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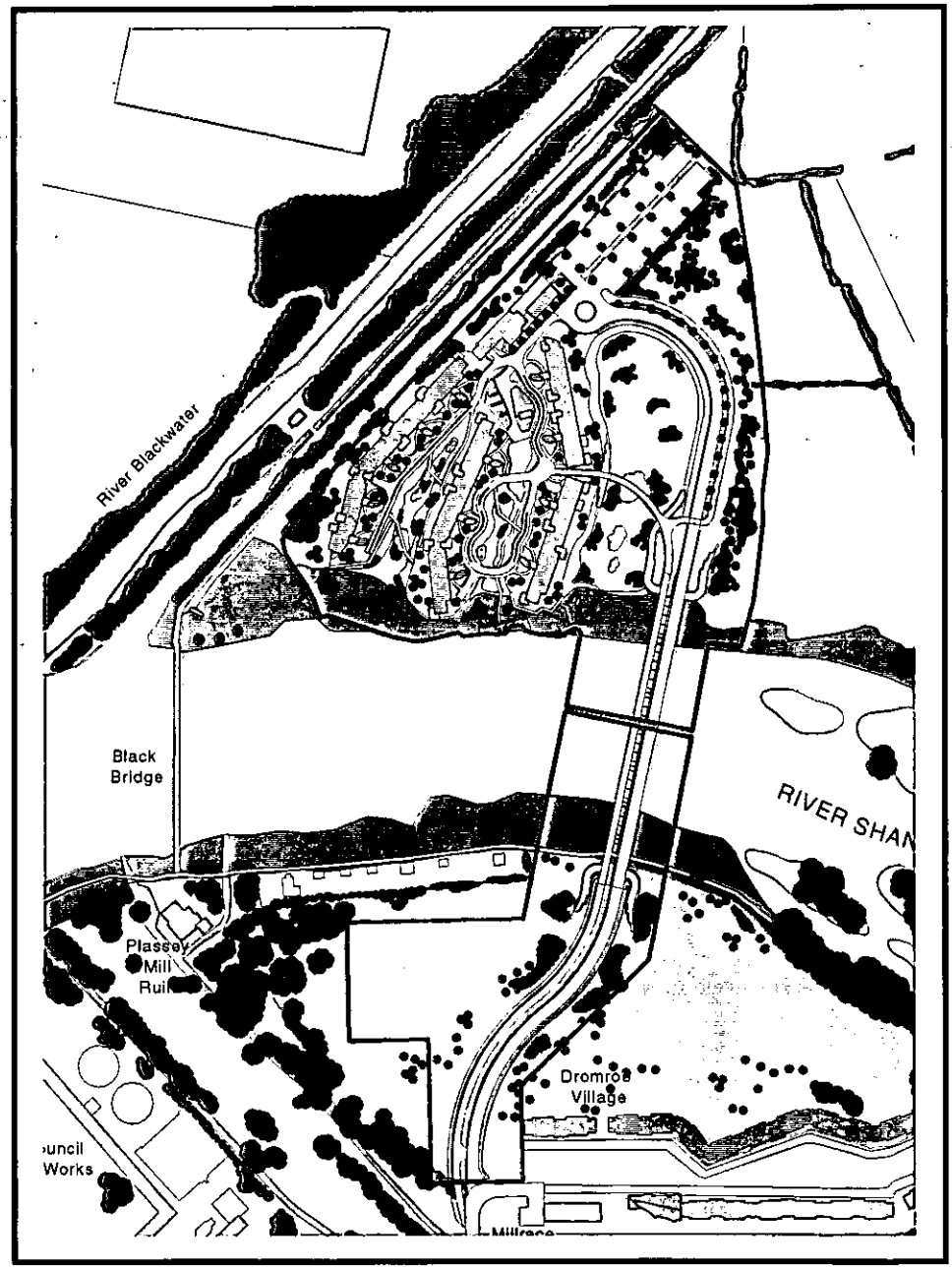
UNIVERSITY of LIMERICK

STUDENT VILLAGE, RIVER SHANNON BRIDGE AND ACCESS ROAD AT THE UNIVERSITY OF LIMERICK



ENVIRONMENTAL IMPACT STATEMENT

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D2387.11
August 2000

ARUP
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ENVIRONMENTAL IMPACT STATEMENT

FOR

A STUDENT VILLAGE, RIVER SHANNON BRIDGE

AND ACCESS ROADS

ON BEHALF OF

THE UNIVERSITY OF LIMERICK

D 2387/11
August 2000

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INTRODUCTION

The University of Limerick proposes to develop a student village on the northern banks of the Shannon River with a link bridge and access road from the existing University of Limerick campus. The student village which will be located in Garraun, Clonlara, County Clare, is proposed to accommodate 503 undergraduates, postgraduates, student families and faculty staff in six, five, four, two and one-bedroom units. Accommodation will be provided for disabled students. The river crossing will feature separate vehicular and cyclist/pedestrian decks, providing safe access to and from the student village. The layout of the proposed development is shown in Figure NTS 1.

An Environmental Impact Statement (EIS) has been prepared as part of the Planning Process under the European Communities (Environmental Impact Assessment) Regulations, 1989 –1999 (the EIA Regulations).

A written opinion on the scope of the EIS (presented in a Briefing Document) was prepared under the EIA Regulations and submitted to Clare County Council on 19 May 2000. This process was completed by receipt of an opinion on 16th August 2000. In addition to this, further consultations were carried out during the preparation of the EIS. A description of this process has been incorporated into the main EIS.

This Non-Technical Summary presents the key conclusions drawn from the Environmental Impact Study of the scheme. Copies of the EIS can be obtained from, or viewed at, the locations listed at the end of this Summary.

BACKGROUND TO THE PROJECT

Need for the Scheme
The University of Limerick is developing the student village to provide accommodation facilities for the increasing numbers of students attending the University. At present only 1,000 students are housed on campus, the University intends to accommodate 40% of all students on campus in the near future. The proposed student accommodation will alleviate congestion in nearby housing estates, designed to cater for families and not large numbers of students.

Examination of Alternatives
A number of alternative locations for the student village within the grounds of the University of Limerick were considered for this development. These sites were examined using a wide variety of criteria. Once the location of the student village was decided upon, the location of the bridge access was considered. Again, a number of locations were examined. On the basis of both assessments, the bridge and village sites were identified as being, on balance, the most appropriate for the development proposed.

Design Issues
The bridge cross-section was developed from the concept of a 'salmon fish-tail' protruding from the surface of the flowing river. Three student accommodation blocks will be constructed running in a southerly direction into the floodplain of the River Shannon. The natural floodplain is therefore preserved between the blocks, temporarily transforming them into river inlets. When the river recedes, the flood plains will become part of the village.

SITE AND SCHEME DESCRIPTION

Site

The University is located approximately 5km northeast of Limerick City at Plassey, 20km from Shannon Airport. The proposed site of the student village is a greenfield (undeveloped) site located in Garraun, Clonlara, County Clare on the northern bank of the River Shannon (see Figure NTS 2). The access road to the student village will lead from Dromroe student village, which is currently under construction. The proposed student village is located on low-lying land with a floodplain at the river bank, poorly drained areas north of the floodplain and relatively dry, farmed land further north again.

The existing campus will provide for the majority of services required for the proposed student village, with electricity provided by ESB lines on the northern side of the river.

Land Use

The land uses in the immediate vicinity of the site are characterised largely by agriculture in the north and the University campus in the south.

Development Proposals

The River is approximately 85m wide at the proposed crossing site, hence a bridge of 150m is required to span the river and maintain the pedestrian right of way along the southern bank. A five-span reinforced concrete deck bridge was chosen as the preferred scheme. The bridge, spanning at 25, 30, 40, 30 and 25m, will feature separate vehicular and cyclist/pedestrian decks. Deck lighting is provided between the vehicular and pedestrian/cyclist decks.

The proposed link road will provide vehicular, cyclist and pedestrian access via Dromroe Student Village at the southern edge of the South Meadows, serving the proposed student village. The proposed access will consist of a 6m wide single carriageway flanked to the west by a 3.75m wide segregated footpath and cycle track. The road and foot/cycle path will be separated by a 3.95m verge, enhancing the safety and comfort of cyclists and pedestrians.

The three student accommodation blocks will be constructed running in a southerly direction into the floodplain of the River Shannon. Village streets will be paved and restricted to pedestrian access only. Access to accommodation buildings will be clearly defined by freestanding 'entrance pods'. These pods provide secure bicycle parking, waste disposal points and electrical switch rooms. Service vehicles and delivery vans will access the village via remote-control operated bollards.

The student accommodation blocks are proposed to cater for undergraduates, postgraduates, student families and faculty staff in six, five, four, two and one-bedroom units. Accommodation is provided for disabled students. In total, 503 people will be accommodated by the development, with accommodation varying in height from one to five storeys. Balconies will be constructed between the bedroom and lounge of each apartment allowing natural light to in to the corridors.

Construction Activities

It is estimated that the period of construction is a total of 77 weeks, including 12 weeks for site enabling works (e.g. filling) and 65 weeks for the main building contract including the bridge and student accommodation blocks. The numbers employed during this time will vary, peaking at a total of 250 persons. It is estimated that during the summer period construction work will peak at a 12-hour day, reducing to an 8-hour day during winter. The construction vehicles will access the site principally via the west gate or main entrance. A temporary 'bailey' bridge structure is required to allow construction traffic to cross the Shannon River and enter the contained construction site north of the river.

In addition to this, it is anticipated that there will be approximately 75 heavy goods vehicle (HGV) movements throughout the day. These vehicle movements and the traffic generated by the construction staff will have a minor impact on traffic on the N7 route. A number of measures will be incorporated into the scheme during the construction phase of the development to minimise the impact on the environment.

Safety
The University has appointed a Project Supervisor (design) for the project. The construction phase will be supervised by a Project Supervisor (construction) to be appointed following the award of the construction contract.

POLICY CONTEXT

The development has been viewed in the light of certain policy documents that are relevant to the area in which the site is located. The National Development Plan 2000-2006 recognises the need to promote the success of universities in providing highly educated, skilled, young individuals who are vital to the continued attraction of foreign investors to this country.

The County Limerick Development Plan 1999 sets out the policies, guidelines, standards and objectives for the county for a five-year period. This Plan acknowledges the input of the University into developing and implementing academic programmes has resulted in economic and social development of Ireland and in particular the Shannon Region. The Clare County Development Plan 1999 outlines Clare County Council's settlement policy objectives and development guidelines, these policies include "*the consolidation and development of existing settlements and residential clusters*".

The proposed development adheres to the Department of Education Guidelines on Residential Developments for Third Level Students, 1999.

LANDSCAPE AND VISUAL EFFECTS

A landscape and visual assessment of the proposed student village, River Shannon bridge and access roads development was undertaken using site surveys and desk top studies, aerial photography, O.S. maps of the area, topographical – tree surveys, photomontage studies and a review of site cross-sections. These studies established a number of key views and zones of visual influence.

The proposed development is located within a locally distinctive stretch of the River Shannon corridor, up-stream of Limerick City. The tower of the ruined Plassey Mill adjoining the south bank and the pedestrian Black Bridge linking the river and canal walkways are the primary landmark features within a predominantly rural, tranquil setting. The construction of the University's third student residential development (Dromroe Village), south of the River Shannon, has introduced a new and direct relationship between the campus and the river corridor. The proposed development of the bridge and the fourth village reflects a further stage of the University's need for expansion and the strengthening of this river – campus relationship.

The development will generally have only slight or no perceptible visual impact on views from public roads and the residential areas of Dromore (Castletroy) and Gilloge, due to a combination of distance and/or intervening tree and hedgerow screening. It will, however, inevitably give rise to significant and, to a limited extent, profound negative change and visual impact in the short term due to the perceived loss of a tranquil, rural setting and change to a traditional recreation area. In the medium term, as the proposed bridge and village development (and the adjoining Dromroe Village) become familiar landmarks and the proposed landscape treatment matures, these impacts will gradually decrease and be increasingly perceived as neutral.

ROADS & TRAFFIC

A detailed Roads and Traffic Study was carried out to evaluate the traffic impact of the proposed development on the University of Limerick Campus and N7 route.

The estimated trips generated by the proposed residential development on the northern bank of the river were obtained through computer modelling. Information inputted into the model was based on a similar development in the UK, where the car ownership for students is higher than that experienced in Ireland at present. Therefore the model indicates the worst-case scenario for the development. During the opening year, 2003, on a typical weekday the model predicted a total of 413 traffic movements.

To service the student village, 96 car-parking and 6 bus-parking spaces will be provided on-site. The carpark is located to the north of the village. All traffic will be diverted to this carpark, with only pedestrians having access to the village.

A high level of pedestrian and cyclist movements between the residential units and the University Campus is expected. Hence a segregated foot/cyclepath from the vehicular movements will be provided. It is proposed that adequate pedestrian facilities and facilities for people with disabilities be provided on either side of the bridge in order to enhance the safety and comfort of the pedestrians in the area.

Based on the information available, a conservative estimate would anticipate that approximately 75 heavy construction vehicles would arrive and depart the site daily. It is envisaged that these traffic volumes would occur during short time periods, particular during the casting of the concrete bridge deck. This construction traffic will have a minor impact on the N7, Dublin/Limerick Route.

In order to mitigate against the traffic impacts of the proposed development, a number of measures are included in the scheme. These include the provision of adequate pedestrian crossing facilities and the use of traffic calming techniques to minimise traffic speeds in the vicinity of the bridge in order to enhance the safety of all road users. If an additional access from the County Clare side is provided to the proposed residential development on the northern side of the river, then in line with University policy this traffic will not be permitted to progress to the south side.

NOISE & VIBRATION

As part of the environmental noise and vibration evaluation, a noise and vibration survey was undertaken in the area of the proposed site to establish the background noise levels. The noise generated by the development was predicted and compared with the appropriate standards. An evaluation was made of the effects of construction and operational noise and vibration.

During the constructional phase of the project there will be a minor impact on nearby residential properties due to noise emissions from site traffic and other activities. The application of binding noise limits and hours of operation, along with the implementation of noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum.

Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed 50dB $L_{Aeq,1hr}$ during the day-time and 40dB $L_{Aeq,5min}$ during the night-time at the façade of the nearest noise-sensitive properties. The resultant noise impact will be negligible.

The predicted noise level associated with vehicular activity on the bridge is within both the day-time criterion of 50dB $L_{Aeq,1hr}$ and the night-time criterion of 40dB $L_{Aeq,5min}$. The resultant noise impact will be negligible.

AIR QUALITY

Potential sources of emission to the atmosphere arising from the development were assessed and an extensive air quality monitoring programme was undertaken (based on the consideration of these sources) to establish the existing setting in the vicinity of the site. This monitoring programme has shown that the area around the site currently experiences good air quality.

Atmospheric dispersion modelling of the road traffic emissions was undertaken for future years, both with and without the scheme. Predictions of the worst-case pollutant levels have been made at a distance of 20m from the centre of the road. Calculations have been based on the predicted traffic flows, taken from the Roads and Traffic Impact Study. The air quality predictions have been assessed against European Union standards. The results of the modelling study indicate that, even under worst-case traffic conditions, vehicle emissions will not breach EU air quality limits.

It has been identified that the release of fugitive dust emissions during the construction phase is a potential risk for adjacent roads and properties. Accordingly, a dust minimisation plan has been formulated to ensure that the dispersion of dust off-site is kept to an absolute minimum.

It has been concluded, therefore, that the development would not result in a significant adverse impact on air quality.

NATURE CONSERVATION

A habitat survey of the site was carried out to ascertain the conservation importance of the proposed development site in relation to birds, mammals and aquatic life. A survey and evaluation of hedgerows was also carried out using recognised methods. The majority of the site of the proposed development is located within the Lower River Shannon proposed candidate Special Area of Conservation (pcSAC). This boundary is currently under review with Dúchas to exclude areas of low ecological value. The pcSAC designation means that the site contains habitats/species of national/international ecological importance.

The aquatic survey of the watercourses in the area of the proposed development suggests that this River Shannon is slightly polluted. The River Shannon is a noted mixed fishery holding stocks of salmon, sea trout, brown trout, eels, pike and coarse fish. Anglers during the open season for salmon, sea trout and brown trout heavily fish the river at Plassey. The stretch of river in the vicinity of Plassey has a peak run of spring salmon in late March and April, with a peak run of grilse in June. Three species of lamprey have been recorded from the River Shannon at Plassey. All three species are listed under Appendix II (Species requiring the designation of Special Areas of Conservation) of the EU Habitats Directive (92/43/EEC). Measures to mitigate impacts during bridge construction will require confining works to the period outside of the breeding season for lamprey, that is from mid-May to July. To allow the potential effects of the construction on salmon spawning area to be addressed, it is proposed that a study will be undertaken to establish its extent and location. The scope of this study will be agreed in advance with the Shannon Regional Fisheries Board.

The central accommodation building will be located within 5m of the edge of the River Shannon. This will directly impact on the wet grassland fringe which forms a 10-20m wide band along the river. This habitat is of high local ecological value and any construction within this wet grassland fringe will constitute a moderate negative impact. Areas of wetland habitat will be constructed as part of the overall landscape design. This will mitigate the loss of some of the floodplain vegetation and provide additional wetland habitat for fauna and flora associated with the river.

During construction of the 'bailey' bridge and the permanent bridge an operating width of approximately 60m will be required on both sides of the river. This will constitute a moderate negative impact on the strip of wet grassland present on the north bank and on the rank grassland on the south bank. Two cofferdams (approximately 10m by 16m) will be established within the riverbed to facilitate the construction of supporting piers for the permanent bridge. These will have a temporary localised severe negative impact on the riverbed. Mitigation measures will facilitate the rehabilitation of the riverbed outside of the pier area. Access into the river for the construction of the cofferdams will be by temporary jetty. This will have a minor negative impact on the river. The construction of the temporary 'bailey' bridge will require the creation of temporary bunds of large granular material on either bank through which pile caps will be driven. This will again constitute a minor negative impact on the river.

During operation, oil interceptors will be installed and maintained to ensure no oil/petrol materials will be discharged in the surface water. In addition, a temporary bund will be constructed on the south and west sides of the student accommodation development to contain surface water run-off during the construction phase releasing sediment into the river.

SOILS AND GEOLOGY

This section describes the soils and geology conditions of the proposed development site, and is based on a desk study carried out by Arup Consulting Engineers.

The bedrock geology of the area south and surrounding Limerick City consists of a variety of rock types including volcanics, intrusive and extrusive basalts and volcaniclastic rocks interstratified with limestone of Visean (Carboniferous) age.

The construction management of the project will incorporate protection measures that will minimise as far as possible the risk of spillage that could lead to ground contamination.

There will be no residual effects on the soils and geology as a result of these proposals.

HYDROLOGY AND DRAINAGE

This section highlights the potential sources of pollution which could enter the River Shannon, the Errina Canal/River Blackwater or the millrace.

The potential for water contamination during the construction phase would be associated with the following:

- Construction of the temporary bridge across the river
- Earth moving works
- Temporary storage of oil and fuel for plant and equipment
- Disposal of foul drainage

During the operational phase of the proposed development, the potential for watercourse contamination arises from run-off from the proposed bridge and access roads arising from rainfall scouring of unburnt exhaust condensate (hydrocarbons) and road grit.

A number of pollution control measures will serve to reduce or eliminate the potential for watercourse contamination, including the construction of a temporary bund around the development site and the installation of petrol/oil interceptors at the student village carpark and on the northern and southern sides of the bridge.

The flood study carried out by ESBI predicts that for a 100-year flood, no change in water levels will occur as a result of the bridge. Adding the proposed student residences, a 1cm rise at a distance of 30m upstream of the bridge will result.

There will be no residual effects on the hydrology and drainage as a result of these proposals.

SOCIO-ECONOMICS

The proposed scheme will benefit the local area by providing much needed accommodation for students of the University, alleviating the increased demand on housing in Limerick City in recent years.

The scheme shall generate employment, creating permanent jobs through the amenities developed at the student village. The development will allow the University of Limerick to expand to meet its objectives thus ensuring the delivery of trained people.

The tourist value of the vicinity will be enhanced by the development as it provides improved access to the amenity areas and will accommodate summer students and conference delegates.

The constructional phase of the development will result in a temporary moderate local adverse effect on the recreation and amenity value of the area, as the existing right-of way along the southern bank will be diverted.

The operational phase of the proposed development will have an overall minor local adverse effect on the recreation and amenity value of the area as the bridge deck may locally impede angling activities on the riverbanks or within the river channel.

SITE UTILITIES & SERVICES

Subject to planning permission from Limerick County Council, the water supply for the fourth student village will be sourced from a ring main in the vicinity of the south of the river and pumped across the bridge.

Surface water run-off from hardstanding areas of the proposed development will be collected through a closed drainage system, and will also be discharged to the Shannon via suitably sized petrol/oil interceptors.

Subject to agreement and planning permission by Limerick County Council, the foul effluent generated by the proposed student village will be pumped through a rising main incorporated into the bridge deck and will connect into the Castletroy Sewage Treatment Plant.

It is proposed that part of the existing overhead ESB network on the Clare side of the River be diverted underground to facilitate the construction of the access road and student village.

Gas is supplied to the existing University of Limerick campus via a pipeline. The proposed bridge will transport this supply to the north side of the River via a 200mm-diameter pipeline which will be contained within the bridge deck.

Overhead telephone cables currently run along the road to the north of the proposed student village. Connections will be made to supply the management and residents of the development with the required telecommunication services.

The available site services are sufficient to cater for the expansion of the University of Limerick campus to the north of the River Shannon.

Careful planning of services works prior to the development, and where necessary undertaking advance works ahead of the main construction elements will ensure that disruption to essential services will not occur.

ARCHAEOLOGY & CULTURAL HERITAGE

A baseline desk study, field investigation and underwater survey were undertaken to ascertain the archaeological and cultural importance of the proposed development site.

There are no known archaeological sites listed in the Sites and Monuments Record for this area. Nothing of archaeological interest was noted on the surface of the fields during the field investigation. Also, a study of cartographic sources from 1787 onwards did not reveal any finds or features of archaeological interest within the development area that might come to light during topsoil stripping.

The only item of archaeological interest observed during the underwater archaeological survey was an isolated ship's timber that was carved in shape and made from the bough and branch of the same tree.

It is proposed that ground and riverbed disturbance works will be monitored by a licensed archaeologist, so that any features of archaeological derivation may be fully excavated and recorded.

OTHER IMPACTS HEADINGS & INTERACTIONS

This Section addresses the environmental aspects that are not specifically addressed in the individual sections of the EIS and also identifies the main interactions between different effects.

A study of climatic effects as a result of the scheme identified that the microclimate and in particular, shading was the only significant issue. A shading study was carried out and the results of this show that there is an effect on the former lock-keeper's cottage. The overall microclimatic impact of the scheme is anticipated to be a cyclical, long-term, minor local negative impact.

In the EIS document, topics including human beings, flora and fauna, material assets, water and residential amenity are not specifically dealt with in one chapter but within other sections of the EIS. For example with regard to human beings, the economic and social considerations are detailed in Section 12.0, land use issues are addressed in Section 3.0 and in Section 4.0, and health and safety issues have been considered in Section 3.0. The effects of development on human beings with regard to Landscape (Section 5.0), Noise (Section 7.0), Traffic (Section 6.0) and Air Quality (Section 8.0) are also addressed.

Two principle interactions have been identified: Landscaping and Nature Conservation as well as Traffic, Air Quality and Noise.

SUMMARY

It would be a policy of the University of Limerick to reduce the effects of its activities on the environment to a practicable minimum, through the development of environmental management measures. This policy commitment has been applied throughout the development of the proposed student village, bridge and access roads. Where unavoidable environmental effects would occur, measures have been proposed to mitigate these effects as much as reasonably possible. These measures would be adopted throughout the construction and operation of the proposed development.

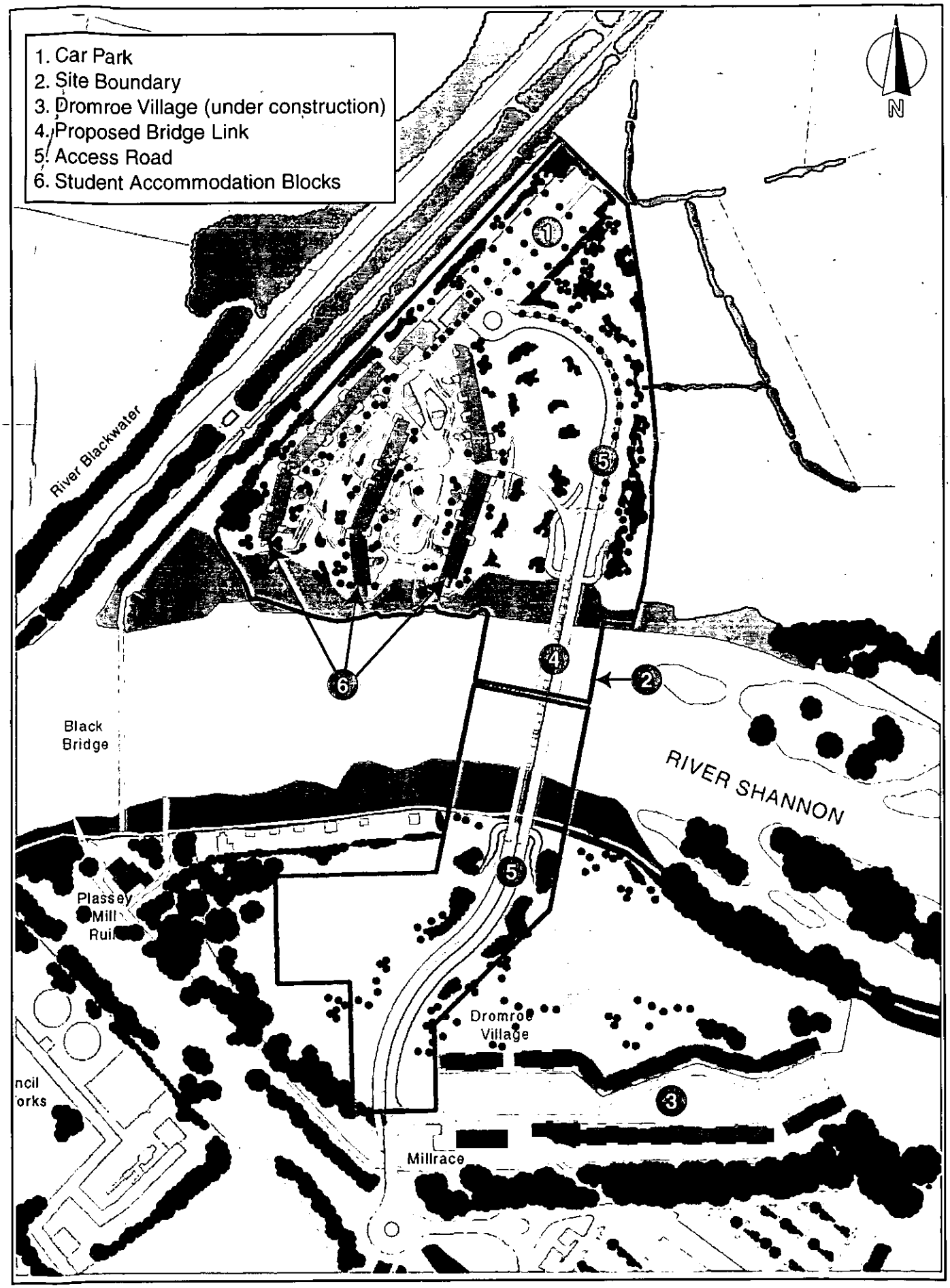
VIEWING AND PURCHASING THE ENVIRONMENTAL IMPACT STATEMENT

The full Environmental Impact Statement from which this Non-Technical Summary has been prepared, together with the deposit plans, can be viewed at the offices of Clare and Limerick County Councils, Planning Departments. The EIS is available for purchase at the price of IR£35.00, from the following addresses:

Limerick County Council
Planning Department
79/84 O'Connell Street
Limerick

Or

Clare County Council
Planning Department
New Road
Ennis
Co Clare



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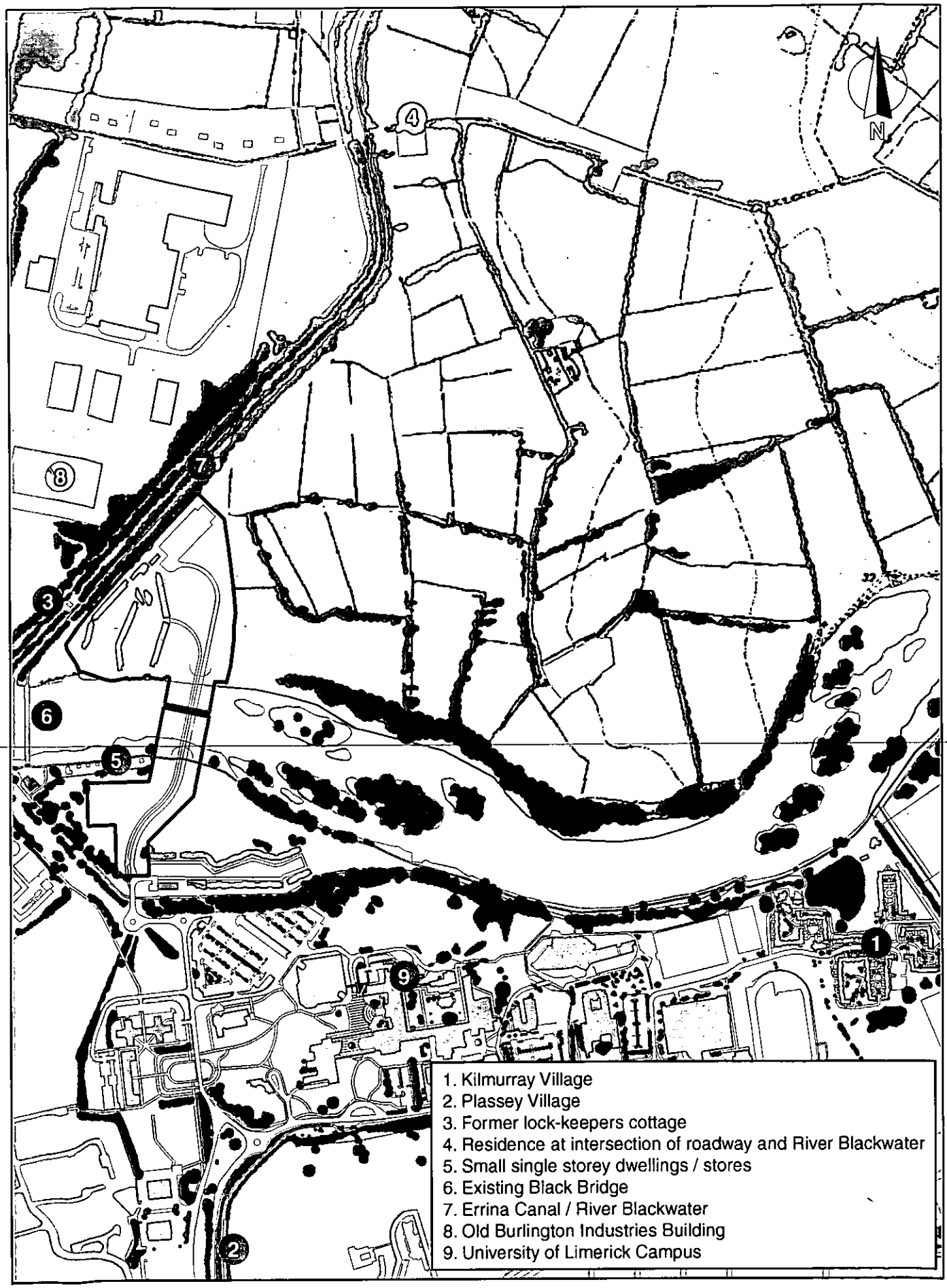
Plan of Proposed Development

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road Non Technical Summary

Figure No: Figure NTS1



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Current Site Layout

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road Non Technical Summary

Figure No: Figure NTS2

1.0 INTRODUCTION

1.1 INTRODUCTION

Arup Consulting Engineers (Arup) has been commissioned by the University of Limerick to prepare an Environmental Impact Statement (EIS) for the development at their campus located at Plassey, Co. Limerick. A number of subconsultants were appointed by Arup to assist with specialised topics covered by the EIS. A list of these subconsultants is shown in Appendix A.

The development consists of a student village north of the River Shannon with link bridge and approach road from the existing University Campus, south of the river. The regional location of the proposed scheme is shown in Figure 1.1 and the existing University Campus layout is shown in Figure 1.2, an aerial photograph.

The student village will be located in the townland of Garraun, Clonlara, Co. Clare and will include five hundred and three en-suite student bedrooms in one, two, four and six bedroom units sharing a living room and kitchen area with management complex and management residence. Communal facilities, subject to future planning applications, will also be provided including an assembly hall, cafè, laundrette and shops. The student village will accommodate and provide facilities for the increasing number of students attending the University.

Access from the University Campus to the northern side of the River Shannon is currently provided by a pedestrian bridge, known locally as 'Black Bridge' and denoted as 'Plassey Bridge' on ordnance survey maps.

The proposed bridge is to be 150m long and 16m wide. The crossing will provide vehicular, cyclist and pedestrian access to the proposed student village. The existing public pedestrian/cyclist right-of-way along the southern bank will be maintained.

The purpose of the EIS is to report on the impact of the proposed development on the environment for certification by the Planning Departments of Clare and Limerick County Councils. The EIS includes all the information relating to potential significant environmental effects, and highlights the proposed mitigation measures where appropriate. The area of the proposed development has been proposed for designation by Dúchas and is classified as a proposed candidate special area of conservation (pcSAC).

1.2 EIS METHODOLOGY AND CONSULTATION PROCESS

1.2.1 Introduction

The need for an Environmental Impact Assessment (EIA) for this scheme arises out of a number of pieces of legislation. These include the Local Government (Planning and Development) Regulations 1999, European Communities (Environmental Impact Assessment) Regulations 1989 to 1999 (the EIA Regulations), Roads Act 1993 and the Roads Regulations 1994 (the Roads Regulations).

The Local Government (Planning and Development) Regulations, 1999 (Article 11 (b) of SI 92 of 1999) lists the planning applications that require the local authority to *"decide whether the development would or would not be likely to have significant effects on the environment"*. This section explains that a development located on a site notified in accordance with Regulation 4 of SI No. 94 of 1997 fulfils this requirement. As discussed in detail in Section 9.0 of this EIS, the site of the proposed development is located within a pcSAC, which is listed in SI No. 94 of 1997.

The development is of a class outlined in Part II of the First Schedule of the European Communities (Environmental Impact Assessment) Regulations 1989 to 1999. These regulations state that developments involving the "*construction of more than 500 dwellings*" require an EIS. A total of 106 residential units are proposed in this development so this requirement does not apply.

Section 50 (1) (a) of the Roads Act, 1993 indicates the type of road developments that require an EIS. This Act applies to a public developer only and reads as follows:

> *"A road authority shall prepare a statement of the likely effects on the environment of any proposed road development consisting of-*
> *(i) The construction of a motorway,*
> *(ii) The construction of a busway,*
> *(iii) Any prescribed type of proposed road development consisting of the construction of a proposed public road or the improvement of an existing public road."*

Article 8 of the Roads Regulations clarifies these 'prescribed types' of road development.

> *"8. The prescribed types of proposed road development for the purposes of subsection (1) (a) (iii) of Section 50 of the Act shall be –*
>
> *(a) 'The construction of a new road of four or more lanes, or the realignment and widening of an existing road so as to provide four or more lanes, where such new or realigned or widened road would be eight kilometres or more in length in a rural area, or 500 metres or more in length in an urban area;*
>
> *(b) 'The construction of a new bridge or tunnel which would be 100 metres or more in length."*

There would clearly be a requirement for an EIS if this scheme were to be proposed by a road authority, though it is likely that the intention was to apply this legislation to all road developers. The University of Limerick, as the proposed developer, is following this legislation as if this were the case and is thus submitting an EIS to the Planning Departments of Clare and Limerick County Councils to accompany their planning application for the student village, River Shannon bridge and access roads development.

1.2.2 The EIA Regulations

The EIA Regulations, as amended, implement the EU Directives (85/337/EEC & 97/11/EU) on the assessment of the effect of certain public and private projects on the Environment. The EIA Regulations require that the following information to be included in an EIS;

> *"A description of the proposed development, comprising information about the site and the design and size or scale of the development; The data necessary to identify and assess the main effects which that development is likely to have on the environment.*

A description of the likely significant effects, direct and indirect, on the environment of the development, explained by reference to its possible impact on:
human beings;
flora;
fauna;
soil;
water;
air;
climate;
the landscape;
the interaction between any of the foregoing;
material assets;
the cultural heritage;

Where significant adverse effects are identified with respect to any of the foregoing, a description of the measures envisaged in order to avoid, reduce, and if possible, remedy those effects."

Article 14 of the EIA Regulations (SI 93 of 1999) introduces certain information that should be included in an EIS for a road development, as follows:

"

(a) A description of the proposed road development comprising information on the site, design and size of the proposed road development;

(b) A description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects;

(c) *The data required to identify and assess the main effects which the proposed road development is likely to have on the environment;*

(d) *An outline of the main alternatives studied by the road authority concerned and an indication of the main reasons for its choice, taking into account the environmental effects;*

(e) *A summary in non-technical language of the above information."*

Further information to supplement the above is also specified, as follows;

"(i) A description of the physical characteristics of the whole proposed road development and the land-use requirements during the construction and operational phases;
(ii) An estimate, by type and quantity, of expected residues and emissions (including water, air and soil pollution, noise, vibration, light, heat and radiation) resulting from the operation of the proposed road development;"

In relation to the 'likely significant' environmental effects, the following aspects are highlighted;

"- Human beings, fauna and flora,
- Soil, water, air, climatic factors and the landscape,
- Material assets, including the architectural and archaeological heritage, and the cultural heritage,
- The inter-relationship between the above factors;"

The following characteristics of the scheme are to be brought out in the description of the effects;

"- The existence of the proposed road development,
- The use of natural resources,
- The emission of pollutants, the creation of nuisances and the elimination of waste.
and a description of the forecasting methods used to assess the effects on the environment"

Finally, an indication of any difficulties (technical deficiencies or lack of know-how) encountered in compiling the required information and a summary in non-technical language of the above information.

This EIS has been prepared with regard to the above requirements. The format used is designed to allow the reader to access the issues of interest to them as easily as possible. Thus, the format of the regulations and Directive above is not strictly applied. For example, effects on human beings are addressed in a number of chapters including traffic, noise, air quality, socio-economics and visual aspects. Issues not directly addressed in individual chapters are discussed in Chapter 15. The interactions between environmental issues are described in Chapter 16.

1.2.3 EPA Guidelines

The EPA publications "Draft Guidelines on the information to be contained in EIS's" (1995a) and "Advice Notes on Current Practice (in preparation of EIS's)" (1995b) were consulted in the preparation of this EIS.

1.2.4 Consultation Process

Formal scoping was carried out through a request for a written opinion on the EIS scope. The information contained in the Briefing Document complied with the requirements under Article 4 of the Local Government (Planning and Development) Regulations, 1999 (S.I. No. 92 of 1999).

The Briefing Document was circulated to the following bodies:

- The Office of Public Works;
- The National Monuments Advisory Council;
- An Taisce – The National Trust for Ireland;
- Bord Fáilte;
- Dúchas;
- National Roads Authority; and
- Shannon Regional Fisheries Board.

Written opinions from the above organisations (deadline for the receipt of these was 2nd August 2000) were reviewed and the EIS has been edited to incorporate the comments received.

Apart from the formal scoping process, a letter of consultation on the EIS was issued to a number of Statutory and Public Consultees notifying them of the scheme and inviting their comments on the proposed development. These consultees were as follows:

- Environmental Protection Agency;
- Local Anglers Association;
- Irish Wildlife Trust;
- Geological Survey of Ireland; and
- BirdWatch Ireland.

Comments received from the above consultees have also been considered in the completion of this EIS.

1.3 PROFILE OF DEVELOPER

The University of Limerick was established by the State in 1972 as The National Institute for Higher Education, Limerick. Full university powers were granted by legislation enacted by the Irish Parliament in 1989. It is the first new University established since the foundation of the State. The University is located on a riverside campus of circa 83 hectares (204 acres) developed as scenic parkland, five kilometres northeast of Limerick City (population over 50,000). Over 9,000 students are enrolled at the University at present.

1.4 PROPOSED DEVELOPMENT

This scheme includes the construction of a student village north of the River Shannon, the link bridge from the campus south and approach roads.

A number of options for the design have been investigated through the Scheme Development process and this is described in Chapter 2.0. A preferred option has been identified and it is the effects of this preferred option on the environment which is evaluated and presented in the EIS.

The proposed bridge will be 150m long and 16m wide. The crossing will provide vehicular, cyclist and pedestrian access to the proposed student village. The village will include five hundred and three individual student bedrooms and communal and management facilities. This is described in more detail in Section 3.5.

