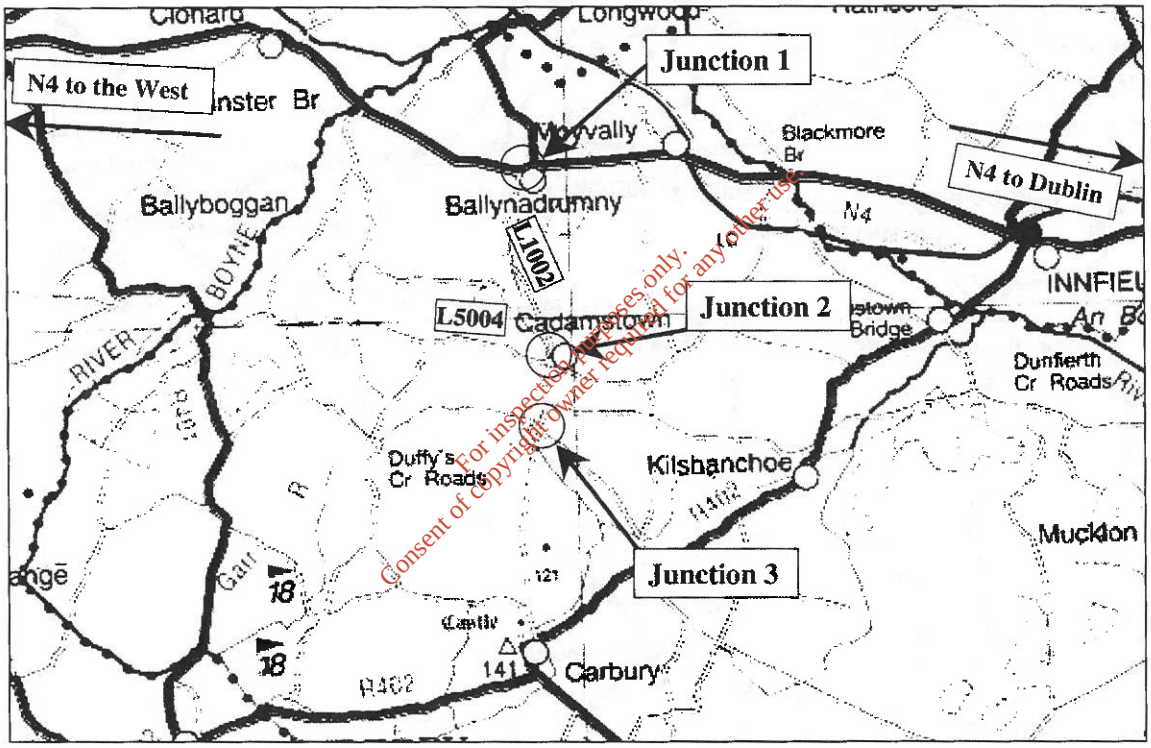

FIGURE 11.2 Junction Layout

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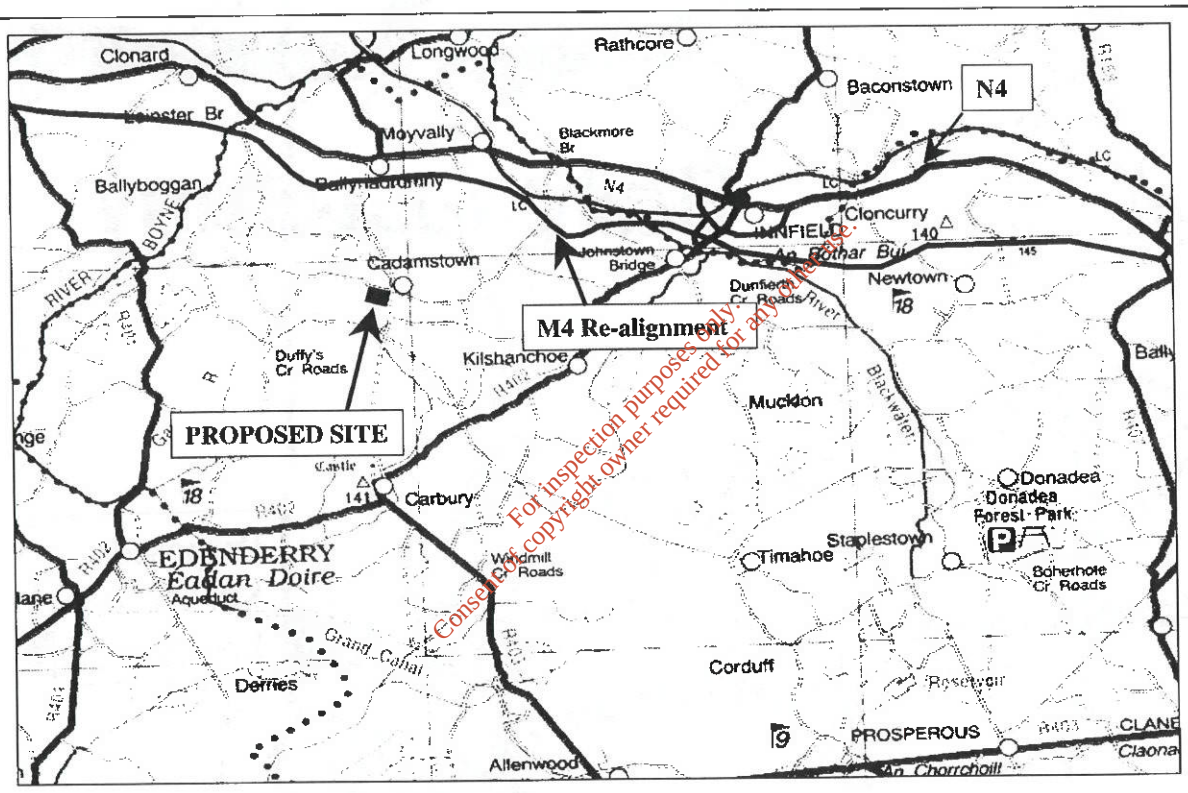

FIGURE 1.3 M4 Re-alignment

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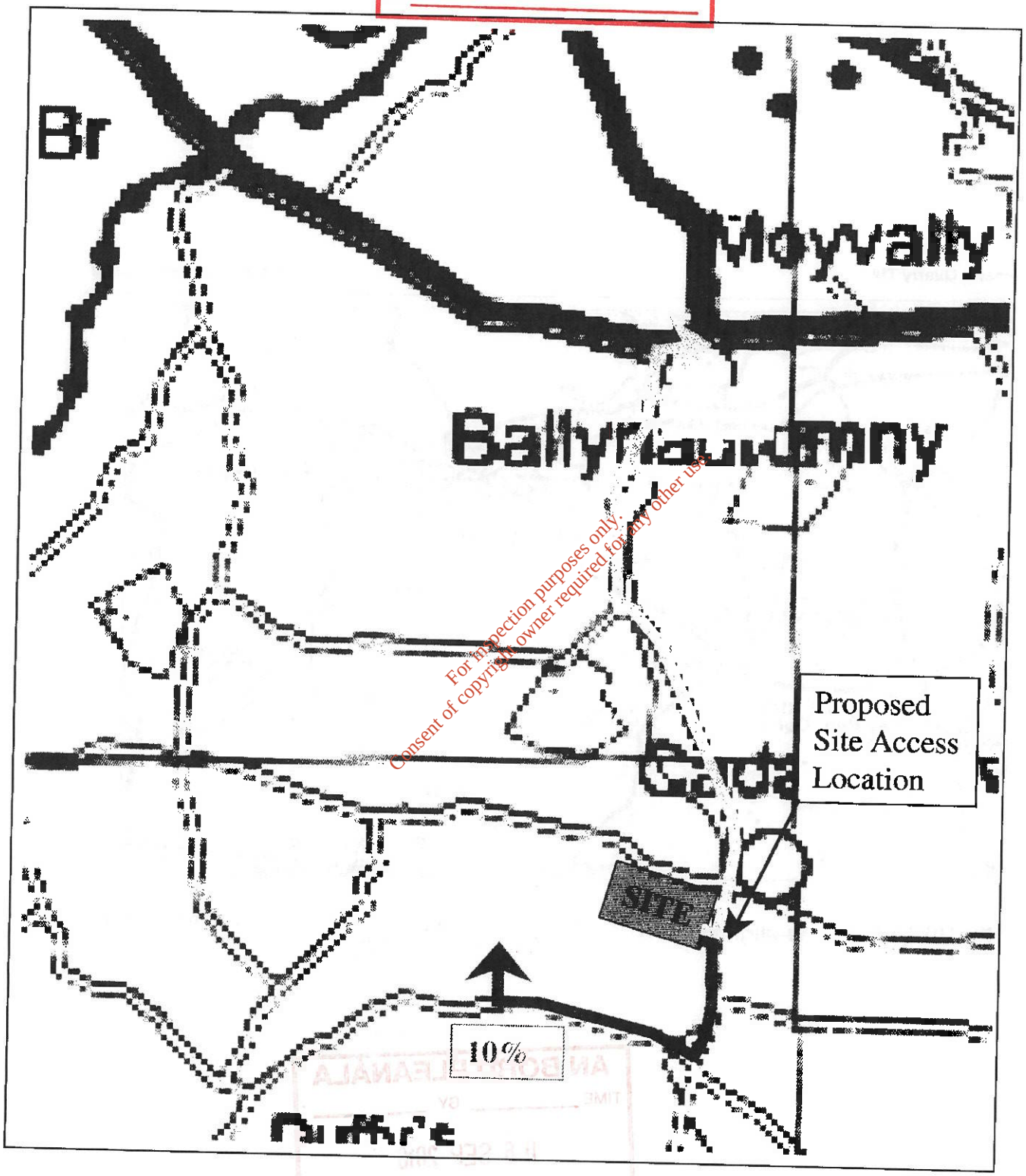

Figure 1.4 Haulage Route 2004-2006

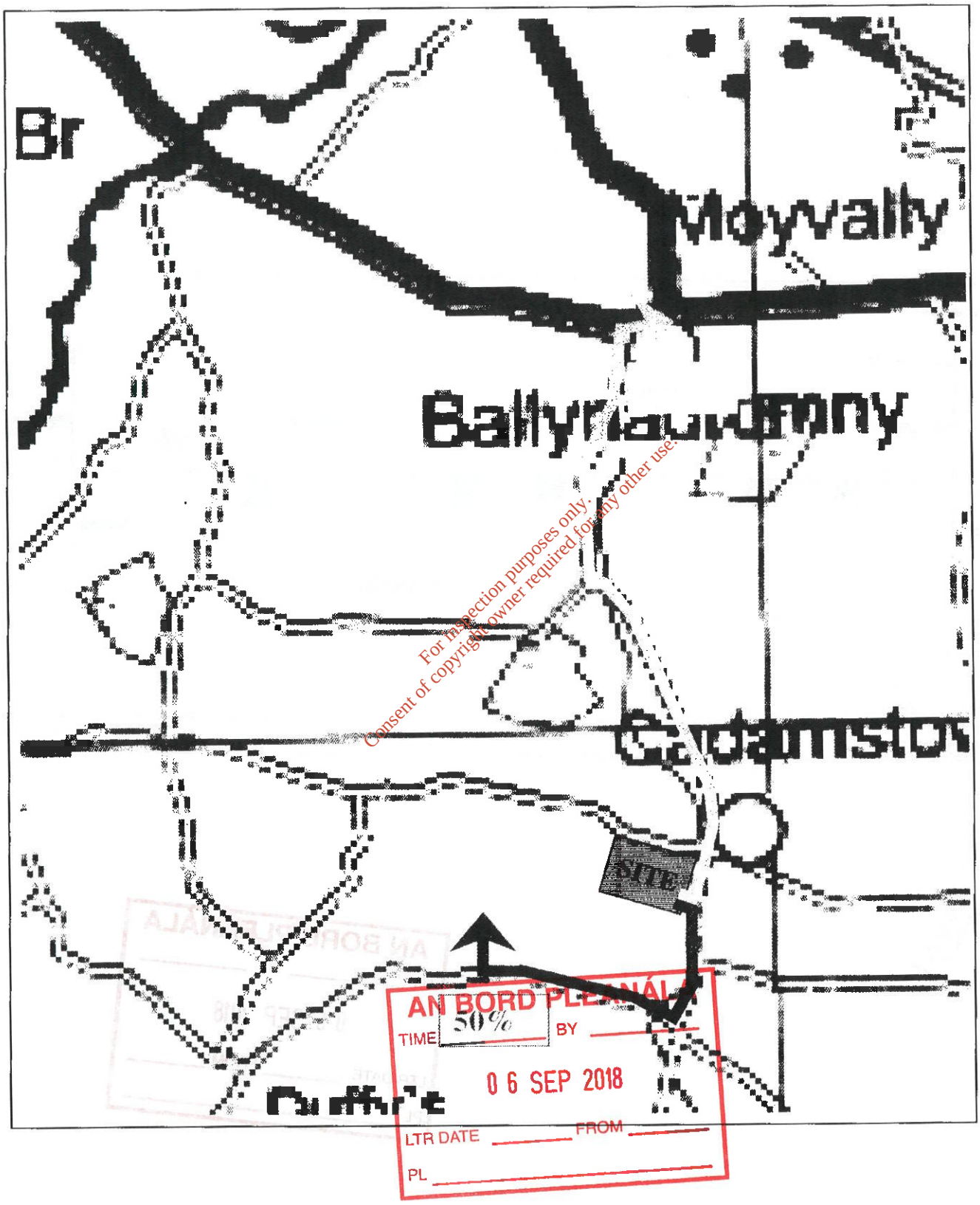

Figure 1.5 Haulage Route 2006-2008

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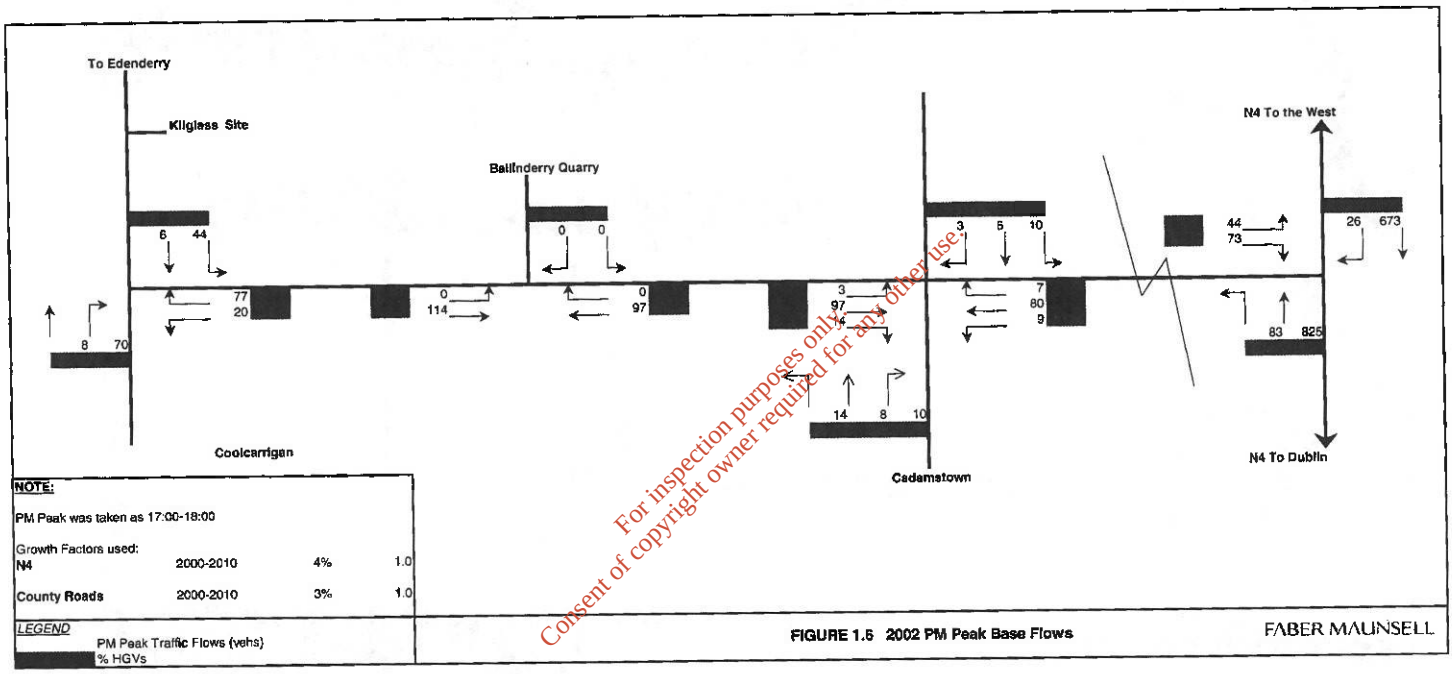

NOTE:

PM Peak was taken as 17:00-18:00

Growth Factors used:

N4	2000-2010	4%	1.0
County Roads	2000-2010	3%	1.0

LEGEND

PM Peak Traffic Flows (vehs)

% HGVs

FIGURE 1.5 2002 PM Peak Base Flows

FABER MAUNSELL

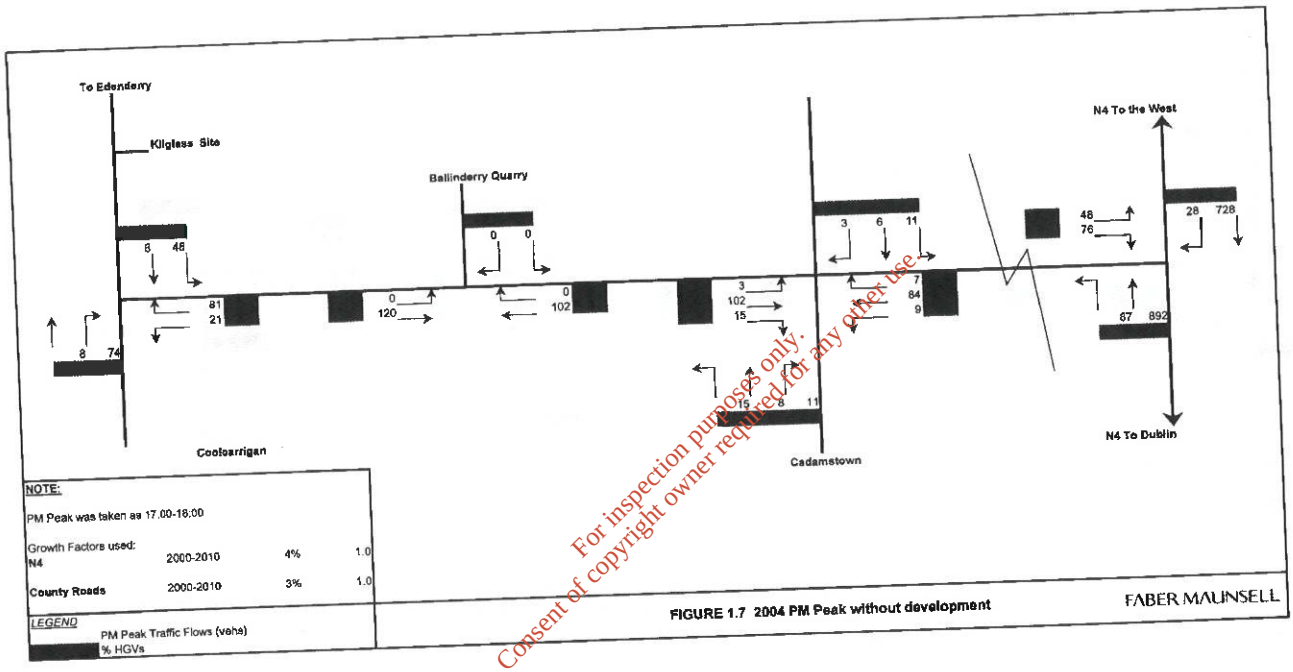

FIGURE 1.7 2004 PM Peak without development

FABER MAUNSELL

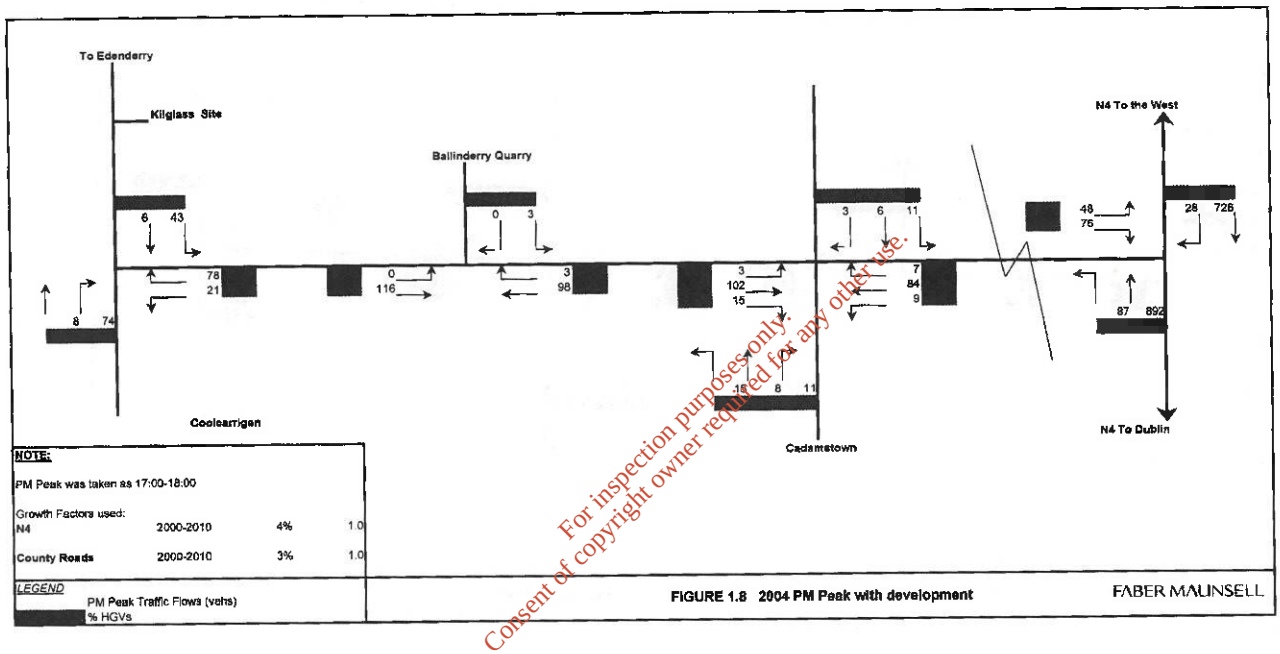

FIGURE 1.8 2004 PM Peak with development

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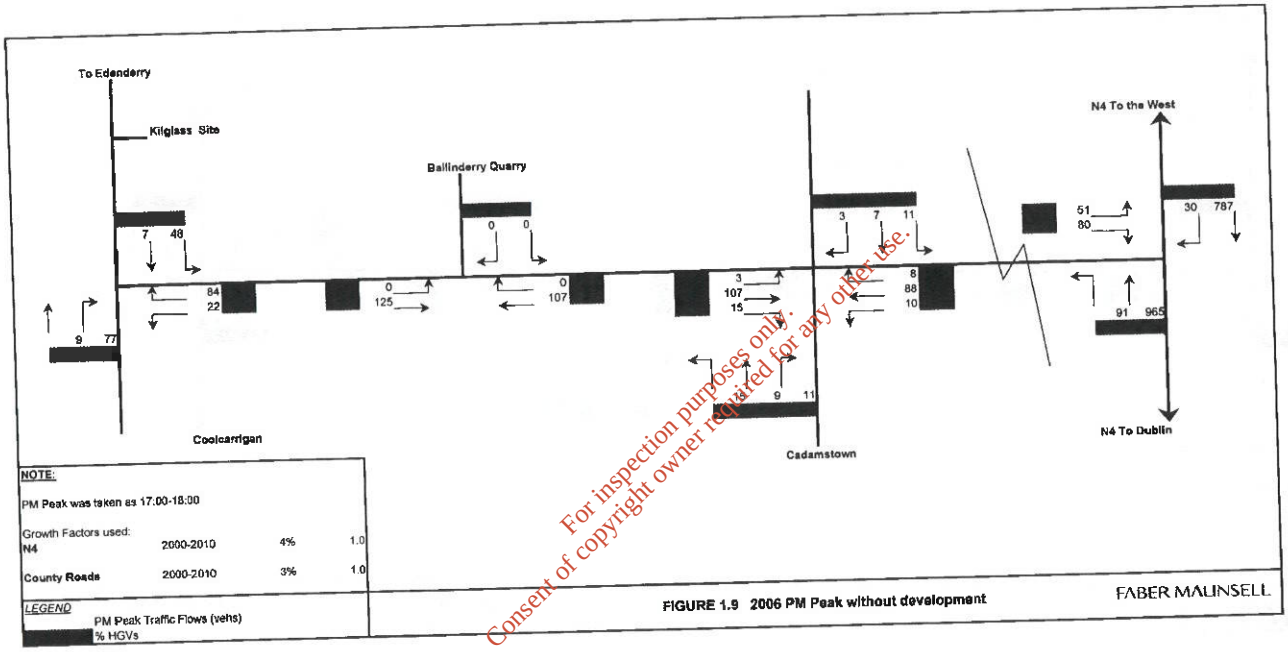


NOTE:

PM Peak was taken as 17:00-18:00

Growth Factors used:

N4	2000-2010	4%	1.0
County Roads	2000-2010	3%	1.0

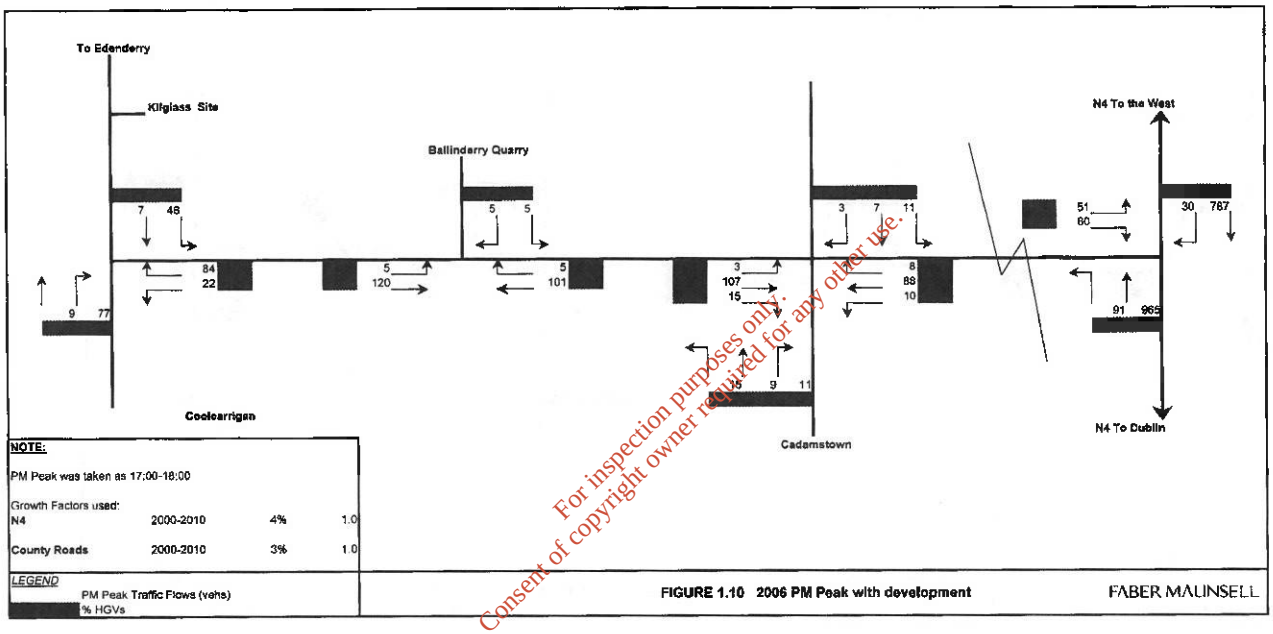
LEGEND

PM Peak Traffic Flows (vehs)

% HGVs

FIGURE 1.9 2006 PM Peak without development

FABER MAUNSELL



NOTE:

PM Peak was taken as 17:00-18:00

Growth Factors used:

N4	2000-2010	4%	1.0
County Roads	2000-2010	3%	1.0

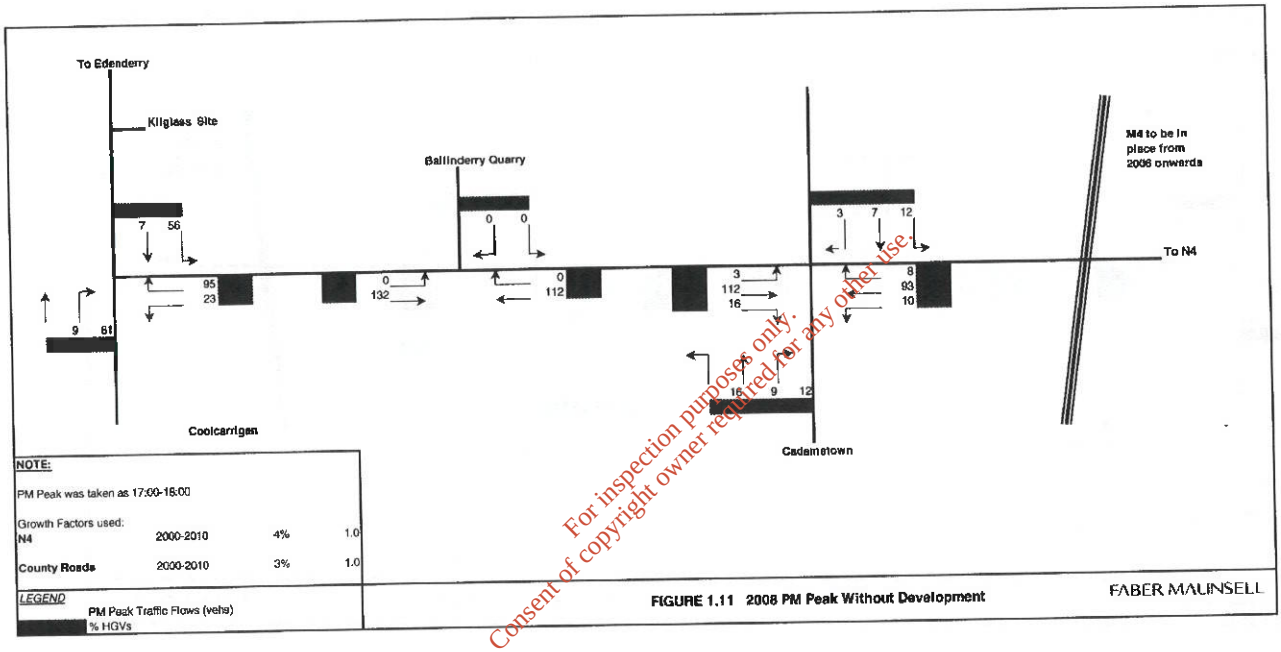
LEGEND

PM Peak Traffic Flows (vehs)

% HGVs

FIGURE 1.10 2006 PM Peak with development

FABER MAUNSELL



NOTE:

PM Peak was taken as 17:00-18:00

Growth Factors used:

N4	2000-2010	4%	1.0
County Roads	2000-2010	3%	1.0

LEGEND

PM Peak Traffic Flows (vehs)

% HGVs

FIGURE 1.11 2008 PM Peak Without Development

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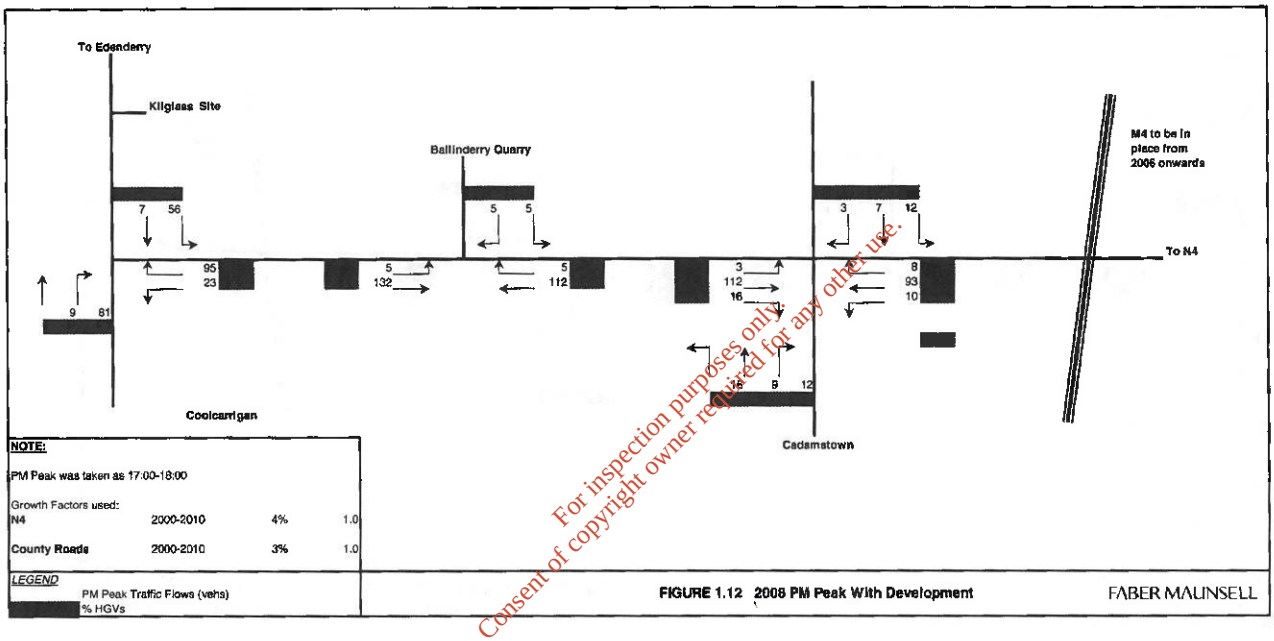

FIGURE 1.12 2008 PM Peak With Development

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12. ARCHAEOLOGY AND THE CULTURAL HERITAGE

12.1 Receiving Environment

12.1.1 Introduction

Declan Brassil & Co. Ltd. on behalf of Goode Concrete Ltd. have been requested to submit an Environmental Impact Statement in relation to an application to Kildare County Council for permission to extract sand and gravel from a site of approximately 13.9 ha. It is also proposed to erect a processing plant to wash and screen sand and gravel on site. The following report, which assesses the potential impact of the proposals in relation to archaeology and cultural heritage, is based on a desk study and site inspection of the lands under consideration.

