

CAPITA

TRAFFIC IMPACT ASSESSMENT

**Project D3,
Grange Castle International
Business Park**

**Project No. CS/025713
July 2007**

TRAFFIC IMPACT ASSESSMENT

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Grange Castle International
Business Park**

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1	TIA	CMD	PC	PC	PC	13/07/07

1.0 INTRODUCTION

- 1.1 Capita Symonds Ltd was appointed by Project Management Group (PM) in June 2007 to examine the transport implications of a proposed development at Grange Castle International Business Park. This report has been prepared in support of the planning application for a proposed Data Centre.
- 1.2 The proposed scheme comprises a Data Centre to house computer systems and networking equipment on a site of 18.9 acres. A total of 80 parking spaces are being provided.
- 1.3 The scope of this Traffic Impact Assessment (TIA) was established following initial discussions with representatives of the Roads and Traffic Department of South Dublin County Council. It was agreed that due to the fact that this development would have a low traffic impact, junction capacity tests would not be necessary. Indeed, a full TIA was not deemed necessary for such a small scale development and it was stated that the transport section of the Environmental Impact Statement (EIS) would suffice.
- 1.4 Existing traffic studies, completed as part of EIS reports for sites within the Business Park were used for reference as a basis for assessing the impact of the Data Centre. The contents of this report reflect the scope agreed with the Roads and Traffic Department of South Dublin County Council and it draws upon two recent traffic studies; Chapter 12 Material Assets [Traffic] of IDA Ireland's EIS for an IC Manufacturing Facility (January 2006), and the TIA produced as Appendix G of the EIS for a New Headquarters, Production and Distribution Facility for IAWS Group (June 2006 and Feb 2007).
- 1.5 Both developments have received planning consent. These reports are included as Appendix A and B respectively.

- 1.6 The remainder of this report is divided into the following 3 sections:
- Section 2 describes the existing situation with respect to the site and the surrounding highway network. Details of proposed road and public transport improvements are discussed;
 - Section 3 provides details of the proposed development and describes access arrangements and parking provision. The level of trip generation likely to arise from the proposed development is examined. Recent traffic studies for developments within the Business Park are discussed with reference to their likely traffic impact;
 - Section 4 contains a summary and conclusion.
- 1.7 This report will demonstrate that the overall situation resulting from the proposals will be acceptable, without adverse effects on the local transport network.

2.0 EXISTING SITUATION AND PROPOSED IMPROVEMENTS

Existing situation

- 2.1 The proposed development site is located within the Grange Castle International Business Park on the western outskirts of Dublin. It covers approximately 120 hectares. The Business Park is currently accessed via two roundabouts, from the Grange Castle Road to the east and the R134 Nangor Road to the south. A third access will be constructed at the Baldonnell Road/ Nangor junction. It has been assumed that this access will be developed prior to opening year for this development. The development site is currently vacant.
- 2.2 The Business Park is occupied by Wyeth Ireland and Takeda. The IAWS Group are developing a site for a headquarters, production and distribution facility. A TIA was submitted for the IAWS site in 2006 and subsequently in February 2007. The site is currently under construction. In addition, a planning application was lodged by IDA Ireland for an integrated circuit manufacturing plant. The traffic impact of this site was also examined and the development was granted planning permission in March 2006.
- 2.3 The site lies in an area that is well served by public transport. Clondalkin rail station is approximately 3km from the site with Kishogue station directly adjacent. The site is served by a number of buses operated by Dublin Bus, namely the No. 68, No. 51B and 51C. In addition, a number of Quality Bus Corridors (QBCs) run in the vicinity of the Business Park. A QBC exists on the N81 and N4 routes. In addition, the Clondalkin QBC runs along the Nangor Road to Grange Castle with another QBC running from Belgard Road to Fonthill Road.
- 2.4 The South Dublin County Council cycle lane runs all the way to Grange Castle and there are plans to extend these lanes. The proposed Grange Castle Road and the Business Park Road network have provision for cycleways throughout.

Proposed road improvements

- 2.5 A comprehensive range of national and local road improvements are currently being implemented which will benefit the development of the Business Park. In terms of the proposed development the most significant will be a road improvement scheme for the R136 Grange Castle Road. On completion this will grant direct access from the Business Park to the N4 and N7 which link Dublin to the West and South of Ireland respectively.
- 2.6 At national level the following schemes are being completed as part of the Government Transportation Plan - Transport 21;
- M50 widening and interchange upgrades
 - N4 widening between M50 and Celbridge interchanges
 - N7 widening from Rathcoole to Naas
- 2.7 In the vicinity of Business Park, a number of road improvement schemes will be implemented by South Dublin County Council prior to, and shortly after the opening of the proposed development. These consist of the following;
- Extension of the R136 Grange Castle Road north to the N4 and south to the N81
 - Link road from R136 Grange Castle Road to the R113 Newlands/Fonthill Road
 - M50 widening and interchange upgrades
 - N4 widening between the M50 junction and the Celbridge Road junction
 - New grade separated junction at Lucan Road/Newcastle Road junction
 - N7 widening from Rathcoole junction to Maudlins junction, Naas
 - Adamstown link road from R136 Grange Castle Road to R120 Lucan Road
 - Realignment of R134 Nangor Road from Grange Castle Road to R120 Lucan/Newcastle Road

-
- Realignment of Lucan/Newcastle Road including the widening of the 12th Lock Bridge
 - Newcastle Bypass

2.8 In planning these road improvements, Arup prepared a SATURN traffic model on behalf of South Dublin County Council. This model incorporates expected traffic associated with the Business Park. The traffic model shows the Grange Castle Road will operate with spare capacity on completion.

Proposed public transport improvements

- 2.9 Existing QBC routes will be supplemented by the introduction of a bi-directional QBC which is proposed for the entire length of the R136 Outer Ring Road. In addition, other QBCs are planned for Belgard Road to Fonthill Road Orbital, Naas Road, South Clondalkin, Citywest N82 and M50.
- 2.10 In terms of rail, the two Dublin – Cork lines which currently run to the north of the Business Park are being upgraded to four lines. A new station is planned for both Adamstown and Kishogue, which will directly serve Grange Castle.
- 2.11 These public transport improvements will greatly improve the accessibility of the Business Park by non car modes and should serve to encourage travel by more sustainable modes.

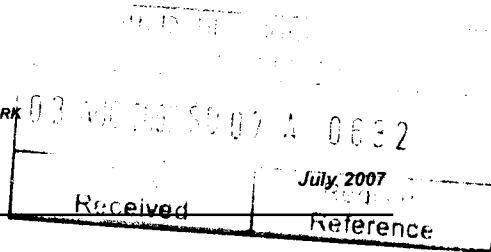
3.0 PROPOSED DEVELOPMENT AND TRIP GENERATION

Development proposals

- 3.1 The proposed scheme comprises a Data Centre, which is a centralised computer server, information storage and management facility designed and operated for the purpose of storing, managing and distributing information to individuals, businesses and organisations. The plant will operate 24hrs/day, 7 days/week, all year round.
- 3.2 The development will be constructed in two phases. Phase one will see approximately half of all employees working at the site, with full occupation being reached in phase two. This report considers full occupation.

Parking

- 3.3 The Council's parking standard requirements for B1 land uses are detailed in Table 12.1 and Paragraph 12.3.3 iii of the South Dublin County Council Development Plan 2004-2010.
- 3.4 *"Car parking shall be provided in a discreet, landscaped and well-screened environment with a view to minimising its visual impact, particularly when viewed from the approach roads. Car parking standards shall be 1 space per 40 sq.m. gross floor area. Car parking provision at the rate of 1 car space per 25 sq.m. of gross floor area may be acceptable where the proposed site is not located within convenient walking distance of a high quality public transport network. Any such deviation from the general rate of 1 car space per 40 sq.m. of gross floor area shall be subject to the agreement of the planning authority."*
- 3.5 Based on a Gross Floor Area (GFA) of 51,000m², the site could be provided with up to 1,275 parking spaces under the B1 use class. It is proposed to provide a total of 80 parking spaces. This level of parking represents a large reduction from the maximum parking ratio to a level



of 1 space/637.5 m2. This level of parking will be sufficient to cater for all arrivals to the site.

- 3.6 In addition to the general car parking standards required, service-parking spaces may also be required. This is for cars or other vehicles necessarily involved in the operation of a business eg. the delivery/collection of goods or people, the carrying out of repair and maintenance services.
- 3.7 As stated in paragraph 12.7.3 I of the Development Plan, the number of service parking spaces required will depend on the nature of the proposed business, and will be determined by the Council in each case.

Access

- 3.8 Construction traffic will travel to the site via existing roads in the Business Park. They will enter the site using the existing haul road to the perimeter and/or a bridge to be constructed at the south west of the site over the existing river as shown in Figure 1. Operational traffic will access the site from this new bridge.

Operational phase traffic of proposed site

- 3.9 The staff will follow a shift system with approximately 50 members of staff present during weekdays for all shifts from 0730-1530, 1530-2330 and 2330-0730. At the weekend, between 20-25 staff members will work each shift at the site.
- 3.10 Along with the permanent members of staff mentioned above, approximately 10 visitors will arrive to the Data Centre each day between 0730-1530, with 5 arriving during the evening shift between 1530-2330. In addition, it is anticipated that approximately 10-15 deliveries will take place daily between 0730-1530, with 5 between 1530-2330.

- 3.11 Based on the information above, the weekday and weekend traffic generation for the site is contained in the following tables;

Table 3.1 Traffic generation of proposed site - Weekdays

Shift	Staff	Visitors	Deliveries	Total
Day 0730-1530	50	10	10-15	75
Evening 1530-2330	50	5	5	60
Night 2330-0730	50	0	0	50

Table 3.2 Traffic generation of proposed site - Weekends

Shift	Staff	Visitors	Deliveries	Total
Day 0730-1530	20-25	10	10-15	50
Evening 1530-2330	20-25	5	5	35
Night 2330-0730	20-25	0	0	20-25

- 3.12 In terms of traffic impact, it is assumed that all employees will travel to the Data Centre by car, with no car sharing taking place and each car having an occupancy of one. Whilst this is unlikely, it represents a worst case scenario. The existing public transport network and the proposed improvements would serve to encourage travel by non car modes.
- 3.13 It is assumed that the AM and PM peaks fall between 0730-0930 and 1630-1830 respectively. The shift patterns to be employed at the Data Centre begin at 0730, 1530 and 2330 as laid out above. The evening and night shifts do not coincide with the peak on the road network. Thus, only the day shift coincides with the network peak. If there was an overlap in arrivals and departures at 0730, the maximum number of vehicles at the site would be 125 during the week. In terms of weekend flows, the maximum number at the site would be 75 at 0730, 85 at 1530 and 60 at 2330.
- 3.14 In order to provide a robust assessment of traffic impact, assuming all staff, visitors and deliveries arrive and depart during the AM peak we

have assumed that the peak traffic generation for the proposed development would be as follows in Table 3.3.

Table 3.3 – Traffic generation of proposed site

AM Peak		PM Peak	
IN	OUT	IN	OUT
75	50	0	0

Traffic generation of fully occupational Business Park

- 3.15 In order to assess the anticipated level of trips likely to be generated by the full Business Park, use has been made of the aforementioned traffic studies, namely Chapter 12 Material Assets [Traffic] of IDA Ireland's EIS for an IC Manufacturing Facility (January 2006), and the TIA produced as Appendix G of the EIS for a New Headquarters, Production and Distribution Facility for IAWS Group (June 2006).
- 3.16 The traffic impact of these developments is much greater than the proposed Data Service Centre. For instance, it is envisaged that the IDA site will employ 2,500 staff plus 300 contractor staff when it is fully operational with a total of 1,506 car parking spaces proposed whilst the IAWS site will employ approximately 500 staff and will provide 470 car parking spaces along with 60 truck parking spaces.
- 3.17 The traffic generation of both sites is summarised in the following table.

Table 3.4 – Traffic generation of other proposed developments

IDA Ireland Site					
	Cars In	Cars Out	HGV In	HGV Out	Total
AM Peak	120	30	6	6	162
PM Peak	0	119	2	0	121
IAWS site					
	Cars In	Cars Out	HGV In	HGV Out	Total
AM Peak	78	160	2	2	240
PM Peak	20	20	2	2	44

- 3.18 As can be seen from the above tables, the IDA site is calculated to generate total peak hour flows of 162 during the morning peak and 121 during the evening peak periods. The IAWS site is estimated to produce 240 movements in the morning peak, with 44 during the evening peak. In comparison to the combined traffic generated by these two sites, the proposed development is calculated to generate merely 31% of these trips in the AM peak with no trips generated in the PM peak.

Construction phase traffic of proposed site

- 3.19 The construction phase of a development can generate short term increases in heavy goods vehicles movements on the highway in the vicinity of the site and an increase in overall traffic levels. Potential transportation and access related impacts that arise comprise:
- Temporary disruptions to road users on the surrounding highway network;
 - Temporary disruptions to pedestrians on the surrounding footpaths.
- 3.20 In terms of this particular development, the level of change in traffic flows during construction will be based upon the following main assumptions:

- Working hours are likely to be from 0730 to 1900 Monday to Friday and 0800-1400 on Saturday;
- The construction period is estimated to be 21 months;
- On average approximately 250 construction jobs will be created with 400 jobs at peak;
- An average of 5 HGVs a day will be generated by the construction phase.

3.21 Construction staff will begin work before the AM peak occurs on the network i.e. 0800-0900. Similarly, they will depart after the PM peak i.e. 1700-1800. It is assumed that the 5 daily HGV trips will be spread out over the course of the day. Thus construction traffic will have a negligible impact on the local transport network.

3.22 In comparison to trips likely from the construction phase of the Data Centre (250 staff average and 400 at peak with 5 HGVs), estimates for construction staff arriving to the IDA site were for 2,500 operatives at peak with 30-40 heavy construction vehicles arriving and departing daily. The IAWS site anticipated having 300 operatives with between 30-40 heavy construction vehicles daily.

3.23 The IDA and IAWS Traffic Impact Assessments both assumed a car occupancy level of 2.5 for construction workers. This level was believed to be typical for a construction site as most contractors operate an employee pickup scheme whereby car sharing or company van/minibuses are used. Application of this to the proposed Data Centre would mean a maximum of 160 construction cars arriving and departing daily. In addition, both TIAs anticipate that 80% of the workforce would arrive half an hour before work starts, and would depart half an hour after work ends. Again, if we apply this methodology, 128 vehicles would arrive between 0700-0730, with the remaining 20% or 32 vehicles arriving between 0730-0830. The same methodology would apply at the end of the working day.

3.24 Thus, while it can be seen that the construction phase will have little impact, the following measures will be employed;

Consideration given to the Access / Egress to Public Roads:-

- Location of entrances / exits
- Traffic turning restrictions on either entering or exiting the site
- Signage required on inside of site warning exiting drivers of risk
- Street signs warning public of site entrance
- Restrictions on delivery times
- Planning requirements concerning location of access / egress routes
- Flagman / security guard required to stop pedestrians on traffic during vehicle movements (equipment required by flagman)

Within Site:-

- Consideration will be given to:-
- Location of site office and access control facilities
- Location of car parking and the potential use of local park & ride facilities
- Location of material store and lay down areas
- Speed restrictions (15kph)
- Time restrictions on delivery types, access to car parking etc
- Traffic flow around the site (separate exit and entrance)
- Construction of temporary roads or early installation of permanent roads
- Provision of turning areas
- Provision of queuing or holding areas
- Warning and regulatory signage
- Location of concrete wash down
- Certification for drivers
- Mandatory safety features required on vehicles (e.g. audible reversing horns and flashing beacons)

3.25 All roads will be maintained in sound condition, a senior supervisor will inspect access roads daily and organise any clean up required. Road

sweeping will be undertaken once daily at a minimum, and more frequently as required keeping local roads (public and private), drains, footpaths and kerbs free of dirt. All haul roads will be maintained in a clean and sound state and be subject to strict speed limits.

- 3.26 All vehicles transporting materials to and from the site will be appropriately covered with a tarpaulin to prevent falling of loose material. All vehicles exiting the site will be cleaned using an automatic wheel wash unit.
- 3.27 Adverse impacts to traffic occurring during the construction phase are considered to be temporary and reversible. They will occur at local level and are therefore defined as being of minor significance, especially with the application of the measures above.

Traffic impact of proposed development

- 3.28 The IAWS report being the most recent, (completed in February 2007), has analysed six key junctions for the 2007 and 2019 AM and PM peak hours. The report takes account of existing traffic flow on the road network, expected growth in traffic, the expected reduction on local roads relating to the Outer Ring Road and the cumulative impact of their proposed Headquarters and the proposed integrated circuit manufacturing campus for which IDA Ireland have received planning permission.
- 3.29 The 'cumulative impact' relates to incremental changes caused by other past, present or reasonably foreseeable actions together with the proposed development. The traffic volumes that would be generated by the fully developed business park have been assessed by Clifton Scannell Emerson Associates on behalf of South Dublin County Council. A 30% reduction on trips was allowed for staggered start and finish times.
- 3.30 A schedule of the development schemes which have been considered in the study completed by Clifton Scannell Emerson Associates is

provided in Table D1 of the IAWS report. The IAWS report updated the flows provided by Clifton Scannell Emerson Associates to take account of actual volumes from their development and the IDA Ireland development, (attach Table D2 of IAWS report). The flows likely to be generated by the proposed Data Centre are imperceptible when compared to overall traffic flows. The Data Centre accounts for less than 1% of total Business Park trips per day. In the AM peak inbound flows they represent 3.3% of the overall Business Park flows during this period, with 8% of outbound flows. The Data Centre will have no impact in either the inbound or outbound traffic flows in the PM peak. This is shown in Table 3.5 below.

Table 3.5 Comparison of estimated traffic flows for fully developed Business Park (updated for actual flows from IAWS and IDA Ireland sites) and proposed development

	Total daily trips	AM veh/hr		PM veh/hr	
		IN	OUT	IN	OUT
Total – Business Park	16,546	2,262	602	582	1,823
Total-Data Centre	125	75	50	0	0
% proportion	0.75%	3.3%	8.3%	0%	0%

3.31 In terms of the six junctions assessed, the IAWS report examines the following:

- IAWS/Cuisine de France Entrance junction
- Proposed R134 Nangor Road/Baldonnell Road Signalised Junction
- R134 Nangor Road/ R120 Newcastle Road Signalised Junction
- R134 Nangor Road (East)/ Castle Greenway (Grange Castle International Business Park) Roundabout
- R136 Outer Ring Road/ Grange Castle International Business Park Entrance Junction
- R136 Outer Ring Road/ R134 Nangor Road Roundabout

- 3.32 The well recognised junction capacity analysis programs PICADY, OSCADY and ARCADY were used to test the capacity of the junctions above. PICADY is used to assess the capacity of priority junctions, OSCADY is used to test signal controlled junctions, with ARCADY being used to test the capacity of roundabouts.
- 3.33 The results of the modelling of roundabouts, priority and signalled intersections are expressed in terms of RFC, the ratio of flow (demand) to capacity, and in terms of vehicles queuing and being delayed. A junction reaches capacity when $RFC = 1$, although the recommended maximum capacity value is 0.85.
- 3.34 The junction capacity tests have shown that all junctions will operate within acceptable operating criteria up to 2019 assuming full occupation of the Business Park. The local highway network and associated improvements will have the capacity to accommodate the fully occupational Grange Castle International Business Park, including the proposed site.

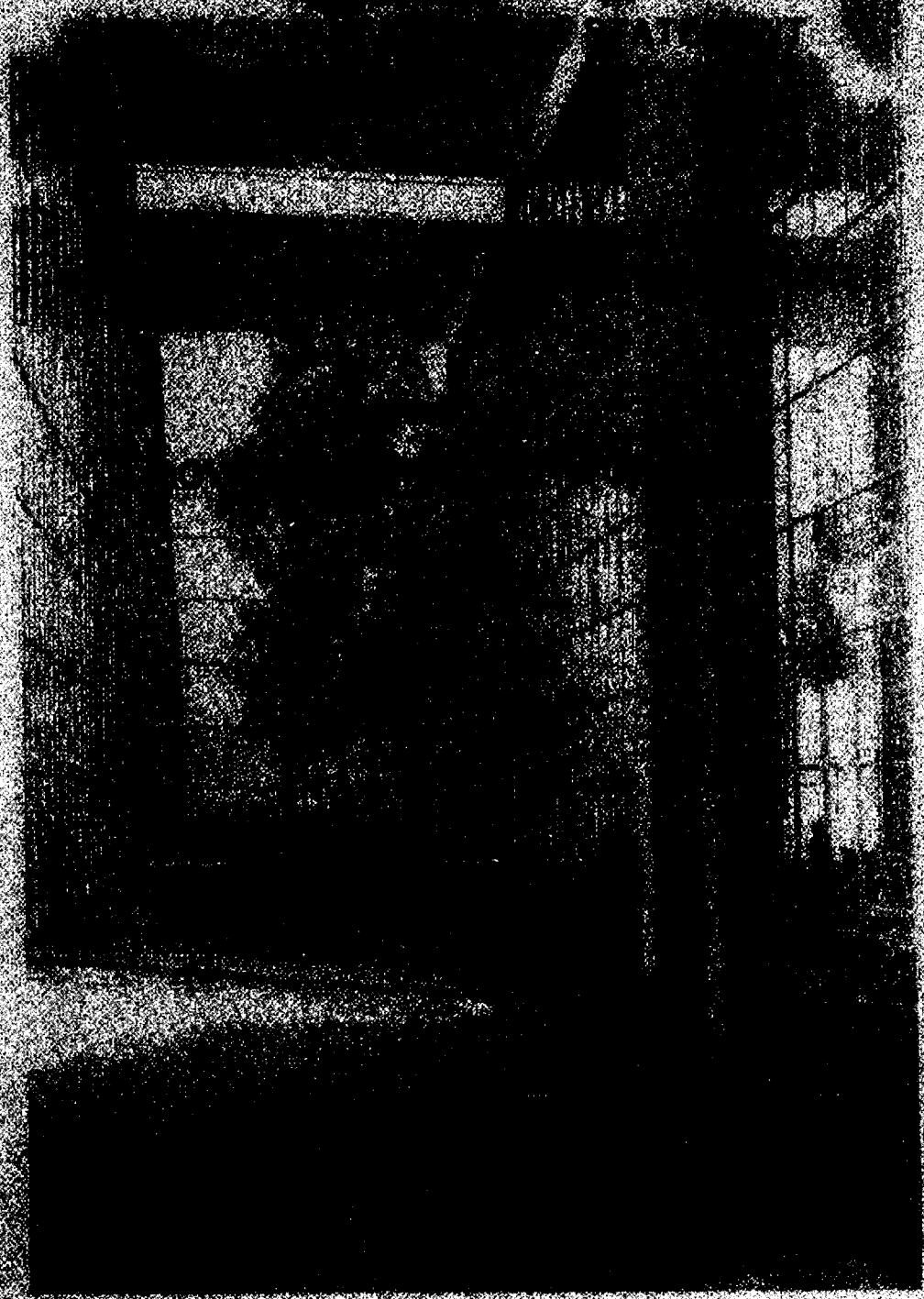
4.0 SUMMARY AND CONCLUSIONS

- 4.1 It is proposed to develop a Data Centre on an 18.9 acre site at the Grange Castle Business Park in Dublin. The proposed scheme will comprise an overall gross floor area of 51,000 m².
- 4.2 It is anticipated that 50 members of staff will be employed at the site on weekdays, with 20-25 employed at weekends. A maximum of 10 visitors and 15 deliveries will arrive to the site a day. Representing a large reduction from the maximum permissible parking ratio, 80 permanent parking spaces are proposed. This level will be sufficient to cater for all arrivals to the site.
- 4.3 The proposed development will have a low traffic impact as the maximum number of two-way vehicular trips likely to be generated is 125 (75 inbound 50 outbound) in the AM peak, assuming an overlap in shifts and that all staff, visitors and delivery movements occur at once in single occupancy vehicles. The Data Centre will not generate any vehicular trips in the PM peak. Such low levels of traffic would have a negligible effect on the transport network.
- 4.4 The traffic volumes that will be generated by the fully developed Business Park have been recently assessed by Clifton Scannell Emerson Associates on behalf of South Dublin County Council. These flows were used in junction capacity tests undertaken in the IAWS February 2007 TIA. The results show that key junctions in the Business Park will operate within acceptable performance criteria on full occupation of the Business Park. The flows likely to be generated by the Data Centre represent a small portion of overall flows on the road network, which in reality will be imperceptible on the network.
- 4.5 A SATURN traffic model prepared by Arups on behalf of South Dublin County Council incorporates expected traffic associated with the fully occupied Business Park. The traffic model shows the Grange Castle Road will operate with spare capacity on completion.

- 4.6 The site lies in an area that is well served by public transport with many improvements planned. Clondalkin rail station is approximately 3km from the site and 1.5km from the proposed Adamstown station and directly adjacent to Kishogue station. The site is served by a number of buses operated by Dublin Bus. In addition, a number of Quality Bus Corridors (QBCs) run in the vicinity of the Business Park. Further QBCs are being planned and constructed.
- 4.7 Plans are afoot to extend existing cycle lanes, and create new cycle lanes in the vicinity of the site. Together with the proposed public transport improvements, it is anticipated that this will help to increase modal share to the site by this sustainable mode.
- 4.8 In conclusion, the local highway network and associated improvements will have the capacity to accommodate the fully occupational Grange Castle International Business Park, including the proposed site. The overall situation resulting from the proposals will be acceptable without adverse effects on the local transport network.

Appendix A – IDA Ireland TIA

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12 TRAFFIC

12.4 INTRODUCTION

An assessment of the transportation impact of the proposed development is set out in different sections of this report. Section 2 describes the location of the site with respect to the existing road infrastructure and outlines the road network's operating capacity and performance. Section 3 outlines the nature of the proposed development on the site. The future infrastructural and public transport improvements proposed for the area are discussed in Section 4. The traffic generation for the proposed development is described in Section 5. Section 6 outlines the proposed access arrangement for the site while Section 7 assesses the distribution of trips to and from the proposed development. An assessment of the traffic impact of the development is outlined in Section 8 and Appendix B. A summary of the traffic and transportation impact of the proposed development is given in Section 9.

A Mobility Management Plan for the development that identifies a range of initiatives that will be adopted by the incoming IC investor, is included in Appendix A.

This report has been prepared taking into account the "South Dublin County Development Plan 2004-2010". The report has been produced with the benefit of discussions with officers of South Dublin County Council and takes cognisance of the Dublin Transport Initiative at all times.

The transportation assessment examines the impact that the incoming IC investor will have on the adjoining area in the opening year (2009). For the purpose of this assessment, it is assumed that a general traffic growth will be experienced in the area that anticipates typical development commensurate with planned infrastructure outlined in South Dublin County Council Development Plan.

12.5 EXISTING CONDITIONS

The proposed development is to be located within the Grange Castle International Business Park (GCIBP) on the western outskirts of the Dublin conurbation, approximately 16km from the city centre. The Business Park covers approximately 120 hectares and is in the process of being developed. The site is currently served by the R136 Grange Castle Road on the east side and the Nangor Road that forms the boundary to the south. A site location plan is shown in Figure 1.0.

It is anticipated that extensive improvements to the local and strategic road network in the area will take place prior to the opening of the proposed development taking into account committed and planned activities by South Dublin County Council. Recent and Future Infrastructural Improvements are shown in Figure 1.0 and are described in detail in Section 4. The most significant road improvement scheme in the area is the R136 Grange Castle Road (Outer Ring Road) which runs north-south to the east of the site. Access to the Business Park is via both a roundabout on the Grange Castle Road on the east and on the R134 Nangor Road to the south.

On completion of the Grange Castle Road direct access will be achieved from the Business Park to the N4 and N7 which provides links from Dublin to the West and South of Ireland respectively. The M50 motorway, approximately 6km east of the site, is a high capacity orbital route around Dublin that interconnects the major national radial routes to the city, including the N4 and N7. Access to Dublin Airport can also be achieved via the M50 and work is currently due to start to upgrade the motorway to dual 3-lanes.

Finally a third access to the Business Park is currently in planning off the Nangor Road to the west of the site close to the R134 Nangor Road / R120 Newcastle Road junction. The proposed access and Nangor Road Upgrade (Polyhops) is being developed by the consultant's RPS and their planning / transport assessment work has been made available for incorporation into this traffic impact assessment on the basis that it will be upgraded before 2009.

For the traffic impact assessment of the proposed ICMF development in the context of the surrounding roadway network the traffic model prepared by Arup on behalf of South Dublin County Council for planning the R136 Grange Castle Road has been utilized.

This model is compatible with the Dublin Transportation Office (DTO) SATURN model and is applicable as it has incorporated the planned major infrastructure developments anticipated to be completed by 2009, particularly in the vicinity of the business park. Notably this model incorporates the expected traffic associated with the Grange Castle Business Park (GCBP).

The Grange Castle Road as designed (dual 2 lane carriageway) has an operating one – direction capacity of 3,600 pcu per hour. Per the Saturn model this road will operate in 2009 at a maximum traffic volume of 1,393 pcu per hour in the AM peak with the proposed development in place. The Nangor road (an urban 2 lane undivided carriageway) has an operating one – direction capacity of 2,000 pcu per hour. Per the Saturn model this road will operate in 2009 at a maximum traffic volume of 544 pcu per hour in the AM peak with the proposed development in place.