Construction of the bridge over the River Shannon will necessitate working within or over the water, but will be carried out with minimal disruption to the river. This is described in more detail in Section 3.6.

The programme for completion of the development is currently projected to be March 2003.

1.5 ENVIRONMENTAL MANAGEMENT PROGRAMME

Where unavoidable environmental effects are anticipated to occur as a result of the proposed development, measures have been proposed to mitigate these effects as far as is practicable. An Environmental Management Programme (EMP) that will be implemented as part of the construction and operational activities at the site has been prepared and this is described in Section 16.4. The EMP describes measures to be undertaken during both the construction and operational phases of the scheme to mitigate impacts identified.

1.6 DIFFICULTIES ENCOUNTERED DURING THE STUDY

1.6.1 Introduction

This section is included as required under SI No. 93 of 1999, Second Schedule, 2 (d) of the EIA Regulations (described in Section 1.2.1). This states that the EIS must include "an indication of any difficulties encountered by the developer in compiling the required information".

1.6.2 Air Quality and Noise

Ambient air quality and noise measurements were carried out for the purposes of the EIS. However, due to the time frame of the project, it was not possible to obtain ambient air quality and noise data representative of all possible conditions on this site. The sites chosen are representative of the closest receptors and are considered 'worst-case'.

The worst weather conditions for dispersion of air pollution which will give rise to highest concentrations of pollutants at the site are stable atmospheres and low windspeeds. High winds and average to high levels of vertical mixing allow pollutants to be rapidly dispersed in the atmosphere.

Windspeeds during the monitoring period were moderate south west and westerly and occasionally blustery, leading to favourable conditions for dispersal of pollutants. This may have contributed to the relatively low existing pollutant concentrations at the sites monitored, which may rise under more stable conditions.

1.6.3 Site Investigation

Dúchas advised that an underwater archaeological survey be carried out at the site prior to geotechnical investigation works. In order to carry out this study, a licence was required from Dúchas. Due to this delay, the site investigation was not completed upon the publication of the EIS. Therefore only reports detailing previous site investigations were considered in the study of soils and geology (Section 10.0).

1.6.4 University of Limerick Campus Traffic Survey

The Roads and Traffic Section of the EIS was completed during summer time, a time when traffic figures on campus would not be representative of term-time traffic volumes. Therefore, traffic generated by the proposed residential development was estimated using the TRICS 4.1 Database (Trip Rate Information Computer System, Version 4.1). The information is based on a similar development in the UK, where the car ownership for students is higher than that experienced in Ireland at present.

1.6.5 Salmon Spawning

The Nature Conservation Section of the EIS details the aquatic life surveyed in the Shannon River. Through survey and investigation it was established that lamprey breed in the area of the proposed bridge. The survey was carried out during the summer months, which coincides with the lamprey-spawning season. As salmon spawn during the winter months, it could not be established at the time of publication of the EIS whether or not salmon breed in the area of the proposed bridge.

REFERENCES

EPA (1995a) Draft Guidelines on the Information to be contained in Environmental Impact Statements

EPA (1995b) Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)

2.0 BACKGROUND TO THE PROJECT

2.1 INTRODUCTION

This Section presents a background to the development of the fourth University of Limerick student village and link bridge and an outline of the site selection process. The proposed link bridge crossing the River Shannon development would include a crossing of 150m length and 16m width and will provide separate vehicular access to cyclists and pedestrians. The student village will include 106 apartments providing 503 student bedrooms, management complex and managers' residences.

2.2 NEED FOR THE DEVELOPMENT

2.2.1 Expansion of Campus Boundaries:

The original Campus lands were planned to accommodate a maximum of 8,000 students in a scenic parkland environment. Already the University has exceeded the accommodation target by approximately 1,000 students. Further growth in the order of 3,000 students is planned by the year 2006. The details of the student population are set out in Table 2.1 below.

Table 2.1 : Summary Student Numbers to Academic Year 2005/2006

Category of Student	Academic year 1999/2000	Academic year 2005/2006
Full time students		
Undergraduates	6,650	7,700
Postgraduates – research	351	800
Postgraduates - taught	543	1,000
Sub-total - full time	**7,544**	**9,500**
Part time students		
Undergraduates	972	1,300
Postgraduates – research	157	350
Postgraduates - taught	403	650
Sub-total - part time	**1,532**	**2,300**
Total	**9,076**	**11,800**

In order to permit the University to implement its long-term development objectives it is necessary to extend Campus boundaries. To ensure that the enlarged Campus is developed to the same high quality of design, both in respect of buildings and the scenic parkland environment, circa 40 hectares (100 acres) is required to meet the future development needs of the University community.

The existing University Campus is bounded by the National Technological Park in the east, by Milford Care Centre and residences in the South and by the River Shannon and Co. Clare in the north. Taking account of this topography the only expansion of the campus possible is north of the River Shannon in Co. Clare. Expanding the campus in this direction has a number of significant attractions:

- Land suitable for the campus range of developments exists north of the river.
- The River Shannon will then run through the heart of the expanded campus and become a central feature.
- A substantial portion of the land required is available on the market.
- The expanded University Campus would remain integrated and contiguous.
- A footbridge at Plassey Mill – the Black Bridge already links the south campus with the expansion to the North.

The University has, to date, acquired 45 hectares (112 acres) of land on the north of the River Shannon.

2.2.2 Student Accommodation Needs

The Campus plans to have a total of 4,000 (circa 40% of the student population) in study bedroom type accommodation on campus. This accommodation is considered essential to relieve the conflict with excessive number of students residing in unsuitable accommodation in family type housing developments. The ratio of circa 40% in on campus accommodation will provide for the future increase in research students as University expands to its full potential in the national and international arena.

At present the University has 969 student study bedrooms at two villages located on campus. A third student village for 457 study bedrooms is under construction and is known as Dromroe Village. A fourth student village is now planned and being submitted for the decision of Clare County Council planning authority in order to continue this progress towards the target of approximately 4,000 student study bedrooms on Campus.

Details of these four student villages are shown in Table 2.2 below.

Table 2.2 : Summary of Study Bedrooms at the University of Limerick to Date

Number	Title	Study Bedrooms	Status
1	Plassey Village	424	Complete
2	Kilmurry Village	545	Complete
3	Dromroe Village	457	Construction
4	Fourth Village	503	Planning
	Total study bedrooms to date	**1,929**	

2.3 BRIDGE OPTIONS CONSIDERED

The University of Limerick considered a number of alternative locations for the development of the Shannon crossing. These include the following locations:

Option 1: A crossing joining the top of the ridges on both sides of the river
The bridge will spring from the Physical Education Building and the all-weather pitch, landing on the higher ground to the proposed North Campus, taking advantage of the existing topography. The bridge will visually separate the Physical Education Building and the all-weather pitches. It will increase the number of cars using the feeder road to the Physical Education Building and associated sports facilities, an area envisaged as a pedestrian area.

Option 2: A north/south bisection from Dromroe Village, at the western edge of the campus
The bridge will commence at the meadow to the west of the campus adjacent to Dromroe Village. A perimeter access road will be established around the campus, servicing the buildings and peripheral car parking spaces, with the North and South Campus treated as pedestrian zones free from traffic. Embankments are required to the North and South Bank to allow the bridge to span the pedestrian walkways and take into account flood levels. The proposed location is exposed with low-lying lands.

These sites were examined using the following criteria:

- Ease of access from the existing campus south of the River
- Width of the River
- Flood plains on banks
- Effect of the location on the environment of the University

On the basis of this assessment, the site on the western edge of the campus, approximately 225m upstream of the Black Bridge was identified as being, on balance, the most appropriate for the bridge development proposed.

The following constraints and conditions were considered when deciding upon the final bridge scheme:

- The potential for a 100-year flood
- The pedestrian right of way on the northern and southern banks of the River Shannon
- The potential for navigation along the River
- The 85 metre river width
- The requirement for a two-way single carriageway, a cycle lane and a footpath
- The proximity of the existing Black Bridge

A number of bridge designs were also considered before the final scheme was decided upon. These options included:

- A single span steel arch
- A three span post-tension concrete box girder
- A five span reinforced concrete deck

The proposed bridge was developed by combining the best engineering and aesthetic qualities of each of the preliminary options considered.

An option for an immersed tube tunnel with ramp access was considered but was dismissed for the following reasons:

- Long approach ramps required from the Southern and Northern banks
- The need to protect the ramps from flood water levels
- Cost of construction in excess of bridge option by approximately £12 million
- Detrimental effects on the environment during construction

2.4 VILLAGE OPTIONS CONSIDERED

A design concept of the proposed student village was initially presented to the University of Limerick. Over time, this concept was developed until the final scheme was decided upon. This design was chosen to co-ordinate with existing buildings and landscape at the University.

Three sites were investigated as possible locations for the fourth student village.

Option 1: West of the Schuman Building
The option of constructing the fourth student village to the west of the Schuman Building was investigated but eliminated as the Business School, located to the north of the Schuman Building, plans to expand in this area in the future. Further west, a 130m-exclusion zone exists as part of the Limerick County Council waste treatment plant.

Option 2: Northwest of Dromroe Village
This option was also eliminated, as the proposed development would be located in the waste treatment plant exclusion zone.

Option 3 Northern Bank of the River Shannon
This proposed site would be situated adjacent to the existing Black Bridge (pedestrian bridge) the Errina Canal and the River Shannon. This area is low lying and the existing levels would have to be raised.

Option 3 was chosen as the location of the proposed accommodation development due to the overlap of the wastewater treatment plant and Options 1 and 2. Also, the village will make full use of the existing site topography with the Erinna Canal running along the north-west and the River Shannon running along the south of the site. This location will provide unique opportunities for the scheme to interact with the waterways, and take advantage of the stunning views surrounding the site.

2.5 OTHER CONSTRAINTS

The University is required to obtain a licence from Dúchas Waterways to construct the bridge. Dúchas have indicated that a navigation clearance of 5m over normal summer water level will be required to allow for possible future dredging. The minimum deck soffit level (underside) at midspan is therefore approximately 8.5mOD.

Permission for the bridge and student village construction is also required from the Office of Public Works (OPW) under Section 50 of the Arterial Act 1945. The OPW require that the proposed development not adversely effect flood levels along the river. A detailed flood study was carried out to evaluate the impact of the development on flood levels\; this study is detailed in Chapter 11.

3.0 SITE AND SCHEME DESCRIPTION

3.1 INTRODUCTION

This section presents a description of the current site layout, the topography of the area, neighbouring land use, the development proposals and constructional and health and safety aspects. The purpose of this section is to provide a setting for the scheme, against which the environmental issues will be described and evaluated in later sections.

3.2 CURRENT SITE LAYOUT

The University is located approximately 5km northeast of Limerick City at Plassey, 20km from Shannon Airport. The regional location of the proposed development is shown in Figure 1.1.

Figure 3.1 shows the current University layout. The precise area of the proposed development is defined in Figure 3.2. It is proposed to construct the student village in the greenfield site adjacent to the Errina Canal and the River Shannon. The proposed site is currently open grassland and is owned by the University.

The Black Bridge, a pedestrian bridge, joins lands on the north of the river in County Clare, to the Limerick lands to the south of the river. The existing bridge links up with a public walk way that runs adjacent to the River Shannon along the southern bank, connecting up to the University carpark in the northwest of the campus. The northern end of the Bridge is linked to a pedestrian path (the Lough Derg Way) that follows the Errina Canal in a northerly direction. This path is used by pedestrians and cyclists for access to the University and for recreational purposes.

The Limerick County Council Sewage Treatment Plant is located on the southern bank of the River Shannon, near the Black Bridge, surrounded by University land. The exclusion zone around the treatment plant was considered when the location of the proposed student village was decided upon.

Dromroe village is currently under construction on the southern side of the river. It is due for completion at the end of 2001 and will accommodate 457 students. The proposed river crossing will link up to the Dromroe Village access road.

The proposed river crossing is located approximately 225m upstream of the existing Black Bridge. A small group of islands are located at a fall immediately upstream of the proposed bridge. The fast-flowing water at this point is known as 'the bulldogs'.

3.3 TOPOGRAPHY

The topography of the northern side of the Shannon is influenced by the ridge running to the east of the development site which terminates with a steep rock outcrop at the River and peters out to general ground level. The proposed student village lies on low-lying land with a floodplain at the river bank, poorly drained areas north of the floodplain and relatively dry, farmed land further north again. Ground levels in the area of the proposed student village range from 4 to 6m O.D. The southern side generally falls south to north and northwest across the site towards the river. Ground levels at the footpath on the southern bank are approximately 6m O.D.

The river width at the proposed crossing is 85m and is flanked by low-lying floodplains, known as the north and south meadows. Flow volumes are regulated by the ESB at Ardnacrusha and are generally low. After prolonged heavy rainfall, however the waterlevels are permitted to rise, which can lead to localised flooding. The south meadow is now part of the Dromroe Village construction site and is linked to the ruined mill and tree lined millrace via the river walk.

3.4 NEIGHBOURING LAND USE

3.4.1 South of the River Shannon

The existing University campus occupies the land south of the Shannon River. The third University of Limerick student village (Dromroe Village) is under construction on a site located immediately south of the River Shannon. The student accommodation blocks will consist of three and four storeys along the millrace while those facing the meadow will be four and five storeys. The approach road to the proposed bridge and fourth village runs through Dromroe Village.

The main University campus carpark and the main body of the campus are located south of Dromroe Village construction site. The University campus consists of the Foundation Building, Plassey House and University Club, the University of Limerick Main Building, Glucksman Library and Information Services Building, the Stables Complex and the Student Services.

Plassey Mill, a ruin, is located at the southern end of the Black Bridge. A millrace runs parallel to the Shannon River entering the river west of Black Bridge. The millrace will be upgraded and widened to increase the water level as part of the development of Dromroe Student Village. The Limerick County Council Castletroy Sewage Works is located west of Plassey Mill. Existing small single storey dwellings/stores are positioned along the pedestrian right of way on the southern bank of the River, west of the proposed bridge. This right of way will be maintained as part of the proposed development so that cyclists, joggers and pedestrians may continue to avail of the path.

East of the main section of the campus, beyond the sports grounds, lies the National Technological Park (NTP). The main technology businesses located in the Park are Dell Computers, Flextronics International, Modus Media, Esat Digifone and Vistakon Ireland.

South of both Campus and NTP runs the N7, linking Limerick, 5km to the west, to Dublin 200km to the east of the campus. The main entrance to the campus is provided by this route, which also gives access for private housing which is located immediately south of the University, beyond the Plassey Park Road.

3.4.2 North of the River Shannon

The proposed student village will be located in the townland of Garraun in County Clare. The site is bounded to the northwest by the Errina Canal which joins the River Shannon just west of the Black Bridge. Agricultural grassland is found immediately east of the site. A strip of wetland vegetation exists along the river bank. The ground then slopes up about 2m and extends out into a large flat area of grassland which is grazed by cattle.

A factory, once occupied by Burlington Industries is located across the Erinna Canal and the River Blackwater in the townland of Gilloge. Planning permission is currently being sought by a cardboard manufacturer to redevelop the building. A reservoir and two pools are connected to this building.

A disused lock (Annabeg Lock) and associated residential dwelling are located along the Errina Canal approximately 200m upstream of the confluence with the River Shannon.

3.5 DESCRIPTION OF DEVELOPMENT PROPOSALS

3.5.1 Introduction

The University of Limerick proposes to construct their fourth student village north of the River Shannon and a link bridge from the existing campus. This section describes the bridge and village development schemes.

3.5.2 Bridge and Access Road Development

The final scheme for the proposed bridge spanning the River Shannon is shown in Figure 3.3. The River is approximately 85m wide at the proposed crossing site, hence a bridge of 150m is required to span the river and maintain the pedestrian right of way along the southern and northern banks. Although the river is not navigable at present, the bridge will be constructed to provide a minimum decrease of 5m above summer water level to allow for the potential future movement of boats.

A five span bridge was chosen as the preferred scheme. The bridge, as shown in Figure 3.4 with spans of 25, 30, 40, 30 and 25m, will feature separate vehicular and cyclist/pedestrian decks, and was developed from the concept of a 'salmon fish-tail' protruding from the surface of the flowing river. The resulting deck cross-section is therefore asymmetric, with the pedestrian/cycle deck supported on cantilevers extending from the main body of the deck at 5m intervals. The main deck and the cantilevered deck will be constructed in in-situ concrete, and will be longitudinally post-tensioned internally with high tensile steel cables. Circular void formers will be used to reduce the dead load of the main deck, resulting in an efficient design (see Figure 3.5).

The lightwell provided between the main body of the deck and the pedestrian/cyclist path allows natural light to penetrate beneath the bridge, resulting in a more inviting environment for users of the river side pathway.

The intermediate supports for the bridge consist of four asymmetric piers supported on foundations placed below the river bed/bank level. Both the foundations and piers will be constructed in in-situ concrete. The asymmetric form of the piers was chosen to continue the 'salmon tail' theme of the bridge, and balances the asymmetry of the deck. Deck lighting is provided by extending and tapering one 'fin' of each of the piers through the lightwell between the vehicular and pedestrian/cyclist decks to support integrated lighting columns.
The bridge abutments, which will also be of in-situ concrete construction, will be placed approximately 32m back from the normal edge of the river. Stone filled 'Reno' mattresses will be used to locally protect the bridge embankments from potential erosion due to flooding of the river. The mattresses will be subsequently planted with vegetation using a suitable 'biomat' fixed to the surface.

Although the detailed geotechnical investigation for the scheme has not yet been carried out, previous investigations in the vicinity indicate that the ground conditions for the construction of the bridge are likely to be relatively poor silty overburden material to a depth of between 6 and 8m overlying rock. It is therefore anticipated that both the abutment and pier foundations will be supported on bored in-situ concrete piles socketed into the underlying rock stratum.

The proposed link road will provide vehicular, cyclist and pedestrian access from Dromroe Student Village at the southern edge of the South Meadows and serving the proposed fourth student village. The minimum requirement is a single carriageway road with cycle track and footpath. The following design standards apply:

- Existing campus roads are 6m in width in the vicinity of the development.
- A minimum width for a foot/cycle path is 2m where there is no segregation between pedestrian and cyclist tracks or 2.7m minimum where surface markings indicate segregation (Ref. UK Department of Transport Standard BD29/87).

The proposed access road will adhere to the above standards by continuing the existing 6m single carriageway width which will be flanked to the west by a 3.75m wide segregated footpath and cycle track (see Figure 3.5). The road and foot/cycle path will be separated by a 3.95m verge, enhancing the safety and comfort of cyclists/pedestrians. The vertical of the road and bridge alignment will follow a parabolic vertical curve with maximum approach and departure gradients of approximately 3%, supported by fill embankments varying in height from approximately 1m to 4m above the existing ground level on the south side of the river, and 2m to 5m above the existing ground level on the north side of the river.

Ramped pedestrian crossings will be provided at both ends of the bridge to slow traffic.

A photograph of a 1:50 scale model of the proposed bridge is shown in Figure 3.6.

3.5.3 Student Accommodation

The proposed layout of the fourth student village is detailed in Figure 3.7. The total area of the proposed student village is 15,092m^2, including 503 ensuite student bedrooms. A total of 106 apartments comprising 57 six bedroom apartments, 5 five bedroom apartments, 28 four bedroom apartments, 8 two bedroom apartments and 8 one bedroom apartments are proposed. Accommodation blocks will be of three, four and five storeys. A single storey and part three storey management complex is proposed to include reception, offices, store, ESB substation, changing rooms and management accommodation.

Three accommodation buildings radiate out from a nodal point in a southerly direction. The building heights vary from one to five storeys, nestling into the natural landscape. Reed beds and indigenous fauna will thrive in between the buildings. Figure 3.8 shows typical north, south, east and west elevations of the proposed student accommodation blocks.

The proposed site is prone to annual flooding and will therefore be raised approximately 2m above the existing ground level. It is proposed to preserve the transitional nature of the landscape, raising only the land required for student accommodation thus creating promontories.

The Errina Canal on the north-western side of the site provides a baseline for the footprint. The buildings form an enclosure at the northern end, the village centre (subject to future planning application), and radiate southwards to the river peeling out to allow the sun penetrate deep into the site.

A site is provided at the heart of this student village for a future Village Centre. This Village Centre will provide communal activities and facilities such as, shops, laundry, cafès, village hall etc. around a sheltered plaza area, which will be paved and judiciously landscaped.

The student accommodation blocks will cater for undergraduates, postgraduates, student families and faculty staff in six, four, two and one bedroom units. Accommodation will be provided for disabled students. In total, 503 people will be housed by the development, with accommodation blocks varying in height from one to five storeys. The reception and manager's residence is located at the entrance to the village and adjacent to accommodation block 1 (three and four storeys). Block 2 consists of four storeys to the north and five in the south, with block 3 five storeys in height. Balconies will be constructed between the bedroom and lounge of each apartment allowing natural light in to the corridors. Figure 3.9 details the ground floor plan of a typical student accommodation block.

The in-between spaces created by the radiating accommodation blocks undergo metamorphosis when the river floods. The natural floodplains preserved between the blocks are temporarily transformed into river inlets. When the river recedes, the floodplain becomes the domain of the residents.

Pedestrian access permeates across the site and entrances to the accommodation units will be clearly defined by free standing 'entrance pods'. The pods provide secure bicycle parking, waste disposal points and houses electrical switch rooms. The paths between the accommodation buildings will be paved and restricted to pedestrian access only. Service vehicles and delivery vans will access the village via remote-control operated bollards. Ninety-six car and six bus parking spaces are located north of the set-down area and disabled residents can avail of car parking spaces adjacent to the entrance pods.

The proposed student accommodation blocks will be constructed using steel framing with precast concrete floors. The majority of external walls will utilise timber or metal stud framing spanning from floor to floor with minimum 100mm mineral wool insulation infill. The external skin comprises WBP plywood sheeting with a continuous vapour barrier to the outer faces finished with vertical / horizontal timber cladding on counter battens. The top storey of each block is clad in metal sheeting applied over a plywood deck with some areas finished in a self-coloured render. The inner faces will be finished with 2 no. layers of skimmed plasterboard. A small portion of the external wall is constructed from 100 mm cavity wall construction with 60mm min cavity insulation with self-finishing coloured render to the outer face. The inner faces will again be finished with 2 no. layers of skimmed plasterboard.

The roofs of the accommodation blocks will be constructed of specialist sheet metal roofing with standing seams, applied over WBP plywood decking and insulation, all supported on timber rafters. There will be foil-backed plasterboard to the ceilings beneath finished with a smooth skim coat.

All windows and doors will be from aluminium and/or timber sections and will be double-glazed. Balustrades will be of galvanised mild steel sections with timber, metal and/or toughened glass sheets set into galvanised mild steel frames. Rainwater goods will be cast aluminium sections by 'Alumasc' or a similarly approved provider.

The façade treatment will complement the organic planning of the development and will consist of a skin of timber cladding wrapping the forms with slots cut in the skin for entrances, windows and balconies. The timber cladding will soften the building edges, complimenting the natural setting evoked by the reed beds and wild flowers. Metal panels at high level, will permit the upper level to be set back and express the protecting eaves, thus breaking the height visually. The choice of materials will enhance the layering of the elevations, highlight the change in scale, massing, and points of interest along the length of the buildings.

3.6 CONSTRUCTION ASPECTS

3.6.1 Introduction

It is estimated that the period of construction is 12 weeks for site enabling works including filling and 65 weeks for the building contract. The numbers employed during this time will vary, peaking at a total of 250 persons. Provision will be made for temporary employee accommodation during the construction period as outlined in the Safety Health and Welfare Regulations. This will include changing rooms/drying room, site canteen and site toilets. Working hours will vary throughout the year. It is estimated that during the summer period construction work will peak at a 12-hour day, reducing to an 8-hour day during winter.

ESB power lines that currently cross the northern end of development site will be diverted underground to facilitate the construction and operation of the student village and bridge. The required temporary water supply will be taken through the temporary 'bailey' bridge from the University mains on the south. A temporary sewage waste facility will be provided during construction and taken off site for emptying at a suitably licenced disposal location.

3.6.2 Bridge and Access Road

As described earlier, the main elements of the proposed bridge will be constructed entirely in in-situ concrete. As the construction of the substructures and superstructures for length of the bridge spanning the river will necessitate working both within and over water, the practical construction methods that will be employed in both circumstances must be considered. It is envisaged that the construction methodology for the elements within and over water will be as follows:

- *Intermediate Supports*: The in-situ concrete piles, pilecaps and piers will be constructed within cofferdams placed locally around each support location, which will allow construction activities to be carried out in dry working conditions. Typically, cofferdams are constructed using interlocking steel sheet piles, which are driven into the riverbed. Once enclosed, the water within the cofferdam is pumped out, and construction work can proceed. Once construction has reached a suitable level above water, the cofferdam will be removed from the river. As this stretch of the river is not navigable, construction of the cofferdams themselves will most likely take place from either bank of the river using temporary jetties erected for the purpose.
- *Superstructure*: Using in-situ concrete for the bridge deck requires that formwork (shuttering) be erected and held in position until such time as the concrete has been poured and the deck becomes self-supporting. In this instance, it is anticipated that the temporary support structure (falsework) for the formwork will consist of prefabricated steel trusses spanning between the intermediate supports, i.e. supported from the foundations of the piers (maximum span 40m approximately). This method of construction will obviate any need for temporary supports erected on the riverbed.

A temporary bund will be erected around the bridge and access roads construction area to avoid run-off from the site into the River Shannon and millrace.

3.6.3 Student Village

The height of the student accommodation blocks will vary from three to five storeys with the manger's residence one storey high. The blocks will have piled foundations with ground beam. The external elevations will have a selection of finishes which will include cedar sheeting with double glazed windows. The roof will have a natural zinc standing seam carried through to an eaves detail.

The structural design of the student village remains at a preliminary stage. However, based on a preliminary design to date and consideration of ground conditions at a nearby site, the following construction details are currently envisaged:

- A working platform will be prepared using imported granular fill
- A grid of piles will be constructed
- In-situ ground beams will be constructed
- Pre-cast, pre-stressed concrete ground floor slabs will be placed
- A pre-fabricated structural steel frame will be constructed
- Pre-cast, pre-stressed concrete upper floor slabs and stairs will be placed
- A secondary timber frame roof will be constructed
- Lightweight pre-fabricated wall panels will be erected
- Non-structural elements will be completed.

A temporary bund will be erected to surround the construction area to avoid run-off from the site to the River Shannon and Errina Canal.

3.6.4 Construction Access

It is estimated that a maximum of 100 vehicle movements daily will be associated with the proposed development, of which 75% will be of HGV nature. The construction site will be fenced off as shown in Figure 3.10; construction traffic movements will be contained within these perimeter fence lines. It is planned that construction traffic will enter the University Campus at the west gate or main entrance and proceed to the site on the internal campus roads. The traffic will enter the contained site north of the River by crossing a temporary bridge structure, a 'bailey' bridge. This 'bailey' bridge will be required until the proposed permanent bridge can be opened to construction traffic, i.e. for a period of approximately 15-18 months. The proposed location of the temporary bridge is shown in Figure 3.10.

Temporary accesses such as the proposed 'bailey' bridge are normally designed by the Contractor to carry the plant and loading as he so requires. It is anticipated, however, that the temporary bridge will consist of a proprietary 'quick' bridging system using prefabricated steel trusses to carry a steel deck, have a minimum of three spans and use temporary steel piers supported on steel 'H' piles driven to rock. Depending on the chosen span arrangement, the bridge spans may either be lifted into place using a crane, or for longer spans, may be incrementally 'push launched' from the south side of the river. In any case it will be specified that the temporary bridge must include continuous solid decking and edge panels to minimise the risk of spillage of construction materials into the river.

The temporary bridge and its supports will be removed entirely once construction is complete.

3.6.5 Construction Programme

The overall duration of the construction programme is estimated at approximately 18 months with the student village and link bridge due for completion in March 2003.

3.6.6 Environmental Management

A number of measures will be incorporated into the scheme during the construction phase of the development to minimise the impact on the environment.

Machinery with a low inherent potential for the generation of noise or vibration will be used during construction. The timing of site activities likely to create high levels of noise or vibration will be limited to minimise the impact potential.

A dust minimisation plan has been formulated to reduce the potential for dust generated on site to be carried to sensitive locations during construction.

A number of measures will be introduced during construction to minimise the potential of impact on the watercourses in the vicinity of the proposed development. These include:

- Confining works in the River Shannon so as to avoid impacting on lamprey spawning;
- Erecting a temporary bund around the construction areas to reduce run-off into the watercourses;
- Preserving wet grassland removed during construction for reinstatement upon the completion of the development;
- Careful controls of cement or wet concrete, including washing out cement lorries off-site;
- Storing fuel, oil and chemicals in an impervious, secure bund.

An archaeologist will be present to monitor the construction site during ground and riverbed disturbance works.

Construction traffic management measures will be employed throughout the construction and operation phases of the development. These measures will assist in minimising any local adverse effects.

3.7 HEALTH AND SAFETY

3.7.1 Safety File

The University has appointed a Project Supervisor (design) for the project. The construction phase will be supervised by a Project Supervisor (construction) to be appointed following the award of the construction contract. The site will have a detailed Safety and Health Plan drawn up in accordance with Health and Safety Authority (HAS) requirements, S.I. No. 138 of the 1995 Safety, Health and Welfare at Work (Construction) Regulations, which will be strictly adhered to, and reviewed as the development progresses.

The Health and Safety Plan and information regarding the nature and extent of the proposed works will be made available to all relevant parties, so that the duties and measures required under the Safety Regulations in the execution of the works can be assessed. At Practical Completion of the works, a Safety File, as defined under the Safety Health & Welfare at Work (Construction) Regulations 1995 will be made available for the ongoing safe maintenance and safe operation of the development.

3.7.2 Fire Safety Certificate

While fire safety will be dealt with in detail at the Fire Safety Certificate application stage under Building Regulations, site emergency access and requirements for fire fighting water supplies have been examined in the preparation of the planning application by a Specialist Fire Consultant, so as to determine that compliance with the fire requirements of Building Regulations is being achieved in the design.

In relation to fire fighting water supplies it is noted that a 200 mm fire ring main is to be provided in the student village development which is to be connected to the existing University of Limerick 225 mm diameter ring main, via 200 mm diameter connection across the bridge.

In relation to fire fighting access, vehicle access is being achieved in accordance with the recommendations in Technical Guidance Document B via the new bridge and student village access roads. It is noted that while the development is in County Clare, fire cover will be provided via the University of Limerick access route by Limerick County Fire Service and it is understood that this can be provided for under Section 10 of the Fire Services Act 1981, as is normal practice. It is noted that the site does not bound any of the public access roads in County Clare and that the option of having a direct link between the site and County Clare road network is not possible and in any event is not required for the purposes of achieving compliance with Building Regulations or with the requirements of the Fire Services Act 1981.

REFERENCES

UK Department of Transport Standard BD29/87
S.I. No. 138 of the 1995 Safety, Health and Welfare at Work (Construction) Regulations

4.0 PLANNING AND POLICY CONTEXT

4.1 INTRODUCTION

This section outlines the national, regional and local planning and policy context in which the student village and bridge access is proposed.

Publications relevant to this development are:

- The National Development Plan, 2000 – 2006;
- Clare County Development Plan, 1999;
- Limerick County Development Plan, 1999; and
- Department of Education Guidelines on Residential Developments for Third Level Students, 1999.

4.2 THE NATIONAL DEVELOPMENT PLAN 2000 – 2006

The central aim of the National Development Plan (2000 – 2006) is to implement public policies, which will ensure the sustainability and consolidation of Ireland's recent economic growth. This is based on an assessment of the development needs of the country, achieving an appropriate balance between development and conservation of the environment.

The National Development Plan (2000 – 2006) identifies the link between Ireland's economic growth and the rising education levels resulting in improvements in living standards. It recognises the need to promote the success of universities in providing highly educated skilled young individuals who are vital to the continued attraction of foreign investors to this country.

Significant investment has been made in recent years to ensure that the skills need of the economy identified in the high technology area are met by the availability of highly qualified graduates.

The National Development Plan estimates that some 500,000 additional new dwellings are required between 2000 and 2010 in order to meet demands. This demand arises due to increased population and the fall in average household size. The priorities of the Plan regarding investment in housing includes the provision of *"the necessary infrastructural investment to facilitate the overall level of housing output required to meet the current and anticipated levels of demand in a planned coherent fashion*".

4.3 CLARE COUNTY DEVELOPMENT PLAN 1999

The Clare County Development Plan of 1999 sets out to *"provide a sustainable basis for deciding on infrastructural investment in County Clare during the Plan period and for the co-ordination of development activities of public and private agencies and to help guide the quality, nature and location of this development*".

The proposed development is located in an area zoned as agricultural and under high development pressure in the Clare County Development Plan. The Plan notes that the land of greatest agricultural potential tends to be the land suffering most from development pressure. The Plan also has regard to the fact that *"agriculture is the predominant rural land-use when considering the competing claims of agricultural developments and residential amenity in rural areas".*

4.3.1 County Profile

- County Clare is situated on the West Coast of Ireland, bounded by Galway, Limerick, Kerry and Tipperary.
- The population of the County increased by 7.4% between 1991 and 1996 with future population growth predicted. Some 31% of the population reside in the urban environments between Ennis and Shannon.
- Employment in the County is centred mainly in the areas of high population. Those employed by agriculture have decreased steadily in recent years.
- County Clare is a popular tourist destination with a large demand on holiday homes in certain areas.

4.3.2 Development Plan Strategy

The strategy of the Plan has three main aims:

- Encourage development in existing settlements in rural areas to ensure their sustainability and economic viability while protecting and enhancing existing amenities;
- Provide safe and convenient movement of people and goods; and
- Encourage a partner approach with agencies and individuals in the pursuit of common policies and objectives.

4.3.3 Housing

The Clare County Development Plan 1999 outlines the Council's settlement policy objectives and development guidelines. These include:

- The consolidation and development of existing settlements and residential clusters;
- The protection of the visual quality of the rural landscape; and
- The acquisition of land in settlements throughout the County and to make sites available for development.

The proposed student village is to be located at Garraun, Clonlara, Co. Clare. In the Clare County Development Plan, the application site is situated in an area under high development pressure (see Map 6 in the development plan) without a visually vulnerable area designation. From Table 1: Types of Rural Housing Development Allowed on Suitable Sites (on page 36) all types of residential development in designated (residential) clusters are permitted in areas under high development pressure. Residential clusters are defined in the plan as groupings of dwellings, substantial in numbers but lacking a basic service centre. Appendix 5 lists the clusters, which includes Clonlara (Cloonlara). It appears to follow therefore that the proposed development complies with development plan's settlement location policy.

4.3.4 Infrastructure

County Clare is served with a good communications system, in particular with the location of Shannon International Transatlantic Airport in the County.

The Development Plan recognises the importance of providing a safe and efficient road system in order to continue the development of the local and national economies. The Plan aims to "*provide and preserve pedestrian rights-of-way in the areas of items of natural, archaeological, historical or amenity value, where the provision or preservation of such rights-of-way would not endanger the item of interest in question.*"

The Planning Authority will take into account the quality and capacity of roads that serve a proposed development when considering applications for planning permission. A payment from the proposed developer towards the upgrading of the public road serving a development is required to facilitate the proposed development.

Provisions will be made for cyclists and pedestrians where possible.

4.3.5 Tourism and Recreation

The County Clare Development Plan places an emphasis on the provision of open space for sports clubs, non-sports club and recreational organisations in towns, villages and settlements.

Tourism is currently one of the growing sectors in the County, with fishing, walking and cultural heritage very popular.

4.4 LIMERICK COUNTY DEVELOPMENT PLAN 1999

The Limerick County Development Plan of 1999 sets out to *"facilitate and promote an efficient, economic and responsible pattern of development in County Limerick reflecting public aspirations to the greatest possible extent"*.

The proposed development is located in an area zoned as educational in the Limerick County Development Plan.

4.4.1 County Profile

- Almost 27% of the population of County Limerick resided in Limerick City in 1996, this showed an increase of 3,488 between 1991 and 1996. The number of households in County Limerick is predicted to increase by 1,355 in the period 1996-2001 with a total increase to 4,889 in 2016.
- Employment in the County's service sector, including tourism, more than doubled in the seventies and eighties.
- Many of the County's towns and villages rely heavily on a small number of large multinational companies to provide employment in these areas.
- Over 9,000 students are enrolled at the University of Limerick representing significant increases on previous years.

4.4.2 Development Plan Strategy

The strategy of the Plan has three fundamental elements:

- Promote sustainable development which may include co-operation and partnership with groups and individuals;
- Encourage and facilitate an improved transportation network; and
- Require high standards of design and setting which will protect, maintain and enhance the natural and manmade environment while maintaining the essential character.

4.4.3 Infrastructure

The Development Plan recognises the need to improve infrastructure in the County in line with economic growth. The building and construction industry is noted as being highly sensitive to the economy though sustained growth is predicted to occur resulting in increased employment.

Investment in transportation infrastructure (both capacity and safety) is vital to the continued growth of industry and tourism and so is a strong objective of the Council. Heavy demands are placed on the current road network due to the following:

- The dispersed nature of the population of the County.
- The small urban centres.
- The increase in road traffic in recent years.

The Council aims to improve the road network resulting in an added attraction for industrial developers considering setting up in the area.

4.4.4 Education

Despite the reduction in the Country's birthrate in the last 20 years, participation in third level is expected to continue to rise. The Development Plan acknowledges the demand for skilled graduates in Ireland and Limerick is at a great advantage as far as attracting industry due to the presence of the University and the National Technological Park. The input of the University into developing and implementing academic programmes has resulted in economic and social development of Ireland and in particular the Shannon Region.

4.4.5 Housing

The Limerick County Development Plan notes the decrease in the average number of persons residing in each household to only 3.5 in 1996. As a result of this and Limerick's expanding population, the projected demand on households will increase by 4,889 by 2016. The Plan predicts the additional land required to satisfy this demand for housing will peak at 110 hectares (270 acres) in 2009.

4.4.6 Tourism and Recreation

The Development Plan specifies a number of water resources, including the River Shannon, for tourism and recreational exploitation. It also acknowledges that access to some visitor attractions is poor. The Planning Authority will protect existing right-of-ways and create further where necessary.

The Planning Authority aims to ensure the sustainability of tourism as a resource. It will "*adopt a positive approach to developments which will maintain, expand and diversify tourist facilities (including accommodation) and amenities provided that such developments are within the carrying capacity of the environment in which they are located*".

4.5 DEPARTMENT OF EDUCATION GUIDELINES ON RESIDENTIAL DEVELOPMENTS FOR THIRD LEVEL STUDENTS 1999

Section 50 of the Finance Act, 1999, provides for a scheme of tax relief for rented residential accommodation for third level students in order to relieve current pressures on the private rented section. The scheme applies to:

- Campus areas of the educational institutions.
- Areas within an 8km radius of the main campus once approved by the certifying educational institution.

The developer must adhere to the following standards under the scheme:

- The grouping of a minimum of 3[1] and a maximum of 8 study bedrooms in each house unit. These units will contain, at minimum, basic kitchen units, with sink, cooker and fridge.
- A common entrance hall and kitchen/living room with adequate space for normal living purposes.
- Bathrooms will be en-suite or one serving a maximum of 3 bedspaces. They shall consist of wash hand basin, water closet and shower/bath.
- Adequate entrance hallway and circulation space and a hot press/store should also be provided with each unit.
- The nature and character of the area in which the developments are located shall be taken into account in the planning and design. The blocks should be designed to give optimum orientation in terms of daylight and sunlight into inhabitable rooms.
- Community facilities such as caretaker/security office and apartment, centralised storage, laundry facilities, drying rooms and utility rooms, waste disposal units and a seminar room shall be provided for. The floor area of these facilities shall not exceed 12% of the total area of the development or 12% of the total cost. Reasonable provision for secure bicycle storage should be provided.
- Entrance hallways and corridors shall be well designed with good lighting and ventilation.
- One out of every fifty of the total number of bedspaces shall be designed for students with disabilities, providing full wheelchair accessibility and ensuite bedrooms.
- Internet services shall be made available to each study space.

4.6 DEVELOPMENTS TRENDS IN THE LOCALITY

The area surrounding the proposed development mainly consists of the University Campus, residential areas and the National Technological Park at Plassey.

4.6.1 University Developments

The University of Limerick is currently developing the following:

The University Arena
The University Arena is currently being developed at the east end of the Campus. This sports arena comprises of a major four-court hall with modern aerobic and changing facilities together with the National 50m Swimming Pool and separate sports club with outdoor changing rooms.

Car and Coach Parking Facilities
The University is presently expanding car and coach parking facilities at the southern end of the campus spine road.

Materials and Surface Science Institute
This government-supported initiative will provide the first dedicated research building on campus. This building is located east of the Kathleen Lonsdale Building.

Engineering Design Centre
This centre for undergraduate and postgraduate students will be located northeast of the existing Foundation Building.