The subject site is located in the townland of Ballinderry, approximately 5km north of Carbury and 3.5km south of the N4 junction near Broadford. The topography of the site is glacial in origin and character, forming a dome rising from the southern and eastern boundaries (81m and 80m AOD respectively) to a high point close to the centre of the site at an elevation of 94.5m AOD. Elevations on the northern boundary rise from 90m on the western side to 92m AOD in the centre, falling to 81m on the eastern side (Declan Brassil & Co., EIS briefing document).

The total application area comprises two fields of pasture separated by a hedgerow aligned north–south through the centre of the site. The lands are bounded on the south by agricultural land and the eastern and most of the northern boundary is formed by county roads. The eastern boundary is also formed by a stream flowing south–north that passes under the road at Clonuff Bridge. The stream diverges westwards from the county road on the eastern boundary leaving a wedge of land (possibly a former millpond) to the northeastern corner of the site.

12.1.2 Sources of Information

A desk study was carried out, primarily involving a literature review and consultation of the Record of Monuments and Places (RMP) compiled and updated by the National Monuments and Historic Properties Service of *Dúchas* The Heritage Service. The RMP is comprised of manuals which list all known archaeological sites and monuments in a county with accompanying maps (based on Ordnance Survey six-inch maps) locating these sites. All sites included in the RMP are protected under the National Monuments Acts (1930–94). The Topographical Files of the National Museum of Ireland were also consulted to assess the area's archaeological potential. These files list, on a townland basis, all archaeological artefacts in the possession of or known to the museum. Such a record can provide evidence for settlement in the absence of physical remains or documentary references.

Historical maps supplied by the Map Library of Trinity College Dublin and aerial photographs held by the Geological Survey of Ireland were examined. These sources can indicate areas of archaeological potential through features like curving field boundaries, cropmarks and soilmarks or can provide information regarding the nature and extent of recorded archaeological sites which have become denuded since the early nineteenth century. A field inspection was also conducted which sought to identify current and

previous land use and to identify areas of archaeological potential and additional items of cultural heritage interest. The site as a whole was found to comprise good quality pasture and features of archaeological potential were identified along the eastern extremity of the site.

12.1.3 Desk-Based Survey

12.1.3.1 Archaeological and Historical Background

The townland of Ballinderry is located in the parish of Mylerstown, barony of Carbury, County Kildare. It is situated in an area characterised by a line of eskers (gravel ridges deposited during the last Ice Age) known as the *Eiscir Riada* which crosses Ireland between Dublin and Galway via Clonard and which once formed the boundary between the ancient kingdoms of Meath and Kildare. Mylerstown takes its name from Meiler de Bermingham whose castle was situated in this parish (Hamilton 1915–17). Ballinderry might be translated as *Baile na Doire* or 'the town of the wood' and in 1640, the proprietor of Ballinderry was Daniel Keigan, an 'Irish papist'. Following the Cromwellian Settlement, the townland was in the possession of Mary Bermingham and Daniel McEgan, possibly the same individual as in 1640 (Anonymous 1922–28).

"There are few districts in the County Kildare more attractive to the archaeologist than the area, roughly speaking, covered by the present barony of Carbury in the northwestern corner of the county" (Devitt 1896–99). This sentiment was expressed more than one hundred years ago but it is just as true today. Carbury is located on the edge of the Bog of Allen which is bounded here by limestone ridges and separated from Carbury Bog by two miles (c.3km) of low flat countryside (Lewis 1837). The Bog of Allen, an "immense stretch of bog once covered with forests", was considered the 'doorway to the English Pale' and almost very hill and ford was guarded by a castle or fortress. The most imposing of these was Carbury Castle on the northeastern side of Carbury Hill which rises to around 143m (Devitt 1896–99).

In prehistory, Carbury Hill had been known as *Sidh Nechtain* or 'the fairy hill of Nechtain' after a legendary ruler of Ireland and husband of Boann who gave her name to the River Boyne. The hill later became known as Carbury after Cairbre, a son of Niall of the Nine Hostages and brother of Laoghaire. The name was later adopted by the O'Careys who controlled the territory known as *Uí Ciardha Cairbre* which was similar in extent to the modern barony of Carbury but extending as far as Kilcock. The O'Careys were a powerful noble family in ancient Ireland before the coming of the Anglo-Normans in AD1169 and by the fourteenth century, they were the last remaining descendants of Niall which gave them the honour of having "the noblest blood in Ireland" (Devitt 1896–99; Fitzgerald 1891–95).

The motte on Carbury Hill was probably built by the first Anglo-Norman proprietor of the area, Meiler FitzHenry, who had been granted the area by Strongbow. At the time, this part of Kildare was actually located inside the kingdom of Meath. The northern boundary of Kildare corresponded to the southern boundary of ancient Meath which was said to run from the confluence of Clonard to the 'Tocher of Carbury' and then on to Geashill. O'Donovan in the 1830s managed to locate all the landmarks along this ancient boundary except two, one of which was the 'Tocher of Carbury'. At the beginning of the nineteenth century, there was a causeway called the 'Togher of Carbury' which now forms the local road (L1102) running north from Carbury village through the large tract of bog called

Knockcor (or Carbury) Bog. The existing road forms the eastern boundary of the proposed development site and joins the N4 at Broadford. The road was built in the mid-nineteenth century along the course of the ancient pedestrian trackway ('togher') over the bog. In medieval times, this togher must have been the approach to Carbury Castle from the north (O'Leary 1896–99). Although it is unlikely that any remains of this togher exist today, the possibility that an early roadway was located in such close proximity to the subject site adds to the site's archaeological potential.

By 1282, Carbury was in the possession of William de Mohun and the demesne was divided into 3½ carucates, much of which lay waste because of the wars between the Anglo-Norman settlers and the native Irish in what was often a violent flashpoint between the two cultures. The unrest in the area took a heavy toll and by 1284, the land around Carbury Hill was considered completely worthless (Devitt 1896–99). By the fourteenth century, Carbury had been acquired by the Berminghams of the Pale and it became known as 'Bermingham's Country'. The Berminghams acquired the barony of Carbury probably during the first years of the fourteenth century. In 1361, Walter de Bermingham of Castle Carbury died and left his land to his sisters. The castle thereby entered the Preston family, leading rival members of the Bermingham family to revolt and ravage Preston's land in Meath. The Berminghams eventually became so isolated from the other Pale lords by this dispute that they were forced to ally themselves with their natural enemies, the O'Connors, and like their new-found Gaelic allies, became 'enemies and rebels' in the eyes of the English. Together, the O'Connors and Berminghams waged a relentless war on the Pale that lasted for generations. The English eventually became determined to neutralise the threat posed by the Bermingham-O'Connor alliance and in 1480 convened a parliament in Naas resolving that "it is very necessary, beneficial and expedient, that a tower or pile of the new fashion should be built at Kesshbaigne [Kishawanny, near Edenderry] on the extreme frontier of the old march." A tax of forty pence was imposed on every ploughland in Meath to fund the measure (Devitt 1896–99; Dowling 1946–53).

When, in the following century, Henry VIII sent commissioners to Ireland to force obedience from his Irish subjects, Bermingham was found to be living like a Gaelic chieftain under the Brehon laws and terrorising the Anglo-Irish families of the Pale. The commissioners decided to coax Bermingham away from the O'Connors by bribing him with lands and titles. On the military front, they cut roads through the forests of Bermingham's Country that had acted as their natural defences for centuries. These new roads were up to a mile long and were wide enough for up to five carts to pass side by side. These measures successfully neutralised the Bermingham threat and by 1540, the O'Connors were devastating Bermingham lands again after two hundred years of co-operation. The Berminghams continued to play an important role in the county, retaining the manors of Dunfierth and Mylerstown, but eventually they lost everything during the Jacobite Wars (Devitt 1896–99).

12.1.3.2 Record of Monuments and Places, *Dúchas*

There are no recorded archaeological sites or monuments within or adjacent to the subject site which would be affected by the proposed development (Figure 12.1). The following monuments are located in the surrounding area and are included here in order to provide an archaeological context for the subject site. Although there has been continuity of settlement in this area since prehistoric times, the items listed below date mainly to the Early Christian and medieval periods. Nearby archaeological sites reflect the nature of the local archaeological landscape and can also offer clues about possible unrecorded

subsurface remains within the development area which could potentially be revealed during groundworks.

RMP No.	TOWNLAND	SITE TYPE	NGR	SH/PL/TR
KD003:005	Balrinnet	Castle site	26739/23889	3/9/3
KD003:006	Balrinnet	Children's burial ground	26794/23882	3/10/1
KD003:007	Kilglass	Cemetery site	26833/23880	3/10/1
KD003:008	Nurney	Church site & graveyard	26721/23801	3/9/6
KD003:009	Calfstown	Enclosure site	26995/23814	3/10/6
KD003:010	Cadamstown	Ringfort site	27048/23806	3/11/4
KD003:011	Mylerstown	Church & graveyard	27036/23722	3/15/1
KD003:012	Mylerstown	Tower house possible	27054/23715	3/15/4
KD003:013	Mylerstown	Ringfort	27130/23669	3/15/5
KD003:014	Cadamstown	Church & graveyard	27130/23877	3/11/5
KD003:015	Cadamstown	Children's burial ground	27148/23915	3/11/2
KD003:016	Clonagh	Cross & burials site	27204/23945	3/11/3
KD003:017	Clonagh	Castle site	27250/23898	3/11/3

(1) Topographical Files, National Museum of Ireland

The topographical files of the National Museum were consulted with reference to Ballinderry and the surrounding townlands. The nearest recorded find comprised a number of burials uncovered in a sandpit in the townland of Kilglass which borders Ballinderry on the west:

Reg No. P1954:3–6
Townland Kilglass
Site Type Skeletal Material
Description Skeletal material comprising seven individuals (excavated) including men, women and children. The "apparently hurried grave" had a cobbled floor which was removed before the arrival of the National Museum archaeologist. All dating evidence was, therefore, gone but it could be anything from a few hundred to a few thousand years old. The first burial was found during work in a sandpit in March 1954 and shortly after, further burials came to light in two parallel graves c.1m apart. The bodies were in an extended position, lying on their backs with their legs stretched out. Neolithic and Bronze Age burials are usually in a crouched position. This grave was shallow and again, there was no dating evidence. A small trench was then uncovered nearby that contained a third burial which was deeper than the others. There is no tradition of a burial ground at this location. The burials appear to be contemporaneous and to have been made "in some haste" which may suggest a battle.

(2) Historical Mapping

The first edition Ordnance Survey six-inch map for the Ballinderry area was surveyed in 1837 and later revised in 1909–11 (Figure 12.1). The twenty-five inch map was surveyed in 1909 and published the following year (Figure 12.2). These maps were all examined to identify any features of potential archaeological origin or cultural heritage interest which might be affected by the proposals. The first item of potential significance was an angular east–west field boundary marked on the 1909–11 maps dividing the western half of the site north and south into two fields. Kinking boundaries such as this can sometimes preserve the shape or even elements of former features such as enclosures or other archaeological site types. During the site inspection, however, it became apparent that this particular boundary was probably just following the natural shape of the ridge from which the field slopes gently to the south. That there is no greater significance to the shape of this former boundary would be verified during archaeological monitoring of groundworks.

The second area of potential cultural heritage interest was located just outside the proposed development site along its eastern boundary and to the northeast of the site adjacent to Clonuff Bridge. At the latter location, a pond is clearly marked on the first edition map of 1837. This probable millpond, which supplied a corn mill to the north of the proposed development site with water via a millrace, was itself fed from the south by the stream which limits the subject site on the east. These features, which were in existence in the 1830s but could be much earlier, are currently separated from the subject site by a good post and barbed-wire fence and should not be affected by the proposed development. The pond has since been filled in and has been landscaped as a public amenity area between the proposed development site and the Carbury–Broadford road.

(3) Aerial Photography

Aerial photography was obtained from the Geological Survey of Ireland and examined for possible archaeological features, mainly in the form of cropmarks. Identifying cropmarks on aerial photography involves identifying patterns produced by differential crop growth; areas of colour variation in the grass, crop or ploughsoil; and earthwork features which have surface expression but which form no discernable pattern at ground level. Examination of the aerial photographs for the Ballinderry site (GSI 1973, N.495) did not lead to the identification of any features of archaeological potential.

12.1.3.2 Field Survey

An archaeological site inspection was carried out by the author on 15th February 2002. The survey involved comprehensive field walking of the site to detect any earthworks indicative of potential archaeological remains and checking ditches for profiles of archaeological deposits or objects. For the purpose of this inspection, the proposed development site was divided into two fields which are described separately below (Figure 12.3):

Field One

This field occupied the western half of the proposed development site and was bound to the north by a tree-lined boundary beyond which was an east–west country road; to the east by a partially denuded tree-lined field bank separating this field from Field Two; and to the west and south by tree-lined field banks (Plate 12.1). The northwestern corner of the field, which is outside the subject site, was occupied by private properties containing modern dwellings.

The field was generally a naturally undulating field of good pasture. The northern portion of the field was relatively flat and featureless but the southern portion sloped gently to the south (Plate 12.2). Views from the centre of the field were quite good in all directions, especially to the north and south, and the Kilglass gravel extraction site was clearly visible to the west (Plate 12.3). The former east–west field boundary marked on the 1909–11 Ordnance Survey maps was no longer present. The angular nature of this bank as seen on the maps appears to correspond to the shape of the ridge which divides the field naturally into two unequal portions (Plate 12.4). In the southwestern corner of the field, there has been ground disturbance caused by farm machinery. No potential features of archaeological derivation were identified in this field.

Field Two

This field occupied the eastern half of the proposed development site and was bound to the north by the east–west country road and a field boundary comprising a field bank with a shallow ditch in places; to the east by a good post and barbed-wire fence beyond which was the stream and the Carbury–Broadford road; to the south by a barbed wire fence and a shallow ditch with occasional trees and thorn bushes; and finally to the west by the partially denuded tree-lined field bank separating this field from Field One.

Field Two was a gently undulating field of good pasture (Plate 12.5) defined on the east by the steep slope of a gravel ridge falling away towards the stream (Plate 12.6). The stream, which may have formerly fed a millrace to the north, comprised a slow shallow flow within a channel c.4m wide by c.3m deep in places (Plate 12.7). The location of the possible former millpond, as indicated on the first-edition Ordnance Survey six-inch map of 1837, now comprises this stream with a landscaped public amenity area beyond this to the east (Plate 12.8). Neither the stream nor the possible former millpond should be affected by the proposed development as long as adequate site boundaries are maintained. Also outside the northeastern corner of the subject site were Clonuff Bridge which appears to be composed entirely of concrete and a King George post box, painted green. Neither item will be affected by the proposals. Kilcandrick House is located on the opposite side of the country road to the north of the proposed development site. This presents as an attractive possibly nineteenth-century dwelling with associated structures (Plate 12.9). The House is not physically affected by the proposals. The visual assessment contained in Section 9 assesses the visual and landscape impact of the development on the setting of the House.

From the top of the ridge and from the majority of the field, views were good to the south and north but to the west and east, they were restricted by high ground. Further gravel ridges were visible in the distance to the north and immediately across the Carbury–Broadford road to the east, the latter being indicated on the 1909–10 twenty-five inch map as the location of a gravel pit (Plate 12.10). Ordnance Survey maps depict the eastern

extremity of the subject site as comprising a strip of marshy ground. However, at the time of inspection this area appeared to be quite well drained and was defined by dark peaty soil and the occasional patch of dead nettles. The ground surface here was somewhat uneven and the stream was lined on the west by a low linear platform or rampart running north–south and measuring c.10m in width (Plate 12.11). Occasional limestone field stones visible along the surface of this platform may relate to earlier field boundaries or to material thrown up during work on the stream itself. This question will be easily resolved by test trenching.

The eastern slope of the gravel ridge was occupied along much of its face by terracing which may relate to former cultivation ridges, traces of which were also visible elsewhere on the surface of the field (Plate 12.12). The main feature of archaeological potential identified during the inspection was a linear depression set into the east-facing slope of the gravel ridge (Plate 12.13). This depression appears as a shallow ditch measuring c.40m in length, c.2.0m in width and c.0.2m in depth. It was located approximately 55m south of the northern field boundary and approximately 20m west of the stream and it is clearly visible from the Carbury–Broadford road. The terracing does not cross this feature, suggesting that the depression was either cut into the terracing or that the terracing was discontinued at this point. Along the length of the feature, several areas of disturbance to the topsoil were visible and these measured c.1.0m in diameter on average. Also within the feature, several tree stumps were located, suggesting that the feature may be the remains of a former east–west field boundary of post-medieval or modern date. Archaeological assessment will be required to verify this interpretation.

Within the southeastern corner of the field, a livestock drinker has recently been provided and this represents an area of disturbance. The soil here was dark and peaty and the bed of the stream in this area was formed almost entirely of a gravel layer. The eastern profile of the stream trench comprised a layer of dark peaty soil overlying gravel (Plate 12.14). The Carbury–Broadford road travels on top of this along the eastern side of the stream. No further features of potential archaeological significance were identified here or in any other part of this field.

12.2 Detailed Description of the Proposed Development

It is proposed to work the Ballinderry resource as a supplementary supply to the Kilglass resource to the west of the subject site. This will involve the extraction of approximately 200,000 tonnes of sand and gravel per annum depending on market demand rising to 600,000 tonnes per annum over the last two tears c. 2007 - 2009. Extraction will take place on a phased basis and in a direction yet to be determined. Washing and screening plant are also proposed for the site. The site infrastructure will include the washing and screening plant, offices, canteen, weighbridge, wheelwash facilities, fuel storage and bunding, and car parking areas etc. The location of these items is to be provided in an Operational Plan which was not available at the time this report was being compiled.

12.3 Potential Adverse Impacts of the Development

Any development which involves ground disturbance, topsoil stripping, ground reduction or excavation has the potential to negatively impact on archaeological remains, both recorded and unrecorded, and on items of more recent cultural heritage value. If any subsurface archaeological remains are located within the boundaries of the subject site,

there is a high potential that they will suffer permanent negative impact through disturbance and/or complete removal. There are currently no recorded archaeological remains within the subject site but this is, nevertheless, an area of high archaeological potential because of its natural topography (i.e. a gravel ridge located in an area of bogland with good views in most directions) and because of its historical and archaeological context.

Despite the archaeological potential of the site, only two aboveground features of possible archaeological derivation were located during the site inspection, the first of which was a low linear platform or rampart running alongside the stream that may relate to boundary activity or to works on the stream itself. The second was a linear depression set into the east-facing slope of the gravel ridge that may relate to post-medieval or modern field division or which may have greater archaeological significance. Both of these features are likely to be subject to permanent negative impacts during the initial site preparation works or at some later stage during the operation's lifecycle.

Both the stream, which fed a former millrace, and the possible former millpond are of cultural heritage interest but these lie outside the development boundary to the east and no impact is anticipated so long as site boundaries are effectively maintained. There is also evidence within this area of the subject site for cultivation ridges and terracing. Such items are increasingly regarded as having cultural heritage significance because of the information they can provide regarding local land use in post-medieval and modern times. These too are likely to be removed during the lifecycle of the extraction works. Finally, there is a potential that Kilcandrick House, which is also of cultural heritage interest, will be subject to a negative but temporary visual impact because of the proposed development. (this is addressed in Section 9)

12.4 Recommended Remedial Measures

In order to establish the significance, if any, of the linear depression in the east-facing slope of the gravel ridge and the possible low linear platform which lines the western side of the stream, an archaeological assessment of these features should be carried out by a licensed archaeologist prior to the commencement of any groundworks which may cause disturbance to them. Following such an assessment, which would involve the excavation of test trenches, a clearer indication of the impacts of the proposals on unrecorded archaeological remains will be gained. Should these features prove to be of no archaeological significance, no further work would be required in relation to them, though continued monitoring might be necessary in their vicinity. If they are of archaeological interest, *Dúchas* will issue recommendations either for their preservation or for full resolution of the remains prior to their removal.

In order to ensure that any unrecorded subsurface archaeological remains that may exist within the remainder of the subject site are properly identified and recorded, it is recommended that all topsoil and subsoil stripping over the entire proposed development area and any other site clearance or earthmoving works be monitored by a qualified archaeologist. As the proposed extraction work is to be phased, it may be necessary for monitoring to be carried out as each new extraction area is opened. Alternatively, it may be possible for archaeologically-supervised topsoil stripping to be carried out during the initial site preparation phase over all proposed extraction areas as well as within the locations for plant, facilities, and infrastructure. This would ensure the early identification and resolution of any remains that may be present. In the event of the discovery of

archaeological deposits during monitoring, all works must cease in the vicinity until a decision is made by *Dúchas* The Heritage Service in relation to the resolution of the archaeology on the site. The recommendations of *Dúchas* could involve avoidance or excavation depending on the significance of the remains uncovered and on the likely impact of the proposed development.

In order to avoid physical disturbance to the possible former millpond and to the stream which limits the site on the east, adequate fencing should be maintained or a protective screening bund will be provided along the eastern boundary of the site during the course of the operation's lifecycle. The potential visual impact of the development on Kilcandrick House outside the proposed development to the north will also be mitigated against through the provision of a screening bund along the northern boundary of the site. Finally, *Dúchas* may request the recording of the terraces and cultivation ridges that are located within Field Two of the subject site, in particular along the east-facing slope of the gravel ridge. Recording would be carried out through a topographical survey and possibly excavation and would ensure that these features are preserved by record prior to removal.

NOTES:

- All conclusions and recommendations expressed in this report are subject to the approval of *Dúchas* The Heritage Service and the local authority. As the statutory body responsible for the protection of Ireland's archaeological and cultural heritage resource, *Dúchas* may issue alternative or additional recommendations.

- The final impact of the proposed development on unrecorded archaeological remains will not be known until the results of archaeological assessment, monitoring and excavation become available should such works be required. These results will be considered in relation to the operational plan which was not available during the preparation of this report.

- The developer should make adequate provisions to fund all archaeological procedures that may be required including monitoring, assessment, excavation and post-excavation works.

12.4 References

Anonymous (1922–28) 'Book of Survey and Distribution' in *Journal of the Kildare Archaeological Society*. Vol. X.

Devitt, M. (1896–99) 'Carbury and the Berminghams' Country' in *Journal of the Kildare Archaeological Society*. Vol. II.

Dowling, M.G. (1946–53) 'Ordnance Survey Letters for Kildare' in *Journal of the Kildare Archaeological Society*. Vol. XIII.

Fitzgerald, Lord Walter (1891–95) 'The Ancient Territories of which the Present County of Kildare was formed and their Septs' in *Journal of the Kildare Archaeological Society*. Vol. I.

Hamilton, G.E. (1915–17) 'The Names of the Baronies and Parishes in County Kildare' in *Journal of the Kildare Archaeological Society*. Vol. VIII.

Lewis, S. (1837) *A Topographical Dictionary of Ireland*. London.

O'Leary, D. (1896–99) 'Notes on the Southern Boundary of the Ancient Kingdom of Meath where it passed through North Kildare' in *Journal of the Kildare Archaeological Society*. Vol. II.

Wilde, W. (1978) *Beauties of the Boyne and its Tributary the Blackwater*. Cork. First published 1849.

12.5 Other Sources

Aerial Photography examined at the Geological Survey of Ireland, Beggar's Bush. Roll numbers: GSI IRL 1/300 6–73 N. 495.

Ordnance Survey maps courtesy of the Map Library, Trinity College, Dublin 2.

Record of Monuments and Places (RMP), formerly the Sites and Monuments Record (SMR), of *Dúchas* The Heritage Service, Department of Arts, Heritage, Gaeltacht and the Islands, 7 Ely Place Upper, Dublin 2.

Topographical Files of the National Museum of Ireland, Kildare Street, Dublin 2.

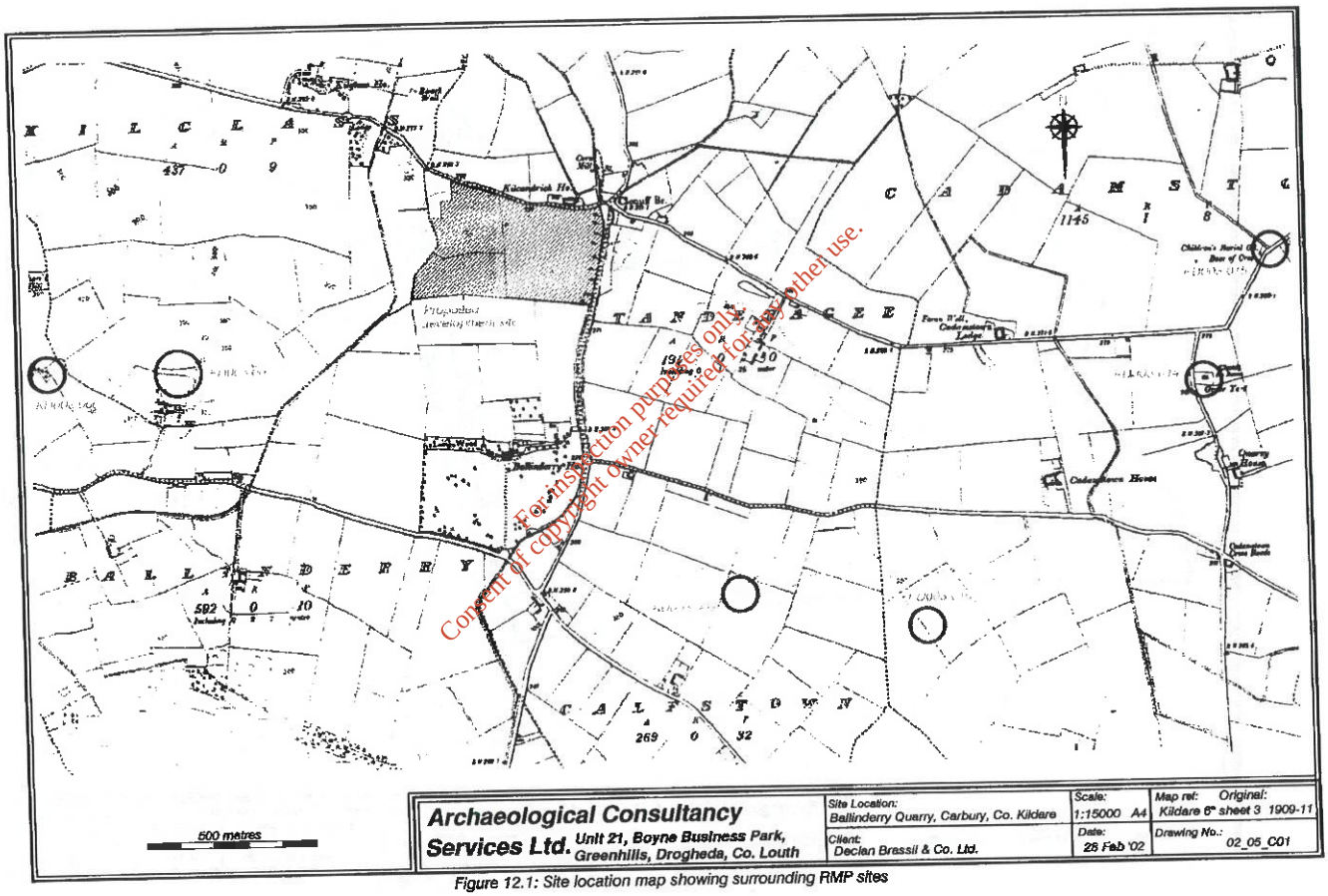


Figure 12.1: Site location map showing surrounding RMP sites

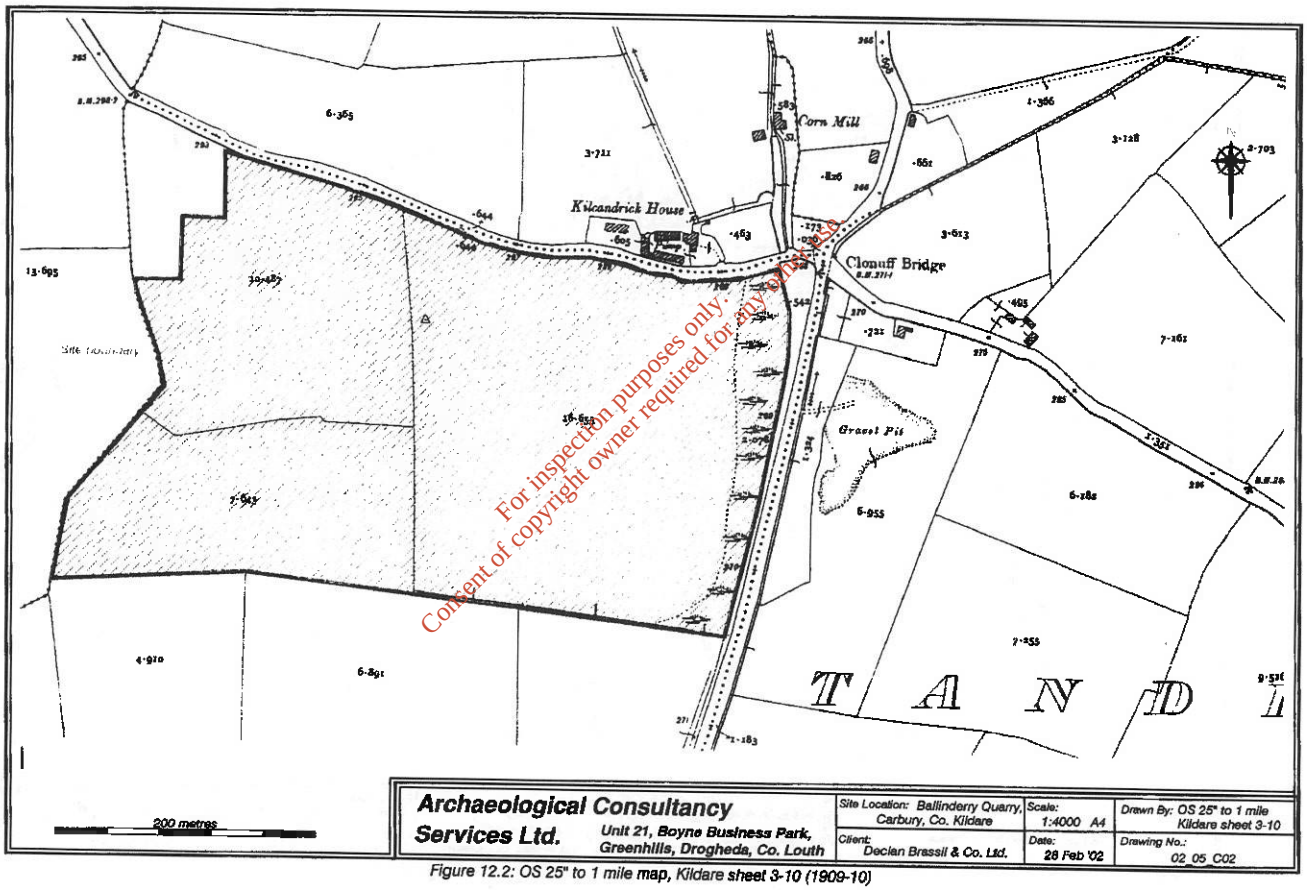


Figure 12.2: OS 25" to 1 mile map, Kildare sheet 3-10 (1909-10)

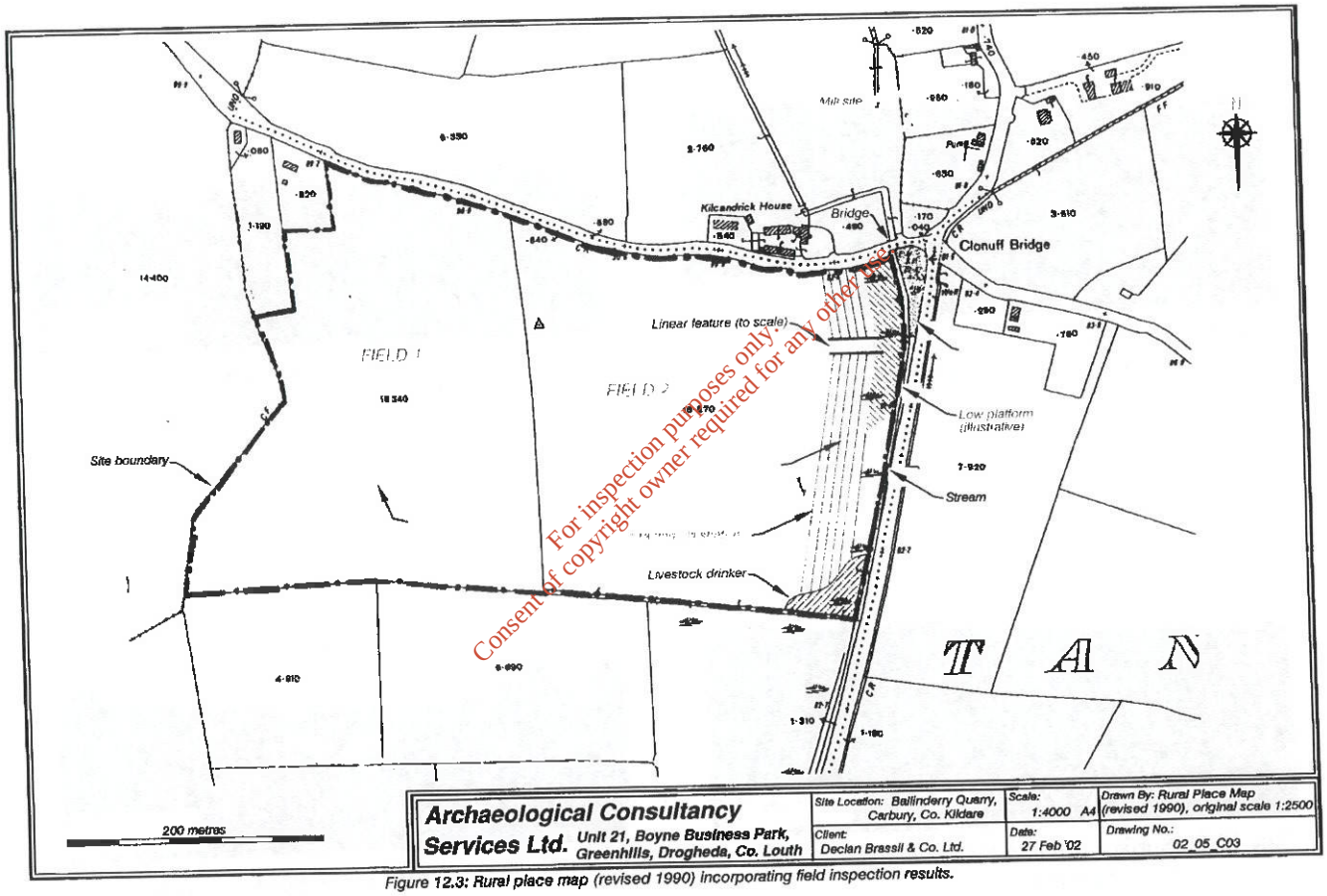


Figure 12.3: Rural place map (revised 1990) incorporating field inspection results.