Existing and future road network improvements are shown in Figure 2.0

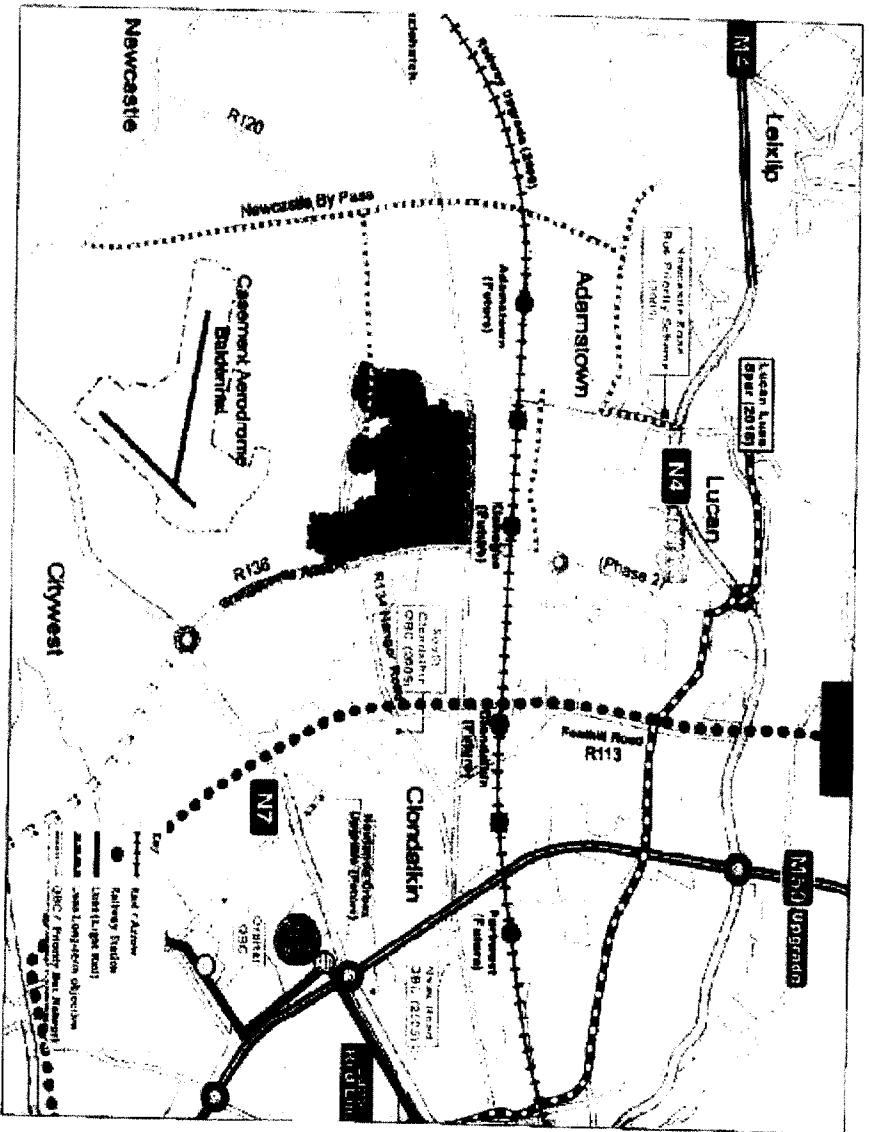


Figure 1.0 Site Location Plan

12.6 PROPOSED DEVELOPMENT

The development will employ 2,800 (2500 staff plus an allocation of 300 service / permanent contractor support) staff when it becomes fully operational. The staff will operate daytime and shift patterns with the expected staff pattern outlined below for the weekday scenario.

Day Shift:	0800 – 1600	1800 staff
Evening Shift:	1600 – 0000	800 staff
Night Shift:	0000 – 0800	200 staff

For the purposes of this assessment the proposed development is to be fully operational by mid 2009. This represents the earliest feasible date and in traffic terms, the most onerous scenario. However a more likely scenario is that the development will grow to full operations over a series of phases with 2009 being the earliest year for operations start-up.

The general car parking standards for the proposed development are examined based on the standards outlined in the South Dublin County Development Plan 2004-2010.

Based on the South Dublin County Development Plan a maximum of 4931 car parking spaces, based on 1 space per 40sq.m gross floor area (*Section 12.3.3.iii South Dublin County Development Plan*), would be allowable at the site for a development of this nature. However, less than half this allocation is planned for this development. Based on the development's highly specialised activities and on an examination of the employment and the shift patterns associated with the proposed facility, the provision of 1506 car parking spaces is deemed sufficient. It should be noted at this stage that the proposed facility will be a purpose built development which will accommodate a highly specialised activity. In the event of the decommissioning or the change of use of the facility it will only be able to accommodate another form of manufacturing activity following significant alterations to its structure and layout.

It is estimated that at the AM peak period (800 hours) approximately 1500 car parking spaces will be required for staff and visitors/services vehicles. This is based on a detailed parking accumulation analysis and allows for the overlap of parking demand associated with consecutive shifts. The provision of 1506 car parking spaces at the campus indicates that a theoretical maximum car park capacity of 99.6% is achieved which is an acceptable value for the proposed development.

Site space has been allowed for future parking demand should it materialize but this provision would require a future planning application. However, as outlined in the Mobility Management plan (Refer to Appendix A), the developer will be endeavouring to reduce car dependency rather than seek to increase parking capacity.

12.7 PROPOSED ROAD AND PUBLIC TRANSPORT IMPROVEMENTS

This report outlines the future improvements planned for the area under two specific headings

- Existing and Planned Road Infrastructure improvements
- Future Public Transport improvements

These improvements are outlined hereunder.

12.7.2 EXISTING AND PLANNED ROAD INFRASTRUCTURE

The Grange Castle area is strategically located from a transportation point of view on the western fringe of the Greater Dublin Area, close to high capacity road infrastructure. The Grange Castle Business Park is currently accessed by road from the R134 Nangor Road and the recently opened section of the R136 Grange Castle Road which will ultimately link the N7 to the N4. The main entrance into Grange Castle Business Park is now provided from a junction on the new Grange Castle Road.

South Dublin County is fortunate that there is an extensive programme of Road Improvements, at both national and local level. The Government Transportation Plan, (Transport 21), provides for the following upgrading road works in the County :

- M50 widening and interchange upgrades (Phase 1) - awarded, contract duration 2 years.
- N4 Widening between M50 Junction and Celbridge Junction and new Grade Separated Junction at Lucan/Newcastle Road junction - will commence on completion of M50 upgrade at N4 Interchange.
- N7 Widening from Rathcoole Junction to Naas (Maudlings Junction) – commenced for completion mid 2006

In addition to the above South Dublin County Councils non-national roads programme provides for the following schemes in the vicinity of Grange Castle :

- Phase 2 of R136 Grange Castle Road extension north to N4 - commenced for completion in 2006
- Phase 3 of R136 Grange Castle Road extension south to N81 - commenced for completion in 2006
- Link Road from R136 Grange Castle Road (Phase 2) to R113 Newlands/Fonthill Road - commenced for completion in 2006.
- Adamstown link road from R136 Grange Castle Road to R120 Lucan/Newcastle Road - commenced for completion early 2007.
- Re-alignment of R134 Nangor Road from Grange Castle Road to R120 Lucan/ Newcastle Road (Polly Hops) - CPO to be published Jan 2006, consultants finalising design, construction to commence end 2006, early 2007, to be completed by 2009.
- Re-alignment of R120 Lucan/Newcastle Road including widening of 12th Lock Bridge - consultants preparing design, acquisition maps to be prepared, commence early 2007.
- Newcastle By – Pass (R120 to Ayimer Road) - consultants preparing design, acquisition maps to be prepared, commence late 2006

12.7.3 FUTURE PUBLIC TRANSPORT IMPROVEMENTS

Grange Castle Business Park is ideally located to take advantage of the future improvements in the public transport provision and infrastructure.

The introduction of Quality Bus Corridors (QBCs) for the Dublin area is an ongoing process. These bus priority measures have already been shown to enhance patron numbers and reduce journey times. Currently there are QBCs on the Tallaght (N81) and the N4 route. A QBC will also run North and South along the entirety of the Grange Castle Road with a local feeder planned for Adamstown. There is also the South Clondalkin QBC along the Nangor road to Grange Castle as well as the Belgard Road to Fonthill Road Orbital QBC. A future N7 QBC from the M50 as far as the Grange Castle Interchange and also on the planned realigned section of the Nangor Road to R120 is being considered.

Park and Ride facilities are also being examined for locations on the N4 and N7 which would feed into the quality bus network.

The Dublin – Cork railway line currently runs to the north of the Business Park and this is in the planning process for upgrading from two lines to four lines which will significantly increase capacity and allow the "Arrow" suburban commuter service to run independently of the main line interurban rail traffic. In conjunction with this work new stations are planned for Adamstown and Kishogue which would directly service Grange Castle. In addition a programme of platform lengthening is also underway for the suburban services. This will allow the Arrow Service to operate once every twenty minutes. These improvement projects for the Heuston Station to Kildare section of the Cork main line are proposed to be complete by 2009.

12.8 TRAFFIC GENERATION

The proposed development will generate a number of different types of traffic over a typical twenty four hour period. Traffic will be generated in the form of employee movements, visitors and deliveries to and from the plant. The different generated traffic characteristics are examined in the following sections.

12.8.2 EMPLOYEE TRAFFIC

It is envisaged that the proposed plant will employ 2,500 staff plus 300 contractor staff when it is fully operational. The work pattern of the employees was outlined previously in Section 3.

A robust assessment of the impact of the traffic generated by employees has been carried out in order to examine the worst case scenario. The exact modal split of employees cannot be anticipated at this stage. It is anticipated that initially a high proportion of staff numbers will commute to the development by car. The following modal split is the worst case assumption based on the location of the site and the existing availability of alternative modes of transport but prior to the introduction of a Mobility Management Plan.

75%	Car Drivers
10%	Car Passengers
10%	Public Transport
5%	Walk/Cycling

Following an examination of the shift patterns of the staff members, the critical AM period for traffic generation will be between 0730 and 0830 and in the PM period between 15:30 and 16:30. It is assumed that the majority of staff movements will occur a half an hour on each side of the shift change time. It is also assumed that 5% of staff arrivals and departures occur in the half hour after the shift commences or before it finishes respectively. Based on these assumptions, Table 4.0 outlines the predicted vehicle trip pattern for staff in the AM and PM peak periods.

Time	Arrivals (Vehicles)	Departures (Vehicles)
0730-0830	1350	150
1530-1630	600	1350

Table 4.0 Staff Vehicle Trip Generation in AM and PM Peak Period

The PM peak vehicle departure time for the proposed development does not coincide with the peak evening period on the adjoining road network. Therefore the traffic impact assessment on the adjoining network is concentrated on the AM peak period.

12.8.3 VISITORS/SERVICE VEHICLES

The expected number of visitors to the site has been estimated as generating 68 vehicles /day. It is assumed that these 136 vehicle trips will be generated within the 0830-1700 time period.

The expected number of service vehicles arriving at the plant each day is estimated to be 23 vehicles. These vehicles are expected to arrive between 0830 and 1900 hours. The anticipated arrivals and departures by visitor and service vehicles during the peak period are minimal.

12.8.4 DELIVERY VEHICLES

The arrival and departure of heavy goods vehicles to the plant is assumed to be spread over the course of the day. Different types of movements will occur and these are outlined below:

Material Deliveries

It is anticipated that weekly deliveries of material to the plant will occur. Deliveries are expected to occur between 0800 and 1800 hours. The materials will be imported from a number of world-wide sources. For this reason good access to the strategic road network is essential for the proposed development.

Waste Disposal

It is envisaged that waste will be disposed of and removed from the site daily. It is assumed that these vehicle movements will occur between 0800 and 1800 hours. The level of waste to be removed from the campus is significantly less than is typically generated at such developments due to the specialised nature of the integrated circuit manufacturing.

Finished Product

The finished product will be transported from the plant to a number of world-wide locations. The movement of finished product will occur daily at the site. The location of the plant with respect to the strategic road network allows ease of movement of the finished product to its final destination.

The type of heavy vehicle movements to and from the proposed development is expected to consist of large container deliveries. A total of between 10 to 15 (maximum) deliveries is expected to occur daily. It is anticipated that approximately 10% of these deliveries will occur in the critical AM and PM periods.

12.8.5 CONSTRUCTION TRAFFIC

The level of construction traffic is mainly dependent upon the following:

- Quantity of materials to be delivered
- Number of construction employees on the site at any one time
- Duration of each construction stage

The earliest construction schedule is likely to start in Autumn 2007 and finish in early 2009 in the event of a successful inward investment. The peak level of construction activities is expected to occur during 2008.

It is envisaged that a construction workforce of approximately 2500 operatives will be present on the site at the peak construction time. The majority of these employees will be from the Greater Dublin and surrounding areas. In order to assess the number of vehicle trips generated by construction employees travelling to the site, a car occupancy factor of 2.5, which is typical for such developments of this size, has been assumed. This assumption is considered to be a robust assessment of car occupancy based on the fact that typically most contractors operate an employee pick-up system whereby individual employees do not have to travel alone to the site by car. Incentivised car sharing or company van/minibuses are typically used.

The assumed typical arrival and departure pattern for construction employees travelling to and from the site is illustrated in Table 6 below. A distributional split of 80% to/from the Greater Dublin Area is assumed. The typical working hours for the construction employees are assumed to occur from 0800 to between 1700 and 1900 hours, Monday to Saturday. It is assumed that 80% of construction employees arrive to the site in the half an hour prior to 0800 and depart between 1700 and 1730 hours. The remaining 20% of employees are assumed to arrive and depart in the preceding and following half hour periods. An assumption is made that 20% of early arrivals will depart the site within the following hour. A similar assumption is made in the PM period. A hardstanding area is proposed to be located at the southern end of the site to accommodate construction employee vehicles.

Time	Arrivals AM	Departures PM
0700-0730	100	0
0730-0800	800	10
0800-0830	100	10
1600-1630	0	100
1630-1700	10	800
1700-1730	10	100

Table 6.0 Assumed Arrival and Departure Pattern of Construction Employees Vehicles (Peak Period)

In addition to the employee generated traffic volumes, significant numbers of heavy construction vehicles will arrive and depart from the site during the various construction stages. Based on information available, a conservative estimate would anticipate that between 40 and 50 heavy construction vehicles would arrive and depart the site daily. This steady HGV traffic estimate reflects the fact that spoil material will be re-used in berms on site and will not be removed off site. These vehicle movements would occur throughout the course of the day. It is assumed that a maximum of 10% of the heavy construction vehicles will arrive and depart within the peak AM and PM periods.

A similar distribution pattern to the construction employee pattern is assumed (Refer to Section 7).

North West	(Lebdip, Celbridge, N4)	:	30%
North East	(Palmerstown, Blanchardstown)	:	25%
South West	(Rathcoole, Kill, N7)	:	15%
South East	(Tallaght, Rathfarnham)	:	15%
East	(Clondalkin, Ronanstown)	:	10%
West	(Newcastle)	:	5%

This assumed distribution has been based on the demographics of the surrounding areas. Based on these trip distribution assumptions, it is envisaged in the AM peak period that 55% (NW & NE) of trips generated will access the site from the R136 Grange Castle Road / Newlands/Forthill Road and R136 Grange Castle Road / Grange Avenue (GCIBP) roundabout junctions and 45% (SW, SE, W & E) via the R136 Grange Castle Road / R134 Nangor Road signalised and R134 Nangor Road (East) / Castle Greenway (GCIBP) roundabout junctions. The trip distribution pattern for the proposed development construction traffic (2007 AM peak) is shown in Figure 3.0.

It is proposed that during the construction phase, wheel washing facilities will be provided at the site. Any effects of noise and dust emissions resulting from the movement of the construction vehicles to and from the site will be monitored and minimised where possible. The good upkeep of construction vehicles will minimise the effect of noise and dust emissions.

12.9 PROPOSED ACCESS ARRANGEMENT

The primary access to the Business Park is provided via a roundabout junction on the R136 Grange Castle Road R136 and Grange Avenue (GCIBP). This roundabout is located approximately 1000 metres north of the R134 Nangor Road/R136 Grange Castle Road signalised junction and accommodates an access road of dual carriageway standard. The roundabout is a three-armed junction with an inscribed circle diameter of 70 metres. The intersection accommodates dual carriageway approach roads from each arm.

A secondary access to the Business Park is also via a roundabout on the R134 Nangor Road and Castle Greenway (GCIBP). This junction consists of a four-armed roundabout with a 35.0m inscribed circle diameter. A circulation width of 9.0 metres is provided. The carriageway width on the Nangor Road approaches is 9.0 metres. The south arm of the roundabout provides an access and egress for the Grange Castle Golf Course.

A second business park access will be developed on the R134 Nangor Road to the west of the site as a 4 way signalised junction (Poly Hops). This access will be in place prior to the proposed IC development opening in 2009.

Access into the proposed development will be achieved via the internal road running north south parallel to the Grange Castle Road and off a new internal road running from the internal dual carriageway on the north southwards to the Nangor road west of the development. These 9.0 metre wide link roads connect the Nangor Road to the dual carriageway access road, and have a theoretical capacity of 2200 vehicles per hour. The proposed development has two access points onto the internal road network.

1.0 TRIP DISTRIBUTION

Based on the generation of trips outlined in Section 5 and the access arrangements for the proposed development, a worst case distribution pattern is assumed for the peak periods. The following origins and destinations for staff vehicles in the peak periods are assumed:

North West	(Lebdip, Celbridge, N4)	:	30%
North East	(Palmerstown, Blanchardstown)	:	25%
South West	(Rathcoole, Kill, N7)	:	15%
South East	(Tallaght, Rathfarnham)	:	15%
East	(Clondalkin, Ronanstown)	:	10%
West	(Newcastle)	:	5%

This assumed distribution has been based on the demographics of the surrounding areas. Based on these trip distribution assumptions, it is envisaged in the AM peak period that 35% of trips generated will access the site from the Nangor Road (West) / Stables Greenway (Grange Castle International Business Park) signalised junction, 40% Nangor Road (East) / Castle Greenway (Grange Castle International Business Park) roundabout and 25% from the R136 Grange Castle Road / Grange Avenue (Grange Castle International Business Park) roundabout.

The trip distribution pattern for the proposed development traffic (2009 AM peak) is shown in Figure 4.0

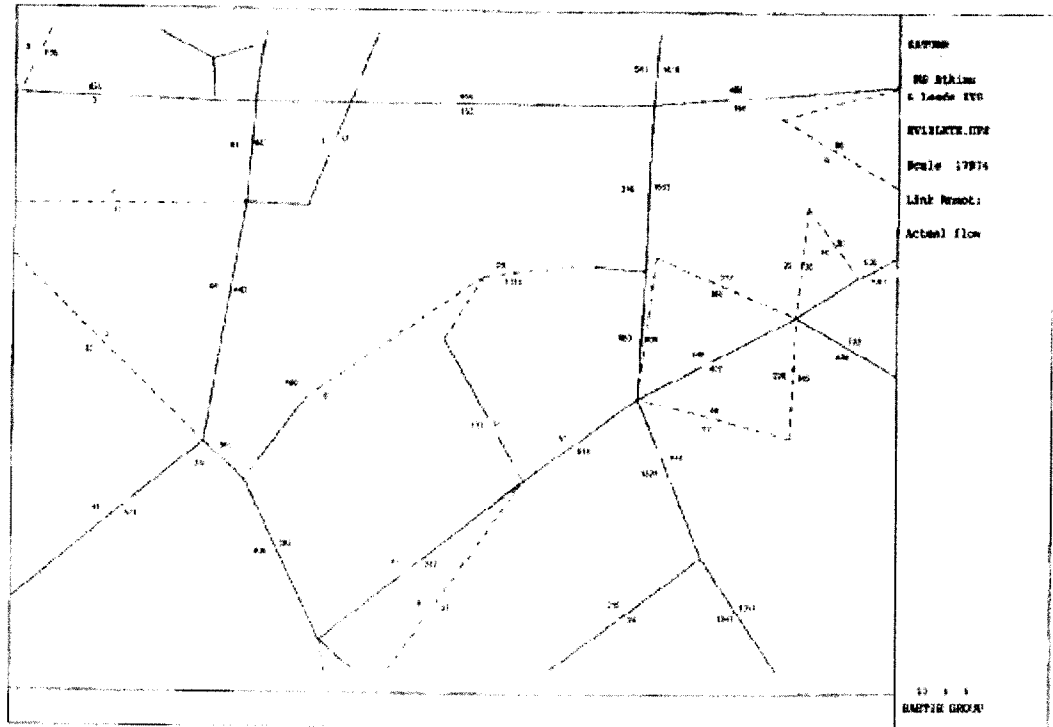


Figure 3.0 Trip Distribution Pattern Proposed Development Construction Traffic 2007 (AM Peak)

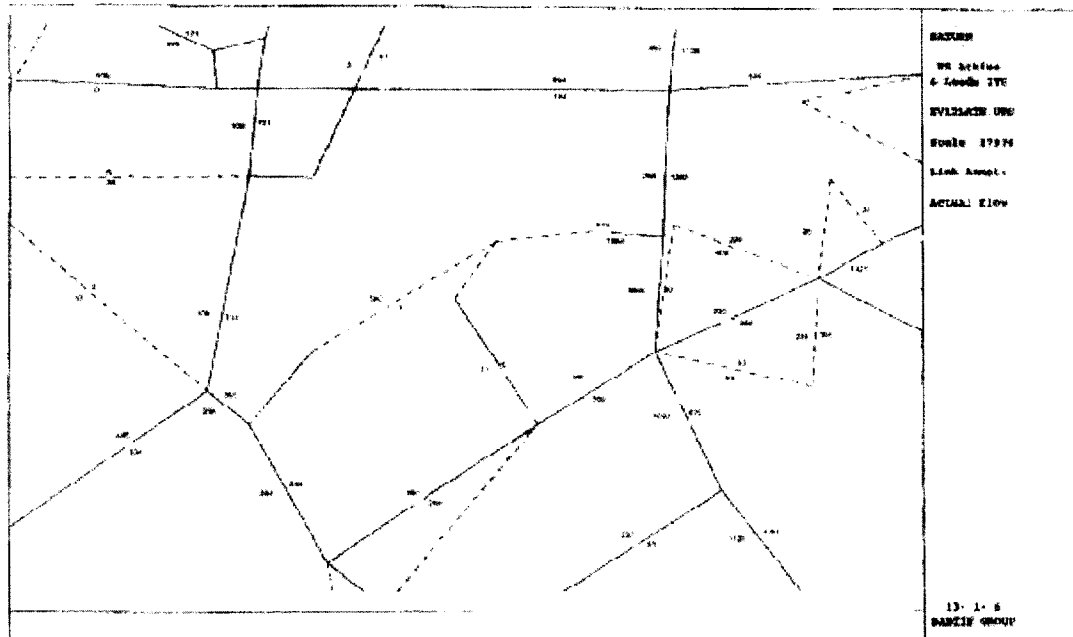


Figure 4.0 Trip Distribution Pattern Proposed Development Traffic 2009 (AM Peak)

12.10 ASSESSMENT OF TRAFFIC IMPACT

12.10.2 ANTICIPATED PERMANENT OPERATIONS TRAFFIC

In order to quantify the impact of the traffic generated by the development, a detailed assessment of junctions in the area was carried out. The impact of the traffic generated by the development on the capacities of the R136 Grange Castle Road, R134 Nangor Road and R120 Newcastle / Lucan Road, was also assessed.

Analysis was conducted for the following junctions:

- R136 Grange Castle Road / Fonthill Road Link roundabout
- R136 Grange Castle Road / Grange Avenue (GCIBP) roundabout
- R136 Grange Castle Road / R134 Nangor Road signalised junction
- R134 Nangor Road (East) / Castle Greenway (GCIBP) roundabout
- R134 Nangor Road (West) / Stables Greenway (GCIBP) signalised junction
- R134 Nangor Road (West) / R120 Newcastle/Lucan Road signalised junction

The examination was carried out for the various scenarios outlined below:

Future 2009 Scenario – Prior to Proposed Development Opening

This Scenario examines the operating capacity of the above junctions in 2009 when no proposed development traffic from the new development is generated in the area. The analysis only takes into account the expected general increase in traffic on the road network in the area. The analysis shows that all the above junctions perform satisfactorily for this scenario.

The results of the Future 2009 Scenario – Prior to Proposed Development Opening analysis are included in Appendix B.

Future 2009 Scenario – With Proposed Development Operational

This Scenario examines the operating capacity of the junctions in 2009 when the manufacturing plant becomes fully operational. The analysis includes the traffic generated by the manufacturing plant and the general increase in traffic on the adjoining road network. The analysis shows that all the above junctions perform satisfactorily for this scenario.

The results of the Future 2009 Scenario – With Proposed Development Operational analysis are included in Appendix B.

12.10.3 CONSTRUCTION TRAFFIC

The impact of the traffic generated by the construction phase was assessed and an analysis of the following junctions was conducted:

- R136 Grange Castle Road / Fonthill Road Link roundabout
- R136 Grange Castle Road / Grange Avenue (GCIBP) roundabout
- R136 Grange Castle Road / R134 Mangor Road signalised junction
- R134 Mangor Road (East) / Castle Greenway (GCIBP) roundabout

The analysis assessed the operating capacity of the above junctions in 2007 when no proposed development traffic is generated in the area, only taking into account the expected general increase in traffic generated by the construction phase.

The analysis shows that all the above junctions perform satisfactorily for this scenario and the results are included in Appendix B.

12.11 MOBILITY MANAGEMENT PLAN

The successful company will be obliged to initiate a mobility plan for all their operations starting with construction activities. The Plan will be a living document that will be subject to annual review and that will respond to changes in the local and global transport environments.

Details of the Plan are included in Appendix A and sets out:

- the policy context for the Plan,
- identifies the principles and lists the measures/elements that will be included in the Plan,
- and identifies targets and describes a monitoring and review regime for the Plan.

12.12 CONCLUSION

South Dublin County Council has specifically tailored the master plan of Grange Castle International Business Park for high sustainability in transport. The delivery of the high speed commuter railway station and its pedestrian links to the park, the direct bus accessibility and the use of sustainable neighbourhoods like Adamstown in the vicinity promises that this IC manufacturing site will be a model for transport sustainability.

The proposed development will be located within the Business Park, and is predicted to employ 2,500 staff and up to 300 contractor support staff when fully operational in 2009. 1,506 car parking spaces will be provided for the development. This parking volume is less than half the allowable for a development of this scale in accordance with the criteria set down in the South Dublin County Development Plan.

Significant improvements are planned for the surrounding road network in the area over the next several years. This will include phases two and three of the R136 Grange Castle Road which will see it extended

north to the N4, south to the N81 Blessington road and east to the R113 Fonthill road. The N4 through Lucan and the N7 to Naas will also be upgraded to dual three lane standard.

There will also be improvements on the roads surrounding the business park. The Nangor road from the R136 Grange Castle road to the west will be widened, realigned, including another entrance to the business park and have a Quality Bus Corridor (QBC). There will also be widening and realignment of the R120 Newcastle road and there will be an access road from the R136 Grange Castle road to the proposed Adamstown development.

An assessment has been carried out to quantify the volume of the different types of traffic, which will be generated by the proposed development. This gives peak generation for the 0730-0830 AM Peak of 1500 staff trips and for the 1530-1630 PM Peak of 1950 staff trips. These trips will be supplemented by other trips generated by visitors and service vehicles during these periods.

The traffic generated during the construction phase was also examined. Construction is expected to commence in 2007 and finish in 2009. At the peak of the construction activity, 2,500 operatives may generate up to 1,000 trips during peak times.

In considering the Impact of the generated traffic a number of junctions were examined. These were:

R136 Grange Castle Road / Fonthill Road Link roundabout
R136 Grange Castle Road / Grange Avenue (GCIBP) roundabout
R136 Grange Castle Road / R134 Nangor Road signalised junction
R134 Nangor Road (East) / Castle Greenway (GCIBP) roundabout
R134 Nangor Road (West) / Stables Greenway (GCIBP) signalised junction
R134 Nangor Road (West) / R120 Newcastle/Lucan Road signalised junction

Impact was quantified for both peak construction (2007) and full operational (2009) periods. A scenario without and with the new development was compared in each case.

In the case of all the junctions assessed above, the analysis showed that the junctions would perform satisfactorily both during the peak construction phase (2007-2008) and when the IC Campus becomes fully operational in 2009.

The proposed development will adopt and implement a Mobility Management Plan in order to reduce reliance on the car for travel to/from work. This will include a range of measures including the promotion of car sharing, the provision of pool cars, and the promotion of public transport, cycling and walking for travel to work. The appointment of a staff travel/mobility co-ordinator and the implementation of an independent annual monitoring and review regime will be essential parts of the ongoing implementation of the Mobility Management Plan.

Finally, the SATURN model developed by Arup upon which this assessment is based assumed the fully developed Business Park generated traffic scenario. This assessment demonstrates that the proposed development, together with existing Business Park development, will operate within the capacity of the network and junctions.

Appendix B – IAWS/Cuisine De France TIA

**IAWS GROUP plc
New Headquarters, Production &
Distribution Facility at Grange
Castle, Co. Dublin**

**Submission to accompany
Planning Application**

VOLUME 2

South Dublin County Council Planning Department - Registry	
13.FEB 2007 SQ07 A 0102	
Date Received	Register Reference

05077
February 2007



2B Richview Office Park
Clonskeagh
Dublin 14

05077 – IAWS GROUP plc

**Schedule of Submissions to accompany
Planning Application
(Malone O'Regan)**

VOLUME 1

REPORT SECTION	TITLE
---------------------------	--------------

1	FOUL EFFLUENT DRAINAGE
2	SURFACE WATER DRAINAGE
3	WATERMAINS
4	GEOTECHNICAL INVESTIGATION
5	PRELIMINARY WASTE MANAGEMENT PLAN

VOLUME 2

1	TRAFFIC IMPACT ASSESSMENT
2	MOBILITY MANAGEMENT PLAN

05077

February 2007

**IAWS GROUP plc
New Headquarters, Production &
Distribution Facility at Grange
Castle, Co. Dublin**

**Submission to accompany
Planning Application**

TRAFFIC IMPACT ASSESSMENT



2B Richview Office Park
Clonskeagh
Dublin 14

**IAWS GROUP plc – New Headquarters, Production & Distribution
Facility at Grange Castle, Co. Dublin**

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NON TECHNICAL SUMMARY

The IAWS Group Plc & Cuisine De France propose to develop a new Corporate Headquarters together with Production and Distribution facilities at Grange Castle International Business Park. IAWS existing office in Thomas Street, Dublin 8 and Cuisine De France's production and distribution facilities at Tallaght and Distribution facility at Dublin Port will be amalgamated and integrated into the new state of the art facility. It is expected that construction will commence in 2006 and production in late 2007.