[1] It is assumed in this study that the minimum of three study bedrooms in each housing unit specified in the guidelines excludes managers' and family residences.

Dromroe Student Village
Dromroe Student Village is currently under construction immediately south of the proposed river crossing. This third student village will provide 457 en-suite student study bedrooms, support facilities for management, social hall and shopping facilities.

These developments aim to provide improved facilities for the increasing numbers of students attending the University.

4.6.2 University Student Accommodation

Table 4.1 shows the capacity of proposed and existing student villages at the University of Limerick.

Table 4.1 : Summary of Study Bedrooms at the University of Limerick

Number	Title	Study bedrooms	Status
1	Plassey Village	424	Complete
2	Kilmurry Village	545	Complete
3	Dromroe Village	457	Construction
4	Fourth Village	503	Planning
	Total study bedrooms to date	**1,929**	

Despite the accommodation currently available to students, the requirement for a student village continues to exist as the University of Limerick. The University's long-term plan is to accommodate 4,000 student on campus.

4.6.3 Land Developments

Since it was set up in 1984, the National Technological Park (NTP) has continued to develop. The Park plans for a 20% expansion this year. This construction work involves seven additional enterprise developments. Over the coming five year period, the NTP targets to create 2000 new graduate/postgraduate jobs by forming 20 new high growth technology companies

At the heart of the Park is the promotion of high potential start up technology enterprises particularly those emerging from Third Level campuses. The Campus Enterprise Programme provides support to such start up companies and is delivered in conjunction with the University of Limerick (UL) and the Limerick Institute of Technology (LIT).

A number of family residential estates are currently under construction in the vicinity of Castletroy.

4.7 PLANNING AND DEVELOPMENT EVALUATION

Since its foundation, the University of Limerick has continued a policy of provision of student accommodation on campus. The current target is to provide a total of 4,000 student study bedrooms. The University requires campus student accommodation to provide for its continued growth from an institute of higher education to a major national university. The University has consulted with all relevant bodies to ensure the acceptability of the project. This development project has been in train since early 1998.

In general, the proposed development will support all relevant policies by:

- Providing accommodation and facilities in line with the Department of Education's Guidelines on Residential Developments for Third Level Students in proximity to the college for the increasing numbers of students attending the University.
- Alleviating the accommodation problems in housing estates in the area which cannot cater for large numbers of students as the estates were designed to accommodate families.
- Having a beneficial impact on traffic congestion to and from the University.
- Providing accommodation and facilities outside the academic year for a range of groups attending summer courses and sports activities at the University of Limerick.
- Having long-term employment potential.

On the other hand, a disbenefit may be the perceived adverse impact on visual amenities. The proposed new bridge structure and residential village will, however, be a landmark development within the enlarging University of Limerick campus.

REFERENCES:

The National Development Plan, 2000 – 2006,
Clare County Development Plan, 1999.
Limerick County Development Plan, 1999.
National Technological Park Plassey Limited, Park House, National Technological Park, Limerick.
Department of Education Guidelines on Residential Developments for Third Level Students, 1999.

5.0 LANDSCAPE AND VISUAL STUDY

5.1 INTRODUCTION

The purpose of this study is to appraise the existing landscape of the application site and its wider setting, to assess the likely impacts arising from the proposed development and describe the proposed mitigation measures

5.2 METHODOLOGY

5.2.1 Introduction

The basis of the assessment follows the *Draft Guidelines on the information to be contained in Environmental Impact Statements (Environmental Protection Agency, 1995)* and the assessment itself entailed: -

- Visiting the area during June and July 2000 and preparing a photographic record of views and landscape features.
- Undertaking a desk study of the site in relation to its local and regional significance.
- Studying aerial photography (vertical and oblique) and 1:50,000 and 1:10,560 (6") scale O.S. maps of the area, and topographical – tree surveys of the application site(s).
- Reviewing the detailed plans, elevations, sections and photomontages of the scheme.
- Preparing cross sections through key areas of the site(s) and its surroundings and reviewing site photography to determine the zone of visual influence of the proposals
- Predicting winter screening conditions based upon prior knowledge of the locality

5.2.2 Aspects of Impact

Impact on the landscape arising from development has two distinct but closely related aspects. This first is impact in the form of change to the character of the landscape and the consequential responses which may be felt towards the combined effects of the new development. The significance of these will partially depend on how people perceive a particular landscape and how much the changes will matter in relation to other senses i.e. sound, feelings etc. as experienced and valued by those concerned. The second aspect, visual impact, in contrast to character impact is less subjective. Visual impact occurs by means of intrusion and/or obstruction, where visual intrusion is impact within a view without blocking it, and visual obstruction is impact on a view involving full or substantial blocking thereof.

5.2.3 Significance Criteria

Whenever appropriate the following terms are used to describe the degree, quality and duration of an impact: -

- *Imperceptible/No Impact* – arises where the development proposal is either distant or adequately screened by existing landform, vegetation or built environment.
- *Slight Impact* – arises where views affected by the proposal form only a small element in the overall panorama, or where there is a small change in the character of the area.

- *Moderate Impact* – arises where an appreciable segment of the panorama is affected, where there is an intrusion in the foreground or where there is a noticeable change in the character of the area.
- *Significant Impact* – arises where the views are affected, obstructed or dominated to such a degree that the proposal becomes the focus of the viewer's attention. A significant impact on character arises where there is a substantial alteration in the character of an area but the essential experience of the original character remains.
- *Profound Impact* – arises where a significant view is completely obscured or altered or where the character of an area has been completely changed.

Note: Moderate impacts are not included in the EPA Glossary of Impacts. Moderate impacts have been included in the scale of impacts to cover the substantial gap between slight and significant impacts as they relate to landscape assessment.

Terms used to describe the quality of change: -

- *Negative Impact* – A change which reduces the quality of the visual environment or adversely affects the character of the landscape.
- *Neutral Impact* – A change which does not effect the quality of the landscape.
- *Positive Impact* – A change which improves the quality of the environment.

Terms used to describe the duration of impact : -

- *Temporary Impact* – Impact lasting for one year or less.
- *Short Term Impact* – Impact lasting for one to seven years.
- *Medium Term Impact* – Impact lasting for seven to twenty years
- *Long Term Impact* – Impact lasting twenty to fifty years
- *Permanent Impact* – Impact lasting over fifty years

5.3 EXISTING LANDSCAPE

5.3.1 Site Context

The proposed development site is situated within the River Shannon corridor, approximately 7.0 km upstream of Limerick City centre. To the north of the river and south along the River Groody the prevailing land use is still agriculture and the landscape rural in character. South of the river the University of Limerick is the principal landholder, having located on the farmland and river frontage parkland of the former Plassey House estate. Immediately south of the University the former Milford House is now operating as a hospice-health care facility (Reference Figure 5.1).

To the east the University adjoins the National Technology Park - Plassey which is a campus style business - high technology park being developed on former agricultural land extending onto the floodplain lands of the River Shannon and its tributary, the River Mulkear. An isolated industrial plant, the former Burlington Industries factory, is also located at Gilloge, northwest of the River Blackwater. Residential development north of the river is confined to a few isolated, rural dwellings and farmhouses and more recent suburban ribbon development at Gilloge. South and west of the University of Limerick most residential development is located within the Castletroy district. Within the University campus there are three student residential villages, the third of which is Dromroe Village, a 457-bed complex on which construction commenced in May 2000. A Limerick County Council treatment works also adjoins the University and the river walkway at Plassey Mill.

Topographically the river corridor in the vicinity of the site comprises alluvium covered floodplain meadows (north and south meadows). North of the river the flood plain is enclosed to the east by a ridge running north-south, terminating at a rock outcrop on the river bank, to the north by low lying but better drained pasture and to the west by the parallel River Blackwater - Errina Canal waterway. South of the river the south meadow is defined by the raised embankments of the former Plassey Mill millrace.

The river corridor is notable for its extensive, large trees (principally 10-20 m high willow and alder) which line its banks and cover the islands which have formed from a build up of silt within the river channel. The embankments of the millrace to the south and the River Blackwater - Errina Canal to the north-west are similarly lined with trees. Greater species diversity, including ash, beech, oak, sycamore, chestnut, occurs south of the river along the millrace.

The tranquil and sylvan setting (ref. Photo Views 5 and 7) and associated wildlife and angling resources are reflected in its popularity as a recreation amenity area. The walkway along the south bank of the River Shannon extends from Limerick City, through the University lands and east and south to Annacotty along a retained strip of public open space fronting the river(s) within the National Technological Park - Plassey. The University encourages access by the general public to the river through its lands.

The Lough Derg Way is a 65 km long walking trail from Limerick City to Killaloe (25 kms), and then to Dromineer. It leaves the River Shannon walkway at the site of the ruined Plassey Mill whose seven storey tower is a prominent local landmark and crosses the river via the pedestrian Black Bridge (Plassey Bridge) to follow the dis-used Errina Canal towpath northwards to Gilloge Bridge. Anglers fish from the Black Bridge and have access to both banks of the river upstream of the bridge.

Most existing development in close proximity to the river is generally well screened and does not detract unduly from the prevailing sylvan - rural setting. Aside from the seven single storey stores/chalets at Black Bridge, the Dromroe Student Village currently under construction will establish a new and more direct relationship between the University and the river.

5.3.2 Significance

The planning policies relating to the proposed development location are described fully in *Section 4.0 - Planning and Policy Context.* The current Clare County and Limerick County Development Plans do not designate any specific visual - landscape status to the area of the proposed development.

The area is, however, part of a distinctive section of the Lower River Shannon in its course from Lough Derg to Limerick City, characterised by the riparian vegetation, islands and fast flowing sections of water. Limerick County Council have the riverside pedestrian walkway on the south bank of the river from the University to Annacotty via the Mulkear (Mulcair) River indicated on the Zoning and Development Objectives Map of the 1997 Castletroy Development Plan.

Clare County Council similarly have a general objective within the 1999 Development Plan (Ref. Clause 2.20.14) to "*protect and preserve and to facilitate the development of long distance and amenity walking routes within the County*". The River Shannon walkway and the Errina Canal section of the Lough Derg Way walking trail are both significant amenity assets of wider significance that the local setting.

The Lower River Shannon is also designated a proposed candidate Special Area of Conservation (pcSAC) due to the habitats of high ecological value and associated rare plant and animal species. The current boundary of the pcSAC includes part of the proposed development site. *(Reference Section 9.0).*

5.4 IMPACT ASSESSMENT

5.4.1 Impacting Features

The proposed development is described fully in *Section 3.0 - Site and Scheme Description* The principal elements which will give rise to varying degrees of visual impact are:-

- A 150 m long, five span bridge crossing and associated abutments, and approach embankments varying from 1 m to 5 m above the existing ground levels. With the soffit height of approximately 5 m above summer water level to allow for the potential movement of boats, the resultant deck level of the bridge at its centre is approximately 4.3 m higher than the existing pedestrian Black Bridge some 240 m downstream. The deck profiles of the bridge and its road embankments to both sides of the river will have a major presence and impact within the immediate setting and be a strong focal point within nearby riverwalk views.
- Three accommodation buildings varying in height from three to five storeys (10.5m to 16.7m above filled site level).

  At five storeys the roof level will be approximately 3.5 m lower than the top of the ruined Plassey Mill tower and some 4.0 m above the height of the adjoining trees along the Errina Canal towpath and boundary drain. Depending upon the location and angle of view the four and five storey buildings will be potentially visible above this particular screening feature, but in many instances other intervening tree belts will provide effective screening. The proposed layout reflects a desired openness towards the river frontage but as a combined group of buildings they will have a major impact within the immediate setting.
- A single storey block of manager's residence, management facilities and ESB station.

  This will be of limited visual significance given its height and location to the north-west of the main accommodation buildings.
- A future Village Centre incorporating communal – service facilities (subject of future planning application).

  This will be of limited visual significance given its height and its location surrounded by the taller three to five storey accommodation buildings.

The proposal will also have a number of related elements which may also give rise to impact, namely:-

- Partial filling of the village site approximately 2 m above existing ground levels.

  This filling will be in the form of promontories between which areas of wetland reedbeds will be established at approximately the original ground level. It will be of limited visual significance given the scale of the setting and the gentle profiling of the outer slopes.
- The stone filled gabion retaining banks at the river front and of the three accommodation buildings.

  These will incorporate a natural vegetation surface. Their steep profile and heights of up to 4.5 m will create significant engineered forms to the ends of the filled building promontories.

- Removal of approximately 170 m length of hedgerow *(Ref. Hedgerow H1 – Section 9.3.4).*

  This section of hedgerow is visually of minor significance when viewed from the south against the taller, more dense tree planting along the Errina Canal. From the north and east other trees and hedgerows provide intervening screening.

- A 96 car and 6 coach spaces parking area

  This is located to the north end of the village and in views from the south will be generally screened by the intervening access road embankments and the accommodation buildings. Potential direct views to parked vehicles from the west on the Lough Derg Way/canal path and from the east on the access road will be well screened by planted, 1.2 m high earth mounds.

- Public lighting to the access road, bridge and circulation areas within the village, and 'spill over' illumination from the buildings.

  There is currently no major source of public or private residential lighting within the immediate river corridor, its absence being a characteristic of the area's prevailing rural character. The introduction of integrally designed lighting columns, 9.0 m high on the bridge and 6.0 m high columns at approximately 25.0 m intervals on the approach roads and primary circulation areas, together with internal illumination spilling out from the buildings will inevitably introduce a significant change to the existing, unlit night-time environment. Such change is already imminent with the completion of the nearby Dromroe Student Village and potentially likely in the future should the river path to and from the University to Limerick City be developed for more intensive use as part of an improved University access policy.

- Pedestrian footpaths and footbridge crossings over wetland reedbeds and drain outlets.

  Along the north side of the village river frontage these will represent a formalising of the existing track and planked drain crossings. Within the village the simple bridge structures and boardwalk crossings will be of minor visual significance and with the establishment of the proposed wetland reedbeds will be largely screened from outside view.

5.4.2 Impacting Features – Temporary/Short Term

The construction of the proposed development over an approximate period of eighteen month will also give rise to impacts relating to:-

- The enclosure of two construction compounds. One for the road – bridge works to be located west of the access road within the south meadow, the second adjoining the west side of the access road embankment to the north of the river.

  The perimeter fences of the enclosures will provide screening to the materials storage and activities within. The impact of the fences will be *slight – moderate* within the overall context of the wider construction site.

- The erection of a temporary Bailey bridge crossing immediately west of the permanent bridge, in order to facilitate construction access.

  This bridge with its trussed structure will be lower than the permanent bridge with a soffit height above water of approximately 7.0 to 7.5 m O.D. It will be very visible while in place and as construction progresses on the permanent bridge there will be significant impact on views immediately upstream and downstream as both are viewed against each other.

- The movement of up to 100 vehicles per day and construction activity.

  It is estimated that up to 75% of movements will be heavy goods *vehicles (Ref. Section 3.6.1).* These, together with general construction activity will have a *significant, negative* impact within the immediate river corridor which, until the recent commencement of construction on the Dromroe Village was free from any noticeable vehicular movement.

5.4.3 Likely Effects of the Proposal

In landscape terms the proposed development will impact in varying degrees upon three inter-related aspects, namely: - the perceived character of the area; - the existing views, and; - its recreational amenity.

5.4.4 Impact on Landscape Character

The river landscape is still essentially rural in character, particularly north of the river where agriculture is still the predominant land use. The Dromroe Student Village, currently under construction, represents the first significant development of the University of Limerick within the immediate river corridor, set back within the tree enclosed setting of the south meadow.

The proposed bridge and student village will be a further major development but the first to both cross the river and relate directly to it, upstream of Limerick City. It will have a *significant* impact on the existing character but due to the curving alignment of the river and the existing tree and hedgerow screening the extent of this change will be confined primarily to the river corridor for a distance of approximately 1.2km. Refer to Figure 5.2 for the zones of visibility and the photograph and photomontage view locations. The photographs are shown on Figures 5.5 and 5.6, and the photomontage images are shown on Figures 5.7, 5.8 and 5.9.

5.4.4.1. Impact on Views – Public Roads

Due to both distance and intervening topography and tree screens there are no views from significant public roads impacted by the proposed development.

5.4.4.2. Impact on Views - Property

Figure 5.3 indicates the following areas subject to visual impact.

A1 (ref. Photo 1) - A row of eight semi-detached houses in Stanford Close at the northern end of the housing estate developments at Dromore, Castletroy. The upper portions of the five storey accommodation buildings some 0.9km distant, will be just visible above the intervening tree screens, east of the Plassey Mill tower.

Impact arising will be *slight, neutral* and *medium* term, until tree screens increase in height.

A2 - (ref. Photo 2) - A row of seven, single storey stores/cabins adjoining the river footpath and screened by a 1.8 m to 2.0 m high trimmed hedge. Their general outlook and setting will be overlooked by the village development on the opposite bank.

Impact arising will be *significant,* and perceived as *negative* and *long term.*

A3 - Former lock keeper's cottage on the west bank of the Errina Canal, currently screened from the canal footpath by a 1.8 m high trimmed hedge. Its general outlook and setting will be overlooked and part of the lower sky obstructed by the 4-storey section of the most westerly accommodation buildings, approximately 40 m distant.

Impact arising will be *significant, negative* and *long term.*

A4 (ref. Photo 3) - Ribbon development bungalows in Gilloge, facing south. The upper portions of the 5 storey accommodation buildings will just be visible above the tree screen to the River Blackwater/Errina Canal. The field of view is restricted and dominated in the foreground by the external features of the former Burlington factory.

Impact arising will be *slight, neutral* and *medium* term.

A5 - Residential development east of Gilloge. Tree screens to the River Blackwater/Errina Canal and other intervening hedgerows effectively screen these properties from anything but minor 'filtered' views at 1.0 km distance.

Impact arising will be generally *imperceptible.*

A6 (ref. Photo. 4) - South-west facing period farmhouses with extensive outlook over meadow pastureland. Village buildings will be partially visible above intervening hedgerows at approximately 1.0 km distant.

Impact arising will *be slight, neutral* and *medium* term.

A7 - South west facing residential properties not directly orientated to the village development and screened by intervening trees and hedgerows, from anything but minor 'filtered' views in winter.

Impact arising will be generally *imperceptible.*

A8 - South and east sides of former Burlington Factory. Upper portion of the five storey village buildings will just be visible above the tree screens.

Impact arising will be *slight, neutral* and *short-medium term,* until existing screen planting within the factory grounds increases in height.

A9 - Elevated parkland frontage to Plassey House, University of Limerick. Glimpse views to upper portion of the taller village buildings through and above the intervening trees will be evident, particularly in winter, when the Burlington factory is also partially visible.

Impact arising will be *slight, neutral* and *short-medium term,* until the tree screen at the north edge of the parkland increase in height and/or future University development occurs.

A10 - Dromroe Village accommodation buildings facing north over south meadow and the river into the north meadow will have the access road, new bridge and much of the upper portions of the village buildings intrude into the view.

Impact arising will be *moderate, neutral* and *long term.*

5.4.4.3. Impact on Archaeological Monuments - Architectural Heritage

Plassey mill and tower is the only site to experience a definable visual impact from the proposed development. The mill site is currently fenced off for public security reasons and is enclosed by vegetation.

The tower is currently the most prominent local landmark to break the surrounding tree skylines. The five storey blocks of the proposed development will be approximately 3.5 m lower than the top of the tower and most of the proposed development will be visible from its higher levels. Public access to the tower is not, however, currently permitted.

The principal impact will be the intrusion of the proposed development within views from the river and Errina Canal walkways where the mill tower is a significant focal point.

The impact arising will be generally *moderate, negative* and *long term.*

5.4.4.4. Impact on Recreation Amenity

For most people who stroll, hike or jog and cycle along the river and the Lough Derg Way (Errina Canal) and fish in the vicinity of the Black Bridge the prevailing tranquil, rural and secluded setting and the sense of being away from the urban environment is likely to be an integral part of its overall attraction and popularity.

The existing developments in close proximity to the river are generally well screened by existing trees, hedgerows and riparian vegetation, particularly during summer when growth is lush and dense. Under these conditions the Black Bridge and the ruined Plassey Mill tower are the primary landmarks which provide a local sense of identify and focal points at a prominent curve in the river.

Within this current context the proposed development will have a *significant* and, to a limited extent, *profound* impact due to both visual intrusion and obstruction within views from the walkways and within the river. These will be initially perceived by many as *negative* due to the apparent loss of the immediate rural setting.

The develoment's primary zone of visual influence will, however, only affect approximately 12% of the total 10km Limerick City to Annacotty river walk and effect a very small part of the total Lough Derg Trail (25 km to Killaloe). Aside from temporary diversions during construction, all existing walks and fishing access tracks will be maintained and pass beneath the proposed bridge where the concrete abutments will have adjoining side slopes faced with random pattern stonework, and the embankments established with locally occurring vegetation species.

The commencement of construction on Dromroe Student Village within the south meadow will see the realisation of a similar height and scale of student accommodation as the proposed development. This represents the first University development with a close, direct relationship to the River Shannon. The proposed development of the bridge and the fourth village reflects a further stage of the University's need for expansion and the strengthening of this river - campus relationship. In the medium term as both villages and the new bridge become familiar landmarks and points of interest in their own right, and the proposed landscape treatments mature these impacts will gradually decrease and be increasingly perceived as neutral within the wider context of an integrated University Campus - river landscape setting.

5.5 MITIGATION MEASURES

5.5.1 Design Development

Mitigation of visual impact has been duly considered within the overall constraints of the development brief and is reflected in the following aspects of the proposed layout and design:-

- The adoption of a five storey maximum building height to be consistent with the Dromroe Village scheme currently under construction within the meadow south of the river and to remain below the top elevation of the ruined Plassey Mill tower (approx. 26.60 m O.D.).
- The reduction of building height to one, three and four storeys for the blocks closest to the Errina Canal and a minimum set back of 18.0m from the edge of the towpath (the Lough Derg Way walking trail).
- The retention of the existing 6m – 13m high ash, alder and hawthorn trees along the west boundary drain and adjoining canal towpath.
- The provision of planted 1.2 m high earth mounds to both the east and west sides of the car park.
- The 'softening' of the road bridge embankments on the south side of the river which are visible from the river walk with shallower gradient slopes and abutment profile.
- Facing the stone filled gabions of the building terraces and the side bridge abutments with specially prepared 'eco-mats' to provide a natural, vegetation cover and 'softening' of the engineered profiles.
- Extensive use of timber cladding to the building facades.

5.5.2 Landscape Replanting

Landscape treatment to further ameliorate visual impact and enhance the overall development is also incorporated within the layout as indicated in Figure 5.4. Its principal objectives are to:-

- To screen and/or 'filter' low-level views from the nearby river walks with informal groups of perimeter screen planting.
- To reflect the character of local planting and the river corridor by primarily selecting native and indigenous tree, shrub and ground flora species.
- To create a distinctive internal village landscape, evocative of its riverside setting. Key features will be the integration of three, managed reed-bed lagoons within the 'fingers' of river floodplain retained between the principal building areas, the incorporation of wildflower/grass meadow areas on the more elevated, filled ground and a random distribution of tree and shrub groupings throughout.

5.5.3 Replanting Species

The principal species selected include the following:-

- Trees

Alder	*Alnus glutinosa*
Ash	*Fraxinus execlsior*
Birch	*Betula pendula*
Bird cherry	*Prunus padus*
Oak	*Quercus robur*
Willow	*Salix cinerea*
White willow	*Salix alba*

- Minor Trees/Understorey

Elder	*Sambucus nigra*
Guelder rose	*Viburnum opulus*
Hawthorn	*Crataegus monogyna*
Hazel	*Corylus avellana*
Rowan	*Sorbus aucuparia*

5.5.4 Monitoring

The proposed landscape treatment - mitigation measures will be the subject of continuing maintenance and monitoring as part of the University of Limerick's well established grounds management programme. This will be guided by a specially prepared management plan incorporating ecologically determined objectives.

5.6 CONCLUSIONS

5.6.1 Context

The proposed development is located within a locally distinctive stretch of the River Shannon corridor, up-stream of Limerick. It is also at a prominent curve in the river where the River Blackwater and the disused Errina Canal enter it from the north-east. The tower of the ruined Plassey Mill adjoining the south bank and the pedestrian Black Bridge linking the river and canal walkways are the primary landmark features within a predominantly rural, tranquil setting.

To the south of the river the University of Limerick buildings were, until recently, well screened from this setting by existing trees. The commencement of construction on the University's third student residential development (Dromroe Village) has introduced a new and direct relationship between the campus and the river corridor. The proposed development of the bridge and the fourth village reflects a further stage of the University's need for expansion and the strengthening of this river – campus relationship.

5.6.2 Residual Effects

The development will generally have only slight or no perceptible visual impact on views from public roads and the residential areas of Dromore (Castletroy) and Gilloge, due to a combination of distance and/or intervening tree and hedgerow screening. It will, however, inevitably give rise to significant and, to a limited extent, profound negative change and visual impact in the short term due to the perceived loss of a tranquil, rural setting and change to a traditional recreation area. In the medium term, as the proposed bridge and village development (and the adjoining Dromroe Village) become familiar landmarks and the proposed landscape treatment matures, these impacts will gradually decrease and be increasingly perceived as neutral.

6.0 ROADS AND TRAFFIC STUDY

6.1 INTRODUCTION

This section of the EIS contains a transportation impact evaluation for the proposed development at the University of Limerick Campus. The vehicular bridge crossing is proposed in order to provide access to the northern bank of the River Shannon which will accommodate the fourth student village to be located at the University.
The following are described in this section of the EIS:

- The location of the site with respect to the existing infrastructure in the area;
- The nature of the proposed bridge development;
- The traffic impact of the proposed development;
- The impact of the proposed crossing on other roads; and
- A summary of the traffic and transportation impact of the proposed river crossing.

This study has been prepared taking into account the Limerick and Clare County Council Development Plans 1999, the Institution of Highways and Transportation publication "Guidelines for Traffic Impact Assessment" and An Foras Forbatha "Geometric Design Guidelines (Intersections at Grade)" RT181.

6.2 EXISTING ROAD CONDITIONS

Access to the campus is via two entrances, the west gate and the east gate, connected internally by the main campus spine road. The campus spine road is constructed 7m wide with all other individual distribution roads constructed 6m wide. A speed limit of 25mph is in operation on all roads within the campus.

The Dublin to Limerick N7 route currently accommodates an annual average daily traffic (AADT) flow of approximately 35,400 vehicles (9% Heavy Goods Vehicles). This AADT is based on the information available from the National Road Authorities publication 'National Roads and Traffic Flow 1998' which has been factored up to represent the traffic flows in 2000. A 6.5% growth factor on the National Primary route has been used based on the growth experienced on the N7 prior to 1998.

A survey of the existing traffic volumes within the University Campus was unable to be conducted as the traffic study was carried out in July 2000, during the off-peak period for the main University activities. No recent historical traffic information was available.

6.3 PROPOSED DEVELOPMENT

The proposed location for the river crossing is to the west end of the University Campus and is up stream of the proposed student accommodation on the northern bank of the River Shannon. The River Shannon is approximately 85 metres wide at this point and is flanked by wide and low-lying flood plains, known as the North and South Meadows.

The location of the crossing is currently well screened from the University by vegetation and trees. There is an existing public right of way along the footpath on the southern bank of the river which is used mainly for recreational purposes. The proposed location of the bridge is approximately 225m upstream of an existing pedestrian bridge known as the Black Bridge. The existing pedestrian bridge has a span of approximately 125 metres. A public right of way also extends northward along the Errina Canal on the northern bank of the river.

The proposed river crossing will provide a vehicular, cyclist and pedestrian connection commencing at Dromroe Student Village (under construction) at the southern edge of the South Meadows and serving the proposed student accommodation on the northern bank. The bridge crossing will consist of a 6.0 metre wide single carriageway flanked to the west by a 3.0 metre wide segregated footpath and cycle track. The segregation of cyclist and pedestrians from the vehicular traffic will enhance the safety and comfort of the bridge users. It is envisaged that the bridge will be open in March 2003. A typical cross section of the proposed bridge is outlined in Figure 3.5.

The river crossing is proposed in order to accommodate a vehicular access to the student village on northern bank of the River Shannon. The University of Limerick intends to expand their campus onto the northern side of the river by locating the student village beyond the river. It is envisaged that the site will accommodate residential space for 503 students and it will be complete in 2003. The development will consist of 106 apartments, varying in size from one to six bed units. The proposed residential development is to provide 96 car parking spaces.

No link into the public roads infrastructure network in County Clare is envisaged. It is the University's policy that if a vehicular access from the County Clare side is provided, that no through traffic will be permitted. This policy is in order to eliminate "rat running" through the University Campus in both directions.

6.4 TRAFFIC IMPACT EVALUATION

6.4.1 Trip Generation

The development of the lands on the northern bank of the river will attract some level of vehicular activity. As outlined in Section 6.3, the development is to accommodate residential units for students of the University. The units are to accommodate 503 students and are due to be completed in early 2003. It should be noted that the proposed student accommodation on the northern bank would only be accessed by vehicular traffic via the proposed river crossing.

The estimated trips generated by the proposed residential development on the northern bank of the river was obtained from the TRICS 4.1 Database (Trip Rate Information Computer System, Version 4.1). As was outlined in Section 6.2, the traffic study was carried out during the off peak period for the University Campus (July 2000). For this reason, no representative traffic surveys could be carried out. The TRICS 4.1 information is based on a similar development in the UK, where the car ownership for students is higher than that experienced in Ireland at present. Therefore, the trip generation pattern outlined in Table 6.1 indicates the worst case scenario for the opening year 2003 on a typical weekday.

Table 6.1 : Estimated Weekday Arrival and Departure Pattern for Bridge Traffic

Time Period	Arrivals (Vehs) Northbound	Departures (Vehs) Southbound	Combined Trips
0800-0900	6	18	24
0900-1000	10	16	26
1000-1100	14	14	28
1100-1200	10	11	21
1200-1300	13	17	30
1300-1400	19	19	38
1400-1500	13	14	27
1500-1600	23	24	47
1600-1700	25	16	41
1700-1800	24	18	42
1800-1900	24	16	40
1900-2000	26	23	49
Total Trips	207	206	413

(Source: TRICS 4.1)

As can be seen from Table 6.1, the peak level of traffic movement occur in the evening periods between 1500 and 2000 hours. However, it can be seen that the proposed traffic on the bridge will generate low vehicles movements throughout the day.

In order to assess any future year scenarios an annual growth of 4% is assumed. This increase in traffic is to reflect the expected general traffic growth in the area between 2000 and 2010, as outlined by the National Roads Authority. It is assumed that this growth will represent a similar increase in car ownership for the students residing at the fourth student village. It is considered that the traffic generated from the fourth student village will have a minimal impact on the traffic flows on the N7 traffic (AADT of approximately 35,400 vehicles).

6.4.2 Trip Distribution

It is assumed in this study that all traffic movements operate via the river crossing. The bridge will accommodate a total of 413 vehicle trips between 0800 and 2000 in the opening year of the bridge. The peak hour traffic flows for the bridge in both directions are outline in Figure 6.3.

Bridge traffic volumes will increase to 612 trips (peak hourly level of 73 vehicles) ten years after the opening as a result of the increased car ownership of students residing on the University Campus.

6.4.3 Parking Provisions

The proposed residential development is located within the Clare County Councils' administration area and therefore, any parking guidelines are subject to their requirements. The Clare County Development Plan 1999 indicates that apartments require 0.75 car parking space per bedroom. Based on this requirement it is envisaged that the residential development will require 378 car parking spaces.

Based on the fact that the development will primarily be occupied by students of the University and the trip generation figures as outlined in Table 6.1, then the provision of 96 car parking spaces will sufficiently accommodate the expected car parking demand.

Information was obtained for a similar residential development. The Castlewhite Apartments at University College Cork accommodates 278 students (63 apartments). The development provides approximately 60 car parking spaces that are used by both residents and staff of the University. It is envisaged, based on previous experiences, that the level of car parking that will be provided at the University development will be sufficient to accommodate the demand.

The car parking provisions will also take into account the needs of persons with disabilities. Designated parking areas are to be reserved in a convenient location and are to be clearly marked. Six coach parking spaces are also provided at the residential development. The provision of facilities for cycle parking is also provided.

6.4.4 Operating Capacity

As can be seen from Section 6.4.1 and 6.4.2, a small number of vehicular traffic will use the new bridge crossing. The operating capacity of a standard two lane carriageway is 1900 vehicles per hour (TD20/85 Table A (DOT 1985b)). The bridge will, therefore, operate within its vehicular capacity.

6.4.5 Other Road Users

Pedestrians
As a result of the expected high level of pedestrian movements between the residential units and the University Campus, a segregated and secure footpath from the vehicular movements will be provided. It is envisaged that a maximum of 380 pedestrian movements may occur in the peak hour periods. This is based on a recent survey carried out for the University that indicated that four times more people walk to the campus than cycle. The peak activity traditionally occurs in the AM, PM and lunch time periods as residents commute to and from the University Campus. It is proposed that adequate pedestrian facilities and facilities for people with disabilities be provided on either side of the bridge in order to enhance the safety and comfort of the pedestrians in the area.

Cyclists
Similar to the pedestrian facilities, an independent and secure area will be provided on the river crossing in order to safely accommodate the levels of cyclists typically generated by student residences. It is envisaged that a maximum of 95 cycle movements may occur in the peak hour periods. The provision of facilities for cycle parking is also provided at the development.

The pedestrian and cycle movements to and from the residential units are envisaged to be the predominant users of the river crossing.

6.4.6 Construction Vehicles

During the construction phase all construction related activities will access via the southern bank of the River Shannon. The overall construction schedule for the bridge is planned to start in 2001 and finish in March 2003.

It is envisaged that a construction workforce of approximately 250 operatives will be present on the site at the peak construction period. The typical working day for the construction staff will be 12 hours during summer, reducing to an 8-hour day during winter. The traffic generated by construction employees during these periods will have an insignificant effect on the existing campus traffic as it will occur outside the peak commuting periods. A hardstanding area will be provided close to the site in order to accommodate car parking facilities for the construction employees.

In addition to the employee generated traffic volumes, a number of heavy construction vehicles will arrive and depart the site during the various construction stages.

Based on the information available, a conservative estimate would anticipate that approximately 75 heavy construction vehicles would arrive and depart the site daily. It is envisaged that these traffic volumes would occur during short time periods, particularly during the casting of the concrete bridge deck. This level of traffic generation that will occur throughout the day will have an insignificant effect on the current N7 traffic volumes (approximately 3,000 heavy goods vehicles daily).

It is proposed that during this stage of construction that wheel-washing facilities will be provided. Road sweeping facilities will also be provided to remove any accidental spillage from vehicles departing the site. It is also proposed that storage of all construction related materials would be at a storage yard remote from the site and materials would only be brought on site as required. It is also proposed that a system of remote stacking of delivery vehicles will be introduced as part of the project management during the construction process.

The overall objective of such a proposal is to minimise the impact of construction related traffic on the University. Appropriate traffic management signage will be provided with the general aim of reducing the speed of construction vehicles to 15 miles per hour both within the site and on the adjoining road network. In general, it is proposed that the site will be so managed as to operate in a manner consistent with the surrounding sensitive areas. However, the effect of construction related traffic is envisaged to be less than the effects of the proposed student village developments on the northern side of the river.

6.4.7 Summary

The additional daily trips generated by the proposed development will have only a minimal effect on the future traffic pattern along the N7 (AADT of approximately 35,400 vehicles).

It should be noted, that the provision of on-campus accommodation will result in a reduction in the number of students arriving and departing the University from off-campus accommodation. It is assumed that this will result in a reduction in the traffic volumes on the N7 in a similar pattern to the traffic generated by the proposed residential development. For this reason, the level of traffic on the adjoining road network and within the University campus will, in essence, remain constant and only a minimal change will occur in the traffic pattern for the area.

The impact of traffic generated by the proposed development can be summarised as follows:

- Minimal impact on campus traffic;
- Neutral effect on the public roads network;
- Safe access for pedestrians and cyclists; and
- Minor adverse effect due to construction traffic.

6.5 MITIGATION MEASURES

In order to mitigate against the traffic impacts of the proposed development, a number of measures are included in the scheme. These include the provision of adequate pedestrian crossing facilities and the use of traffic calming techniques to minimise traffic speeds in the vicinity of the bridge in order to enhance the safety of all road users. If, in the future, an additional access from the County Clare side is provided to the proposed residential development on the northern side of the river, then in line with University policy this traffic will not be permitted to progress to the south side.

6.6 RESIDUAL EFFECTS

The proposed development will result in no adverse residual effects in respect of roads and traffic.

7.0 NOISE AND VIBRATION STUDY

7.1 INTRODUCTION

This environmental noise and vibration evaluation encompasses the noise baseline study, details the noise and vibration characteristics of the development and evaluates the noise and vibration impacts. Mitigation measures are proposed to ensure the minimisation of noise and vibration impacts. The noise and vibration impacts of construction have also been addressed.

7.2 NOISE BASELINE

7.2.1 Introduction

An environmental noise survey was conducted in order to quantify the existing noise environment. The survey was conducted generally in accordance with ISO 1996: 1982: *Acoustics – Description and Measurement of Environmental Noise*. Vibration measurements were recorded to quantify existing levels of vibration in the area. Specific details are set out below.

7.2.2 Measurement Locations

Four measurement locations were selected; refer to Figure 7.1 for their approximate positions. Each is discussed in turn below.

Location 1 is located within the University grounds, adjacent to Kilmurry Student Village.

Location 2 is located within the Dromore private housing estate at a point adjacent to residential dwellings, close to the pedestrian entrance to the University.

Location 3 is located close to a residential dwelling situated along a roadway to the north of the proposed site at a point where the roadway is intersected by the Errina Canal in the townland of Garruan.

Location 4 is close to the former lock-keepers cottage located on the northern bank of the river, along the Lough Derg Way running adjacent to the Errina Canal.

7.2.3 Survey Periods

Measurements were conducted over the course of two survey periods as follows:

Daytime - 10:00hrs to 14:00hrs on 19/5/00;

Night-time - 23:00hrs to 02:00hrs on 18-19/5/00.

The daytime measurements therefore cover a typical busy period. It is likely that there will be less activity on the site during the night-time. There may be occasional pedestrian and vehicular activity within the development and on the bridge. Building services plant may operate at night-time.

The weather throughout the survey period was mostly calm with an occasional light breeze and dry.

7.2.4 Instrumentation

The measurements were performed using a Brüel & Kjær Type 2236 Sound Level Analyser and an Instantel Minimate Vibration Analyser with integral accelerometer. Before and after the survey the sound level apparatus was check calibrated using a Brüel & Kjær Type 4231 Sound Level Calibrator and the vibration apparatus was check calibrated using its internal calibrator.

7.2.5 Procedure

Measurements were conducted at the four locations on a cyclical basis. Sample periods were 15 minutes. The results were noted onto a Survey Record Sheet immediately following each sample, and were also saved to the instrument memory for later analysis. Survey personnel noted all primary noise sources contributing to noise build-up. Vibration measurements were also noted onto a Survey Record Sheet immediately following each sample.

7.2.6 Measurement Parameters

The survey results are presented in terms of the following five parameters:

L_{Aeq} is the equivalent continuous sound level. It is a type of average and is used to describe a fluctuating noise in terms of a single noise level over the sample period.

L_{Amax} is the instantaneous maximum sound level measured during the sample period.

L_{Amin} is the instantaneous minimum sound level measured during the sample period.

L_{A10} is the sound level that is exceeded for 10% of the sample period. It is typically used as a descriptor for traffic noise.

L_{A90} is the sound level that is exceeded for 90% of the sample period. It is typically used as a descriptor for background noise.

The "A" suffix denotes the fact that the sound levels have been "A-weighted" in order to account for the non-linear nature of human hearing. All sound levels in this report are expressed in terms of decibels (dB) relative to $2x10^{-5}$ Pascals (Pa).

The results of the vibration measurements are presented in terms of Peak Particle Velocity (mm/s).

7.2.7 Results and Discussion

Location 1
The results for Location 1 are summarised in Table 7.1 below.

Table 7.1 : Summary of Results for Location 1

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	10:07 – 10:22	50	76	38	51	39
	12:42 – 12:57	53	75	46	57	48
Night-time	22:55 – 23:10	48	71	45	49	46
	00:47 – 01:02	47	52	44	48	45

During the daytime, the dominant sources of noise were students entering and leaving the Kilmurry accommodation complex and water noise from the river located nearby. Wind generated noise from foliage and noise from construction works nearby also contributed to noise levels measured in this area. Noise levels were in the range 50dB L_{Aeq} to 53dB L_{Aeq}, which is typical for the type of environment under consideration.

During the night-time, the dominant sources of noise were student activity at the accommodation complex and water noise from the river. Noise levels were in the range 47dB L_{Aeq} to 48dB L_{Aeq}, which again is typical for this type of environment.