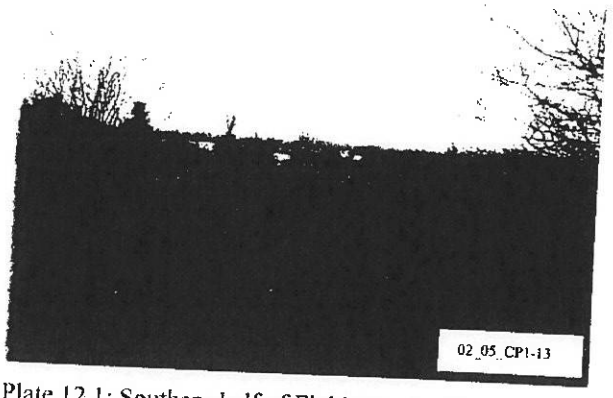


Plate 12.1: Southern half of Field One, looking southwest from boundary with Field Two.

Plate 12.2: Southern half of Field One, looking southeast from western boundary.

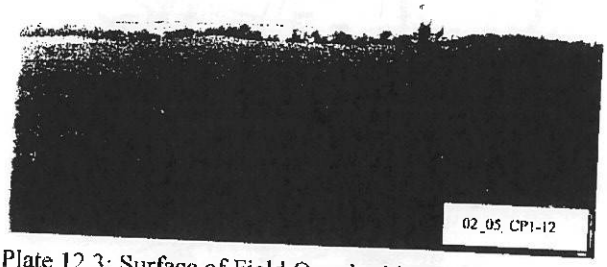


Plate 12.3: Surface of Field One, looking west towards Kilglass gravel extraction works.

Plate 12.4: Surface of Field One, looking east over course of former east-west boundary.

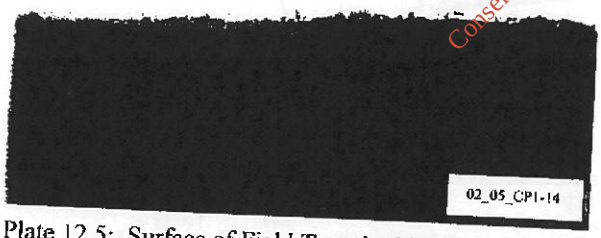


Plate 12.5: Surface of Field Two, looking west towards Field One.

Plate 12.6: Eastern extremity of Field Two with east-facing slope of gravel ridge on right; looking south from northeastern corner of field.

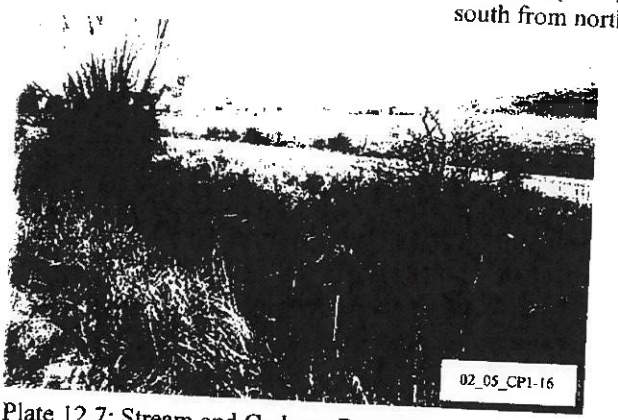


Plate 12.7: Stream and Carbury-Broadford road which limit the site on the east.

02_05_PS01

Plate 12.8: Location of possible former millpond (foreground) now landscaped as a public amenity.

Plate 12.9: Kilcandrick House from east with proposed development site visible as rising ground on left.

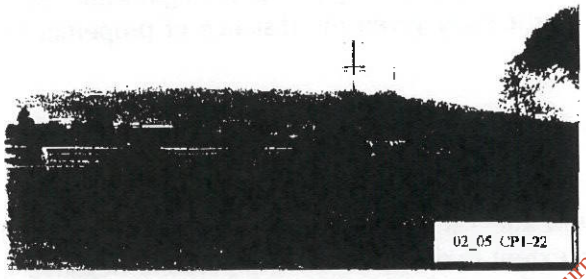


Plate 12.10: Gravel ridge (marked as location of gravel pit on OS maps) located to east of site.

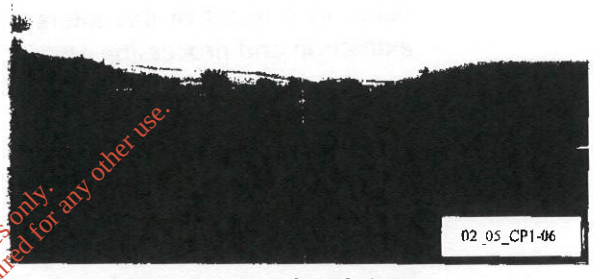


Plate 12.11: Eastern extremity of Field Two, looking south over east-facing slope. Linear feature visible on right and low linear platform or rampart visible on left.

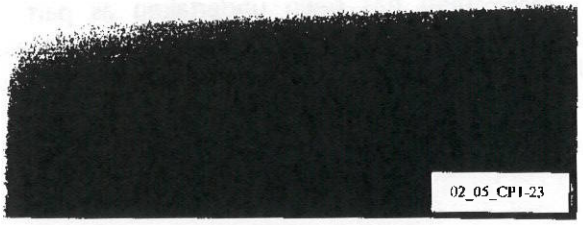


Plate 12.12: East-facing slope of gravel ridge showing terracing and linear feature (extreme left).

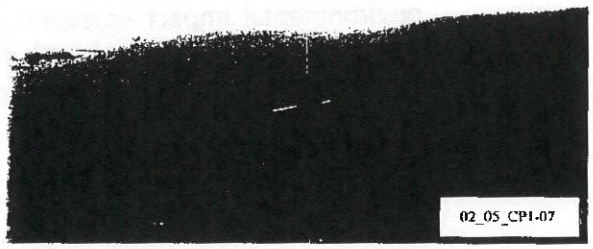


Plate 12.13: Linear feature (marked by ranging rod) from north.

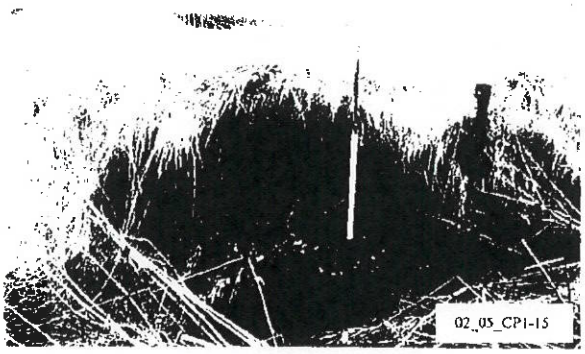


Plate 12.14: Profile of stream which limits site on east.

02_05_PS02

13. INTERACTION OF THE FOREGOING

An assessment of interactions between the foregoing aspects of the environment has been undertaken. The interactions identified relate to air quality, noise, water, landscape and traffic; and, flora, fauna, water and the landscape.

These interactions have been identified in the Scoping exercise in advance of the preparation of the EIS, and have been considered in detail in the respective reports included in the relevant Sections above. These can be summarised as follows:

Human Beings and Air

The site is located in a quite sparsely populated area and a number of mitigation measures have been described to ensure that noise and dust are contained well within recognised standards and no nuisance is likely to arise. It is envisaged that no significant impacts will occur as a result of this interaction, particularly given the distance of properties from the extraction and processing areas.

Water And Flora & Fauna

The only possible pollutants that could affect the water and consequently flora and fauna are suspended solids and to a lesser extent hydrocarbons. Any possible negative impacts from these sources will be obviated by the operation proposed, namely recycling process water in the silt-master, undertaking maintenance on hard-standing areas, bunding of tanks, and an oil trap/interceptor.

Landscape and Human Beings

A comprehensive landscape impact assessment has been undertaken as part of this environmental Impact Assessment, and is contained as Section 9.0. Impacts are assessed from roads, dwellings and settlements, and proposed mitigation and restoration measures are included in the proposed design.

APPENDIX 3.1

COPY OF CORRESPONDENCE WITH ESB REGARDING HIGH VOLTAGE TRANSMISSION LINE TRAVERSING THE SITE

ESB INTERNATIONAL

Ref. PE452-F184-1-2969

5th March 2002

Ms. Una Crosse,
Declan Brassil & Co. Ltd.,
Chartered Planning Consultants,
4 Cloncourt, Main Street,
Clonee,
Co. Meath

RE : Proposed Sand & Gravel Extraction in spans 549-551 of the Moneypoint-Woodland 400kV Line at Ballinderry, Carbury, Co. Meath

Dear Ms. Crosse,

Thank you for your letter dated 5th February 2002.

I have checked our records for this 400kV Line and would make the following recommendations :-

- Intermediate tower no. 550 is located on the site. An area of undisturbed ground around this tower must be retained to ensure the stability of the structure. This will form a truncated pyramid (frustum) with a surface dimension of 30m x 30m and slopes of 45°. The height of the retained frustum will depend on the final pit floor level.

  Assuming the maximum proposed excavation depth is to the water table at or around the level of the river on the eastern side of the site (i.e. 80.0m AOD), the tower elevation is approx. 84.0m AOD, which would entail a frustum averaging 4m in height. I have sketched onto a copy of the site plan the extent of this area to be retained in the event of excavation to an elevation of 80.0m AOD.

  Please see enclosed drawing showing typical foundation pyramid detail for the 400kV Line.

- The 30m x 30m area of undisturbed ground must be fenced and clearly marked with ESB warning signs.

- Within 35m of the centreline of the transmission line, the siting of fixed plant including buildings (mobile or permanent) will not be permitted. Roads, car & vehicle parking, lighting etc. will only be permitted with prior agreement by ESBI.

- The operation of all vehicles, cranes and other mobile plant within 35m of the centreline of the transmission line must be agreed with ESB in advance.

ELECTRICAL POWER SYSTEMS
ESBI ENGINEERING LTD
Stephen Court 18/21 St Stephen's Green Dublin 2 Ireland
Telephone+353-1-703 8000 Fax+353-1-661 5359/662 3269
www.esbi.ie
Registered in Ireland No. 155249 Registered office as above

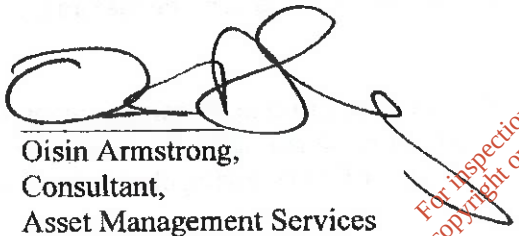
- At two locations near the centres of spans 549-550 and 550-551, vertical clearance is extremely limited due to sag and these areas must be placed strictly off-limits for normal operations on the site. The removal of any material in these areas must be specifically agreed with ESB in advance and only under their direction and supervision, as required. These areas are shown on a copy of the site survey plan.

Please see attachment A enclosed for general guidelines relating to developments in close proximity to ESB's overhead lines. Prior to any work commencing on this site it is essential that whoever has overall responsibility for work on the site contacts the local ESB Transmission Office to agree safe working procedures. The contact number are as follows :-

Chris Donovan (Transmission Eng. Officer)	MOB (087) 6837592
Martin Heavey (Transmission Manager)	DDI (01) 6042921

If you require further information or assistance please do not hesitate to contact me at (01) 7038283 or (087) 6795606.

Sincerely,



Oisin Armstrong,
Consultant,
Asset Management Services

Cc Mr. C. Kelleher, Manager, Transmission Maintenance, ESB National Grid
Mr. M. Heavey, Tranmission Manager, ESB Dublin Region

Encls.

ATTACHMENT A

1. Within 23m of tower legs :-

   (a) Telephone circuits should be protected by gas discharge tubes.

   (b) The neutral earth connection of the L.T. supply must not be made within 23m of the tower legs.

   (c) Fences should be of a non-conducting material or in the case of conducting fencing its continuity must be broken at intervals of 20m either side of the Tower. This can be achieved by inserting 2m sections of non-conducting material or having a break in the fence, a minimum gap of 80cm would suffice.

2. If trees are to be planted adjacent to or under the transmission lines, they should be of the dwarf type. The reason for this is that trees will have to be lopped if they infringe on ESB's Electrical Safety Clearances (maximum height allowed for trees in mid span is 3m; while for trees adjacent to the towers the maximum height is 5m).

3. Building material, soil / spoil and sheds, must not infringe the minimum lateral clearances already specified i.e. they must not be stored under the Line. The terrain under the line must not be raised without first receiving clearances from ESB.

4. Lamp standards TV aerials, goal post and security cameras / lights, etc. must not be erected without first receiving clearances from ESB.

5. The use of cranes, low loaders, high loaders, excavators and other construction equipment in close proximity to the transmission are potentially hazardous and their use must be agreed with ESB in advance. Please notify your local ESB office if in any doubt regarding the use of this type of machinery adjacent to ESB Transmission Lines.

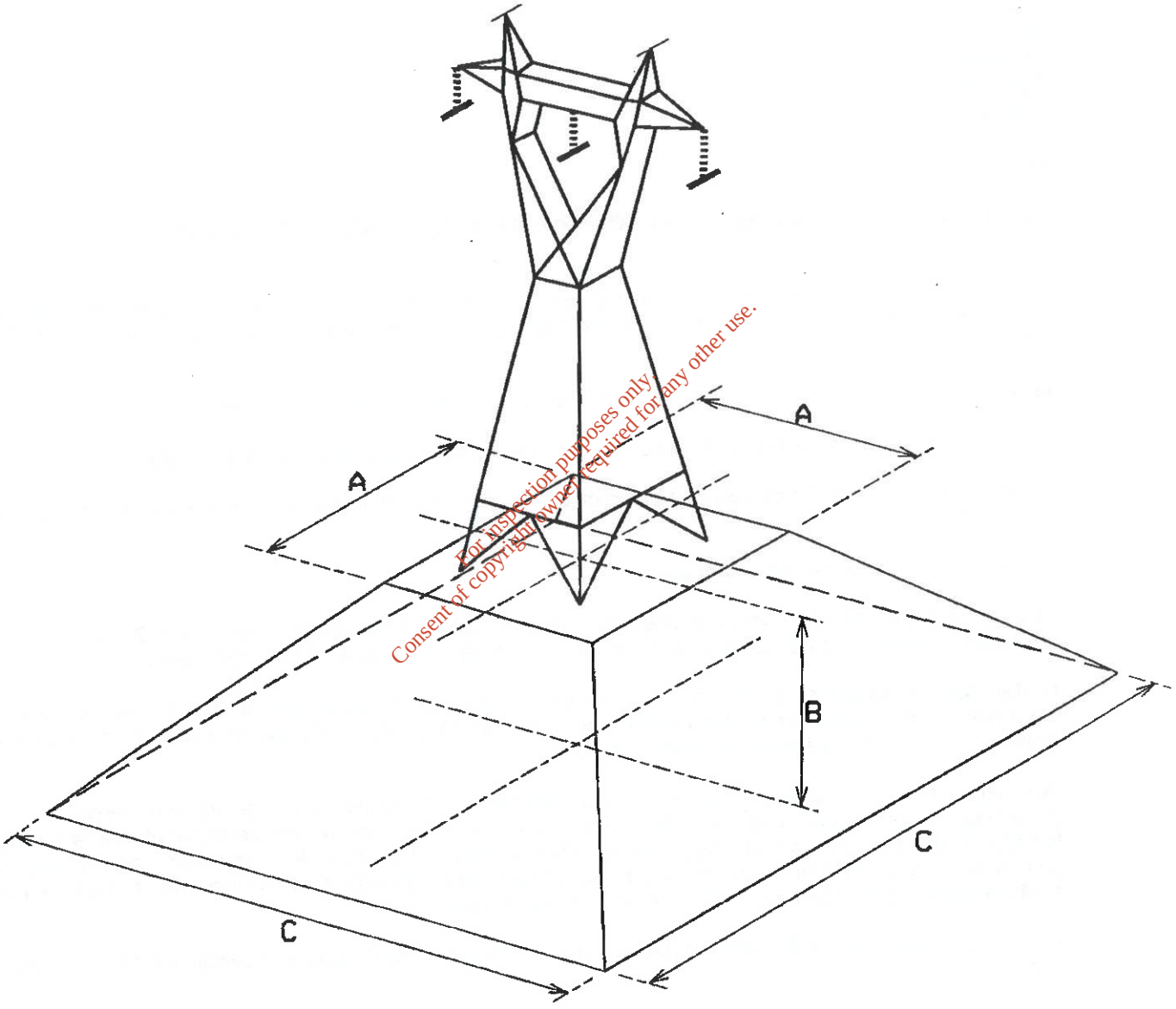
Please furnish us with the final design plans so that we can verify clearances prior to construction commencing.

Please find enclosed the booklet "Avoidance of Electrical Hazards when working near Overhead Electrical Lines" and one on EMF. Please inform the contractors of the dangers involved in developments adjacent to Transmission Lines. Recommended methods and procedures are set out in this pamphlet which, if adopted, will provide a positive approach to the elimination of accidents / tragedies.

If you need further information or assistance on this matter, please do not hesitate to contact us.

NOT TO SCALE

DIMENSION A = 30.0 METRES
DIMENSION B = DEPENDING ON EXCAVATION DEPTH
DIMENSION C = DEPENDING ON EXCAVATION DEPTH



NOTE: FOUNDATION PYRAMID SLOPE ANGLE = 45 DEGREES

D		E	
B		C	
A4	D	REVISION DETAILS:	

CLIENT: ESB

PROJECT: MONEYPOINT-WOODLAND 400KV LINE

	SIG.	REV.
DRAWN		
CHECKED		
APPROVAL		
DATE		

PURPOSE OF ISSUE (TICK)

PRELIMINARY	APPROVAL	AS BUILT
TENDER	CONSTRUCTION	

ESBI ENGINEERING LTD
STEPHEN COURT, 18-21 ST. STEPHENS GREEN,
DUBLIN 2. IRELAND.
TELEPHONE: +353 - 1 - 7638000. FAX: +353 1 6613294
TELEX: 30598 ESBT EI
ESB INTERNATIONAL

TITLE: VIEW OF TYPICAL FOUNDATION PYRAMID TO BE RETAINED UNDER TOWER NO. 550 AT BALLINDERRY, CARBURY, CO. KILDARE

DRAWING NO.

SHEET 1
1 SHEET(S)

KEYGS GEO. SOLUTIONS

Geological & Geotechnical Consultants
to the Quarrying Industry

Key GeoSolutions Ltd
37 Crathes Gardens
Murieston
Livingston
West Lothian
EH54 9EN

Office Tel. (01506) 400731
Home Tel. (01506) 400044
Mobile 07748 638789
email adrian@keygs.co.uk
www.keygs.co.uk

June 11, 2002

Ref: acc00209

Mr Oisin Armstrong
Asset Management Services
ESB International
Stephen Court
18/21 St Stephens Green
Dublin 2
Ireland

Dear Oisin

re: Proposed Sand & Gravel Extraction at Ballinderry – Draft design in respect of 400kV line

Further to your letter of the 5th March to Una Crosse of Declan Brassil & Co Ltd and our subsequent telephone conversation this afternoon, I write to enclose an initial draft of the proposed development scheme (A3 1:2000 scale - Drg 3.3)

As requested I would ask you to consider the draft design in respect of the following points:

1. Proposed road crossing point under the overhead cables to the west of the centre hedgeline
2. The location of the proposed shipping office/ weighbridge and wheelwash areas adjacent to the access road.
3. The surface water settlement lagoon

I can confirm that the final extraction has been designed with a final excavation face at 1v:2h for the entire excavation and therefore well within your maximum 1v:1h design to the tower 550 frustrum standoff.

As discussed the proposed position of shipping office/ weighbridge and wheelwash is within the 35m standoff to the powerline centreline. If really required these features and the associated access road could be moved to the south by shortening the adjacent noise/screening bund.

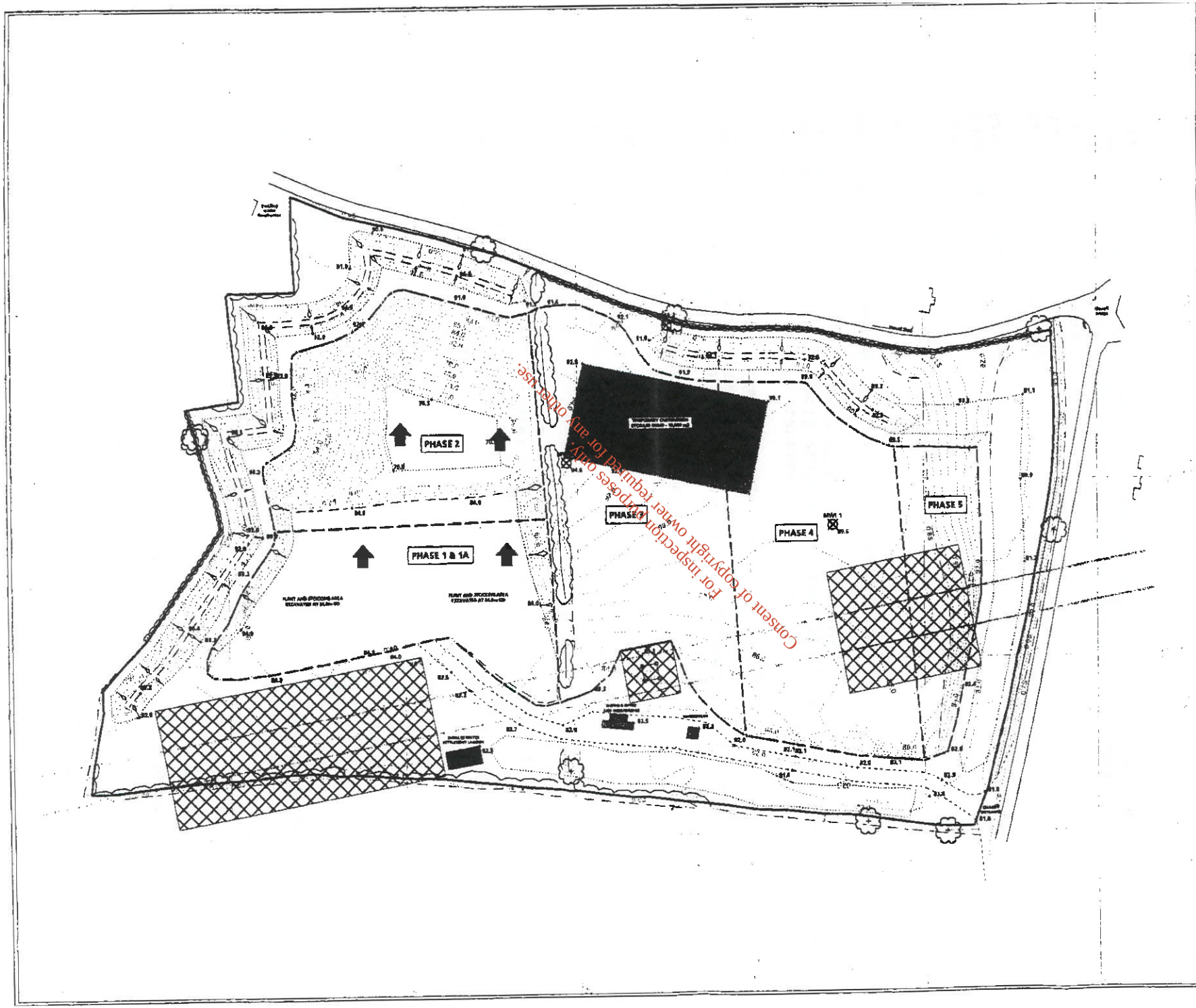
With regard to the removal of soils and overburden within the eastern restricted line sag area it is proposed to use a low height dozer to push these materials aside from this area. Excavation from the advancing mineral face within this area will be from west to east. The excavator will be working on the mineral floor some 4-6m below the original ground level. All excavation machinery and a method statement to be used for extraction within this area will be made between the Operator and ESB in advance of any siteworks.

If you require any further information regarding these issues please don't hesitate to contact me on the numbers above.

Yours sincerely
for Key GeoSolutions Ltd

Adrian Charters BSc MSc CGeol FGS MIQ
Chartered Geologist

Cc Una Crosse/Declan Brassil



KEY

- APPLICATION AREA
- PROPOSED LIMIT OF EXTRACTION & PHASE
- OVERHEAD POWER LINES
- RESTRICTED AREA WORKING TO BE AGREED WITH ESB
- SCREENING AND NOISE BUNDS
- FUTURE SCREENING & NOISE BUNDS
- ANTICIPATED FACES
- ACCESS ROAD

DRAFT

Key GeoSolutions Ltd

BALLINDERRY QUARRY

OPERATIONAL PLAN
PHASES 1 & 2 EXTRACTION

Drawn By	Date
ACC	11-JUN-2002
Scale	Drawing No.
1 : 2000	3.3

To: "'Armstrong. Oisin ESBI'", INTERNET:Oisin.Armstrong@esbi.ie
CC: "Declan Brassil", DeclanBrassil
From: "Adrian Charters", INTERNET:adrian@keygs.co.uk
Date: 6/14/102, 4:08 PM
Re: RE: Proposed Sand & Gravel Extraction in spans 549=551 of thhe Moneypoint-Woodl

Oisin,

Thank you for your quick response to my letter and plan and your positive comments with regard to the draft development proposal plan.

We can now proceed to finalise the application drawings

Kind regards

Adrian

-----Original Message-----
From: Armstrong. Oisin ESBI [mailto:Oisin.Armstrong@esbi.ie]
Sent: 14 June 2002 13:57
To: 'adrian@keygs.co.uk'
Subject: Proposed Sand & Gravel Extraction in spans 549=551 of thhe Moneypoint-Woodland 400kV Line

Ref. PE452-F184-1-2969

Adrian,

Thank you for your letter dated 11th June.

I can confirm that I have no problem with the proposed site layout including road access under the line and the location of the weighbridge/shipping office and suface water settlement pond.

The production of a method statement for work within the east side restricted area, together with discussions with ESB in advance should satisfy our concerns regarding extraction within this area.

Any questions, please do not hesitate to contact me.

Regards,

Oisin Armstrong
Consultant,
Asset Management Services

Tel. (01) 7038283
Mob. (087) 6795606
Fax (01) 6615359
Email oisin.armstrong@esbi.ie <mailto:oisin.armstrong@esbi.ie>
Addr. ESBI Engineering Ltd., Stephen Court, 18-21 St. Stephens Green, Dublin 2

APPENDIX 6.1

BOREHOLE LOGS

BMA GeoServices Ltd.

REPORT NO. 7287 | GEOTECHNICAL BORING RECORD | IGSL

CONTRACT: Carbury site investigation

CLIENT: Tom Goode, Goode Concrete

ENGINEER:

CO-ORDINATES: E 0.00 N 0.00

GROUND LEVEL (mOD) 0.00

BOREHOLE DIAMETER (mm) 200

BOREHOLE DEPTH (m) 18.80

CASING DEPTH (m) 18.80

BOREHOLE NO: BH1 Sheet 1 of 2

DATE STARTED: 25/07/2001

DATE COMPLETED: 28/07/2001

BORED BY: T. M. McCarhy

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES REF. NUMBER	SAMPLE TYPE	SAMPLES DEPTH (m)	FIELD TEST RESULTS	STAND PIPE DETAILS
	TOPSOIL								
	Brown, slightly sandy CLAY			0.20	8162	DB	0.00-1.50		
1	Brown, slightly sandy SILT with occasional sand lenses			0.80					
2					8163	DB	1.50-3.00		
3					8164	DB	3.00-4.50		
4									
5	Grey/brown, fine to coarse GRAVEL with occasional cobbles			4.70	8165	DB	4.50-6.00		
6	Grey/brown, fine to coarse (predominately coarse) GRAVEL with some large boulders			6.00	8166	DB	6.00-7.50		
7					8167	DB	7.50-9.00		
8									
9					8175	DB	9.00-10.50		

Continued next sheet

Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments
4.90	5.10	0.50	
5.40	5.60	0.75	
5.90	6.00	0.75	
6.00	6.20	0.75	
7.90	8.20	1.50	
9.30	9.50	0.75	
10.10	10.40	1.00	

Water Strike Details

Water Strike	Casing Depth	Sealed at	Rise to	Time	Comments
4.60	4.60	0.00	4.50	0	Slow
14.60	14.60	0.00	14.40	0	Slow

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type
28/07/2001	18.80	4.00	18.80	

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REPORT NO. 7287	GEOTECHNICAL BORING RECORD	IGSL

CONTRACT: Carbury site investigation

BOREHOLE NO: BH1
Sheet 2 of 2

CLIENT: Tom Goode, Goode Concrete.

ENGINEER:

CO-ORDINATES: E 0.00
N 0.00

GROUND LEVEL (mOD) 0.00
BOREHOLE DIAMETER (mm) 200
BOREHOLE DEPTH (m) 18.80
CASING DEPTH (m) 18.80

DATE STARTED: 25/07/2001
DATE COMPLETED: 28/07/2001

BORED BY: T. M. McCa

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES REF. NUMBER	SAMPLES SAMPLE TYPE	SAMPLES DEPTH (m)	FIELD TEST RESULTS	STAND PIPE
	Grey/brown, fine to coarse (predominately coarse) GRAVEL with some large boulders				8169	DB	10.50-12.00		
					8170	DB	12.00-13.50		
					8171	DB	13.50-15.00		
					8172	DB	15.00-16.50		
					8173	DB	16.50-18.00		
	Grey/brown, slightly sandy, fine to coarse GRAVEL with many cobbles			17.00					
					8174	DB	18.00-18.80		
	Obstruction			18.70					
	End of Borehole at 18.80 m			18.80					

Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments

Water Strike Details

Water Strike	Casing Depth	Sealed at	Rise to	Time	Comments
4.60	4.60	0.00	4.50	0	Slow
14.60	14.60	0.00	14.40	0	Slow

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type
28/07/2001	18.80	4.00	18.80	

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REPORT NO. 7287 | GEOTECHNICAL BORING RECORD | IGSL

CONTRACT: Carbury site investigation

CLIENT: Tom Goode, Goods Concrete.

ENGINEER:

CO-ORDINATES: E 0.00 N 0.00

GROUND LEVEL (mOD) 0.00

BOREHOLE DIAMETER (mm) 200

BOREHOLE DEPTH (m) 19.30

CASING DEPTH (m) 19.30

BOREHOLE NO: 8H2 Sheet 1 of 2

DATE STARTED: 14/07/2001

DATE COMPLETED: 18/07/2001

BORED BY: T. M. McCarl

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES REF. NUMBER	SAMPLES SAMPLE TYPE	SAMPLES DEPTH (m)	FIELD TEST RESULTS	STAND PIPE DETAILS
	TOPSOIL								
	Brown, very silty, coarse SAND			0.20	8139	DB	0.00-1.50		
					8140	DB	1.50-3.00		
					8141	DB	3.00-4.50		
					8142	DB	4.50-6.00		
	Brown, very silty SAND with occasional gravel			4.80					
	Grey/brown, fine to coarse GRAVEL with occasional cobbles			5.90	8143	DB	6.00-7.50		
					8144	DB	7.50-9.00		
					8145	DB	9.00-10.50		

Continued next sheet

Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments
6.00	9.50	10.00	
9.80	10.00	1.00	
10.40	10.70	0.75	
11.90	12.10	0.75	
12.40	12.60	0.50	
13.10	13.80	4.00	
14.10	14.30	1.25	

Water Strike Details

Water Strike	Casing Depth	Sealed at	Rise to	Time	Comments
14.90	14.90	0.00	14.70	0	Slow

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REPORT NO. 7287	GEOTECHNICAL BORING RECORD	IGSL

CONTRACT: Carbury site investigation		BOREHOLE NO: BH2 Sheet 2 of 2	
CLIENT: Tom Goode, Goode Concrete.	GROUND LEVEL (mOD) 0.00	DATE STARTED: 14/07/2001	
ENGINEER:	BOREHOLE DIAMETER (mm) 200	DATE COMPLETED: 16/07/2001	
CO-ORDINATES: E 0.00 N 0.00	BOREHOLE DEPTH (m) 19.30	BORED BY: T. M. McCarthy	
	CASING DEPTH (m) 19.30		

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES REF. NUMBER	SAMPLES SAMPLE TYPE	SAMPLES DEPTH (m)	FIELD TEST RESULTS	STAND PIPE DETAILS
	Grey/brown, fine to coarse GRAVEL with occasional cobbles				B146	DB	10.50-12.00		
					B147	DB	12.00-13.50		
	Grey/brown, fine to coarse GRAVEL with many cobbles			13.50	B148	DB	13.50-15.00		
	Grey/brown, slightly silty SAND with occasional gravel			14.90	B149	DB	15.00-16.50		
					B150	DB	16.50-18.00		
	Grey/brown, slightly silty, very sandy GRAVEL			18.70					
	End of Borehole at 19.30 m			19.30					

Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments

Water Strike Details

Water Strike	Casing Depth	Sealed at	Rise to	Time	Comments
14.90	14.90	0.00	14.70	0	Slow

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REPORT NO. 7287 — GEOTECHNICAL BORING RECORD — IGSL

CONTRACT: Carbury site investigation

CLIENT: Tom Goode, Goode Concrete.