This report assesses the impact that the traffic that will be generated by the proposed development will have on the existing and short-term future transportation network. The assessment considers the cumulative impact of this proposed development together with the impact of the proposed integrated circuit manufacturing campus for which South Dublin County Council has recently notified its decision to grant planning permission.

The traffic that will be generated by the proposed development is based on IAWS and Cuisine De France's current operations together with an allowance for new business into the future. The assessment is based on a worst case scenario with the expectation that ongoing and planned public transport schemes will reduce the dependency on cars.

Grange Castle International Business Park is currently accessed via two entrances, one off the R136 Outer Ring Road and one off the R134 Nangor Road. A second entrance off the Nangor Road will be constructed prior to the occupation of the proposed development. Traffic accessing the IAWS / Cuisine De France site will do so via all three junctions and the traffic that will be generated by the proposed development was assigned to the road network accordingly.

Six key junctions were analysed for the 2007 and 2019 AM and PM peak hour traffic flows, taking account of existing traffic on the road network; expected growth in the general traffic on the road network; the expected reduction on local roads once the Outer Ring Road is fully in place and the traffic that will be generated by this proposed development and that of the proposed integrated circuit manufacturing campus.

The junctions were analysed using well recognised junction modelling software. All junctions were found to operate within acceptable operating criteria.

All developments of this type result in the generation of increased traffic during both the construction and operational phases. The increased volumes of traffic directly affect all road users including motorists, cyclists and pedestrians. Possible significant effects to road users include the following:

- Increased journey times;
- Increased difficulty in crossing roads for pedestrians and cyclists;

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- Increased risk of accidents for all road users, and
- Congestion on the existing road network and junctions as a result of the development.

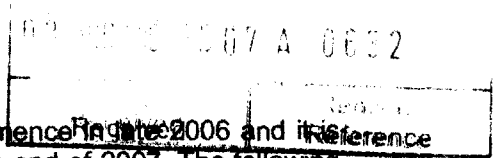
The traffic associated with the proposed development will contribute to increased traffic levels on the R136 Grange Castle Road. Based on the implementation of all the proposed mitigation and design measures the associated impacts will not be significant.

1. INTRODUCTION

This report aims to assess the potential effects of increased traffic volumes on the existing road network due to the proposed IAWS / Cuisine De France development at Grange Castle International Business Park and to recommend suitable mitigation measures.

2. ASSESSMENT YEARS

Construction of the proposed development will commence in 2006 and it is envisaged that it will be substantially complete by the end of 2007. The following traffic assessment measures the effect of the generated traffic at that time of construction, the time of occupancy and subsequently 12 years into the future in 2019.



3. RECEIVING ENVIRONMENT

3.1 Existing Road Network and Surrounding Infrastructure

The proposed development will be located within the Grange Castle International Business Park. The Grange Castle International Business Park is located approximately 16 km South West of Dublin International Airport, 10 km west of Dublin City Centre and 1.5 km west of Clondalkin Village centre. Nearby towns and villages include Lucan 2.5 km to the north, Tallaght 3 km to the south east, Saggart 4 km to the southwest, Newcastle 3 km to the west, all within South Dublin County, and Leixlip, Co. Kildare, 6 km to the northwest.

To date Wyeth Ireland – Ahp and Takeda Pharma Ireland have developed facilities within the Business Park and a planning application has been lodged for an Integrated Circuit manufacturing plant. The site is currently accessed off The Grange Castle road to the east and off the Nangor Road that forms the boundary to the south.

Grange Castle International Business Park is currently accessed via two entrance roundabouts located on the R136 Outer Ring Road and the R134 Nangor Road. A third entrance will be constructed at the Baldonnell Road / Nangor Road junction and this entrance is expected to be fully operational prior to the commencement of operations at the proposed development.

3.2 Future Road Network

South Dublin County Council is currently implementing an extensive programme of road improvements that will further facilitate the development of the Business Park.

National roads projects include:

- M50 widening and interchange upgrades
- N4 widening between M50 and Celbridge interchanges
- N7 widening from Rathcoole to Naas (Close to completion)

It is anticipated that several local road improvement schemes will be implemented prior to and shortly after the opening of the proposed facility including:

- Extension of the R136 Grange Castle Road north to the N4 and south to the N81 – complete 2006
- Link road from R136 Grange Castle Road to the R113 Newlands / Fonthill Road – complete 2006
- M50 widening and interchange upgrades – Phase 1 complete 2008
- N4 widening between the M50 junction and the Celbridge Road junction
- New grade separated junction at Lucan Road / Newcastle Road junction
- N7 widening from Rathcoole junction to Maudlins junction, Naas – scheduled for completion mid 2006
- Adamstown link road from R136 Grange Castle Road to R120 Lucan Road
- Realignment of R134 Nangor Road from Grange Castle Road to R120 Lucan / Newcastle Road – construction 2007 – 2009
- Realignment or R120 Lucan / Newcastle Road including the widening of the 12th Lock Bridge – construction to commence early 2007
- Newcastle By-Pass (R120 – Aylmer Road)

The most significant of these schemes in terms of the proposed development is the R136 Outer Ring Road which when complete will provide direct access from the Business Park to the N4 and N7 National Primary Routes.

The existing and future road network is shown on Fig. 1 over.

3.3 Public Transport Network

Grange Castle International Business Park is well located to take advantage of existing, ongoing and future planned improvements in the Greater Dublin public transport infrastructure.

3.3.1 Quality Bus Corridors

Quality Bus corridors already exist on the N4 and N81 Tallaght routes. There is also the Clondalkin Quality Bus Corridor on the Nangor Road to Grange Castle and the Belgard road to Fonthill Road Quality Bus Corridor.

A Quality Bus Corridor will be provided in both directions on the entire length of the R136 Outer Ring Road.

3.3.2 Rail

The duplication of the existing rail lines on the main line from Dublin to the South is at an advanced stage of planning. A new station is planned for Adamstown at the Outer Ring Road Transport Interchange.

3.4 Existing Traffic Flows

3.4.1 Traffic Counts

Traffic counts were carried in May 2004 out at the Nangor Road / Baldonnell Road, the Nangor Road / Newcastle Road junctions on behalf of the RPS Group. These counts are included in the Appendix A of to this report.

3.4.2 Network Traffic Growth

Projected growth rates for passenger car traffic for National Secondary Routes, given in "Future Traffic Forecasts 2002-2040" (NRA, 2003), are shown in Table 3.1 below:

	2000	2004	2006	2007	2019
Growth Factor – 2002 Base Year	100	107	113	116	143

Table 3.4: NRA Projected Growth Rates – National Secondary Routes

These growth factors were applied in the assignment of traffic to the road network

3.4.3 Outer Ring Road

The completion of the Outer Ring Road will lead to a reduction in traffic volumes on the surrounding road network as follows:

R134 Nangor Road	-43%
R120 Newcastle Road	-32%
Baldonnell Road	-44%

4 CHARACTERISTICS AND IMPACTS OF THE PROPOSAL

4.1 Characteristics of the Proposal

The IAWS Group and Cuisine de France multi-purpose facility is proposed for a 12 ha site in Grange Castle Business Park. The facility will function as the corporate headquarters of the IAWS GROUP plc and Cuisine de France. It will also incorporate a state of the art food manufacturing facility and distribution centre serving domestic and international markets. A key feature of the development will be the provision of a centre of excellence to provide the research and development, concept marketing and training requirements of the Group's international Lifestyle Foods operations.

Individual components of the development will include offices, production facilities, cold stores, a distribution centre, car-parking, landscaping and attenuation ponds. The buildings will be architecturally designed to a very high standard and in a manner that will be in keeping with the high quality visual surroundings of the existing business park.

Approximately 500 people will be employed at the facility. Approximately 80% of the employees will work normal office hours from 08:00 – 5:00, with the remainder working on a three shift basis, providing 24hr, 7 days per week production capabilities. All incoming deliveries will occur during normal working hours; however product will be dispatched on a 24-hour basis.

The proposed new development will integrate Cuisine De France's production facility, which currently operates, in Tallaght, cold storage facilities which the company uses in Bond Road, Dublin Port and the IAWS Group offices which are currently located in Thomas Street, Dublin 8.

4.2 Operational Phase Traffic

4.2.1 Traffic Generation – Proposed Development

Table 4.1 below represents the worst case scenario for traffic volumes throughout the day for the proposed development. It is based on a robust assessment of the existing IAWS and Cuisine De France operations on 3 No. existing sites and takes account of:

- a. the cessation of trips between the three sites as all operations will be located at the proposed new development;

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- b. the projected increase in traffic generated by additional employment that will be created at the new single site facility.

The actual traffic counted on a typical day at the three sites is included in Appendix B – Thursday was chosen as one of the peak day's traffic in any given week. It should be noted that Cuisine De France in particular devote much internal assessment of their traffic on / off their current sites and are very well placed to provide accurate assessment of their existing and projected traffic volumes.

As noted above Table 4.1 represents a worst case scenario as it is proposed to put in place a mobility management plan to take advantage of the existing and future proposed improvements to the public transport network that will service Grange Castle International Business Park.

The Mobility Management Plan is included as Appendix F of this report.

Time	IN	Vehicle Type	OUT	Vehicle Type
1am - 2am			21	Cars (Cold Store Pickers)
2am - 3am				
3am - 4am				
4am - 5am	15	Cars (Local Drivers)		
5am - 6am	35	Cars (Local Drivers)	20	Trucks (Local)
6am - 7am	3	40ft Containers		
6am - 7am	7	Cars (Goods In)	30	Trucks (Local)
7am - 8am	35	Cars(Telesales/Cold Store	3	40ft Containers
7am - 8am	6	40ft Containers		
8am - 9am	6	40ft Containers	30	Cars (Manufacturing)
8am - 9am	120	Cars (Mfg, OMS, Supply Chain	6	40ft Containers
9am - 10am	5	40ft Containers		
9am - 10am	125	Cars (Head Office, T/Sales, Cold store	6	40ft Containers
10am - 11am	5	40ft Containers		
10am - 11am	43	Cars	5	40ft Containers
11am - 12pm	4	40ft Containers	5	40ft Containers
12pm - 1pm	2	40ft Containers	4	40ft Containers
1pm - 2pm	1	40ft Containers	2	40ft Containers
1pm - 2pm	20	Trucks (Local)	20	Cars (Local Drivers)
2pm - 3pm	2	40ft Containers	1	40ft Containers
2pm - 3pm	30	Trucks (Local)	30	Cars (Local Drivers)
3pm - 4pm			2	40ft Containers
3pm - 4pm			7	Cars
4pm - 5pm	21	Cars (Cold Store Pickers)	15	Cars
5pm - 6pm	1	40ft Containers		
5pm - 6pm	1	40ft Containers	119	Cars

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6pm - 7pm	2	40ft Containers	1	40ft Containers
6pm - 7pm	1	40ft Containers	1	40ft Containers
6pm - 7pm			119	Cars
7pm - 8pm	2	40ft Containers	1	40ft Containers
7pm - 8pm			2	40ft Containers
7pm - 8pm			40	Cars
8pm - 9pm			2	40ft Containers
8pm - 9pm	30	Cars (Manufacturing)	30	Cars

Table 4.1 Operational Traffic

The peak hours traffic may be summarised as follows:

	Cars In	HGV in	Cars Out	HGV Out
AM Peak	120	6	30	6
PM Peak	0	2	119	0

Table 4.2 IAWS / Cuisine De France Peak Hours Traffic

4.2.2 Traffic Generation – Other Proposed Developments

South Dublin County Council has notified its intention to grant planning permission for a proposed integrated circuit manufacturing campus in Grange Castle International Business Park. The peak hours traffic that will be generated by the proposed campus has been assessed as summarised below. Appendix C also refers.

	Cars In	HGV in	Cars Out	HGV Out
AM Peak	78	2	160	2
PM Peak	20	2	20	2

Table 4.3 Peak Hours Traffic ICM Campus

The traffic volumes that will be generated by the fully developed business park have been assessed by Clifton Scannell Emerson Associates on behalf of South Dublin County Council.

The peak hours traffic (excl. IAWS / Cuisine De France and the ICM Campus) that will be generated by the fully developed Business Park is summarised below. Appendix E also refers.

	Veh In	Veh Out
AM Peak	2,056	410
PM Peak	558	1,665

**Table 4.4 Peak Hours Traffic from Fully Developed Business Park
(excl. IAWS / Cuisine De France & ICM Campus Traffic)**

4.3 Construction Phase Traffic

It is estimated that between 30 and 40 heavy construction vehicles will arrive and depart from the site daily. These vehicle movements will occur throughout the day with a maximum of 10% occurring of the movements occurring during the AM and PM peak periods.

It is anticipated that all spoil arising from earthworks operations will be retained on the site for mounding and landscaping purposes so the volume of heavy construction vehicle traffic will be reasonably steady.

It is anticipated that the construction workforce will comprise 300 operatives at the peak construction time. Most of the employees will likely be from the Greater Dublin area. Most of the workforce will travel to the site in cars. A vehicle occupancy of 2.5 would be typical for a construction site of this nature as most contractors operate an employee pickup schemes whereby car sharing or company van / minibuses are used so that all individual employees will not have to travel alone to the site by car.

Working hours on the site will be typical of the industry standard, i.e. from 08:00 to 17:00 – 19:00 Monday to Saturday. It is anticipated that the majority (80%) of the workforce will arrive in the half hour preceding 08:00 and depart in the half hour after 17:00. Arrivals and departures for the AM and PM peak hours will be of the order shown in Tables 4.5 below.

	Veh In	Veh Out
AM Peak	28 (24 cars + 4 HGV)	7 (3 cars + 4 HGV)
PM Peak	7 (3 cars + 4 HGV)	100 (96 cars + 4 HGV)

Table 4.4 Peak Hours Construction Traffic from IAWS / Cuisine De France & ICM Campus Traffic)

It is most unlikely that the peak construction period on this proposed development will occur simultaneously with that on the proposed integrated circuit manufacturing campus.

It is assumed that 50% of the construction traffic will enter and exit the site at each of the two existing roundabouts.

5 TRAFFIC IMPACT ASSESSMENT

5.1 General

6 No. key junctions were examined to assess the impact of the proposed development on the existing and proposed network, they being:

- IAWS / Cuisine De France Entrance Junction

- Proposed R134 Nangor Road / Baldonnell Road Signalised Junction
- R134 Nangor Road / R120 Newcastle Road Signalised Junction
- R134 Nangor Road (East) / Castle Greenway (Grange Castle International Business Park) Roundabout
- R136 Outer Ring Road / Grange Castle international Business Park Entrance junction
- R136 Outer Ring Road / R134 Nangor Road Roundabout

5.2 Assignment of Traffic to the Road Network

Grange Castle International Business Park is currently accessed via two entrance roundabouts located on the R136 Outer Ring Road and the R134 Nangor Road. A third entrance will be constructed at the Baldonnell Road / Nangor Road junction and this entrance is expected to be fully operational prior to the commencement of operations at the proposed development.

A survey of the current IAWS / Cuisine De France staff indicates the majority of the employees reside in the greater Dublin area. Based on this survey and the general demographics of the area, the following origins and destinations for the development traffic in the peak periods are assumed:

Origin / Destination

North West	(Leixlip, Celbridge, N4)	30%
North East	(Palmerstown, Blanchardstown)	25%
South West	(Rathcoole, Kill, N7)	15%
South East	(Tallaght, Rathfarnham)	15%
East	(Clondalkin, Ronanstown)	10%
West	(Newcastle)	5%

Based on this analysis it is assumed that 20% of traffic entering and leaving the business park will do so via the new Nangor Road / Baldonnell Road junction, 25% via the existing Nangor Road entrance and 55% via the Outer Ring Road entrance.

5.3 Junction Capacities

5.3.1 General

In order to quantify the impact of the traffic that will be generated by the proposed development together with that of other proposed developments analyses of the following junctions were undertaken using the well

recognised junction capacity analysis programs PICADY, ARCADY and OSCADY:

- IAWS / Cuisine De France Entrance Junction
- Proposed R134 Nangor Road / Baldonnell Road Signalised Junction
- R134 Nangor Road / R120 Newcastle Road Signalised Junction
- R134 Nangor Road (East) / Castle Greenway Grange Castle International Business Park) Roundabout

The anticipated traffic flows on these junctions and the analysis data are included in Appendix E of this report.

The results of the junction analyses are summarised below.

Entrance to IAWS / Cuisine De France				
	2007		2019	
	AM Peak	PM Peak	AM Peak	PM Peak
Max RFC	0.15	0.16	0.17	0.17
Max Queue Length	0	0	0	0

Table 5.1 Entrance to IAWS / Cuisine De France

Nangor Road / Baldonnell Road Junction				
	2007		2019	
	AM Peak	PM Peak	AM Peak	PM Peak
Max RFC	0.66	0.23	0.83	0.69
Max Queue Length at end of Red	12	7	20	11

Table 5.2 Nangor Road / Baldonnell Road Junction

Nangor Road / Newcastle Road Junction				
	2007		2019	
	AM Peak	PM Peak	AM Peak	PM Peak
Max RFC	0.49	0.54	0.84	0.78
Max Queue Length at end of Red	7	4	13	6

Table 5.3 Nangor Road / Newcastle Road Junction

R136 Grange Castle Road / Grange Avenue (Grange Castle International Business Park) Roundabout				
	2007		2019	
	AM Peak	PM Peak	AM Peak	PM Peak
Max RFC	0.26	0.11	0.31	0.23
Max Queue Length	0	0	1	1

Table 5.4 Nangor Road / Grange Avenue (Grange Castle International Business Park) Roundabout

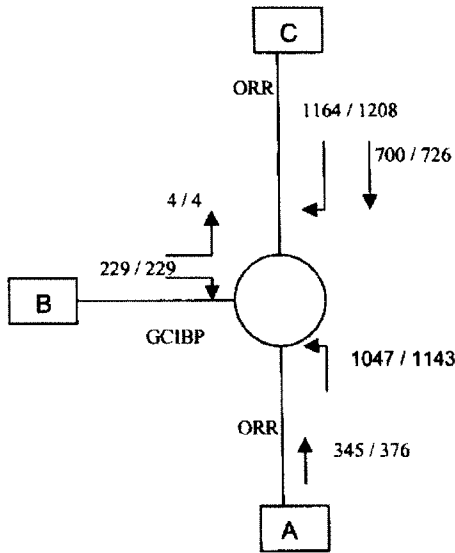
The results of the modelling of the priority intersections and roundabouts are expressed in terms of RFC, the ratio of flow (demand) to capacity and maximum number of vehicles queuing and delay/vehicle. Capacity of the junction is reached when RFC = 1, although the recommended maximum RFC value is 0.85.

The results of the analysis which are included in Appendix E to this report show that all junctions will operate within acceptable performance criteria (with a maximum RFC of 0.55 and a queue of just 4 vehicles) even with all developments are in place.

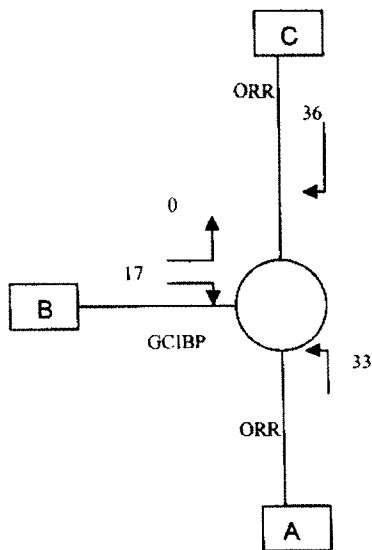
Similarly for the traffic signal controlled junctions at the Nangor Road / Baldonnell Road and Nangor Road / Newcastle Road, the maximum RFC value is 0.84 and the maximum queue length 20 vehicles.

5.3.2 R136 Outer Ring Road / Grange Castle International Business Park Entrance Roundabout

Arup Consulting Engineers developed a SATURN model as part of the traffic impact assessment for the Outer Ring Road. The estimated 2019 AM and PM Peak Demand and Actual flows at the R136 / GCIBP roundabout as extracted from the model are included in Appendix H of this report. These traffic flows which are inclusive of an allowance for the IAWS / Cuisine De France site are summarised below.



2019 AM Peak Actual / Demand Flows including Development Traffic at ORR / GCIBP Junction

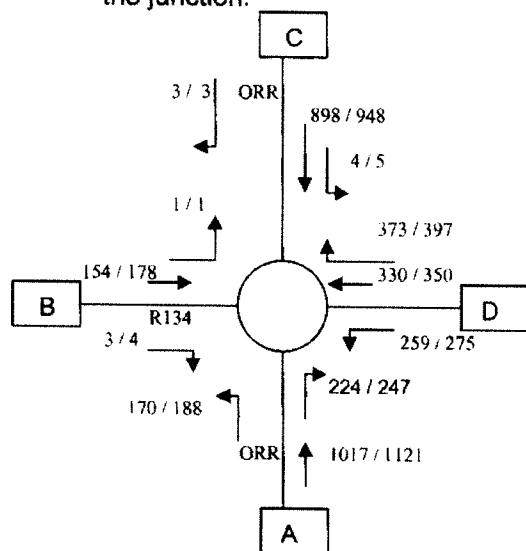


2019 AM Peak IAWS / Cuisine De France Traffic at ORR / GCIBP Junction

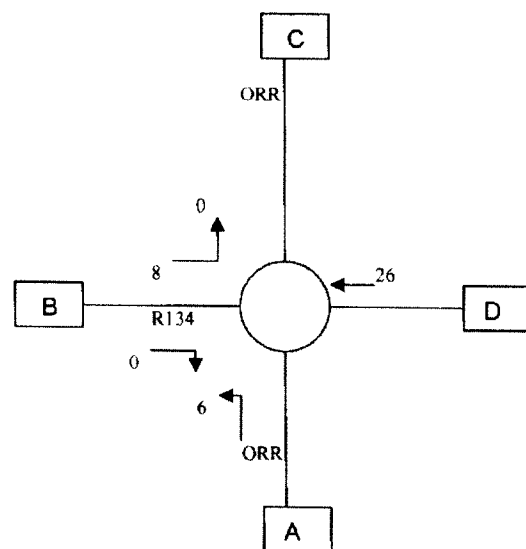
The IAWS / Cuisine De France 2019 AM Peak traffic represents less than 3% of the predicted actual flow at the Outer Ring Road / Grange Castle International Business Park Junction. Similar percentages apply to the PM Peak and the proposed development is therefore considered not to impact on the capacity or operation of the junction.

5.3.3 R136 Outer Ring Road / R134 Nangor Road Junction

Similarly to the Outer Ring Road / GCIBP junction, the Actual and Demand Flows at the R136 Outer Ring Road / R134 Nangor Road Junction are summarised below. The IAWS / Cuisine De France 2019 AM Peak traffic at the Outer Ring Road / Nangor Road junction represents approximately 1% of the predicted actual flow at the Outer Ring Road / Grange Castle International Business Park Junction. Similar percentages apply to the PM Peak and the proposed development is therefore considered not to impact on the capacity or operation of the junction.



2019 AM Peak Actual / Demand Flows including Development Traffic at ORR / R134 Junction



2019 AM Peak IAWS / Cuisine De France Traffic at ORR / R134 Junction

5.3.4 Construction Traffic

With regard to construction traffic, the only junctions that have been assessed are the existing Nangor Road / Baldonnell Road and Nangor Road / Newcastle Road junctions as the estimated volumes of construction traffic are less than the operational flows that the junctions have been assessed for in the 2019 scenarios.

	2007	
	AM Peak	PM Peak
Max RFC	0.40	0.27
Max Queue Length	1	1

Table 5.5 Nangor Road / Baldonnell Road Summary of Construction Traffic AM Peak Modelling Results

	2007	
	AM Peak	PM Peak
Max RFC	0.46	0.61
Max Queue Length	4	11

Table 5.6 Nangor Road / Newcastle Road Junction Summary of Construction Traffic PM Peak Modelling Results

The results show that the junctions will operate within acceptable performance criteria.

5.4 Safety

5.4.1 General

As may be seen from the above analyses, the existing road network has capacity to accommodate the traffic that will be generated by the proposed development. Nonetheless it will be important to ensure that the proposed development does not lead to an increase in the probability of motor traffic accidents, particularly during the construction phase.

The Contractor will put in place a traffic management plan to ensure that:

- Adequate warning signs are provided internal and external to the site
- Construction vehicles do not travel at excessive / inappropriate speeds;
- Deliveries to the site are far as possible restricted to off peak hours;
- Designated set down areas are provided for deliveries;
- Vulnerable road users such as pedestrians and cyclists are adequately catered for.

5.4.2 Truck Turning Movements

An "Autotrack" analysis has been carried out to demonstrate that trucks can enter and exit the development site safely. The results of the analysis are shown graphically on Fig. 2 over.

6 PARKING

6.1 Parking Requirements and Provision

It may be seen from Table 4.1 above that the maximum number of cars and trucks on the developed site will be 350 and 54 respectively. It is proposed to provide 470 No. car parking spaces and 60 No. truck parking spaces on the site.

7 IMPACTS OF THE PROPOSED DEVELOPMENT

7.1 Impacts

All developments of this type result in the generation of increased traffic during both the construction and operational phases. The increased volumes of traffic directly affect all road users including motorists, cyclists and pedestrians. Possible significant effects to road users include the following:

- Increased journey times;
- Increased difficulty in crossing roads for pedestrians and cyclists;
- Increased risk of accidents for all road users, and
- Congestion on the existing road network and junctions as a result of the development.

Increased traffic may also result in significant impacts on the wider community and on the environment in terms of:

- noise
- vibration
- air quality
- water quality

These potential traffic related impacts have been dealt with in preceding sections.

7.2 Proposed Mitigation Measures

- Road sweeping and/ or the use of wheel washes will be put in place to mitigate dispersal of debris and mud onto the public highway.
- The majority of the material excavated onsite during construction works will be reused onsite for landscaping purposes i.e. mounding. Therefore this will reduce the numbers of HGVs entering and exiting the proposed site during the construction phase.
- Traffic signal settings per OSCADY models.

7.3 Residual Impacts

The traffic associated with the proposed development will contribute to increased traffic levels on the R136 Grange Castle Road. Based on the implementation of all the proposed mitigation and design measures the associated impacts will not be significant.

7.4 Interactions with Other Environmental Attributes

- Human Beings: The design of the site entrance and the overall layout of the development will be sufficient to accommodate pedestrians
- Air: The volumes of traffic associated with the development will not result in an adverse impact on sensitive receptors in the long term.
- Noise: Traffic noise associated with the development will result in a slight negative impact on receptors near the site entrance during the construction and operational phases.

7.5 Monitoring

Not applicable.

7.6 Reinstatement

Not applicable

7.7 Difficulties Encountered when Compiling this Report

No difficulties were encountered.

***APPENDIX D – Correspondence with Clifton Scannell Emerson
Associates and Interpretation Thereof***

Frank Moran

From: Ronan Geoghegan [ronan.geoghegan@csa.ie]
Sent: 21 March 2005 14:49
To: 'moran@morce.ie'
Subject: Grange Castle Business Park - Traffic

Tap generated
and in time

REFERENCE EML/02_028A/153
cc: the attention of Frank Moran

Frank,

Further to your phone call earlier today I would like to confirm the following with regard to the IWS site at Grange Castle Business Park

The AADT figure of 5700 given by WPS is based on our figures for Grange Castle Business Park as a fully developed business park

AADT of 5700 includes for a site of 41 acres with traffic flows of 230 in and 62 out for the am and 230 out and 62 in in the pm, please see the attached spreadsheet

The overall dispersion of traffic through the business park was taken to be 55% through the Outer Ring Road, 15% through the existing Nangor Road entrance and 20% through the proposed new Nangor Road entrance.