A vibration level of 0.143mm/s (vertical) was recorded at this location.

Location 2
The results for Location 2 are summarised in Table 7.2 below.

Table 7.2 : Summary of Results for Location 2

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	10:35 – 10:50	46	40	58	48	42
	13:00 – 13:15	44	64	39	46	41
Night-time	23:41 – 23:56	41	53	38	43	39
	01:08 – 01:23	42	56	39	44	40

During the daytime, the dominant noise sources were activity within the Dromore private housing estate i.e. children playing, grass cutting, students using the entrance to the University etc., and noise from the waste water treatment facility located close to the existing Black Bridge. Noise from construction activities within the University grounds was also audible at times during the survey period. Noise levels ranged from 44dB L_{Aeq} to 46dB L_{Aeq}, which would be considered typical for this type of environment.

During the night-time, the dominant sources of noise were activity within the housing scheme and noise from the waste water treatment facility. Noise levels ranged from 41dB L_{Aeq} to 42dB L_{Aeq}. These noise levels are again typical of what would be expected in the type of environment under consideration.

A vibration level of 0.063mm/s (vertical) was recorded at this location.

Location 3
The results for Location 3 are summarised in Table 7.3 below.

Table 7.3: Summary of Results for Location 3

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	11:11 – 11:26	55	77	39	58	42
	13:29 – 13:44	51	70	47	51	48
Night-time	00:12 – 00:27	54	78	39	56	38
	01:38 – 01:52	49	70	37	52	38

During the daytime, the dominant source of noise was traffic along the roadway. Wind noise from foliage nearby and birdsong also contributed to noise levels at this location. Noise levels ranged from 51dB L_{Aeq} to 55dB L_{Aeq}, which would be considered typical for a rural environment.

During the night-time, the dominant source of noise remained traffic along the roadway. Noise levels ranged from 49dB L_{Aeq} to 54dB L_{Aeq}. These noise levels are typical of what would be expected in the type of environment under consideration.

A vibration level of 0.063 mm/s (vertical) was recorded at this location.

Location 4
The results for Location 4 are summarised in Table 7.4 below.

Table 7.4 : Summary of Results for Location 4

Time		Measured Noise Levels (dB re. $2x10^{-5}$ Pa)				
		L_{Aeq}	L_{Amax}	L_{Amin}	L_{A10}	L_{A90}
Daytime	11:11 – 11:26	55	77	39	58	42

The noise climate at this location is dominated by the continuous sound of cascading water along the River Blackwater.

7.3 NOISE AND VIBRATION CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

When considering a development of this nature, the potential noise and vibration impact on the surroundings must be considered for each of two distinct stages: the short-term impact of the constructional phase and the longer-term impact of the operational phase. Given the nature of this development, there is unlikely to be any overlap between these phases.

The constructional phase will involve clearing the site, erecting the bridge, new buildings and providing new car parking facilities.

There are two primary sources of noise in the operational context:

i building services plant;
ii vehicular activity on the bridge;

7.4 POTENTIAL IMPACT OF THE PROPOSED DEVLOPMENT

7.4.1 Noise Criteria

Due consideration must be given to the nature of the primary noise sources when setting criteria. In this instance, there are two primary sources of noise associated with the development once operational. Criteria for noise from building services plant and vehicular activity on the bridge will be set in terms of $L_{Aeq,T}$, the equivalent continuous sound level.

There are no Irish Standards containing guidance that is applicable in this instance. In the absence of such standards, best practice dictates that the potential noise impact of the proposed development be assessed against appropriate British and International Standards.

Appropriate guidance is contained within BS8233: 1999: *Sound Insulation and Noise Reduction for Buildings – Code of Practice*. This British Standard sets out recommended noise limits for indoor ambient noise levels as follows:

Table 7.5: Recommended Indoor Ambient Noise Levels from BS8233: 1999

Criterion	Typical situation	Design range $L_{Aeq,T}$ (dB)	
		Good	Reasonable
Reasonable resting /sleeping conditions	Living rooms	30	40
	Bedrooms	30	35

It is considered appropriate to select the most onerous criterion for night-time, i.e. 30dB $L_{Aeq,T}$ (lower end of the range for bedrooms). However, it is usual to adopt a less rigorous standard for daytime, i.e. 40dB $L_{Aeq,T}$.

For the purposes of this study, it is appropriate to derive external limits based on the internal criteria given in Table 7.5 above. This is done by factoring in the degree of noise reduction afforded by an open window. This is nominally 10dB.

A shorter assessment time period (T) is adopted for night-time in order to reflect the increased potential for disturbance. Appropriate periods are 1 hour for daytime (07:00hrs to 23:00hrs) and 5 minutes for night-time (23:00hrs to 07:00hrs).

In summary, the following criteria apply at the façades of those residential properties closest to the development:

Daytime (07:00hrs to 23:00hrs) 50dB $L_{Aeq,1hr}$
Night-time (23:00hrs to 07:00hrs) 40dB $L_{Aeq,5min}$

These criteria are also in compliance with the following guidance taken from the World Health Organisation publication "Community Noise".

> *"To protect the majority of people from being moderately annoyed during the daytime, the sound pressure level should not exceed 50dB L_{Aeq}.*
>
> *At night-time outdoors, sound pressure levels should not exceed 45dB L_{Aeq}, so that people may sleep with bedroom windows open."*

The criteria set out above relate to noise from building services plant and vehicular activity on the bridge. Comparison with the survey results confirms that compliance with these criteria will ensure that the noise impact of the development is negligible.

7.4.2 Forecasting Methods

Prediction calculations for building services plant and vehicular activity on the bridge have been conducted generally in accordance with ISO9613: *Acoustics - Attenuation of Sound Outdoors, Part 2: General Method of Calculation*, 1996.

7.4.3 Constructional Phase

A variety of items of plant will be in use, such as excavators, lifting equipment, dumper trucks, compressors and generators. There will be vehicular movements to and from the site that will make use of existing roads.

Due to the nature of the activities undertaken on a large construction site, there is potential for generation of significant levels of noise and vibration. The flow of vehicular traffic to and from a construction site is also a potential source of relatively high noise levels. The potential for vibration at neighbouring sensitive locations during construction is typically limited to excavation works, piling operations and lorry movements on uneven road surfaces. The more significant of these is vibration from excavation and piling operations; the method of which will need to be selected and controlled to ensure there is no likelihood of structural or even cosmetic damage to existing neighbouring structures. BS5228 provides clear guidance on the methods to control vibration during construction. Its application in this instance would be expected to minimise disturbance to residents in the vicinity of the development site.

Due to the fact that the construction programme has been established in outline form only, it is not possible to calculate the actual magnitude of noise emissions to the local environment. However, the impact due to construction activities will be transient in nature.

7.4.4 Operational Phase

7.4.4.1 Noise

Each of the primary operational noise sources is addressed in turn below.

Building Services Plant
Once a development of this nature becomes fully operational, a variety of electrical and mechanical plant will be required to service the complex. Most of this plant will be capable of generating noise to some degree. Some of this plant may operate 24 hours a day, and hence would be most noticeable during quiet periods (i.e. overnight). Noisy plant with a direct line of sight to noise sensitive properties would potentially have the greatest impact. Noise from building services plant will be controlled such that it does not exceed a level of 40dB $L_{Aeq,\ T}$ at a distance of 10m from the facade of any building associated with the development.

The nearest noise-sensitive location to the proposed development on the northern bank of the river is the residential dwelling located adjacent to the Errina Canal, close to the western boundary of the proposed development. The corresponding maximum noise level at the façade of the nearest building is 31dB $L_{Aeq,T}$, which is within both the daytime criterion of 50dB $L_{Aeq,\ 1hr}$ and the night-time criterion of 40 dB $L_{Aeq,5\ min}$.

The nearest noise-sensitive location on the southern bank of the river is the row of small single storey dwellings/stores, to the west of the proposed bridge. The corresponding maximum noise level at the façade of the nearest building is 25 dB $L_{Aeq,T}$, which is within both the daytime criterion of 50dB $L_{Aeq,\ 1hr}$ and the night-time criterion of 40 dB $L_{Aeq,5\ min}$.

Vehicular Activity on the Bridge
Arup Consulting Engineers have prepared a detailed report on traffic associated with the development. CRTN[1] is not appropriate in this instance due to the fact that the anticipated traffic volume is low and also the anticipated typical speed of the vehicles using the facility will be less than 25mph. In such circumstances, the level of accuracy associated with the CRTN standard is low. An alternative rigorous method of assessment is set out below.

[1] *Calculation of Road Traffic Noise*, Department of Transport Welsh Office, HMSO, 1988

The noise level associated with an event of short duration, such as a vehicle drive-by, may be expressed in terms of its Sound Exposure Level[2] (L_{Ax}). The L_{Ax} can be used to calculate the contribution of an event or series of events to the overall noise level in a given period

The mean value of Sound Exposure Level for a variety of passenger vehicles (i.e. estate, saloon, hatchback, executive) at low to moderate speeds (i.e. 10 to 30mph) is of the order of 64dB L_{Ax} at a distance of 5m from the edge of the roadway. This figure is based on a series of measurements conducted under controlled conditions.

Opening Year (2003) - the traffic report indicates that traffic volumes using the bridge will reach a peak hourly level of 49 vehicles in the opening year.

The "worst case" noise level due to vehicle movements along the proposed bridge and along the main road within the development at a distance of 5m from the edge of the roadway is calculated to be 45dB

The nearest noise-sensitive location to the proposed development on the northern bank of the river is the residential dwelling located adjacent to the Errina Canal and close to the western boundary of the proposed development. Taking into account attenuation due to distance, the resultant noise level at the façade of the residential dwelling due to development traffic is 25dB $L_{Aeq,1hr}$, which is well within both the daytime criterion of 50dB $L_{Aeq,\ 1hr}$ and the night-time criterion of 40 dB $L_{Aeq,5\ min}$.

The nearest noise-sensitive location on the southern bank of the river is the small single storey dwellings/stores along the riverbank to the west of the proposed bridge. Taking into account attenuation due to distance, the resultant noise level at the façade of the nearest building is 26 $L_{Aeq,1hr}$, which is well within both the daytime criterion of 50dB $L_{Aeq,\ 1hr}$ and the night-time criterion of 40 dB $L_{Aeq,5\ min}$.

Assessment Year (2013) - the traffic report indicates that traffic volumes using the bridge will reach a peak hourly level of 73 vehicles by 2013.

The "worst case" noise level due to vehicle movements along the proposed bridge and along the main road within the development at a distance of 5m from the edge of the roadway is calculated to be 47dB.

Taking into account attenuation due to distance, the resultant noise level at the façade of the nearest residential dwelling on the northern bank of the river due to development traffic is 27dB $L_{Aeq,1hr}$, which is well within both the daytime criterion of 50dB $L_{Aeq,\ 1hr}$ and the night-time criterion of 40 dB $L_{Aeq,5\ min}$.

Taking into account attenuation due to distance, the resultant noise level at the façade of the nearest building on the southern bank of the river due to the development traffic is 28 $L_{Aeq,\ 1hr}$, which is well within both the daytime criterion of 50dB $L_{Aeq,\ 1hr}$ and the night-time criterion of 40 dB $L_{Aeq,5\ min}$.

In summary, the likely noise impact of vehicular activity on the bridge on the local environment is negligible.

[2] Defined as being the "A-weighted" equivalent continuous sound level which, when maintained for one second, contains the same quantity of sound energy as the actual time varying level of one event.

7.4.4.2 Vibration

As a vehicle travels along a road, vibration can be generated in the road and subsequently propagate towards nearby buildings. Such vibration is generated by the interaction of a vehicle's wheels and the road surface and by direct transmission through the air of energy waves. Some of these waves arise as a function of the size, shape and speed of the vehicle, and others from pressure fluctuations due to engine, exhaust and other noises generated by the vehicle.

It has been found that ground vibrations produced by road traffic are unlikely to cause perceptible structural vibration in properties located near to well-maintained and smooth road surfaces. Problems attributable to road traffic vibration can therefore be largely avoided by maintenance of the road surface.

Ground vibration from the operation of the proposed scheme would be expected to be orders of magnitude less than that required to cause disturbance to occupiers of nearby buildings (about 1mm/s) or structural damage to property (>8mm/s).

7.5 MITIGATION MEASURES

In order to sufficiently ameliorate the likely noise impacts set out above, a schedule of noise control measures has been formulated for both constructional and operational phases.

7.5.1 Constructional Phase

With regard to construction activities, reference will be made to BS5228: *Noise Control on Construction and Open Sites*, which offers detailed guidance on the control of noise and vibration from demolition and construction activities. In particular, it is proposed that various practices be adopted during construction, including:

- limiting the hours during which site activities are likely to create high levels of noise or vibration are permitted;
- establishing channels of communication between the contractor/developer, Local Authority and residents;
- appointing a site representative responsible for matters relating to noise and vibration;
- keeping all site roads even so as to mitigate the potential of vibration from lorries.

Furthermore, it is envisaged that a variety of practicable noise and vibration control measures will be employed. These may include:

- selection of plant with low inherent potential for generation of noise and/or vibration;
- erection of barriers as necessary around items such as generators or high duty compressors;
- siting of noisy/vibratory plant as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.

7.5.2 Operation Phase

Building Services Plant
Plant will be sited as far away from noise-sensitive locations as is practicable. Proven noise control techniques will be employed to ensure that emissions from plant comply with the daytime and night-time criteria.

With regard to building services plant it is envisaged that the following measures will be employed:

- duct mounted attenuators on the atmosphere side of all air moving plant;
- splitter attenuators or acoustic louvres providing free ventilation to internal plant areas;
- solid barriers screening any external plant;
- anti-vibration mounts on all reciprocating plant.

Vehicular Activity on the Bridge
The noise impact assessment outlined above has demonstrated that mitigation measures are not required.

7.6 RESIDUAL EFFECTS

This section summarises the likely noise impact associated with the proposed development, taking into account the mitigation measures.

7.6.1 Constructional Phase

During the constructional phase of the project there will be a minor impact on nearby residential properties due to noise emissions from site traffic and other activities. The application of binding noise limits and hours of operation, along with the implementation of noise and vibration control measures, will ensure that noise and vibration impact is kept to a minimum.

7.6.2 Operational Phase

Building Services Plant
Proprietary noise and vibration control measures will be employed in order to ensure that noise emissions from building services plant do not exceed 50dB $L_{Aeq,1hr}$ during the daytime and 40dB $L_{Aeq,5min}$ during the night-time at the façade of the nearest noise-sensitive properties. The resultant noise impact is negligible.

Vehicular Activity on the Bridge
The predicted noise level associated with vehicular activity on the bridge is within both the daytime criterion of 50dB $L_{Aeq,1hr}$ and the night-time criterion of 40dB $L_{Aeq,5min}$. The resultant noise impact is negligible.

8.0 AIR QUALITY STUDY

8.1 INTRODUCTION

This section outlines the monitoring programme that was undertaken to establish the existing air quality in the area of the proposed development. As part of the proposed scheme, the traffic access from the existing campus to the village will be along the access road through Dromroe Village (under construction) and across the bridge to the carparks in the north of the village. Predicted average traffic flows in the vicinity of the proposed development were obtained from the traffic consultants responsible for the section of the Statement devoted to roads and traffic.

An evaluation of the impact of the scheme on the existing environment is presented and any mitigation measures proposed are outlined.

8.2 AMBIENT ATMOSPHERIC BASELINE

8.2.1 Ambient Air Quality Standards

In the region of the proposed development, current and projected pollution sources will be dominated by fuel burning and traffic emissions. Specifically, these sources will emit pollutants which are currently of concern due to their effect on human health and their potential to reach significant concentrations in ambient air. The pollutants of concern from these sources include nitrogen dioxide (NO_2), benzene, PM_{10} (particulate matter which passes through a size-selective inlet with a 50% efficiency cut-off at 10µm aerodynamic diameter), carbon monoxide (CO) and sulphur dioxide (SO_2).

8.2.2 Trends in Air Quality

The Environmental Protection Agency (EPA) data indicates that levels of CO, SO_2, smoke and lead are significantly below the respective limit values even at worst-case roadside locations in major urban centres. However, PM_{10}, NO_2 and benzene currently approach or may even exceed new EU Directives at kerbside and major junctions in large urban centres. However, spatial variations in air quality are important, with concentrations falling significantly with distance from roadside[1]. Thus, residential exposure across urban centres will typically be less than those reported by the EPA, which focused generally on monitoring worst-case kerbside locations.

In relation to the current scheme, baseline conditions will be the air quality that exists just prior to the opening of the [1], assuming that the scheme has not been built, but taking into account the forecast traffic levels in the absence of the scheme. Air quality would be expected to improve as a result of emission reductions in vehicles, despite traffic increases, over the next few years. Emission reductions will reduce emissions of NO_2, benzene and PM_{10} by between 23 – 45% between 1998 and 2001[1].

8.2.3 Meteorological Factors

The greatest variable in measuring air quality, on a day to day basis is variations in meteorological conditions rather than in source strengths[2]. Wind is of key importance in dispersing air pollutants and for ground level sources, such as traffic emissions, pollutant concentrations are inversely related to wind speed. Thus, concentrations of pollutants derived from traffic sources will be greatest under very calm conditions and low wind speeds when movement of the air is restricted. The frequency of these conditions is low.

The nearest representative weather station collating detailed weather records is Shannon Airport, approximately 20 kilometres north-west of the site. Data from Shannon Airport has been examined to identify the frequency of the worst-case weather conditions that would give rise to the highest levels of pollutants. For data collated during five representative years (1993-97), the worst-case conditions occurred for approximately 7% of the time. The predominant wind directions in the worst-case year (1997) are south-westerly and south-easterly with average wind speeds of approximately 3-4 m/s (see Figure 8.1).

8.2.4 Monitoring Strategy

Air quality is not constant but variable over both space and time. The current monitoring programme aims to assess current baseline air quality in the region of the scheme, both in terms of variations in space (spatially) and over time (temporally). In order to optimise the information obtained both temporally and spatially, sampling was carried out for those pollutants most likely to reach significant concentrations near road sources. The spatial coverage involved careful siting of monitoring locations in order to assess worst-case concentrations. The timescale over which pollutants were monitored depended on the averaging period of the limit value and the risk of an exceedence of this limit value.

A review of recent EPA data in Dublin & Cork has indicated that SO_2, smoke, CO and lead are unlikely to be exceeded at locations such as the current one and thus these pollutants do not require detailed monitoring to be carried out. However, the review did indicate potential problems in regards to NO_2 and benzene at busy junctions in urban city centres. PM_{10} has also been highlighted as a potential problem in regions with significant local sources of diesel traffic. The current baseline survey focuses on NO_2, benzene and Total Dust (as a surrogate for PM_{10}) as indicators of general traffic-derived air quality in the region.

Benzene
The proposed EU Directive - COM(98) 591 final – 98/0333 (SYN) has set an annual limit value for benzene. In order to obtain representative data which may give an indication as to whether the prevailing air quality is likely to exceed this limit value, benzene was monitored, using passive diffusion tubes, over a two-week period at four locations near the proposed scheme. The locations were strategically positioned to allow an assessment of both worst-case and typical exposure of the residential population. The results allowed an indicative comparison with the annual average and an assessment of the spatial variation of benzene away from the source.

NO_2
EU Directive 1999/30/EC has set annual limit values for NO_2. In order to assess whether the prevailing air quality is likely to exceed these limit values, NO_2 was monitored, using nitrogen dioxide passive diffusion tubes, over a two-week period at four locations near the proposed scheme. Again, the locations were strategically positioned to allow an assessment of both worst-case and typical exposure of the residential population. The results allow an indicative comparison with the annual average and an assessment of the spatial variation of NO_2 away from the source.

Total Dust (Surrogate for PM_{10})
EU Directive 1999/30/EC has set a 24-hour and annual limit value for PM_{10}. In order to obtain data, which may give some indication as to whether the prevailing air quality is likely to exceed these limit values, Total Dust (as a surrogate for PM_{10}) was monitored, over a 24-hour period at two locations near the current development. This allowed an indicative comparison with the 24-hour and annual limit value.

8.2.5 Assessment of Compliance

The baseline survey targeted the exposure of the nearest residential receptors to the proposed scheme. The monitoring locations have been designed to optimise both the spatial coverage in the region and to determine the worst-case air quality at the nearest sensitive receptors. The long-term survey, using diffusive samplers, has the advantage of averaging out short-term variations in pollutant levels as a result of meteorological conditions and thus would be more representative in terms of assessing current baseline conditions and trends than short-term peak period monitoring.

Monitoring of benzene and nitrogen dioxide (NO_2) was carried out over a two-week period at each of the four locations outlined in Figure 8.2 (Locations M1-M4). The results are presented in Tables 8.1 and 8.2.

Table 8.1 : Average NO_2 Concentrations ($\mu g/m^3$) at Locations M1 – M4

Location	Sampling Date	NO_2 ($\mu g/m^3$)
M1	04/05/00 - 19/05/00	7
M2	04/05/00 - 19/05/00	<6
M3	04/05/00 - 19/05/00	<6
M4	04/05/00 - 19/05/00	<6
	Limit Value	40 (1)

(1) New EU Ambient Air Standard (1999/30/EC) (as an annual average)

Table 8.2 : Average Benzene Concentrations ($\mu g/m^3$) at Locations M1 – M4

Location	Sampling Date	Benzene ($\mu g/m^3$)
M1	04/05/00 - 19/05/00	0.8
M2	04/05/00 - 19/05/00	- (1)
M3	04/05/00 - 19/05/00	0.4
M4	04/05/00 - 19/05/00	2.0
	Limit Value	5 (2)

(1) Sample tube contaminated – unable to analyse
(2) Proposed EU Ambient Air Standard - COM (2000) 223 Final – 1998/0333 (COD) (as an annual average)

Average concentrations of nitrogen dioxide are very low at the nearest residential receptors to the scheme and are well below the new EU annual limit value, which is enforceable in 2010 (see Table 8.1). Moreover, a margin of tolerance of 50% currently applies, and thus the annual limit value is currently 60 $\mu g/m^3$. The margin of tolerance will start to reduce from 1 January 2001 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date of 2010. Moreover, air quality would be expected to improve over the next few years, despite increasing traffic numbers. Specifically, in regards to nitrogen dioxide, emissions from light duty vehicles are predicted to fall by 40% between 2000 and 2003 whereas emissions of NO_2 from HGVs are predicted to fall by 19% between 2000 and 2003 [(1)]. Therefore, NO_2 levels are predicted to remain low in future years in the region.

Average concentrations of benzene at locations M1 – M4 indicate levels are significantly below the proposed EU annual limit value, which is enforceable in 2010, at both locations (see Table 8.2). Moreover, a margin of tolerance of 100% currently applies, and thus the annual limit value is, at present, 10 $\mu g/m^3$. The margin of tolerance will start to reduce from 1 January 2003 and every 12 months thereafter by equal annual percentages to reach 0% by the attainment date of 2010. Furthermore, air quality, would be expected to improve over the next few years, despite increasing traffic numbers. Specifically, in regards to benzene, emissions from light duty vehicles are predicted to fall by 42% between 2000 and 2003 whereas emissions of NO_2 from HGVs are predicted to fall by 24% between 2000 and 2003 [(1)]. Therefore, benzene levels are predicted to fall in future years in the region.

Table 8.3 : Average Total Dust Concentrations (µg/m^3) at Locations M1 and M3

Location	Sampling Date	Total Dust (µg/m^3)
M1	18/5/00 – 19/5/00	59.5
M3	18/5/00 – 19/5/00	<59.5
	Limit Value	50(1)

(1) EU Ambient Air Standard (1999/30/EC) for PM_{10} (as a 90.4th percentile of 24 hour averages)

Total Dust results over a 24-hour period, at two locations near the proposed scheme are shown in Table 8.3. Maximum 24-hour concentrations of total dust over the period just exceed the PM_{10} limit value. It may be expected that approximately 50% of the Total Dust may be composed of particles less than 10 µg. Thus, the results indicated that compliance with the 24-hour EU limit value was likely for PM_{10}.

8.2.6 Odour

A small sewage treatment works is situated in the vicinity of the proposed development. The treatment works, built in 1993, is relatively modern and small scale. In discussion with Limerick Corporation, it was reported that odour has not been an issue in relation to the works over the last few years. Therefore, the plant is deemed to have no significant potential to cause background odour nuisance in the area.

8.3 AIR QUALITY CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

8.3.1 Construction

There is the potential for a number of emissions to atmosphere during the construction of the development. In particular, the construction activities may generate quantities of dust. Construction vehicles, generators etc., will also give rise to some exhaust emissions.

8.3.2 Odour

No odour nuisance is expected to arise as part of the proposed development.

8.3.3 Road Traffic

Road traffic would be expected to be the dominant source of emissions in the region of the scheme. Detailed traffic flow information has been obtained from the traffic section of the Statement and has been used to model pollutant levels under various traffic scenarios and under sufficient temporal and spatial resolution to assess whether any significant impact on sensitive receptors may occur.

Cumulative effects will be assessed using the air dispersion model, as recommended in the recent EU Directive on EIA (Council Directive 97/11/EC) and using the methodology of the UK DETR[3,4]. Firstly, typical urban background concentrations[1] were included in the modelling study, for both baseline and with development scenarios. These background concentrations are year-specific and account for non-localised sources of the pollutants of concern. Baseline conditions were modelled for both year of opening and scheme years (ten years from year of opening) with the additional impact of the scheme also assessed, relative to baseline conditions, in both years. Thus, an assessment of the cumulative impact of the proposed scheme and other existing and proposed developments in the study region could be fully assessed over a ten-year period.

8.3.4 Heating

The space heating for the development is intended to be mains gas supply or LPG boilers in central boiler houses for each unit. The boilers may effect emissions to atmosphere of carbon monoxide, sulphur dioxide, oxides of nitrogen and particulates.

8.4 IMPACT OF DEVELOPMENT ON AMBIENT AIR QUALITY

8.4.1 Introduction

The possible effects of a proposal of this kind are a lowering of air quality due to a combination of pollutants and particulates during construction and operational stages and an increase in greenhouse gas emissions during the operational stages.

8.4.2 Air Dispersion Modelling

The impact on air quality as a result of the projected increase in road traffic has been calculated using the procedures given in Annex 1 in the UK Dept. of Transport Design *Manual for Roads and Bridges* (Revised May 1999), Volume 11, Section 3, Part 1, Air Quality[1]. The Annex provides a screening method for the prediction of ground level concentration of various pollutants at sensitive receptor points close to new traffic developments.

As the model involves a screening procedure, a worst-case scenario was investigated. Firstly, the emission factors for each pollutant have been biased to overestimate the actual emission rate (but without generating unrealistically high results). Additionally, wind speeds are assumed to be 2 m/s, which is lower than that typically found in Ireland. Furthermore, background concentrations have been incorporated into the model and represent worst-case values for the site.

Overall, the procedure has been developed to indicate whether or not more detailed air dispersion modelling is necessary. A number of features of the procedure are designed to overestimate likely pollution levels and, in consequence, it can be assumed with some confidence that a project will not produce air pollution problems if none are identified by this method. If, on the other hand, possible problem locations are found, the conclusion reached is that a more detailed study is necessary.

Average concentrations of carbon monoxide, hydrocarbons, oxides of nitrogen and PM_{10}, at reference dates 2003 and 2013, have been determined for the most sensitive residential receptor points close to scheme. The years are chosen so as to be representative of baseline conditions (year 2003) and the design year of the scheme (year 2013). The locations chosen are considered to be where the most significant effects of increased traffic flow will be felt. Specifically, the residential receptors which are proposed as part of this scheme have been modelled assuming a worst-case distance of 20m from the centre of the road and under two different traffic speeds.

Calculations have been made based on traffic flows predicted for 2003 with and without the development and for 2013 with and without the scheme. As the average speed of traffic, as well as distance of potential receptors from junction points has a significant effect on the generation of pollutants, calculations have been carried out for 2 different traffic speed scenarios. These speeds are 5 km/hr (to represent traffic rush-hour conditions) and 25 km/hr (general speed limit on campus). The results of these calculations are presented in Table 8.4.

In order to facilitate direct comparison with the relevant evaluation criteria, the annual average traffic flows (vehicles/hour) have been adjusted to give predictions of:

- the maximum 8-hour concentration of carbon monoxide,
- the annual average and maximum hourly concentrations,
- the annual average benzene concentration, and
- the annual average and 99th percentile of 24-hour PM_{10} values,

using the formulae given in Annex 1 of Volume 11, Section 3, Part 1 of the UK Dept. of Transport *Design Manual for Roads and Bridges* (May 1999). These adjusted figures for 2003 and 2013 are given in Table 8.4 and are compared with the relevant EU Directives, which will be enforceable in Ireland from July 2001.

Background concentrations have been included in the analysis using the information obtained for NO_2 and benzene from the baseline monitoring study and using the procedure given in Chapter 5 of Volume 11, Section 3, Part 1 of the *Design Manual for Roads and Bridges* for CO. Recent data compiled by the EPA in Ireland has indicated that background PM_{10} levels are in the region of 10-15 µg/m^3. A background level of 15 µg/m^3 has been used in this evaluation for 2003.

8.4.3 Modelling Study Evaluation

The maximum hourly concentrations, determined by the dispersion model, have been converted into the applicable significance criteria for comparison with the relevant limit values. The results of the modelling have been detailed in Table 8.4 and indicate the maximum receptor concentrations near the scheme. All other receptors in the region will experience pollutant concentrations less than the levels indicated in Table 8.4.

NO_2

The modelled results indicate that, at the nearest sensitive receptors to the scheme, NO_2 will not exceed any of the significance criteria, under any of the conditions examined and for all scenario years (see Table 8.4). Compared to baseline (year 2003), levels will decrease in future years, as a result of legislation-driven technical improvements, by as much as 18%. Relative to no scheme, the impact of the scheme will, at most, contribute an additional 2% of the annual average NO_2 limit value to the baseline concentration in 2003 and an additional 1% of the annual average NO_2 limit value in 2013.

On a cumulative basis, the worst-case NO_2 concentration due to the scheme and incorporating worst-case background concentrations will still only reach approximately 20% of the annual average limit value, at the nearest sensitive receptor, in any modelled year and thus will not be significant (see Table 8.4).

CO

Predicted CO levels have also been modelled at the nearest residential receptors to the scheme (see Table 8.4). Compared to the baseline (year 2003), levels will decrease in future years, as a result of legislation-driven technical improvements, by as much as 20% (see Table 8.4). Relative to no scheme, the impact of the scheme will contribute, at most, an additional 2% of the maximum 8-hour CO limit value to the baseline concentration at the nearest residential receptor in any modelled year.

On a cumulative basis, the worst-case CO concentration due to the scheme and incorporating worst-case background concentrations will still only reach approximately 20% of the limit value at the nearest residential receptor in any modelled year and thus will not be significant (see Table 8.4).

Benzene

Predicted benzene levels have also been modelled at the nearest residential receptors to the scheme (see Table 8.4). Compared to baseline (year 2003), levels of benzene will decrease in future years, as a result of legislation-driven technical improvements, by as much as 23% (see Table 8.4). Relative to no scheme, the impact of the scheme will contribute, at most, an additional 1% of the annual benzene limit value, to the baseline concentration at the nearest residential receptor in any modelled year.

On a cumulative basis, the worst-case benzene concentration due to the scheme and incorporating worst-case background concentrations will still only reach approximately 21% of the limit value at the nearest residential receptor in any modelled year and thus will not be significant (see Table 8.4).

PM_{10}

In relation to PM_{10}, the modelled results indicate that, at the nearest occupational receptors to the scheme, this pollutant will not exceed any of the significance criteria, under any of the conditions examined for all scenario years (see Table 8.4). Compared to the baseline (year 2003), levels will decrease in future years as a result of legislation-driven technical improvements by as much as 10%. Relative to no scheme, the impact of the scheme will contribute, at most, an additional 1% of the maximum 24-hour PM_{10} limit value (as a 99^{th} percentile) to the baseline concentration at the nearest residential receptor in any modelled year (this is a worst-case assessment as the EU standard is set as a 90.4^{th} percentile and thus will be less than the maximum value).

On a cumulative basis, the worst-case PM_{10} concentration, due to the scheme and incorporating worst-case background concentrations, will still only reach approximately 91% of the limit value at the nearest residential receptor in any modelled year and thus will not be significant (see Table 8.4).

All scenarios are also currently below the indicative annual average for PM_{10}, which may be introduced in 2005 (with a margin of tolerance of 50%), to be fully complied with in 2010 and these levels are predicted to remain below this significance criteria in future years (see Table 8.4).

8.4.4 Summary of Modelling Study

In relation to NO_2, carbon monoxide, benzene and PM_{10}, screening modelling study predictions have shown that concentrations present at the proposed development site during baseline year (2003) will be below significance criteria even under rush-hour traffic conditions (5 km/hr).

Furthermore, compared to baseline conditions (year 2003), levels will decrease or remain at low levels in future years, as a result of legislation-driven technical improvements. Indeed, relative to no scheme in any modelled year, the impact of the scheme will, at most, only contribute an additional 2% of these limit values to the baseline concentration.

On a cumulative basis, worst-case concentrations will, at most, reach approximately 20-91% of the limit value and thus will not be significant.

Thus, in summary, although some increase in the maximum concentration of pollution may occur at the nearest sensitive receptor as a result of the scheme, no significant increase in pollutant levels will occur. Thus, the proposed development will not result in a significant negative impact on air quality.

TABLE 8.4: Air Quality Assessment, Proposed Development at University of Limerick. Summary of Predicted Air Quality at Worst-Case Receptors Located Near the Proposed Development.

Scenarios	Traffic Speed	Carbon Monoxide (ppm)		Benzene ($\mu g/m^3$)	Nitrogen Dioxide ($\mu g/m^3$)		Particulates (PM_{10}) ($\mu g/m^3$)	
	(km/hr)	Annual Mean	Maximum 8-hour	Annual mean	Maximum 1-hr NO_2	Annual average NO_2	Annual average	Maximum 24-hr values (99^{th}%ile)
2003	5	0.15	1.5	1.0	35.0	7.0	15.0	45.0
no change	25	0.15	1.5	1.0	35.0	7.0	15.0	45.0
2003	5	0.169	1.69	1.03	39.3	7.85	15.09	45.3
with scheme	25	0.156	1.56	1.01	38.7	7.73	15.06	45.2
2013	5	0.124	1.24	0.8	30.0	6.0	13.5	40.5
no change	25	0.124	1.24	0.8	30.0	6.0	13.5	40.5
2013	5	0.136	1.36	0.82	32.2	6.44	13.55	40.7
with scheme	25	0.128	1.28	0.81	31.9	6.38	13.53	40.6
Standards			8.6[2]	5[2]	200[1,5]	40[1]	40[2], 20[5]	50[1,4]

1 EU Council Directive 1999/30/EC
2 Proposed EU Directive COM (2000) 223 Final – 1998/0333 (COD)
3 1-hr limit of 105 ppb not to be exceeded more than 18 times/year (99.8^{th} percentile)
4 24-Hr limit of 50 $\mu g/m^3$ not to be exceeded > 35 times/year (90.4^{th} percentile)
5 Indicative annual limit of 20 $\mu g/m^3$ which may be applicable in 2010 in the light of further information.

8.5 MITIGATION MEASURES

8.5.1 Construction

The potential for dust to be emitted depends on the type of construction activity being carried out in conjunction with environmental factors including levels of rainfall, wind speeds and wind direction. The potential for impact from dust depends on the distance to potentially sensitive locations and whether the wind can carry the dust to these locations. The majority of any dust produced will be deposited close to the potential source and any impacts from dust deposition will typically be within several hundred metres of the construction area.

In order to ensure that no dust nuisance occurs, a series of measures will be implemented as part of a dust minimisation plan. Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any unsurfaced roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust must be regularly watered, as appropriate, during dry and/or windy conditions.

Vehicles using site roads shall have their speed restricted, and this speed restriction must be enforced rigidly. Indeed, on any unsurfaced site road, this shall be 20 km per hour, and on hard surfaced roads as site management dictates.

All vehicles exiting the site shall make use of a wheel wash facility prior to entering onto public roads, to ensure mud and other wastes are not tracked onto public roads. Public roads outside the site shall be regularly inspected for cleanliness, and cleaned as necessary.

At all times, the procedures put in place will be strictly monitored and assessed. The dust minimisation plan shall be reviewed at regular intervals during the construction phase to ensure the effectiveness of the procedures in place and to maintain the goal of minimisation of dust through the use of best practise and procedures.

8.5.2 Road Traffic

Emissions of pollutants from road traffic can be controlled most effectively by either limiting the number of road users or by controlling the flow of traffic. For the majority of vehicle-generated pollutants, emissions rise as speed drops, although the opposite is true for oxides of nitrogen. Emissions are also higher under stop-start conditions when compared with steady speed driving. Because of these effects, the calculations of the impact of road traffic were made under several different speed considerations.

The pollutant concentration predictions discussed above show the effect of average speed on the generation of vehicle emissions. The free flow of the traffic in urban areas and in the vicinity of proposed developments is normally essential in order to minimise the generation of traffic related pollutants. When this development is operational, however, even if the average traffic speed drops to 10 km/hr (which is unlikely), compliance with all the significance criteria will be achieved at the nearest sensitive residential and occupational receptors.

8.5.3 Heating

The heating systems for the development will be operated in accordance with principles of best practice and within consent conditions and by employing energy efficient operating procedures.

8.5.4 Odour

No mitigating measures are deemed necessary in relation to odour as part of the proposed development.

8.6 RESIDUAL EFFECTS

8.6.1 Construction

If a satisfactory environmental impact minimisation plan is implemented, the effect of construction on air quality will not be significant.

8.6.2 Road Traffic

The predictions for road traffic pollution generation indicate that there will be an increase in the levels of various traffic-related pollutants, as a result of the development, in the vicinity of the nearest residential receptors. However, with reference to current evaluation criteria published by the EU, these increases will not have a significant effect on air quality by the year 2013, even for worst-case average traffic speeds.

8.6.3 Heating

Provided that adequate consideration is given to the environmental impact of space heating at the design stage and that the heating systems are operated in accordance with principles of best practice or within consent conditions, then the effect of the space heating on air quality is not considered likely to be significant. In terms of climate, the size and nature of the development and the nature and volume of emissions will have no significant impact.

8.6.4 Odour

No significant odour nuisance is likely to occur as part of the proposed development.

REFERENCES

(1) UK DETR (1999) *Design Manual for Roads and Bridges*
(2) World Health Organisation (1999) *Guidelines for Air Quality*
(3) UK DETR, (1998) *Framework for Air Quality Reviews & Assessments*, LAQM.TG1(98)
(4) UK DETR (1998) *Preparation of Environmental Statements for Planning Projects That Require Environmental Assessment – A Good Practice Guide, Appendix 8 – Air & Climate*

9.0 NATURE CONSERVATION STUDY

9.1 INTRODUCTION

The purpose of this study is to evaluate the impact of the proposed development of the fourth student village and access bridge at the University of Limerick on the receiving ecological environment. Methods used to evaluate the ecological environment, the existing habitats, the significance of the ecology and the predicted environmental impacts are described in this section. Mitigation measures are proposed to ensure the minimisation of any adverse effects on the ecological resources of the site.

9.2 SURVEY METHODS

9.2.1 Habitat Survey

The site of the proposed development was surveyed in May 2000 and a Phase 1 Habitat Survey (Anon. 1993) was carried out. The habitat categories are based principally on vegetation, augmented by reference to topographic and substrate features. This does not comprise a comprehensive list of plant species but is sufficient to describe the character of vegetation and evaluate the ecological significance of the flora.

9.2.2 Hedgerow Survey

A survey and evaluation of hedgerows on the site was carried out using the Hedgerow Evaluation and Grading System (HEGS) method (Clements & Tofts, 1992). This uses a quantitative methodology which gives weighted scores to various ecological attributes such as structure, diversity, connectivity (links with other hedges) and associated features (such as banks, drains and grass verges).

9.2.3 Birds and Mammals Survey

A list of birds observed during the field visit was made and signs of mammal activity were looked for on the site. Dúchas, The Heritage Service, was consulted to determine the proximity of the site to the boundaries of any designated areas in its vicinity.

9.2.4 Aquatic Survey

The aquatic environment was surveyed in early June 2000 by conducting a visual assessment of the river substrate and associated biota using mask and snorkel. Two transects were assessed in this manner, located approximately 50m upstream and 50m downstream of the proposed bridge. Water quality at these points was determined using standard Environmental Protection Agency (EPA) techniques. The EPA biological assessment of water quality procedure requires that invertebrates are collected using a 2mm mesh hand-net by kick-sampling in a suitable gravel-stone substrate for a duration of 2 minutes. Such substrate conditions are normally present in fast flowing riffle areas.

Samples were transferred to plastic buckets and preserved in 70% alcohol. Samples were subsequently sorted, identified and enumerated in a laboratory. The evaluation of a water quality rating is based on the relative abundance of groups of indicator organisms. Table 9.1 outlines the key features of the classification system.