ENGINEER:

CO-ORDINATES: E 0.00 N 0.00

GROUND LEVEL (mOD) 0.00

BOREHOLE DIAMETER (mm) 200

BOREHOLE DEPTH (m) 5.90

CASING DEPTH (m) 5.90

BOREHOLE NO: BH3

Sheet 1 of 1

DATE STARTED: 18/07/2001

DATE COMPLETED: 19/07/2001

BORED BY: T. M. McCarl

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES REF. NUMBER	SAMPLES SAMPLE TYPE	SAMPLES DEPTH (m)	FIELD TEST RESULTS	STAND PIPE DETAILS
	TOPSOIL								
	Brown, slightly sandy CLAY			0.20	8152	DB	0.00-1.50		
1	Grey/brown, fine to coarse (predominately coarse) GRAVEL with many cobbles			0.70					
2					8153	DB	1.50-3.00		
3									
4					8154	DB	3.00-4.50		
5					8155	DB	4.50-5.90		
6	End of Borehole at 5.90 m		5.90						
7									
8									
9									

Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments
0.80	0.90	0.50	
1.60	1.80	0.75	
2.20	2.30	0.50	
2.60	2.80	0.75	
3.10	3.30	1.25	
3.90	4.10	0.75	
5.10	5.30	0.50	

Water Strike Details

Water Strike	Casing Depth	Sealed at	Rise to	Time	Comments

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REPORT NO. 7287	GEOTECHNICAL BORING RECORD	IGSL

CONTRACT: Carbury site investigation

BOREHOLE NO: BH3A
Sheet 1 of 2

CLIENT: Tom Goode, Goode Concrete.
ENGINEER:

CO-ORDINATES: E 0.00
N 0.00

GROUND LEVEL (mOD) 0.00
BOREHOLE DIAMETER (mm) 200
BOREHOLE DEPTH (m) 14.40
CASING DEPTH (m) 14.30

DATE STARTED: 19/07/2001
DATE COMPLETED: 25/07/2001
BORED BY: T. M. McCarth

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES REF. NUMBER	SAMPLES SAMPLE TYPE	SAMPLES DEPTH (m)	FIELD TEST RESULTS	STAND PIPE DETAILS
	TOPSOIL			0.20					
	Brown, slightly sandy CLAY			0.70					
1	Grey/brown, fine to coarse (predominately coarse) GRAVEL with many cobbles								
2									
3									
4									
5									
6				5.90	8156	DB	6.00-7.50		
	Grey/brown, slightly silty, sandy, fine to coarse (predominately coarse) GRAVEL with many cobbles								
7					8157	DB	7.50-9.00		
8				7.90					
	Grey/brown, slightly silty, coarse SAND								
9					8158	DB	9.00-10.50		
	Continued next sheet								

Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments
1.40	1.60	0.50	
2.90	3.10	0.75	
3.60	3.90	1.00	
4.20	4.40	0.50	
4.80	5.20	1.25	
5.70	5.90	0.50	
6.40	6.70	0.75	

Water Strike Details

Water Strike	Casing Depth	Sealed at	Rise to	Time	Comments
8.00	8.00	0.00	7.80	0	Slow

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments

REPORT NO. 7287 | GEOTECHNICAL BORING RECORD | IGSL

CONTRACT: Carbury site investigation

CLIENT: Tom Goode, Goods Concrete.

ENGINEER:

CO-ORDINATES: E 0.00
N 0.00

GROUND LEVEL (mOD) 0.00
BOREHOLE DIAMETER (mm) 200
BOREHOLE DEPTH (m) 14.40
CASING DEPTH (m) 14.30

BOREHOLE NO: BH3A
Sheet 2 of 2
DATE STARTED: 19/07/2001
DATE COMPLETED: 25/07/2001
BORED BY: T. M. McCar

DEPTH (M)	DESCRIPTION	LEGEND	ELEVATION (mOD)	DEPTH (m)	SAMPLES REF. NUMBER	SAMPLES SAMPLE TYPE	SAMPLES DEPTH (m)	FIELD TEST RESULTS	STAND PIPE DETAILS
	Grey/brown, slightly silty, coarse SAND				B159	DB	10.50-12.00		
					B160	DB	12.00-13.50		
	Grey/brown, very sandy, fine to coarse (predominately coarse) GRAVEL			13.70	B161	DB	13.50-14.40		
	Obstruction			14.30					
	End of Borehole at 14.30 m			14.40					

Hard Strata Boring / Chiselling

From (m)	To (m)	Hours	Comments

Water Strike Details

Water Strike	Casing Depth	Sealed at	Rise to	Time	Comments
8.00	8.00	0.00	7.80	0	Slow

Standpipe Installation Details

Date	Tip Depth	RZ Top	RZ Base	Type

Groundwater Observations

Date	Hole Depth	Casing Depth	Depth to Water	Comments

Geotechnical Well Log Record

Client : Goode Concrete Ltd.

Contractor : Dempsey Well Drillers

BMA — B J Murphy & Associates
Geotechnical Engineering
Engineering Geology
Engineering Geophysics
Groundwater Engineering

sing :
Diameter (mm) : 150 mm
Location : Ballinderry, Carbury, Co. Kildare
Ground Level (mod) :

Inclination :
Casing Depth :
Drilling Commenced : 15/04/2002
Drilling Ceased : 15/04/2002
Drilled By :

Logged By : DG
Final Depth : 15
Sheet 1 of 2

Project :
EIS for a Proposed Sand and Gravel Quarry

Borehole No : BH4

DOWNHOLE DEPTH (m)	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION	ELEVATION	WATER STRIKES	WELL DETAILS	INSTALLATION DETAILS	COMMENTS
0		Clay					
1							
2		Gravel					
3							
4							
5							
6							
7							
8		Sand					
9							

Remarks :

Scale : 1 : 50

Edition Date : 24/04/2002

Geotechnical Well Log Record

Client : Goode Concrete Ltd.

Contractor : Dempsey Well Drillers

BMA — B J Murphy & Associates
Geotechnical Engineering
Engineering Geology
Engineering Geophysics
Groundwater Engineering

sing :
Diameter (mm) : 150 mm
Location : Ballinderry, Carbury, Co. Kildare
Ground Level (mod) :

Inclination :
Casing Depth :
Drilling Commenced : 15/04/2002
Drilling Ceased : 15/04/2002
Drilled By :

Logged By : DG
Final Depth : 15
Sheet 2 of 2

Project :
EIS for a Proposed Sand and Gravel Quarry

Borehole No : BH4

DOWNHOLE DEPTH (m)	SYMBOLIC LOG	GEOLOGICAL DESCRIPTION	ELEVATION	WATER STRIKES	WELL DETAILS	INSTALLATION DETAILS	COMMENTS
10							
11		Gravel					
12							
13				▼ 13			
14							
15							
16							
17							
18							
19							

...emarks :

Scale : 1 : 50

Edition Date : 24/04/2002

APPENDIX 6.2

APPENDIX 6.2

GEOPHYSICS REPORT

BMA GeoServices Ltd.

BMA GeoServices

Geophysical **Geotechnical** **Environmental**

Report

Geophysical Survey for a proposed Sand and Gravel Quarry at Carbury, County Kildare

for

Declan Brassil Ltd

BMA GEOSERVICES LTD
8 STRAWHALL BUSINESS PARK
ATHY ROAD, CARLOW
CO. CARLOW
REG. NO. 335742
VAT NO. 63557426

AUTHOR	CHECKED	JOB NUMBER	DATE
Ruth Staunton	James A. Hodgson	897	January 2002

FOREWORD

Geophysical surveying is an indirect, non-invasive process and involves interpretation of readings made at the ground surface in terms of likely subsurface conditions. This interpretation is based on the existing knowledge of ground conditions, typical geophysical responses of known materials and the experience of the author. This report has been prepared by BMA Geoservices in line with best current practice and with all reasonable skill, care and diligence within the limitations imposed by the survey technique applied and the resources devoted to it by agreement with the client. The client should take the interpretative basis for any conclusions or opinions contained therein into account in any future use of this report.

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TABLE OF CONTENTS

Maps Enclosed

Map 1: Location Map	1:2000
Map 2: Apparent Resistivity Contour Map (ohm.m)	1:2000
Map 3 Summary Map	1:2000

Interpreted Sections Enclosed

Interpreted 2D-Resistivity Profiles 1-8	1:1000

Appendices

Appendix I: Geophysical Methodology.

1. Summary

- BMA Geoservices; Geophysical Consultants, were requested by Declan Brassil Ltd., to carry out a geophysical survey for a proposed sand and gravel quarry at Carbury, County Kildare.

- The geophysical survey comprised of Wenner Constant Separation contour mapping and 2D-Resistivity Profiling (Maps 1 and 2).

- The results of the 2D-Resistivity profiling (Sections 1-8) have been interpreted as indicating the following:

Interpretation	Thickness (m)	Resistivity (Ohm-m)	Excavatability
Gravelly Clay	5 - 10	100 - 500	Diggable
Sand and Gravel	10 - 25	>500	Diggable

*Estimates of soil stiffness and rock quality are based on the measured geophysical properties.

- The interpretation of the data generally showed thick sand and gravel deposits (15 – 20 m thickness) over the majority of the area with the exception of the southern boundary of the site (Map 2).

- If we were to assume that there was an average thickness of 15 m across Zone A, an estimate of the potential sand and gravel reserves would be 372,900 m^3. Assuming an average thickness of 10 m across Zone B, an estimate for potential sand and gravel reserves would be 281,610 m^3. Assuming a density for sand and gravel of 1.8 kg/ m^3, a total value of 2,150,226 tonnes is calculated.

2. Introduction

BMA Geoservices, Geophysical Consultants, were requested by Declan Brassil Ltd., to carry out a geophysical survey for a proposed sand and gravel quarry at Carbury, County Kildare.

Objectives

- To determine the presence of sand and gravel resources and provide an estimate of the reserve.
- To estimate the thickness of the sand/gravel deposits.

Methodology

- Wenner Constant Separation (WCS) resistivity mapping to produce a contour map to outline areas of varying overburden type across the site.
- 2D-Resistivity profiles to estimate the overburden and sand and gravel thicknesses.

The geophysical locations are indicated on Maps 1 & 2. A location map was provided by the client.

Site Description and Geological Setting

The site lies to the north of the R403 approximately 25 km from Newbridge, Co. Kildare and stands at an elevation of between 81 and 94 mOD. The geological map (Geology of Kildare, Sheet 16, GSI., 1995) indicates the site is underlain by Chadian – Brigantian basinal limestone. This sequence of rocks consists of dark grey limestone and shale. The site currently comprises a large undulating grass field. A working sand and gravel pit lies to the northwest of the site.

Report Outline

The results are discussed in Section 3 and recommendations are listed in Section 4. A detailed account of the geophysical methods and equipment used and data processing is contained in Appendix I.

3. Results

This section integrates the geophysical results with the available geological data. The interpretation is based on the available factual information, typical geophysical responses of known materials and the experience of the author. The interpreted 2D-Resistivity sections are shown at the end of this report.

The Wenner Constant Separation (WCS) resistivity survey has highlighted variations in apparent resistivity across the site with apparent resistivity values ranging from 89-2305 Ohm-m. A contour map of the resistivity data is shown on Map 2.

The 2D-Resistivity profiles were located based on the results of the WCS survey.

The 2D-Resistivity profile data showed good correlation with the WCS values. The recorded resistivities ranged from 50 Ohm-m to greater than 2000 Ohm-m. Two layers have been interpreted on the 2D-Resistivity profiles indicating gravelly clay and sand and gravel deposits. Limestone bedrock was not encountered during the geophysical survey.

The 2D-Resistivity data have been summarised as follows:

Resistivity (ohm-m)	Interpretation
100 - 500	Gravelly Clay
> 500	Sand and Gravel

Profile 1 has been interpreted as indicating approximately 5 m of medium resistivity (100 – 500 Ohm-m) gravelly clay, overlying thick > 15 m, high resistivity (> 500 Ohm-m) sand and gravel deposits.

A similar sequence is evident along Profile 2, although it is interpreted to have a thicker overburden of gravelly clays. High resistivity sand and gravel deposits are interpreted to occur at > 20 m depth. The contact between the two sequences appears to occur at approximately 15 m depth along the entire length of the profile.

A thick layer of medium resistivity (100 – 500 Ohm-m) gravelly clays are interpreted to occur to 20 m depth at the southern end of Profile 3. However it is interpreted that high resistivity (> 500 Ohm-m) sand and gravel deposits occur along the majority of this profile, achieving thicknesses of > 20 m. A thin layer (< 5 m) of medium resistivity gravelly clays are interpreted with thickness of up to 10 m at the northern end of the profile.

Profile 4 has been interpreted to indicate a thick sequence of medium resistivity (100 – 500 Ohm-m) gravelly clays with relatively small occurrences of high resistivity sand and gravel deposits. Material 10 m in thickness and exhibiting resistivities of > 500 Ohm-m interpreted to be sand and gravel occurs at approximately 15 m depth at the southwestern end of the profile. A lense of material (5 – 12 m in thickness) exhibiting similar resistivity values is evident at the surface approaching the northeast and is interpreted to be indicative of similar sand and gravel material.

A thick sequence of gravelly clays up to 15 m in thickness have been interpreted to occur at the western end of profile 5 and taper to a thickness of just 2 m towards the east. This

layer overlies a 15 – 20 m thick sequence of material with resistivities > 500 Ohm-m interpreted to be sand and gravel deposits..

Profile 6 has been interpreted as indicating thick sand and gravel deposits with high resistivity (> 500 Ohm-m). A thin lense of medium resistivity gravelly clay (100 - 500 Ohm-m) is interpreted to overlie this sand and gravel sequence in the western end of the profile. At the eastern end, it is interpreted that a small pocket of this material occurs below the sand and gravel deposits at approximately 18 m depth.

A thick sequence (> 15 m) of high resistivity sand and gravel deposits have been interpreted along the entire length of Profile 7. It is indicated that this sequence overlies material of medium resistivity (100 – 500 Ohm-m) interpreted to be gravelly clays, which increase in thickness from < 5 m in the east to 5-10 m in the western end of the profile. A thin lense of this material also appears to overlie the sand and gravel deposits in the western end of the profile.

Profile 8 has been interpreted as indicating a layer of medium resistivity gravelly clay which varies in thickness across the entire length of the profile. It is interpreted to overlie a thick sequence of high resistivity sand and gravel deposits 15 - 20 m in thickness. Two small pockets of material exhibiting similar resistivities also interpreted as sand and gravel deposits occur in the top 10 m at the southern end of the profile.

The combined geophysical properties can be summarised as follows:

Interpretation	Thickness (m)	Resistivity (Ohm-m)	Excavatability
Gravelly Clay	5-15	100 - 500	Diggable
Sand and Gravel	5-25	> 500	Diggable

*Estimates of soil stiffness and rock quality are based on the measured geophysical properties.

The site has been divided into three zones based on the interpretation of the geophysical data (Map 2), as follows:

Zone A:

Zone A occurs in the central and northern parts of the survey area and has WCS values from 500 – >2000 ohm-m. This zone has been interpreted as indicating thick (10 - 25 m) sand and gravel deposits, below thin (> 3 m) overburden.

Zone B:

Zone B is a thin zone which occurs predominantly in the center and west of the survey area. WCS values range from 400 – 500 Ohm-m. This zone has been interpreted as indicating sand and gravel deposits below 3 – 10 m of overburden.

Zone C:

Zone C comprises the area at the very south and east of the site and has WCS values of < 400 Ohm-m. This zone has been interpreted as indicating a thick (10 – 15 m) sequence of gravelly clay at the surface

Assuming an average thickness of 15 m across Zone A and of 10 m across Zone B, a total estimate of the potential sand and gravel reserves would be 1194,570 m^3. Assuming a density for sand and gravel of 1.8 kg/ m^3 a value of 2,150,226 tonnes is calculated.

4. Recommendations

Further investigation should consist of the following:

Trial pits are advised at the locations shown on Map 3 to determine the exact thickness of overburden and the extent of sand and gravel deposits.

5. References

Campus Geophysical Instruments, 1997: User Manual for computer program RES2DINV, Birmingham, England.

Campus Geophysical Instruments, 1994: User Manuals for computer programs IMAGE50 and PRMFILE, Birmingham, England.

Campus International products Ltd, 1999: User Maunual for Geopulse Tigre Resistivity Meter, Bedfordshire, England.

Golden Software, 1994: WINSURF Surface Mapping System, Users Manual, Golden Software, CO., USA.

McConnell B. & Philcox, M.E. 1994: Geology of Kildare - Wicklow, Geological Survey of Ireland.

Appendix I Geophysical Methodology.

A1. Methods Used

A1.1 Wenner Constant Separation

A1.2 2D-Resistivity Profiling

A2. Equipment Used

A2.1 Wenner Constant Separation

A2.2 2D-Resistivity Profiling

A3. Field Procedure

A3.3 Wenner Constant Separation

A3.2 2D-Resistivity Profiling

A4. Data Processing

A4.1 Wenner Constant Separation

A4.2 2D-Resistivity Profiling

A1. Methods Used

A1.1 Wenner Constant Separation

The method determines the resistivity of the subsurface with the Wenner array as described below in A1.2. Measurements are taken at different locations with the electrodes having a constant separation and allow a contour map of resistivity values to be produced, highlighting areas of interest that require further investigation with 2D-Resistivity and Seismic methods.

A1.2 2D-Resistivity Profiling

A basic measurement technique in resistivity work is the Wenner array, whereby four electrodes are planted along a line in the ground and a current is introduced through the two outer electrodes. The potential difference across the two inner electrodes is then measured and the resistance (physical unit: Ohm) is determined as the quotient of the potential and the current. All measurements are made with a resistivity meter.

To obtain the resistivity (physical unit: Ohm * m), which is a quantity independent of test conditions and characteristic for different soils and liquids, the following formula is applied:

$$\text{Resistivity} = 2 * \text{Pi} * \text{Spacing} * \text{Resistance}$$

In 2D-Resistivity a large number of resistivity measurements are taken both laterally and vertically in order to map changes in material types in these directions. This is achieved in a very efficient way by connecting a series of electrodes to the resistivity meter and using a computer to control the process of data collection and storage.

A2. Equipment Used

A2.1 Wenner Constant Separation

The resistivity data was recorded using a Megger resistivity meter, with cables and stainless steel electrodes.

A2.2 2D-Resistivity Profiling

The Geopulse TIGRE resistivity meter, a multi-core cable with 32 takeouts and 32 stainless steel electrodes were deployed and used to measure the resistivity sections.

The RES2DINV software was used for processing and viewing the data immediately after the survey (Campus Geophysical Instruments, 1997).

A3. Field Procedure

The locations of the geophysical measurements were recorded using GPS and are shown on Maps 1.

A3.1 Wenner Constant Separation

Seventy two readings were taken at approximate 50 x 50 m centers with a constant electrode separation of 10 m. Data quality was very good and all locations were recorded using a Garmin 12 XL GPS receiver and are shown on Map 1.

A3.2 2D-Resistivity Profiling

The location of the 2D-Resistivity profiles were selected based on the results of the Wenner Constant Separation survey. A total of 8 2D-Resistivity profiles were carried out across the survey area. The profiles were located to <5m accuracy using a Garmin 12 XL GPS receiver.

The recording parameters for each profile are listed below.

Table A3.2: 2D-Resistivity Profile locations

	NO. OF ELECTRODES	SPACING (m)	LENGTH (m)	AZIMUTH -
RES1	32	5	155	S-N
RES2	32	5	155	SW-NE
RES3	32	5	155	S-N
RES4	32	5	155	SW-NE
RES5	32	5	155	W-E
RES6	32	5	155	W-E
RES7	32	5	155	W-E
RES8	32	5	155	S-N

A4. Data Processing

A4.1 Wenner Constant Separation

The field readings of the resistances were converted to resistivities using the formula quoted in A1.2, using an electrode spacing of 10 m.

The resistivity values have been gridded, blanked and contoured with the program WINSURF (Golden Software, 1994). The contours are displayed on Map 2, and the measured resistivities are annotated at their locations.

A4.2 2D-Resistivity Profiling

The field data were stored in computer files and converted within the TIGRE resistivity meter. The resulting files were loaded into RES2DINV (Campus Geophysical Instruments, 1997), where an inversion with up to 5 iterations of the measured data was carried out for each profile to obtain a 2D-Depth model of the resistivities.

These 2D-Resistivity models and interpreted geology are displayed on Sections 1 - 8. The horizontal axis shows the distance along the profile, while the depth (b.g.l.) is indicated at the sides. Constant contour intervals and colour codes have been used for Sections 1 - 8.

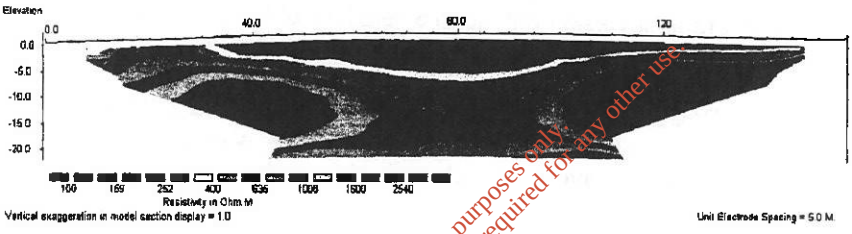
Note: Care should be taken when using these sections. The data displayed is real physical data that can be measured with a high repeatability, but transforming resistivities directly into geological layers requires interpretation of the geophysical results.

2D-Resistivity Profile 1

South
E269199 N239177

Measured Data

North
E269210 N239338



Gravelly Clay Sand and Gravel

Notes:	Drawn: Ruth Staunton Scale: 1 / 1000 Date: Jan 2002 Checked: Kevin Galvin Issued On:	Title: SECTION 1 INTERPRETATION 2D-RESISTIVITY PROFILE 1	Job: CARBURY SAND & GRAVEL	Client: DECLAN BRASSIL & CO	Drg No: 897/R1

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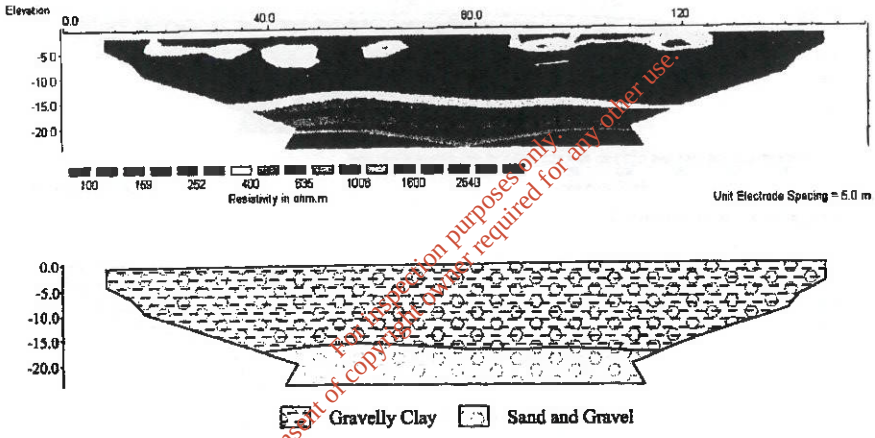
2D-Resistivity Profile 2

Measured Data

Southwest
E269113 N239069

Northeast
E269250 N239127



Notes:	Drawn: Ruth Staunton Scale: 1 / 1000 Date: Jan 2008 Checked: Kevin Galvin Record Dr:	Title: SECTION 2 INTERPRETATION 2D-RESISTIVITY PROFILE 2	Job: CARBURY SAND & GRAVEL	Client: DECLAN BRASSIL & CO	Drg No: 897/R2

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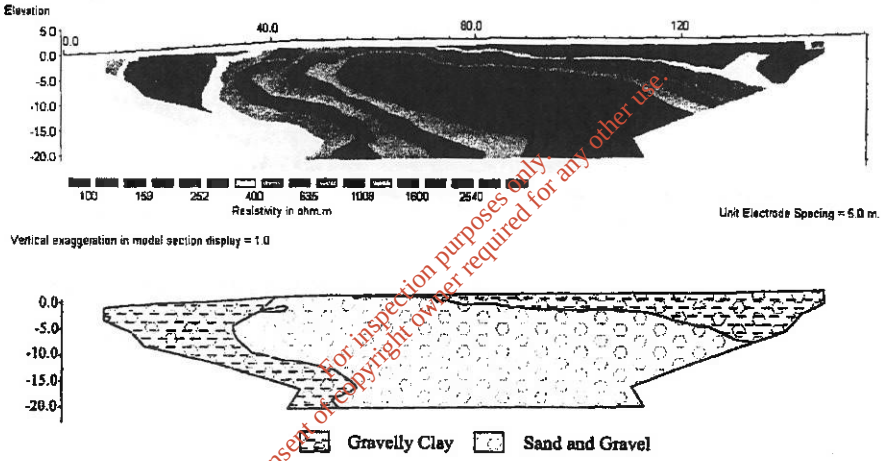
2D-Resistivity Profile 3

South — E269319 N239100

Measured Data

North — E269270 N239234



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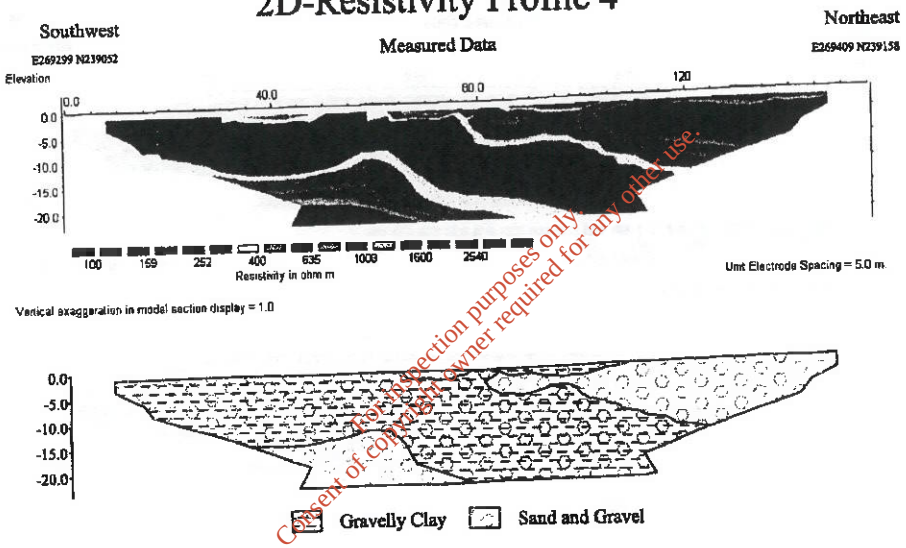
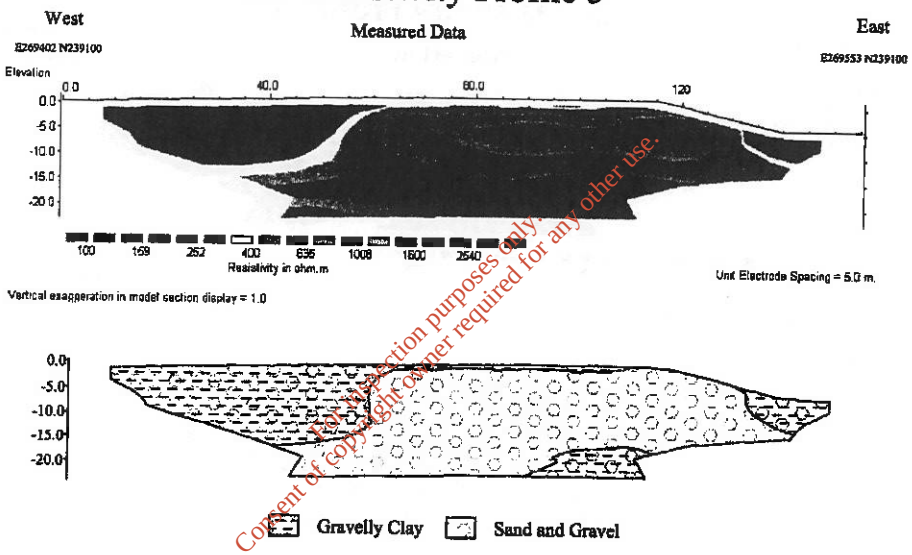
2D-Resistivity Profile 4



Notes:	Drawn: Kevin Staunton Scale: 1 / 1000 Date: Jun 2002 Checked: Kevin Galvin Issued By:	Title: SECTION 4 INTERPRETATION 2D-RESISTIVITY PROFILE 4	Job: CARBURY SAND & GRAVEL	Client: DECLAN BRASSIL & CO	Drg No: 897/R4 **BMA GeoServices** *Ground Engineering Consultants* *Comhairleoirí Cré-Innealtóireachta* BMA, Stroehall Business Park, Athy Road, Carlow, Ireland. Phone: 353-503-34455 Mobile: 087-2477823 Fax: 353-503-34490 E-mail: bmadublin@bma.ie

2D-Resistivity Profile 5



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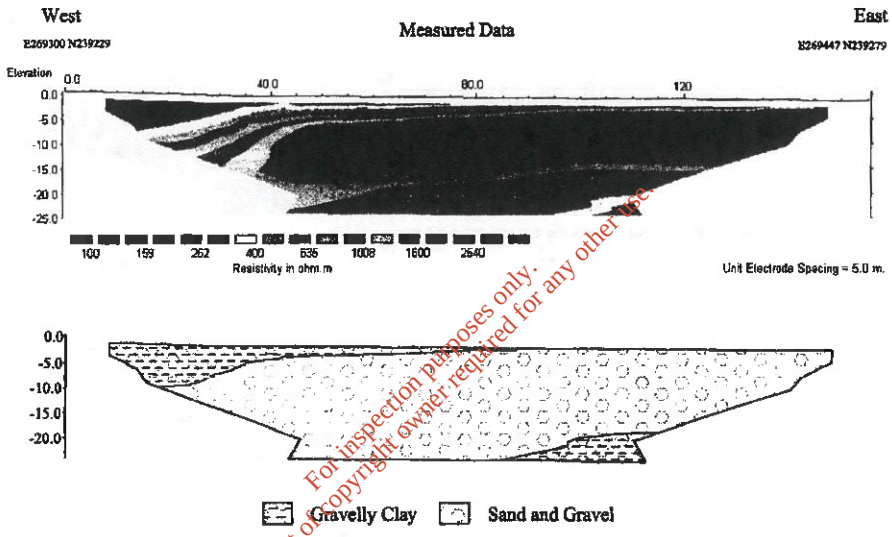
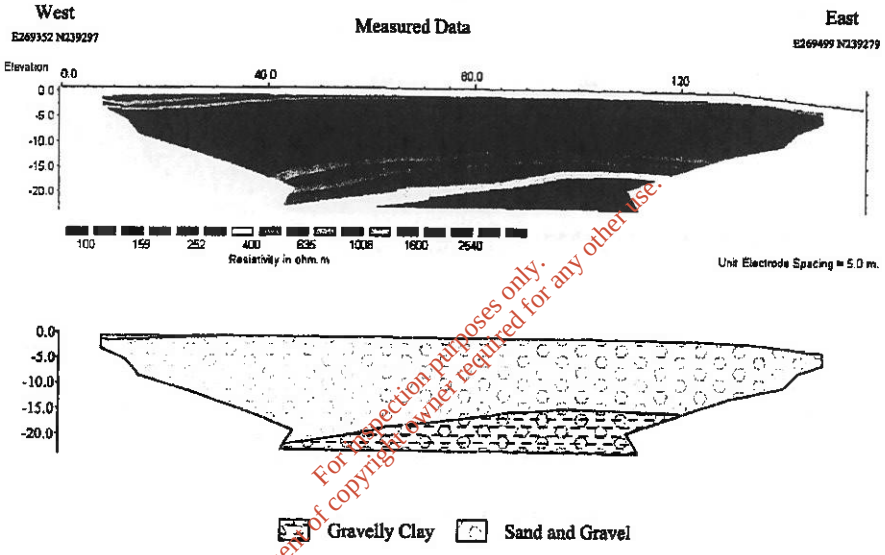
2D-Resistivity Profile 6



	Drawn: Ruth Staunton Scale: 1 / 250 Date: Jan 2002 Checked: Kevin Galvin Issued On:	Title SECTION 6 INTERPRETATION 2D-RESISTIVITY PROFILE 6	Job CARBURY SAND & GRAVEL	Client DECLAN BRASSIL & CO	Dwg No: 897/06 **BMA GeoServices** *Ground Engineering Consultants* *Comhairleoiri Cré-Innealtóireachta* BMA, Stranhall Business Park, Athy Road, Carlow, Ireland. Phone: 353-503-34455 Mobile: 087-2477823 Fax: 353-503-34460 E-mail: bmadublin@bma.ie

2D-Resistivity Profile 7



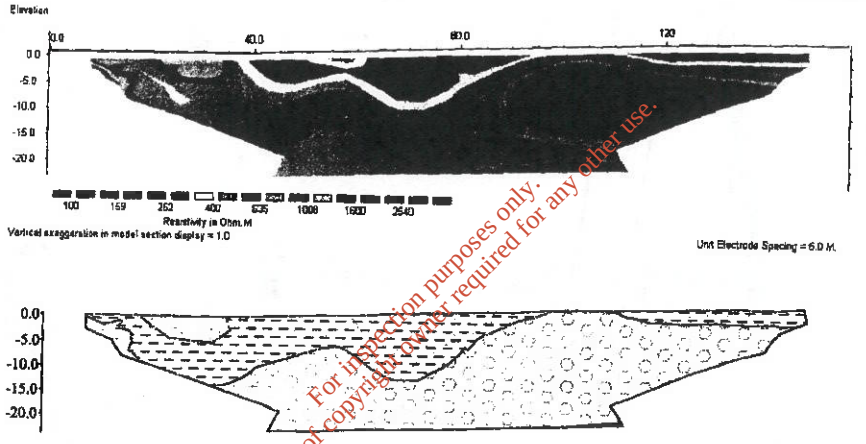
Drawn: Ruth Staunton Scale: 1 / 1000 Date: Jun 2002 Checked: Kevin Galvin Issued On:	Title: SECTION 7 INTERPRETATION 2D-RESISTIVITY PROFILE 7	Job: CARBURY SAND & GRAVEL	Client: DECLAN BRASSIL & CO	Drg No: 697/R7	BMA GeoServices Ground Engineering Consultants Comhairleoiri Cré-Innéalóireachta BMA, Shrowhall Business Park, Athy Road, Carlow, Ireland. Phone: 353-503-34488 Mobile: 087-2477823 Fax: 353-503-34490 E-mail: bmadublin@bma.ie

2D-Resistivity Profile 8

South
E269100 N239161

Measured Data

North
E269148 N239303



Gravelly Clay Sand and Gravel

Notes:	Drawn: Ruth Staunton Scale: 1 / 1000 Date: Jun 2002 Checked: Kevin Galvin Record Dr:	Title: SECTION 8 INTERPRETATION 2D-RESISTIVITY PROFILE 8	Job: CARBURY SAND & GRAVEL	Client: DECLAN BRASSIL & CO	Dg No: 897/03

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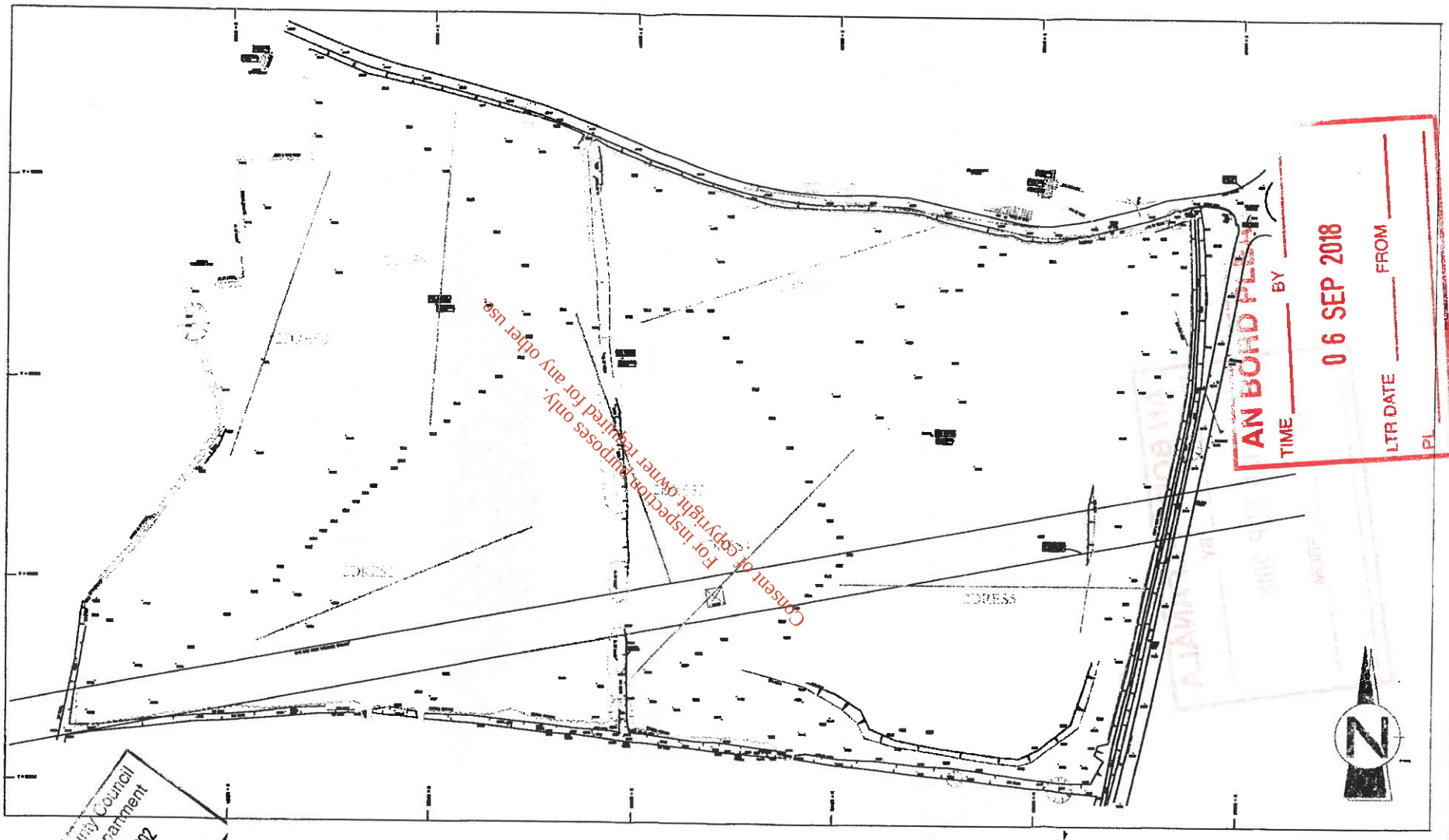

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Revision Details	Issue	By	Date	Rev
Revision Details	Issue	By	Date	Rev
Revision Details	Issue	By	Date	Rev
Revision Details	Issue	By	Date	Rev

Drawn: Kevin Cahill
Scale: 1/ 2000
Date: Jan 2002
Checked: Jim Hodgson
Record Drn:

Title:
MAP 1
LOCATION MAP

Job:
CARBURY SAND & GRAVEL

Client:
DECLAN BRASSIL LTD.