As it stands the proposed junction during the years 2007 to 2010 will always be under capacitated

Should you have any questions on the above please let us know

Regards
Ronan Geoghegan
Design Engineer

Clifton Spinnell Emerson Associates,
Newport Lodge,
Castledawson Ave.,
Stochess,
Co. Dublin

Tel: 01 2885005
Fax: 01 2885014
E-mail: ronan.geoghegan@csa.ie

Grange Castle Business Park (Extended Site)
Estimated Total Trip Generation for complete development 2019

Usage	Area of Site Hectares (Acres)	Gross Floor Area (sq.m.)	Trips per Day	A.M. Peak Hour Traffic Flow (veh./hour)		P.M. Peak Hour Traffic Flow (veh./hour)	
				IN	Out	In	Out
Wyeth, Medeva - Phase 1 Biotechnology Campus	34.185	67,517	2,340	563	94	300	500
- Phase 2		23,204	468	113	19	60	113
Biotechnology Campus 2	24.3 (60)	100,000	2,340	563	94	300	563
Novartis Pharma	1.40	8,131	120	36	12	12	36
Biotechnology 3	8.20	8,163	120	36	12	12	36
Biotechnology 4	8.20	8,163	120	36	12	12	36
Office Development at Lake and Canal per masterplan		5,800 2,840 20,672 8,485 17,914 5,600 12,840 6,756 23,400 Total office 113,157	10,238	1,587	154	103	1,177
Research & Science / Information Technology Commercial	51.1 (126)	114,370	12,625	1,645	180	190	1,325
Small & Medium Enterprise	15.6 (41)		3,075	230	62	62	230
Total			31,446	4,804	649	1,051	4,079
Less 30% allowance for staggered start and finish times			22,012	3,363	464	736	2,855

**IAWS GROUP plc – New Headquarters, Production & Distribution Facility at
Grange Castle, Co. Dublin
Traffic Impact Assessment**

February 2007

Wyeth Medica - Phase 1	34 (85)	107,517	2,340	563	94	300	563
Biotechnology Campus - Phase 2		23,204	468	113	19	60	113
Biotechnology Campus 2	24.3 (60)	100,000	2,340	563	94	300	563
Takeda Pharma	8 (20)	8,189	120	36	12	12	36
Biotechnology 4	8 (20)	3,169	120	36	12	12	36
Biotechnology 5	8 (20)	3,169	120	36	12	12	36
Office Development at Lake and Canal per Master Plan		5,600					
		12,840					
		20,672					
		8,495					
		7,814					
		5,600					
		12,840					
		6,796					
		23,100					
Total office		113,757	10,238	1,587	154	103	1,177
Research & Science / Information Technology	51.1 (126)	114,770	12,625	1,640	190	190	1,325
Small & Medium Enterprise	16.5 (41)		3,075	230	62	62	230
Total			31,446	4,804	649	1,051	4,079
Less 30% allowance for staggered start and finish			22,012	3,363	454	736	2,855

Table D1 Estimated Traffic Volumes for Fully Developed Business Park as provided by Clifton Scannell Emerson Associates

Wyeth Medica - Phase 1	34 (86)	107,517	2,340	563	94	300	563
Biotechnology Campus - Phase 2		23,204	468	113	19	60	113
Biotechnology Campus 2	24.3 (60)	100,000	2,340	563	94	300	563
Takeda Pharma	8 (20)	3,169	120	36	12	12	36
Biotechnology 4	8 (20)	3,169	120	36	12	12	36
Office Development at Lake and Canal per Master Plan		113,757	10,238	1,587	154	103	1,177
Integrated Circuit Manufacturing Campus	58.7 (145)	72,300	4,200	80	162	22	22
IAWS / Cuisine De France	9.3 (23)		1,044	126	30	7	119
Small & Medium Enterprise (IAWS Optional Lands)	2.8 (7)		519	39	10	10	39
Total based on IAWS / Cuisine De France / IC Manufacturing Facility			21,389	3,143	587	821	2,544
Less 30% allowance for staggered start and finish times (No reduction on IAWS / Cuisine / IC Manufacturing Facility)			16,546	2,262	602	582	1,823
Net of IAWS / Cuisine / ICM Campus			11,302	2,056	410	558	1,665

Table D2 Estimated Traffic Volumes for Fully Developed Business Park Updated for Actual Volumes from IAWS / Cuisine De France & Integrated Circuit Manufacturing Campus

ATTACHMENT C

BYRNE LOOBY PARTNERS

**HANLEY PEPPER, MICROSOFT GRANGE CASTLE BUSINESS PARK,
GEOTECHNICAL REPORT**

011600-22-RP-0001 A 0632

Received	Reference
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REPORT ISSUE

Report Title: Hanley Pepper, Microsoft Grangecastle Business Park, Geotechnical Report.

Issue No.	Date	Checked	Passed
1	July 2007	LKW	JJB
2	August 2007	LKW	JJB

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- Appendix B – Photographs of Soil/Rock cores
- Appendix C – Trial Pit Records
- Appendix D – Trial Pit Photos
- Appendix E – Dynamic Probe Test Records
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- Appendix G – Laboratory Test Results

Figures

- Figure 1 – Site Location Plan
- Figure 2 – Site Photos
- Figure 3 – Bedrock Geology of Dublin
- Figure 4 – Site Layout Plan
- Figure 5 – Site Investigation Layout Plan
- Figure 6 – Weathered Rock Contour Map
- Figure 7 – Strong Rock Contour Map

1.0 INTRODUCTION

Byrne Looby Partners (BLP) have been requested by Hanley Pepper Consulting Engineers to carry out a site investigation and prepare a geotechnical interpretative report for a proposed development at Grangecastle Business Park, Dublin 22. The site investigation, which consisted of coreholes, trial pits, dynamic probes, in-situ testing and laboratory analyses was carried out in June 2007. The site investigation was carried out in accordance with *BS5930 British Standard for Site Investigation*.

This report outlines the fieldwork and laboratory analyses carried out and provides geotechnical recommendations for the proposed development.

2.0 SITE DESCRIPTION

2.1 Site Location

The site is located in Grangecastle Business Park, Dublin 22 beside the Griffeen river.

Figure 1 presents the site location while Figure 2 presents photographs of the site taken in June 2007. The site measures approximately 7.5 Ha (18.5 acres) in area, approximately 430m in length, 250m in width to the north-west end and approximately 150m in width to the south-east end. The site is generally flat with current topographical levels varying from approximately 64.5m to 67m OD across the site.

2.2 Geology

The bedrock geology of Dublin is shown in Figure 3.

The Geological Map of Ireland published by the Geological Survey of Ireland indicates that the geology of the site consists of Carboniferous rocks of the Upper Paleozoic Era. The rocks are of the Calp Limestone which range in age from Chadian to Brigandian and consist of Limestones and Shales covered by Quaternary sediments.

2.3 Proposed Development

The proposed development consists of a main operational building, office buildings, lightweight electrical substations, water tanks and internal roads & drainage. The main area of the building will be subject to loadings of 4000kN to 5000kN per column (unfactored) while office areas will be subject to loadings of 2000kN – 3000kN per column (unfactored). The electric power substation/water tanks are expected to impose service bearing pressures of approximately 200kN/m². Floor area loadings for the main building are approximately 250kN/m² (SLS).

Figure 4 presents the site layout plan.

3.0 SITE INVESTIGATION

3.1 General

The site investigation fieldwork was carried out by IGSL in June 2007 in accordance with BS 5930 "British Standard For Site Investigations". A BLP engineer supervised the site works.

The aims of the site investigation were to determine the ground conditions at the site and foundation solutions for the proposed development. It also aims to provide proposal for material reuse and soil/rock excavatability. Environmental tests were also carried out to check for possible soil contamination.

The investigation consisted of carrying out and recording 10 No. Geobore-S coreholes (RC1 to RC10), 64 No. Insitu Dynamic Probe Tests (DP1 to DP73 but excluding DP25, DP53, DP58, DP61, DP63, DP66, DP67, DP69, DP70), excavating and logging 22 No. trial pits (TP1 to TP22) and soil/groundwater sampling at selected locations for geotechnical and environmental testing. It was originally intended to carry out 73 No. Dynamic Probe Tests but 9 No. were cancelled during the site investigation.

Figure 5 presents the site investigation layout plan.

3.2 Boreholes

10 No. (102mm diameter) coreholes (RC1 to RC10) were advanced to depths of between 7.7m and 8.4m using Geobore-S drilling. Polymer gel was used to flush the boreholes to increase core recovery in the soil during drilling and it was switched to air-mist for some core mins due to excessive losses of flush.

Continuous samples of soil/rock were recovered from the coreholes and contained in Geobore-S coreliners. The coreholes were carried out with at least 6.5m minimum rock coring into bedrock.

RC2 and RC8 were instrumented with 50mm diameter UPVC groundwater monitoring standpipes extending about 1m above ground level with response zones at 5.7m to 8.2m bgl and 3.8m to 7.9m bgl respectively. The response zones consisted of gravel filters with the upper part sealed with bentonite.

The Geobore-S corehole logs are presented in Appendix A while Appendix B contains the photographs of the soil/rock cores.

3.3 Trial Pits

22 No. trial pits (TP1 to TP22) were excavated to provide information on the extent and nature of superficial material, establish bedrock level, assess rippability of rock and to collect samples for environmental classification.

Appendix C includes the geotechnical records for trial pits TP1 to TP22 while Appendix D presents representative photographs taken from the trial pits.

3.4 Dynamic Probes

64 No. in-situ Dynamic Probe Tests (DP1 to DP73 but excluding DP25, DP53, DP58, DP61, DP63, DP66, DP67, DP69, DP70) were carried out to provide information on the strength and stiffness of the superficial material. The dynamic probe (DPH) uses a 50kg weight dropping through a height of 500mm to advance the probe cone into the soil. Probe readings (no. of blows) were recorded for each 100mm incremental penetration into the soil.

Appendix E presents the Dynamic Probe Test records.

3.5 Environmental Testing

Current EU legislation states that analytical testing mainly on leachate samples (liquid residue after soil samples are mixed with water) should be carried out to determine soil contamination levels for classifying how soils may be disposed of off site. Analytical leachate laboratory testing was therefore undertaken so that soils could be classified in accordance with EU Directive 2003/33/EC and suitable excavation plan and disposal route options could be determined.

In addition to the leachate samples the analytical testing required also includes tests on the dry soil matter.

The 2003/33/EC Directive includes limit values for acceptable wastes for inert, non-hazardous and hazardous landfills.

The analytical testing carried out included the parameters required for disposal at the KTK landfill site in Kilcullen, Co. Kildare and the Murphy Landfill site in Balbriggan Co. Dublin which are licensed by the EPA to take non-hazardous and inert soils respectively and derive their acceptance criteria from 2003/33/EC.

Environmental testing has been scheduled for disturbed samples removed during the site investigation and groundwater. Selected soil and water samples were forwarded to Alcontrol Laboratories, Dublin accompanied by Chain of Custody documentation and analysed for the relevant range of compounds and parameters.

The following 6 No. tests were carried out on the 10:1 (by weight) liquid to solid ratio leachates:

- Inert and non-hazardous waste suite (based on combined Murphy-KTK suite), which includes Metals, Chloride, Sulphate, Fluoride, Total Phenols, Total Dissolved Solids (TDS) and Dissolved Organic Carbon (DOC).

The following 6 No. tests were carried out on the dry soil matter:

- Metals, Petrol Range Organics (PRO), Diesel Range Organics (DRO), Mineral Oil, BTEX, Polychlorinated biphenols (PCBs), Total Organic Carbon (TOC), Total Cyanide, Free Cyanide,

Thiocyanate, Total Sulphate, Acid Soluble Sulphide, Total Sulphur, Total Phenols, pH, Chloride
Total 6 PAHs, Total 10 Dutch PAHs Total 16 EPA PAHs and Total 17 PAHs.

The following 5 No. tests were carried out on the groundwater:

- Petrol Range Organics (PRO), Diesel Range Organics (DRO), Mineral Oil, BTEX, Metals, Total Cyanide, Free Cyanide, Thiocyanate, Sulphate, Sulphide, Free Sulphur, Total Phenols, pH, Chloride, Total Aqueous 16 EPA PAHs.

To determine the sub-surface concrete requirements the following tests were carried out on the 2:1 (by weight) liquid to solid ratio leachates as well as on groundwater samples:

- pH Value and Sulphate

Appendix F contains the Environmental Test Results for Soil and Groundwater

4.0 GROUND CONDITIONS

4.1 General

In general the ground conditions across the site consisted of:

- Topsoil over
- Sandy gravelly CLAY over
- Limestone bedrock

Table 1 below presents the site stratigraphy:

Stratum	Depth to Top (mbgl)	Thickness (m)
Topsoil	0	0.1 – 0.4
Firm to stiff becoming very stiff sandy gravelly CLAY	0.1 – 0.4	0.4 – 2.1
Limestone bedrock	0.4 – 2.1	-

Table 1 – Stratigraphy

All samples obtained from site were transported to the soil laboratory of IGSL and the following laboratory tests were carried out on selected soil/rock samples.

- Moisture Content Tests
- Atterberg Limit Tests
- Particle Size Distribution Tests
- CBR Tests on Re-compacted Soil Samples
- Compaction Tests
- Point Load Tests (Rock)
- Unconfined Compressive Strength Tests (Rock)

Appendix G contains the laboratory test results of the soil/rock samples.

4.2 Topsoil

Topsoil was encountered immediately at ground level. The thickness of the topsoil varied between 0.1m and 0.4m with an average of about 0.3m.

4.3 Sandy gravelly CLAY

Firm sandy gravelly CLAY with increasing stiffness with depth (stiff to very stiff) was encountered beneath the topsoil. This material was found to contain occasional cobbles and boulders. The layer thickness encountered varied between 0.4m and 2.1m.

Based on a standard plasticity chart, the soils tested are typically classified as a low to intermediate plasticity clay.

The particle size distribution curves confirm presence of principally sandy gravelly CLAY.

The natural moisture contents of the top surface 0.5m ranges from 8.5% to 33.3%. This zone would be influenced by weather conditions at the time of sampling. The natural moisture contents from 0.5m to 1.5m bgl ranges from 12.4% to 22.9%.

3 No. laboratory CBR tests were carried out on samples taken from 0.5m bgl and the results obtained were 1.7%, 8.3% and 18.5% showing a degree of variability. A design value of 3% should be assumed with softer spots being removed during construction.

A standard 2.5kg Proctor Compaction Test was carried out on a sample from TP19 at 0.5m bgl. The natural moisture content was 10.8% and the optimum moisture content determined was 9.9%. This indicated that the soil is close to its optimum moisture content at its current state. However, as indicated by the previous tests, a reasonable degree of variability in optimum moisture content can be expected. It is anticipated that the soils engineering properties are likely to be moisture sensitive.

The dynamic probe values recorded vary between 3 and 11 indicating that the material is firm to stiff. These indicate that the soil has an undrained shear strength in the range of:

$$C_u = 50 \text{ kN/m}^2 \text{ to } 150 \text{ kN/m}^2$$

It should be noted that the top 0.5m of clay immediately below the topsoil is somewhat softer with DP values measuring less than 3.

4.4 Bedrock

10 No. Geobore-S coreholes were carried out to between 7.7m to 8.4m bgl. and 22 No. trial pits were excavated to expose bedrock. Bedrock was encountered at a depth of 0.4m to 2.5m bgl (63.3m to 66.3m OD) with the upper 0.3m – 1.8m being highly to moderately weathered rock.

Intact rock was encountered at 1.6m to 2.7m bgl (62.7m to 64.6mOD) and was classified as moderately strong to very strong, fine to medium grained, fresh to slightly and locally moderately weathered grey to dark grey cherty LIMESTONE.

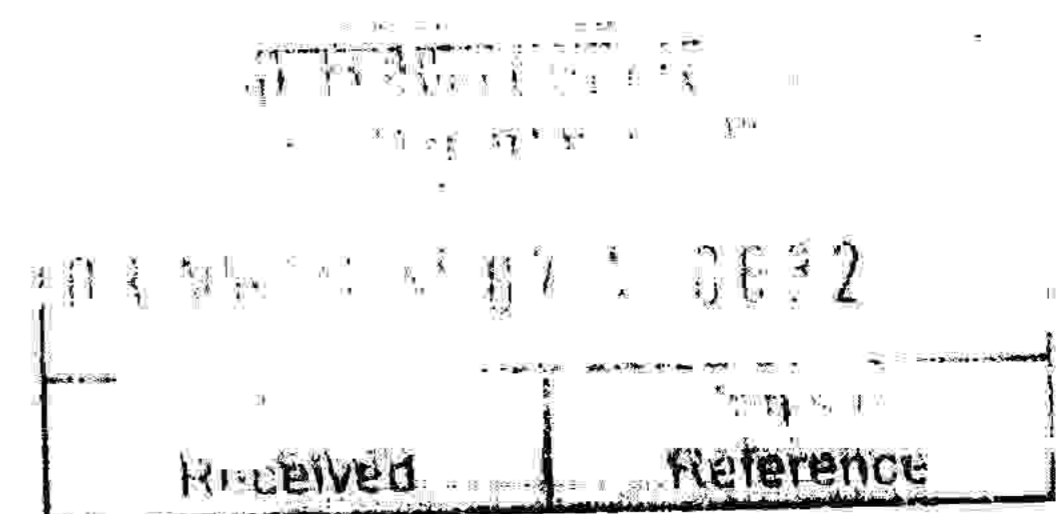


Table 2 below presents the properties of the rock:

Stratum	Weathered Rock	Intact Rock
Total Core Recovery, TCR	38-94 %	100%
Solid Core Recovery, SCR	0%	20-100%
Rock Quality Designation, RQD	0%	11-100%
Fracture Spacing, FI	-	>50mm

Table 2 – Properties of rock

Figure 6 presents the weathered rock contour map while Figure 7 presents the strong rock contour map.

Point Load Tests and Unconfined Compressive Strength (UCS) Tests carried out on the rock cores confirmed that the rock is moderately strong to very strong with UCS values ranging from 34.9 to 114.8MPa and Is50 values generally ranging from 1.34 to 5.42MPa. However, lower Is50 values were observed in RC1 (0.13MPa) at 3.1m bgl and RC9 (0.13MPa) at 2.8m bgl.

4.5 Groundwater

Groundwater strikes were encountered in the boreholes at depths of 0.8m – 1.4m bgl during drilling.

In the trial pits, water seepages were encountered as Table 3 illustrates:

Location	Depth (m bgl)	Soil/Rock Layer
TP1	2.4	Bedrock
TP3	2.5	Bedrock
TP6	1.9	Bedrock
TP7	3.0	Bedrock
TP8	2.4	Bedrock
TP12	2.5	Bedrock
TP13	2.3	Bedrock
TP14	2.4	Bedrock
TP18	2.2	Bedrock
TP20	2.3	Bedrock
TP21	2.3	Bedrock
TP22	2.1	Bedrock

Table 3- Water Seepages observed during Trial Pitting (25-27 June 2007)

Generally the groundwater table is at approximately 2m to 2.5m bgl with the highest water level recorded in TP6 of 1.9m bgl.

5.0 ENVIRONMENTAL TEST RESULTS

5.1 Soil to Remain on Site

Irish contaminated land legislation is contained mainly in the adopted European Union directive(s) on the protection of groundwater. To date, there are no criteria that can be applied to situations where the water table is not endangered or where there is no discharge to a watercourse that is a regulated habitat or a source of drinking water. There are no statutory criteria for the concentrations of contaminants in soils that are acceptable for industrial, commercial, public service or residential purposes.

For this reason it is necessary (and common practice in Ireland) to invoke international standards to assess whether soil is contaminated and whether a site requires remediation. Recommendations in this report are based on Dutch Intervention Values. In relation to the Dutch values, the Intervention Value represents that concentration of a contaminant in soil or groundwater, which is unacceptable ("the functional properties of the soil or groundwater are seriously diminished") and must be treated.

Generally the results on samples from the site did not exceed the action levels of the "Dutch list".

Appendix F contains the environmental testing results for soil and water samples obtained from site.

5.2 Soil Disposal to Landfill

Referring to the present EC Directives and the requirements of the Irish Landfill Sites a combination of leachate and dry matter tests are required to classify the soils environmental properties. Various limits exist for waste acceptance as follows:

Inert Waste (Class 1)

Inert material (Non-Contaminated) may be disposed of at a licensed site in Ireland subject to the individual landfill criteria.

Inert Waste but with low levels of contamination (Class 2).

This kind of mildly contaminated material can be disposed of to selected licensed landfills in Ireland, for e.g. Murphy Environmental, Ballbriggan, Co. Dublin.

Non-Hazardous Waste but with high PAH and DRO (Class 3)

Non-hazardous waste or moderately contaminated material can be accepted to a non-hazardous licensed landfill in Ireland. KTK landfill, Co. Kildare, operated by Greenstar is the only landfill in Ireland that accepts moderately contaminated soil.

Hazardous Waste (Class 4)

Large amounts of hazardous or heavily contaminated material as outlined by 2003/33/EC cannot be disposed of in Ireland and must be disposed of to Mainland Europe to a waste treatment facility. The more economical option for disposing of hazardous soil may be to transport it overseas.

The analytical evaluation is based on an examination of the detected values along with the limit values provided in Directive 2003/33/EC, in the EPA list of limits for inert waste acceptance. Reference has been made to the Murphy & KTK Waste License. The table below presents a summary of landfill classification based on the environmental test results.

Sample	Depth (m)	Landfill Classification	Comments
TP6	0.5	CLASS 1	All values below inert limits
TP1	1.5	CLASS 1	All values below inert limits
TP22	1.5	CLASS 1	All values below inert limits
TP15	2.5	CLASS 1	All values below inert limits
TP14	0.5	CLASS 3	Antimony, Nickel and Sulphate levels between inert and non-hazardous limits
TP12	1.5	CLASS 1	All values below inert limits

Table 4 – Summary of Landfill Classification based on Environmental Test Results

The following high values were recorded in the dry matter analysis:

Parameter	Concentration (mg/kg)	Location	Depth (m bgl)	Inert Limit Value (mg/kg)	Non-Hazardous Limit Value (mg/kg)
Antimony	0.07	TP14	2.5	0.06	0.7
Nickel	0.47	TP14	2.5	0.4	10
Sulphate	1786	TP14	2.5	1000	20,000

Table 5 – Summary of Concentrations Recorded for Antimony, Nickel and Sulphate

With respect to the leachate and dry matter analysis results, 5 No. soil samples tested can be described as non-contaminated or as inert waste (Class 1) and 1 No. soil sample classified as non-hazardous waste but with high PAH and DRO (Class 3).

Appendix F contains the environmental testing results for soil samples obtained on site.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Foundation

The proposed development is understood to consist of a main operational building, office buildings, lightweight electrical substations, water tanks and internal roads & drainage. The main area of the buildings will be subject to loadings of 4000kN to 5000kN per column (unfactored) while office areas will be subject to loadings of 2000kN – 3000kN per column (unfactored). The electric power substation/water tanks are expected to impose service bearing pressures of approximately 200kN/m². The floor area loadings for the main building are approximately 250kN/m² (SLS).

For lightweight buildings, foundations can be placed on the boulder clay or weathered rock at approximately 1.25m bgl. An allowable bearing pressure of 200kN/m² can be assumed. Local soft areas should be removed. Total settlement in this case should be less than 10mm and differential settlements less than 5mm.

The floor slab levels are proposed to be fixed at approximately 0.5-1m bgl on compact structural fill (E = 150MPa). To achieve a maximum allowable bearing pressure of 250kN/m², a further 0.5m to 1m of insitu soil underlying the floor slabs, i.e. 1.5m below natural ground level will need to be removed and replaced with compact structural fill. This will allow the foundation loads to be transferred to the underlying stiff sandy gravelly CLAY or weathered bedrock. Under these conditions, the predicted total settlement will be less than 10mm and differential settlement less than 5mm.

The recommended foundation solution for the heavier loaded buildings is spread foundations founded on strong Limestone bedrock due to the relatively shallow superficial overburden with thickness ranging from 0.4m to 2.1m bgl.

An allowable bearing pressure of 1000 kN/m² can be assumed for the strong Limestone at a depth of 1.6m to 2.7m bgl (62.7m to 64.6m OD). Under these conditions, the predicted total settlement will be less than 6mm with differential settlement of approximately 3mm.

It is proposed to have the structural pad levels fixed at approximately 1.5m bgl. The overburden soil and the weathered rock should therefore be excavated to expose the strong Limestone bedrock and lean mix concrete should be used to transfer the foundation load to the underlying competent Limestone bedrock where relevant.

There is a shallow gradient across the site and it may be required to fix a single floor level. However, notwithstanding this, Table 4 below presents the existing ground level at each of the borehole locations, the level at 1.5m below this (being the expected underside of structural pads), the level of the strong rock and the fill of lean mix concrete required to achieve this foundation level.

Location	Existing Ground Level (m OD)	Foundation Level (m OD) (1.5m bgl)	Strong Rock Level (m OD)	Fill of Lean Mix Concrete (m)
RC1	66.7	65.2	64.0	1.2
RC2	66.2	64.7	64.6	0.1
RC3	65.8	64.3	63.4	0.9
RC4	66.6	65.1	64.6	0.5
RC5	65.8	64.3	63.8	0.5
RC6	64.9	63.4	63.3	0.1
RC7	66.2	64.7	64.3	0.4
RC8	65.2	63.7	63.5	0.2
RC9	64.4	62.9	62.7	0.2
RC10	65.8	64.3	64.2	0.1

Table 6 - Level of strong rock and fill of lean mix concrete

It is very important to note that all formations should be kept clean and dry until they are blinded or until foundations are cast. All foundation formations should be inspected by suitably qualified and experienced engineer.

6.2 Rock Excavatability

A 15-ton tracked excavator (JCB JS130) was used to excavate the trial pits. The trial pit excavations were generally terminated when weathered bedrock was encountered. However, excavations into the weathered limestone bedrock were carried out in TP7 & TP14 until strong intact Limestone bedrock was encountered. It can therefore be assumed that the weathered rock may be excavated with conventional excavators. However below this depth, due to the presence of strong Limestone bedrock at 1.6m to 2.7m bgl (62.7m to 64.6m OD) excavation may be more difficult and rock breakers may be required.

6.3 Soil Resusability

Soil reusability has been based on moisture content, CBR, SPT and particle size distribution tests.

From the trial pit logs, the overburden soil is described as firm to stiff becoming very stiff, rendering the soil potentially suitable for re-use. However from the laboratory test results, the soil from 0.3m to 1m bgl is wet with recorded moisture content as high as 33%. Therefore, further processing of material by air-drying or lime stabilisation may be required.

However due to the relatively flat nature of the site, it may not be required to re-use excavated soil. This can be further assessed when the proposed floor and pavement levels are fixed.

6.4 Road Construction

It is anticipated that the in-situ subgrade CBR values will typically range from 2% to 5%. 3 No laboratory CBR tests were carried out on samples taken from 0.5m bgl and the results obtained were 1.7%, 8.3% and 18.5% showing a degree of variability. A design value of 3% should be assumed with softer spots being removed during construction.

Road and other paved areas can be constructed on the firm to stiff sandy gravelly clay layer which was found beneath the topsoil. The suggested road construction should consist of 150mm CL804 sub-base layer and 300mm capping layer (Class 6F2). All foundations should be inspected to ensure that all soft spots have been removed prior to placing of the capping layer.

In-situ CBR tests should be undertaken during the construction stage, as these values may be weather dependent.

6.5 Subsurface Concrete

6 No. soil samples and 5 No. water samples were tested for sulphate content and pH-value. The soil sample tests were carried out on 2:1 water/soil extract. The results are as follow:

Borehole	Sample	Depth to Top (m bgl)	pH Value (I)	Sulphate Content (g/l)
TP06	Soil	0.5	8.43	<3
TP1	Soil	0.5	8.41	6
TP22	Soil	1.5	8.49	4
TP15	Soil	1.0	8.43	4
TP14	Soil	1.0	8.03	155
TP12	Soil	-	8.44	<3
TP6	Water	-	7.77	45
TP1	Water	-	7.61	190
TP12	Water	-	7.76	162
TP14	Water	-	7.60	52
TP20	Water	-	4.65	192

Table 7 – The Sulphate Content and pH Value Test Results

Low sulphate values were measured and the detected pH values were between 7.6 and 8.49.

Therefore “DS1: AC-1” concrete classification in accordance with BRE Special Digest 1 should be used.

6.6 Environmental Recommendations

6.6.1 Soil

6 No. soil samples were taken from depths of between 0.5m and 2.5m bgl. Contaminant levels in the soil are below Dutch Intervention Limit values. This means that soil from 0m to 2.5m bgl does not pose a health risk to future site users and can therefore remain in situ unless excavation is required for the proposed development.

The samples were also analysed for the inert and non-hazardous waste criteria (based on Murphy/KTK Landfill) up to 2.5m bgl. Contaminant concentrations for 5 No. soil samples tested were below the inert limits for most landfills (Class 1) and 1 No. soil sample was classified as non-hazardous waste but with high PAH and DRO (Class 3). Consultation with the local landfill operatives will be required before the soil is disposed of off site.

6.6.2 Groundwater

6 No. groundwater samples were taken and analysed for a range of parameters. The groundwater did not exhibit levels of contamination greater than the Dutch Intervention Values.

7.0 SUMMARY

In general the ground conditions across the site consisted of:

- Topsoil over
- Sandy gravelly CLAY over
- Limestone Bedrock

Generally the groundwater is at about 2m to 2.5m bgl.

The proposed development is understood to consist of a main operational building, office buildings, lightweight electrical substations, water tanks and internal roads & drainage.

For lightweight buildings, foundations can be placed on the boulder clay or weathered rock at approximately 1.25m bgl. An allowable bearing pressure of 200kN/m² can be assumed. Total settlements in this case should be less than 10mm and differential settlements less than 5mm.

The floor slab levels are proposed to be fixed at 0.5 to 1m bgl with overburden soil excavated to 1.5m bgl, founded on stiff sandy gravelly CLAY or weathered bedrock. Compact structural fill (E=150Mpa) will be used to make up to the floor slab levels. Total settlements should be less than 10mm and differential settlements less than 5mm under an allowable bearing pressure of 250kN/m².

The recommended foundation solution for the heavier loaded buildings is spread foundations founded on strong Limestone bedrock. An allowable bearing pressure of 1000 kN/m² can be assumed for the strong Limestone at a depth of 1.6m to 2.7m bgl with predicted total settlement less than 6mm and differential settlement of approximately 3mm.

It is proposed to have the structural pad levels fixed at approximately 1.5m bgl. The overburden soil should therefore be excavated to expose the strong Limestone bedrock and lean mix concrete should be used to transfer the foundation load to the underlying strong bedrock.

It can be assumed that the weathered rock may be excavated with conventional excavators. However if excavation into the strong bedrock is anticipated, then rock breakers may be required.