Table 9.1 : The Biological River Quality Classification System (Q Value)*.

Q Value	Community diversity	Water quality	Condition
Q5	High	Good	Satisfactory
Q4	Reduced	Fair	Satisfactory
Q3	Much reduced	Doubtful	Unsatisfactory
Q2	Low	Poor	Unsatisfactory
Q1	Very low	Bad	Unsatisfactory

*After Lucey *et al.*, 1999.

In addition to the assessment of quality using the Q value system, diversity indices were determined which rate the overall diversity of macroinvertebrates found. In general, the higher the diversity index, the more stable the environmental conditions.

9.3 EXISTING ENVIRONMENT

9.3.1 General Description of Site Surroundings

The development site is located on the River Shannon just east of Black Bridge. Most of the site is located to the north of the river in the townland of Garraun but it incorporates the river and its banks, and an area of grassland on the south shore in Plassey. The site is bounded to the northwest by the Blackwater River/Errina Canal and to the east by agricultural grassland. South of the river the site is surrounded by amenity grassland within the Limerick University Campus. There is a strip of wetland vegetation along both riverbanks followed by a gentle rise of approximately 2m in elevation.

9.3.2 Designated Areas

The Lower River Shannon is designated a proposed candidate Special Area of Conservation (pcSAC), (site code 2165). The existing boundary of the pcSAC includes part of the site as shown on Figure 9.1. The Lower River Shannon has been designated a pcSAC because it contains habitats of high ecological value and the presence of rare plant and animal species.

A pcSAC is a statutory designation which has legal basis in the EU Habitats Directive (92/43/EEC) as transposed into Irish law through the European Communities (Natural Habitats) Regulations, 1997 (S.I. 94 of 1997). The main implication of this designation is that any project likely to have a significant adverse impact on the integrity of the pcSAC may only be carried out for "imperative reasons of overriding public interest, including those of a social or economic nature". Where a pcSAC includes a "Priority Habitat" or a "Priority Species", as indicated in Annex I and Annex IV of the Directive, then "the only considerations which may be raised are those relating to human health or public safety or, further to an opinion from the Commission, to other imperative reasons of overriding public interest".

There are two proposed Natural Heritage Areas within 5km of the site as listed in Table 9.2. Both the sites have been designated because they are breeding sites for bats. These will not be affected by the proposed development.

Table 9.2 : Designated Areas Within a 5km Radius of the Site

Status	Site Name	Reference No:
pNHA	Castleconnell	0433
pNHA	Cloonlara House	0028

A proposed Natural Heritage Area (pNHA) is presently a non-statutory designation which replaced the previous designation, Area of Scientific Interest (ASI), in 1994. It may become a statutory designation if the Wildlife (Amendment) Bill of 1999 is passed by the Oireachtas. Most local authority development plans include an objective to protect pNHAs within their jurisdiction so this gives the designation some legal status under the Local Government (Planning and Development) Act, 1992. An application for planning permission for any development which may have impacts on a pNHA, will be referred by the planning authority to Dúchas (The Heritage Service) for comment.

9.3.3 Habitats

The existing habitats within the site are described below and shown in Figure 9.1.

9.3.3.1 River Shannon

The River Shannon at the proposed crossing point is approximately 85m wide. The depth of the river varies from 6 to 7m downstream of the existing footbridge to less than 1m at the chain of islands which span the river 500m upstream. A rock sill occurs midway between these two points (known locally as "Peig's Heights") which forms the first rapid section on the river upstream of the estuary. The profile of the river downstream of the islands is gently sloping from less than 1m on the south bank to approximately 2m on the north bank. As the river forms a gentle bend at this point flow is swiftest on the south bank producing an eroding environment, with slack and counter flows occurring on the north bank forming a depositing environment. The substrate grades from sand, gravel, cobbles and scattered large boulders in the swifter flowing parts to silt and boulders in the deeper and slacker flowing stretches.

Aquatic vegetation
The marginal aquatic vegetation along the northern bank is comprised mainly of common club-rush (*Schoenoplectus lacustris*), yellow flag iris (*Iris pseudacorus*), canary reed-grass (*Phalaris arundinacea*) and common spike-rush (*Eleocharis palustris*). The bank side vegetation on the south bank includes small areas of reed sweet-grass (*Glyceria maxima*) and occasional reed canary grass in the water.

Within the river, submerged aquatic plants are widespread and in some areas form extensive clumps. The submerged form of bulrush is frequent in the swifter flowing waters along with stream water-crowfoot (*Ranunculus pencillatus*), various-leaved pondweed (*Potamogeton gramineus*) and perfoliate pondweed (*P. perfoliata*). Willow moss (*Fontinalis antipyretica*) is abundant on rocks and boulders.

Aquatic invertebrates
Kick samples of aquatic macroinvertebrates were collected at two stations (S1 and S2). S1 was located about 50m upstream of the proposed bridge and S2 about 50m downstream of the proposed bridge. The results are given in Appendix B. The EPA recommend that a Q value of 3 – 4 be assigned when Group A taxa are only sparsely present or absent, where Group B and C taxa are the main groups with some Group C groups reaching very high numbers.

Sampling Station 1 was given a Q value of 3 – 4. This sample is dominated by Group C taxa, such as the uncased caddis Hydropysicidae. Group D taxa were well represented by molluscs. The diversity in this site is quite high. The EPA Q value of 3 – 4 suggests that this site is only slightly polluted.

Sampling Station 2 was also assigned a Q value of 3 – 4. Group C taxa also dominated in this sample, with two group B and one group A (*i.e. Ecdyonuris venosus*) taxa represented. Group D taxa were represented by two specimens of *Ascellus* and numerous individuals belonging to the Chironomidae. Diversity of this sample is also relatively high, with the EPA Q-value of 3 – 4 again suggesting that this site is only slightly polluted.

Fish

The River Shannon is a noted mixed fishery holding stocks of salmon, sea trout, brown trout, eels, pike and coarse fish. The river at Plassey is heavily fished by anglers during the open season for salmon and sea trout (February 1st to September 30th) and brown trout (February 15th to September 30th). The Shannon fishing rights are reserved by the ESB and a permit is required to fish for salmon on any part of the river. The stretch of river in the vicinity of Plassey has a peak run of spring salmon in late March and April, with a peak run of grilse in June. Both salmon and trout spawn in the stretch of river at Plassey (Shannon Regional Fisheries Board *pers. Comm.*). Spawning on the lower Shannon occurs primarily between November and February.

The three species of lamprey occurring in Ireland, the sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatalis*) and brook lamprey (*Lampetra planeri*), have been recorded from the River Shannon at Plassey (Kurz and Costello, 1999). Lampreys are surviving members of the most primitive group of vertebrates, the Agnatha or jawless fish. Their mouth is adapted as a toothed, sucking disc with which they attach themselves (with the exception of the brook lamprey which does not feed as an adult) to a wide variety of fish and occasionally to cetaceans. All three species are listed under Appendix II (Species requiring the designation of Special Areas of Conservation) of the EU Habitats Directive (92/43/EEC) and are listed as 'indeterminate' in the Irish Red Data Book (Whilde, 1993), they are however, unprotected under the Wildlife Act (1976). Within the Shannon catchment, the main spawning grounds for both the sea lamprey and the river lamprey are located at Plassey (Kurtz and Costello, 1999). Mature sea lampreys were observed in spawning scoops during the aquatic survey in June 2000, and consultation with local fishermen indicated that the mid and northern section of the river between Black Bridge and the rapid upstream, were the major spawning grounds of the species in the area. Spawning occurs between mid-May and July.

9.3.3.2 Other watercourses

Errina Canal

The Errina Canal is located west of the site and flows into the River Shannon just west of Black Bridge. This fast flowing canal is 3 – 5m wide has steep embankments down to a disused lock (Annabeg Lock) located upstream of the confluence with the Shannon River. The substrate is comprised of gravel and stones and some muddy areas. The steep banks are largely wooded with willow *(Salix cinerea*) and alder (*Alnus glutinosa)* near the water's edge. Higher up the banks, ash (*Fraxinus excelsior*), sycamore (*Acer pseudoplatanus*) and hawthorn (*Crataegus monogyna*) are common. The ground flora is typical of woodlands and includes ivy (*Hedera helix*), wood brome (*Brachypodium sylvaticum*), germander speedwell (*Veronica chamaedrys*), wood avens (*Geum urbanum*) and common violet (*Viola riviniana*). On the lower parts of the bank lesser celandine (*Ranunculus ficaria*) and valerian (*Valeriana officinalis*) are present as well as patches of water mint (*Mentha aquatica),* brooklime (*Veronica becabunga*) and bulrush (*Typha latifolia*) at the water's edge. Giant hogweed (*Heracleum mantegazzianum*) is widespread along the canal banks.

Stream
The north-western side of the site on the northern side of a stream which runs parallel to the Errina Canal which runs parallel to the River Blackwater. A high embankment with a pedestrian track along the top runs between the stream and the canal. The stream is 1-2m wide. It is slow-flowing over a mud and gravel substrate. The stream has steep banks (1.5 – 2m high) which have been planted with a line of young trees dominated by alder with occasional ash and sycamore. The woody vegetation overhangs the stream but where there are gaps emergent aquatic vegetation is present including fool's water-cress (*Apium nodiflorum*), water mint (*Mentha aquatica*), bur-reed (*Sparganium sp.),* reed canary grass (*Phalaris arundinacea*) and angelica (*Angelica sylvestris*). The stream discharges into the Shannon west of Black Bridge.

9.3.3.3 Grasslands

Wet Grassland
There is a fringe (10 –15m wide) of species-rich wet grassland which is grazed by cattle along the northern banks of the River Shannon. Its low-lying elevation relative to the river (about 1m) results in periodical flooded. The vegetation is comprised of a mixture of species favouring wet and dry conditions. The wetland species include creeping bent grass (*Agrostis stolonifera*), reed canary grass (*Phalaris arundinacea*), hard rush (*Juncus inflexus),* yellow iris (*Iris pseudacorus*), brown sedge (*Carex disticha*), glaucous sedge (*Carex flacca*), cuckoo flower (*Cardamine pratensis*) and, occasionally, common spike rush (*Eleocharis palustris*) and meadowsweet (*Filipendula ulmaria*). The species characteristic of drier conditions include perennial rye grass (*Lolium perenne*), white clover (*Trifolium repens*) and Yorkshire fog (*Holcus lanatus*).

Semi-improved Grassland
There is an extensive flat area of semi-improved grassland on the northern side of the river which is approximately 2m above the mean water level. The pasture is on a heavy clay soil with impeded drainage. The dominant grasses include perennial rye grass, crested dog's tail (*Cynosurus cristatus*), foxtail (*Alopecurus pratensis*), and Yorkshire fog as well as a good diversity of herbaceous plants such as white clover, ribwort plantain (*Plantago lanceoloata*), meadow buttercup (*Ranunculus acris*), dandelion (*Taraxacum agg.),* common sorrel (*Rumex acetosa*), field wood rush (*Luzula campestris*). There are some damp depressions with rushes (*Juncus articulatus/acutiflorus),* creeping bent grass, and cuckoo flower. The semi-improved grassland on the southern side of the river has a similar species composition with some additional species such as meadow brome (*Bromus commutatus*), soft rush (*Juncus effusus*) and occasional meadowsweet (*Filipendula ulmaria*).

Rank Grassland
On the southern bank of the river near the water's edge, there is a band of grassland with mixed tall rank grasses growing on a gentle slope almost down to the water's edge. The main species include Yorkshire fog, nettles (*Urtica dioica*), and occasional reed canary grass, with field bindweed (*Convolvulus arvensis*), creeping buttercup (*Ranunculus repens*) and meadow foxtail (*Alopecurus pratensis*). This area is used for amenity purposes. It is unmanaged except for a few strips which are kept cut for access to the river by fishermen.

9.3.3.4 Hedges

Two hedges were surveyed within the site. Both rated as of moderate ecological value as shown on Table 9.3. H1 is a hawthorn (*Crataegus monogyna*) dominated hedge, and H2 is a willow (*Salix cinerea*) dominated hedge along a ditch. Both have a few associated trees mainly ash with crab apple (*Malus sylvestris*) in H1. Other shrubs include blackthorn (*Prunus spinosa*) and guelder rose (*Viburnum opulus*). Overall, these hedges are typical and widespread in the region.

Table 9.3 : Ecological Evaluation of Hedgerows

Ref	Approx. Length (m)	Grade*	Local Ecological Value	Comments
H1	250	2	Moderate	Hawthorn dominated hedge with few trees and associated dry ditch.
H2	110	2	Moderate	Unmanaged willow hedge with damp ditch and wetland vegetation

* *Grade:* Grade 1: High local value
Grade 2: Moderate local value
Grade 3: Low local value
Grade 4: Very low local value

9.3.4 Birds and Mammals

The following birds were noted on the River Shannon in the vicinity of Plassey; mallard, heron, moorhen, pied wagtail and mute swan, the latter of which were nesting on one of the islands upstream of the site. A number of birds typically associated with hedgerows and farmland were also recorded during the field survey including blackbird, robin, blue tit, great tit, wood pigeon, dunnock, wren, bullfinch and rook.

Rabbits were reasonably abundant on the site. While signs or tracks of other mammals were not found, the habitats present provide suitable conditions for a range of other species including otter along the river and badger, fox, stoat, pygmy shrew and hedgehog in the terrestrial habitats. The combination of riparian, woodland and open habitats is also likely to support a number of bat species.

9.4 SIGNIFICANCE OF TERRESTRIAL AND AQUATIC ENVIRONMENT

A large proportion of the site is located within the Lower River Shannon proposed candidate Special Area of Conservation (pcSAC). The pcSAC designation means that the site contains habitats/species of national/international ecological importance. The habitat of greatest importance within the site is the River Shannon itself. It is an important salmonid river and contains spawning redds for salmon and trout in the shallower waters at Plassey. The Shannon also has populations of three species of lamprey, which are listed as Annex II species under the EU Habitats Directive (EU92/43/EEC). The main spawning grounds for these primitive fish within the Shannon catchment are located at Plassey. The presence of the lampreys is of international ecological significance.

The wetland vegetation fringing the river is a semi-natural habitat that is periodically inundated during floods. This habitat is of high local ecological value. The semi-improved grassland used for pasture north of the river and amenity south of the river is a managed habitat that is of low ecological value but due to its proximity to sensitive aquatic habitats, its land use and management needs to be carefully considered to avoid adversely impacting on the River Shannon.

9.5 PREDICTED ENVIRONMENTAL IMPACTS

9.5.1 Introduction

Limerick University is proposing to build student residences on the north bank of the River Shannon, located on a flat grassland area currently subject to periodic flooding. Three accommodation buildings with 503 student bedrooms will radiate out from a nodal point. The central building will extend to within a few meters of the banks of the River. A bridge will be constructed across the river to provide vehicular, cyclist and pedestrian access. Prior to construction of this bridge, a temporary 'bailey' bridge will be constructed to facilitate the construction of the main bridge and access to the north bank of the river.

9.5.2 Direct Impacts

Impacts within the pcSAC boundary
The Lower River Shannon pcSAC boundary within the site extends to the nearest field boundary north of the river Shannon upstream of Black Bridge (See Figure 9.1). This boundary is currently under review with Dúchas to exclude areas of low ecological value. The present boundary includes a large field of pasture that is of low ecological value. The proposed development is largely located inside the existing pcSAC boundary. It is expected, following the Dúchas review, that the boundary will be altered to exclude habitats of low ecological value and to include a buffer zone parallel to the edge of the river.

Impacts on habitats
The proposed development of student residences will require the removal of some existing habitats. The development is largely located within the flat field currently used for pasture, which is at an elevation of approximately 2m above mean summer water level. Here the vegetation is semi-improved grassland that is of low ecological value. Landscaping between the buildings will also result in the loss of some of the existing grassland habitat. The loss of this habitat will constitute a minor negative impact.

The central accommodation building will be located within 5m of the edge of the River Shannon. This will directly impact on the wet grassland fringe which forms a 10-20m wide band along the river. This wet grassland habitat is typically associated with riverbanks and floodplains and has a very important function as a buffer to the river. This habitat is of high local ecological value. While only a small percentage of this high value area is being affected, any development within this wet grassland fringe will constitute a moderate negative impact.

A hedge (H1) will be removed. This will constitute a minor negative impact.

9.5.3 Construction Impacts

Impact of the bridge on the river and riparian habitats will primarily be of a temporary nature. During construction of the 'bailey' bridge and the permanent bridge an operating width of approximately 60m will be required on both sides of the river. This will constitute a temporary moderate negative impact on the strip of wet grassland present on the north bank and on the rank grassland on the south bank.

Two cofferdams (approximately 10m by 16m) will be established within the riverbed to facilitate the construction of supporting piers for the permanent bridge. These will have a temporary localised severe negative impact on the riverbed. Mitigation measures as described in Section 9.6.3 will facilitate the rehabilitation of the riverbed outside of the pier area. Access into the river for the construction of the cofferdams will be by temporary jetty. This will be supported on steel piles or a steel framework resting on the riverbed (dependant on the results of the site investigations) and will be removed upon completion of the piers. This will have a minor negative impact on the river.

It is anticipated that a 3-span 'bailey' bridge will be provided, with the central span traversing the river from bank to bank. In this instance, temporary bunds of large sized granular material will be required on either bank through which the piles will be driven to support the bridge. The area of fill for each bund will extend for approximately 3m into the river and will be removed upon completion of the permanent bridge. This will constitute a minor negative impact on the river. The location of the 'bailey' bridge is shown in Figure 3.10.

The construction phase of the student residence development will result in an additional temporary loss of semi-improved grassland habitat which will be of minor impact. Due to the proximity of the proposed buildings to the edge of the River Shannon (the proposed central building is located within 5m of the edge of the river and the eastern building is within 10m of the river bank), the construction phase will result in a temporary loss of a large part of the wet grassland habitat which will constitute a temporary moderate negative impact. This will also result in potential impacts on the river by sediment-rich surface runoff.

The construction and maintenance of wetland habitats between the buildings will require water to be pumped from the River Shannon and the installation of a sluice gate to regulate the flow back into the river. This will have a temporary negative impact during the construction phase.

9.5.4 Indirect Impacts

As the site is located within the floodplain of the River Shannon, there is a potential for surface water contamination of the River Shannon through run-off from areas around the student residences and the car park facilities. Mitigation measures as described in Section 11.5 will avoid this.

9.6 MITIGATION MEASURES

9.6.1 Mitigation by Avoidance

Measures to mitigate impacts during bridge construction will require confining works to the period outside of the breeding season for lamprey. This breeding season occurs from mid-May to July. To allow the potential effects of the construction on salmon spawning area to be addressed, it is proposed that a study will be undertaken to establish its extent and location. The scope of this study will be agreed in advance with the Shannon Region Fisheries Board.

The working strip required for bridge construction along the banks of the river will have wet grassland vegetation removed in sods and stored under appropriate conditions for re-instatement upon completion of the permanent bridge. This measure will be carried out prior to any works commencing in the vicinity of the river.

A temporary bund will be constructed on the south and west sides of the student accommodation development to contain surface water run-off during the construction phase releasing sediment into the river. The run-off will be fed to settlement ponds which will release settled water into the Shannon system.

9.6.2 Mitigation by Reduction

The coffer dams used for the construction of bridge piers will be set within the river in a manner which will minimise turbulence and consequential scouring of the river substrate in the vicinity.

The bridge piers are designed so that they minimise obstruction to the two-way movement of fish at any time regardless of the amount of water in the channel.

There will be no applications of chemical fertilisers, herbicides and insecticides in the landscaped areas around the student resident blocks.

Surface water from the student residence area will be fed into the wetland habitat created within the development (see Section 5.3). Surface run-off from the north side of the bridge, the car park serving the student residences and the connecting road will be also be fed into the wetland area via petrol/oil interceptors. The interceptors will be designed with sufficient capacity for the catchment and to allow for reduced capacity due to siltation between maintenance. The design will facilitate ease of maintenance, and the maintenance programme should be specified.

9.6.3 Mitigation by Remedy

The wet grassland fringe along the riverbank impacted during the construction phase will be reinstated by replacing the grass sods that were removed pre-construction. All materials used as temporary fill during the construction of the 'bailey' bridge and permanent bridge will be removed upon completion of works and the riverbed re-instated.

Areas of wetland habitat will be constructed as part of the overall landscape design. This will also mitigate the loss of some of the floodplain vegetation and provide additional wetland habitat for fauna and flora associated with the river. Only indigenous wetland species already existing along the River Shannon will be used in the planting. Landscaping around the student residences will include the use of native meadow seed mixtures for amenity grassland, part of which will be managed as a traditional hay meadow. Trees and shrubs planted around the development will include native species such as oak, ash, hazel, birch and alder. Plantings should maintain continuity to provide corridors for mammal and bird movements.

9.7 RESIDUAL EFFECTS

The loss of some of the floodplain vegetation that provides additional wetland habitat for fauna and flora associated with the river cannot be mitigated against and would result in a residual moderate adverse impact.

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10.0 SOILS AND GEOLOGY

10.1 INTRODUCTION

This chapter describes the soils and geology at the site of the proposed fourth student village and link bridge at the University of Limerick. The impact of the construction and operation of the village, bridge and access roads on the surrounding soils and geology is discussed and evaluated. The mitigation measures proposed and the residual effects conclude this chapter.

10.2 EXISTING SOILS AND GEOLOGY

The following account of the geology is based on a desk study of previous investigations of the site and surrounding area.

The University of Limerick is divided by a ridge which traverses the middle of the site in a north-south direction. Low-lying land exists to the west of the ridge which includes a floodplain at the riverbank. Poorly drained areas are found north of the floodplain with well-drained land located further north.

The encountered subsurface soil and rock strata are listed below in order of increasing depth below ground level. This sequence represents the general order of occurrence.

However, one or more of the strata may be absent at specific locations.

- Alluvial deposits
- Sand and Gravel
- Boulder Bed
- Boulder Clay
- Bedrock

Alluvial Deposits
Alluvial deposits were encountered in the low-lying floodplains. This stratum was frequently interbedded with flood deposits, bog alluvium and shell marl. All of these layers were observed to be soft or loose. The soil is essentially a mixture of clay and carbonate of lime which crumbles rapidly and easily. The marl contains many invertebrate shells, some of which are low in lime content. The thickness of these deposits was generally 3m, with flood deposits extending 150m horizontally into the site at the southwest.

Sand and Gravel
Beneath the alluvium, a 3 to 5m sand layer exists, which was probably deposited as glacial wash-out material during the retreat stage of a late glacial advance. It is a light grey brown loose to medium dense fine to medium sand, with no perceptible increase in density with depth.

Underlying the sand there is a layer of sand and gravel with cobbles, of between 1 and 3m thick.

Boulder Bed
Over the majority of the site a boulder bed of between 0.5 and 0.8m is present beneath the sand and gravel

Boulder Clay
A stiff to hard black glacial till ('Boulder Clay') lies beneath the boulder bed. The thickness of this stratum varies between 5 and 11m.The glacial till consists of gravel, cobbles and boulders in a matrix of sandy clay.

Bedrock
The bedrock geology of the area south and surrounding Limerick City consists of a variety of rock types including volcanics, intrusive and extrusive basalts and volcaniclastic rocks interstratified with limestone of Visean (Carboniferous) age.

The principal rock types in the area consist of volcanic ash, ash breccia and shales as well as limestone. Rock outcrops can be found on either bank of the River Shannon and in the river, east of the Black Bridge.

The volcanic rocks tend to be predominantly green or purple in colour, and are strong in the unweathered condition. The limestones are uniformly dark greyish blue fine grained, often cherty, and strong. The ash layers represent periodic volcanic eruptions in the otherwise steady deposition of limestone. Quite often the ash material is itself calcareously cemented.

Bedrock close to the south bank was encountered at 15.4m. The depth to the rock is quite variable across the site but is generally greater than 10m.

The River Shannon substrate grades from sand, gravel, cobbles and scattered large boulders in the swifter flowing parts to silt and boulders in the deeper and slacker flowing stretches.

10.3 SUB-SURFACE CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The alluvial area, with soft soils and high water table will present very poor construction conditions. Piled foundations, penetrating the dense sand and gravel, will be necessary under the buildings and the bridge. Pumping of excavated foundations and trenches will be required to allow the pouring of concrete and installation of services for the student village. Filling will be necessary in the areas subject to flooding, the student accommodation blocks, by approximately 2m.

The upper ground and silty clays are considered unsuitable for foundation purposes and foundations must be transferred below these strata onto the more competent granular strata.

10.4 EVALUATION OF SOILS AND GEOLOGY IMPACT

With the exception of the student accommodation blocks, it is not envisaged that the soil present on-site will present a problem in establishing the infrastructural development. The blocks will be raised by approximately 2m to prevent flooding, with natural seasonal flooding continuing alongside the accommodation.

The impact on the soils and geology of the area will not be significant, as any soils excavated will be redistributed elsewhere within the site or to a licenced landfill.

10.5 MITIGATION MEASURES

The construction management of the project will incorporate protection measures that will minimise as far as possible the risk of spillage that could lead to ground contamination.

10.6 RESIDUAL IMPACT

There will be no residual effects on the soils and geology as a result of these proposals.

11.0 HYDROLOGY AND DRAINAGE

11.1 INTRODUCTION

This chapter presents a description of the hydrology and drainage issues associated with both the construction and operation of the student village, proposed bridge and access roads. The purpose of the chapter is to highlight the potential sources of pollution which could enter the River Shannon, the Errina Canal or the millrace, and the drainage design and pollution control measures which will serve to reduce or eliminate any risk. The results of a flood study, which was commissioned to evaluate the impact of the proposed bridge and student village on the water levels in the River Shannon, is also included in this Section. The chapter concludes with an account of the scheme's residual effects on water resources.

11.2 EXISTING HYDROLOGY AND DRAINAGE

The proposed bridge would cross the Shannon River approximately 225m upstream of the existing pedestrian bridge known as the Black Bridge. The river at this point is approximately 85m wide, and is flanked by wide low-lying floodplains (the north and south meadows). The depth of the river varies from 6 to 7m downstream of the existing footbridge to less than 1m at the chain of islands which span the river 500m upstream. A rock sill lies midway between these two points (known locally as "Peig's Heights") which forms the first rapid section on the river upstream of the estuary. The profile of the river downstream of the islands is gently sloping from less than 1m on the south bank to approximately 2m on the north bank. As the river forms a gentle bend at this point, flow is swiftest on the south bank producing an eroding environment, with slack and counter flows occurring on the north bank forming a depositing environment.

At Parteen Weir, 15km upstream of the proposed development, a section of the River Shannon is diverted down the Errina Canal to Ardnacrusha, with the remainder flowing down the Shannon's natural course. The latter part to be hereafter referred to as the 'Old' Shannon. There are also minor contributions to this part of the Shannon from the Mulkear, the Kilmastulla and other minor tributaries.

The Shannon is a very regulated river with a large non-flashy catchment. The Mulkear, by contrast, is unregulated and has a very flashy catchment.

The reach of the Shannon of concern to this study stretches from Parteen Weir to Athlunkard Bridge, approximately 3.5km downstream of the proposed development. It is bounded on the upstream end by the weir which divides flow between the power station and the river, and at the downstream end by Athlunkard Bridge. In normal flow situations a minimum compensation flow of $10m^3/s$ is diverted to the 'Old' Shannon at Parteen Weir. When the flow exceeds the maximum capacity of the turbines at Ardnacrusha, its excess is also diverted to the 'Old' Shannon.

There is continuous flow monitoring of the spillage at Parteen Weir, and there is also an automatic water level recording station at the confluence of the 'Old' Shannon with the Mulkear. There is an automatic recording gauge at Annacotty (gauge no. 25001, circa 3.5km upstream of the development area) on the Mulkear, National Grid Reference R642576, with a catchment area of $646km^2$, and operated by the Office of Public Works (OPW).

The millrace that runs parallel to the southern riverbank is shallow at 0.5m and is 2m wide. The millrace is currently being upgraded and widened as part of the construction of Dromroe Village.

The Errina Canal and River Blackwater run parallel to the west of the proposed student village and flow into the River Shannon just downstream of the Black Bridge. The Blackwater is a fast flowing river which is 3 – 5m wide with steep embankments down to a disused lock (Annabeg Lock), located approximately 200m upstream of the confluence with the Shannon River. The substrate is comprised of gravel and stones and some muddy areas. A high embankment separates the Errina Canal from the River Blackwater. The canal is disused and overgrown. It is slow-flowing over a substrate that is partly stoney and partly muddy. The canal is bounded by steep banks 1.5 – 2 m high which have been planted with a line of young trees.

11.3 FLOOD STUDY

11.3.1 Introduction

Under Section 50 of the Arterial Drainage Act 1946, a licence to construct the bridge will be required from the OPW. During consultations, the OPW stipulated that any increase in river levels due to the bridge should not have any impact on the duration or severity of upstream flooding for the design flood return period. ESB International (ESBI) were commissioned to carry out a flood study to evaluate the effect of the proposed bridge on water levels expected during a flood with a return period of 100 years. The 100-year flood is the normally accepted criterion for evaluating flooding events for major rivers, and is given as the normally accepted return period by UK Department of Transport Advice Note HA71/95 'Effects of Highway Construction on Flood Plains'.

The effect of the construction of the student accommodation blocks was also evaluated.

11.3.2 Methodology

ESBI flood study analysed the potential effects of the 100-year flood. This is the flood which will occur on average once every 100 years, and is derived using statistical methods. The hydraulic model was calibrated from maximum water levels for the flood of 1990 recorded at Annacotty gauge.

Previous studies by ESBI have given a value for the 100-year flood on the 'Old' Shannon through Parteen Weir of 510m^3/s. The 100-year flood on the Mulkear has been calculated as 240m^3/s. This gives a 100-year flood at the University of Limerick of 750m^3/s.

A curve of levels versus discharge was developed for the Shannon at Athlunkard, and this has been used to set the downstream boundary. For a flood of 750m^3/s the water level at this point should be 5.4m O.D. This was entered into the model as a fixed level at this point.

The accuracy and reliability of results predicted by any model will depend to a large extent on the availability and quality of data used to represent that which is being modelled. Cross-sections of the river channels at relevant locations, hydraulic characteristics of the river channels and their associated flood plains together with the geometry of relevant features such as weirs and bridges are required if a complete representation of the river valley is to be made.

ESBI undertook a detailed survey of the Shannon River, from Parteen Weir to Athlunkard Bridge as part of the River Shannon Inundation Study. A survey of the three bridges along this reach, O'Brien's Bridge, Black Bridge (beside the University) and Athlunkard Bridge was carried out.

Based on this surveyed information, 24 cross-sections were digitally constructed and used to represent the river system. A river hydraulic computer model of the 'Old' Shannon River and floodplain was developed using 'HYDRO'. The program 'HYDRO' was developed to provide accurate and timely information for both steady and unsteady flood conditions in a river drainage system and has been used extensively by ESBI on various river model studies. The model uses the US Bureau of Public Roads procedure to estimate the backwater caused by the bridge.

Several more river cross-sections have since been surveyed at the University of Limerick. Some of these have been included in the model but some are not yet included in this model but will be included in due course. The inclusion of these sections may have a local effect on the predicted water levels along the University grounds, but will not have any noticeable effect on the change in water levels predicted due to the proposed development. Thus, the difference predicted between the water levels at the 100-year flood for the case with the development versus the existing case without the development will remain approximately the same when these sections are included.

11.3.3 Results

Estimated water levels from the model are shown in Table 11.1. Taking the bridge only, the model predicts no rise in water levels at the upstream face of the bridge. The level predicted just upstream of the bridge site for the 100-year flood is 6.63m O.D. The level of 6.63m O.D. would cause substantial flooding of green areas in the University of Limerick grounds south of the river, and some flooding of green areas on the steeper north bank, but the bridge should cause little or no additional flooding. The model only estimates levels to an accuracy of 1cm so any change of this magnitude in model results may be caused by numerical instability or rounding as easily as by actual change. The predicted level change should be considered with this in mind.

Adding the proposed student residences into the model, the estimated water levels increase by 1cm at the upstream face of the bridge, from 6.63m O.D. with the bridge only, to 6.64m O.D. with the bridge and apartments. At the next section, 750m upstream, there is no increase predicted over the previous cases. Therefore any extra flooding caused by the 1cm level rise would occur only over a short reach. The levels estimated by the model are in some cases lower than the pre-construction levels. The model shows slightly increased velocities through these sections which balance out the fluctuations in level. These fluctuations are more likely to be a result of numerical errors in the model than real changes.

Also, while floods on the Shannon tend to occur over a relatively long period of time and be quite long lasting, floods on the Mulkear are much shorter events, due to the much smaller size of the catchment, which gives it a quicker response to rainfall. This means that the Mulkear component of the 100-year flood will not persist for very long so that levels will quickly begin to recede from the predicted levels. The rise of 1cm is due to the student residences is therefore not expected to have any noticeable impact.

Table 11.1 : Estimated Water Levels from the Model for the 100-Year Flood

Node	Dist. D/S Parteen km	Description	m O.D. Malin		
			No Bridge	Bridge	Bridge & Res.
23	18.600	Athlunkard	5.4	5.4	5.4
22	17.400		6.04	6.04	6.04
21	16.540		6.22	6.22	6.22
20	15.320	Plassey Br.	6.46	6.46	6.46
195	15.203		6.48	6.48	6.47
194	15.128		6.55	6.55	6.55
193	15.118	Proposed	6.59	6.58	6.58
192	15.108	Bridge	6.6	6.59	6.59
191	15.098		6.63	6.63	6.64
19	14.345		7.73	7.73	7.73
18	13.470		9.36	9.36	9.36
17	12.620		9.78	9.78	9.78
16	11.620		9.8	9.8	9.8
15	10.170		9.86	9.86	9.86

11.3.4 Conclusions

The model predicts that for the 100-year flood, no change in water levels will occur due to the proposed bridge. Therefore, no increased flooding should occur as a result of the bridge.

Adding the new student residences to the model causes estimated water levels to rise by 1cm at a distance of 30m upstream of the bridge. This is not expected to pose any significant potential for increased flooding.

11.4 DESCRIPTION AND EVALUATION OF THE IMPACTS OF THE PROPOSED DEVELOPMENT

11.4.1 Introduction

A water quality analysis was undertaken as part of the nature conservation study (Section 9.0) and this indicated that the River Shannon is only slightly polluted. This section details and evaluates the potential impacts that run-off during the construction and operation phases may have on the watercourses in the area of the proposed development.

11.4.2 Construction Phase Run-off

The construction project will entail the spanning of the River Shannon with a bridge for vehicular, cyclist and pedestrian traffic and also the spanning of the river with a temporary structure for constructional purposes. The potential for water contamination during the construction phase would be associated with the following:

- Construction of the temporary bridge across the river;
- Earth moving works;
- Temporary storage of oil and fuel for plant and equipment;
- Disposal of foul drainage.

Temporary Bridge
Due to the lack of suitable road infrastructure to the north of the construction site, a temporary 'bailey' bridge will be constructed across the Shannon. This will allow for the movement of plant and materials to allow the construction of the student village and bridge. The 'bailey' bridge will be required until the proposed permanent bridge can be opened to traffic. The temporary bridge will also allow for an early start on the construction of the proposed student village. A temporary diversion to the pedestrian path along the southern bank will be in operation while the 'bailey' bridge is in place.

Earthworks
Earthworks will be required for the placement of piers supporting the bridge and for regrading soil levels at the north and south bridge abutments, as well as during construction of the student village. It is during this period that the potential for water pollution through excessive soil run-off and siltation of the watercourses could arise. Run-off of suspended solids from the construction areas into the River Shannon will not have an adverse impact due to the large flow rates of the Shannon. Nonetheless, care will be exercised during periods of heavy rainfall, when the erosion of exposed subsoils within construction areas is more likely.

Oil and Fuel Storage
Temporary storage of oil and diesel for plant machinery will be required for the duration of the construction period. All fuels will be stored in a secure bunded facility. The filling and take off points will be located within the bunded areas. The bunds will protect against accidental tank rupture and will ensure that any spilled oil can be retained for subsequent disposal to an appropriate outlet such as a waste oil recycler.

Foul Drainage
The construction crew will be provided with temporary, contained chemical toilet facilities such as *'Portaloos'*. The chemical toilet will be taken off site for emptying at a suitably licenced disposal location. Consequently, there will be no discharge of sewage to surface waters.

Construction Site Run-Off
A temporary bund will be erected on the southern and western sides of the student village construction site and surrounding the construction areas of the bridge and access roads. All run-off from the site will be channelled through settlement ponds to trap silt and debris prior to discharge into the Shannon River. The ponds will be placed at the lowest points on the site. This retention system will reduce the possibility of contaminated material from the site entering the watercourses and effectively remove it from the run-off.

11.4.3 Operational Phase Run-off

Run-off from the proposed bridge and access roads will arise from rainfall. There will be a potential for this run-off to collect pollutants due to the scouring of unburnt exhaust condensate (hydrocarbons) and road grit. This run-off will be collected through a closed drainage system and will pass through oil/petrol interceptors. Interceptors will be located at the carpark and at the northern side of the bridge, discharging into the reed beds on the northern bank of the River Shannon. A third interceptor will be located on the southern side of the bridge, discharging into the millrace. These interceptors are designed to retain the grit, suspended solids and hydrocarbon run-off from road surfaces, and to allow it to be discharged into surface water courses without an adverse impact on water quality. These units will be desludged and degritted at regular intervals as part of a routine bridge maintenance programme.

The concentration of these pollutants depends on site-specific characteristics such as average daily traffic, rainfall intensity and duration and the length of the antecedent dry period. These pollutants are predominantly associated with suspended solids, and can therefore be removed using petrol/interceptors.

Accidental spillages are not of concern in this study due to the non-HGV nature of the traffic associated with this route.

11.5 MITIGATION MEASURES

11.5.1 Surface Water Drainage

The following mitigation measures are proposed to minimise the impacts on water quality due to the scheme proposals described in Section 11.4.

Construction Phase

These measures will be implemented as part of the construction phase.

- Stabilisation of disturbed areas as soon as construction is finished to minimise erosion.
- Careful controls of cement or wet concrete on site so as to minimise the risk of any material entering the watercourses. The use of prefabricated concrete beams would reduce this risk. Cement lorries will not be cleaned out on site.
- Installation of petrol/oil interceptors where storm water drains discharge to the Shannon River.
- Fuel, oil and chemicals stored on site will be situated on an impervious base and secured. Refuelling of plant will be carried out in a designated area away from the Shannon River.
- Construction of a temporary bund around the construction area.
- The temporary bridge will include continuous solid decking and edge panels to minimise the risk of spillage of construction materials into the River Shannon.

Operation-Phase
Operation-phase mitigation measures essentially comprise petrol/oil interceptors installed where stormwater drains discharge to the Shannon River. These are designed to trap suspended solids and solids-associated contaminants which are characteristic of highway runoff. Shannon Regional Fisheries Board will be consulted in order to discuss the design during the design phase.

Petrol/oil interceptors will be provided for at the student village car park and loading areas and north and south of the proposed bridge.

11.5.2 Hydrological Flood Study

No mitigation is envisaged to address the flooding effect upstream of the proposed bridge and residences.

11.6 RESIDUAL EFFECTS

Provided the above mitigation measures are employed, there will be no residual effects on the hydrology or drainage at the site.

12.0 SOCIO-ECONOMICS

12.1 INTRODUCTION

In order to provide the background for the evaluation of the socio-economic impact of the proposed development, it was necessary to undertake a review of the existing socio-economic status of the area. In particular, policies and objectives of the Limerick and Clare Development Plans, recent trends in population, employment and economic performance were reviewed. The impact of the proposed development was assessed against this background.

The University of Limerick was established by the State in 1972 as The National Institute for Higher Education, Limerick. Full university powers were granted by legislation enacted by the Irish Parliament in 1989. It is the first new University established since the foundation of the State. The University is located on a riverside campus of circa 83 hectares (204 acres) developed as scenic parkland, five kilometres northeast of Limerick City (population over 50,000). Over 9,000 students are enrolled at the University at present.

The proposed student village will be located in the townland of Garruan on the northern bank of the Shannon with the Errina Canal running along the northwestern boundary. The proposed bridge will provide access for students travelling between the student village and the existing campus south of the river.

The proposed student village is located within County Clare with the proposed bridge joining lands in County Limerick to those in County Clare. Both Development Plans are examined in this study and are described in greater detail in Sections 4.3 and 4.4 of this EIS.

12.2 POPULATION

12.2.1 County Limerick

The population of County Limerick has increased by 12,078 between 1981 and 1996 to 113,003 (Limerick County Development Plan, 1999). This trend is likely to continue with a predicted maximum further increase of 11,442 within the next sixteen years. This projected population will be influenced significantly by both in and out migration. According to the 1999 Limerick County Development Plan the population of Limerick City declined by 8,697 between 1981 and 1996. The decrease in population is believed to be due to declining birth rates in the City and/or increased emigration.