Drg No: 897/1

BMA GeoServices
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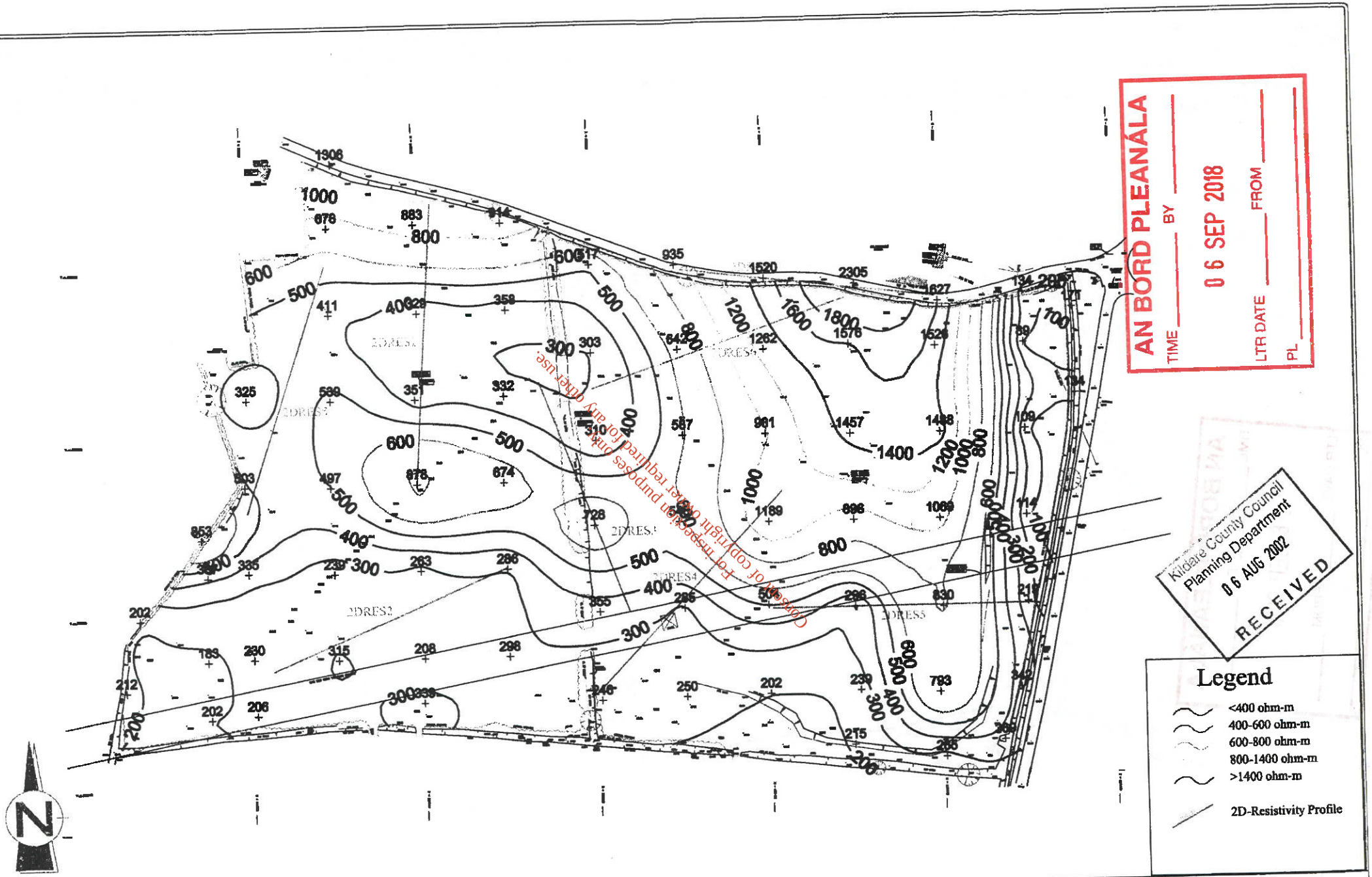

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Drawn: Kevin Colvin
Scale: 1/ 2000
Date: Jan 2002
Checked: Jim Hodgson
Issued On:

MAP 2
APPARENT RESISTIVITY
CONTOUR MAP (OHM-M)

CARBURY SAND & GRAVEL

DECLAN BRASSIL LTD.

Drg No: 8972

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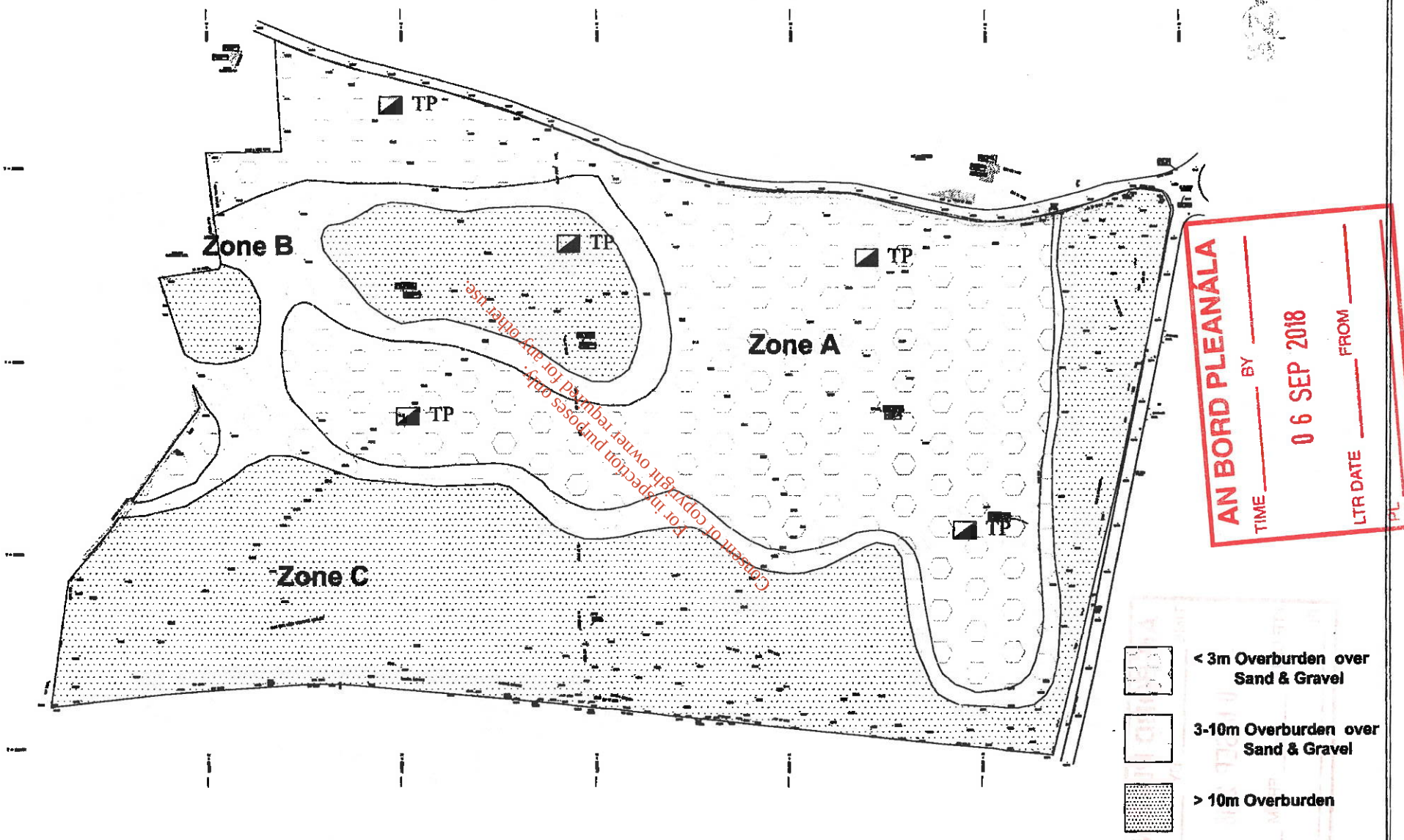

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Notes: Refer

Revision Details	Issue	By	Date	Rev
Revision Details	Issue	By	Date	Rev
Revision Details	Issue	By	Date	Rev
Revision Details	Issue	By	Date	Rev

Drawn: Nuala Galvin
Scale: 1/ 900
Date: Jun 2002
Checked: Jim Hodgson
Issued On:

Title: MAP 3
SUMMARY MAP

Job: CARBURY SAND & GRAVEL

Client: DECAN BRASSIL LTD.

Drg No: 897/3

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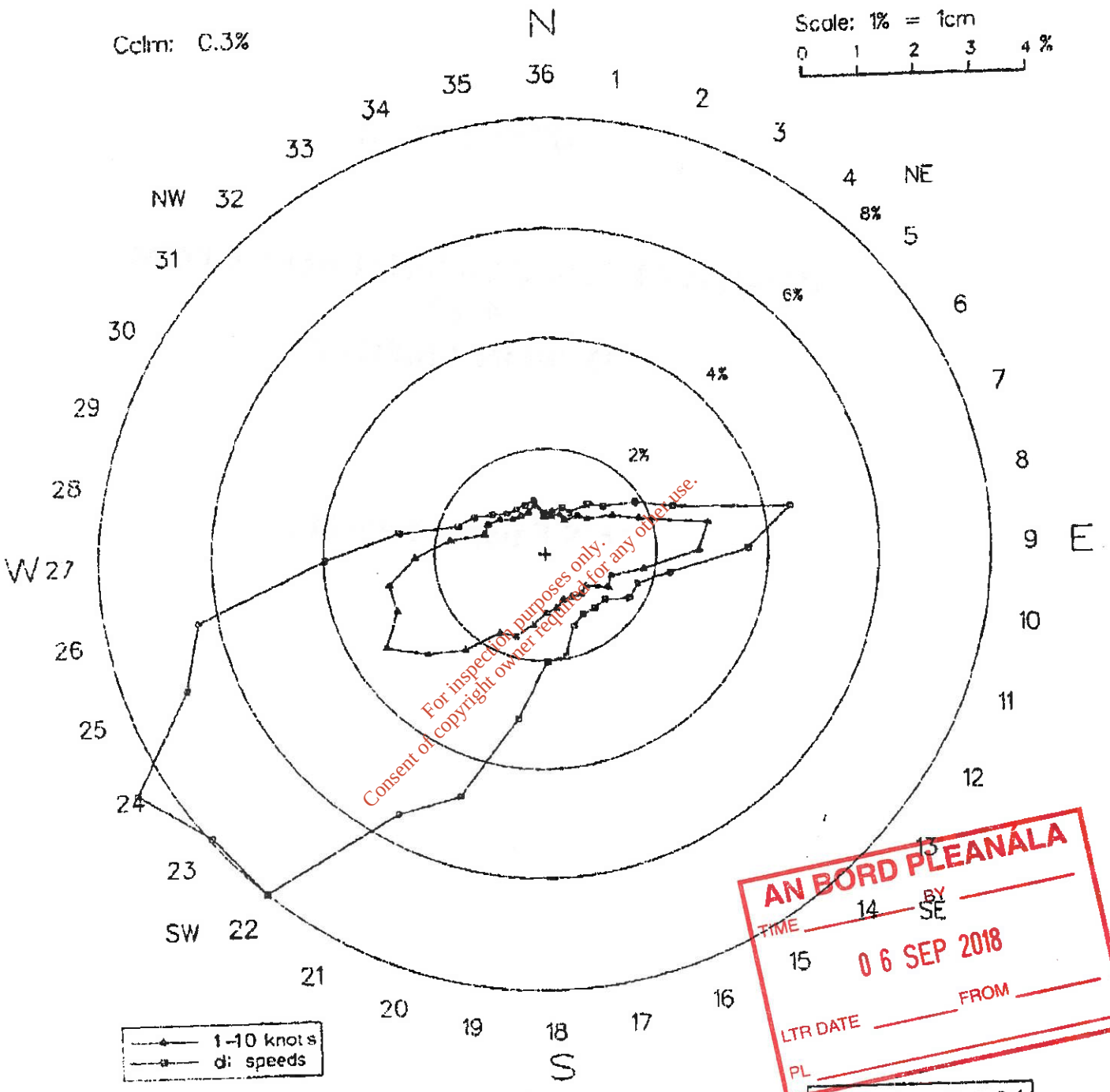
APPENDIX 7.1

WINDROSE FOR CASEMENT AERODROME AND DUBLIN AIRPORT

TMS Environment Ltd.

CASEMENT AERODROME 1992--1996

Percentage Frequency of Occurrence of Wind Directions



+ less than 0.1

Percentage Frequency of Occurrence of Wind Speeds

knots	0	1-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	41-47	over 48
%	0.3	12.2	17.7	23.9	25.3	12.7	6.1	1.5	0.3	+	+

mean wind speed: 10.9 knots

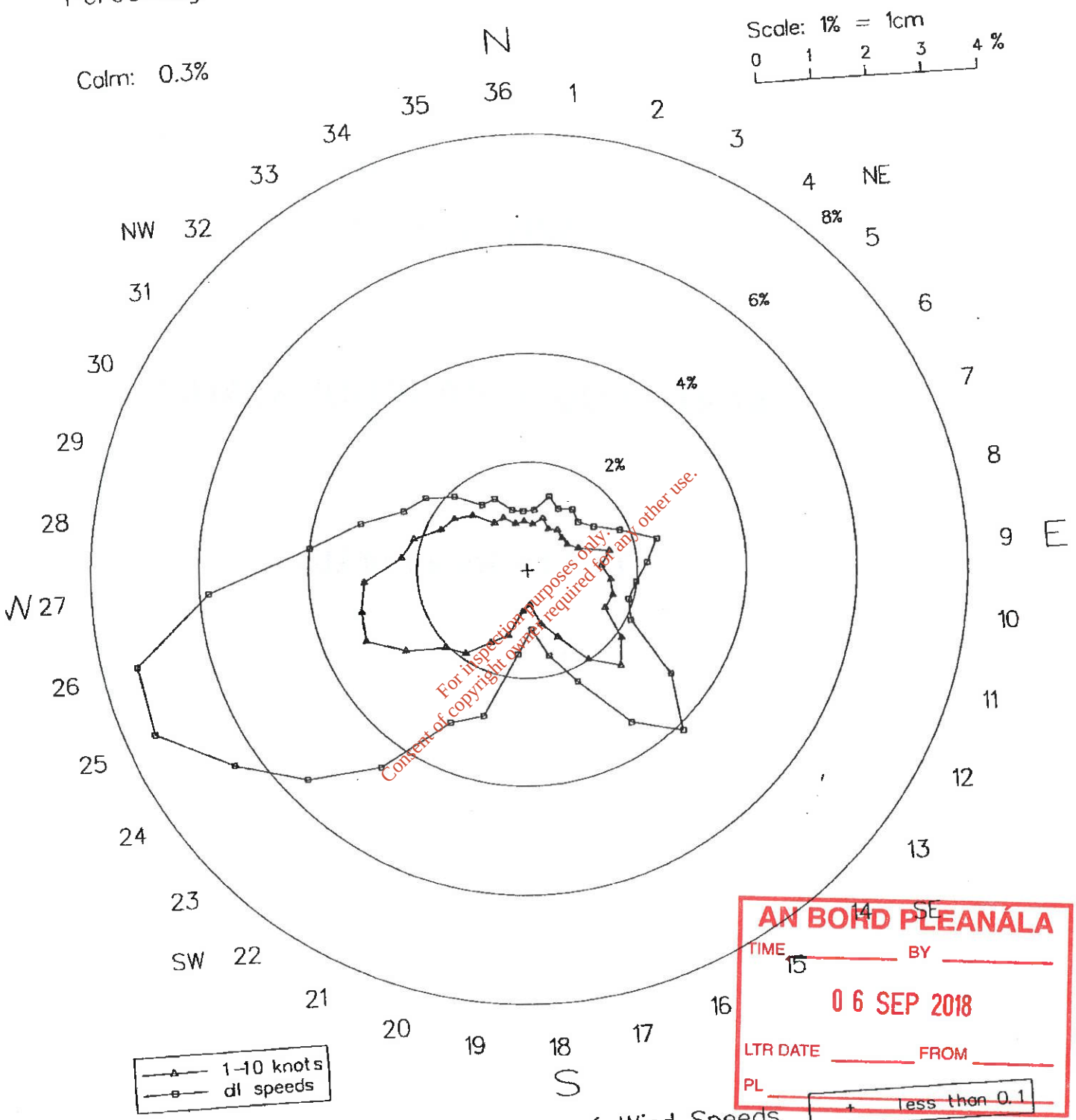
standard deviation: 6.8 knots

anemometer height: 12m

Meteorological Service, Glasnevin Hill, Dublin 9.

DUBLIN AIRPORT 1996–2000

Percentage Frequency of Occurrence of Wind Directions



Percentage Frequency of Occurrence of Wind Speeds

0	1–3	4–6	7–10	11–16	17–21	22–27	28–33	34–40	41–47	over 48	knots
0.3	7.6	19.6	28.7	29.5	10.3	3.3	0.6	+	+	0.0	%

mean wind speed: 10.4 knots

standard deviation: 5.6 knots

anemometer height: 12m

Meteorological Service, Glasnevin Hill, Dublin 9.

APPENDIX 7.2

BASELINE DUST DEPOSITION SURVEY

TMS Environment Ltd.

tms environment ltd

Confidential Report

Customer Ref:

Customer: Declan Brassil and Company Ltd
Main Street,
Clonee,
Co Meath

TMS Environment Ref: 4567

F.T.A.O.: Declan Brassil

Order No.	Commencement Date: 25/02/2002	Completion Date: 19/03/2002

Report title: Dust deposition survey, Goode Concrete, Ballinderry, Carbury, Co. Kildare.

Report by: Tom Ryan — Sheelagh Flanagan

Approved by: Imelda Shanahan
Dr Imelda Shanahan

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Registration No. 217750

1.0 Scope

This report presents the results of a dust deposition survey, which was carried out at four locations (D-1 to D-4) around the boundary of the Goode Concrete site at Ballinderry, Carbury, Co. Kildare.

2.0 Methodology

The survey was conducted by TMS Environment Ltd personnel during the period 25th February to 13th March 2002. The procedure employed for this survey was Standard Method VDI 2119 (Measurement of Dustfall, Determination of Dustfall using Bergerhoff Instrument (Standard Method) German Institute).

The dust deposition rate was measured by positioning four Bergerhoff Dust Deposit Gauges at strategic locations near the boundaries of the site for a period of 17 days. The selection of sampling point locations was completed after consideration of the requirements of VDI 2119 with respect to the location of the samplers relative to trees and other obstructions, height above ground and sample collection and analysis procedures. After the exposure period was complete, the Gauges were removed from the site; the dust deposits in each Gauge were determined gravimetrically and expressed as a dust deposition rate in mg/m^2-day in accordance with the relevant standards. The locations of the Dust Deposit Gauges are marked as D-1 to D-4 on a map of the site presented separately in Figure 1.

3.0 Results

The measurement results are presented in Table 1 with the measurement locations highlighted in Figure 1.

Table 1 Dust deposition rate, Goode Concrete, Carbury Co. Kildare.

SAMPLING POINT	DUST DEPOSITION RATE mg/m^2-day
D-1	154.0
D-2	51.4
D-3	117.6
D-4	[1]

NOTE
[1] No measurement result was obtained for this sample as the gauge was knocked over.

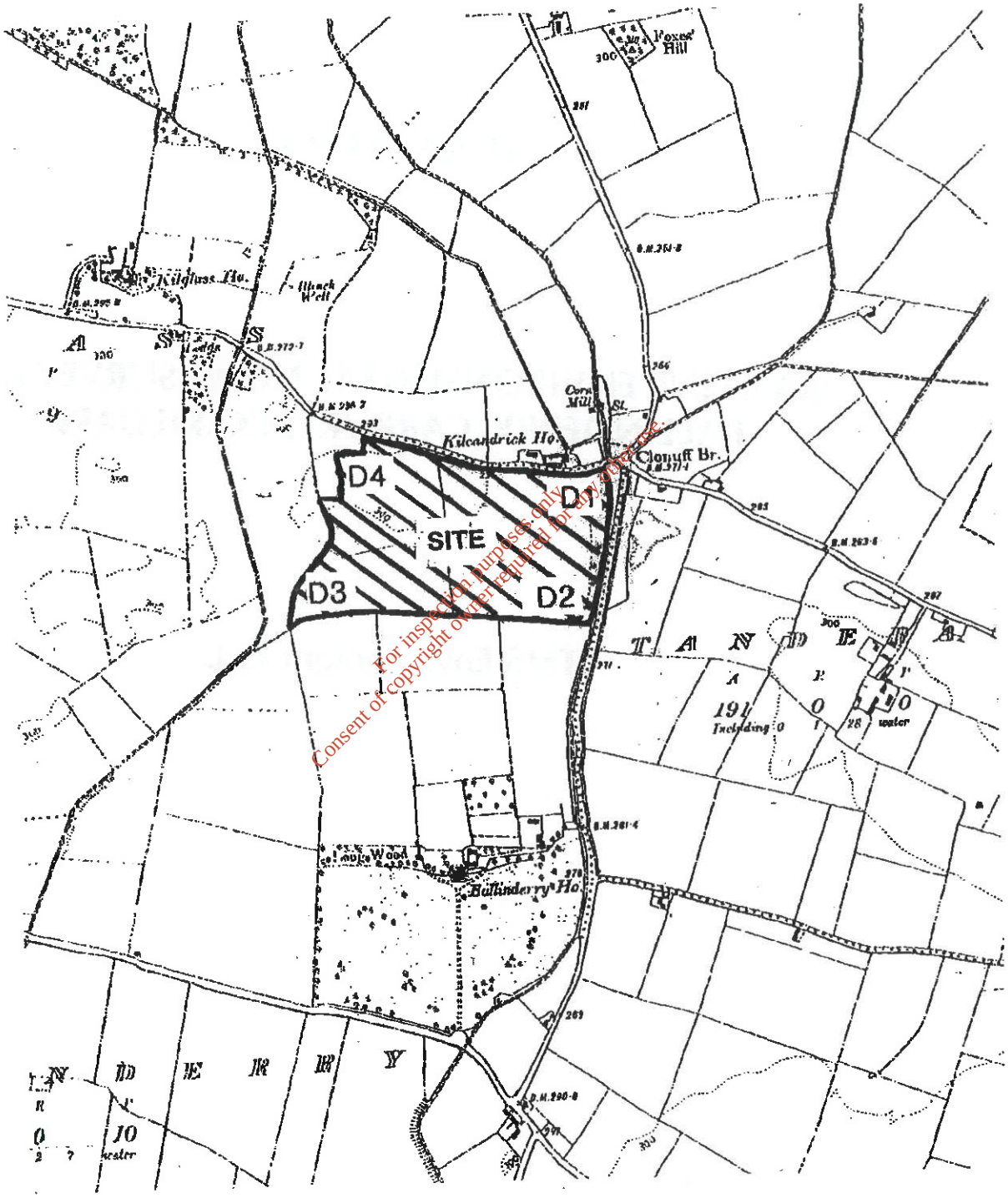
4.0 Evaluation of results

Dust measurements were completed at four locations (D-1 to D-4) within 5m of the boundaries of the site. A measurement frequently used in connection with air quality assessments where dust emissions may be significant is Dust Deposition Rate, which is normally measured by gravimetrically determining the mass of particulates and dust deposited over a specified surface area over a period of one month (28 days). Measurements were recorded over a 17-day period due to time constraints as dust gauges deployed during an earlier monitoring period had been previously interfered with. The results are expressed as dust deposition rate in mass per unit area per day.

For the purpose of this assessment, a survey of dust deposition rates over a 17 day period was completed. Typical dust deposition rates in a rural agricultural environment are in the extremely low mg/m^2-day range, typically 30 – 100, with values of up to 150 – 180 mg/m^2-day in urban locations. The monitoring results for D-1 and D-3 are outside the expected concentration range for rural locations. They are above the typical dust deposition rates for rural location with measurement results of 154.0 and 117.6 mg/m^2 day respectively. D-3 is located on the site boundary adjacent to a busy road, which is used by heavy lorries transporting gravel and sand in the area. There is also a green field site across the road where earthmovers are levelling the ground and shifting large volumes of soil, which may have contributed to the high dust level found in D-3.

These results indicate that dust deposition at the existing site is not adversely affecting ambient air quality for three of the four locations. The location D-3 will probably fall into the expected range when the earth moving activities across the road have ceased. A standard of 350 mg/m^2-day is normal for ensuring that no significant adverse nuisance effects such as soiling of buildings are encountered as a result of dust deposition from industrial activities. The existing measurement results are all lower than the Nuisance Threshold of 350 mg/m^3-day.

Figure 1 Location of Dust Deposition Gauges at Carbury, Co. Kildare



APPENDIX 8.1

BASELINE ENVIRONMENTAL NOISE SURVEY AT BALLINDERRY, CARBURY, CO.KILDARE

TMS Environment Ltd.

tms environment ltd

DECLAN BRASSIL AND COMPANY LTD
MAIN STREET
CLONEE
CO MEATH

ENVIRONMENTAL NOISE SURVEY AT BALLINDERRY, CARBURY, CO. KILDARE

Report Prepared by:

Tom Ryan

Approved by:

Dr. Imelda Shanahan

Report Ref 4562
TMS Environment Ltd.
13th March 2002

TMS Environment Ltd., 53 Broomhill Drive, Tallaght, Dublin 24.
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Registration No. 217750

CONTENTS

1.0 Scope

This report presents the results of an environmental noise survey carried out at a green-field site located in Ballinderry, Carbury, Co. Kildare. The existing noise climate at the boundaries of the site, and at two noise sensitive receptors in close proximity to the site were assessed.

2.0 Regional environmental setting

The site of the proposed development is situated in the townland of Ballinderry approximately 5km north of Carbury and 3.5km south of the N4 junction near Broadford. The site is bordered on the northern and western boundaries by Third Class Roads. The road running along the western boundary joins the villages of Broadford and Carbury and is the busier of the two roads. The proposed site is bordered by agricultural land to the north, south and east. There is an established extractive operation bounding the site to the west. There is an animal slaughtering facility approximately 600m to the east of the site. There are three private residences located near the northwest corner of the site and a new house is currently being built adjacent to the northwest corner. There are two houses located directly south of the site, one adjacent to the Carbury-Broadford road and the other located approximately 100m west of the road. There is a scattering of houses north and south of the junction at Clonuff Bridge adjacent to the northeastern corner of the site, numbering nine in total.

3.0 Receptors

Noise measurements were taken at two boundary positions that can be classed as Noise Sensitive Receptors and at two other locations that are situated in the vicinity of the site. The existing noise climates at these residences or close to the residences were assessed during daytime periods when the ambient noise levels could be considered typical of the area. These locations were selected for noise monitoring due to their close proximity to the site and since they have the potential to be affected by any redevelopment of land in the area. A description of the measurement positions is presented in Table 1.

There are four private residences situated along the Third Class Road that runs adjacent to the northern boundary in the northwestern corner of the site. Measurements were recorded here at the boundary of the site at the private residence closest to the site boundary (N-4). Measurements recorded at N-1 (the northeastern corner of the site) are representative of both boundary measurements and Noise Sensitive Receptor measurements for the scattering of houses situated north and south of Clonuff Bridge. Measurements were recorded on the roadside in front of Kilglass House, northwest of the proposed site (N-5). Measurements were also recorded outside a private residence to the south of the site adjacent to the roadside (N-6).

Table 1 Description of Noise Measurement Positions at Ballinderry

MONITORING POINT	DESCRIPTION	APPROXIMATE DISTANCE FROM MEASUREMENT POSITION TO NOISE SENSITIVE RECEPTOR (m)	APPROXIMATE DISTANCE FROM NOISE SENSITIVE RECEPTOR TO NEAREST SITE BOUNDARY (m)
N-1	North eastern corner of the site	80	40
N-2	South eastern corner of site	350	350
N-3	South western corner of site	-	-
N-4	North western corner of site	30	15
N-5	On roadside in front of Kilglass House	75	500
N-6	On roadside in front of house south of site	15	350

4.0 Survey Protocol

4.1 Choice of measurement positions

The noise monitoring locations chosen for this survey were selected in order to assess the existing noise climates at the boundaries of the site (N-1 to N-4) and to assess the existing noise climates at two noise sensitive receptors (N-5 and N-6) that are situated in close proximity to the site.

The monitoring points chosen for locating the noise measuring instrument were chosen according to the guidelines in ISO 1996: Acoustics - Description and Measurement of Environmental Noise. In all cases the sound level meter was located 1.3m above ground and at least 3.5m away from any sound reflecting objects. A wind cover was placed on the microphone to reduce any wind interference during measurements. A description of the monitoring points is presented in Table 1.

4.2 Instrumentation and methodology

The measurements were made according to the requirements of ISO 1996: Acoustics - Description and Measurement of Environmental Noise. The measurements were made using a Cirrus 703A Data logging integrating sound level meter. The instrument was calibrated at 94 dB prior to use using a Cirrus CRL 511E Sound Level Calibrator. The microphone was mounted on an outdoor microphone stand, which in turn was mounted on a tripod at 1.3m above ground level. This instrument is a Type 1 instrument in accordance with IEC 651 regulations. The Time Weighting used was Fast and the Frequency Weighting was A-weighted as per IEC 651

4.3 Survey implementation

The survey was conducted by TMS Environment Ltd personnel on 13th March 2002. The measurement parameters included meteorological observations of prevailing conditions at the time of the survey. The main measurement parameter was the equivalent continuous A-Weighted Sound Pressure Level, $L_{Aeq,T}$, over 60 minute measurement intervals. A statistical analysis of the measurement results was also completed so that the percentile levels, $L_{AN,T}$, for N = 90% and 10% over 60 minute measurement intervals were also recorded. The percentile levels represent the noise level in dB(A) exceeded for N% of the measurement time. Noise measurements were taken at each of the six monitoring locations during the course of the survey.

5.0 Survey results

The environmental noise measurement results are reported in Table 2.

Table 2 Results of Environmental Noise Survey at Ballinderry

MONITORING LOCATION	SURVEY DATE &TIME INTERVAL	$L_{Aeq, 60min}$ dB(A)	$L_{A90, 60min}$ dB(A)	$L_{A10, 60min}$ dB(A)	SOURCES OF NOISE
N-1	13/03/2002 11:40 to 12:40	55	42	57	Passing traffic on both the Third Class Roads Strong breeze
N-2	13/03/2002 13:00 to 14:00	60	43	64	Passing traffic on the Broadford-Carbury road Strong breeze
N-3	13/03/2002 09:30 to 10:30	50	43	53	Passing traffic on the Broadford-Carbury road Strong breeze Reverse bleepers from adjacent site
N-4	13/03/2002 10:35 to 11:35	51	43	53	Passing roadside traffic Strong breeze
N-5	13/03/2002 14:10 to 15:10	59	44	55	Passing roadside traffic Strong breeze
N-6	13/03/2002 15:15 to 16:15	69	44	65	Passing roadside traffic Strong breeze

NOTE

The observed weather conditions during monitoring were as follows:
13/03/02: cold, dry and strong breeze, (Wind velocity was 3-6 m/s, Easterly)

6.0 EVALUATION OF RESULTS

The results of this survey indicate that the current noise climate in the vicinity of the proposed site at Ballinderry, Carbury, Co. Kildare is typical of a rural environment. The area is free from any major industrial noise sources. The high volume of road traffic travelling at speeds in excess of 50 mph on the Broadford-Carbury Third Class Road was the most significant overall noise source observed in the vicinity of the site. There was also contribution to the noise levels in the area from the passing traffic on the Third Class Road running along the northern border of the site but to a lesser extent.