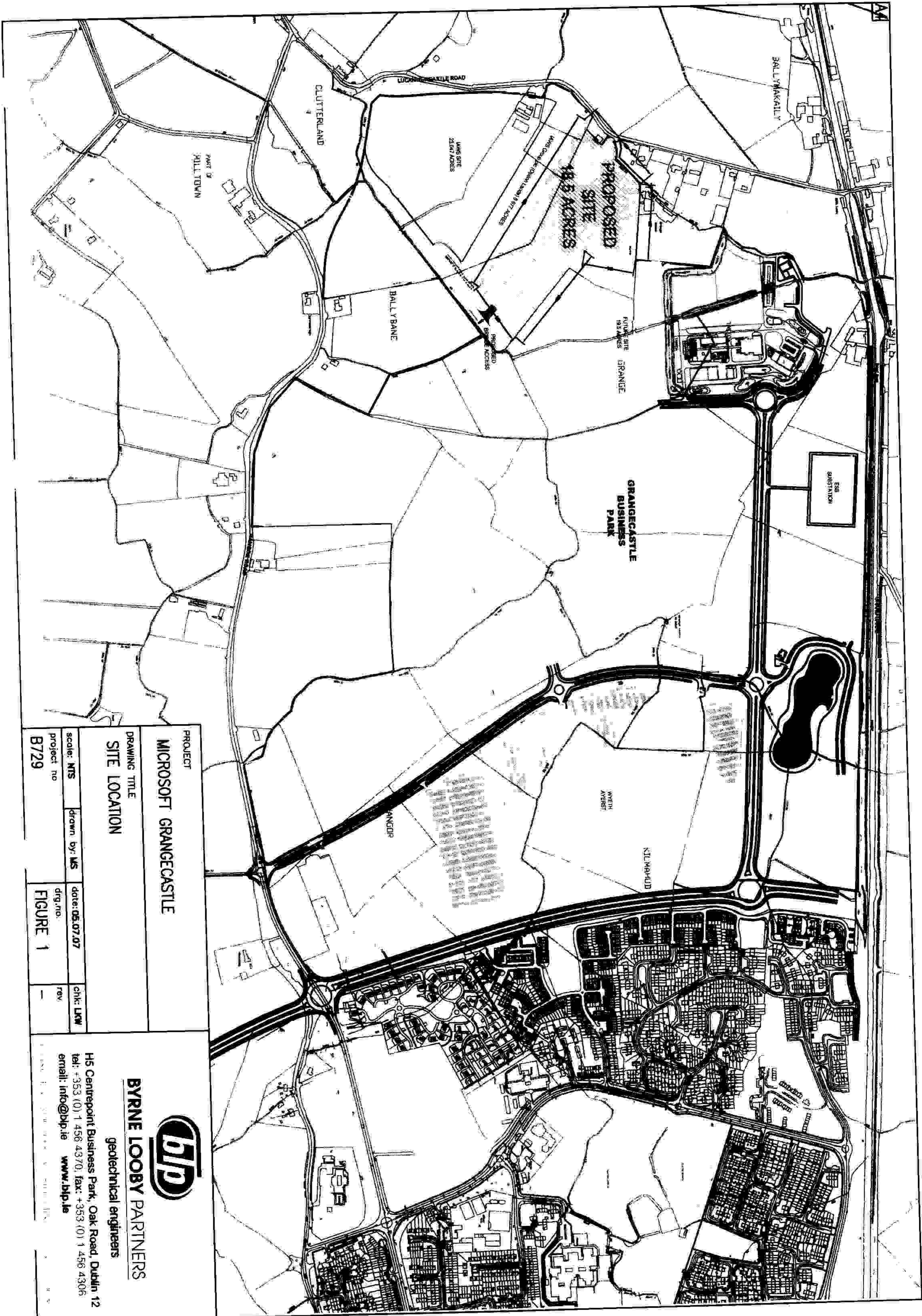
The soil from 0.3m to 1m bgl is wet and further processing of material by air-drying or lime stabilisation may be required.

The suggested road construction should consist of 150mm CL804 sub-base layer and 300mm capping layer (Class 6F2). A design CBR value of 3% should be assumed with softer spots being removed during construction.

"DS1: AC-1" concrete classification in accordance with BRE Digest 1 should be used.

6 No. soil samples were below the inert limits for most landfills (Class 1) and 1 No. soil sample was classified as non-hazardous waste but with high PAH and DRO (Class 3). Consultation with the local landfill operatives will be required before the soil is disposed of off site.

The soil does not pose a health risk to future site users and can therefore remain in situ unless excavation is required for the proposed development. The groundwater did not exhibit levels of contamination higher than the Dutch Intervention Values.



PROJECT		MICROSOFT GRANGECASTLE	
DRAWING TITLE		SITE LOCATION	
scale: NTS	drawn by: MS	date: 05.07.07	chk: LKW
project no		drg.no.	rev
B729		FIGURE 1	

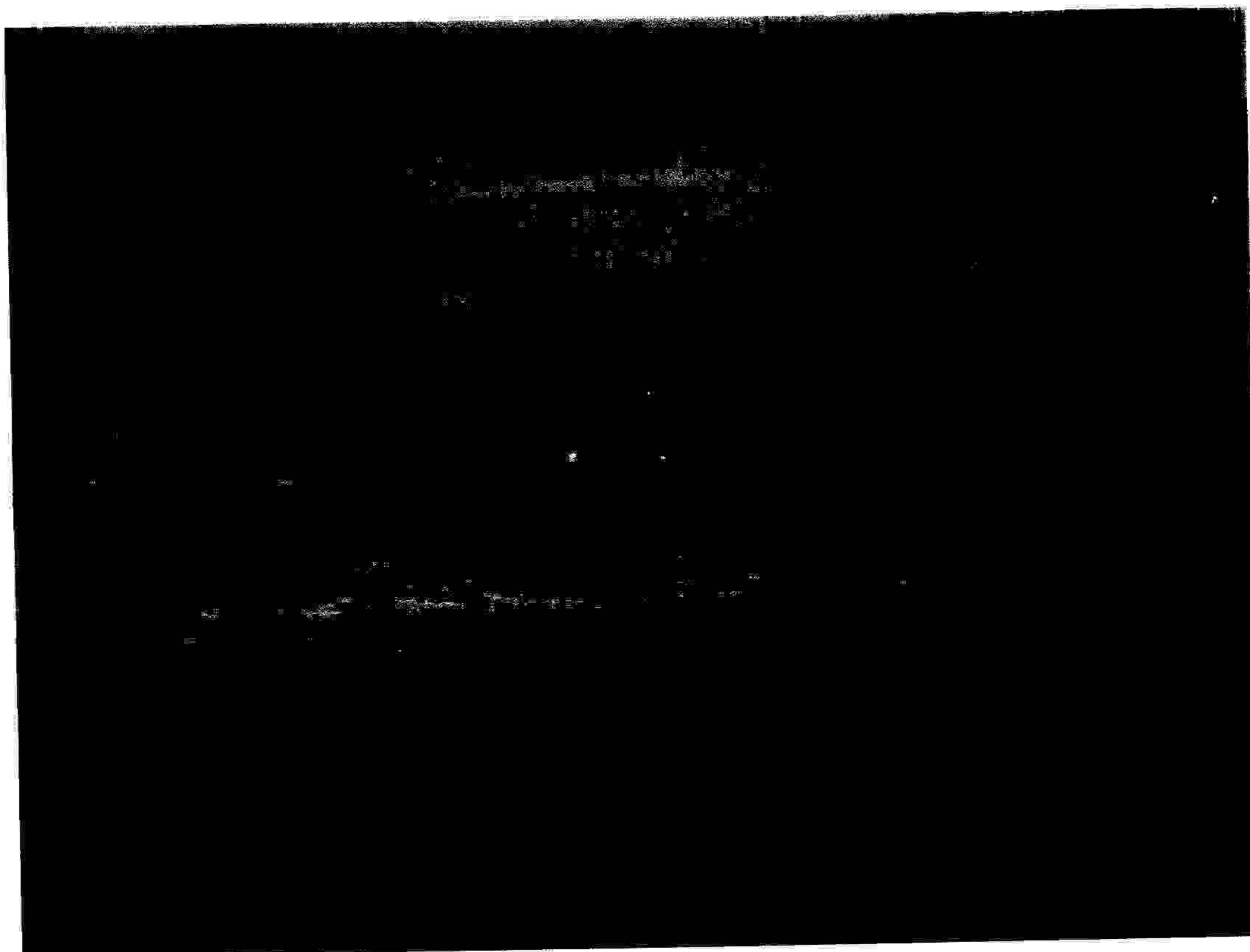


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SITE PHOTO No. 1 – BOUNDARY WITH GRIFEEN RIVER



SITE PHOTO No. 2

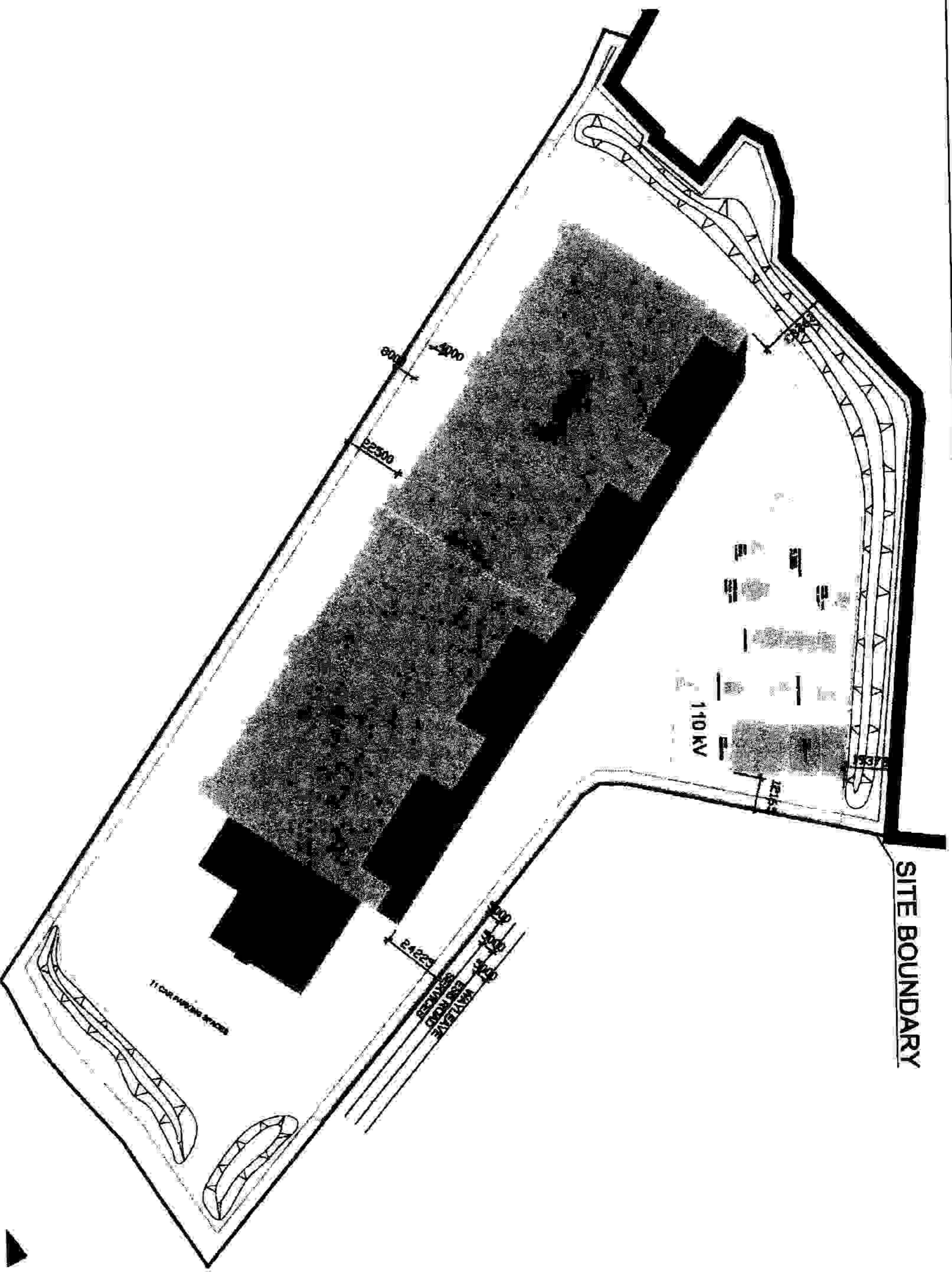
PROJECT			
MICROSOFT GRANGECastle			
DRAWING TITLE			
SITE PHOTO'S			
scale: NTS	drawn by: MS	date: 06.07.07	chk: LKW
project no		drg. no.	rev.
B729		FIGURE 2	—



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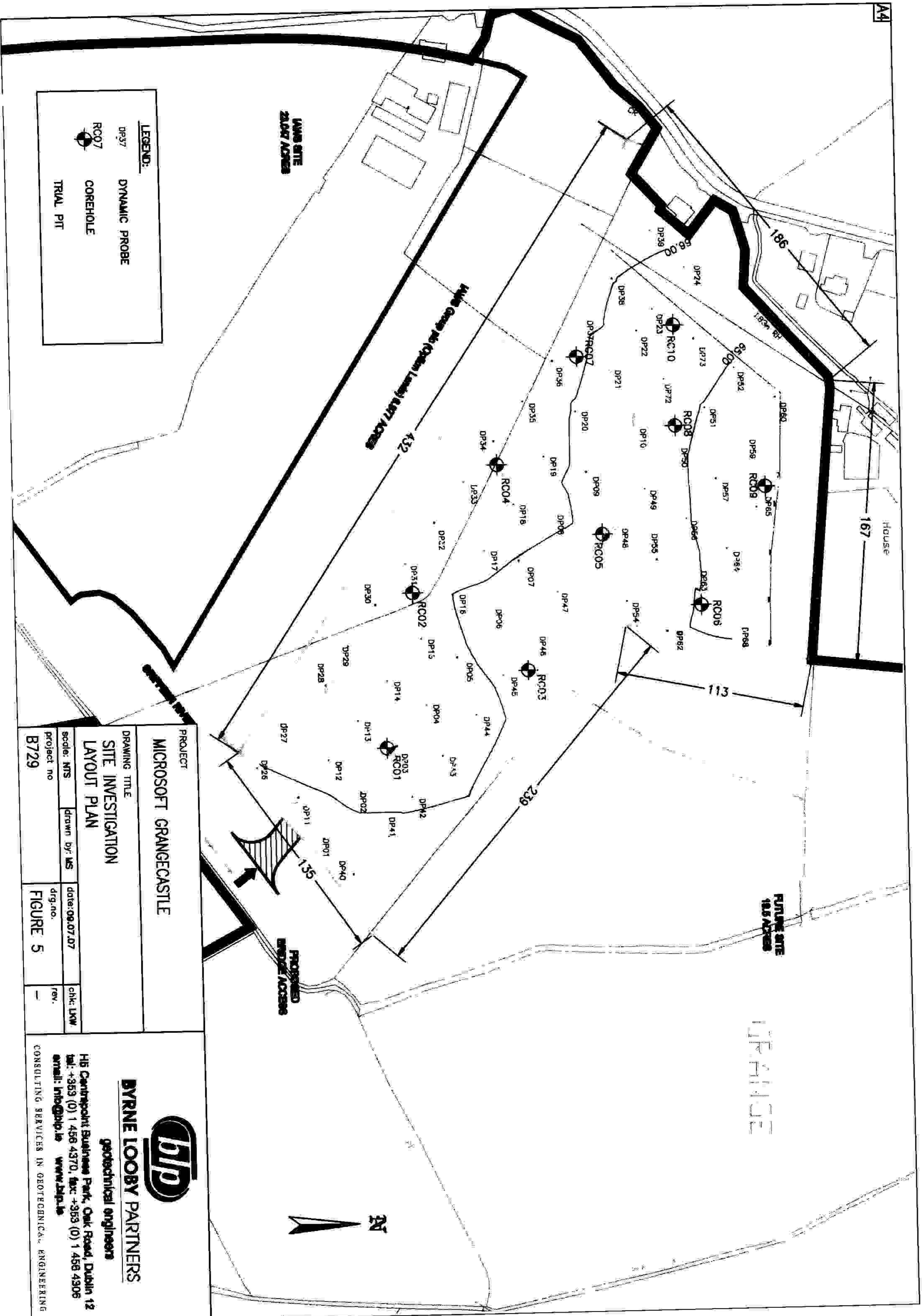


PROJECT		MICROSOFT GRANGECASTLE	
DRAWING TITLE			
SITE LAYOUT PLAN			
scale: NTS	drawn by: MS	date: 05.07.07	chk: LKW
project no		drwg. no.	rev.
B729		FIGURE 4	-



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LEGEND:

- DP37 DYNAMIC PROBE
- RC07 COREHOLE
- TRIAL PIT

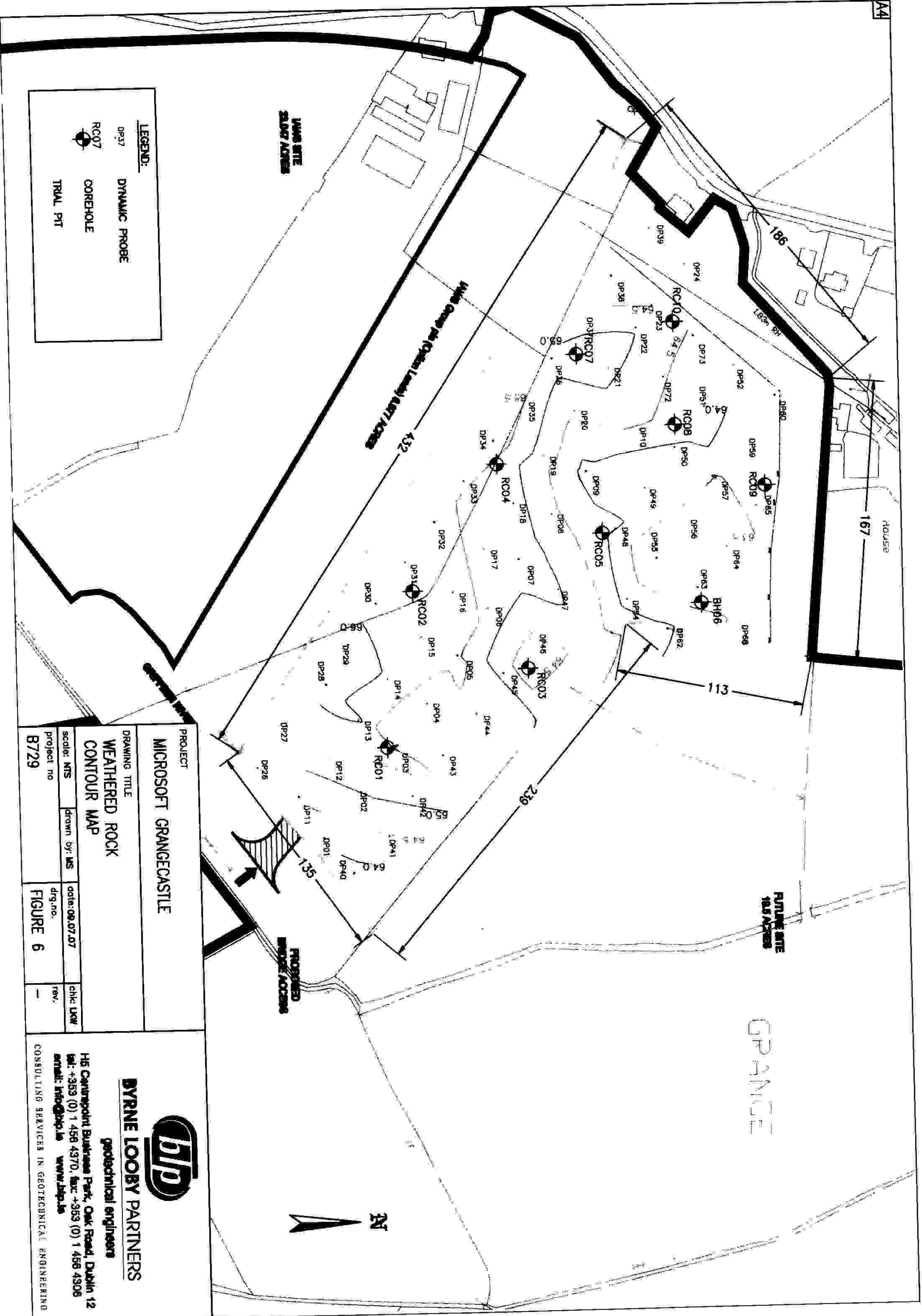
PROJECT		MICROSOFT GRANGECASTLE	
DRAWING TITLE		SITE INVESTIGATION LAYOUT PLAN	
scale: NTS	drawn by: MS	date: 09.07.07	chk: LKW
project no		drg. no.	rev.
B729		FIGURE 5	-

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LEGEND:

- DP37 DYNAMIC PROBE
- RC07 COREHOLE
- TRIAL PIT

PROJECT		MICROSOFT GRANGECASTLE	
DRAWING TITLE		WEATHERED ROCK CONTOUR MAP	
scale: NTS	drawn by: MS	date: 09.07.07	chk: LKW
project no		fig. no.	rev.
B729		FIGURE 6	-

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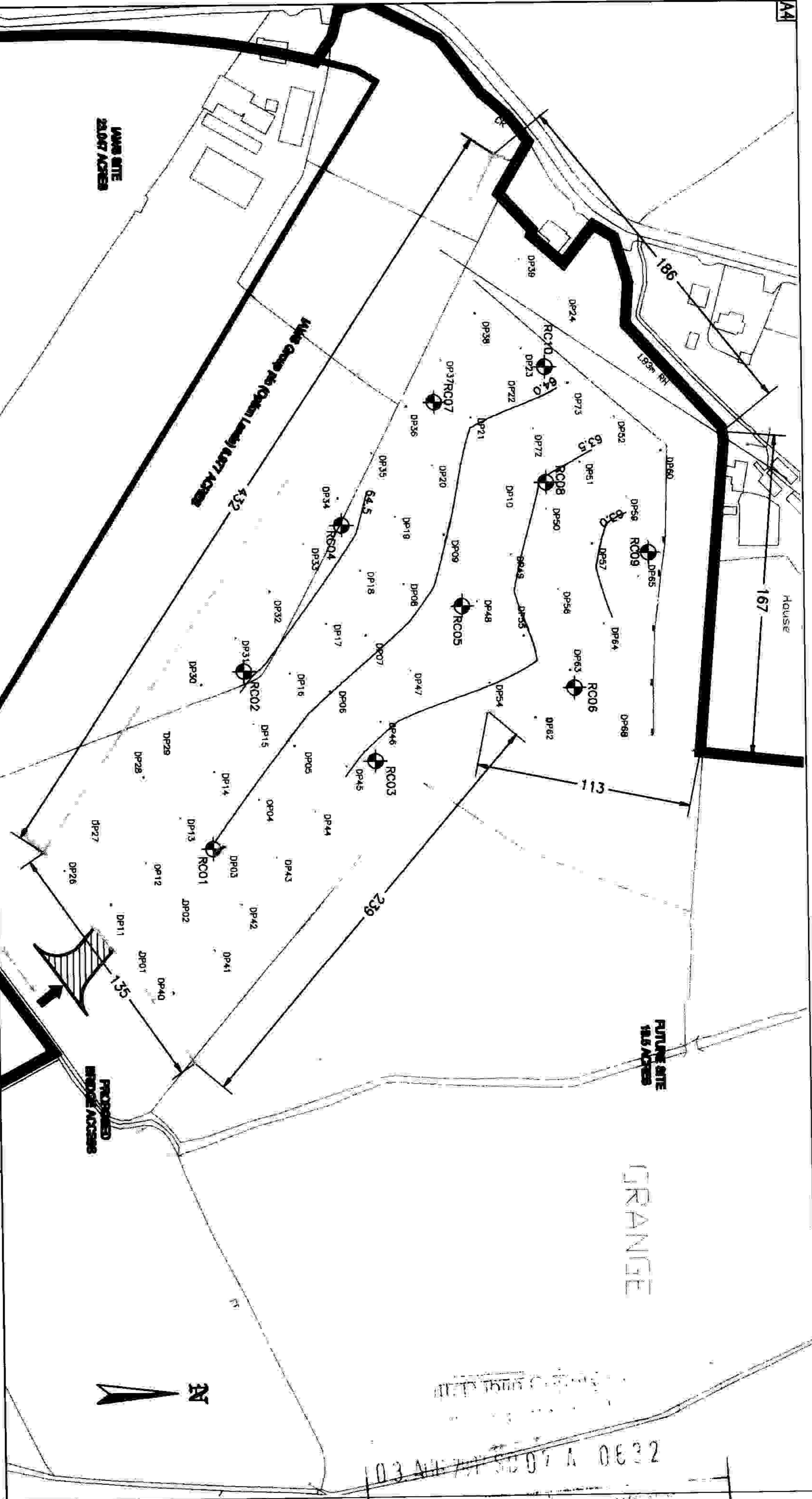
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CONSULTING SERVICES IN GEOTECHNICAL ENGINEERING

LEGEND:

- DP37 DYNAMIC PROBE
- RC07 COREHOLE
- TRIAL PIT



PROJECT		MICROSOFT GRANGECASTLE	
DRAWING TITLE		STRONG ROCK CONTOUR MAP	
scale: NTS	drawn by: MS	date: 09.07.07	chk: LKW
project no: B729		fig. no: FIGURE 7	rev: -

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Received Reference

ATTACHMENT D

BIOSPHERE ENVIRONMENTAL SERVICES

FLORA AND FAUNA ASSESSMENT REPORT

Dublin City Council
03 AUG 2007 10 06 32
Received Reference

**GRANGE CASTLE SITE
COUNTY DUBLIN**

FLORA AND FAUNA ASSESSMENT

JUNE 2007

Prepared for

PROJECT MANAGEMENT LTD

by

**Biosphere Environmental Services
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1.0 RECEIVING ENVIRONMENT

1.1 Introduction

Biosphere Environmental Services was commissioned by Project Management Ltd to assess the ecological impacts of a proposed development at a site at Grange Castle, Clondalkin, Co. Dublin.

The assessment is based on a site survey that was carried out in May 2006 as part of a study for an adjoining site. A low level colour aerial photograph of the site taken in summer 2007 was used to assess changes in the area since the field survey of 2006.

The site was visited on 18th May 2006 when an inventory of habitats and flora species present on the site was compiled. Habitats are categorised according to Fossitt (2000). Plant nomenclature follows Scannell & Synnott (1987). Observations were made on fauna species present. Presence of mammals is indicated principally by their signs, such as dwellings, feeding signs or droppings - though direct observations are also occasionally made. The nature and type of habitats present are also indicative of the mammal and bird species likely to be on site.

No part of the site is covered by a conservation designation. However, the Grand Canal proposed Natural Heritage Area (site no. 02104) occurs less than 1 km to the north. This linear site, which starts at the mouth of the Liffey and passes through the entire of County Dublin and continues westwards through Kildare, has extensive habitat, flora and fauna interests. There are no further designated sites within a radius of at least 2 km of the site.

1.2 Habitats, vegetation and flora

The site is agricultural land that had been intensively managed until the recent past. A large development under construction occurs to the west and south-west, with further developed land to the north. The Griffeen River, which is a tributary of the River Liffey, runs close to the south-eastern boundary. This sector of the Griffeen River has been realigned recently. A new road occurs to the other side of the river corridor. An agricultural field, which is now essentially isolated by developments, occurs immediately east of the site.

The majority of the site is unmanaged arable land – at the time of survey an unmanaged wheat sward was growing from the stubble and waste from the previous season (volunteer wheat). While containing old stubble and a high diversity of weed species, this was still accommodated in the habitat class **Arable crops BC1**. Ruderal (weed) species present included chickweed *Stellaria media*, common speedwell *Veronica persica*, redshank *Polygonum persicaria*, fumitory *Fumaria* spp., charlock *Sinapis arvensis* and rank grasses such as common bent *Agrostis stolonifera*.

Recently, the south-eastern part of the field has been disturbed by vehicle tracks and this area of the site is classified as **Bare ground ED2**.

A low (c.1.5 m), remnant **Hedgerow WL1** occurs in the southern sector of the site and part of this has been removed by the trackway referred to above. This hedge is predominantly of hawthorn *Crataegus monogyna* and elder *Sambucus nigra*, with some ash *Fraxinus excelsior* and brambles *Rubus fruticosus*. Nettles *Urtica dioica* and hogweed *Heracleum sphondylium* occur along the hedge base and field edge. This hedge can only be considered as a remnant. A further remnant hedgerow occurs along the northern boundary, between the site and an adjoining industrial unit. This also is mainly of hawthorn. A short **Treeline WL2** occurs along the north-west boundary, separating the site from housing.

A recently constructed narrow road passes through the northern part of the site.

The Griffeen River is an example of a **Lowland river FW2**. This section of the river has been realigned, with the banks landscaped. No aquatic plants were observed within the river in May 2006. .

1.3 Fauna

This site has low potential for mammal species other than ubiquitous Irish mammals such as brown rat *Rattus norvegicus*, rabbit *Oryctolagus cuniculus* (frequent), pygmy shrew *Sorex minutus*, long-tailed field mouse *Apodemus sylvaticus* and fox *Vulpes vulpes*. There are no potential roost sites for bats.

At the time of survey in May 2006, the unmanaged arable field attracted a good range of small birds due to the frequency of weed species. Of some note was the presence of several skylarks *Alauda arvensis*, a species characteristic of mixed farmland. Also present were chaffinches *Fringilla coelebs*, goldfinches *Carduelis carduelis*, linnets *Carduelis cannabina*, woodpigeons *Columba palumbus*, and pheasant *Phasianus colchinus*. The hedgerows associated with this site are poor in quality and the only birds recorded were blackbird *Turdus merula* and blue tit *Parus caeruleus*.

1.4 Conservation assessment for site

This site has until recently been intensively managed for agriculture. Arable land is not of any conservation value as it is a highly artificial and widespread habitat. The hedgerows associated with the site (one within and one on boundary) are remnants and not of any conservation value. The adjoining Griffeen River is a small watercourse that has been realigned in the recent past. However, it does provide useful habitat diversity and a corridor for wildlife and thus has some local conservation value.

The mammal species associated with the site are common and generally ubiquitous in the Irish countryside and none is of any particular conservation importance. Most of the birds associated with the site are species commonly found in the open countryside. The occurrence of skylark is of some note as this is listed by Newton et al. (1999) as a species of medium conservation concern (Amber list), though is still fairly widespread in eastern Ireland, including Co. Dublin, where arable farming is practised (Coombes et al. 2002).

The site is not covered by any conservation designation.

2.0 PREDICTED IMPACTS

The proposed development will utilise all of the site area. Access will be at the southern end from the existing new road, with a bridge over the Griffeen River.