In line with the State at large, the population of County Limerick can be characterised as an ageing one with almost 11% over 65 in 1996. Between 1986 and 1996 there was an increase of 3% in the population falling within the age group of 15-24. This will have an impact on provision of universities and accommodation in the future.

12.2.2 County Clare

In 1996, the population of County Clare reached 94,006, showing an increase of 6,439 over the previous 15 years. This growth rate of 7.4% is 2.1% greater than the national average. The area of the proposed development recorded an increase in population of between 5 and 15% between 1991 and 1996. The County Clare Development Plan notes the unpredictability of future population trends due to the decline in agricultural employment, continuing emigration, a fluctuating birth rate and the variable economic climate.

The Plan also notes an overall ageing of the population and expects an increase in demand for housing, employment and social and community facilities as the younger and largest section of the community grows older.

12.3 EMPLOYMENT TRENDS

12.3.1 Introduction

The Limerick County Development Plan 1999 reports on the general employment situation as follows:

"Overall it is envisaged that in the short run there will be a reversal of the decline in employment experienced in the 1980s. This growth will not be distributed equally over all occupations and agriculture will experience a high decline."

The Clare County Development Plan describes the Council's function in relation to employment is to "*both ensure the provision of adequate infrastructural facilities and to actively participate in the acquisition and development of sites where appropriate as in the case of Shannon and Ennis."*

The Quarterly National Household Survey (QNHS) for the fourth quarter of 1999 shows a continued decrease in unemployment and the corresponding increase in labour force participation, particularly for women. The QNHS replaced the Annual Labour Force Survey in September 1997. The purpose of the survey is the production of quarterly labour force estimates and occasional reports on special social topics. The QNHS for the first quarter of 2000 was released on 7th of June 2000.

The unemployment rate in the Midwest was reported at 4.3% (6,400) for the first quarter of 2000, in line with the national average. The Midwest region encompasses Clare, Limerick County Borough, Limerick County and Tipperary North Riding. Labour force participation rates fell slightly to 58.4% (150,200) but has showed a steady increase from 55.8% since the second quarter of 1998 (see Table 12.1).

Table 12.1 : Numbers of Persons Aged 15 Years and Older in Employment, in Labour Force and Unemployed in the Midwest Region

	In Employment ('000)	Unemployed ('000)	In Labour Force ('000)	Unemployment Rate (%)	Labour Force Participation Rate[1] (%)
Mar-May 98	129.0	9.5	138.5	6.9	55.8
Jun-Aug 98	135.9	9.6	145.5	6.6	58.2
Sep-Nov 98	131.6	7.7	139.3	5.5	55.4
Dec-Feb 99	133.1	7.1	140.2	5.1	55.8
Mar-May 99	136.5	7.2	143.7	5.0	56.9
Jun-Aug 99	147.4	8.8	156.2	5.6	61.5
Sep-Nov 99	143.4	7.7	151.1	5.1	59.2
Dec-Feb 00	143.8	6.4	150.2	4.3	58.4

Source: Central Statistics Office, Quarterly National Household Survey, First Quarter 2000
[1] Labour Force Participation includes all persons in employment (either part-time or full-time) and those currently looking for work.

National trends reported by both the QNHS for the first quarter of 2000 and the 1996 Census show the continued increase in the numbers of women entering the labour force, and the steady growth in service related industries corresponding with the decline of the numbers employed in agricultural industries. The QNHS notes that most of the labour force growth in the past year was in construction (+20,400), financial and other business services (+19,800) and the wholesale and retail sectors (+14,100).

Table 12.2 shows the breakdown of persons in Limerick Borough and County and County Clare employed in each socio-economic group, and a comparison is made with the corresponding national average.

Table 12.2 : Persons (as Percentage of Total Labour Force of the Area) Classified by Socio-Economic Group

	Limerick Co. & Limerick Co. Borough	Limerick Co. Borough	Limerick County	Clare County	State
Employers & Managers	10.4	9.2	10.9	10.1	11.4
Higher Professional	4.4	4.0	4.5	3.4	4.4
Lower professional	7.3	6.3	7.8	8.4	8.0
Non-manual	15.4	19.3	13.6	13.8	16.9
Manual-skilled	14.1	15.9	13.2	12.6	14.2
Semi-skilled	10.3	13.1	9.0	9.9	9.6
Unskilled	9.0	10.2	8.4	7.7	7.6
Own account workers	5.1	4.0	5.6	6.0	5.6
Farmers	9.0	0.2	13.1	15.7	8.5
Agricultural Workers	2.2	0.4	3.0	1.6	2.1
Others	12.8	17.4	10.9	10.8	11.7

Source: Central Statistics Office, Census 1996, Principle Socio-economic Results.

The mid west region as a whole experienced substantial overall growth in 1999 with a net growth in employment of 8.6% over the year, exceeding the national average.

The majority of employment within the County is located in and around the city of Limerick. Other major employers are dispersed around the county. The major employment base outside the Limerick County Borough is the Shannon Development area, which is a strong base for electronic and engineering firms. The biggest contributor to the economic growth of Limerick is Dell Computers, with its developments in Raheen and at the National Technological Park in Limerick, contributing in excess of £250 million a year to the economy in the form of wages and the purchase of Irish raw materials. Other major employers in the area are Kostal Ireland, Analog Devices BV, Vistacon Anderson Ireland and Aughinish Alumina Ltd.

The responsibility of promoting industry in County Clare is on State Authorities such as Shannon Development and the County Council's Development team, according to the Clare County Development Plan.

Ennis is a major source of employment in the County this can be linked to its location between Shannon, Limerick and Galway. The main industries in the region are located in the Shannon Free Zone and Shannon Aviation Park which provide employment for over 7,000 mainly in the electronics, aerospace and equipment manufacturing industries. Roche Ireland Ltd., Chemfab Europe and Olympus Ireland are all major employers based in County Clare.

12.3.2 Forecast of Employment and Economic Trends

The National Development Plan 2000 – 2006 reports that in the six years to 1999, the labour force increased by an average of 3% per annum (285,000), driven by demographic trends which has resulted in an increase in the population of working age. This increase is also due to increased labour force participation rates, a large proportion of which is due to increased labour force participation by women. The Plan predicts a continued increase in labour force participation, which will be augmented by net immigration. An annual average labour force growth rate of 2% is predicted between 2000 – 2006.

However, as unemployment rates continue to fall, Ireland's labour market is experiencing pressures, particularly in the high skills sector where there is an emerging imbalance between labour supply and demand. This needs to be addressed by measures to re-integrate the long-term unemployed and encouraging more women to rejoin the labour force. Efforts need to be made to up-skill and re-train workers already in the workplace.

12.3.3 University of Limerick Current Employment Environment

The University of Limerick currently employs approximately 690 people as part of its core staff. This figure does not include those employed by campus contract services, for example catering, cleaning or security services. Approximately 105 people are presently working on research projects at UL, these include campus companies and those employed in research by Forfás.

During term, circa 300 extra staff are hired at an hourly rate by the University to present tutorials and lectures to students.

During the summer months, student village bedrooms at the University are rented out to conference delegates, tourists and summer school students. The use of the residences and all campus facilities during these months has increased in recent years, thereby maintaining employment throughout the summer vacation in restaurants, bars and shops. The company employs up to 50 students from the University and local schools for the season.

12.4 HOUSING

The Small Area Population Statistics, states that in 1991, over 96% of the population of County Limerick resided in conventional houses within the county. The average number of persons residing in each household is 3.5 persons, representing a decline on previous years. Nearly 80% of houses are owner occupied, 6.3% are being rented and 6.2% owned by the local authority.

It is envisaged by the Development Plan that due to Limerick's expanding population and decline in average household size, that the number of households will increase by 1,355 between 1996 and 2001, reaching 4,889 in 2016.

Planning permission was granted by Limerick County Council for 537 houses in 1996 an increase of over one hundred from 1994. The majority of building activity is located in the environs of the city.

Limerick County Council has identified locations in mainly rural areas of the County, where there is extreme pressure for residential development. A strict planning policy will be imposed in these areas, in all other areas development in the countryside will generally be allowed subject to certain criteria.

In Clare, the demand for housing has increased, due to the urbanisation of the County and the national decline in the average household size (from 3.5 in 1986 to 3.15 in 1996). This increase in demand is expected to continue according to the Development Plan. The average number of houses built between 1992 and 1998 averaged 880 per year, peaking at 1400 in 1997. The Plan expects pressure on finding suitable areas for residential housing in the near future.

Of the 8,826 full-time students attending the University during the 1998/1999 academic year, only 2,290 students reside at home or with relatives, 1,021 reside on campus with the remainder living in flats, digs or hostels. Campus accommodation is currently provided for university students and summer school students at the two existing villages at Plassey and Kilmurry. Dromroe student village is presently in construction and is expected to provide accommodation for 457 students by the end of 2001.

12.5 TOURISM

The Market Research and Planning Department of Bord Fáilte publish annual information on tourism in Ireland. It is estimated that in 1998, the total expenditure on tourism was IR£3 billion. This represented an increase of approximately IR£200 million for the equivalent figure in 1997. Of this, there was an expenditure of IR£751 million spent on domestic tourism.

Tourism provided 126,700 jobs in 1998, and this approximated at 8.2% of the total labour force. In the same year, the value of exported goods and services was estimated was to be IR£5.033 billion, of which IR£2.281 billion can be attributed to tourism. These estimates show that tourism, in 1998, accounted for 5% of all exports and 6.4% of GNP.

Specific data for the Clare region shows that overseas tourism provides IR£52 million, from approximately 570,000 tourists in 1999 (Bord Fáilte). Bunratty Castle, the Burren, Ennis, the Cliffs of Moher and Ailwee caves are amongst the main visitor attractions.

In total, IR£68 million was generated from 409,000 tourists in Limerick in 1999 (Bord Fáilte). Tourists are attracted to the Limerick area for the wide variety of attractions on offer. These include outdoor activities, cultural and heritage centres, Mediaeval towns and fine examples of architecture and archaeology.

The following sports facilities are currently or will soon be available to summer visitors to the University of Limerick campus:

- Indoor swimming pool, large indoor sports hall, gym, and squash courts
- Running track, all weather pitches and tennis courts
- Outdoor Activity Centre - offering a range of water and land based activities - windsurfing, sailing, canoeing orienteering, rock climbing and team building exercises.

In 1999, Limerick hosted the UK Ireland Corporate Games event which brought 4,000 visitors to the city to compete in various sports for three days. The range of facilities available at the University was one of the main reasons the city secured the event.

From June to September, between 10,000 and 15,000 tourists and conference delegates reside at the University campus every year. The University promotes Kilmurry Village and Plassey Village as ideal summer residences that include multi-channel TV, card phones in each house, reception and tourist information, laundrette and nearby shops, free car parking and wheel chair accessibility.

Plassey Campus Centre Limited develops and manages the residential, social and communal facilities on campus. It promotes the use of the campus year round for international conferences, summer schools and sporting events. The use of the residences for summer occupancy represents 30% of the company's revenue while the average rate of growth in income over the last 5 years is 10%. The 1998/1999 turnover for accommodation income and catering increased by 10.3% on the previous year to £805,000. Bednight occupancy increased by 6% to 38,100 bednights. This increase in revenue allowed the University to significantly refurbish the campus' older facilities.

12.6 RECREATION AND AMENITY

The River Shannon is identified by the Limerick County Development Plan as a water resource for tourism and recreation. It also acknowledges that access to some visitor attractions is poor and intends to protect existing right-of-ways where necessary.

The area of the proposed development is popular with families who stroll along the river walk during all months of the year.

The River Shannon is a nationally important river for angling. Three game angling clubs fish in the area of the proposed bridge; Shannon Mulcair and District Angling Association, Limerick Pike Angling Club Federation and Limerick Anglers Association as it is the first shallow water encountered upstream of Limerick City. Salmon is the main fish caught in the Shannon Anglers tend to fish in the water in the vicinity of the proposed bridge, along the shores of the river and from the Black Bridge. Pike, smelt and lamprey are also found in the vicinity.

The Clare County Development Plan places an emphasis on the provision of open space for sports clubs, non-sports clubs and recreational organisations in towns, villages and settlements where appropriate.

An indoor swimming pool, a large sports hall, gym, running track, all weather pitches, tennis courts and squash courts are presently in use or under construction at the University.

12.7 EDUCATION

In 1998, according to the Higher Education Authority (HEA), 14,549 primary degrees and 2,926 higher degrees were conferred on full-time students by the Universities and National Council for Educational Awards (NCEA). This represents an increase of 1,012 (7.5%) on the primary degree awards in 1997 and an increase of 220 (8.1%) on higher degree awards over the same period.

The lack of educational attainment remains a critical factor in the persistence of long-term unemployment in this country (Central Statistics Office, Labour Force Survey, 1993-1997). This problem is exaggerated due to the increased demand for skilled workers in recent years as the economic boom continues.

The Labour Force Survey compares the educational attainment of the Border Midland Western (BMW) Region to the national averages. In 1997 the proportion of the population (15 years of age and over) with education up to primary level only was 33%, compared with the state average of 28%, this showed a decrease of 9% on the 1993 figure. Those attending secondary level education averaged an 11% increase over the same four-year period in the BMW region. For non-degree third level the increase was 36% nationally and 30% for the BMW region. The category degree third level showed an increase of 25% nationally and 19% in the BMW region. The overall trend in the BMW, although less than the national average, is of an increasingly educated population reflecting, in particular the availability of free second level education, the young population and substantial investment in human resources development. These figures are encouraging for potential enterprises seeking a skilled workforce.

At present 9,076 students are enrolled at the University of Limerick. This figure shows as an increase of 857 on the previous year.

12.8 TRANSPORTATION

The 1996 Census reported that walking to school or college was the principal means of travel used by students aged 19 years and over in Ireland in 1996. In 1996 approximately 31% of all students walked to college. A total of 28% of students took the bus to college with 12% cycling. Students who travelled to college by car (as passenger or driver) or by van or lorry amounted to 16% in 1996. It is anticipated that an increasing trend in the use of private vehicle will result due to the significant recent economic growth.

The public right of way along the southern bank of the Shannon is a popular access route to the University used by students on foot and by bicycle. This route shall be maintained, though a temporary diversion will be put in place while the temporary 'bailey' bridge is in place.

At present, the River Shannon at the location of the proposed bridge is not navigable, as the waters are too shallow. Boats are currently diverted along the Lough Derg Way via Ardnacrusha. The proposed bridge will be constructed to a height of 5m above summer water level to allow for the potential future movement of boats along this stretch of the River Shannon.

12.9 CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

The proposed development involves the construction of the fourth University of Limerick student village. It will be located north of the present campus, across the River Shannon; a bridge will provide access to the village.

During the 1999/2000 academic year, 6,650 under-graduate and 894 postgraduate full-time students were enrolled at the University. Of these, only 13% could be accommodated by the two student villages presently in existence.

Approximately 250 people will be employed during the construction phase of the development. During the operation of the student village a total complement of 10 persons will be employed fulltime in its management, maintenance and service. An additional 20 persons will be employed during the summer months.

The proposed student village will consist of 507 en-suite bedrooms and dining/social area, facilities for disabled students, communication network to provide internet access and appropriate landscaping. The village is to be planned to provide intimate social space for students with building heights restricted to five storeys. The location of the village surrounded by the Shannon, Errina Canal and pastureland takes advantage of the stunning views in the area.

The bridge link over the River Shannon will be in an aesthetically pleasing format with special attention being given to the safety of cyclists and pedestrians by providing a separate bridge deck for their sole use. Sufficient car parking facilities will be provided at the village.

12.10 EVALUATION OF THE SOCIO-ECONOMIC IMPACTS

12.10.1 Local Impacts

The scheme will benefit the local area by providing much needed accommodation for students of the University, alleviating the accommodation problems in housing estates in the area which cannot cater for large numbers of students as the estates were designed to accommodate families.

The scheme shall generate employment, creating permanent jobs through the amenities developed at the village.

The tourist value of the vicinity will be enhanced by the development as it provides improved access to the amenity areas and accommodates summer students and conference delegates.

Anglers' access to the fishing areas in the vicinity of the proposed bridge will be restricted during the construction phase of the development by riverside construction works. Pedestrians and cyclists availing of the path on the southern bank of the River Shannon will be diverted around the site during construction. Full access along the banks will be reinstated following construction. The constructional phase of the development will therefore result in a temporary moderate local adverse effect on the recreation and amenity value of the area.

In the operational phase, the deck of the proposed bridge may locally impede angling activities on the riverbanks or within the river channel, this will be partially offset by the availability of the pedestrian/cycle path for angling activities. As stated above, the existing accesses along the river are to be fully reinstated upon completion of construction, and therefore, aside from the visual impact (discussed in Section 5.0), the development will have no long-term impact on pedestrians and cyclists using the riverside pathways. Therefore, the operational phase of the proposed development will have an overall minor local adverse effect on the recreation and amenity value of the area.

12.10.2 Regional Impacts

The proposed development conforms to the objectives outlined both the Clare and Limerick County Development Plans.

The Limerick County Development Plan encourages "*development in existing settlements, aims to provide safe and convenient movement of people and goods and encourages the economic development of the County*". It also intends the Council to *"co-operate with adjoining local authorities in the pursuit of policy objectives along the boundary*".

The Clare County Development Plan aims to "*provide for the safe and convenient movement of people and goods*" and to "*encourage the development of rural areas of the County by seeking to consolidate and develop existing settlements and residential clusters*".

The University, in conjunction with the National Technological Park, is an important current and future contributor to growth in the Shannon region. The rate of indigenous start-up companies in the Shannon region is double the national average (Forfás) from 1990 to 1998.

Many University degree courses include work placements which also contributes to the local economy. Most of the companies on the NTP operate either in the information and communication technologies (ICT) area, or in healthcare. The areas in which the University of Limerick is concentrating its research attention correspond to these: ICT, biosciences/bioengineering and materials and surface science, therefore the continuing development of the University is of moderate benefit to the region.

12.10.3 National Impacts

The proposed development will continue to enhance the University of Limerick's attraction for both national and international students to attend due to improved amenities.

12.11 MITIGATION MEASURES

It is not anticipated that any mitigation measures would be required in respect of socio-economic effects.

12.12 RESIDUAL IMPACTS

The completed student village and access bridge would have significant operational benefits as described above, as residual effects in the future.

REFERENCES

Central Statistics Office (1997) *Labour Force Survey*
Department of Enterprise & Employment (1994-1996) ESRI (1997) *Economic Status of School Leavers*
ESRI (April 1998, May 1999) *Quarterly Economic Commentary*
HEA 1998 *First Destination of Award Recipients in Higher Education*
Bord Fáilte
The National Development Plan, 2000 – 2006,
Clare County Development Plan, 1999.
Limerick County Development Plan, 1999.
Small Area Population Statistics, 1991, Central Statistics Office

13.0 SITE UTILITIES AND SERVICES

13.1 INTRODUCTION

This section of the EIS discusses the services and utilities within and in the vicinity of the proposed development site. The section outlines the existing features associated with each utility.

The services considered include surface water, foul water, potable water, gas, electricity supply, and telecommunications.

13.2 WATER SUPPLY

A 200 mm diameter watermain is available adjacent to the University Foundation Building, located through the carpark directly south of the proposed development.

Subject to agreement and planning permission by Limerick County Council it is planned to extend this watermain across the proposed bridge to the north to provide a water supply to this fourth student village.

Provision will be made for a fire-fighting ring main and hydrants on the site. These facilities will be provided in accordance of Technical Guidance Document B – 'Fire Safety' under the Building Regulations, 1997.

13.3 SURFACE WATER

The surface water is currently discharging from the existing campus into the River Shannon, via a system of pipelines and open ditch drains. Surface water run-off from hardstanding areas of the proposed development, the bridge and access roads will be collected through a closed drainage system, and will also be discharged to the Shannon via suitably sized petrol/oil interceptors located on the northern bank of the river at the reed beds and at the millrace on the south.

The proposed student village north will be prone to annual flooding, as it is low-lying. The waterways formed by the flooding will interact with the village, with only the land required for development being raised by 2m, thus creating promontories. The in-between spaces created by the accommodation blocks will undergo a metamorphosis when the river does flood. The natural floodplain preserved between the blocks is temporarily transformed into river inlets. When the River recedes the floodplains become the domain of the residents.

13.4 FOUL WATER

At present, the University's foul water discharges into the Castletroy Drainage sewer, west of Plassey Mill and is treated at a neighbouring sewage treatment plant. A number of options were considered when deciding on the how to deal with foul sewage generated by the proposed student village:

- Individual treatment plants for various buildings;
- Construction of a significant central treatment plant on the North Campus;
- Negotiate the use of the old Burlington Industries treatment plant, extending the plant if necessary; and
- Pump across the River Shannon to the Castletroy Foul Sewer.

Subject to agreement and planning permission by Limerick County Council, the waste generated by the proposed student village will be pumped through a rising main incorporated into the bridge deck and will connect into the Castletroy Sewage Treatment Plant. The existing 900mm-diameter sewer will be sized and laid to adequate falls to cater for the foul discharge currently being generated by intense developments on the University of Limerick Campus. As the system is anticipated to have adequate capacity, this will produce no significant effect.

13.5 ELECTRICITY SUPPLY

At present, there is an existing electricity supply to the area south of the River Shannon from a number of existing sub-stations. The University land, north of the river, is traversed by a number of ESB overhead local distribution power lines. It is proposed that part of this existing overhead network be diverted underground to facilitate the construction of the access road and student village. Electricity supply for this development will come from a substation on this diverted section of the cables. The diversion will extend from a point east of the proposed access road to west of the Errina Canal and River Blackwater, with the portion under the canal and river being routed through a duct installed using a 'thrust-bore' method.

Spare ducts within the bridge will be provided within the bridge design so that supply from the south of the river can be allowed for if necessary.

13.6 GAS SUPPLY

Gas is supplied to the existing University of Limerick campus via a pipeline. The proposed bridge will transport this supply to the north side of the River via a 200mm-diameter pipeline which will be contained within the bridge deck.

13.7 TELECOMMUNICATIONS

Overhead telephone cables currently run along the road to the north of the proposed student village. Connections will be made to supply the management and residents of the development with the required telecommunication services.

Underground ducts from the existing campus network will be conveyed to the fourth student village using the void formed in the River Shannon bridge footpath deck.

Information Technology structural wiring is to be provided for all bedrooms in the residences and other locations throughout the development.

13.8 DOMESTIC WASTE

Domestic waste produced by students will be stored in the pods situated at entrances to the accommodation units. This waste will be collected from the pods by a licenced contractor to be disposed of at a landfill site. A recycling centre will be located in the student village.

13.9 ASSESSMENT OF SITE UTILITIES

The available site services are sufficient to cater for the expansion of the University of Limerick to the north of the River Shannon.

During the construction phase of the development, there may be at times temporary disruption to any of the services on the site itself. However, aside from a short outage to enable connection of the proposed diversion of ESB overhead lines, no disturbance of services at properties adjacent to the site is anticipated.

13.10 MITIGATION MEASURES

Careful planning of services works prior to the development, and where necessary undertaking advance works ahead of the main construction elements will ensure that disruption to essential services will not occur. This can be achieved by producing a planned strategy for providing the services to cover the entire duration of the development.

13.11 RESIDUAL EFFECTS

The proposed development will result in no adverse residual effects in respect of the site utilities.

14.0 ARCHAEOLOGY AND CULTURAL HERITAGE

14.1 INTRODUCTION

This section of the study assesses the archaeological importance of the land under consideration for the proposed University of Limerick student village north and link access. The main purpose of the study is to assess the impact on the receiving archaeological environment and to propose ameliorative measures to safeguard any monuments, features or finds of antiquity.

The information contained in this section is based on a baseline desk study and a field inspection. The primary source of information for the desk study is the Sites and Monuments Record (SMR) of the Department of Arts, Heritage, the Gaeltacht and the Islands (Dúchas) and the topographical files of the National Museum of Ireland (NMI). These files provide a record of all stray archaeological finds which are provinced by townland.

A field inspection was undertaken to assess current and previous land use, the access to the site, the local topography and any relevant additional environmental information relevant to this section. It also sought to identify any low visibility archaeological features with little surface expression. There are no known archaeological sites listed in the Sites and Monuments Record (SMR) within the proposed development area; however, there are a number in the surrounding townlands. Documentary and literary references were also consulted as well as historic mapping sources.

Constructing the bridge to cross the Shannon gave rise to a requirement for significant pre-construction underwater archaeological appraisal. The archaeological significance of this river is well attested in the archaeological record. It is therefore regarded as highly sensitive and to have a very significant archaeological potential unless proved otherwise by pre-construction investigation.

Arising from this, and in consultation with Dúchas, the University of Limerick agreed to carry out an underwater survey in advance of any geotechnical works. These investigations were carried out by a licenced archaeologist and included a metal detection and dive survey, 30m upstream and downstream of the proposed development site.

14.2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

There are no known archaeological sites listed in the Sites and Monuments Record (SMR) within the proposed development area, however there are a number in the surrounding townlands (Figure 14.1).

- The closest site is located 50m to the west of the development on the western side of the canal (SMR CL063:015). This site is among three sites (SMR CL063:018, CL063:0020 and CL063:024) to north and east of the study area, classified as *enclosures.* This term usually refers to sites which, due to destruction or denudation, cannot be classified on the basis of their morphology. They may only be known from aerial photography or from documentary sources. Enclosures are often ploughed-out ringforts but they may also be destroyed ring barrows or curved field boundaries, common in upland areas. While the origins of ringforts are believed to lie in the Late Bronze Age/Early Iron Age, the majority of these sites are Early Christian in date i.e. AD 400-1200.

- The remains of a Holy Well (SMR CL063:017), and a Church and Graveyard (SMR CL063:019), both north of the development area, indicate an early Christian presence in the surrounding townlands.
- Over 1km south of the proposed development area the site of a tower house (SMR LI005:025) is recorded. Tower houses generally are small fortified residences of the Anglo-Norman landowning classes dating from the fourteenth to the sixteenth century. They often have very thick walls, intramural staircases, small windows (the earliest have very thin arrow or musket loops), and a vaulted first storey, to prevent the spread of fire. Some castles and tower houses have bawns (large defensive enclosures) attached to, or enclosing, the castle.
- Approximately 200m southwest of the proposed student village, the ruins of Plassey Mill (SMR 005:052) are located. The mill was built in the grounds of Plassey House in the 1820's.

A SMR Site Location Map marks the SMR Sites in the area surrounding the proposed site (see Figure 14.1); a detailed description of these sites and a general historical background of the area are available in Appendix C.

Henry Peltram's *Map of Limerick,* 1787 is a sparse representation and shows Milford House located south of the original Plassey House. This house was the home of George Maunsell of Milford, a Limerick Banker. The horse-ferry would have been in use at this time to carry people across the Shannon.

The Ordnance Survey first edition, 1842, hints at the former grandeur of Plassey House, gardens and mill. A gate lodge with its own gardens stands at the entrance gate and a tree-lined avenue leads to the house. Ornate gardens to the rear of the house can be clearly made out. Plassey mill and millrace is located to the northwest. Black Bridge crossing the Shannon is marked as *Metal Br.* The Clare side of the river consists of irregularly-shaped large fields, and it states that they are in an area *liable to floods*. Plassey Lock is clearly indicated (Figure 14.3).

The metal bridge in the Ordnance Survey third edition (Revised Current), 1938 is marked *Plassey Bridge* and Plassey Mill is described as being in ruins. Buildings and a yard have replaced the picturesque gardens of Plassey House, Milford House and its additions are the *Sacred Heart Convalescent Home*. On the Clare side of the river the field boundaries have changed considerably, having been subdivided to a number of smaller fields (Figure 14.1).

The National Museum of Ireland has record of two Roman coins found in the silt build-up on the riverbank at a depth of 45 to 60cm. A metal detector found the coins in Sreeland townland in a location that is upstream of the proposed bridge site.

14.3 ARCHAEOLOGICAL AND HERITAGE INSPECTION AND EVALUATION

A field inspection was conducted on June 8, 2000 during favourable weather conditions. Tall grass in the fields on the northern side of the Shannon hampered the identification of potential low visibility archaeological features. The area inspected is illustrated in Figure 14.2.

The field inspection concentrated on three separate zones within the development site; the landfall on the southern side of the proposed bridge, the bridge site on the Shannon, and three fields on the opposite bank at the landfall of the proposed new bridge at Garraun.

The land on either side of the River Shannon is flat, low lying and liable to flooding. The ground gently undulates, although these undulations were interpreted as naturally occurring features, apart from a millrace running parallel to the River Shannon, north and east of Plassey Mill. The river bank is steep sided along this stretch of the river between the townlands of Garraun and Dromore; however, this is not a natural feature and reflects the drop in water level resulting from the diversion of the river for the head race of the Ardnacrusha Hydro Electricity Scheme. This has resulted in the water level falling within the old Shannon River channel (Figure 14.2).

Black Bridge (Plassey Bridge) is located immediately downstream of the site of the new bridge. A group of small islands are located at a fall immediately upstream of the proposed new bridge (oblique air photo, Figure 14.2, Plates 1 & 3). The fast flowing water at the falls is known as *the bulldogs*. South of this, along the western bank of the river, at a location known as *Peig's Heights*, is the landfall of the proposed new bridge. The river south of Black Bridge is known as *Monamuck* (Figure 14.2).

The site of Shanny's pub is located within the area inspected at Garraun. It was located on the bank of the river adjacent to the islands known as the bulldogs (Figure 14.2). No trace of buildings is present on the ground surface with the exception of a single stone that may be a remnant of a wall.

A shallow ditch (millrace) is evident running parallel to the riverbank south of Dromroe village (see Figure 14.2) which is currently under construction. The new proposed road will bisect the ditch. The millrace has silted up and is approximately 2m wide and 0.5m deep and is likely to be associated with the mill at Plassey. Mills are often located on the site of earlier structures of the same function and the ditch at Dromroe is likely to have provided water at velocity to power a mill.

A 20m Garrison wall is located at the northern edge of the existing single storey dwellings/stores on the bank of the river east of Plassey Mill. It is built of coursed limestone and is reputed to have been built to protect the ferry that was located here prior to the erection of Plassey Bridge in the late 1830s. Its name suggests a military association, perhaps in the defence of Limerick City during one of the sieges of that period (Figure 14.2).

No recorded monuments or sites are located within the proposed development area and no previously undetected sites were revealed during the course of the field inspection and documentary research.

A study of cartographic sources from 1787 onwards did not reveal any features of archaeological interest within the development area. The land, from this cartographic evidence, would appear to consist of large open fields used for agricultural purposes. The aerial photograph taken in the study area also did not reveal any further archaeological features.

The only item of archaeological interest observed during the underwater archaeological survey was a ship's timber that was carved in shape and made from the bough and branch of the same tree. The bough is squared in section, while the branch is more ovoid. A single dowel is set transversely across the bough end. The timber measures 1.9m long. The squared bough measures 24cm wide and deep. It is likely that the timber is oak. The timber was discovered on the surface of the riverbed adjacent to the south bank, in a location along the upstream edge of the proposed bridge. A comprehensive search of the riverbed and bank in the immediate vicinity was carried out but no other indications of related timbering or associated materials were observed. It was concluded that the timber is an isolated find that has been washed downstream. Due to its location with respect to the bridge, the timber was removed from its original location, recorded, drawn and photographed, and relocated within a shallow silt deposit along the south bank downstream of the proposed works area. The new location was plotted.

The underwater metal detection survey revealed a number of small targets, mainly beer cans, located in proximity to both banks.

The underwater survey did not reveal in situ archaeological material within this section of the River Shannon. The one item of interest that was observed appeared to be without a clear context and was not associated with other material.

14.4 MITIGATION MEASURES

From the above information the potential impact of this development of the land on archaeological material would appear to be low. However, it is possible for archaeological finds, features and soils to be revealed during earthmoving, landscaping, foundation excavation and riverbed disturbance works, such deposits are often buried deep and remain undisturbed. Given the number of archaeological sites in the surrounding area, it is proposed that an archaeologist be present to monitor the site once earthmoving works have commenced to ensure the recognition and proper excavation and recording of any surviving archaeological features. Care will also be taken to minimise the impact of

The attention of the developer has been drawn to the appropriate sections of National Monuments Legislation (1930-1994), which states in the event of the discovery of archaeological finds or remains, *Dúchas,* The Heritage Service of the Department of Arts, Heritage, Gaeltacht and the Islands, should be notified immediately (Appendix C). The developer will make provision to allow for, and to fund, the necessary archaeological monitoring and inspection works that may be needed on the site during the site preparation phase of development.

All recommendations regarding the site will be subject to discussion with, and approval from, *Dúchas,* The Heritage Service of the Department of Arts, Heritage, Gaeltacht and the Islands.

14.5 RESIDUAL EFFECTS

There are no known archaeological sites listed in the Sites and Monuments Record (SMR) for this area. Therefore there are anticipated to be no residual effects on the archaeology and heritage as a result of this proposal.

15.0 OTHER IMPACT HEADINGS & INTERACTIONS

15.1 INTRODUCTION

The EIA Regulations list the environmental issues which should be assessed in an EIS, (see Section 1.2.2), and also require a description of the likely significant environmental interactions between these environmental issues. This Section addresses the environmental aspects that are not specifically addressed in the individual sections of the EIS and also identifies the main interactions between different effects.

15.2 OTHER IMPACT HEADINGS

15.2.1 Climate

While it is considered that the scheme will cause no change to the long-term weather patterns in the area around the University of Limerick, a review has been undertaken of the effects of the proposed development on the microclimate in the vicinity of the site.

The microclimate of an area can be described in terms of the highly localised atmospheric conditions of the area (winds, shading, temperature, etc.), and depends on factors such as aspect, slope and shelter of the area. It is anticipated that the only potentially significant microclimatic effect will be in relation to overshadowing from the student blocks on the north side of the river.

A shading study has been carried out on the proposed scheme and the results of this study indicate that there is only one property close enough to the site to be at risk from overshadowing. This property is the former lock keeper's cottage the west of the site and on the far side of the Errina Canal.

The setting of the property at present is characterised by a number of banks of large trees, which effectively surround the property. These trees are mainly large deciduous trees, which are established and mature. In the summer time when these trees are in full bloom, there is a proportion of screening from direct sunlight, except to the southeast, where there is little screening. During the winter and autumn months when the trees are largely devoid of leaves, the cottage is almost entirely exposed to direct sunlight. In addition to this, the property is located outside the *primary zone of visual influence* as discussed in the landscape and visual evaluation (section 5.0) and indicated on Figure 5.2.

The shading study has shown that the proposed development will have a noticeable overshadowing effect on the cottage at certain times of the day and during certain periods of the year. The greatest effect will be seen during morning hours and through the winter months, when the sun remains low in the sky. It is noted that the period of greatest effect is characterised by the time of year when the weather conditions are most unsettled and exposed to many cloudy episodes.

It is anticipated that the presence of the student blocks at this location will introduce a moderate local negative impact during morning hours of the effected months and have no overshadowing impact outside of these times and months. Therefore, it is predicted that the overall microclimatic impact of the scheme reduces to a minor local negative impact. This effect would be cyclical and long-term into the future.

15.2.2 Flora and Fauna

Flora and fauna is addressed in the context of nature conservation in Section 9.0.

15.2.3 Material Assets

The services and drainage features are discussed in Section 13.0. A detailed assessment of the effects of the proposed development on the Planning and Policy of the area of the site has been presented in Section 4.0 and referenced in Section 12.0.

Water is addressed in Sections 9.0, 10.0, 11.0 and 13.0.

15.2.4 Soil

Soil is addressed in Section 10.0.

15.3 INTERACTION OF EFFECTS

All environmental factors are inter-related to some extent, and can be highly complex. The following sections outline the main interactions anticipated as a result of this development.

15.3.1 Landscaping and Nature Conservation

The landscaping proposals have been assessed in order that they optimise the interaction with Nature Conservation in terms of providing a portion of native species.

15.3.2 Traffic, Air Quality and Noise

The traffic generated by the proposed student village would an impact on the noise and air quality environments at nearby sensitive receptors. Sections 7.0 and 8.0, respectively, detail the evaluation of these effects.

16.0 SUMMARY

16.1 INTRODUCTION

It is the policy of the University of Limerick to reduce the effects of its activities on the environment to a practicable minimum, through the development of an Environmental Management Programme. This policy commitment has been applied throughout the development of the proposed student village, river crossing and access roads. Where unavoidable environmental effects will occur, measures have been proposed to mitigate these effects as much as reasonably possible. These measures will be adopted throughout the construction and operation of the proposed development.

16.2 SUMMARY OF IMPACTS

16.2.1 Construction Phase

Construction traffic movements, together with general construction activity, will have a significant, negative visual impact within the immediate River Shannon corridor.

Traffic will be generated during construction from site personnel. At the peak of activity there will be approximately 25 commuter vehicle movements daily. In addition to this, it is anticipated that there will be approximately 75 heavy goods vehicle (HGV) movements throughout the day.

During construction, noise will be generated from fixed plant, construction traffic and piling. Vibration from construction sites may be generated by many of the items of plant operating. The highest levels of ground borne vibration are generally caused during piling. It is anticipated that piling will not cause a significant effect on nearby residential property.

It has been identified that the release of fugitive dust emissions is a potential risk for adjacent roads and properties.

During construction of the 'bailey' bridge and the permanent bridge an operating width of approximately 60m will be required on both sides of the river. This will constitute a moderate negative impact on the strip of wet grassland present on the north bank and on the rank grassland on the south bank. Two cofferdams (approximately 10m by 16m) will be established within the riverbed to facilitate the construction of supporting piers for the permanent bridge. These will have a temporary localised severe negative impact on the riverbed. Due to the proximity of the proposed buildings to the edge of the River Shannon (the proposed central building is located within 5m of the edge of the river and the eastern building is within 10m of the river bank), the construction phase will result in a temporary loss of a large part of the wet grassland habitat which will constitute a temporary moderate negative impact.

The potential for water contamination during the construction phase may be associated with the construction of the temporary bridge across the river, earth moving works, temporary storage of oil and fuel for plant and equipment and disposal of foul drainage.

16.2.2 Operational Phase

The proposed development will inevitably give rise to significant and, to a limited extent, profound negative change and visual impact in the short term due to the perceived loss of a tranquil, rural setting and change to a traditional recreation area. In the medium term, as the proposed bridge and village development (and the adjoining Dromroe Village) become familiar landmarks and the proposed landscape treatment matures, these impacts will gradually decrease and be increasingly perceived as neutral.

The traffic assessment has examined the traffic generated by the development on the access roads. The traffic model shows that the estimated weekday traffic generated by the proposed student village to be 413 vehicle movements.

There will be a negligible noise impact associated with the development.

The results of the air quality modelling study indicate that, even under worst-case traffic conditions, vehicle emissions will not breach EU air quality standards.

A small section of the proposed student village will be located in the wet grassland habitat typically associated with riverbanks and floodplains. This habitat has a very important function as a buffer to the river. This habitat is of high local ecological value and locating within this wet grassland fringe will constitute a moderate negative impact. The loss of the hedgerows and semi-improved grassland due to the construction of the student residences will constitute a minor adverse effect.

The flood study carried out by ESBI predicts that for a 100-year flood, no rise in water levels will occur as a result of the bridge and 1cm as a result of the student accommodation blocks.

When the student village has been developed, there may be up to 20 staff employed. This is seen as being a permanent beneficial effect of the scheme. The proposed development will continue to enhance the University of Limerick's attraction for both national and international students to attend due to improved amenities.

A study of climatic effects as a result of the scheme identified that the microclimate and in particular, shading was the only significant issue. A shading study was carried out and the results of this show that there is an effect on the former lock-keeper's cottage. The overall microclimatic impact of the scheme is anticipated to be a cyclical, long-term, minor local negative impact.

16.3 SUMMARY OF MITIGATION MEASURES

16.3.1 Construction Phase Mitigation

Construction traffic will be managed so as to minimise any local adverse effects.

Noise will be mitigated against by controlling hours of work, and the location and intensity of activities. Construction noise will be kept to a minimum by using noise suppressers and acoustic enclosures where possible, in accordance with BS5228.

A rigorous Code of Practice has been developed to ensure that the dispersion of dust off-site is kept to an absolute minimum.

The construction management of the project will incorporate protection measures, including the construction of a temporary bund around the construction site, that will minimise as far as possible the risk of spillage that could lead to contamination of watercourses. Measures to mitigate impacts during bridge construction will require confining works to the period outside of the breeding season for lamprey, that is from mid-May to the end of July. The salmon spawning season will also be avoided if the area of the proposed development is found to be a breeding area. The wet grassland fringe along the riverbank impacted during the construction phase will be reinstated by replacing the grass sods that were removed pre-construction.

Careful planning of services works prior to element of the development, and where necessary undertaking advance works ahead of the main construction elements will ensure that disruption to essential services will not occur. This can be achieved by producing a planned strategy for providing the services, to cover the duration of the development.