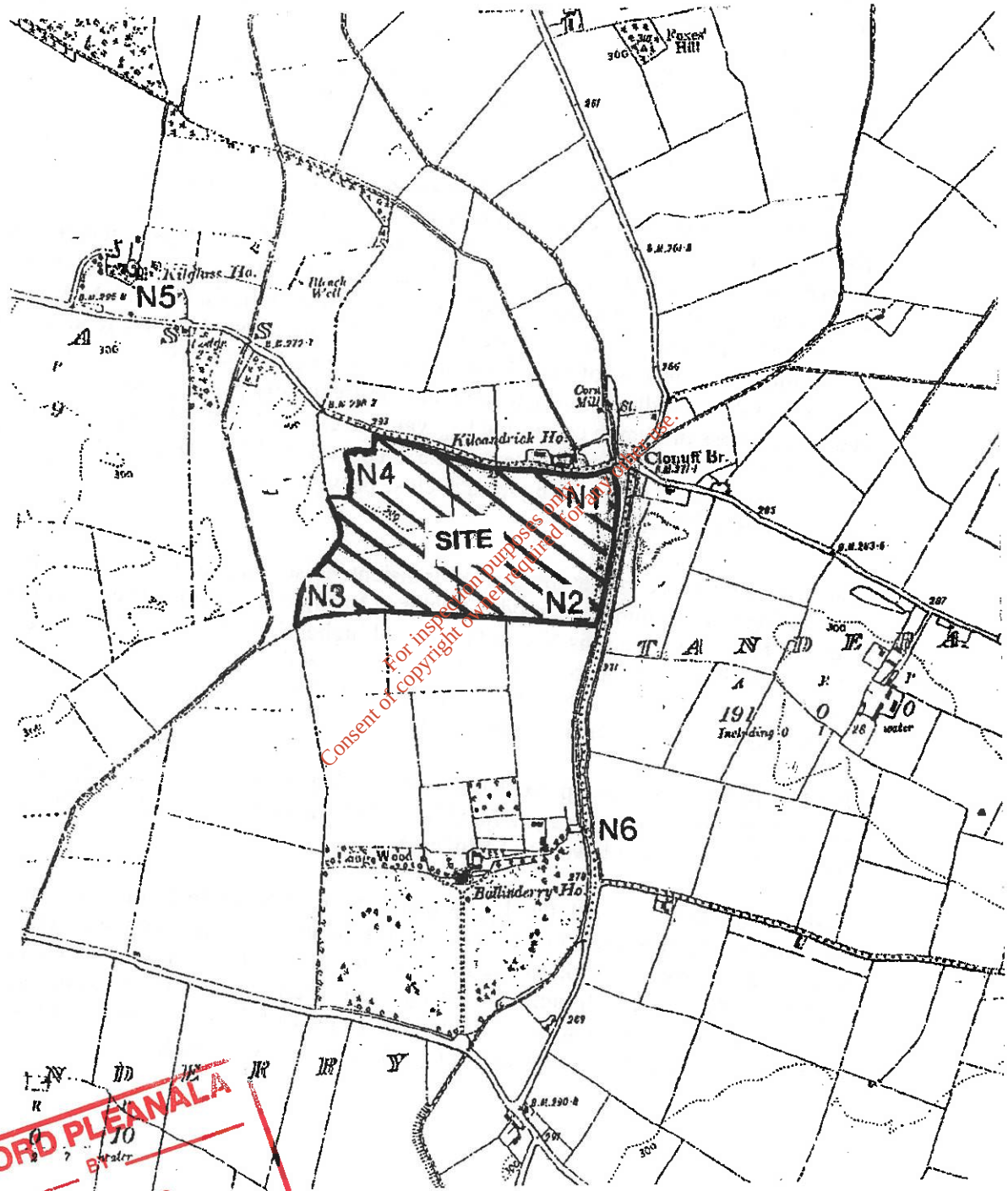
According to EPA BATNEEC Guidance Notes for Noise, if the total noise level from all sources is taken into account, the daytime noise level at noise sensitive receptors should be kept below a decibel level of approximately 55dB(A) in order to avoid disturbance. The L_{Aeq} values measured at N-3 and N-4 were below the 55dB(A) guideline value measuring 50 and 51dB(A) respectively. These were the only two locations monitored where the L_{Aeq} values were below 55dB(A). This is due to the fact that N-3 and N-4 are not in close proximity to the passing traffic on the Broadford-Carbury road, which is approximately 450m east of these locations. Monitoring locations N-1, N-2 and N-6 are all close to the Broadford-Carbury road and the frequently passing traffic travelling at speeds in excess of 50mph causes the L_{Aeq} value to exceed the 55dB(A) guideline value. At the second Noise Sensitive Receptor N-5, a L_{Aeq} value of 59dB(A) was recorded. This is due to the passing traffic being in such close proximity to the noise meter, which was located at the roadside.

The L_{A10} values are representative of transient noise sources occurring during the monitoring interval and are a good indicator of traffic contribution. The L_{A10} values for the four boundary locations N-1 to N-4 are all higher than the L_{Aeq} values indicating a strong contribution from passing traffic to the overall L_{Aeq} value. At the two noise sensitive receptors N-5 and N-6 the LA10 values are 55 and 65dB(A) respectively, which also indicates a strong traffic contribution.

The L_{A90} measurement is representative of the background noise levels in the area. From Table 2, the recorded L_{A90} values for (N-1 to N-6) range between 42 - 44dB(A), which are well within the guide value of 55dB(A).

Considering the L_{A90} and the L_{Aeq} values, these indicate that there are no major fluctuations of noise levels in the area. This is primarily as a result of the area being free of any significant continuous noise sources. The main source of noise in the area is the passing traffic on the Broadford-Carbury road. From the results obtained it can be inferred that the existing noise climate in the vicinity of the proposed site is consistent with that expected of such a rural setting adjacent a busy roadside.

Figure 1 Noise monitoring locations at Ballinderry, Carbury, Co. Kildare



APPENDIX 8.2

PREDICTIONS OF NOISE LEVELS AT NOISE SENSITIVE RECEPTORS

TMS Environment Ltd.

TABLE 1
NOISE PREDICTION AT N-1
CLOSEST DISTANCE FROM NSR TO NEAREST PIT BOUNDARY

PREDICTION OF NOISE FROM STATIONARY/QUASI STATIONARY PLANT (ACTIVITY LAEQ METHOD)

PLANT TYPE / NOISE SOURCE	L_{Aeq}, AT 1m, dB	L_{Aeq}, AT 10m, dB	DISTANCE, m	ADJUSTMENTS (dB)				RESULTANT L_{Aeq}, dB	FRACTION ON TIME	CORRECTIONS TO $L_{Aeq,\ 1\ HR}$		ACTIVITY $L_{Aeq,\ 1\ HR}$
				DISTANCE		SCREENING	REFLECTION					
List all noise sources	*Average*		*Minimum distance to receptor, m*	$K_1 = 20\log_{10}(R/10)$	$K_2 = (25\log_{10}(R/10) - 2$	*0, 5, 10, calculate*	*0, 3*	L_{WA} - *adjustments* =	*(Activity duration / working period)*	$t_e = T_1 \times F$	$(t_e)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_e)(10^{0.1L_i})$
FRONT END LOADER		79	50		15.5	20	0	43.5	1	1	22520.3	
FRONT END LOADER		79	50		15.5	20	0	43.5	1	1	22520.3	
DUMP TRUCK		76	50		15.5	20	0	40.5	1	1	11286.9	
SCREENING DECK		90	400		38.1	20	0	31.9	1	1	1566.2	
GENERATOR		86	400		38.1	20	0	27.9	1	1	623.5	

NOTE

1. This assessment is based on a worst case scenario in which all items of plant are operating simultaneously, on a continual basis, at the nearest site boundary position to the receptor.

	ACTIVITY $L_{Aeq,\ 1\ HR}$
SIGMA $(t_e)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_e)(10^{0.1L_i})$
58517.3	48

TABLE 2
NOISE PREDICTION AT N-4
CLOSEST DISTANCE FROM NSR TO NEAREST PIT BOUNDARY

PREDICTION OF NOISE FROM STATIONARY/QUASI STATIONARY PLANT (ACTIVITY LAEQ METHOD)

PLANT TYPE / NOISE SOURCE	L_{Aeq}, AT 1m, dB	L_{Aeq}, AT 10m, dB	DISTANCE, m	ADJUSTMENTS (dB)				RESULTANT L_{Aeq}, dB	FRACTION ON TIME	CORRECTIONS TO $L_{Aeq,1\,HR}$		ACTIVITY $L_{Aeq,1\,HR}$
				DISTANCE		SCREENING	REFLECTION					
List all noise sources	*Average*		*Minimum distance to receptor, m*	$K_b = 20log_{10}(R/10)$	$K_b = (25log_{10}(R/10) - 2$	*0, 5, 10, calculate*	*0, 3*	L_{eA} - *adjustments*	*(Activity duration / working period)*	$t_r = T_r \times F$	$(t_r)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10log_{10}[1/1\ \Sigma(t_r)(10^{0.1L_i})$
FRONT END LOADER		79	50		15.5	20	0	43.5	1	1	22520.3	
FRONT END LOADER		79	50		15.5	20	0	43.5	1	1	22520.3	
DUMP TRUCK		76	50		15.5	20	0	40.5	1	1	11266.9	
SCREENING DECK		90	250		32.9	20	0	37.1	1	1	5071.7	
GENERATOR		86	250		32.9	20	0	33.1	1	1	2019.1	

NOTE

1. This assessment is based on a worst case scenario in which all items of plant are operating simultaneously, on a continual basis, at the nearest site boundary position to the receptor.

	ACTIVITY $L_{Aeq,1\,HR}$
SIGMA $(t_r)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10log_{10}[1/1\ \Sigma(t_r)(10^{0.1L_i})$
63418.3	48

TABLE 3
NOISE PREDICTION AT N-5
CLOSEST DISTANCE FROM NSR TO NEAREST PIT BOUNDARY

PREDICTION OF NOISE FROM STATIONARY/QUASI STATIONARY PLANT (ACTIVITY LAEQ METHOD)

PLANT TYPE / NOISE SOURCE	L_{Aeq}, AT 1m, dB	L_{Aeq}, AT 10m, dB	DISTANCE, m	ADJUSTMENTS (dB)				RESULTANT L_{Aeq}, dB	FRACTION ON TIME	CORRECTIONS TO $L_{Aeq,1\,HR}$		ACTIVITY $L_{Aeq,1\,HR}$
				DISTANCE		SCREENING	REFLECTION					
List all noise sources	*Average*		*Minimum distance to receptor, m*	$K_1 = 20\log_{10}(R/10)$	$K_2 = (25\log_{10}(R/10) - 2$	*0, 5, 10, calculate*	*0, 3*	L_{WA} + adjustments	*(Activity duration / working period)*	$t_e = T_i \times F$	$(t_e)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_e)(10^{0.1L_i})$
FRONT END LOADER		79	500		40.5	20	0	18.5	1	1	71.2	
FRONT END LOADER		79	500		40.5	20	0	18.5	1	1	71.2	
DUMP TRUCK		76	500		40.5	20	0	15.5	1	1	35.7	
SCREENING DECK		90	500		40.5	20	0	29.5	1	1	896.6	
GENERATOR		86	500		40.5	20	0	25.5	1	1	356.9	

NOTE

1. This assessment is based on a worst case scenario in which all items of plant are operating simultaneously, on a continual basis, at the nearest site boundary position to the receptor.

	ACTIVITY $L_{Aeq,1\,HR}$
SIGMA $(t_e)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_e)(10^{0.1L_i})$
1431.6	32

TABLE 4
NOISE PREDICTION AT N-6
CLOSEST DISTANCE FROM NSR TO NEAREST PIT BOUNDARY

PREDICTION OF NOISE FROM STATIONARY/QUASI STATIONARY PLANT [ACTIVITY LAEQ METHOD]

PLANT TYPE / NOISE SOURCE	L_{Aeq}, AT 1m, dB	L_{Aeq}, AT 10m, dB	DISTANCE, m	ADJUSTMENTS (dB)				RESULTANT L_{Aeq}, dB	FRACTION ON TIME	CORRECTIONS TO $L_{Aeq,\ 1\ HR}$		ACTIVITY $L_{Aeq,\ 1\ HR}$
				DISTANCE		SCREENING	REFLECTION					
List all noise sources	*Average*		*Minimum distance to receptor, m*	$K_h = 20\log_{10}(R/10)$	$K_s = (25\log_{10}(R/10) - 2$	*0, 5, 10, calculate*	*0, 3*	L_{WA} - *adjustments*	*(Activity duration / working period)*	$t_e = T_i \times F$	$(t_e)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_e)(10^{0.1L_i})$
FRONT END LOADER		79	350		36.6	20	0	22.4	1	1	173.7	
FRONT END LOADER		79	350		36.6	20	0	22.4	1	1	173.7	
DUMP TRUCK		76	350		36.6	20	0	19.4	1	1	87.1	
SCREENING DECK		90	350		36.6	20	0	33.4	1	1	2188.9	
GENERATOR		86	350		36.6	20	0	29.4	1	1	870.6	

NOTE

1. This assessment is based on a worst case scenario in which all items of plant are operating simultaneously, on a continual basis, at the nearest site boundary position to the receptor.

	ACTIVITY $L_{Aeq,\ 1\ HR}$
$SIGMA\ (t_e)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_e)(10^{0.1L_i})$
3492.0	35

TABLE 5
NOISE PREDICTION AT N-1
Closest distance from NSR to screening bank construction activities

PLANT TYPE / NOISE SOURCE	L_{Aeq} AT 1m, dB	L_{Aeq} AT 10m, dB	DISTANCE, m	ADJUSTMENTS (dB)				RESULTANT L_{Aeq}, dB	FRACTION ON TIME	CORRECTIONS TO $L_{Aeq,\ 1\ HR}$		ACTIVITY $L_{Aeq,\ 1\ HR}$
				DISTANCE		SCREENING	REFLECTION					
List all noise sources	*Average*		*Minimum distance to receptor, m*	$K_h = 20\log_{10}(R/10)$	$K_s = (25\log_{10}(R/10) - 2$	*0, 5, 10, calculate*	*0, 3*	L_{WA} - *adjustments*	*(Activity duration / working period)*	$t_c = T_i \times F$	$(t_c)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_c)(10^{0.1L_i})$
Crawler mounted backhoe		80	50		15.5	0	0	64.5	1	1	2635143.1	
Bulldozer		82	50		15.5	0	0	66.5	1	1	4493399.1	
Dump Truck		81	50		15.5	0	0	65.5	1	1	3569233.7	

NOTE

1. This assessment is based on a worst case scenario in which all items of plant are operating simultaneously, on a continual basis, at the nearest site boundary position to the receptor.

	ACTIVITY $L_{Aeq,\ 1\ HR}$
SIGMA $(t_c)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_c)(10^{0.1L_i})$
10897775.9	70

TABLE 6
NOISE PREDICTION AT N-4
Closest distance from NSR to screening bank construction activities

PLANT TYPE / NOISE SOURCE	L_{Aeq} AT 1m, dB	L_{Aeq} AT 10m, dB	DISTANCE, m	ADJUSTMENTS (dB)				RESULTANT L_{Aeq}, dB	FRACTION ON TIME	CORRECTIONS TO $L_{Aeq,1\,HR}$		ACTIVITY $L_{Aeq,1\,HR}$
				DISTANCE		SCREENING	REFLECTION					
List all noise sources	*Average*		*Minimum distance to receptor, m*	$K_A = 20\log_{10}(R/10)$	$K_s = (25\log_{10}(R/10) - 2$	*0, 5, 10, calculate*	*0, 3*	L_{WA} + *adjustments*	*(Activity duration / working period)*	$t_c = T_f \times P$	$(t_c)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/t\ \Sigma(t_c)(10^{0.1L_i})$
Crawler mounted backhoe		80	50		15.5	0	0	64.5	1	1	2835143.1	
Bulldozer		82	50		15.5	0	0	66.5	1	1	4483399.1	
Dump Truck		81	50		15.5	0	0	65.5	1	1	3569233.7	

NOTE

1. This assessment is based on a worst case scenario in which all items of plant are operating simultaneously, on a continual basis, at the nearest site boundary position to the receptor.

	ACTIVITY $L_{Aeq,1\,HR}$
SIGMA $(t_c)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/t\ \Sigma(t_c)(10^{0.1L_i})$
10897775.9	70

TABLE 7
NOISE PREDICTION AT N-5
Closest distance from NSR to screening bank construction activities

PLANT TYPE / NOISE SOURCE	L_{Aeq} AT 1m, dB	L_{Aeq} AT 10m, dB	DISTANCE, m	ADJUSTMENTS (dB)				RESULTANT L_{Aeq} dB	FRACTION ON TIME	CORRECTIONS TO $L_{Aeq,\ 1\ HR}$		ACTIVITY $L_{Aeq,\ 1\ HR}$
				DISTANCE		SCREENING	REFLECTION					
List all noise sources	*Average*		*Minimum distance to receptor, m*	$K_b = 20\log_{10}(R/10)$	$K_s = (25\log_{10}(R/10) - 2$	*0, 5, 10, calculate*	*0, 3*	L_{WA} - *adjustments*	*(Activity duration / working period)*	$t_c = T_i \times F$	$(t_c)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_c)(10^{0.1L_i})$
Crawler mounted backhoe		60	500		40.5	0	0	39.5	1	1	8965.5	
Bulldozer		82	500		40.5	0	0	41.5	1	1	14209.4	
Dump Truck		81	500		40.5	0	0	40.5	1	1	11286.9	

NOTE

1. This assessment is based on a worst case scenario in which all items of plant are operating simultaneously, on a continual basis, at the nearest site boundary position to the receptor.

	ACTIVITY $L_{Aeq,\ 1\ HR}$
$SIGMA\ (t_c)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/1\ \Sigma(t_c)(10^{0.1L_i})$
34461.8	45

TABLE 8
NOISE PREDICTION AT N-6
Closest distance from NSR to screening bank construction activities

PLANT TYPE / NOISE SOURCE	L_{Aeq} AT 1m, dB	L_{Aeq} AT 10m, dB	DISTANCE, m	ADJUSTMENTS (dB)				RESULTANT L_{Aeq}, dB	FRACTION ON TIME	CORRECTIONS TO $L_{Aeq,1\,HR}$		ACTIVITY $L_{Aeq,1\,HR}$
				DISTANCE		SCREENING	REFLECTION					
List all noise sources	*Average*		*Minimum distance to receptor, m*	$K_1 = 20\log_{10}(R/10)$	$K_1 = (25\log_{10}(R/10) - 2$	*0, 5, 10, calculate*	*0, 3*	L_{WA} - adjustments	*(Activity duration / working period)*	$t_c = T_1 \times F$	$(t_c)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/t\ \Sigma(t_c)(10^{0.1L_i})$
Crawler mounted backhoe		80	440		38.1	0	0	40.8	1	1	12341.5	
Bulldozer		82	440		39.1	0	0	42.8	1	1	19560.0	
Dump Truck		81	440		39.1	0	0	41.8	1	1	15537.0	

NOTE

1. This assessment is based on a worst case scenario in which all items of plant are operating simultaneously, on a continual basis, at the nearest site boundary position to the receptor.

	ACTIVITY $L_{Aeq,1\,HR}$
$SIGMA\ (t_c)(10^{0.1L_i})$	$L_{Aeq,1hr} = 10\log_{10}[1/t\ \Sigma(t_c)(10^{0.1L_i})$
47438.5	47

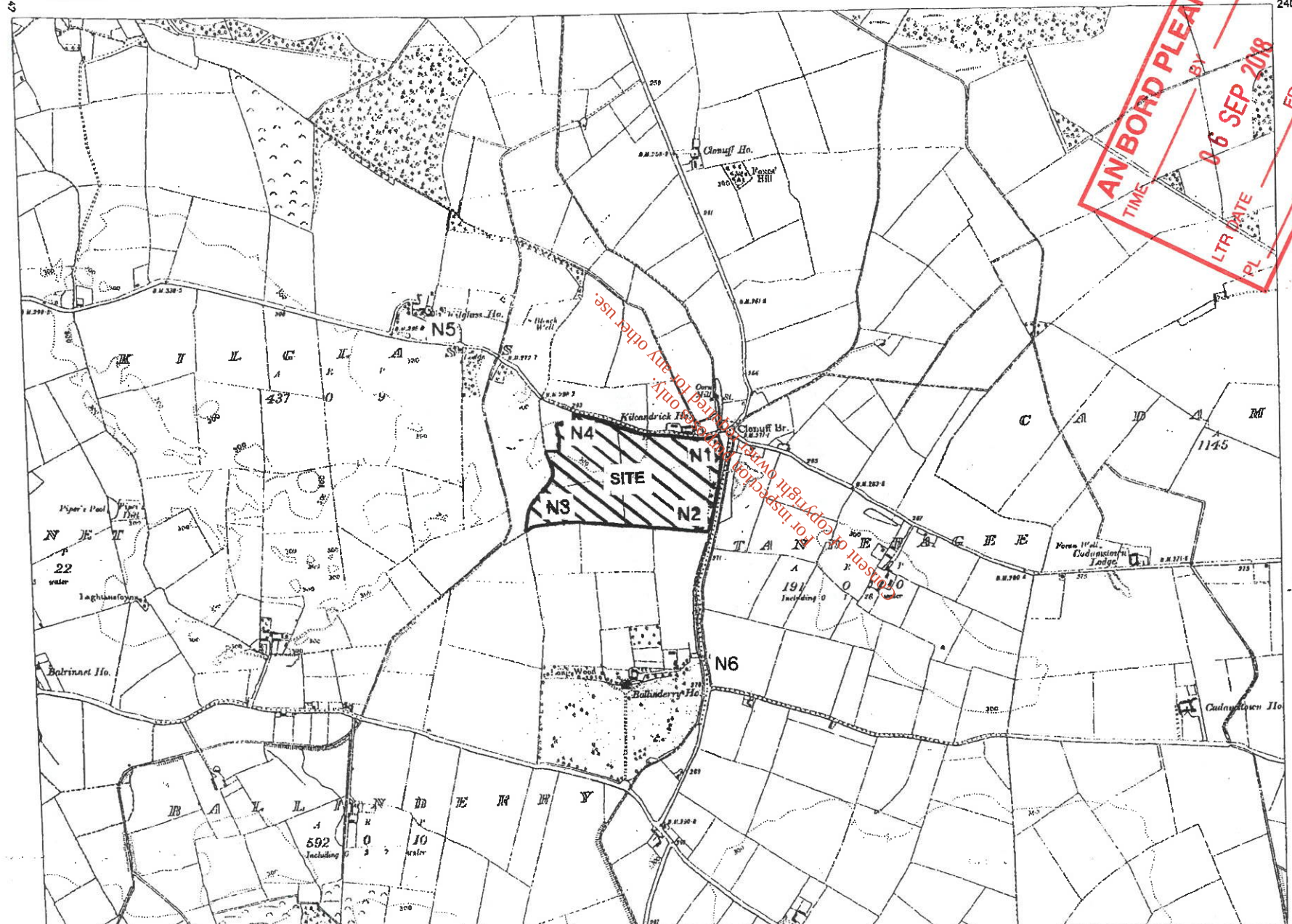
APPENDIX 8.3

MAP OF SITE SHOWING LOCATIONS OF NOISE SENSITIVE RECEPTORS

TMS Environment Ltd.

Surveyed 1836 – 1837
Revised 1909 – 1910
Levelled 0

Record PLACE Map



267642
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AN BORD PLEANÁLA
DESCRIPTION
TIME
BY
0 6 SEP 2018
FROM
LTR DATE
PL

ORDNANCE SURVEY IRELAND ©

osi Ordnance Survey Ireland

Suirbhéireacht Ordanáis Éireann, Páirc an Fhionnuisce, Baile Átha Cliath a dhéanmaigh, a chlóigh agus a d'fhoilsigh.

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The representation on this map of a road, track or footpath is not evidence of the existence of a right of way.

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Scale:– 1:10560
Scála:– 1:10560

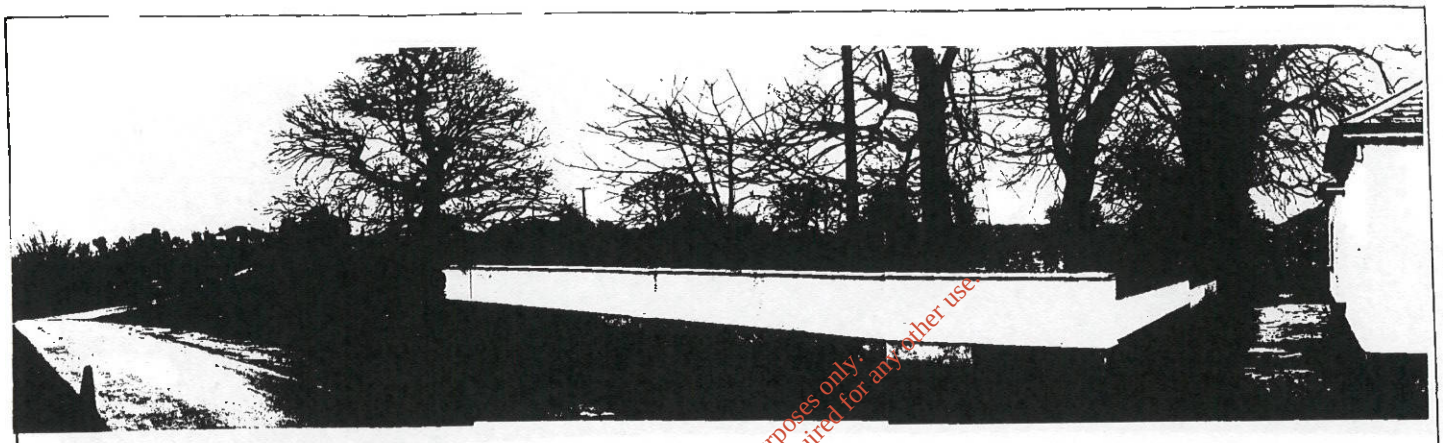
500 400 300 200 100 0 500 Metres
1000 500 0 1000 Feet

Plot Ref. No. 177170_1_7
Plot Date 08-AUG-2001

APPENDIX 9. 1

Viewpoint assessment sheets

Brassil Jarvis & Co. Ltd.



VIEWPOINT: 1 0.25 km NORTH WEST OF SITE **DATE:** JAN 02 **DIRECTION OF VIEW:** SE.

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised

Dwelling plots are located around a road which runs over the rise of undulating landform. The dwellings do not appear to be placed randomly but take position on the higher landform areas.

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

						OTHER
SCALE:	Intimate	Small	Large	Vast		
ENCLOSURE:	Tight	Enclosed	Open	Exposed		
DIVERSITY:	Uniform	Simple	Diverse	Complex		
BALANCE:	Harmonious	Balanced	Discordant	Chaotic		
MOVEMENT:	Dead	Calm	Busy	Frantic		
TEXTURE:	Smooth	Textured	Rough	V. rough		
COLOUR:	Monochrome	Muted	Colourful	Garish		
FORM:	Straight	Angular	Curved	Sinuous		

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

Hamlets	Irregular fields	Narrow lanes	Ancient woods	Railways	
Villages	Mixed hedges	Hedge banks	Parkland	Dykes	
Commons	Field ponds	Bracken	Heathland	Plantations	
Historic sites	Ridge and furrow	Hedgerow oaks	Scrub	Regular fields	
Fords	Walled fields	Old pollards	Rough grass	Thorn hedges	
Canals		Straight roads	Meres		

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel

Densely vegetated views over largely undulating landform, wherein pots free visual emphasis on settlements.

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Arable uture 40%
Settlement (dwellings) 40%
Trees / hedgerows 20%

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT: 2 — **DATE:** — **DIRECTION OF VIEW:**

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised.
Road corridor bound by hedgerows and native trees limits the view to the right of open agricultural land and a number of extractive sites. There appears little organisation to the landscape.

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

• Hamlets	• Irregular fields	• Narrow lanes	• Ancient woods	• Railways
• Villages	• Mixed hedges	• Hedge banks	• Parkland	• Dykes
• Commons	• Field ponds	• Bracken	• Heathland	• Plantations
• Historic sites	• Ridge and furrow	• Hedgerow oaks	• Scrub	• Regular fields
• Fords	• Walled Fields	• Old pollards	• Rough grass	• Thorn hedges
• Canals		• Straight roads	• Meres	

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Agriculture	80%
Trees/hedgerows	15%
Settlement	5%

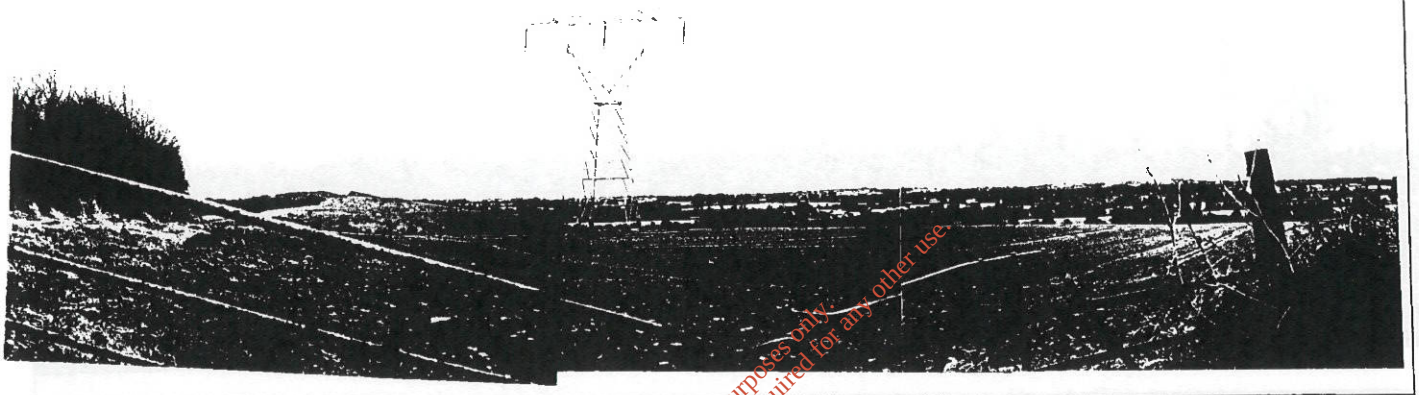
AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

						OTHER:
SCALE:	• Intimate	• Small	• Large	• Vast	• Exposed	•
ENCLOSURE:	• Tight	• Enclosed	• Open	• Complex	• Chaotic	•
DIVERSITY:	• Uniform	• Simple	• Diverse	• Chaotic	• Frantic	•
BALANCE:	• Harmonious	• Balanced	• Discordant	• Busy	• V. rough	•
MOVEMENT:	• Dead	• Calm	• Busy	• Rough	• Garish	•
TEXTURE	• Smooth	• Textured	• Rough	• Colourful	• Sinuous	•
COLOUR:	• Monochrome	• Muted	• Colourful	• Curved		
FORM:	• Straight	• Angular	• Curved			

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
An elevated view across open landscape - partially screened by hedgerow vegetation. The focus travels along the road length to cover ground where it ends in densely enclosing vegetation.

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS



VIEWPOINT: 3 2-3 KM WEST OF THE SITE

DATE: JAN 02 DIRECTION OF VIEW: E

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised.

Agricultural landscape elevated with native hedgerows, interrupted irregular pattern by rose planting, settlements and main lines

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

								OTHER:
SCALE	• Intimate	• Small	• Large	(•) Vast	•
ENCLOSURE:	• Tight	• Enclosed	• Open	• Exposed	•
DIVERSITY:	• Uniform	• Simple	(•) Diverse	• Complex	•
BALANCE:	• Harmonious	(•) Balanced	• Discordant	• Chaotic	•
MOVEMENT:	• Dead	(•) Calm	• Busy	• Frantic	•
TEXTURE:	• Smooth	(•) Textured	• Rough	• V rough	•
COLOUR:	• Monochrome	(•) Muted	• Colourful	• Garish	•
FORM:	• Straight	(•) Angular	• Curved	• Sinuous	•

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

•	Hamlets	(•)	Irregular fields	•	Narrow lanes	•	Ancient woods	•	Railways
•	Villages		Mixed hedges	•	Hedge banks	•	Parkland	•	Dykes
•	Commons		Field ponds	•	Bracken	•	Heathland	•	Plantations
•	Historic tiles	•	Ridge and furrow	(•)	Hedgerow oaks	(•)	Scrub	•	Regular fields
•	Fords	•	Walled fields	•	Old pollards		Rough grass	•	Thorn hedges
•	Canals			•	Straight roads	•	Meres		

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel

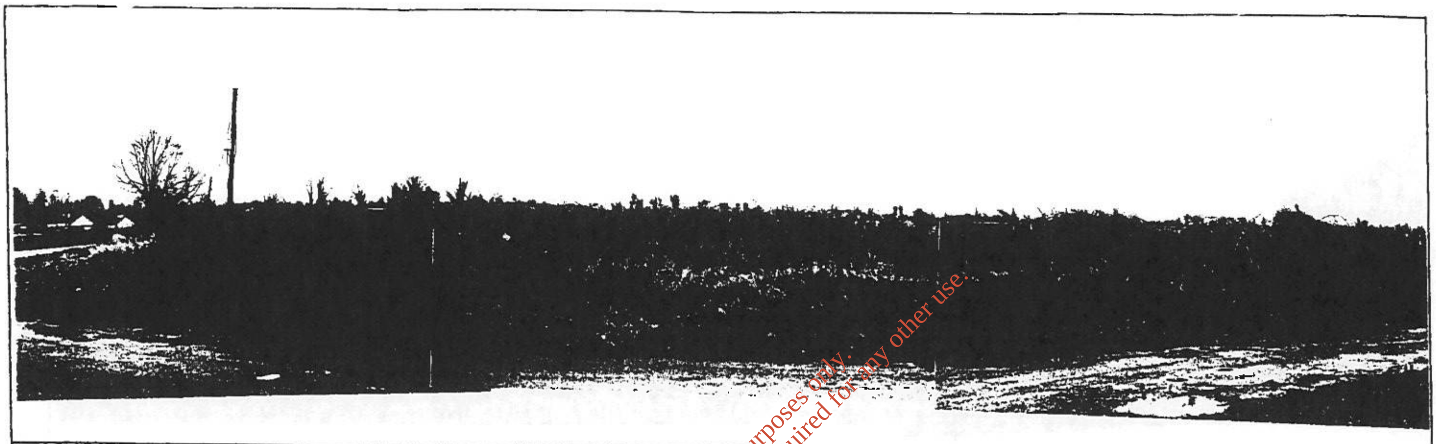
A vair across open landscape from an elevated position. More prominent level change occurs in the foreground and ground, including a steep rise to the left with visible worked elements at the top. Pylons are evident throughout - continuously breaking the skyline.