The loss of arable land is not of significance as it is not of any conservation value. The internal hedgerow is a mere remnant and its loss is not of significance. The hedgerow and treeline sections along the northern boundary of the site are likely to remain intact.

The new access road will cross the Griffeen River and due care will be required to prevent any negative impacts on this river.

The loss of the habitats within the site will remove foraging and nesting habitat for a range of bird species. The principal bird species of conservation interest is the skylark. However, this species is only attracted to the site because it has been used for arable farming - as the unmanaged sward becomes taller and more coarse, conditions will become less attractive for skylark and other seed eating birds. Skylark will still occur in mixed farmland elsewhere in the vicinity, for instance to the west of the site. Overall, the impact on birds and mammals by the loss of the field and hedgerow section is of Negligible significance.

The development could not have any impacts, direct or indirect, on the Grand Canal proposed Natural Heritage Area.

3.0 MITIGATION MEASURES

3.1 Protection of nesting birds

Section 40 of the Wildlife Act 1976, as amended by Section 46 of the Wildlife (Amendment) Act 2000, restricts the cutting, grubbing, burning or destruction by other means of vegetation growing on uncultivated land or in hedges or ditches during the nesting and breeding season for birds and wildlife, from 1 March to 31 August.

While the site is obviously former cultivated land, its present rank condition is likely to support ground nesting birds and possibly skylark. Therefore, it is recommended that site clearance should take place outside of the bird nesting season (unless it can be shown that there are no birds nesting and such is agreed with the National Parks & Wildlife Service).

3.2 Landscaping

The opportunity exists to encourage the presence of wildlife within the site by including an appropriate range of native trees and shrubs within the landscaping proposals. Plantings at the river end of site would be particularly useful as already there have been new plantings along the river margins. Suggested tall trees include ash and oak *Quercus robur*, with small trees such as alder *Alnus glutinosa*, hawthorn, blackthorn *Prunus spinosa*, hazel *Corylus avellana*, native willow *Salix* spp, holly *Ilex aquifolium*, birch *Betula pubescens* and rowan *Sorbus aucuparia*. Also of value are crab apple *Malus sylvestris* and roses which produce hips (e.g. dog rose *Rosa canina*).

3.3 River crossing

During the construction of the new access road, particular care will need to be taken at the river crossing point. A standard bridge would be the preferred structure as this will allow wildlife to pass along the river corridor unhindered.

During construction works, the entry into the water of potential pollutants, including suspended solids, will need to be strictly controlled.

It is recommended that all works in the vicinity of the Griffeen River be carried out in accordance with the Eastern Regional Fisheries Board guidance document "*Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*".

The Eastern Regional Fisheries Board should also be consulted in relation to the design and construction of the proposed crossing structure.

4.0 RESIDUAL IMPACTS BY PROPOSED DEVELOPMENT

Owing to the existing low ecological interests at this site, and providing the mitigation measures as suggested are followed, it is considered that the proposed development would not have any adverse impacts on the ecological interests of the area.

5.0 REFERENCES

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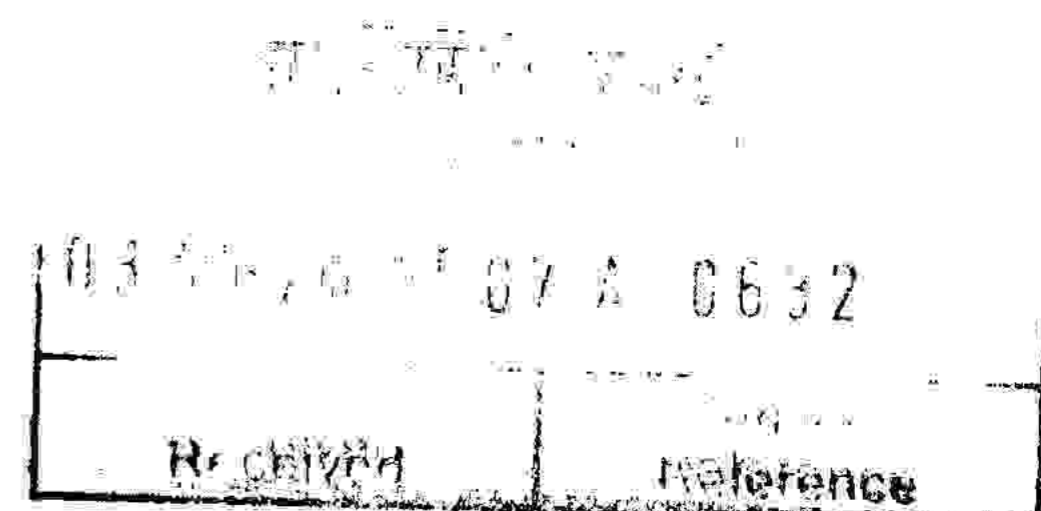
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ATTACHMENT E

PM GROUP

NOISE IMPACT ASSESSMENT REPORT



**DUBLIN 3-Grange
Environment Impact Assessment**

Project No.: 011600

NOISE IMPACT ASSESSMENT

File No. 011600.22.140

Document No: 011600-22-RP-0002

CURRENT ISSUE					
Issue No: A	Date: 03/08/07	Reason for Issue: For Planning			Customer Approval (if required)
Sign-Off	Originator	Checker	Reviewer	Approver	
Print Name	Ann Marie Keane	Barry McDermott		Barry McDermott	
Signature	<i>Ann Marie Keane</i>	<i>Barry McDermott</i>		<i>Barry McDermott</i>	
Date	03/08/07	03/08/07		03/08/07	

PREVIOUS ISSUES (Type Names)							
Issue No.	Date	Originator	Checker	Reviewer	Approver	Customer	Reason for Issue

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1.1	Scope	3
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1. INTRODUCTION

Project Management Group (PM) carried out an environmental noise assessment as part of an Environmental Impact Statement (EIS) at a site in Grange Castle International Business Park. This entailed the assessment of external noise sources at the proposed development site and the contribution of these noise sources to ambient noise levels on the boundaries of the site and the closest noise sensitive locations.

The assessment consisted of:

- Baseline noise survey of the site
- Noise modelling of continuous noise sources at the site
- Comparison of ambient monitoring results with those predicted by the noise model

A range of construction activities are currently being carried out at the Grange Castle International Business Park due to the development of another facility to the south west of the proposed development site.

The proposed development site is located in a zoned industrial area, the pharmaceutical company Takeda is situated to the north east of the site, Donohue's Scaffolding yard to the north, the R120 roadway to the west and IAWS, currently under construction, to the south west. The Griffen River borders the site to the south. There are residential properties located approximately 10m west of the site, behind the tree line to the North West and in front of the scaffolding yard to the north (see Appendix 1 for site location drawing).

1.1 Scope

The scope of the noise impact assessment was to determine the potential impact of the proposed development on the existing environment. This entailed a baseline noise monitoring survey to establish the existing ambient noise levels. Potential continuous noise sources as a consequence of the proposed facility was then modelled to determine their impact on the existing environment. Noise levels were measured at 6 monitoring points (NMP1-NMP6) throughout the site, which includes the points NMP5 & 6 closest to the Noise Sensitive Locations (NSL).

The noise monitoring was conducted in accordance with the requirements of *EPA Guidance Note for Noise in relation to Scheduled Activities* (2nd Edition), 2006. The locations of baseline noise monitoring points are included in Appendix 1.

2. NOISE MONITORING SURVEY

2.1 Noise Monitoring

The noise survey was carried out at the Grange Castle International Business Park on the 29th of June & 10th July 2007

Noise levels were recorded at six different locations at the proposed development site. The measurements were taken at least 3m from reflecting surfaces and the measurement height was 1.2m above ground level. The noise monitoring points are detailed as follows:

Location	Description
NMP1	At the north east boundary of the site
NMP2	At the southeast boundary of the site adjacent to the Griffeen River
NMP3	At southern boundary of the site adjacent to IAWS construction site
NMP4	At western boundary of site adjacent to construction road
NMP5	At western boundary of site adjacent to a residential property (NSL-1)
NMP6	At north west boundary of site adjacent to a non-residential house and Donohue Scaffolding yard (NSL-2)

The locations of baseline noise monitoring points are included in Appendix 1.

During the survey, the noise levels were recorded over 30 minute measurement periods for daytime monitoring and over 15 minute measurement periods for night-time monitoring.

The following parameters were recorded during each measurement, as well as weather conditions and a description of audible noises:

- L_{Aeq}
- $L_{AF (Max)}$
- L_{A10}
- L_{A90}

One third octave band readings were also recorded for each measurement.

(Refer to Section 2.5 for a description of the noise terminology used in this report).

2.2 Noise Guidance & Standards

The noise monitoring was conducted in accordance with the following guidance:

- EPA Guidance Note for Noise in relation to Scheduled Activities (2nd Edition), 2006
- International Standard ISO 1996-1:2003 - Acoustics – Description and Measurement of Environmental Noise (2003)

2.3 Equipment

The following noise measurement equipment was used to conduct the noise monitoring:

- Bruel and Kjaer 2260 Sound Level Meter¹ c/w Bruel and Kjaer type 4189 Microphone with wind shield
- Bruel and Kjaer Type 4231 Calibrator. The Sound Level Meter was calibrated before and after the daytime and night-time surveys using the calibrator
- Tripod
- GPS Handheld GPS Personal Navigator – used to pinpoint each monitoring location

2.4 Weather Conditions

Daytime 29th June 2007: Dry, cloudy, moderate breeze.

Night-time 10th July 2007: Dry, clear sky, very mild breeze

2.5 Measurement Parameters

Noise is measured in terms of decibels (dB). The various measurement parameters and noise terminology are defined below.

- **Decibel (dB)**
Decibel (dB) is the standard unit for expressing the noise level (sound pressure level). It is calculated as a logarithm of the intensity of sound. It is derived from the logarithm of the ratio between the value of a quantity and a reference quantity. For sound pressure level the reference quantity is 20µPa which is the threshold of normal hearing and equates to 0dB. At the upper end of the scale 140dB is the threshold of pain.
- **A-weighted Decibel (dBA)**
Decibels measured on a sound level meter incorporating a frequency weighting (A Weighting) which differentiates between sound of different frequency (pitch) in a similar way to the human ear. This takes account of the fact that the human ear has different sensitivities to sound at different frequencies.

¹ The Bruel and Kjaer 2260 Sound Level Meter is a Type 1 meter

- **L_{eq}**
The equivalent continuous sound level – the sound pressure level of a steady sound having the same energy as a fluctuating sound over a specified measuring period. It can be considered similar to an average level. The L_{Aeq} value is the A-weighted L_{eq} .
- **L_{A90} and L_{A10} Values**
The L_{A90} and L_{A10} values represent the A-weighted sound pressure levels exceeded for a percentage of the instrument measuring time. The L_{A90} represents the sound pressure level exceeded for 90% of the monitoring period and is a good indicator of the background noise level excluding peak noise events. L_{A10} indicates the sound pressure level exceeded for 10% of the monitoring period and is a good parameter for expressing event noise such as passing traffic.
- **Tonal Noise**
A prominent tonal component can be identified by one-third octave band analysis or narrow band (NB) analysis as specified in ISO 1996-2: 1987, where the level of a one-third octave band exceeds the levels of the adjacent bands by 5 dB or more.
- **Impulsive Noise**
A noise that is of short duration (typically less than one second), the sound pressure level of which is significantly higher than the background. e.g. hammer blow to metal sheet.

2.6

Noise Monitoring Results

The results of the environmental noise monitoring for the daytime and night-time periods are summarised in Tables 2.1 and 2.2. Appendix 1 includes a drawing showing the location of each monitoring point.

Table 2.1: Environmental Noise Monitoring Results – Daytime monitoring

Location No.	Location Description	Time	L _{eq}	L _{mid}	L _{sub}	Comments
1	At the north east boundary of the site	11.40	54	57	50	Constant earth moving machinery movement (300m), hammering from scaffolding yard (300m), mild traffic, helicopter, aeroplane, train in distance.
2	At the south east boundary of the site adjacent to the Griffeen River	12.15	57	60	52	Constant earth moving machinery movement (100m), grinding saw noise (100m), construction noise (100m), mild construction traffic and street swipper on closed road, helicopter, alarms from trucks reversing, birdsong.
3	At southern boundary of the site adjacent to IAWS construction site	12.55	64	67	55	Constant earth moving machinery movement (50m), earth moving machinery banding arm against ground (50m), mild construction traffic from IAWS site, dumper truck driving (20m), helicopter, aeroplane.
4	At western boundary of the site adjacent to construction road	13.35	53	56	46	Heavy construction traffic, mild construction noise (50m), hammering from scaffolding yard (30m), train in distance, aeroplane, helicopter, birdsong.
5	At western boundary of the site adjacent to a residential house	14.10	59	62	52	Heavy traffic on main road (20m), heavy construction traffic (10m), construction noise (30m), pressure release from truck (10m), car horn, aeroplane.
6	At north west boundary of the site adjacent to a residential house & Scaffolding yard	14.45	60	61	52	Heavy construction traffic (10m), construction machinery noise (30m), vehicle movement in scaffolding yard (10m), train in distance, aeroplane.

Table 2.2: Environmental Noise Monitoring Results – Night-time monitoring

Location No.	Location Description	Time	L _{eq}	L _{A10}	L _{A90}	Comments
1	At the north east boundary of the site	23.30	43	45	41	Heavy traffic on R120, siren in the distance
2	At the south east boundary of the site adjacent to the Griffioen River	23.10	42	44	40	Heavy traffic on R120, aeroplane passing.
3	At southern boundary of the site adjacent to JAWS construction site	22.45	39	41	36	Heavy traffic on R120
4	At western boundary of the site adjacent to construction road	23.50	43	45	38	Heavy traffic on R120, train in the distance
5	At western boundary of the site adjacent to a residential house	22.05	51	55	39	Heavy traffic on R120 (20m), people shouting in the distance, helicopter passing.
6	At north west boundary of the site adjacent to a residential house & Scaffolding yard	22.25	47	50	39	Heavy traffic on R120 (40m), two aeroplanes passing, people shouting in distance, birds rustling in the trees, dog barking in the distance.

3. NOISE MODELLING

The purpose of the modelling is to assess the contribution of continuous noise sources for the proposed development to noise levels at noise sensitive locations close to the site.

3.1 Noise Model

The Bruel & Kjaer Predictor Type 7810 software package was used to model the noise levels to be emitted to the surrounding environment from the proposed development.

Predictor Type 7810 is a proprietary noise calculation package for computing noise levels in the vicinity of industrial sites. Calculations are based on the International Standard ISO 9613-2: 1996 "Acoustics – Attenuation of Sound Outdoors – Part 2: General Method of Calculation." This method has the scope to take into account a range of factors affecting the attenuation of sound including:

- Magnitude of the noise source in terms of sound power;
- Distance between the source and the receiver;
- Presence of obstacles such as screens or barriers in the propagation path;
- Presence of reflecting surfaces;
- Hardness of the ground between the source and receiver;
- Attenuation due to atmospheric adsorption;
- Meteorological effects such as wind gradient, temperature gradient and humidity.

Calculations are performed over octave bands from 63 Hz to 8 kHz and results are reported in overall A-weighted decibels (dBA).

3.2 Brief Description of ISO 9613-2: 1996

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

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

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

The average downwind sound pressure level from any point source at a receiver location, $L_{AT}(DW)$, is determined by calculating $L_{PT}(DW)$ which is the equivalent continuous downwind octave-sound pressure level at the receiver location. This is calculated for each point source, and its image sources, and for the eight octave bands with nominal midband frequencies from 63Hz to 8 kHz. The equation for calculating this parameter is given below:

$$L_{PT}(DW) = L_w + D_c - A$$

where:

- L_w is the octave band sound power level produced by the point source;
- D_c is the directivity correction for the point source;
- A is the octave band attenuation that occurs during propagation, namely attenuation due to geometric divergence, atmospheric absorption, ground effect, barriers and miscellaneous other effects.

The agreement between calculated and measured values of $L_{AT}(DW)$ support the estimated accuracy shown in Table 3.1.

Table 3.1: *Estimated accuracy for broadband noise of $L_{AT}(DW)$*

Height, h^1	Distance, d^2	
	$0 < d < 100m$	$100m < d < 1000m$
$0 < h < 5m$	$\pm 3dB$	$\pm 3dB$
$5m < h < 30m$	$\pm 1dB$	$\pm 3dB$

Note 1: h Mean height of the source and receiver.

Note 2: d Mean distance between the source and receiver.

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

3.3 Noise Model Input Data

The model was run with 119 continuous noise sources

- 90 Roof Air Handling Units (AHU's)
- 24 Ground level AHU's
- 1 Office AHU
- 4 Transformers (20 mVA)

The equipment and associated sound power levels input to the model are detailed in Appendix 2. Data for the ground AHU's was unavailable therefore sound power data for the roof AHU's was used. Noise sound pressure levels (L_{pa} dB(A)) for the transformers were obtained from the manufacture. No data relating to the potential tonal noise from the transformer manufacture was available. The locations of the proposed principal noise sources and modelled receptor points at the Grange Castle International Business Park site are shown on the site contour plan in Appendix 3.

The input data for each noise source included:

- **The source positions** – the proposed location on the site of each principal equipment item/noise source.
- **The source elevation (metres)** – the height at which noise is emitted from each noise source.
- **Directivity** – emission direction
- **Source Noise Emissions** – The A weighted sound power levels for each source between frequencies 63Hz and 8kHz. In accordance with ISO 9613-2, the sound power levels at 31 Hz were not input into the model.
- **Working Hours** – The model allows the user to define daytime and night-time periods, so that noise levels can be predicted for each period e.g. daytime/night-time. For the purposes of this assessment, in order to predict the maximum possible noise levels, all of the noise sources were assumed to run continuously during the day and at night.
- **The Receptor Positions** – Receptors NMP1 – NMP4 are the site boundary points where noise monitoring was carried out by PM in July 2007. Receptors NSL1 and NSL2 are the closest noise sensitive locations to the site. NMP5 (NSL1) represents a single story dwelling adjacent to the west corner of the site. NMP6 (NSL2) represents a two storey dwellings to the north of the site (see layout in Appendix 1).
- **Receptor Elevation** – Input into the model as 1.5m to represent average head height.
- **Ground Conditions** - Ground conditions between the noise sources and the receptor points were also included in the model. A background map of the proposed site was included in the model for reference purposes.

4. NOISE MODEL RESULTS

The cumulative effect on the nearest NSLs of existing noise levels and the predicted noise levels due to the proposed development noise sources have been calculated by the Predictor software. The equipment items (as outlined above) were modelled in order to assess their impact. As can be seen from Table 4.1 and 4.2 the proposed development would cause no significant increase in noise levels at the noise sensitive locations. It would however result in an increase in night time noise levels along the south western site boundary, NMP3.

Table 4.1: Predicted Daytime Noise Levels from the proposed Facility

Receiver Point	Existing Daytime Noise Levels (dBA)	Contribution of Equipment (dB) (Daytime)	Cumulative Noise Levels (dBA)
NMP1	54	37	55
NMP2	57	31	57
NMP3	64	50	64
NMP4	53	33	53
NMP5 (NSL1)	59	22	59
NMP6 (NSL 2)	60	35	60

Table 4.2: Predicted Night time Noise Levels from the proposed Facility

Receiver Point	Existing Night-time Noise Levels dBA)	Contribution of Equipment (dB) (Night-time)	Cumulative Noise Levels (dBA)
NMP1	43	37	44
NMP2	42	31	43
NMP3	39	50	51
NMP4	43	33	43
NMP5 (NSL1)	51	22	51
NMP6 (NSL 2)	47	35	47

5. DISCUSSION

The baseline noise measurements results for the daytime noise monitoring period at locations NMP1 - NMP6 are reported in Table 2.1. The equivalent results for night time noise monitoring period at locations NMP1 - NMP6 are reported in Table 2.2.

5.1.1 Daytime Monitoring results

The L_{Aeq} recorded during the daytime noise survey at the site boundary point closest to the nearest noise sensitive locations (i.e. NMP 5 & 6) were 59 dBA and 60 dBA, respectively. It was noted during this noise survey that there was a continuous flow of construction traffic passing these locations; consisting mainly of cars, vans, trucks and diggers, which dominated the noise levels audible at these locations. The L_{Aeq} at NMP 5 was also highly influenced by the constant flow of heavy domestic traffic on the R120 roadway situated approximately 10m away from the NMP.

Daytime L_{Aeq} levels at the site boundary points NMP 2 and NMP 3 were also quite elevated as a result of construction activities. The L_{Aeq} for NMP 2 was 57 dBA and the L_{Aeq} for NMP 3 was 64 dBA. Both NMP's were highly influenced by the presence of an earth mover constantly operating for the duration of the measurement, approximately 50 -100m away. Daytime L_{Aeq} levels at the remaining site boundary points NMP 1 & 4 were 54 dBA and 53 dBA, respectively.

5.1.2 Night-time Monitoring results

The L_{Aeq} for the NMP 5 and 6 were 51 dBA and 47 dBA, respectively. Noise levels at both NMP's were highly influenced by the constant flow of heavy domestic traffic on R120, which is located approximately 20-40m away from both points. Night -time L_{Aeq} levels at the site boundary points NMP 1 - 4 were 43 dBA, 42 dBA, 39 dBA & 43 dBA, respectively.

5.1.3 Tonal Noise

Tonal analysis was carried out on the baseline noise survey results and no clearly audible tonal or impulsive noise was evident at the NMP 5 or NMP 6.

5.1.4 Noise Modelling Results

The results of the noise modelling (Table 4.1 and 4.2), demonstrates that the predicted noise levels from the proposed facility will not result in noise levels greater than the recommended day and night time limits. NMP3 night time noise monitoring levels are the exception to this.

Predicted noise modelling results at NMP 3 (night-time) demonstrate that the noise levels from the proposed facility will increase the existing ambient noise levels in the area. The ground floor AHU's influence the result at this monitoring location. No data for the ground floor AHU's was available during the timeframe of noise prediction modelling, therefore sound power data for the roof AHU's was used. In addition ground floor AHU's will be of smaller capacity than the roof AHU's and therefore modelling results represent a worst case scenario. During operations, the ground floor AHU's will be enclosed in an acoustic enclosure which will provide attenuation, this will be assessed in the detailed design phase of the project. The ground floor AHU's do not impact the NSLs and the noise level at NMP3 will not exceed 50dBA.

From cumulative impact calculations it can be seen that the noise contribution from the proposed facility is insignificant in the context of the current average ambient noise levels. The cumulative noise levels that exceed the existing ambient noise levels are highlighted in bold in tables 4.1 and 4.2. It should be noted that the human ear cannot perceive changes in sound level of less than 3 dBA (Bies, David A. and Hansen, Colin H. *Engineering Noise Control Theory and Practice* 3rd Edition, 2003).

The predicted noise levels are based on all of the noise sources running simultaneously and continuously over a 24 hour period.

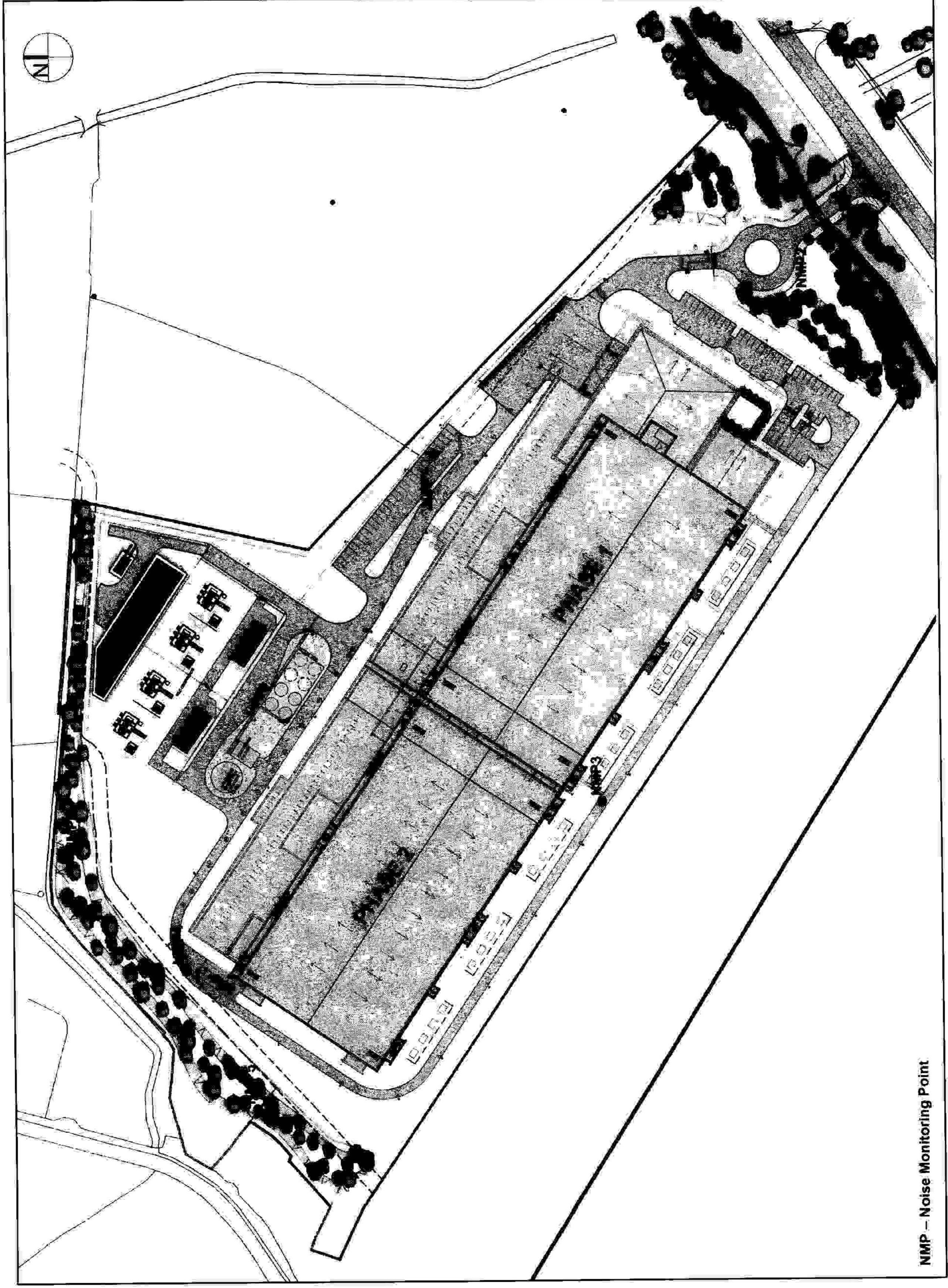
6. CONCLUSION

Predicted noise modelling results at NMP 3 (night-time) demonstrate that the predicted noise levels from the proposed facility will result in noise levels greater than that of the ambient noise. As data was unavailable at the time of modelling this represents a worst case scenario however this will be available at the detailed design stage of the project.

In conclusion, the noise modelling demonstrates that the noise emissions from the continuous noise sources at the proposed development site will not increase the noise levels greater than that of the current ambient noise.

APPENDIX 1

NOISE MONITORING LOCATIONS



NMP – Noise Monitoring Point

APPENDIX 2

SOUND POWER LEVELS FOR EQUIPMENT

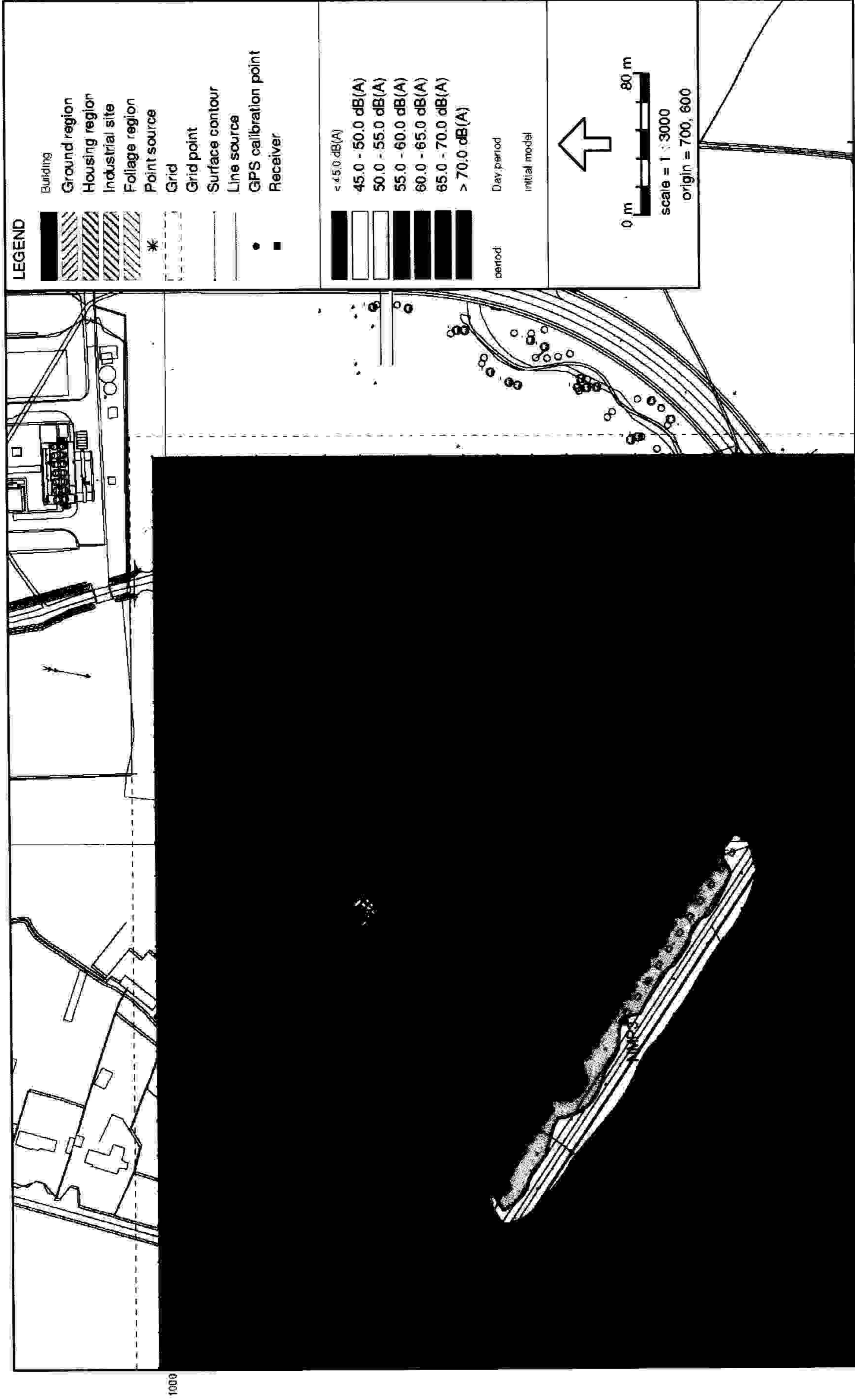
INPUT TO NOISE MODEL

SOUND POWER LEVELS FOR EQUIPMENT INPUT TO NOISE MODEL

Source Description	Octave Bands Hertz (Hz)										Total
	63	125	250	500	1K	2K	4K	8K			
	Sound Power Levels (dBA) per band										
Combined (Supply and Return Fan) Roof	58	69	66.5	66	70	66	48	41			75
AHUs (Ground)	58	69	66.5	66	70	66	48	41			75
Transformers	59	59	59	59	59	59	59	59			68

APPENDIX 3

CONTOURS PLOT OF NOISE LEVELS



Industrial Noise - ISO 9613.1/2, Initial Model - version of Initial Model - initial model [ENVIRO-1\NOISE\11D3] , Predictor Type 7810 V4 00
1000

ATTACHMENT F

MAURICE F. HURLEY

ARCHAEOLOGY & CULTURAL HERITAGE ASSESSMENT REPORT

Archaeology & Cultural Heritage
Grange Castle Business Park, Clondalkin, Co. Dublin

By

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July 2007

1. Introduction

It is proposed to develop a site within Grange Castle International Business Park. The site is located approximately 4km west of Clondalkin (Figure 1). The proposed development site consists of 18.9 acres in the townland of Grange, and is located in the western side of Grange Castle International Business Park. The site consists of an open field of pasture; the site is divided by field boundary ditches. To the southwest of the site a late 19th century dwelling house and a number of farm outbuildings of relatively modern date, were recently demolished to make way for the extensive Cuisine de France complex which was recently developed on a twenty acre site forming the southwest boundary of the site (Figure 1, 2 & 3).