The student accommodation blocks will be raised by approximately 2m to prevent flooding, with natural seasonal flooding continuing alongside the accommodation.

It is proposed that all ground and riverbed disturbance works will be monitored by a licensed archaeologist, so that any features of archaeological derivation may be fully excavated and recorded.

16.3.2 Operational Phase Mitigation

The visual impact of the proposed development will be mitigated against by retaining existing vegetation, 'softening' structures, where possible, screening and/or filtering low-level views from river walks and selecting native and indigenous tree, shrub and ground flora species for planting. These elements have helped to shape the landscape replanting proposals for the scheme.

In order to mitigate against the traffic impacts of the proposed development, a number of measures are included in the scheme. These include the provision of adequate pedestrian crossing facilities and the use of traffic calming techniques to minimise traffic speeds in the vicinity of the bridge in order to enhance the safety of all road users. If an additional access from the County Clare side is provided to the proposed residential development on the northern side of the river, then in line with university policy this traffic will not be permitted to progress to the south side.

Trapped gullies will be provided for surface drainage throughout and petrol/oil interceptors will be included at the bridge, car parking and loading areas to prevent pollution of the receiving waters. These will be regularly maintained to ensure effectiveness.

16.4 ENVIRONMENTAL MANAGEMENT PROGRAMME

The University of Limerick recognises the importance of being a 'Good Neighbour' and establishing an 'Environmental Policy'. This is based on meeting, to the fullest extent, all appropriate environmental legislation with particular concern for the protection of the public. The University have set out a number of environmental management measures in this EIS to mitigate impacts and to achieve policy and legislative commitments.

These measures apply to all stages of the construction and operation of the student village, River Shannon crossing and access roads. Responsibility and accountability is with all staff to be aware of their responsibilities through appropriate training. Senior management will monitor the environmental performance of individual contractors who will be responsible for implementing sound environmental practices in their workplace.

During construction, as with many large development sites, emissions of dust and noise may arise during the construction phase. As discussed in Section 8.0, fugitive emissions of dust from the construction site will have the potential, under favourable weather conditions, to be deposited off-site. Accordingly, a dust management plan has been formulated and is outlined in Section 8.0 of this EIS.

Section 6.0 outlines construction traffic management measures that will be employed throughout the construction and operation phases of the development. These measures will assist in minimising any local adverse effects.

Noise levels will be controlled during the operation and construction phases, in accordance with BS 5228, using the guidance presented in Section 7.0.

The grounds of the University of Limerick will be subject to continuing landscape maintenance and monitoring (Section 5.0).

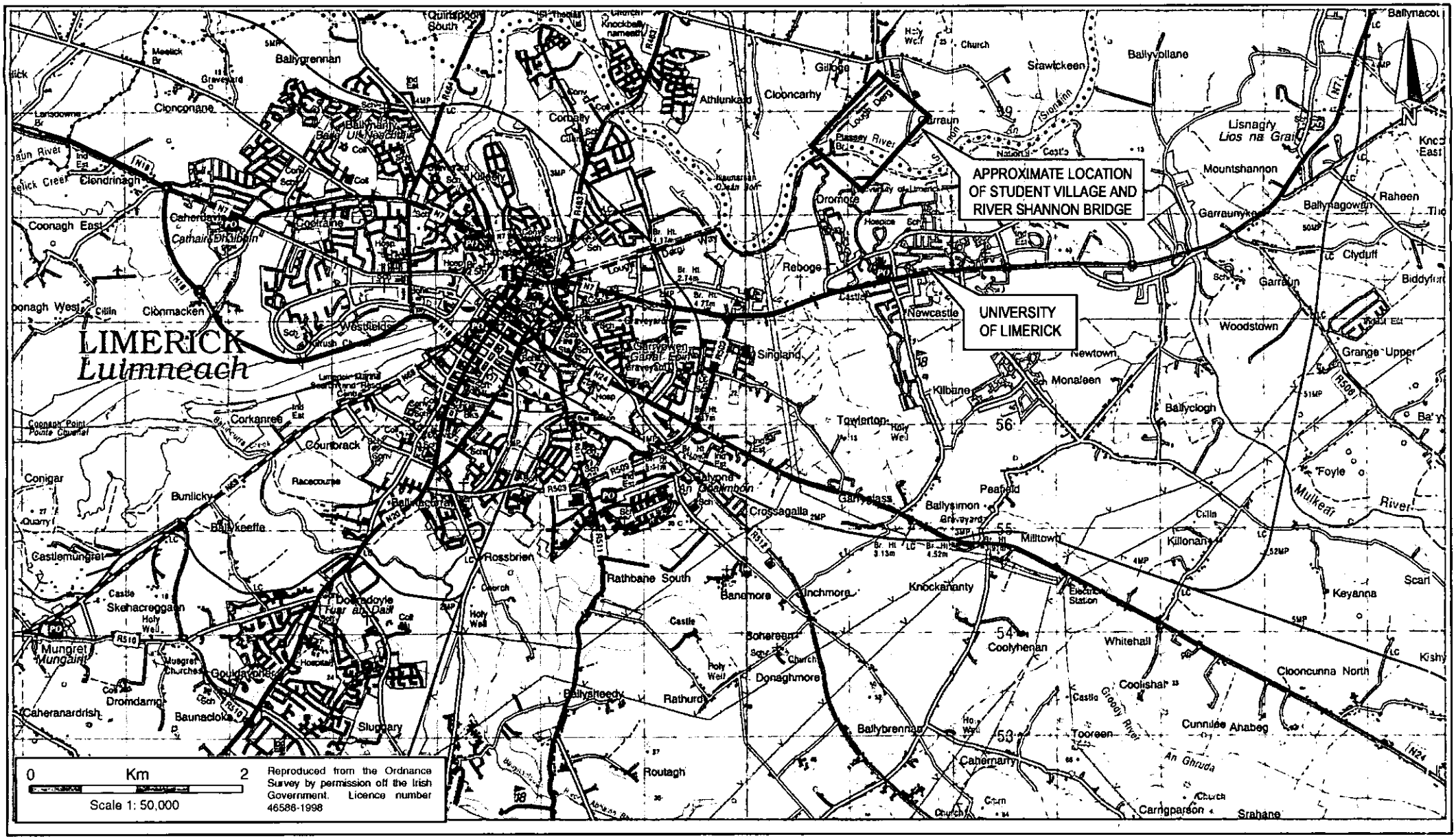
The student village will be tidied on a daily basis. Rubbish will not be allowed to accumulate but will be collected in covered skips and removed from site. Food waste will be removed to avoid attracting birds, rats and other vermin. No rubbish will be burned on site (Section 8.0).

Storage of all materials on site will be done in an environmentally sensitive way, in order to minimise the risk of spillage and subsequent risk of pollution of watercourses, ground and groundwater (Section 9.0).

The site will have a detailed Safety and Health Plan drawn up by the contractors responsible for the construction. It will be strictly adhered to, and reviewed once the development is completed. Sub-contractors will operate to the standard Safety, Health and Welfare Specification for Sub-Contractors produced by the main contractors.

FIGURES

TABLE OF FIGURES



ARUP
Consulting Engineers

Site Location

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 1.1

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Aerial Photograph of Site

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 1.2

ARUP
Consulting Engineers

Current Site Layout

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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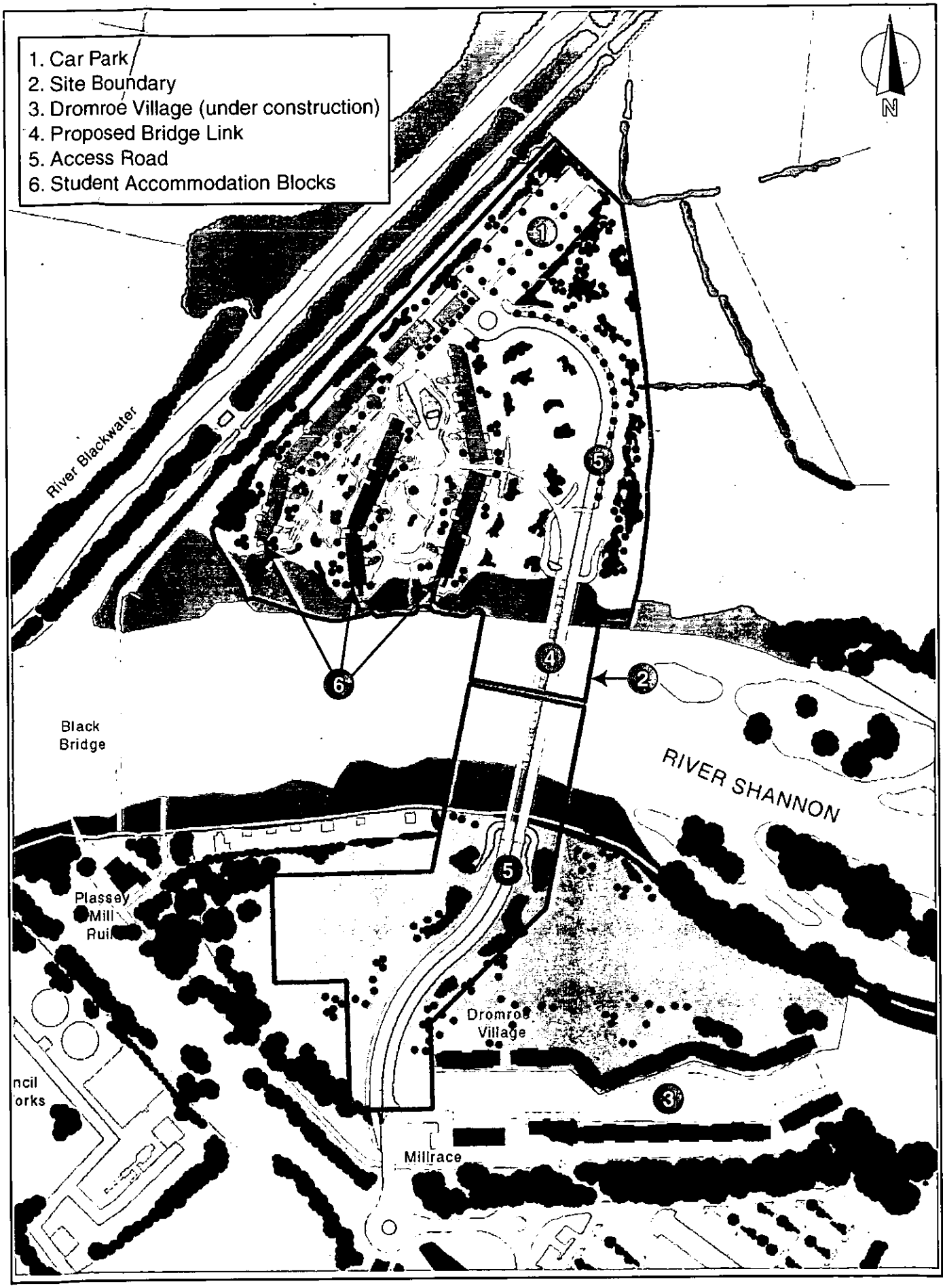

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Plan of Proposed Development

Student Village, River Shannon Bridge and Access Road EIS

Job No: D2387/11

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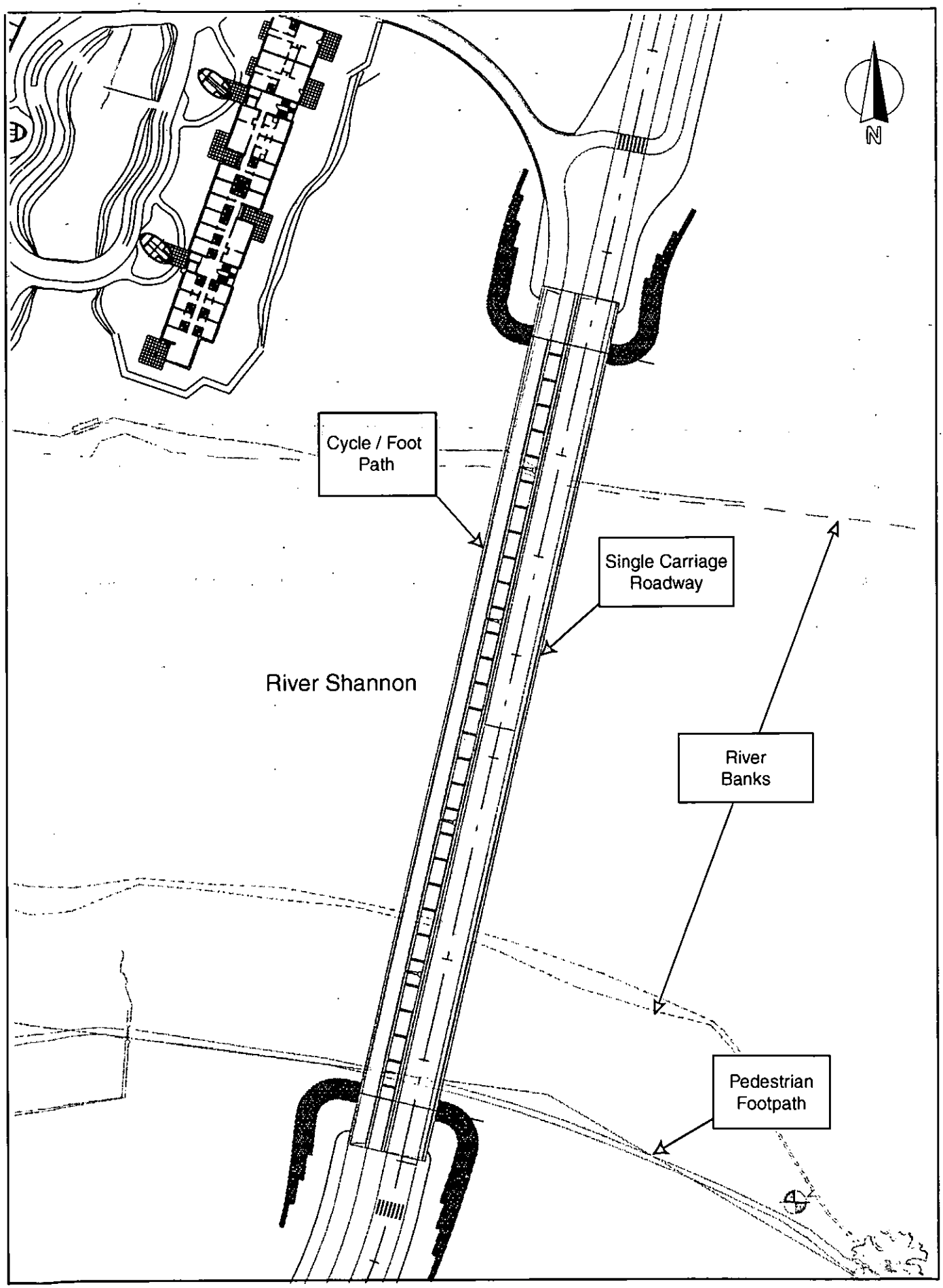

ARUP
Consulting Engineers

Bridge Plan

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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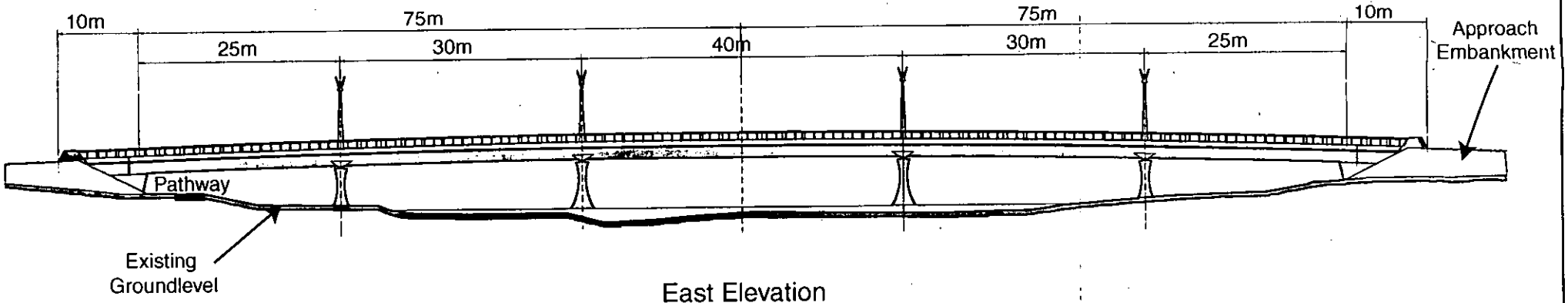
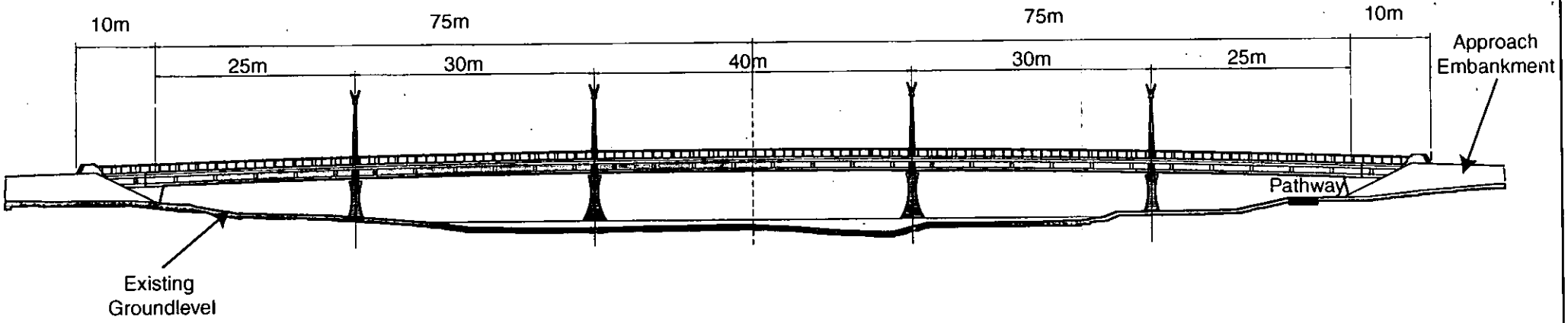


East Elevation



West Elevation

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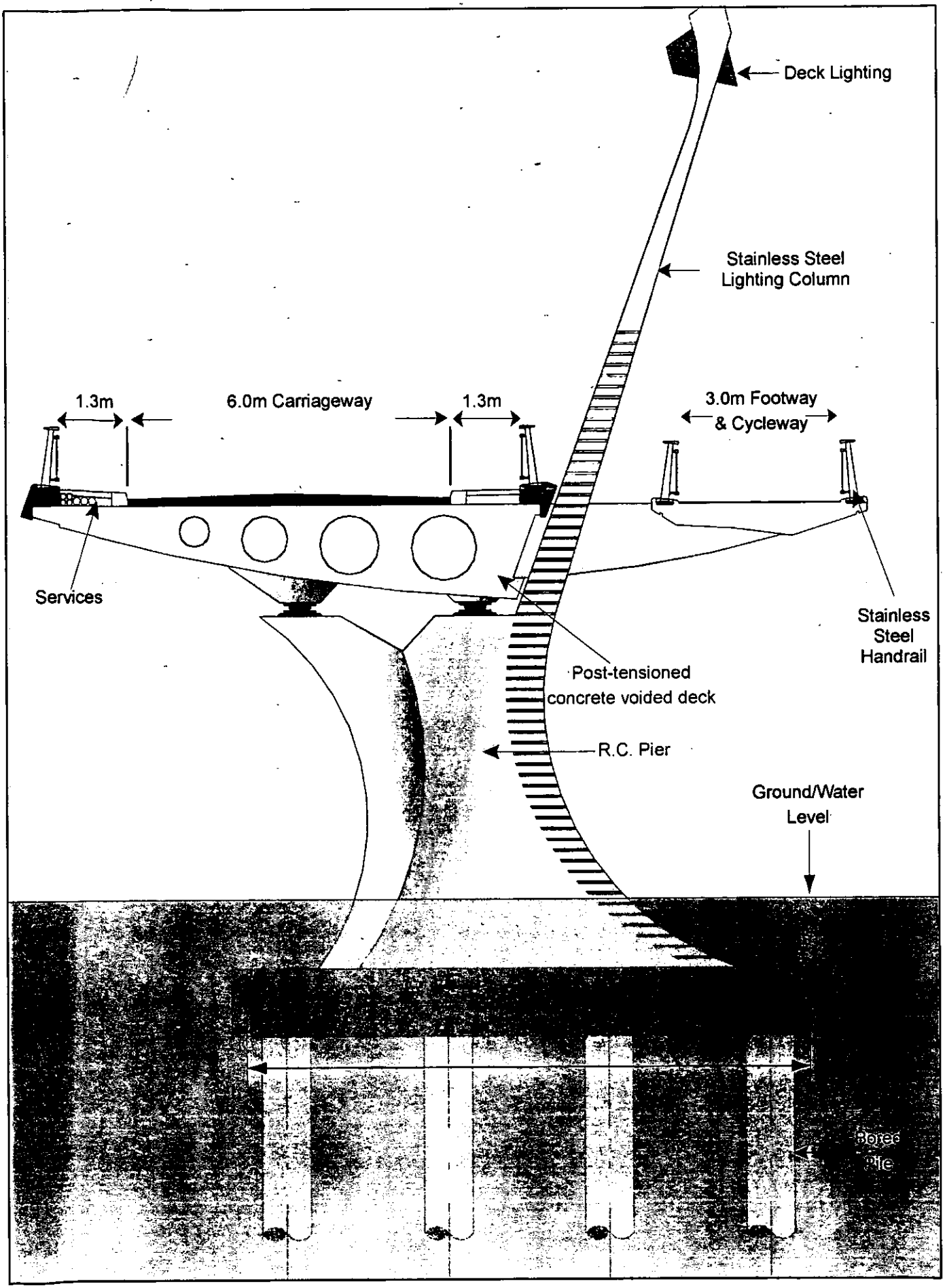
Bridge Elevations

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 3.4



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Bridge Section

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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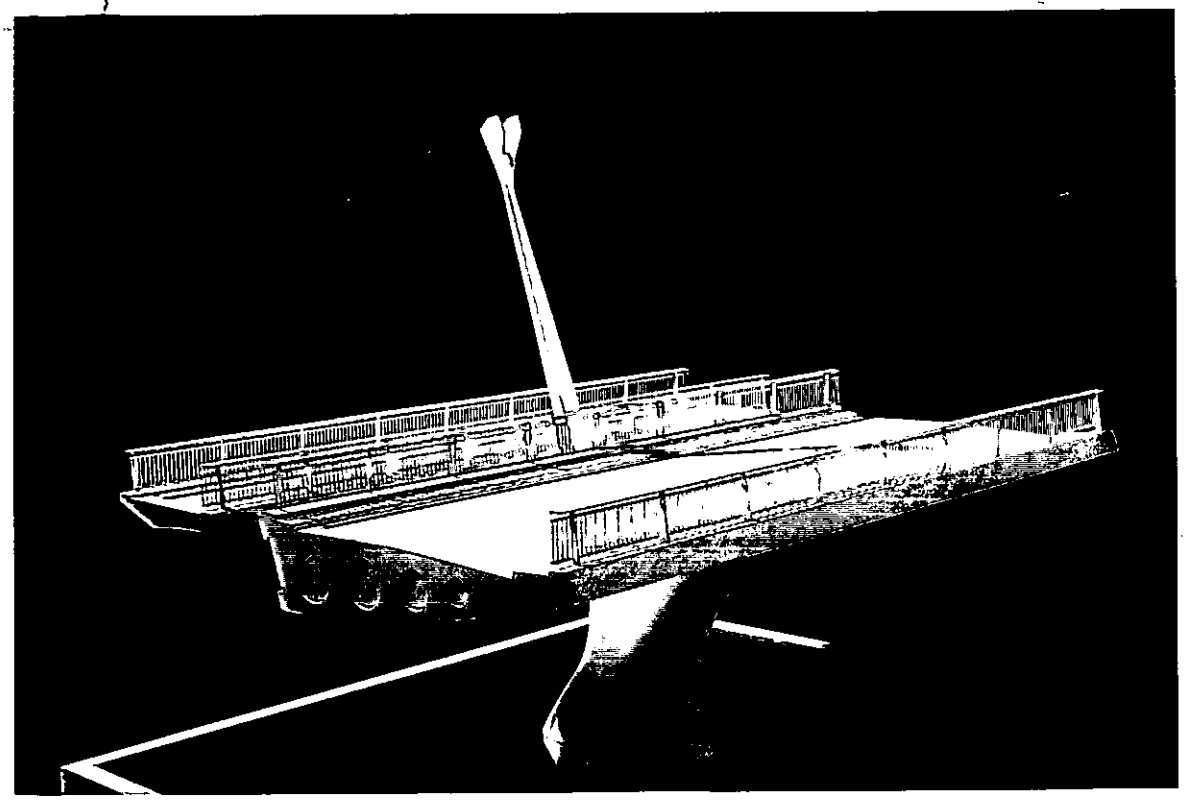

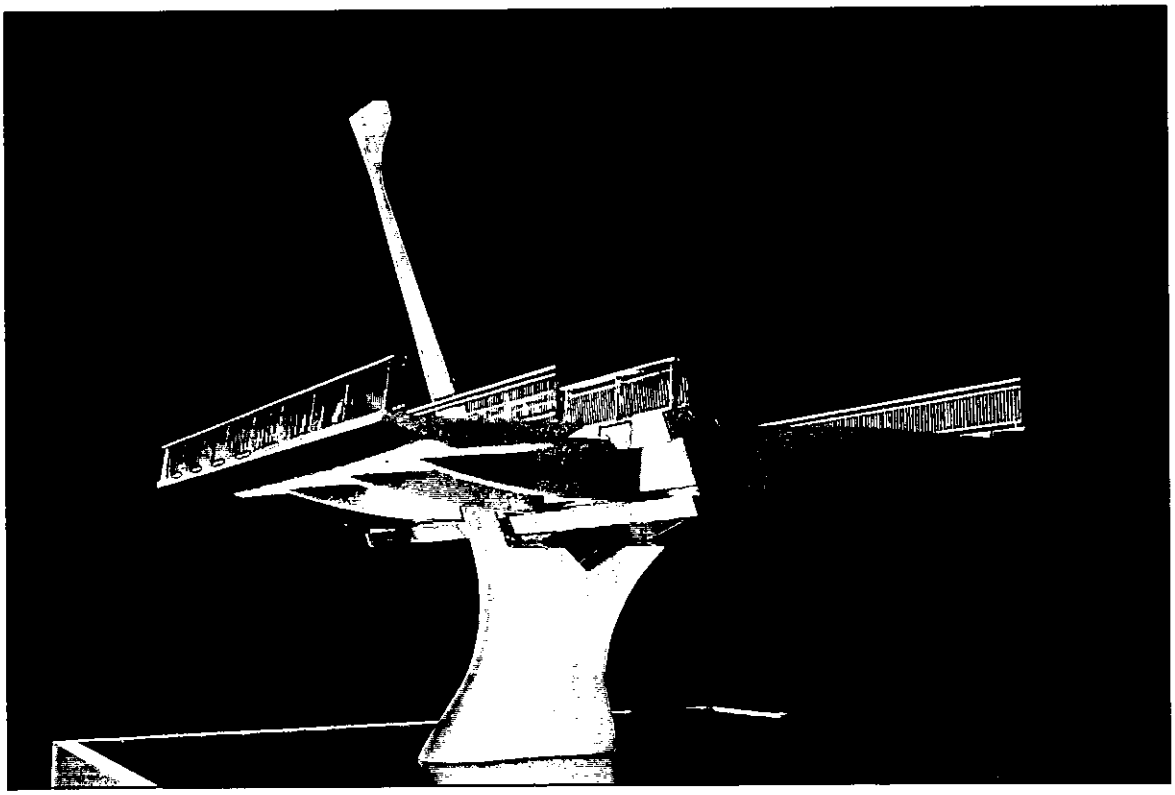

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Bridge Model

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Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 3.6

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Village / Access Roads Plan

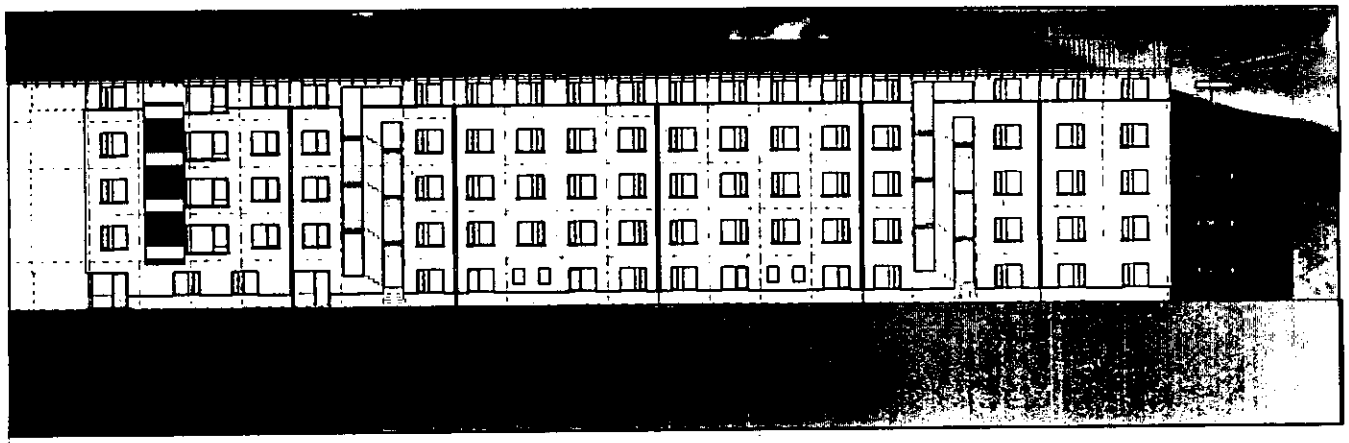
Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

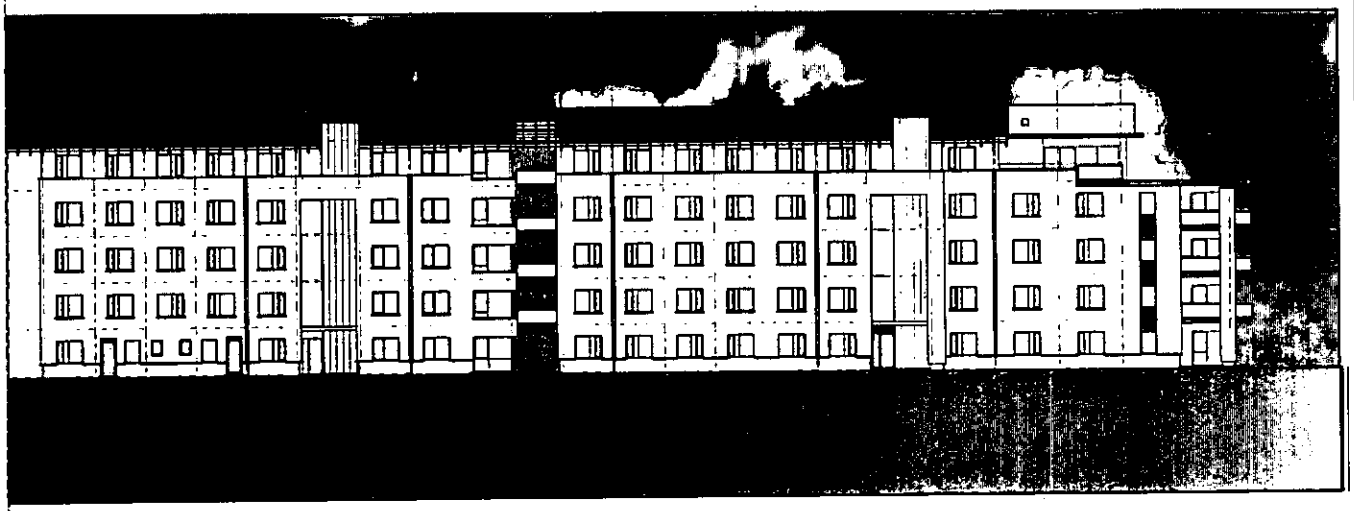
Figure No: Figure 3.7

Typical North Elevation

Typical East Elevation



Typical South Elevation



Typical West Elevation

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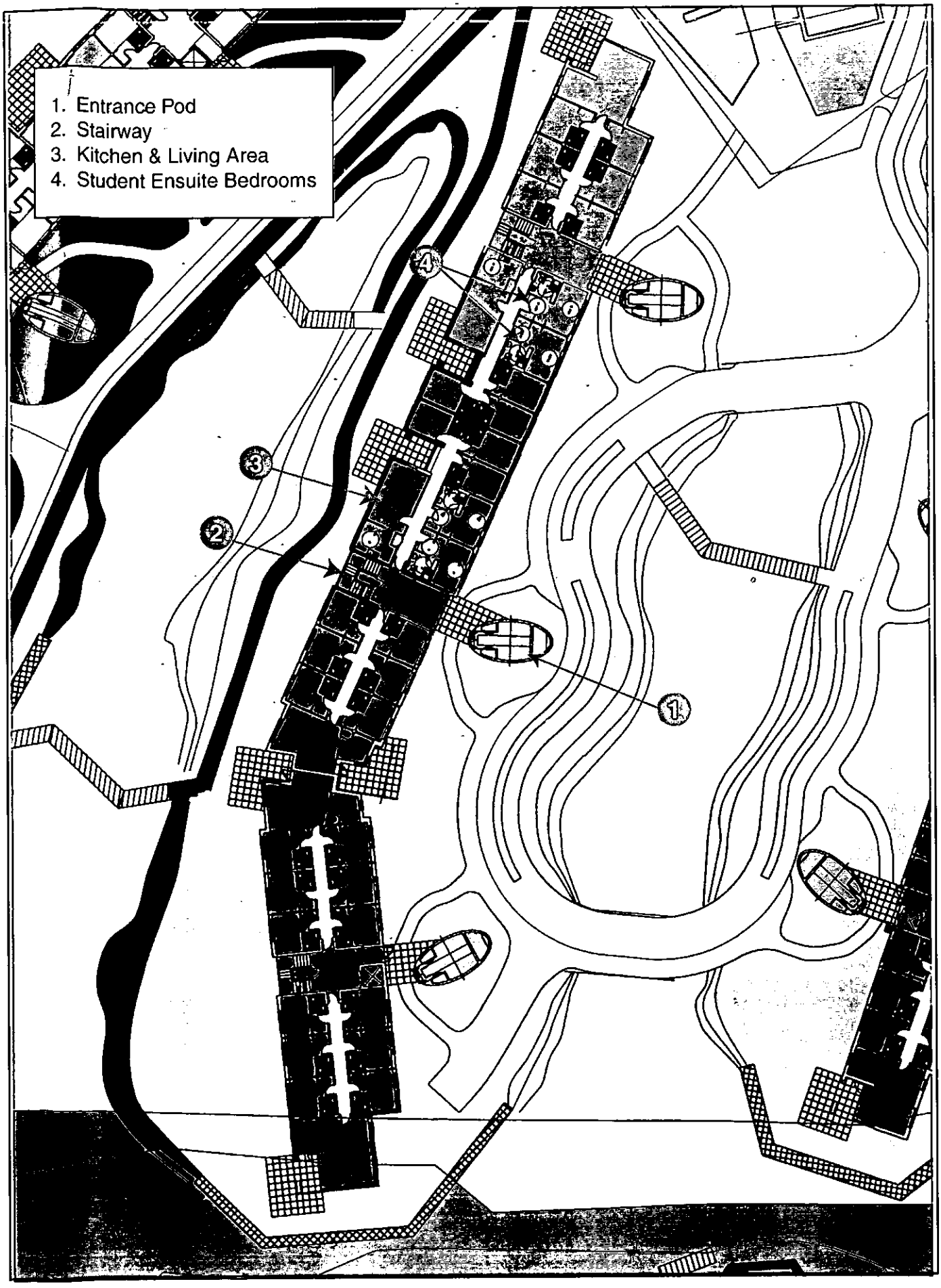
Student Block Elevations

Student Village, River Shannon Bridge and Access Road EIS

Job No: D2387/11

Figure No: Figure 3.8



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Typical Student Block Floor Plan

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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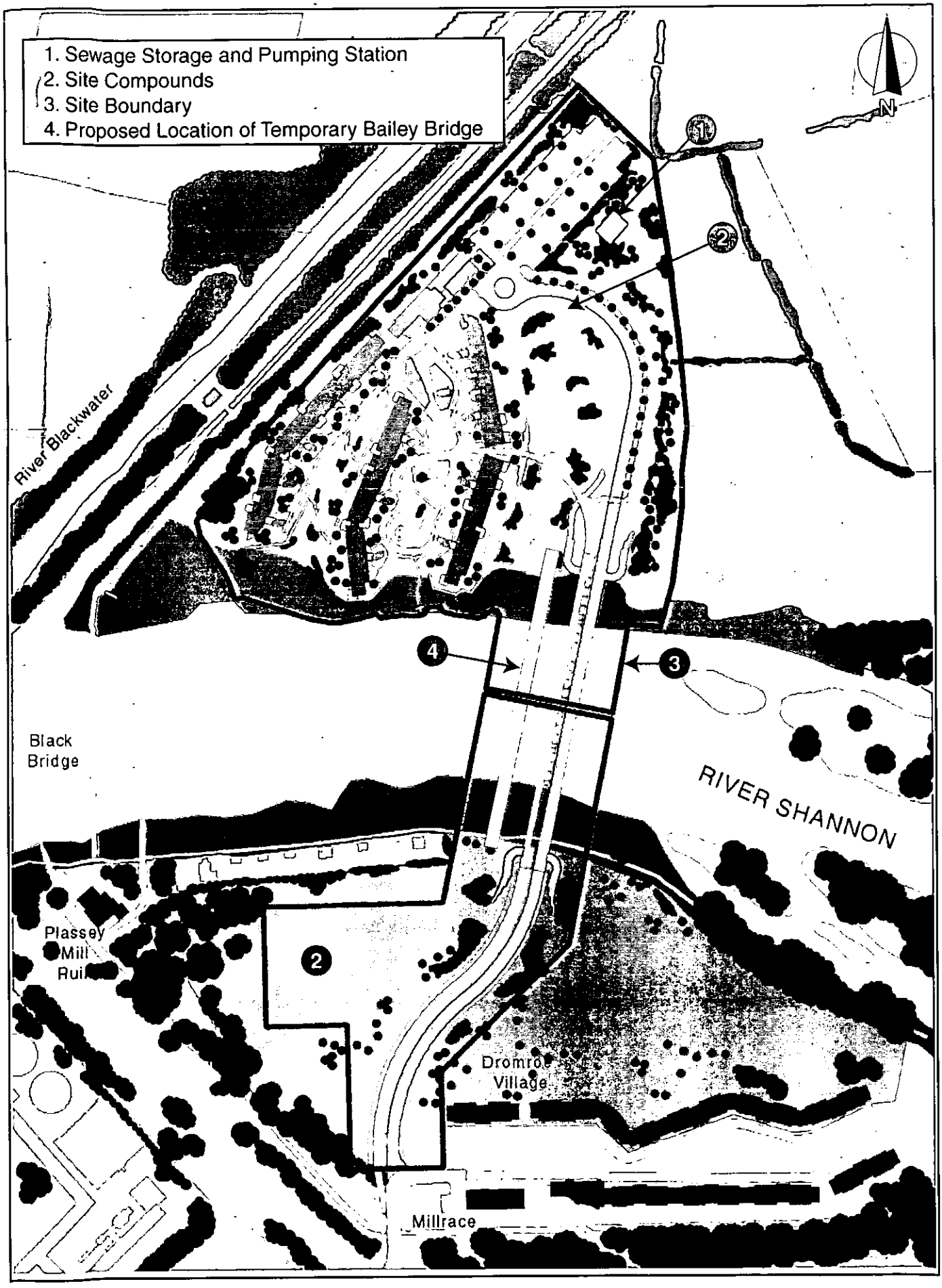

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Construction Areas and Site Works