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Agriculture. 70%
Trees/hedgerows. 20%
Settlements 10%

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS



VIEWPOINT: 4 3.3 km ... [illegible] **DATE:** Jan 02 **DIRECTION OF VIEW:** NE.

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised
Generally large agricultural field pattern surrounded by mixed hedges & scattered trees.

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

Hamlets	Irregular fields	Narrow lanes	Ancient woods	Railways
Villages	Mixed hedges	Hedge banks	Parkland	Dykes
Commons	Field ponds	Bracken	Heathland	Plantations
Historic sites	Ridge and furrow	Hedgerow oaks	Scrub	Regular fields
Fords	Walled fields	Old pollards	Rough grass	Thorn hedges
Canals		Straight roads	Meres	

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Agriculture. 80%
Settlements / Structures 5%
Trees & Hedgerows 15%

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

					OTHER.
SCALE:	Intimate	Small	Large	Vast	
ENCLOSURE	Tight	Enclosed	Open	Exposed	
DIVERSITY.	Uniform	Simple	Diverse	Complex	
BALANCE:	Harmonious	Balanced	Discordant	Chaotic	
MOVEMENT.	Dead	Calm	Busy	Frantic	
TEXTURE:	Smooth	Textured	Rough	V. rough	
COLOUR:	Monochrome	Muted	Colourful	Garish	
FORM:	Straight	Angular	Curved	Sinuous	

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
View across relatively flat agricultural land toward a skyline dominated by mature trees in a studded pattern.

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT: 5 **DATE:** JAN 02 **DIRECTION OF VIEW:** NE

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised

A medium field with trees a separating gap between road edge and grazing sites. A number of trees & hedgerows cross-line both, mixed with scattered unorganised dwellings & farm buildings.

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

								OTHER
SCALE:	•	Intimate	•	Small	•	Large	•	Vast	•
ENCLOSURE:	•	Tight	•	Enclosed	•	Open	•	Exposed	•
DIVERSITY:	•	Uniform	•	Simple	•	Diverse	•	Complex	•
BALANCE:	•	Harmonious	•	Balanced	•	Discordant	•	Chaotic	•
MOVEMENT:	•	Dead	•	Calm	•	Busy	•	Frantic	•
TEXTURE:	•	Smooth	•	Textured	•	Rough	•	V rough	•
COLOUR:	•	Monochrome	•	Muted	•	Colourful	•	Garish	•
FORM:	•	Straight	•	Angular	•	Curved	•	Sinuous	•

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

•	Hamlets	•	Irregular fields	•	Narrow lanes	•	Ancient woods	•	Railways
•	Villages	•	Mixed hedges	•	Hedge banks	•	Parkland	•	Dykes
•	Commons	•	Field ponds	•	Bracken	•	Heathland	•	Plantations
•	Historic sites	•	Ridge and furrow	•	Hedgerow oaks	•	Scrub	•	Regular fields
•	Fords	•	Walled fields	•	Old pollards	•	Rough grass	•	Thorn hedges
•	Canals			•	Straight roads	•	Meres		

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel

A broadly agricultural area, over undulating landform to the mid-distance. Skyline glimpses of worked material are evident through/over hedgerows. There is no single focus, but scattered dwellings, pylons and agricultural buildings attract attention throughout.

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Agriculture	70%
Trees / hedgerows	15%
Settlements / farmbuildings	10%
Working sites	5%

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT:

DATE: **DIRECTION OF VIEW:**

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

- Hamlets
- Villages
- Commons
- Historic sites
- Ponds
- Canals
- Irregular fields
- Mixed hedges
- Field ponds
- Ridge and furrow
- Walled fields
- Narrow lanes
- Hedge banks
- Bracken
- Hedgerow oaks
- Old pollards
- Straight roads
- Ancient woods
- Parkland
- Heathland
- Scrub
- Rough grass
- Meres
- Railways
- Dykes
- Plantations
- Regular fields
- Thorn hedges

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

					OTHER:
SCALE	Intimate	Small	Large	Vast	
ENCLOSURE:	Tight	Enclosed	Open	Exposed	
DIVERSITY:	Uniform	Simple	Diverse	Complex	
BALANCE:	Harmonious	Balanced	Discordant	Chaotic	
MOVEMENT:	Dead	Calm	Busy	Frantic	
TEXTURE:	Smooth	Textured	Rough	V. rough	
COLOUR:	Monochrome	Muted	Colourful	Garish	
FORM:	Straight	Angular	Curved	Sinuous	

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL LAITTE

VIEWPOINT: 6 [illegible] **DATE:** JAN 02 **DIRECTION OF VIEW:** N/NW

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised
A cluster of dwellings visible across broadly open landscape, partially screened by tree/hedgelines and native trees on the lower ground to the right of frame.

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

• Hamlets	• Irregular fields	(•) Narrow lanes	• Ancient woods	• Railways
• Villages	• Mixed hedges	(•) Hedge banks	• Parkland	• Dykes
• Commons	• Field ponds	• Bracken	• Heathland	• Plantations
• Historic sites	• Ridge and furrow	(•) Hedgerow oaks	(•) Scrub	• Regular fields
• Fords	• Walled fields	• Old pollards	• Rough grass	• Thorn hedges
• Canals		• Straight roads	• Meres	

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Agriculture	60%
Trees & Hedgerows	30%
Settlements / man made elements	10%

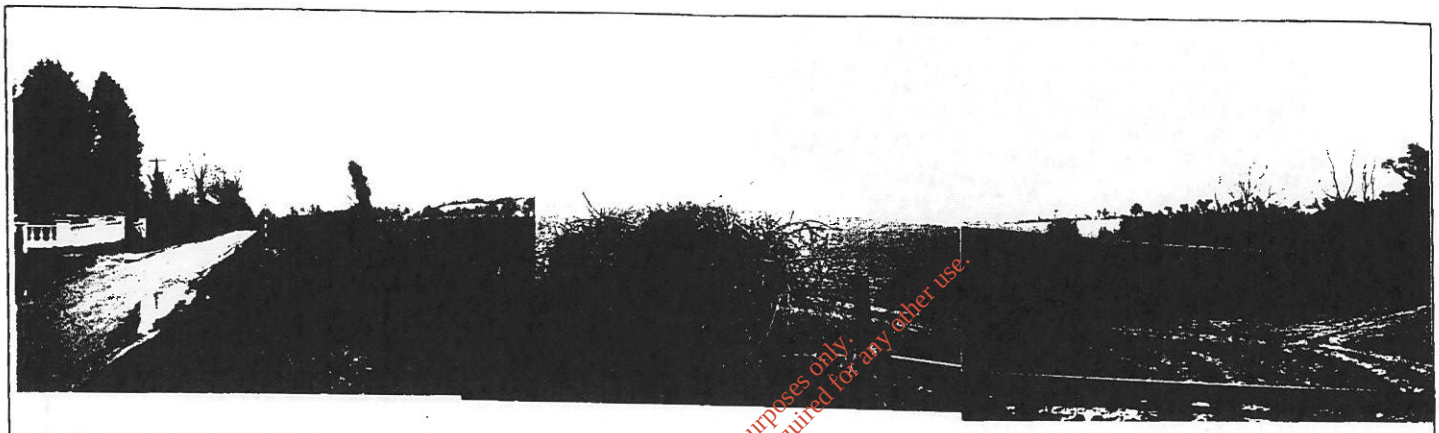
AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

								OTHER
SCALE:	•	Intimate	•	Small	(•)	Large	•	Vast	•
ENCLOSURE:	•	Tight	•	Enclosed	•	Open	•	Exposed	•
DIVERSITY:	•	Uniform	•	Simple	•	Diverse	•	Complex	•
BALANCE:	•	Harmonious	•	Balanced	•	Discordant	•	Chaotic	•
MOVEMENT:	•	Dead	•	Calm	•	Busy	•	Frantic	•
TEXTURE:	•	Smooth	•	Textured	•	Rough	•	V rough	•
COLOUR:	•	Monochrome	•	Muted	•	Colourful	•	Garish	•
FORM:	•	Straight	(•)	Angular	•	Curved	•	Sinuous	•

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
View across valley slightly interrupted with a number of dwellings throughout. Views of skylights and lights are evident but do not affect the skyline

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?
If visible roads/skylights are permanent features, they should be grassed/planted.

BRASSIL JARVIS



VIEWPOINT: 7 — **DATE:** JAN 02 — **DIRECTION OF VIEW:** E/SE

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised
Road corridor on left of view creates strong division between areas of rough pasture land and agricultural grassland to the right. In the distance the land rises, and is covered with a higher percentage of vegetation with little farm

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

• Hamlets	• Irregular fields	• Narrow lanes	• Ancient woods	• Railways
• Villages	• Mixed hedges	• Hedge banks	• Parkland	• Dykes
• Commons	• Field ponds	• Bracken	• Heathland	• Plantations
• Historic sites	• Ridge and furrow	• Hedgerow oaks	• Scrub	• Regular fields
• Fords	• Walled fields	• Old pollards	• Rough grass	• Thorn hedges
• Canals		• Straight roads	• Meres	

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?
Agriculture . 60%
Trees / hedges & planting . 35%
Settlement (dwellings) . 5%

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

							OTHER:
SCALE:	• Intimate	• Small	(•) Large	• Vast	•
ENCLOSURE	• Tight	• Enclosed	(•) Open	• Exposed	•
DIVERSITY:	• Uniform	• Simple	(•) Diverse	• Complex	•
BALANCE	• Haimonious	(•) Balanced	• Discordant	• Chaotic	•
MOVEMENT:	• Dead	(•) Calm	• Busy	• Frantic	•
TEXTURE:	• Smooth	(•) Textured	• Rough	• V rough	•
COLOUR:	• Monochrome	(•) Muted	• Colourful	• Garish	•
FORM:	• Straight	(•) Angular	• Curved	• Sinuous	•

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
A view over changing landforms, more prominent in the distance, where steeper angles and planting clusters attract the view.

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT: 8 1-2. fm NORTH OF SITE

DATE: JAN 02 **DIRECTION OF VIEW:** SOUTH.

BRIEF DESCRIPTION

describe the main elements and features of the landscape, and the way in which they are organised

Agricultural fields divided by both mature planting and post and wire fencing moving away from the viewpoint southern. A number of enclosures surround both housing and uncharacteristic landform changes in the mid-ground

AESTHETIC FACTORS CHECKLIST
indicate those factors that apply:

						OTHER:
SCALE:	Intimate	Small	**Large** (circled)	Vast		
ENCLOSURE:	Tight	**Enclosed** (circled)	Open	Exposed		
DIVERSITY:	Uniform	**Simple** (circled)	Diverse	Complex		
BALANCE:	Harmonious	**Balanced** (circled)	Discordant	Chaotic		
MOVEMENT:	Dead	**Calm** (circled)	Busy	Frantic		
TEXTURE:	Smooth	**Textured** (circled)	Rough	V. rough		
COLOUR:	Monochrome	**Muted** (circled)	Colourful	Garish		
FORM:	Straight	**Angular** (circled)	Curved	Sinuous		

HISTORICAL AND ECOLOGICAL ASSOCIATIONS

Are any of the following present ?

Hamlets	**Irregular fields** (circled)	Narrow lanes	Ancient woods	Railways
Villages	**Mixed hedges** (circled)	Hedge banks	Parkland	Dykes
Commons	Field ponds	Bracken	Heathland	Plantations
Historic sites	Ridge and furrow	**Hedgerow oaks** (circled)	Scrub	Regular fields
Fords	Walled fields	Old pollards	Rough grass	Thorn hedges
Canals		Straight roads	Meres	

AESTHETICS

Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel

A 'glimpsed' view through field entrance, across flat agricultural land enclosed by mature planting. The view is halted in the mid-ground by further vegetation where a steep landform rise becomes the central focus.

LANDSCAPE ELEMENTS

Which are the dominant elements in the landscape :

Agriculture 70%
Trees / hedges 20%
Settlement / houses 10%

GUIDELINES

What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT: 4 ~~9AM SOUTH of site~~

DATE: JAN 02 **DIRECTION OF VIEW:** N/NW

BRIEF DESCRIPTION

describe the main elements and features of the landscape, and the way in which they are organised

A series of mature trees in singular and clustered form break the landscape and form of the agricultural landscape - creating irregular fields. little organisation of landscape occurs, but a band of vegetation covers the mid-ground.

HISTORICAL AND ECOLOGICAL ASSOCIATIONS

Are any of the following present ?

Hamlets	(Irregular fields)	Narrow lanes	Ancient woods	Railways
Villages	(Mixed hedges)	(Hedge banks)	Parkland	Dykes
Commons	Field ponds	Bracken	Heathland	Plantations
Historic sites	Ridge and furrow	(Hedgerow oaks)	Scrub	Regular fields
Fords	Walled fields	Old pollards	Rough grass	Thorn hedges
Canals		Straight roads	Meres	(NHA.)

LANDSCAPE ELEMENTS

Which are the dominant elements in the landscape ?

Mature specimen trees. 35%
agricultural land. 60%
farm buildings & housing 5%

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

						OTHER
SCALE:	Intimate	(Small)	Large	Vast		
ENCLOSURE:	Tight	(Enclosed)	Open	Exposed		
DIVERSITY:	Uniform	(Simple)	Diverse	Complex		
BALANCE:	Harmonious	(Balanced)	Discordant	Chaotic		
MOVEMENT:	Dead	(Calm)	Busy	Frantic		
TEXTURE:	Smooth	(Textured)	Rough	V. rough		
COLOUR:	Monochrome	(Muted)	Colourful	Garish		
FORM:	Straight	(Angular)	Curved	Sinuous		

AESTHETICS

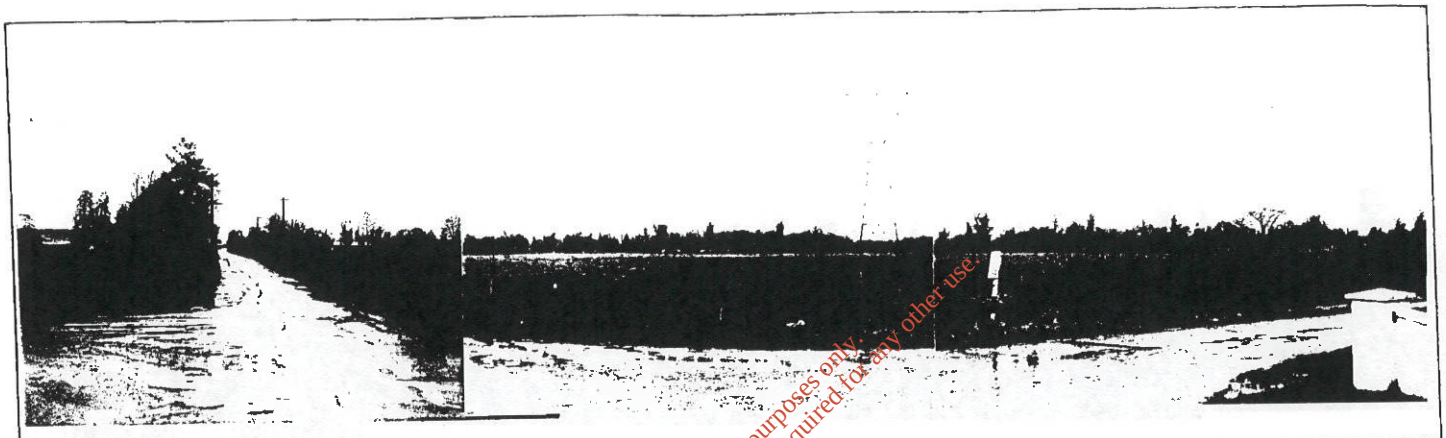
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel

An elevated view looking toward a heavy line of planting in the lower mid-ground. The skyline rises in the distance but remains below the tree top height. Slight views of buildings are evident, but the mature trees attract more focus within the view.

GUIDELINES

What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS



VIEWPOINT: 10. 2.5 KM NEXT NORTH NE3 ON SITE **DATE:** JAN 01 **DIRECTION OF VIEW:** W/SW

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised

Agricultural fields enclosed by hedgerows & mature trees, dividing [illegible] in a broadly geometric way. Lines run roughly at 90° to each other and are interrupted by a overhead power line - running diagonally to this foreground.

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

• Hamlets	(•) Irregular field	• Narrow lanes	• Ancient woods	• Railways
• Villages	(•) Mixed hedges	• Hedge banks	• Parkland	• Dykes
• Commons	• Field ponds	• Bracken	• Heathland	• Plantations
• Historic sites	• Ridge and furrow	(•) Hedgerow oaks	• Scrub	• Regular fields
• Fords	• Walled fields	• Old pollards	• Rough grass	• Thorn hedges
• Canals		• Straight roads	• Meres	

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Agriculture.
Settlement/farm buildings
Trees/vegetation.

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

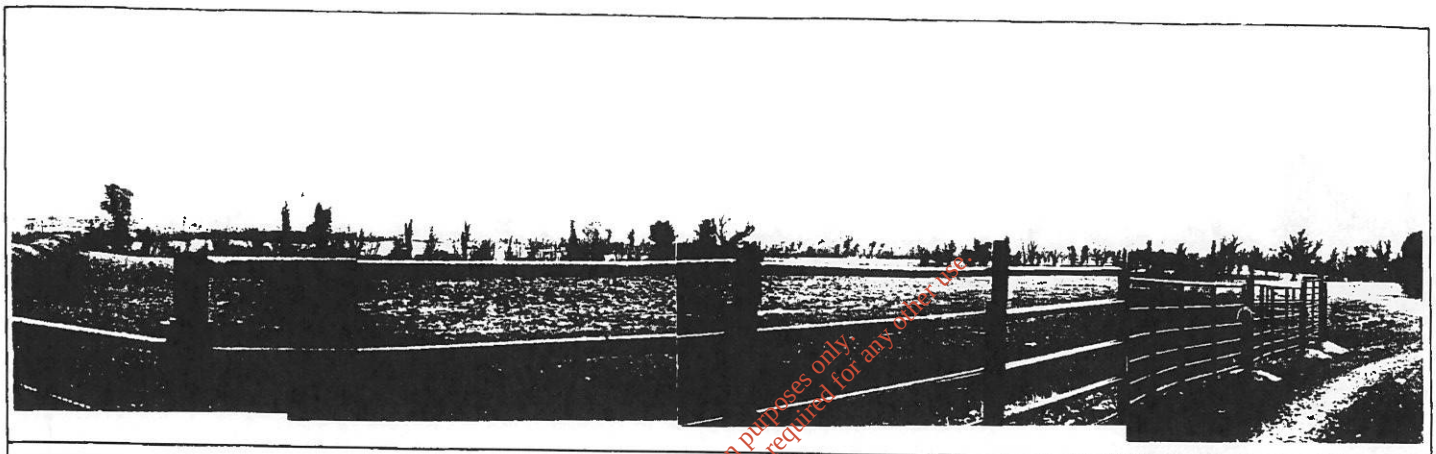
						OTHER
SCALE:	• Intimate	• Small	(•) Large	• Vast	• Exposed	•
ENCLOSURE:	• Tight	• Enclosed	(•) Open	• Exposed	• Complex	•
DIVERSITY:	• Uniform	• Simple	• Diverse	• Complex	• Chaotic	•
BALANCE:	• Harmonious	(•) Balanced	• Discordant	• Chaotic	• Frantic	•
MOVEMENT:	• Dead	• Calm	• Busy	• Frantic	• V. rough	•
TEXTURE:	• Smooth	(•) Textured	• Rough	• V. rough	• Garish	•
COLOUR:	• Monochrome	• Muted	• Colourful	• Garish	• Sinuous	•
FORM:	• Straight	(•) Angular	• Curved	• Sinuous		

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel

The view is taken from a cross roads, looking into an agricultural field. The boundaries adjoining the road are mixed hedges of little significance, on the opposite side of the field the hedges are mature, enclosing visual travel, centrally located within the field is a [illegible] which dominates within the view.

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS



VIEWPOINT: 1 — 1 KM EAST OF SITE

DATE: JAN 61 **DIRECTION OF VIEW:** W.

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised

Wide river corridor - wide & long meandering landscape to an agricultural region with straight lines of trees & hedgerows. Skyline buildings in left look down upon flatter lands of little variation.

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

• Hamlets	• Irregular fields	• Narrow lanes	• Ancient woods	• Railways
• Villages	• Mixed hedges	• Hedge banks	• Parkland	• Dykes
• Commons	• Field ponds	• Bracken	• Heathland	• Plantations
• Historic sites	• Ridge and furrow	• Hedgerow oaks	• Scrub	• Regular tks. +
• Fords	• Walled fields	• Old pollards	• Rough grass	• Thorn hedges
• Canals		• Straight roads	• Meret	

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Agricultural Grassland. 70%
Trees / vegetative cover. 25%
Houses / buildings. 5%

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

									OTHER
SCALE:	•	Intimate	•	Small	(•)	Large	•	Vast	•
ENCLOSURE	•	Tight	•	Enclosed	(•)	Open	•	Exposed	•
DIVERSITY:	•	Uniform	•	Simple	(•)	Diverse	•	Complex	•
BALANCE:	•	Harmonious	(•)	Balanced	•	Discordant	•	Chaotic	•
MOVEMENT:	•	Dead	(•)	Calm	•	Busy	•	Frantic	•
TEXTURE:	•	Smooth	(•)	Textured	•	Rough	•	V. rough	•
COLOUR:	•	Monochrome	(•)	Muted	•	Colourful	•	Garish	•
FORM:	•	Straight	(•)	Angular	•	Curved	•	Sinuous	•

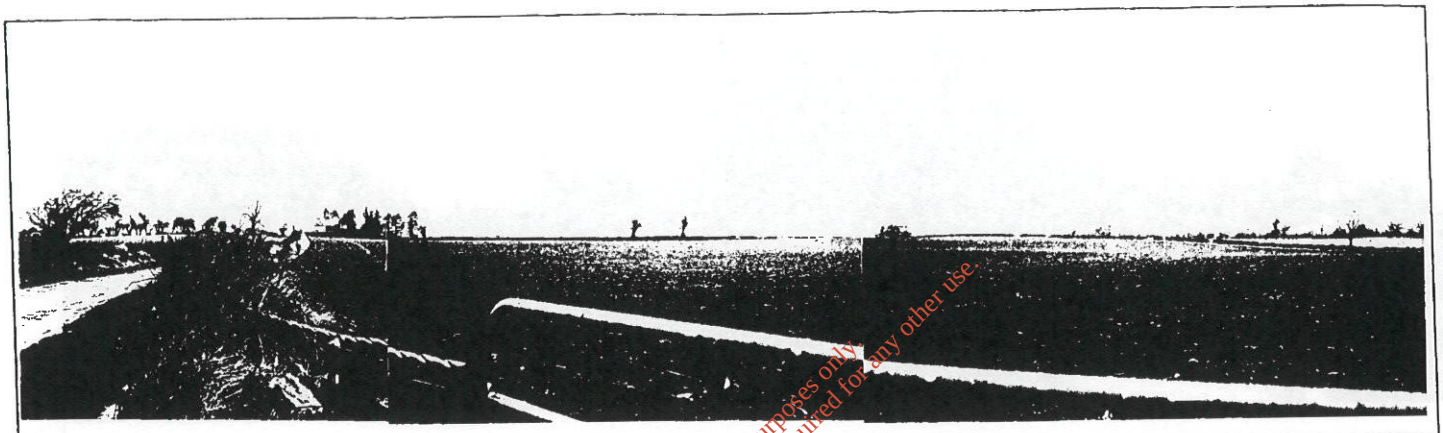
AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel

A view across relatively flat agricultural grassland, which begins to rise in the distance. Pylons dominate the skyline but are partially screened in the mid-ground by mature planting. Skyline buildings to the left of the view provide a focus in an otherwise simple landscape.

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

screening buildings on skyline

BRASSIL JARVIS



VIEWPOINT: 12. 2 KM SOUTH EAST OF SITE **DATE:** JAN 02 **DIRECTION OF VIEW:** NW

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised
large agricultural field pattern, broadly perpendicular/parallel with a road to the left of view. A cluster of trees surrounding a single dwelling are located adjacent the road left of mid.

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

								OTHER:
SCALE:	•	Intimate	•	Small	•	Large	(•)	Vast
ENCLOSURE:	•	Tight	•	Enclosed	•	Open	(•)	Exposed
DIVERSITY:	•	Uniform	(•)	Simple	•	Diverse	•	Complex
BALANCE:	•	Harmonious	(•)	Balanced	•	Discordant	•	Chaotic
MOVEMENT:	•	Dead	(•)	Calm	•	Busy	•	Frantic
TEXTURE	•	Smooth	(•)	Textured	•	Rough	•	V. rough
COLOUR:	•	Monochrome	(•)	Muted	•	Colourful	•	Garish
FORM:	•	Straight	(•)	Angular	•	Curved	•	Sinuous

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

•	Hamlets	(•)	Irregular fields	•	Narrow lanes	•	Ancient woods	•	Railways
•	Villages	(•)	Mixed hedges	(•)	Hedge banks	•	Parkland	•	Dykes
•	Commons	•	Field ponds	•	Bracken	•	Heathland	•	Plantations
•	Historic sites	•	Ridge and furrow	•	Hedgerow oaks	(•)	Scrub	•	Regular fields
•	Fords	•	Walled fields	•	Old pollards	•	Rough grass	•	Thorn hedges
•	Canals			•	Straight roads	•	Meres		

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
A view from an elevated location across flat agricultural land, a broadly uninterrupted skyline, imparted in vicinity by single dwelling and enclosing trees within fine pass of the view.

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?
Agriculture 85%
Trees/planting 10%
Settlements 5%

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT: 13 [illegible]

DATE: JAN 02 DIRECTION OF VIEW: E/SE

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised
Agricultural land and vegetation belts appear in uniformly [illegible] to the left of the road, while strong boundary planting to the right of the site boundary limits views.

AESTHETIC FACTORS CHECKLIST indicate those factors that apply

								OTHER
SCALE:	•	Intimate	•	Small	•	Large	•	Vast	•
ENCLOSURE:	•	Tight	•	Enclosed	•	Open	•	Exposed	•
DIVERSITY:	•	Uniform	•	Simple	•	Diverse	•	Complex	•
BALANCE:	•	Harmonious	•	Balanced	•	Discordant	•	Chaotic	•
MOVEMENT:	•	Dead	•	Calm	•	Busy	•	Frantic	•
TEXTURE:	•	Smooth	•	Textured	•	Rough	•	V. rough	•
COLOUR:	•	Monochrome	•	Muted	•	Colourful	•	Garish	•
FORM:	•	Straight	•	Angular	•	Curved	•	Sinuous	•

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

•	Hamlets	•	Irregular fields	•	Narrow lanes	•	Ancient woods	•	Railways
•	Villages	•	Mixed hedges	•	Hedge banks	•	Parkland	•	Dykes
•	Commons	•	Field ponds	•	Bracken	•	Heathland	•	Plantations
•	Historic sites	•	Ridge and furrow	•	Hedgerow oaks	•	Scrub	•	Regular fields
•	Fords	•	Walled fields	•	Old pollards	•	Rough grass	•	Thorn hedges
•	Canals			•	Straight roads	•	Meres		

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
A split view divided by a narrow road corridor - to the south/right (the site) is enclosed by mature hedgerow vegetation. To the north/left topographic change creates vast views across broadly flat agricultural land with a high percentage of vegetation. A number of settlements & pylons are scattered throughout

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Agricultural land/grass land	50%
Trees/hedgerows	15%
Settlement/man-made elements	5%

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT: 1

DATE:

DIRECTION OF VIEW:

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

					OTHER:
SCALE:	• Intimate	• Small	• Large	• Vast	•
ENCLOSURE:	• Tight	• Enclosed	• Open	• Exposed	•
DIVERSITY:	• Uniform	• Simple	• Diverse	• Complex	•
BALANCE:	• Harmonious	• Balanced	• Discordant	• Chaotic	•
MOVEMENT:	• Dead	• Calm	• Busy	• Frantic	•
TEXTURE:	• Smooth	• Textured	• Rough	• V. rough	•
COLOUR	• Monochrome	• Muted	• Colourful	• Garish	•
FORM:	• Straight	• Angular	• Curved	• Sinuous	•

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

• Hamlets	• Irregular fields	• Narrow lanes	• Ancient woods	• Railways
• Villages	• Mixed hedges	• Hedge banks	• Parkland	• Dykes
• Commons	• Field ponds	• Bracken	• Heathland	• Plantations
• Historic sites	• Ridge and furrow	• Hedgerow oaks	• Scrub	• Regular fields
• Fords	• Walled fields	• Old pollards	• Rough grass	• Thorn hedges
• Canals		• Straight roads	• Meres	

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT: 1A. IN FIELD OF MECHANICAL HSE (NORTH OF SITE)

DATE: AUG 18 DIRECTION OF VIEW: SOUTH

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised.
3 prong road division divides an area of land dominated by non-native development, and an area of grassland which rises to the west

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

									OTHER
SCALE:	•	Intimate	(•)	Small	•	Large	•	Vast	•
ENCLOSURE:	(•)	Tight	•	Enclosed	•	Open	•	Exposed	•
DIVERSITY:	•	Uniform	•	Simple	•	Diverse	•	Complex	•
BALANCE:	•	Harmonious	•	Balanced	•	Discordant	•	Chaotic	•
MOVEMENT:	•	Dead	•	Calm	•	Busy	•	Frantic	•
TEXTURE	•	Smooth	•	Textured	•	Rough	•	V. rough	•
COLOUR:	•	Monochrome	•	Muted	•	Colourful	•	Garish	•
FORM:	•	Straight	•	Angular	•	Curved	•	Sinuous	•

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

• Hamlets	(•) Irregular fields	• Narrow lanes	• Ancient woods	• Railways	
• Villages	• Mixed hedges	• Hedge banks	• Parkland	• Dykes	
• Commons	• Field ponds	• Bracken	• Heathland	• Plantations	
• Historic sites	• Ridge and furrow	• Hedgerow oaks	• Scrub	• Regular fields	
• Fords	• Walled fields	• Old pollards	• Rough grass	• Thorn hedges	
• Canals		• Straight roads	• Meres		

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
A view, restricted by mature hedgerow, topographic change allows views to settlements which due to their location draw the visual focus.

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?
Agriculture / grassland 60%
Trees / hedgerows 20%
Settlements / roads 20%

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT: **DATE:** **DIRECTION OF VIEW:**

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

					OTHER.
SCALE:	Intimate	Small	Large	Vast	
ENCLOSURE:	Tight	Enclosed	Open	Exposed	
DIVERSITY:	Uniform	Simple	Diverse	Complex	
BALANCE:	Harmonious	Balanced	Discordant	Chaotic	
MOVEMENT:	Dead	Calm	Busy	Frantic	
TEXTURE:	Smooth	Textured	Rough	V. rough	
COLOUR:	Monochrome	Muted	Colourful	Garish	
FORM:	Straight	Angular	Curved	Sinuous	

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

- Hamlets
- Villages
- Commons
- Historic sites
- Fords
- Canals
- Irregular fields
- Mixed hedges
- Field ponds
- Ridge and furrow
- Walled fields
- Narrow lanes
- Hedge banks
- Bracken
- Hedgerow oaks
- Old pollards
- Straight roads
- Ancient woods
- Parkland
- Heathland
- Scrub
- Rough grass
- Meres
- Railways
- Dykes
- Plantations
- Regular fields
- Thorn hedges

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel .

LANDSCAPE ELEMENTS
Which are the dorninant elements in the landscape ?

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

VIEWPOINT: 15. ST MINDY'S NORTH EAST OF SITE **DATE:** JAN 02 **DIRECTION OF VIEW:** SW

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised
Dwelling sites border the view to the left and right, between which the road corridor runs towards the site and forms in the centre of the view.

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

						OTHER
SCALE:	• Intimate	• Small	• Large	• Vast	•	
ENCLOSURE:	• Tight	• Enclosed	• Open	• Exposed	•	
DIVERSITY:	• Uniform	• Simple	• Diverse	• Complex	•	
BALANCE:	• Harmonious	• Balanced	• Discordant	• Chaotic	•	
MOVEMENT:	• Dead	• Calm	• Busy	• Frantic	•	
TEXTURE:	• Smooth	• Textured	• Rough	• V. rough	•	
COLOUR:	• Monochrome	• Muted	• Colourful	• Garish	•	
FORM:	• Straight	• Angular	• Curved	• Sinuous	•	

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

• Hamlets	• Irregular fields	• Narrow lanes	• Ancient woods	• Railways
• Villages	• Mixed hedges	• Hedge banks	• Parkland	• Dykes
• Commons	• Field ponds	• Bracken	• Heathland	• Plantations
• Historic sites	• Ridge and furrow	• Hedgerow oaks	• Scrub	• Regular fields
• Forest	• Walled fields	• Old pollards	• Rough grass	• Thorn hedges
• Canals		• Straight roads	• Marshes	

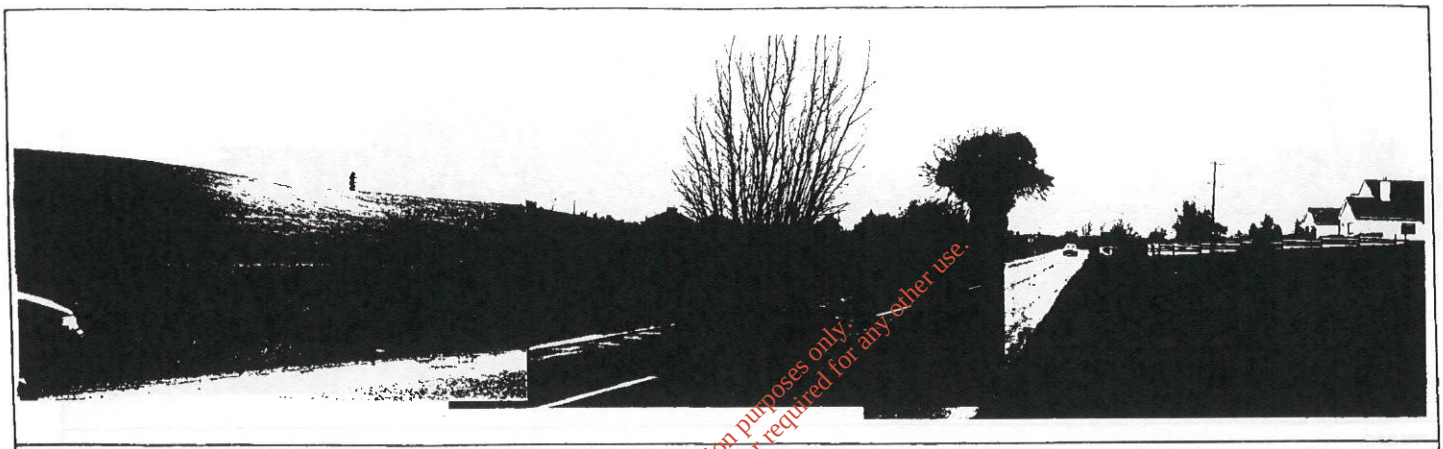
AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
A view along a road lengthen enclosed by settlement plots, to the centre of the view the road divides and is enclosed by rural agricultural land of simple nature. The junction forms the focus of the view.