2. The Scope of the Study

This study is produced to assess the archaeological resource and cultural heritage of the site in the context of the archaeological and historical environment of the area.

The study is informed by site inspection and is based on the results of documentary and cartographic research. Consulted sources include.

- All editions of the Ordnance Survey maps (from 1843)
- The Record of Monument and Places (RMP). These files are based on the pre-existing Sites & Monument Record (RMP) and information from completed county archaeological inventories. As such it records known upstanding archaeological monuments, their location (in cases of destroyed monuments) and the position of possible sites identified as cropmarks on vertical aerial photographs.
- The topographical files of the National Museum of Ireland.
- Pre-Ordnance Survey maps of the area. Cartographical Sources, including maps in the Map Library of Trinity College, especially the Down Survey map (1656) and Rocque's map (1760).
- Published and unpublished documentary sources for the area including unpublished EIS report and references on archaeological testing and excavation in the vicinity.

- Field inspection, to assess the possibility of unrecorded archaeological site being present within and adjacent to the proposed development area.

3. The Receiving Environment

The site is located on the western side of the Grange Castle International Business Park in the townland of Grange (Figure 1). The townland boundaries of Grange, Ballybane, Clutterland and Ballymakaily run close to the boundary of the site (Figure 1 & 2). The old channel of the stream that once defined the townland boundary has been filled and the stream diverted into a new man made channel (Plate 1 & Figure 2). The Newcastle Road lies to the west of the site boundary (Figure 2 & 3). The boundary between the townlands of Grange and a small unit of Clutterland follows the centre of the road (Figure 4), to the west of this lies the townland of Ballymakaily. The village of Milltown stands at the crossroads *c.* 350m south of the site boundary (Figure 4). The site is part of the 'Grange Castle Agricultural lands' and consists largely of one field under pasture (Figure 3) and part of another field, lying to the west separated by a field boundary composed of a drainage ditch and burrow (Plate 2 & 5). A field fence once ran through the lower centre part of the site but this has been removed, clear evidence for its existence can be seen in the aerial photograph (Figure 3) A farm-sted, consisting of a dwelling house and farm sheds stood at the northwest corner of this field until 2006 when it was demolished to make way for the Cuisine de France development (Figures 2 & 3). The realignment of the stream at the southern side of the site (Plate 1) has already taken place.

The farmhouse (Plate 4) was a four bay, two storey dwelling (with later alterations) of late 19th-early 20th century date. The house was not shown on the first edition Ordnance Survey map (1843) or the second edition Ordnance Survey (Figure 7) maps. The farm buildings were mostly hay sheds of late 20th century date (Plate 3).

4. The History & Archaeology of the area

Archaeological evidence (see Section Previous Archaeological Research in the Vicinity) has revealed evidence of occupation of this area since Neolithic times. A Neolithic house and associated flint tools and pottery were found in the Kishoge townland *c.* 1km to the north in archaeological investigations (O' Donovan 2003

p.125-126). Finds from the Bronze Age are represented by a *fulacht fiadh* excavated near Nangor Castle (Doyle 2003 p. 121), while a Bronze Age ring-barrow was excavated in Killmahuddrick townland (Doyle 2001, p.16-19, Figure 9 and Plate 5). It can therefore be seen that this area consistently attracted human settlement. It is for the medieval period however that we have the most comprehensive historical and archaeological evidence.

There is extensive evidence for the medieval landholding pattern in the parish of Kilmactalway, Grange and Killmahuddrick townlands. From the 12th century, the Cistercian abbey of St. Mary's held lands in the area of Clondalkin. The lands held by St. Mary's were referred to as Ballymacheilmer and Kilmacruddrick (now Killmahuddrick). According to Ó Conbhuidhe (1962), the lands of Ballymacheilmer were held by the abbey before 1172 and possibly before the coming of the Anglo-Normans. Possession of Ballymacheilmer was confirmed to the abbey by Henry II in two chapters dated 1174 and 1179. A confirmation of the lands, chapel and tithes was also made by the archbishop of Dublin, John Comyn, in 1186. A marginal entry in another confirmation by the same archbishop identifies Ballymacheilmer with Kilmacoldrick (now Killmahuddrick). Killmahuddrick and the parish of Kilmactalway (in which the townland of Grange is located), both suggest origins in ecclesiastical settlement.

By the 16th century, the Cistercian abbey held the Grange of Balichelmer and the *vil of Kilmacodryke*, amongst other lands. The Grange of Balichelmer can be equated with the present townland of Grange, while the '*vil of kylmacodryke*' is probably the townland of Killmahuddrick. The name Killmahuddrick probably applied initially not to the lands but to the church, which was situated in the division referred to as Ballimacheiler. The name of the church was subsequently extended to the entire townland (Ó Conbhuidhe 1962).

The townland of Grange may be equated with the 'Grange of Balichelmer' listed in the monastic dissolution extents of 1540-41. An inquisition of 1621-22 refers of 'New-grange alias Balichelmer'. By 1640, it was simply known as 'Grange'. Further lands adjoining Balichelmer were granted to the monks in 1250 by Henry III. By the time of dissolution of the monasteries in 1540-41, the monastic possessions in the

Grange of Ballichelmer were estimated at one hundred and fifty-two acres, while the possession at Kilmacuddrick were estimated at fifty-one acres. Grange subsequently came into the hands of 'Fagan of Feltrim, Irish Papist', who held it in 1640, while Kilmacuddrick was held by another 'Irish Papist' called Mr Aylmer (Ó Conbhuidhe 1962). In 1650, New Grange was occupied a farmer called Nicholas Wolverston and twenty other persons, including a weaver and a 'greymerchant'. In 1666, the lands of Kilmahuddrick were held by Patrick Thunder (Ball 1906).

Two castle sites in the area of Grange International Business Park testify to an Anglo-Norman presence. Nangor Castle (DU017-037) (Figure 4) was located to the east of the proposed development site, although no upstanding remains survive. The place name is obscure in origins but seems to be of English or French derivation. The Norman de Verdon family held the locality in the early 14th century. Nangor Castle is recorded as the property of John Bath in 1634, but later passed to Joseph Budden. The castle subsequently became the residence for John Falkiner, who built a Queen Anne-style house adjoining the castle, both buildings have since been demolished, but an area of interest of archaeological potential surrounds the site.

An early description by Cooper in 1780 describes Grange Castle (DU017-034), located to the northeast of the proposed development as 'neat well built castle inhabited by a farmer and kept in very good repair' (Price 1942). In the *Irish Builder* in 1897, Grange Castle was described as 'very much modernised...the northeast corner projects the unusual tower, which still contains two small slit-windows unusual in stair towers'. However, the author goes onto claim 'that the form of the old castle clearly stands out still, and graces its modern partner' (McC. Dix 1897. Healy (1974) describes it only as an 'occupied fifteenth century castle in County Dublin'. The castle is at present uninhabited, dilapidated.

Approximately 1.1km to the north of the proposed development site lies the Grand Canal (Figure 6 & 7). In 1775 the idea was first mooted of linking Dublin to the River Shannon by canal. In 1770 a group of noblemen and merchants decided to form a company to undertake the construction of a canal aimed initially at providing fresh water for Dublin City and a water-bourn transport system to the countryside west of

Dublin. The ultimate aim of the project was of course to link Dublin City to the River Shannon.

Work on the length of canal between Dublin and the River Liffey took place between 1773 & 1779. The canal from the Liffey to Dublin was opened to traffic in February 1779 (Delaney 1995, 21). An aqueduct had been built over the River Morrell but not over the River Liffey consequently, the place where Sallins Village began to develop was the most westerly point on the navigable canal where a road junction occurred. It was to this point therefore that goods were brought by ground transportation for loading on barges to avail of the cheap and convenient transport to Dublin, provided by the canal. The first passenger boat began to ply in August 1780 between Osberstown (near the Liffey) and Dublin (ibid). In 1780 work began on a new site for the Liffey aqueduct, known as The Leinster Aqueduct, Robertstown west of the River Liffey.

In 1783 work began on the Barrow Line, a branch of the Grand Canal leading south from just west of Sallins. By 1789, work was well advanced on the Monasterevan to Athy length of canal. The canal was opened to Daingean (then Philipstown) in 1797 and a year later to Tullamore. The canal opened up access for agricultural produce and passengers from the midlands to reach Dublin with unprecedented levels of speed, comfort and safety.

There are no archaeological monuments listed in the RMP within the proposed development area. There are however a number of sites in the wider area, most of which date from the early medieval to later medieval period and post-medieval periods.

Only two Recorded Monuments date to the prehistoric period; a Bronze Age burial (DU021-069) un Kilbride and a *fulacht fiadh* (DU021-023) in Brownsbarn, both located a considerable distance to the south of the proposed development.

Recent excavations in Nangor, Kishoge and Kilmahuddrick, adjacent townlands to the east of the proposed development uncovered several prehistoric monuments. A Neolithic House has been excavated in 2000 in Kishoge to the northeast of Grange Castle (O' Donovan 2001). Excavations in Kilmahuddrick revealed a substantial

ringbarrow (Doyle 2001) and a *fulacht fiadh* was discovered in the northern section of Nangor townland (Doyle 2001). These sites have been preserved by recorded (excavation) and are not listed in the RMP.

Many early and later medieval churches, with associated graveyards such as the medieval church sites at Kilmahuddrick (DU17-3901), Kilbride (DU021-00501) and Kilmactalway (DU021-003) are present in the wider area.

There are also several castles in the area. While there are some large Anglo-Norman castles in Ireland, most castles are tower houses—small, fortified residences of the gentry dating to the 14th to 16th centuries, such as Nangor (DU017-037), Grange (DU017-0340 and Adamstown (DU017-029) (Figure 4). Tower houses often have very thick walls with intramural staircases, small windows and a vaulted first storey to prevent the spread of fire. As new military technologies such as gunpowder rendered thick walls less useful as a defence, houses became less defensive. Tower houses were replaced in some areas by hall houses and fortified houses, similar to tower houses but less strongly fortified. From the 17th century onwards large, more comfortable houses became the norm. Frequently houses in the new style inspired by concepts of classical symmetry were added on to existing tower houses. The examples at Grange and Nangor are good examples of a widespread building phenomenon of the late 17th and early 18th century. *‘The world of these ambivalent residences---the tower houses expanded---lies as a major shadow behind the more common image of the 18th century landowner in his Palladian villa---a number of more complex and gentler realities beneath the stark opposites offered by history’* (McCullough 1994, 55).

5. Archaeological Sites in the Vicinity

RMP	DU017-029
Townland	Adamstown
National Grid	30292/23268
Type of site	Tower House (site)
Description	No trace remains on the ground, demolished in the

1960s, and today the site is occupied by a construction company. Adamstown Castle was originally a simple oblong tower house, three storeys high with a vault over the ground floor. It had a projecting turret with stepped battlements. Photographs taken in 1963 by H. A. Wheeler shows that only two walls of the tower house remained standing.

Distance from site *c.1.3km*

RMP DU017-034

Townland Grange

National Grid 30395/231887

Type of site Castle

Description The tower is attached to a farmhouse in flat low-lying ground, south of the Grand Canal. It is shown as a castle on the Down's Survey of 1655 (Figure 5). The rectangular tower has a projecting stair turret in the northeast corner and rises to three stories to a parapet level. The walls were plastered, but where stonework was visible it shows coursed limestone and roughly dressed quoins. The windows are later insertions. The entrance is to the east through a two-centred doorway. There is a murder hole over the entrance doorway, which leads to a vaulted ground floor. Access to the turret is through a round-headed window. There is a garderobe in the southeast corner, supported by corbels, the entrance of which is narrow round-headed door; the jambs are hammer dressed. A square turret rises above the parapet level and provides access to this level through a plain lintelled doorway. (Healy 1974, 22; *Irish Builder* 1879, Vol.22)

Distance from site *c.900m*

RMP	DU17-037
Townland	Nangor
National Grid	30459/23111
Type of site	Castle site (01), earthwork (02)
Description	<p>An excavation in the vicinity of the now-demolished castle and eighteenth century house in 1996 (McConway 1997) produced evidence for a substantial ditch and associated shallower linear feature. Neither feature produced any dateable artefacts, but had silted up with a series of organic-rich clays containing animal bone, shell and matted grass, possibly bedding material. After an extensive geophysical survey, trial trenching in the field bounding the castle site to its south suggested the survival of widespread archaeological remains below the ploughed soil. The lignite core and slivers of early medieval pottery and metal slag retrieved both from the trenches and from field walking suggested a date of at least the medieval period (12th-13th century). Several trenches cut through a large ditch located on both the east and west of the field. This ditch apparently substantiated the impression, given from the overall lie of the land, that the field possessed the remains of a ploughed out rath or ring ditch. Human skeletal remains were also recovered, as were numerous charcoal-flecked irregular features.</p>
Distance from site	c.1.2km

6. Cartographic Evidence

The Down Survey (Figure 5) of the Barony of Newcastle and Uppercross of 1656 shows the townland of Grange divided into arable, pasture and meadowland. A tower

house is shown immediately to the east of the land boundary parcel (Grange) in unfortified land.

Rocque's map (Figure 6) published in 1760 shows the area around Grange Castle as predominantly pasture. Both Grange and Nangor Castle are shown on the map. Grange Castle faces onto an unnamed road to the north. The Grand Canal is shown on the map as 'New Canal' and a river is shown flowing to the south of the proposed development.

Taylor's map of 1816 (Figure 7) shows that there are additional buildings at both castles Grange and Nangor to the east of the proposed development. The road onto which Grange Castle faces is now called the 'Green Road' and the 'New Canal' is now named the Grand Canal. A mill is shown on the western side of the Griffeen River, located to the north of the proposed development. Two other buildings are shown between the mill and Green Road, there is no trace of these buildings present.

The Ordnance Survey map of 1873 (Figure 8) does not show the farm buildings or house to the southwest of the site which, are present today and were demolished in the course of site re-development in 2006. These buildings did not have any significant architectural merit.

7. Previous Archaeological Research in the Vicinity of the Proposed Development

Geophysical survey was carried out in the vicinity of Grange and Nangor Castle, and along the route of the Grange Castle Business Park access road in 1996-7. Test trenches and excavations followed to resolve possible archaeological features and anomalies identified by the survey. Archaeological sites, dating from the prehistoric to the medieval period were identified and it was concluded that the area should be treated as a zone of archaeological potential.

Monitoring of the Grange Castle Business Park access road and sewage drain cutting was carried out by O' Brein and Conway in 1997-98 (McConway 1997, 1997, 1998, O' Brien 1998, 1998). The remains of 13th century hearths and charcoal pits were

identified and two curving ditches beneath a post-medieval stone and brick trackway. These features were recorded and excavated, establishing some archaeological potential along the corridor of the access road. Trenching in 2000 near Grange and Nangor Castles revealed evidence for a ring ditch and other deposits (Doyle 2001).

An archaeological appraisal carried out by Deery (2000) summarised the above work to date. The report included a field inspection at Grange Castle business Park in the townlands of Grange, Kilmahuddrick and Nangor, which did not identify any additional above ground features.

Doyle (2000, 2001) carried out excavations in Kilmahuddrick townland within Grange Castle Business Park. A ring barrow containing a series of cremation deposits was excavated. The ring barrow was found to be enclosed within a field system (Figure 9, Plate 5). *'geophysical survey and follow-up archaeological testing uncovered a fine example of a ring-barrow in Kilmahuddrick townland, which was excavated during the summer of 2000. ...Ring –barrows are generally characterised by the presence of a low, artificial central mound, with or without a circular ditch from which the central mound was created. An outer bank is also a feature of certain barrow types. The excavation of the Kilmahuddrick ring-barrow revealed a large ditch with a well-stratified sequence of fills and a series of cremated bone deposits in the centre of the barrow. The site had been intensively ploughed in the past, and no trace of a raised central area or mound was present. The barrow was located on a low natural rise within an otherwise low-level field.The ring-barrow was found to be enclosed in a field system. This was represented by a shallow, narrow, linear feature running on a north/south axis, skirting the western edge of the ring-barrow for a distance of almost 40m....Two small spreads of cremated material, containing both animal and human bones, were found to overlie the fill of the field system....The date of this cremation appears to be broadly similar to the Iron Age date obtained from cremated bone within layer F5 of the ring-barrow. (Doyle 2001, Archaeology Ireland Winter 2001, p. 16-19)*

Doyle (2000; 2001) conducted further excavations in the two fields north of Nangor Castle within Grange Castle Business Park. This revealed a medieval field system with medieval metal work, plant microfossil and pollen remains, faunal remains and

over fifteen hundred sherds of 14th century pottery (local wares), probably representing activity associated with the occupation of Nangor Castle. A large medieval ditch that probably enclosed Nangor Castle was found. A *fulacht fiadh* in the northern sector of Nangor townland was also excavated, providing evidence for Bronze Age presence in the area.

Archaeological excavations were carried out at Grange Castle Business Park in the townland of Kishoge by O' Donovan in 2001, in advance of the development of an attenuation lake. The excavation revealed evidence for a rectangular post and plank built house dating to the Neolithic period. Artefacts retrieved from the excavation included some flint scrapers, waste flint and a single sherd of pottery.

8. The Potential Archaeological resource of the site

There are no known or positively identifiable archaeological monuments on the site of the proposed development. Archaeological excavation in the vicinity has shown the potential for previously unidentifiable sites to be discovered in the course of pre-construction survey and test excavation. Sites discovered in the vicinity date from the Neolithic to Medieval period.

The earliest reliable detailed maps from the Down Survey (Figure 5) of 1656, Rocque's map (Figure 6) published in 1760, to the Ordnance Survey map of 1873 (Figure 8) all show the fields in the area of development site as agricultural land.

However there are a number of archaeological sites in the wider landscape, most of which date from the early medieval to later medieval and post medieval periods such as Grange (Figure 9) and Nangor Castle.

The existing Recorded Monuments and the extensive subsurface archaeological remains recently excavated near the wider area of Grande Castle Business Park all indicate the high archaeological potential of the entire region and the likelihood of further material being revealed wherever the ground is disturbed by development.

9. The Likely Impact of Development

Impacts of the development on the archaeological environs are likely to arise from three distinct elements of the proposal;

- The preparation of the ground for the construction of buildings
- Ground disturbance for associated services and car-parking
- Green area and landscaping including drainage, cutting and filling (the area at the southern and eastern side of the site is already landscaped, Plate 1).

10. Possible effects of the proposal

Any groundwork involving topsoil removal, excavation of trenches and cutting of ground etc., is likely to endanger or destroy buried material of archaeological importance if such remains occur on the site.

11. Mitigation

In regard to archaeology, mitigation is recommended;

- All groundwork and all soil removal and excavation should be subject to archaeological monitoring following from an agreed method statement approved by the Department of Environment, Heritage & Local Government (Appendix 1). In the event of a find, the Department of Environment, Heritage & Local Government will be consulted and an appropriate agreed response for preservation *in situ* or preservation by record (excavation) shall be put in place.

The above is required due to the likely impact of the development on an area of high archaeological potential. The potential archaeological resource of the site is based on an assessment of archaeological sites and finds in the vicinity and as on a general review of the history and development of the area.

APPENDIX 1

National Monuments Legislation

All archaeological sites have the full protection of the National Monuments legislation (Principal Act 1930 and Amendments 1954, 1987 and 1994).

In amendment of Section 2 of the Principal Act (1930) in the National Monuments (Amendment) Act 1987, a 'monument' is defined as:

Definition of a monument

- (a) any artificial or partly artificial building, structure or erection or group of such buildings, structures or erections,
- (b) any cave, stone or other natural product, whether or not forming part of the ground, that has been artificially carved, sculptured or worked upon or which (where it does not form part of the place where it is) appears to have been purposely put or arranged in position,
- (c) any, or any part of any, prehistoric or ancient –
 - (i) tomb, grave or burial deposit, or
 - (ii) ritual, industrial or habitation site,and
- (d) any place comprising the remains or traces of any such building, structure or erection, any such cave, stone or natural product or any such tomb, grave, burial deposit or ritual, industrial or habitation site...'

Under Section 14 of the Principal Act (1930):

Interference with a monument

- 'It shall not be lawful for any person...
- (a) to demolish or remove wholly or in part or to disfigure, deface, alter, or in any manner injure or interfere with any such national monument without or otherwise than in accordance with the consent hereinafter mentioned [a licence issued by the Office of Public Works National Monuments Branch], or
 - (b) to excavate, dig, plough or otherwise disturb the ground within, around, or in the proximity to any such national monument without or otherwise than in accordance with the

consent hereinafter mentioned [a licence issued by the Office of Public Works National Monuments Branch]...'

Under Amendment to Section 23 of the Principal Act:

**Reporting of
an
archaeological
find**

'A person who finds an archaeological object shall, within 4 days after the finding, make a report of it to a member of the Garda Síochána...or the Director of the National Museum or a servant or agent of his...'

The latter is of particular relevance to any finds made during development.

The 1994 Amendment (Section 12 (1-4) of the Principal Act (1930) established the Record of Monuments. All the sites and 'places' recorded by the Sites and Monuments Record of the Office of Public Works were provided with a new status in law. This new status provides protection to the listed sites which is equivalent to that accorded to 'Registered' sites (Section 5 - (1-10), National Monuments (Amendment) Act 1987) as follows:

**The Record of
Monuments**

- (1) The Commissioners shall establish and maintain a record of monuments and places where they believe there are monuments and the record shall be comprised of a list of monuments and such places and a map or maps showing each monument and such place in respect of each county in the State.
- (2) The Commissioners shall cause to be exhibited in a prescribed manner in each county the list and map or maps of that county drawn up under *subsection (1)* of this section and shall publish in a prescribed manner information about when and where the lists and maps may be consulted.
- (3) When the owner or occupier (not being the Commissioners) of a monument or place which has been recorded under *subsection (1)* of this section or any person proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Commissioners and shall not, except in the case of urgent necessity and with the consent of the Commissioners, commence the work for a period of two months after having given the notice.'

In effect the record is the list of known archaeological sites and areas drawn up from the Sites and Monuments Record for each county. It includes

- 1) All known monuments, e.g., ringforts, castles, etc. dating to before 1700AD, each surrounded by a standard circle defining a Zone of Archaeological Potential associated with the monument.
- 2) The details of the proposed record and its existence in law from the 1st January 1999 were advertised on the national papers on Wednesday 30th December 1998.
- 3) It requires that each person intending to undertake works on their property within a monument or zone must notify the Commissioners. The onus is on the owner/developer.

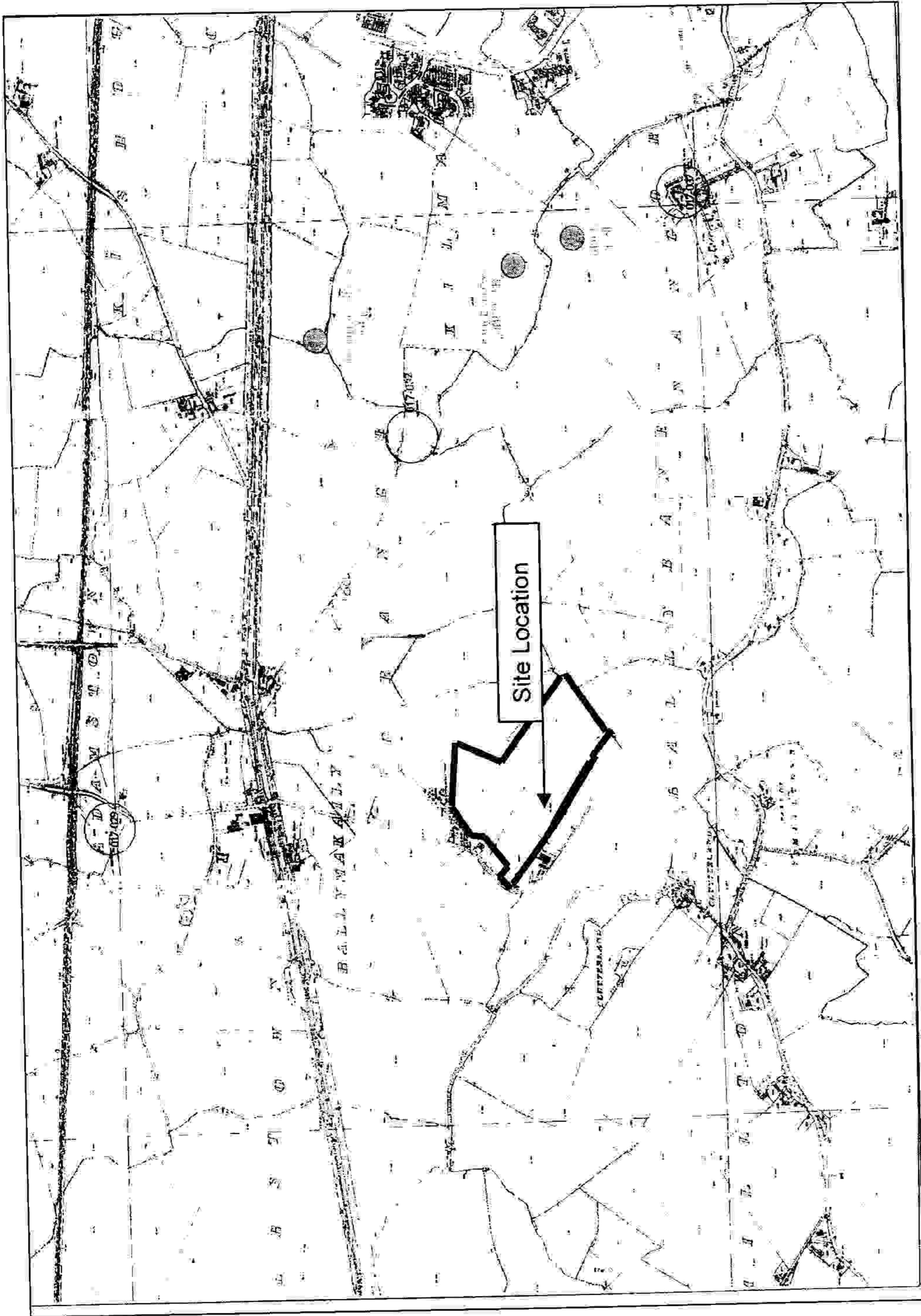


Figure 4. RMP sites map, also shows the sites of recent archaeological excavation in the area

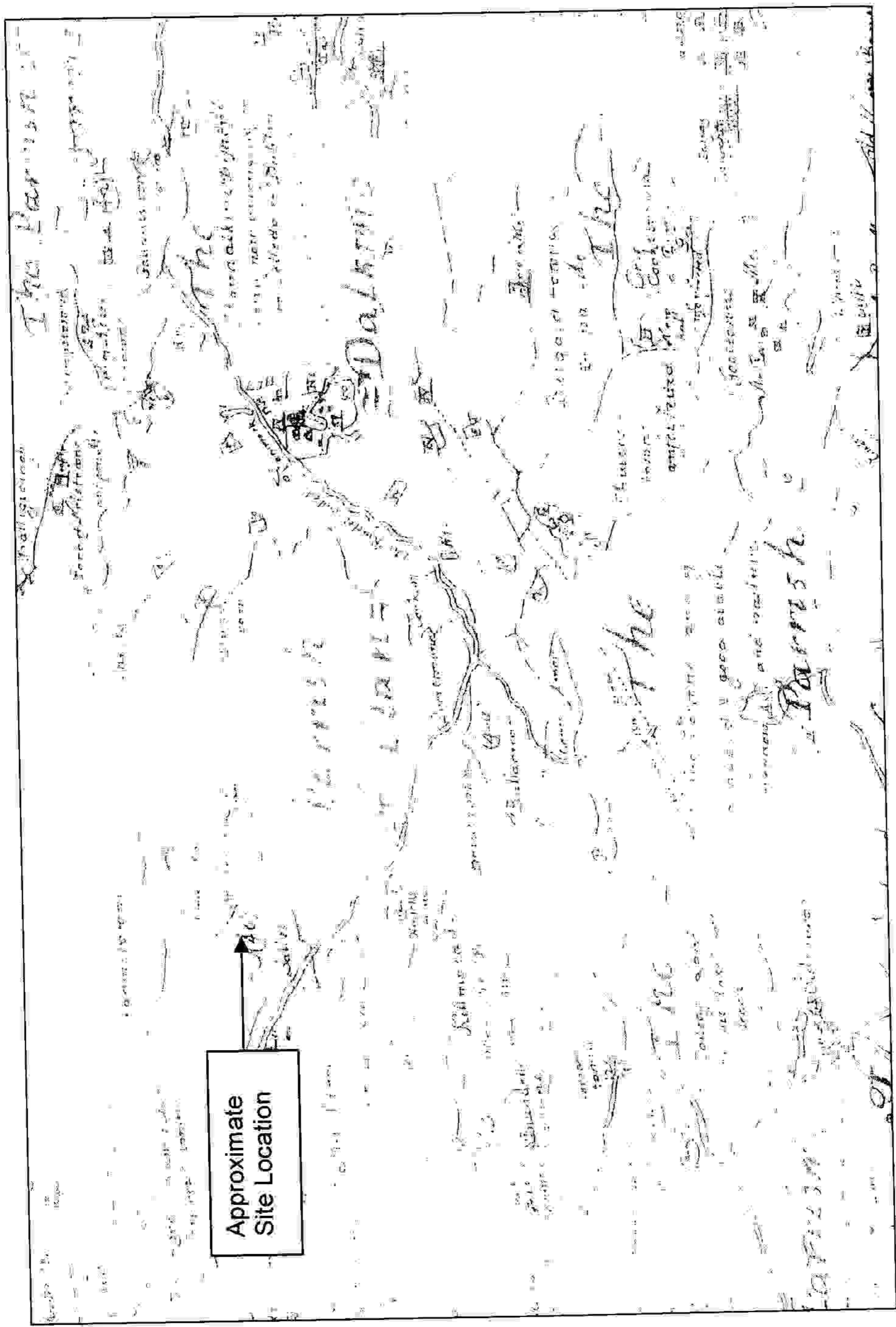


Figure 5. Down Survey, 1656.

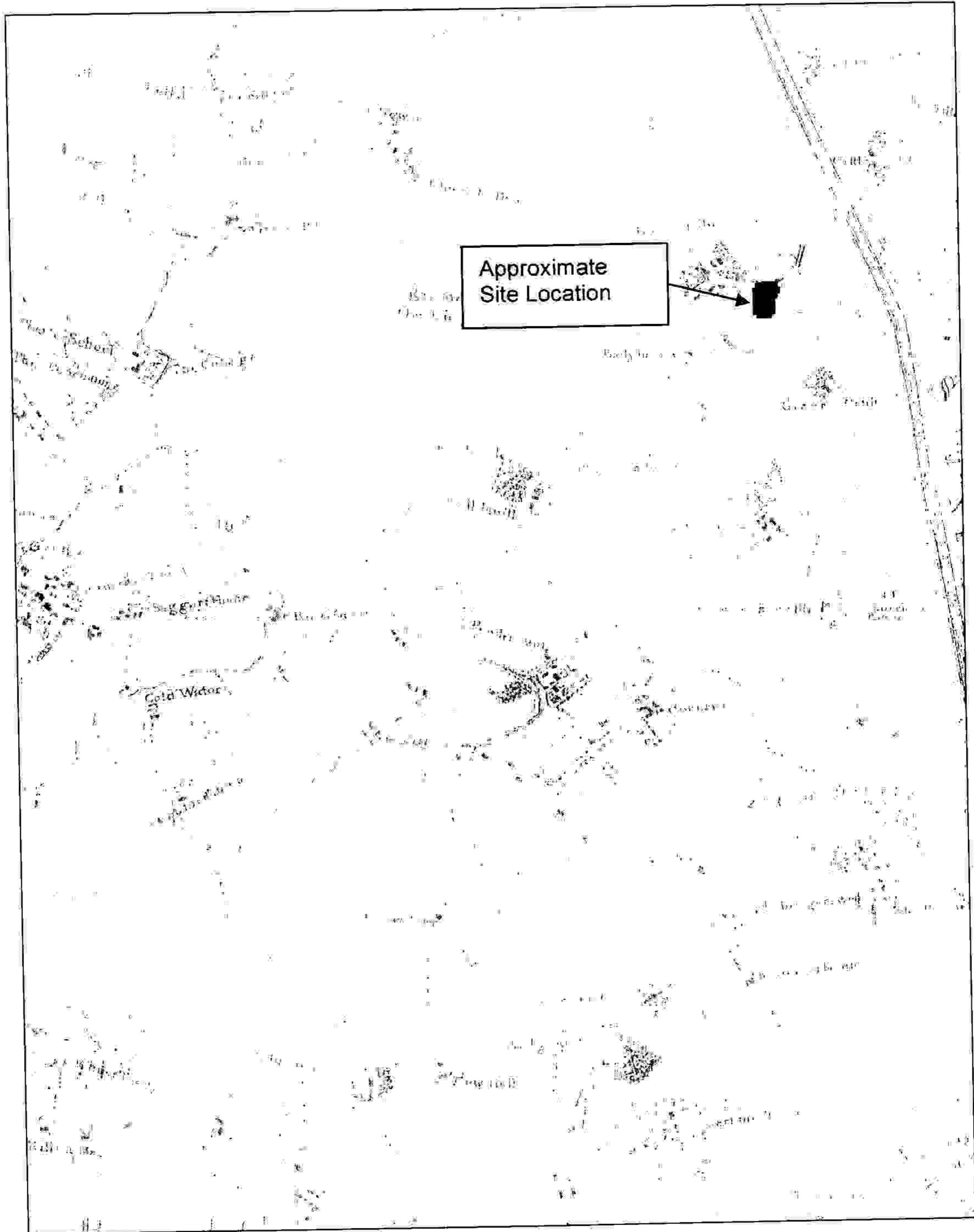


Figure 6. Rocque's map of 1760

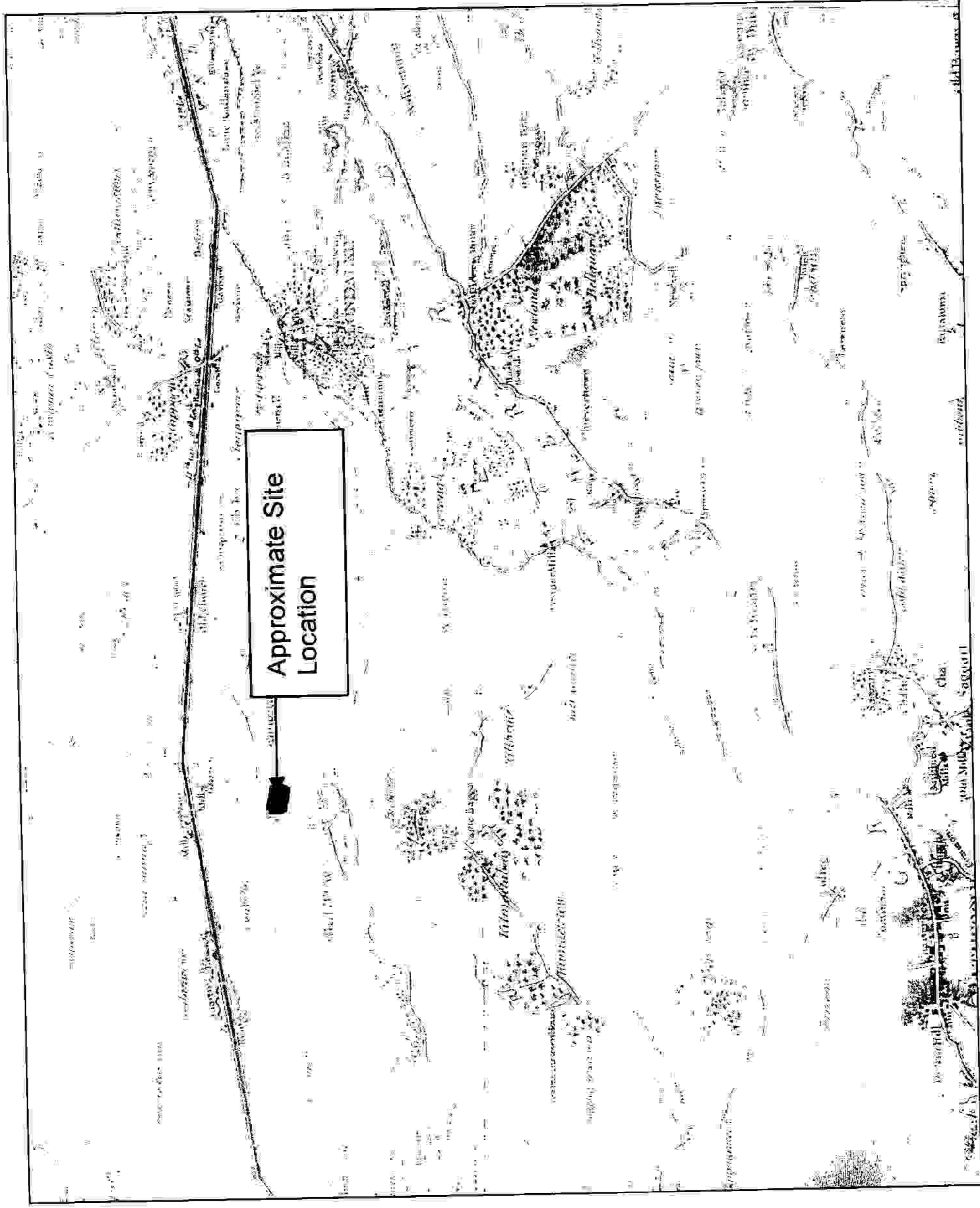


Figure 7. Taylor's map of 1816

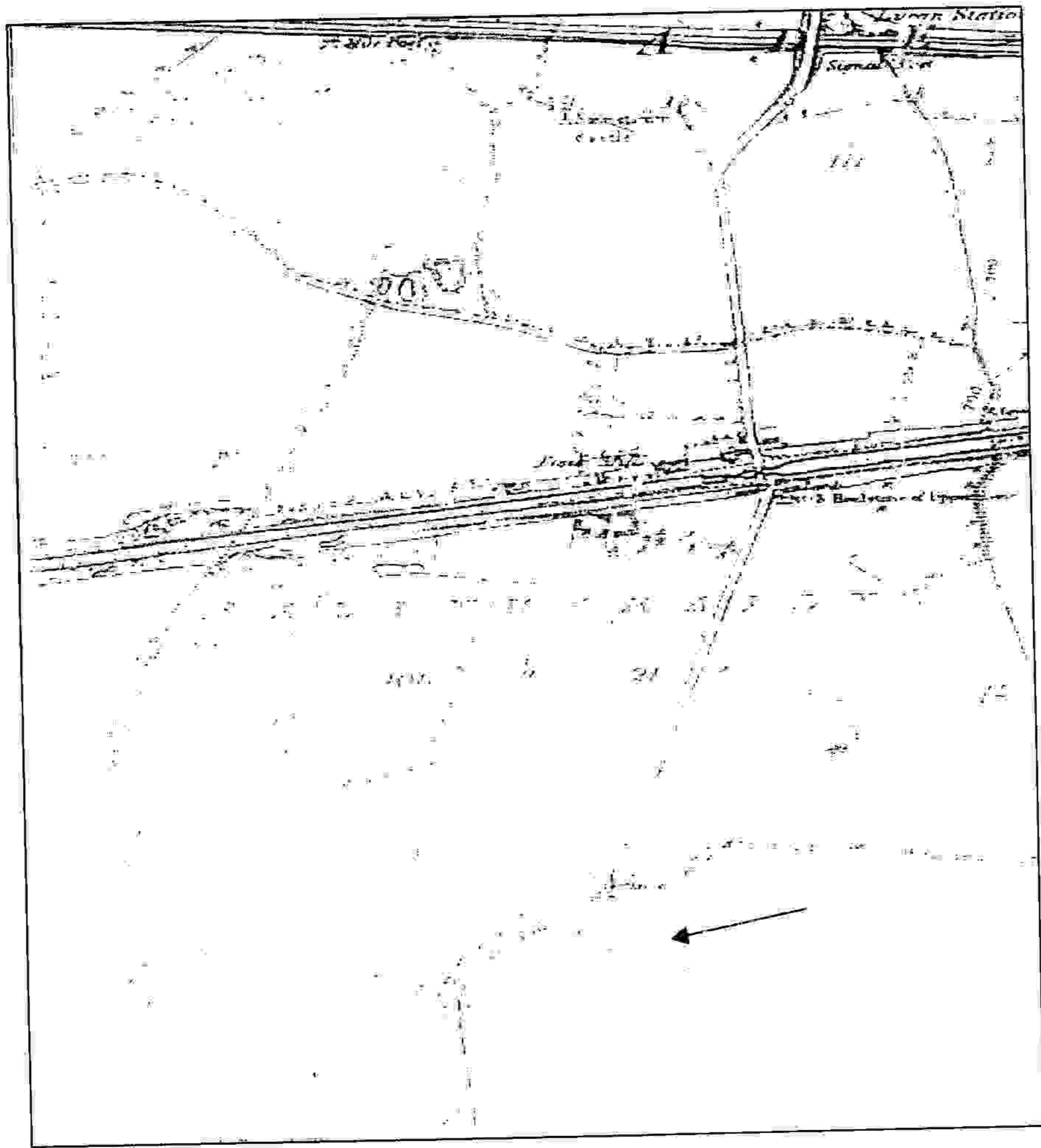


Figure 8. Ordnance Survey, 1873, Note the (Arrow) farm has not been built at this stage

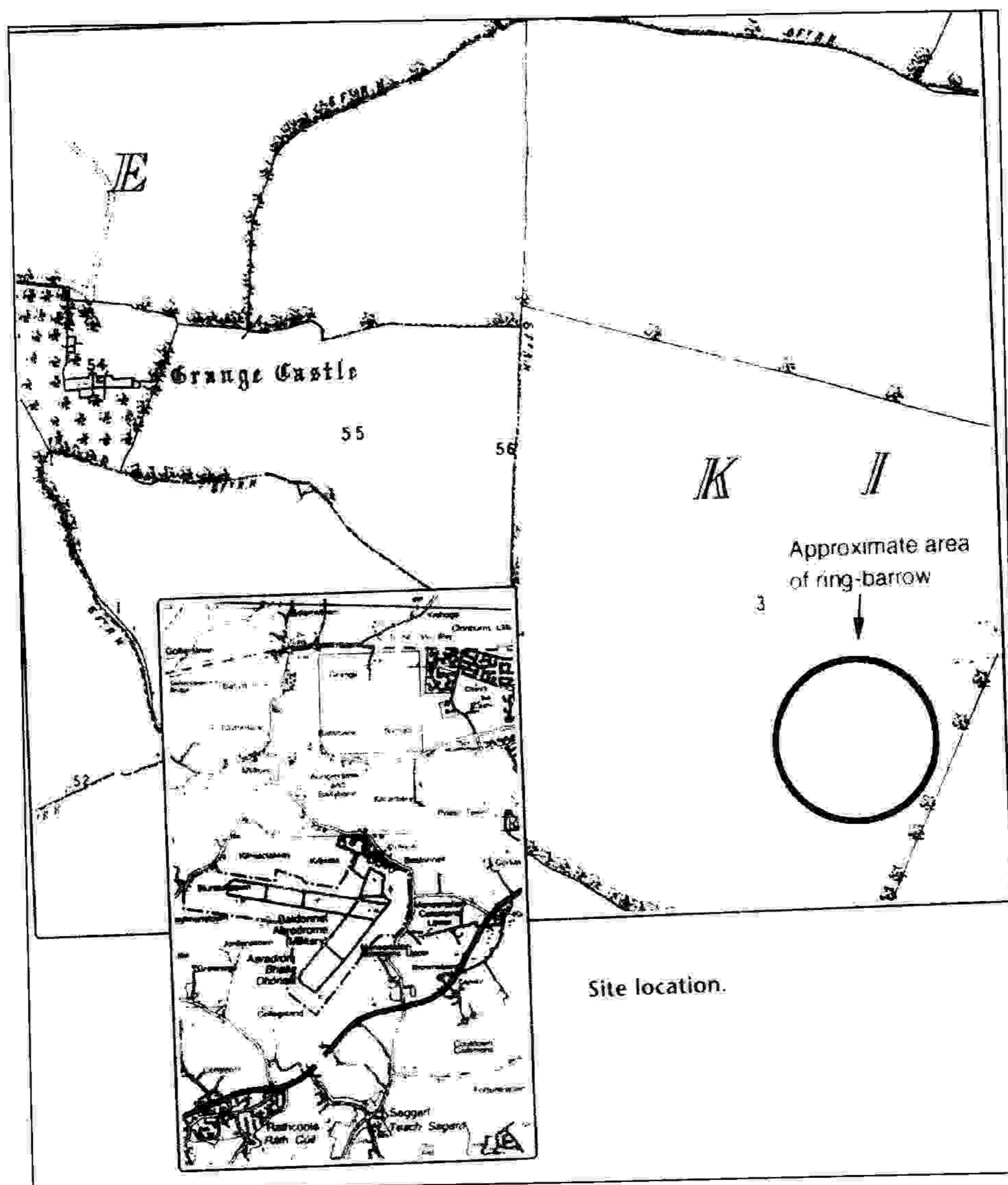


Figure 9. Location map of ring-barrow excavation in Kilmahuddrick townland, West Clondalkin (after Doyle, I. 2001, p. 17)

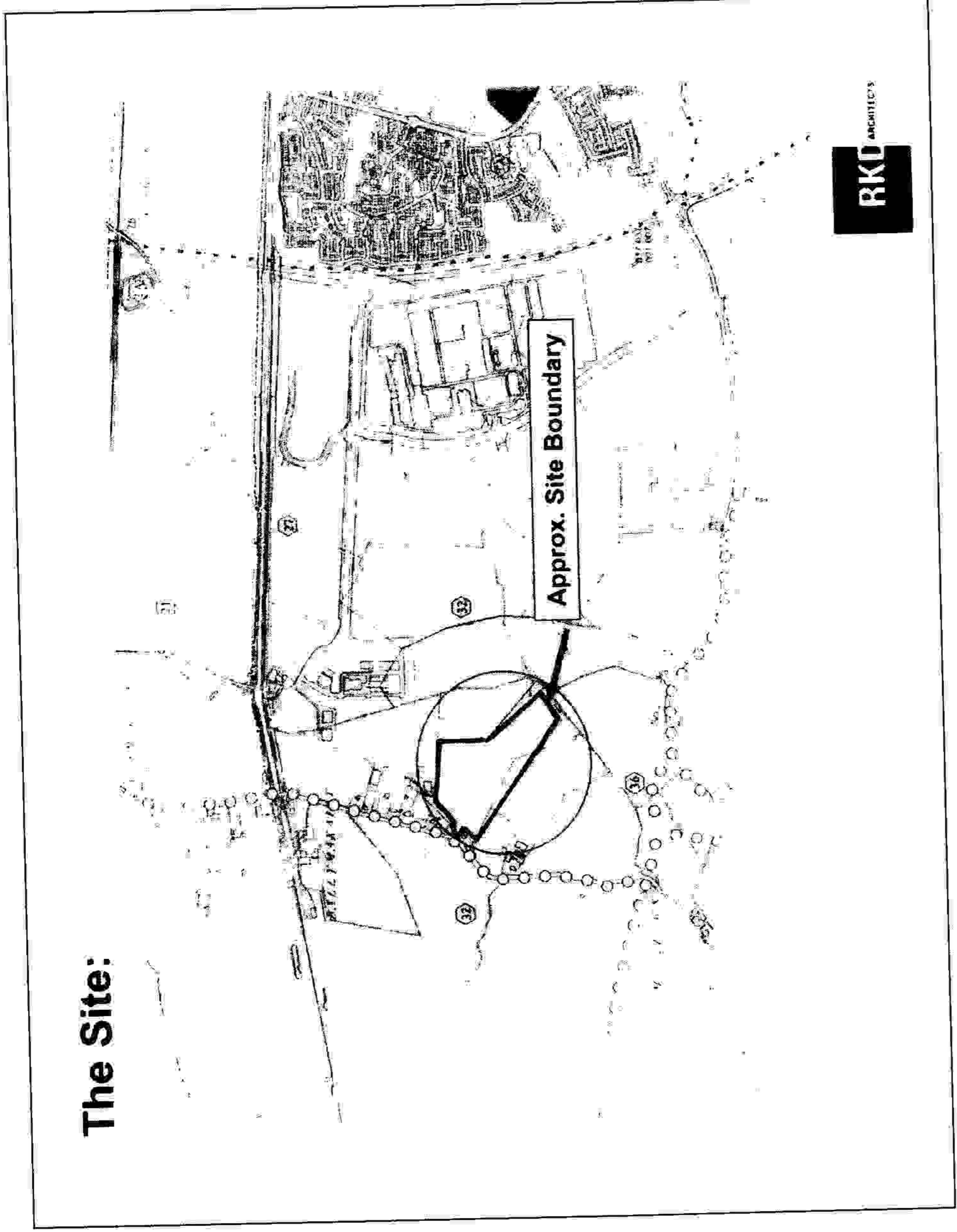


Figure 2. Location of site and approximate site boundary



Figure 3. Aerial photograph of proposed development site

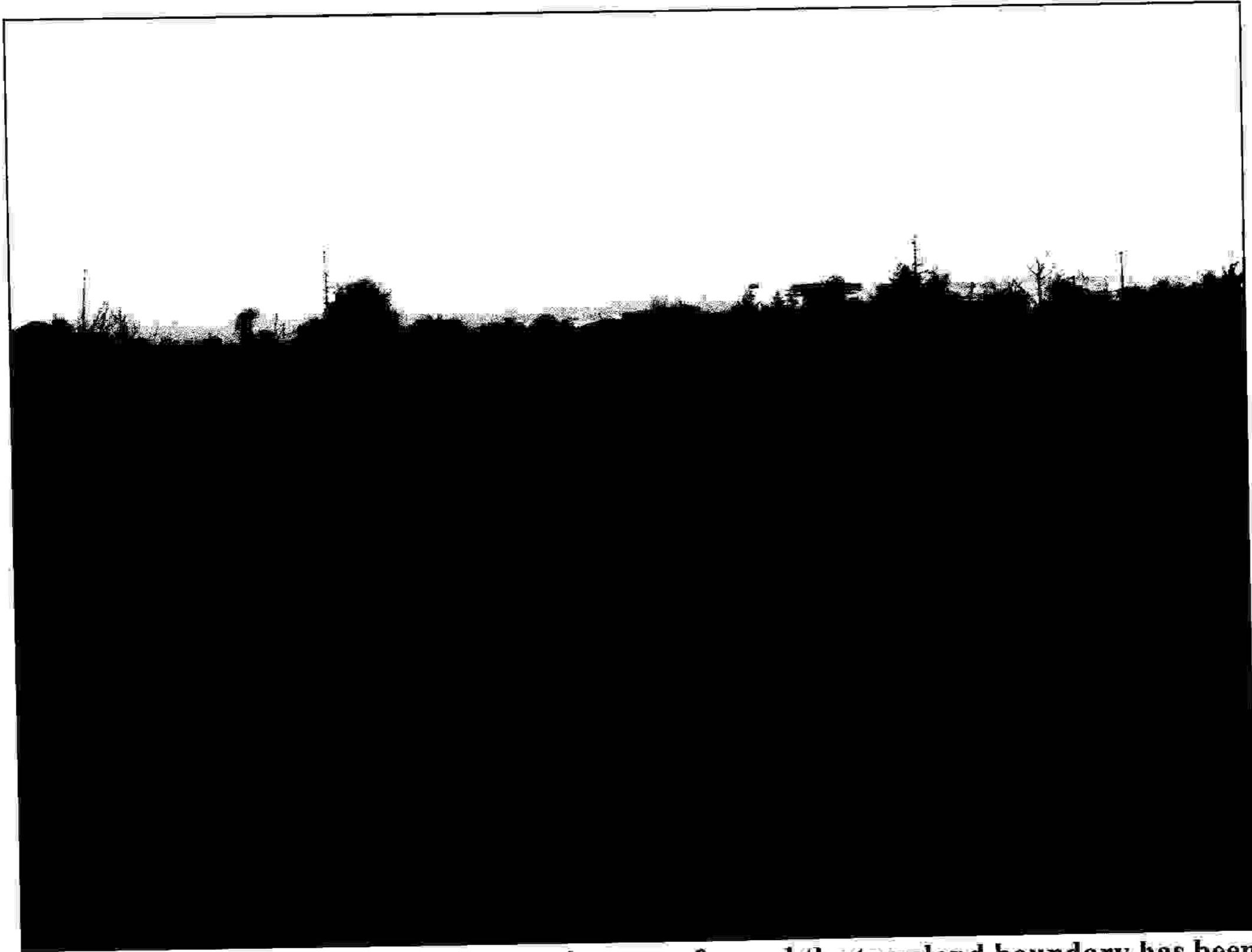


Plate 1. The old channel of the stream that once formed the townland boundary has been realigned into a new manmade channel.



Plate 2. The site is divided by a field boundary composed of drainage ditch and burrow



Plate 3. Looking N. at the farm sheds demolished as part of the Cuisine de France development in 2006



Plate 4. Farm house to the northwest of site under review has been demolished as part of the Cuisine de France development in 2006

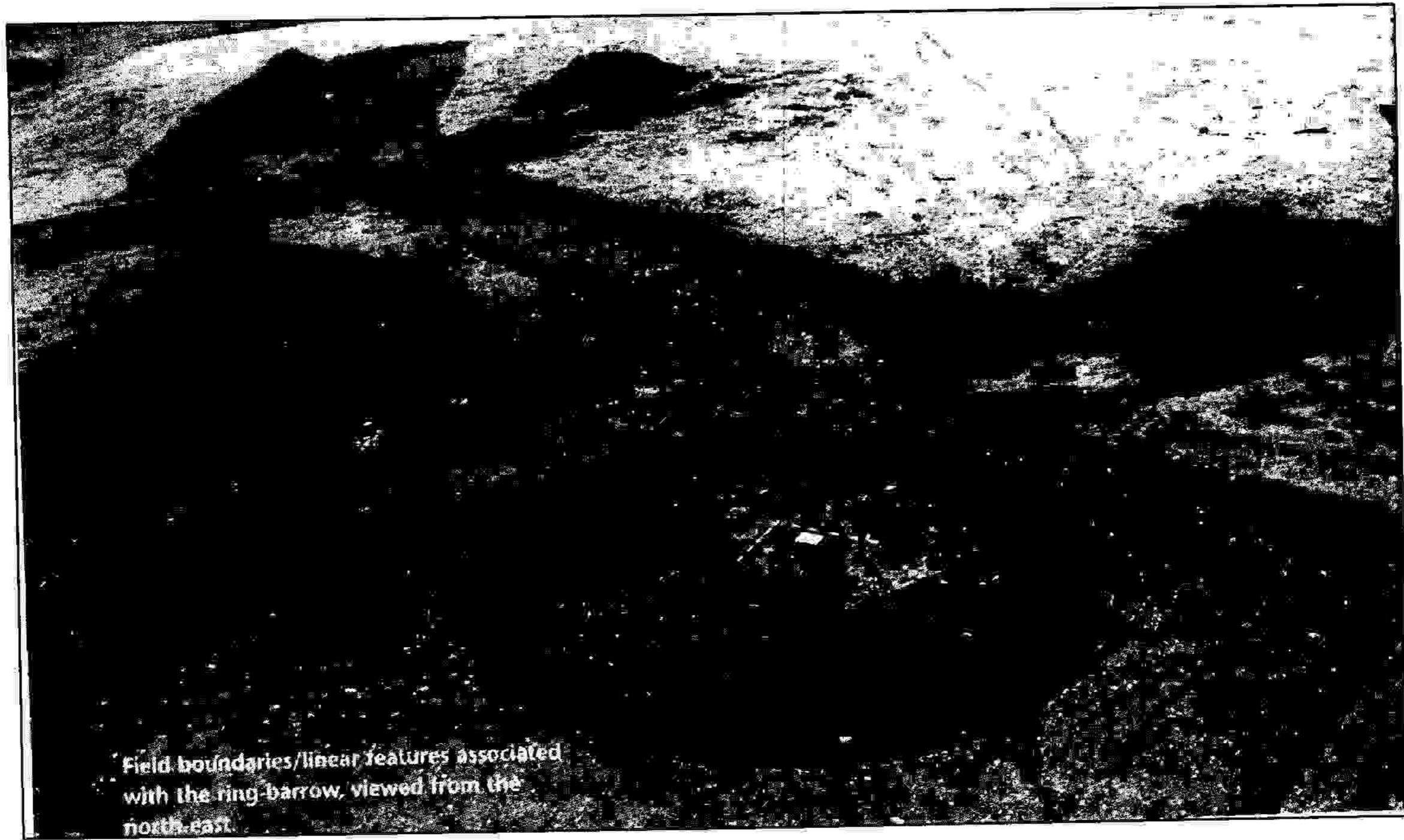


Plate 5. Ring-barrow with linear features/field boundaries excavated in Kilmahuddrick townland within Grange Castle Business Park (after Doyle, 2001 p.18) for location see figure 9