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

Agricultural Grassland	50%
Settlements/roads etc	30%
Trees/hedgerows	20%

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?
Hedge planting to replace fencing.

BRASSIL JARVIS



VIEWPOINT: 16 **DATE:** JAN 02 **DIRECTION OF VIEW:** WEST.

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised
Strong rod corridor bound by broken hedgerows - through which cultivated agricultural grassland is clearly visible. Some field direction occurs by small hedgerows running perpendicular to the road corridor.

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

					OTHER:
SCALE:	• Intimate	(•) Small	• Large	• Vast	•
ENCLOSURE:	• Tight	• Enclosed	(•) Open	• Exposed	•
DIVERSITY:	• Uniform	(•) Simple	• Diverse	• Complex	•
BALANCE:	• Harmonious	(•) Balanced	• Discordant	• Chaotic	•
MOVEMENT:	• Dead	(•) Calm	• Busy	• Frantic	•
TEXTURE:	• Smooth	(•) Textured	• Rough	• V rough	•
COLOUR:	• Monochrome	(•) Muted	• Colourful	• Garish	•
FORM:	• Straight	• Angular	(•) Curved	• Sinuous	•

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

• Hamlets	(•) Irregular fields	• Narrow lanes	• Ancient woods	• Railways
• Villages	(•) Mixed hedges	• Hedge banks	• Parkland	• Dykes
• Commons	(•) Field ponds	• Bracken	• Pavement	• Plantations
(•) Historic sites	• Ridge and furrow	(•) Hedgerow oaks	• Scrub	• Regular fields
• Fords	• Walled fields	• Old pollards	(•) Rough grass	• Thorn hedges
• Canals		• Straight roads	• Meres	

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
A view through a broken hedgerow to rising agricultural land which dominates the skyline.

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?
AGRICULTURAL GRASSLAND. 70 %
ROADS & SETTLEMENT 15 %
TREES & HEDGEROWS. 15 %

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?
Create stronger hedge line form.

BRASSIL JARVIS

VIEWPOINT: 1 .

DATE: **DIRECTION OF VIEW:**

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised.

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

										OTHER:
SCALE:	•	Intimate	•	Small	•	Large	•	Vast	•	
ENCLOSURE:	•	Tight	•	Enclosed	•	Open	•	Exposed	•	
DIVERSITY:	•	Uniform	•	Simple	•	Diverse	•	Complex	•	
BALANCE:	•	Harmonious	•	Balanced	•	Discordant	•	Chaotic	•	
MOVEMENT:	•	Dead	•	Calm	•	Busy	•	Frantic	•	
TEXTURE:	•	Smooth	•	Textured	•	Rough	•	V. rough	•	
COLOUR:	•	Monochrome	•	Muted	•	Colourful	•	Garish	•	
FORM:	•	Straight	•	Angular	•	Curved	•	Sinuous	•	

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

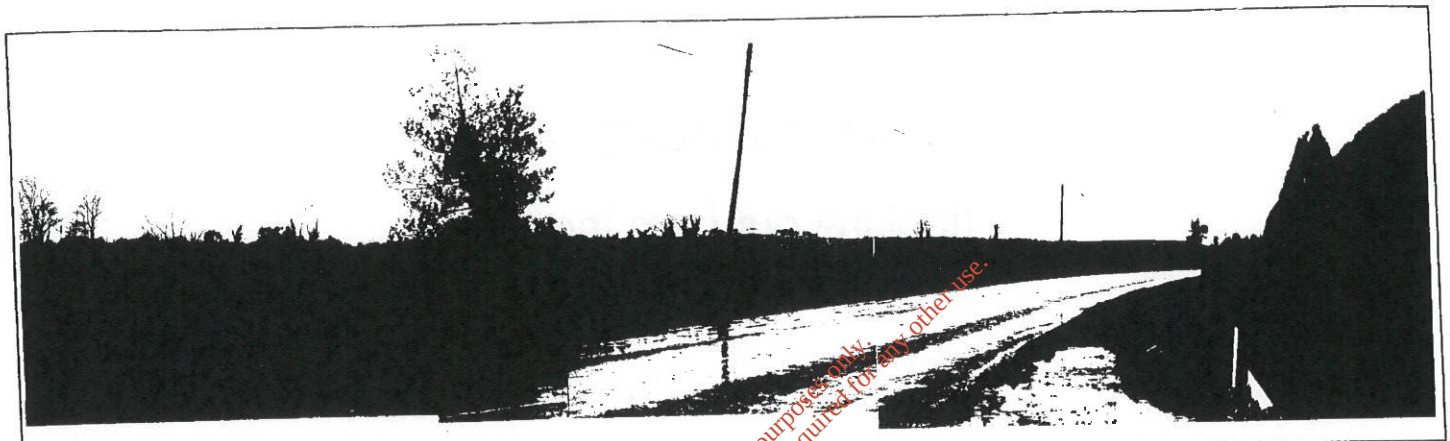
• Hamlets	• Irregular fields	• Narrow lanes	• Ancient woods	• Railways
• Villages	• Mixed hedges	• Hedge banks	• Parkland	• Dykes
• Commons	• Field ponds	• Bracken	• Heathland	• Plantations
• Historic sites	• Ridge and furrow	• Hedgerow oaks	• Scrub	• Regular fields
• Fords	• Walled fields	• Old pollards	• Rough grass	• Thorn hedges
• Canals		• Straight roads	• Meres	

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel .

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS



VIEWPOINT: 13 TAKEN FROM ROAD SOUTH WEST OF SITE **DATE:** JAN 02 **DIRECTION OF VIEW:** N/NW

BRIEF DESCRIPTION
describe the main elements and features of the landscape, and the way in which they are organised
Shrub planting runs across the landscape almost parallel with a road running enclosing undulating agricultural grassland. Scattered pylons and vegetation can be seen throughout.

AESTHETIC FACTORS CHECKLIST indicate those factors that apply:

						OTHER:
SCALE:	Intimate	Small	(Large)	Vast		
ENCLOSURE:	Tight	Enclosed	Open	Exposed		
DIVERSITY:	Uniform	Simple	Diverse	Complex		
BALANCE:	Harmonious	Balanced	Discordant	Chaotic		
MOVEMENT:	Dead	Calm	Busy	Frantic		
TEXTURE:	Smooth	Textured	Rough	V. rough		
COLOUR:	Monochrome	Muted	Colourful	Garish		
FORM:	Straight	Angular	Curved	Sinuous		

HISTORICAL AND ECOLOGICAL ASSOCIATIONS
Are any of the following present ?

Hamlets	(Irregular fields)	Narrow lanes	Ancient woods	Railways
Villages	(Mixed hedges)	Hedge banks	Parkland	Dykes
Commons	Field ponds	Bracken	Heathland	Plantations
Historic sites	Ridge and furrow	Hedgerow oaks	Scrub	Regular fields
Fords	Walled fields	Old pollards	Rough grass	Thorn hedges
Canals		Straight roads	Meres	

AESTHETICS
Describe the above, including any other special aesthetic factors, attractors, detractors, genius loci and visual travel
View across agricultural land which remains relatively constant on the skyline, strong vertical lines interrupt this form - Pylons, over head lines and a number of scattered native trees. There is no single focus to the view.

LANDSCAPE ELEMENTS
Which are the dominant elements in the landscape ?
Agricultural grassland 70%
Trees & Hedgerows 20%
Roads & settlement 10%

GUIDELINES
What measures might be appropriate to strengthen or improve the landscape character of the area ?

BRASSIL JARVIS

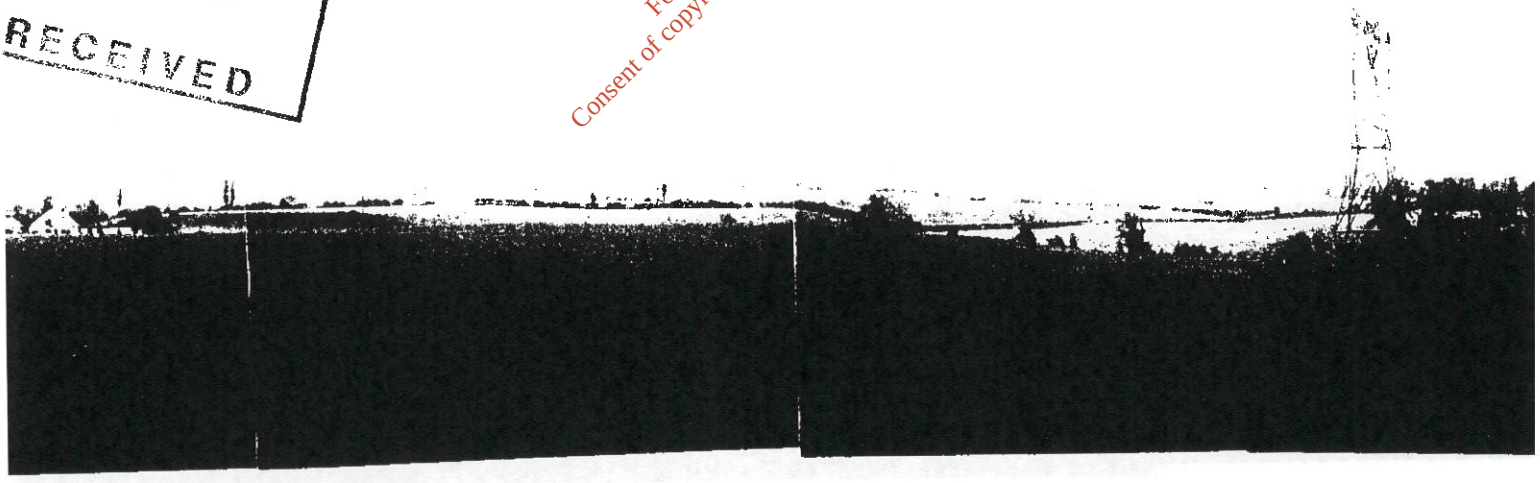
APPENDIX 9. 2

Site Photography

(looking out from the site)

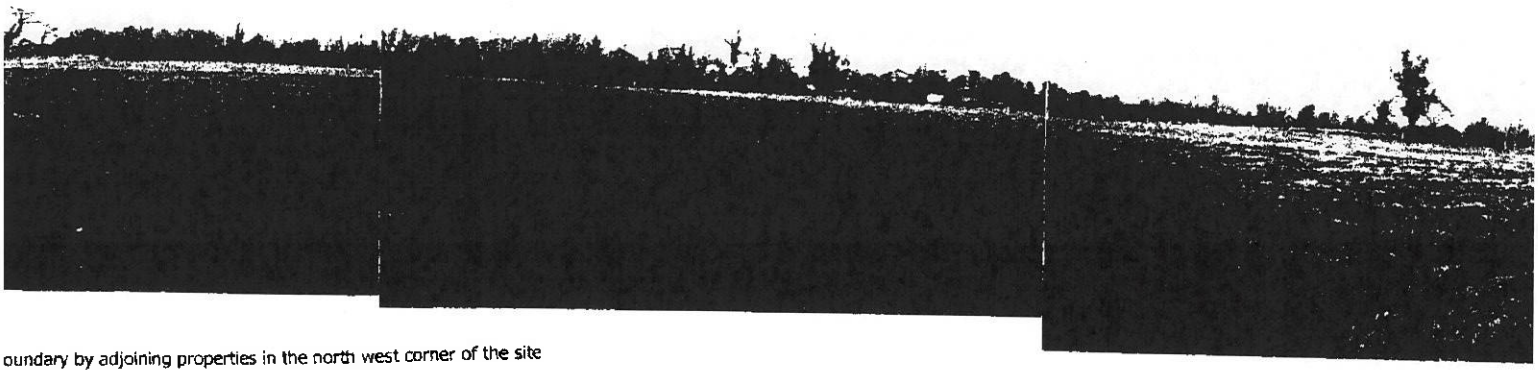
Brassil Jarvis & Co. Ltd.

ıdary of the eastern field



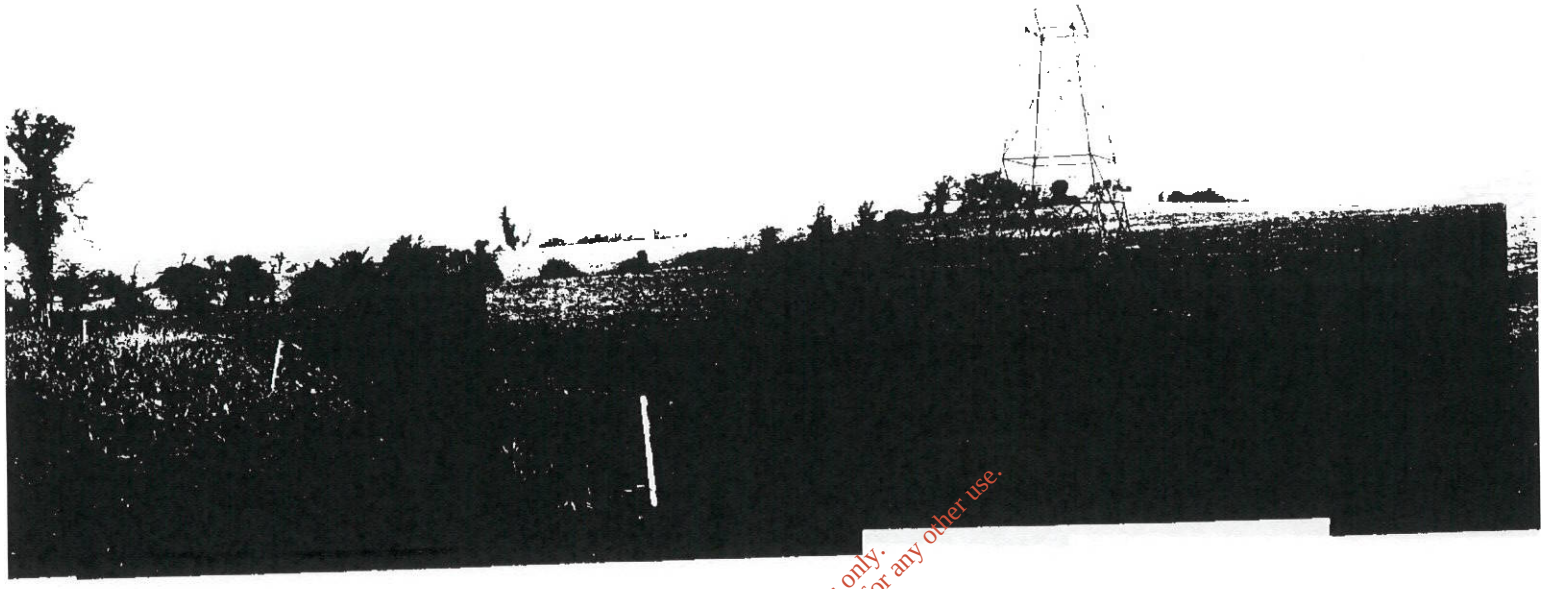
ı boundary, and proposed access point

ıe western field



oundary by adjoining properties in the north west corner of the site

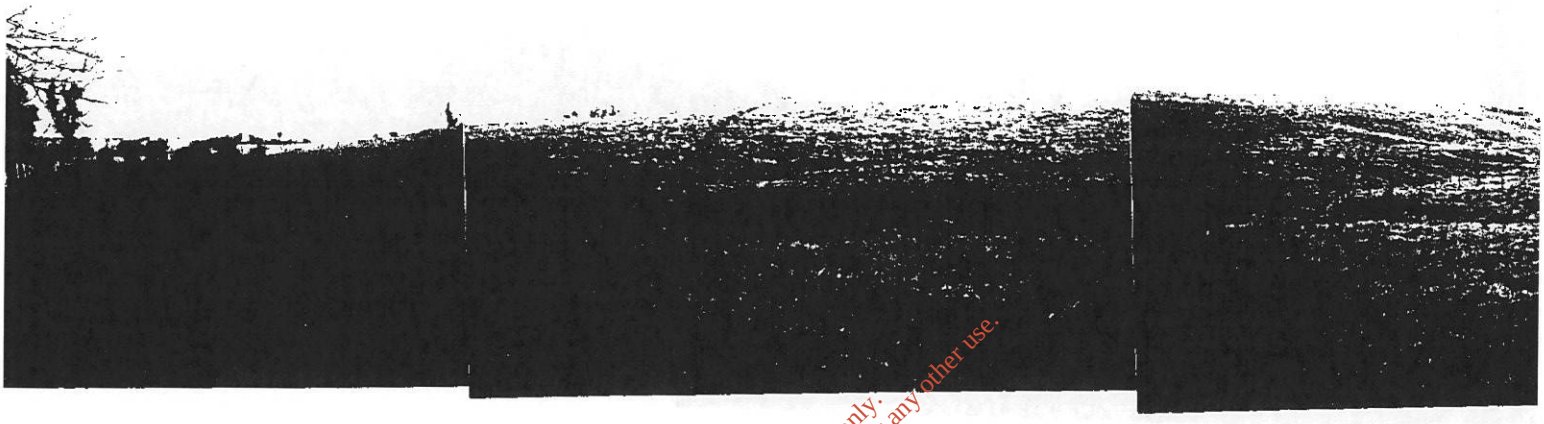
INT



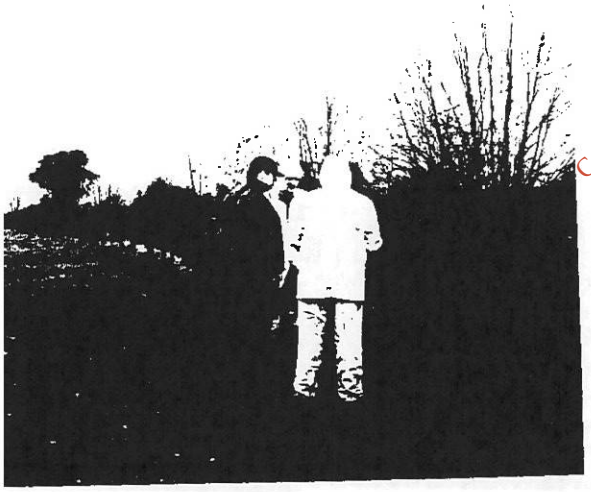
n field looking west

tern field looking north, north east

I



nt looking along the southern boundary



ıg northward along the eastern field boundary and stream

INTE

APPENDIX 11.1

PICADY OUTPUTS

Faber Maunsell Consulting Engineers

TRANSPORT RESEARCH LABORATORY

CAPACITIES, QUEUES, AND DELAYS AT 3 OR 4-ARM MAJOR/MINOR PRIORITY JUNCTIONS

Visual PICADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (DEC 1998)

ADAPTED FROM PICADY/3 WHICH IS CROWN COPYRIGHT
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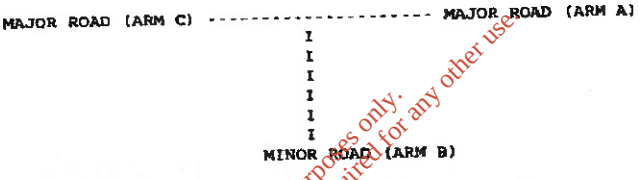
Run with file:- "C:\TRAFFIC PROGRAMS\PICADY4\2008.vpi" at 17:32:04 on Wednesday, 12 June 2002

RUN TITLE
****
2008 Peak Site Entrance Junction

.MAJOR/MINOR JUNCTION CAPACITY AND DELAY
****

INPUT DATA



ARM A IS To Edenderry
ARM B IS To N4
ARM C IS To Site

STREAM LABELLING CONVENTION

STREAM A-B CONTAINS TRAFFIC GOING FROM ARM A TO ARM B

STREAM B-AC CONTAINS TRAFFIC GOING FROM ARM B TO ARM A AND TO ARM C

ETC.

.GEOMETRIC DATA

DATA ITEM		MINOR ROAD B	
TOTAL MAJOR ROAD CARRIAGEWAY WIDTH	(W)	6.00 M.	
CENTRAL RESERVE WIDTH	(WCR)	0.00 M.	
MAJOR ROAD RIGHT TURN - WIDTH	(WC-B)	2.20 M.	
- VISIBILITY	(VC-B)	100.0 M.	
- BLOCKS TRAFFIC		YES	
MINOR ROAD - VISIBILITY TO LEFT	(VB-C)	215.0 M.	
- VISIBILITY TO RIGHT	(VB-A)	215.0 M.	
- LANE 1 WIDTH	(WB-C)	3.50 M.	
- LANE 2 WIDTH	(WB-A)	0.00 M.	
- LENGTH OF FLARED SECTION		1 VEHS	

.TRAFFIC DEMAND DATA

TIME PERIOD BEGINS 07.45 AND ENDS 09.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	TOP OF PEAK IS REACHED	FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ARM A	15.00	45.00	75.00	1.71	2.57	1.71
ARM B	15.00	45.00	75.00	1.46	2.19	1.46
ARM C	15.00	45.00	75.00	0.13	0.19	0.13

TIME	TURNING PROPORTIONS / TURNING COUNTS (VEH/HR) / (PERCENTAGE OF H.V.S) FROM/TO	ARM A	ARM B	ARM C
07.45 - 09.15	ARM A	0.000 0.0 (0.0)	0.964 132.0 (7.0)	0.036 5.0 (86.0)
	ARM B	0.957 112.0 (7.0)	0.000 0.0 (0.0)	0.043 5.0 (86.0)
	ARM C	0.500 5.0 (86.0)	0.500 5.0 (86.0)	0.000 0.0 (0.0)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA

THE PERCENTAGE OF HEAVY VEHICLES VARIES OVER TURNING MOVEMENTS

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-08.00								
B-AC	1.46	10.32	0.142		0.0	0.2	2.4	
C-AB	0.06	5.46	0.012		0.0	0.0	0.2	
C-A	0.06							
A-B	1.65							
A-C	0.06							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.00-08.15								
B-AC	1.75	10.26	0.170		0.2	0.2	3.0	
C-AB	0.08	5.42	0.014		0.0	0.0	0.2	
C-A	0.07							
A-B	1.97							
A-C	0.07							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.15-08.30								
B-AC	2.14	10.18	0.210		0.2	0.3	3.9	
C-AB	0.09	5.36	0.017		0.0	0.0	0.3	

	C-A	0.09							
	A-B	2.41							
	A-C	0.09							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.30-08.45								
B-AC	2.14	10.18	0.210		0.3	0.3	4.0	
C-AB	0.09	5.36	0.017		0.0	0.0	0.3	
C-A	0.09							
A-B	2.41							
A-C	0.09							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.45-09.00								
B-AC	1.75	10.26	0.170		0.3	0.2	3.2	
C-AB	0.08	5.42	0.014		0.0	0.0	0.2	
C-A	0.07							
A-B	1.97							
A-C	0.07							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
09.00-09.15								
B-AC	1.46	10.32	0.142		0.2	0.2	2.6	
C-AB	0.06	5.46	0.012		0.0	0.0	0.2	
C-A	0.06							
A-B	1.65							
A-C	0.06							

WARNING NO MARGINAL ANALYSIS OF CAPACITIES AS MAJOR ROAD BLOCKING MAY OCCUR

QUEUE FOR STREAM B-AC

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.2
08.15	0.2
08.30	0.3
08.45	0.3
09.00	0.2
09.15	0.2

QUEUE FOR STREAM C-AB

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.0
08.45	0.0
09.00	0.0
09.15	0.0

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

STREAM	TOTAL DEMAND		* QUEUEING * DELAY *		* INCLUSIVE QUEUEING * DELAY *	
	(VEH)	(VEH/H)	(MIN)	(MIN/VEH)	(MIN)	(MIN/VEH)
B-AC	160.4	107.0	18.9	0.12	18.9	0.12

C-AB	7.0	4.6	1.3	0.19	1.3	0.19			
C-A	6.8	4.5							
A-B	181.6	120.7							
A-C	6.9	4.6							
ALL	362.0	241.3	20.3	0.06	20.3	0.06			

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD .
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.

END OF JOB

========== end of file ==========

TRANSPORT RESEARCH LABORATORY

CAPACITIES, QUEUES, AND DELAYS AT 3 OR 4-ARM MAJOR/MINOR PRIORITY JUNCTIONS

Visual PICADY 4 ANALYSIS PROGRAM
RELEASE 2.1 (DEC 1998)

Run with file:- "C:\TRAFFIC PROGRAMS\PICADY4\2008.vpi" at 17:32:04 on Wednesday, 12 June 2002

RUN TITLE
2008 Peak Site Entrance Junction

.MAJOR/MINOR JUNCTION CAPACITY AND DELAY

INPUT DATA

MAJOR ROAD (ARM C) ---------- MAJOR ROAD (ARM A)
I
I
I
I
I
I
MINOR ROAD (ARM B)

ARM A IS To Edenderry
ARM B IS To M4
ARM C IS To Site

STREAM LABELLING CONVENTION

STREAM A-B CONTAINS TRAFFIC GOING FROM ARM A TO ARM B

STREAM B-AC CONTAINS TRAFFIC GOING FROM ARM B TO ARM A AND TO ARM C

ETC.

.GEOMETRIC DATA

DATA ITEM		MINOR ROAD B
TOTAL MAJOR ROAD CARRIAGEWAY WIDTH	(W)	6.00 M.
CENTRAL RESERVE WIDTH	(WCR)	0.00 M.
MAJOR ROAD RIGHT TURN - WIDTH	(WC-B)	2.20 M.
- VISIBILITY	(VC-B)	100.0 M.
- BLOCKS TRAFFIC		YES
MINOR ROAD - VISIBILITY TO LEFT	(VB-C)	215.0 M.
- VISIBILITY TO RIGHT	(VB-A)	215.0 M.
- LANE 1 WIDTH	(WB-C)	3.50 M.
- LANE 2 WIDTH	(WB-A)	0.00 M.
- LENGTH OF FLARED SECTION		1 VEHS

.TRAFFIC DEMAND DATA

MINOR ROAD - VISIBILITY TO LEFT	(VB-C)	40.0 M.	(VD-A)	80.0 M.		
- VISIBILITY TO RIGHT	(VB-A)	40.0 M.	(VD-C)	80.0 M.		
- LANE 1 WIDTH	(WB-C)	3.50 M.	(WD-A)	3.50 M.		
- LANE 2 WIDTH	(WB-A)	0.00 M.	(WD-C)	0.00 M.		
- LENGTH OF FLARED SECTION		1 VEHS		1 VEHS		

.TRAFFIC DEMAND DATA

TIME PERIOD BEGINS 07.45 AND ENDS 09.15

LENGTH OF TIME PERIOD - 90 MINUTES.
LENGTH OF TIME SEGMENT - 15 MINUTES.

DEMAND FLOW PROFILES ARE SYNTHESISED FROM TURNING COUNT DATA

ARM	NUMBER OF MINUTES FROM START WHEN FLOW STARTS TO RISE	TOP OF PEAK IS REACHED	FLOW STOPS FALLING	RATE OF FLOW (VEH/MIN) BEFORE PEAK	AT TOP OF PEAK	AFTER PEAK
ARM A	15.00	45.00	75.00	1.64	2.46	1.64
ARM B	15.00	45.00	75.00	0.28	0.41	0.28
ARM C	15.00	45.00	75.00	1.39	2.08	1.39
ARM D	15.00	45.00	75.00	0.46	0.69	0.46

TIME	TURNING PROPORTIONS / TURNING COUNTS (VEH/HR) / (PERCENTAGE OF H.V.S)				
	FROM/TO	ARM A	ARM B	ARM C	ARM D
07.45 - 09.15	ARM A	0.000	0.023	0.855	0.122
		0.0	3.0	112.0	16.0
		(0.0)	(0.0)	(5.0)	(14.0)
	ARM B	0.136	0.000	0.545	0.318
		7.0	0.0	12.0	7.0
		(0.0)	(0.0)	(20.0)	(0.0)
	ARM C	0.838	0.072	0.000	0.090
		93.0	8.0	0.0	10.0
		(14.0)	(14.0)	(0.0)	(11.0)
	ARM D	0.432	0.243	0.324	0.000
		16.0	9.0	12.0	0.0
		(0.0)	(0.0)	(0.0)	(0.0)

TURNING PROPORTIONS ARE CALCULATED FROM TURNING COUNT DATA

THE PERCENTAGE OF HEAVY VEHICLES VARIES OVER TURNING MOVEMENTS

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN) *	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
07.45-08.00								
B-ACD	0.28	8.71	0.032		0.0	0.0	0.5	
A-BCD	0.24	9.11	0.026		0.0	0.0	0.5	
A-B	0.04							
A-C	1.36							
D-ABC	0.46	9.74	0.047		0.0	0.0	0.7	
C-ABD	0.12	9.55	0.012		0.0	0.0	0.2	
C-D	0.12							
C-A	1.15							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.00-08.15								
B-ACD	0.33	8.60	0.038		0.0	0.0	0.6	
A-BCD	0.29	9.25	0.032		0.0	0.0	0.6	
A-B	0.04							
A-C	1.62							
D-ABC	0.55	9.62	0.057		0.0	0.1	0.9	
C-ABD	0.14	9.65	0.015		0.0	0.0	0.3	
C-D	0.15							
C-A	1.37							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.15-08.30								
B-ACD	0.40	8.47	0.048		0.0	0.0	0.7	
A-BCD	0.37	9.44	0.040		0.0	0.1	0.8	
A-B	0.05							
A-C	1.97							
D-ABC	0.68	9.44	0.072		0.1	0.1	1.1	
C-ABD	0.18	9.78	0.018		0.0	0.0	0.3	
C-D	0.18							
C-A	1.67							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.30-08.45								
B-ACD	0.40	8.46	0.048		0.0	0.0	0.7	
A-BCD	0.37	9.44	0.040		0.1	0.1	0.8	
A-B	0.05							
A-C	1.97							
D-ABC	0.68	9.44	0.072		0.1	0.1	1.2	
C-ABD	0.18	9.78	0.018		0.0	0.0	0.3	
C-D	0.18							
C-A	1.67							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
08.45-09.00								
B-ACD	0.33	8.60	0.038		0.0	0.0	0.6	
A-BCD	0.29	9.25	0.032		0.1	0.0	0.6	
A-B	0.04							
A-C	1.62							
D-ABC	0.55	9.62	0.057		0.1	0.1	0.9	
C-ABD	0.14	9.65	0.015		0.0	0.0	0.3	
C-D	0.15							
C-A	1.37							

TIME	DEMAND (VEH/MIN)	CAPACITY (VEH/MIN)	DEMAND/ CAPACITY (RFC)	PEDESTRIAN FLOW (PEDS/MIN)	START QUEUE (VEHS)	END QUEUE (VEHS)	DELAY (VEH.MIN/ TIME SEGMENT)	GEOMETRIC DELAY (VEH.MIN/ TIME SEGMENT)
09.00-09.15								
B-ACD	0.28	8.70	0.032		0.0	0.0	0.5	
A-BCD	0.24	9.11	0.026		0.0	0.0	0.5	
A-B	0.04							
A-C	1.36							
D-ABC	0.46	9.74	0.047		0.1	0.1	0.8	
C-ABD	0.12	9.55	0.012		0.0	0.0	0.2	
C-D	0.12							
C-A	1.15							

WARNING NO MARGINAL ANALYSIS OF CAPACITIES AS MAJOR ROAD BLOCKING MAY OCCUR

QUEUE FOR STREAM B-ACD

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.0
08.45	0.0
09.00	0.0
09.15	0.0

QUEUE FOR STREAM A-BCD

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.1
08.45	0.1
09.00	0.0
09.15	0.0

QUEUE FOR STREAM D-ABC

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.1
08.30	0.1
08.45	0.1
09.00	0.1
09.15	0.1

QUEUE FOR STREAM C-ABD

TIME SEGMENT ENDING	NO. OF VEHICLES IN QUEUE
08.00	0.0
08.15	0.0
08.30	0.0
08.45	0.0
09.00	0.0
09.15	0.0

QUEUEING DELAY INFORMATION OVER WHOLE PERIOD

STREAM	TOTAL DEMAND (VEH)	TOTAL DEMAND (VEH/H)	* QUEUEING * DELAY * (MIN)	* QUEUEING * DELAY * (MIN/VEH)	* INCLUSIVE QUEUEING * DELAY * (MIN)	* INCLUSIVE QUEUEING * DELAY * (MIN/VEH)
B-ACD	30.2	20.1	3.6	0.12	3.6	0.12
A-BCD	27.1	18.1	3.9	0.14	3.9	0.14
A-B	4.0	2.7				
A-C	148.5	99.0				
D-ABC	50.7	33.8	5.6	0.11	5.6	0.11
C-ABD	13.1	8.7	1.6	0.12	1.6	0.12
C-D	13.5	9.0				
C-A	125.6	83.7				
ALL	412.7	275.2	14.7	0.04	14.7	0.04

* DELAY IS THAT OCCURRING ONLY WITHIN THE TIME PERIOD .
* INCLUSIVE DELAY INCLUDES DELAY SUFFERED BY VEHICLES WHICH ARE STILL QUEUEING AFTER THE END OF THE TIME PERIOD.
* THESE WILL ONLY BE SIGNIFICANTLY DIFFERENT IF THERE IS A LARGE QUEUE REMAINING AT THE END OF THE TIME PERIOD.