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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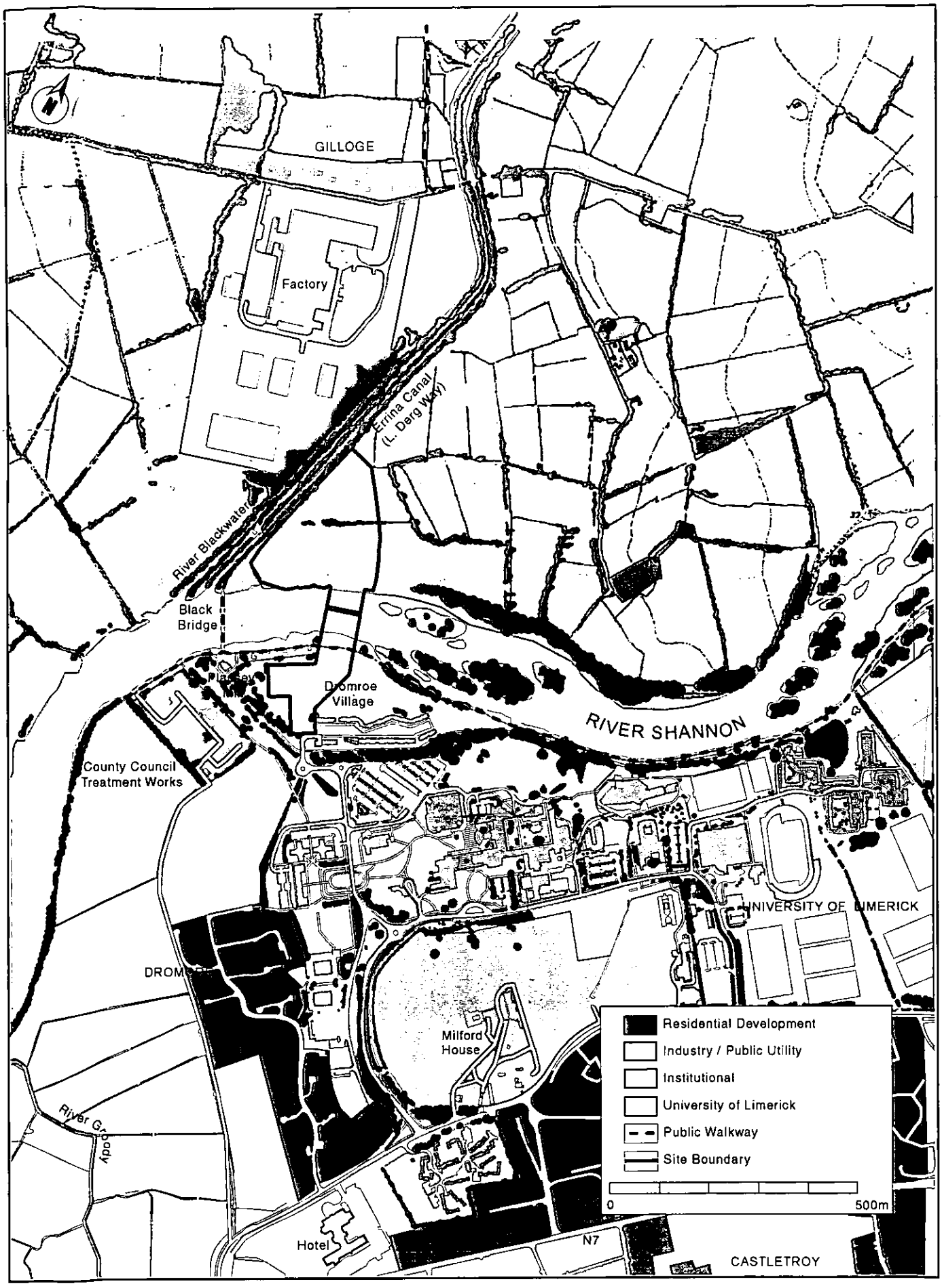

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Landscape Context

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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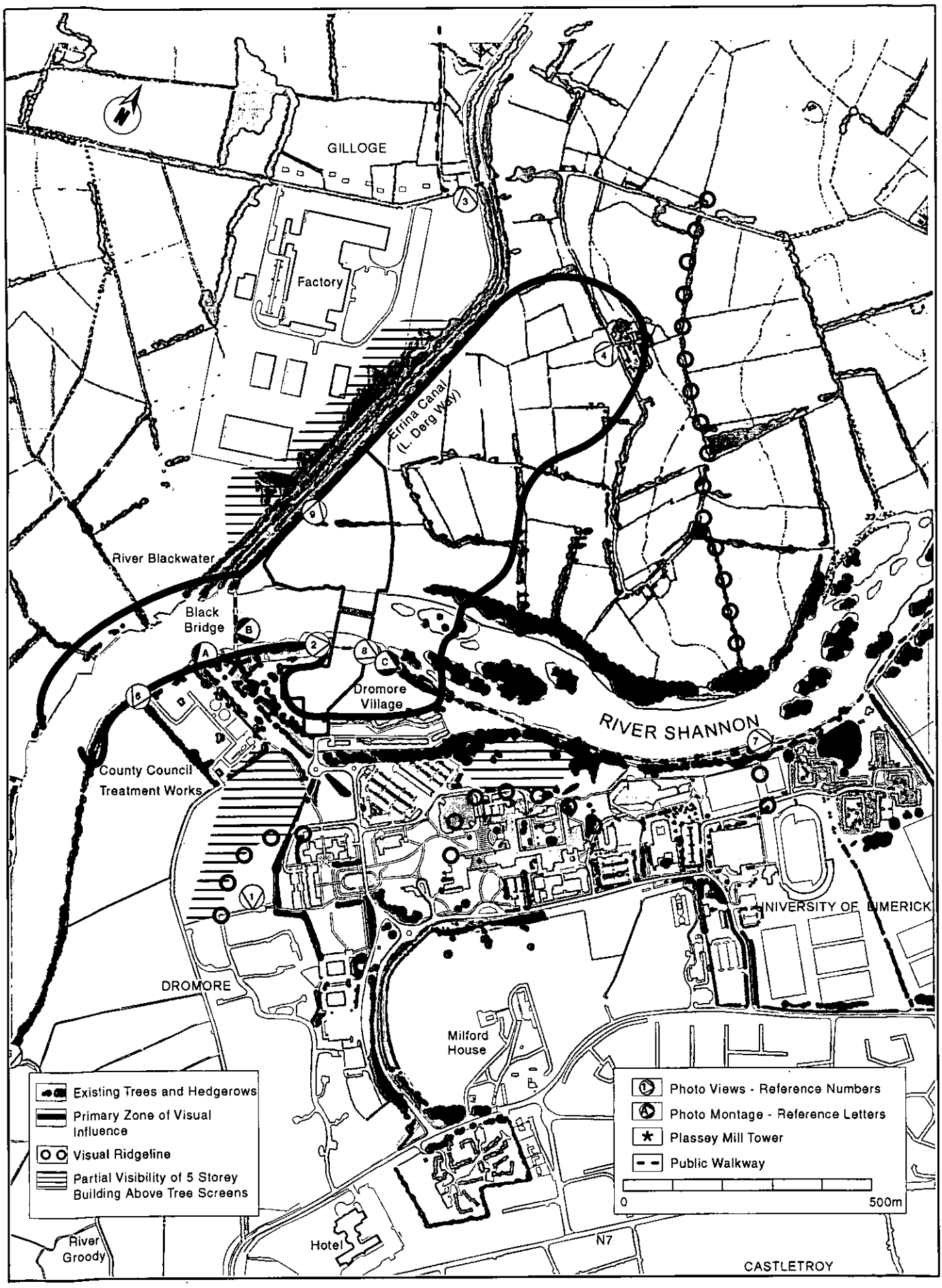

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Photo Locations - Visibility

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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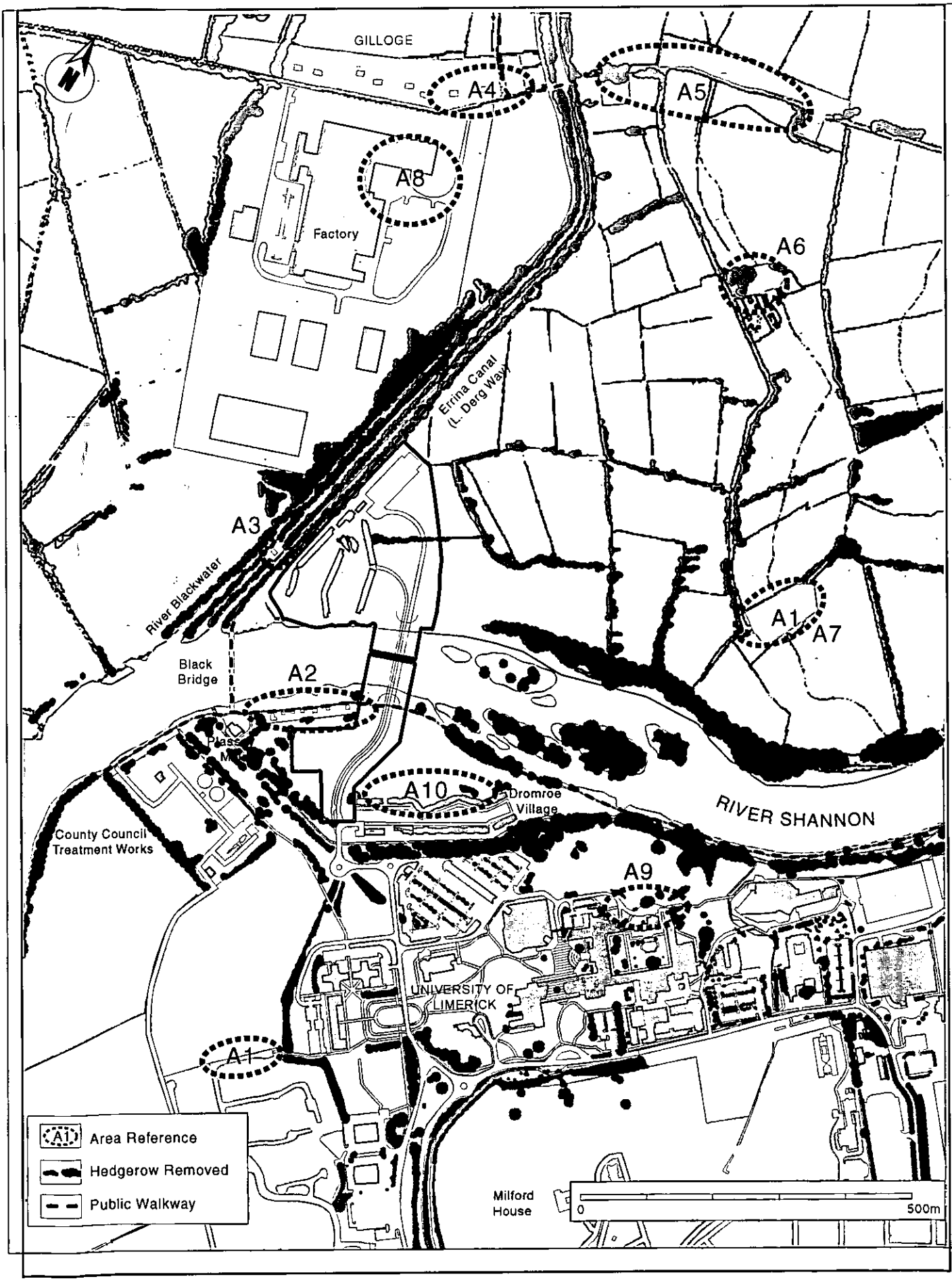

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Consulting Engineers

Visual Impact Areas

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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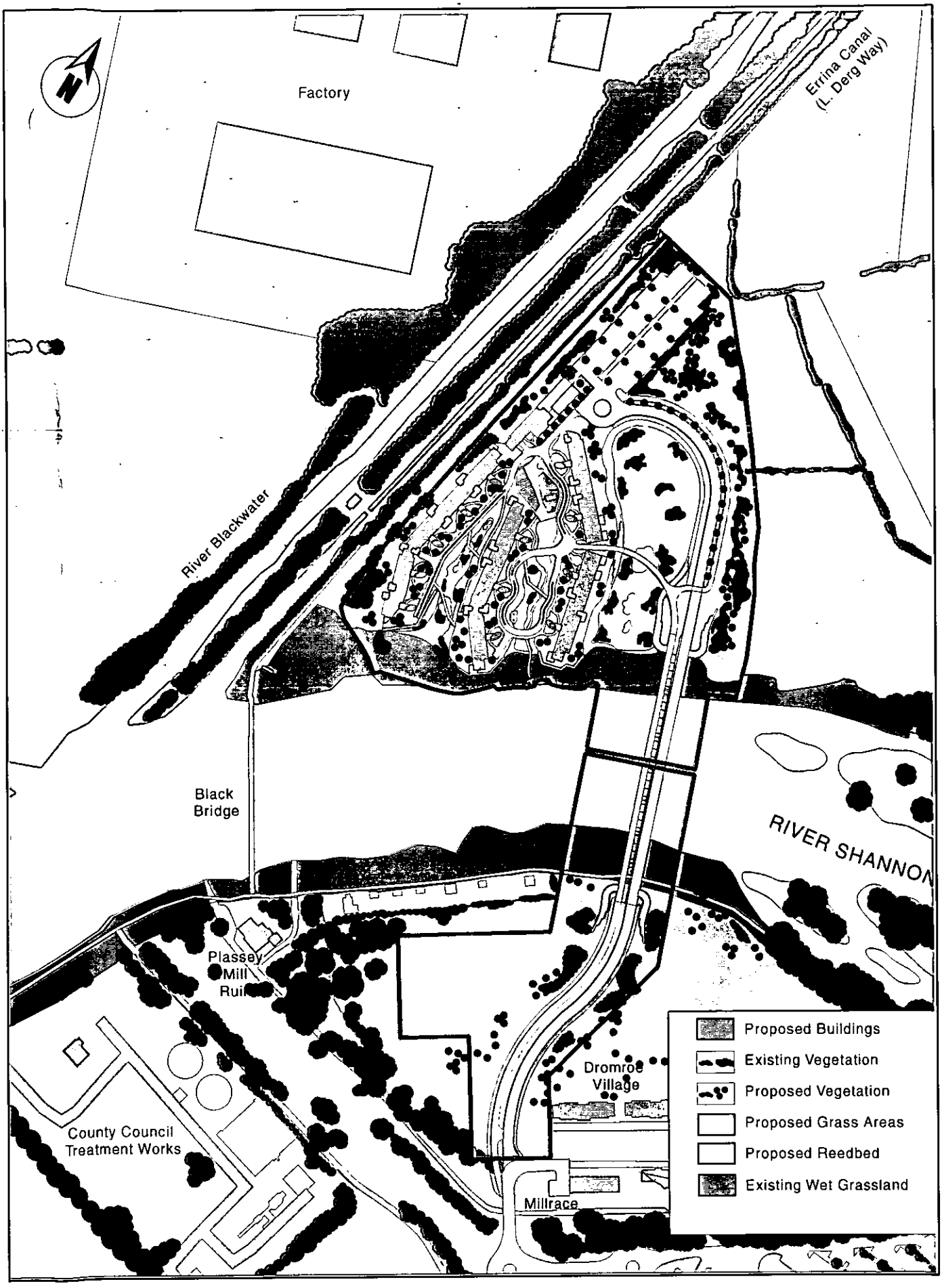

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Landscape Masterplan

Student Village, River Shannon Bridge and Access Road EIS

Job No: D2387/11

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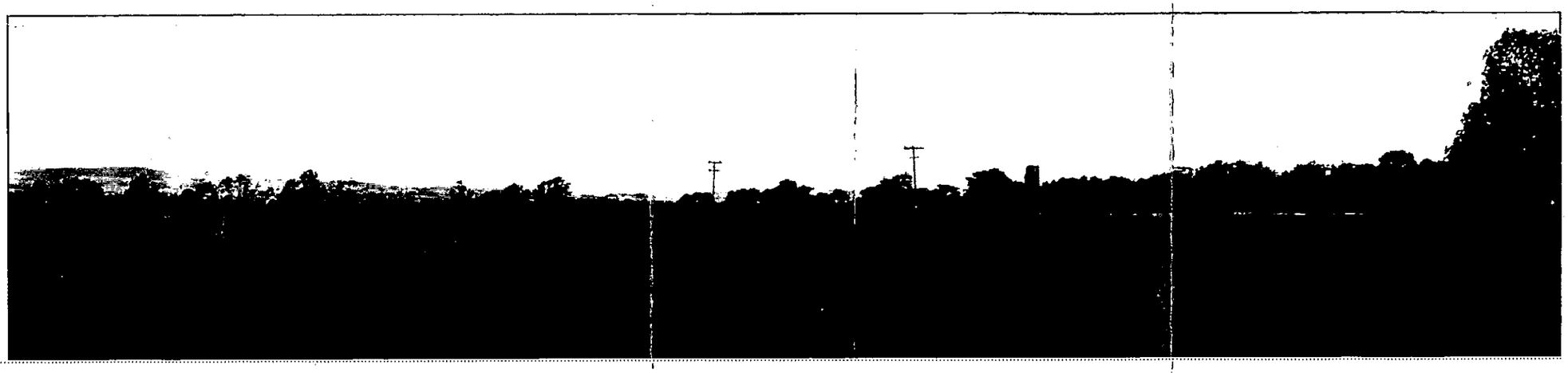

Photo View 1

Photo View 2

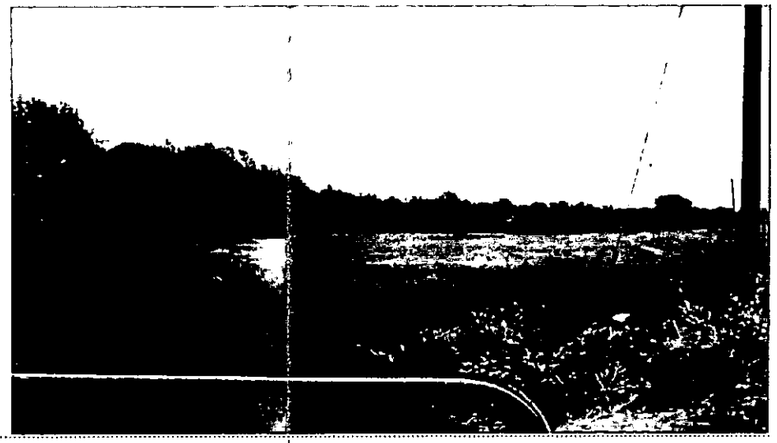

Photo View 3

Photo View 4

Photo View 5

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Photo Views 1 - 5

Student Village, River Shannon Bridge and Access Road EIS

Job No: D2387/11

Figure No: Figure 5.5

Photo View 6

Photo View 7

Photo View 8

Photo View 9

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Photo Views 6 - 9

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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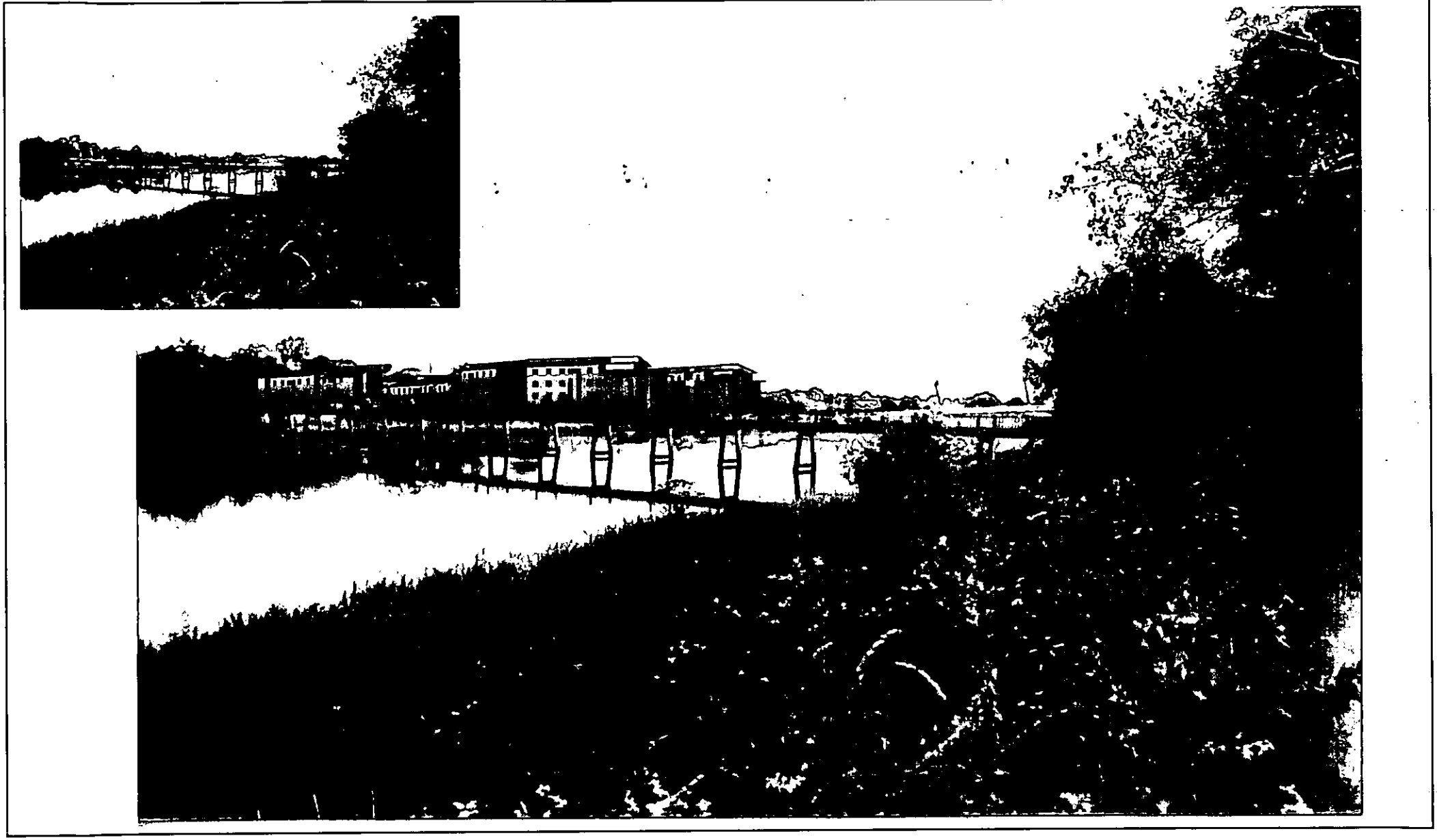

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Photomontage View A (with existing view inset)

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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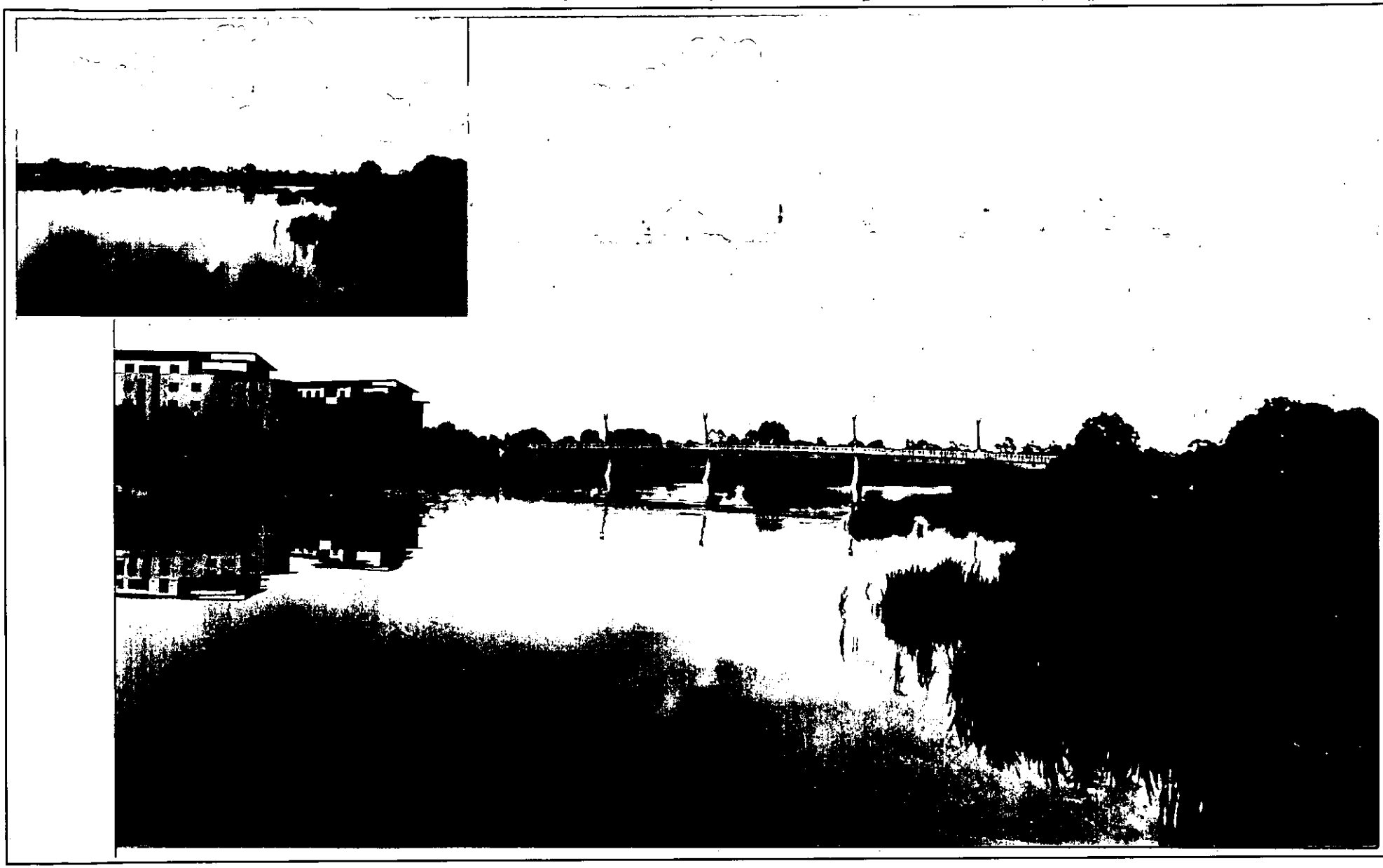

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Photomontage View B (with existing view inset)

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 5.8

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Photomontage View C (with existing view inset)

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Student Village, River Shannon Bridge and Access Road EIS

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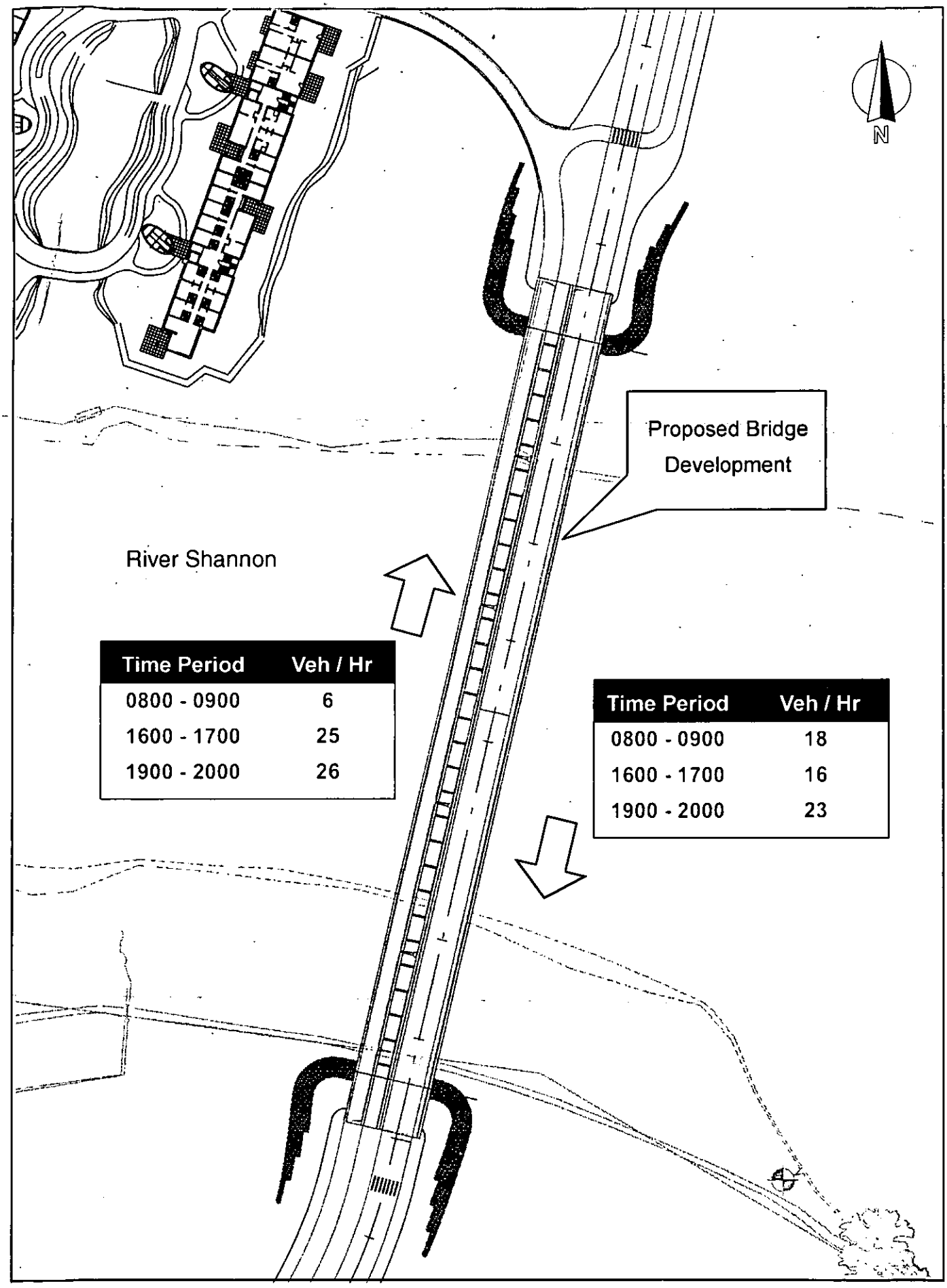

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Peak Hour Traffic Flows

Student Village, River Shannon Bridge and Access Road EIS

Job No: D2387/11

Figure No: Figure 6.1

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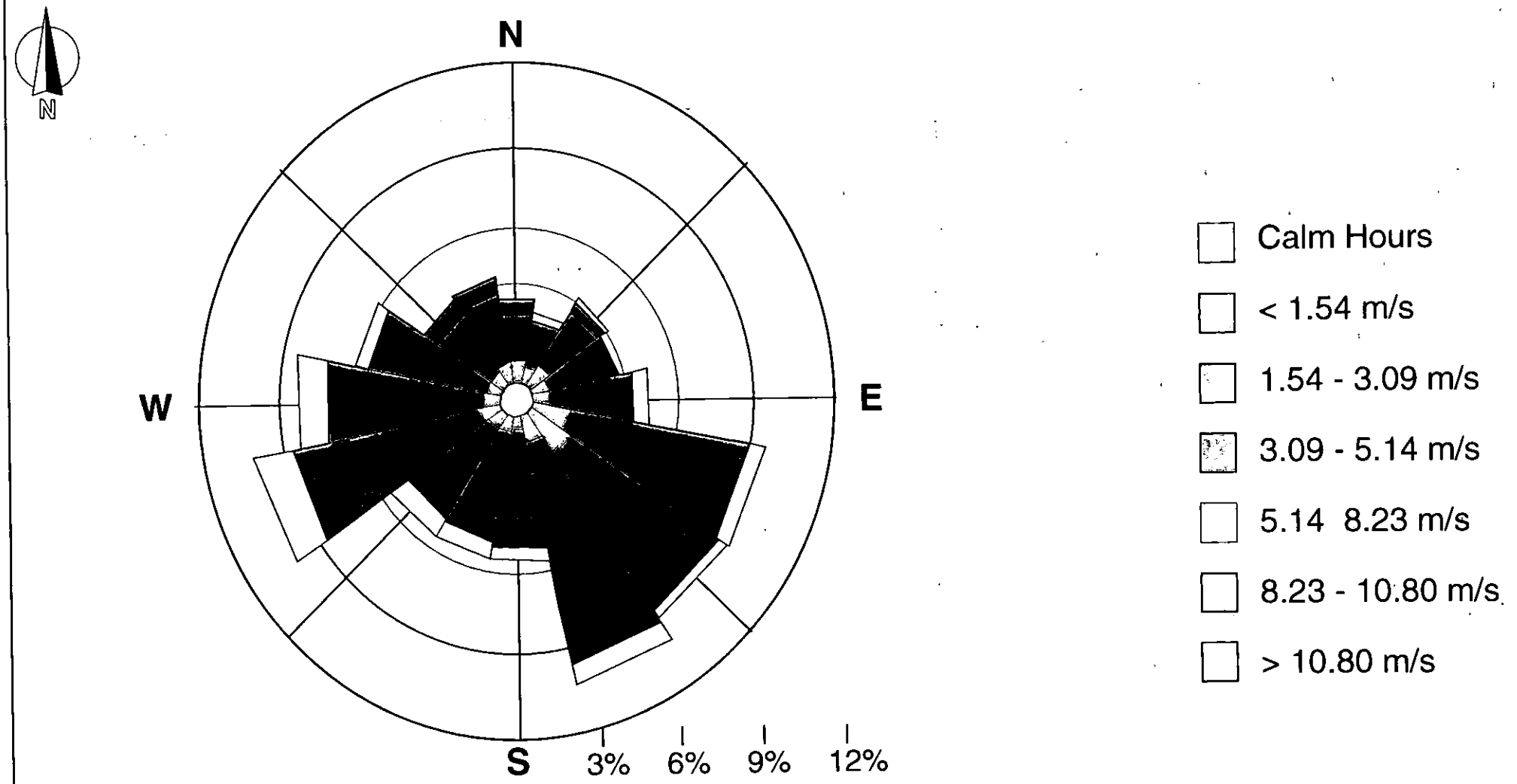
Ambient Noise Monitoring Locations

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 7.1



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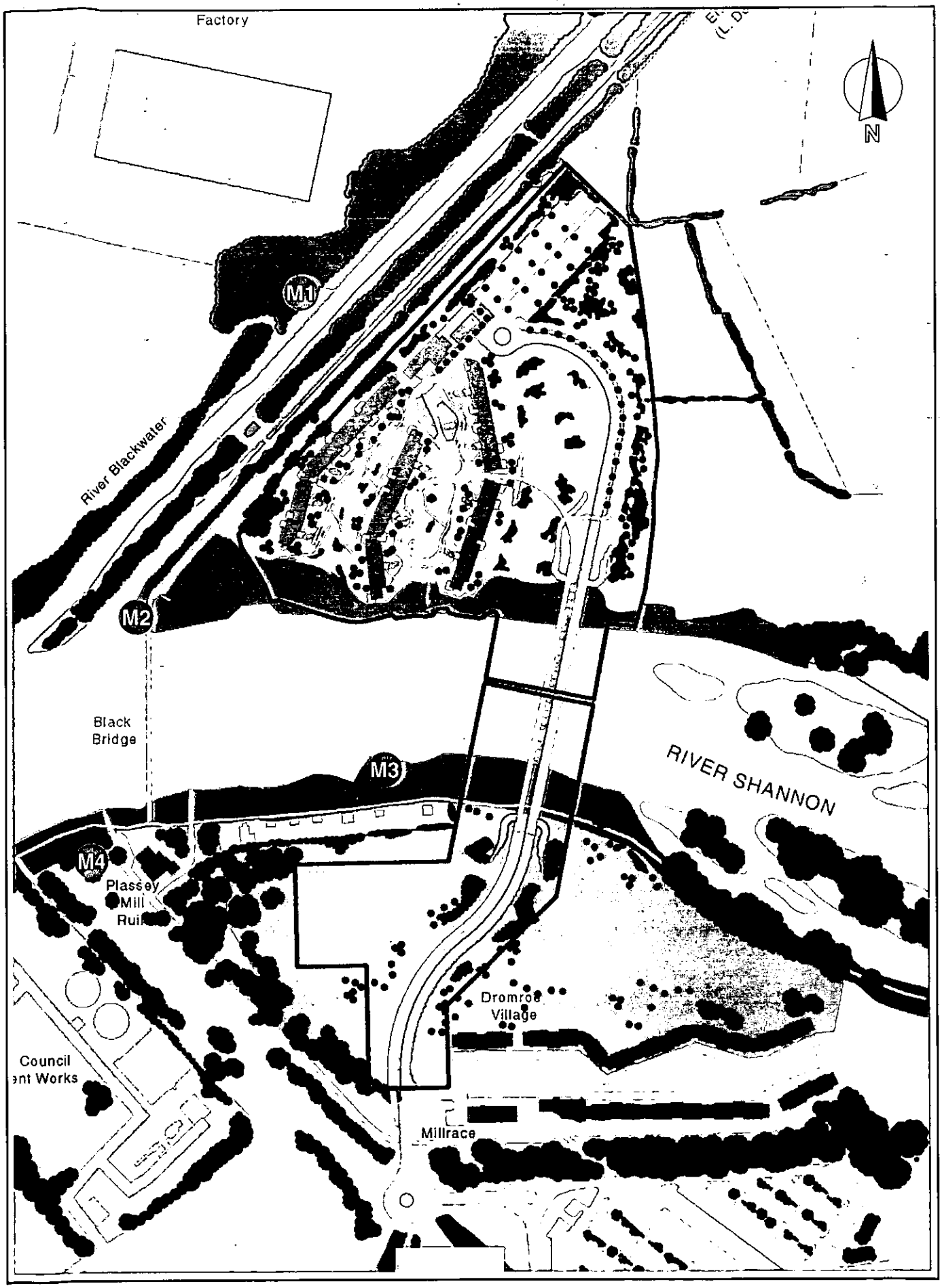
Windrose for Shannon Airport 1997

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 8.1



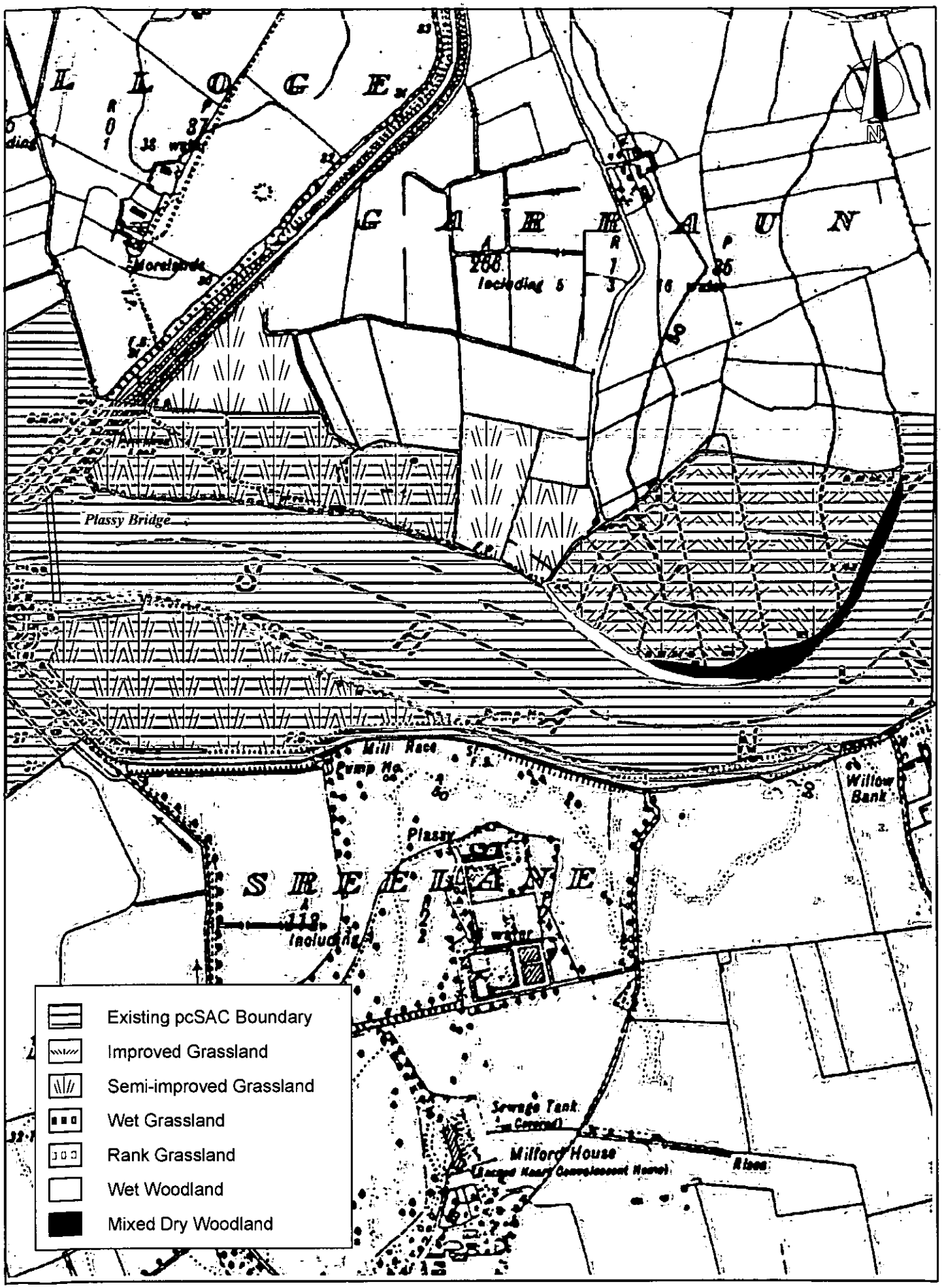
ARUP
Consulting Engineers

Air Quality Monitoring Locations

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 8.2



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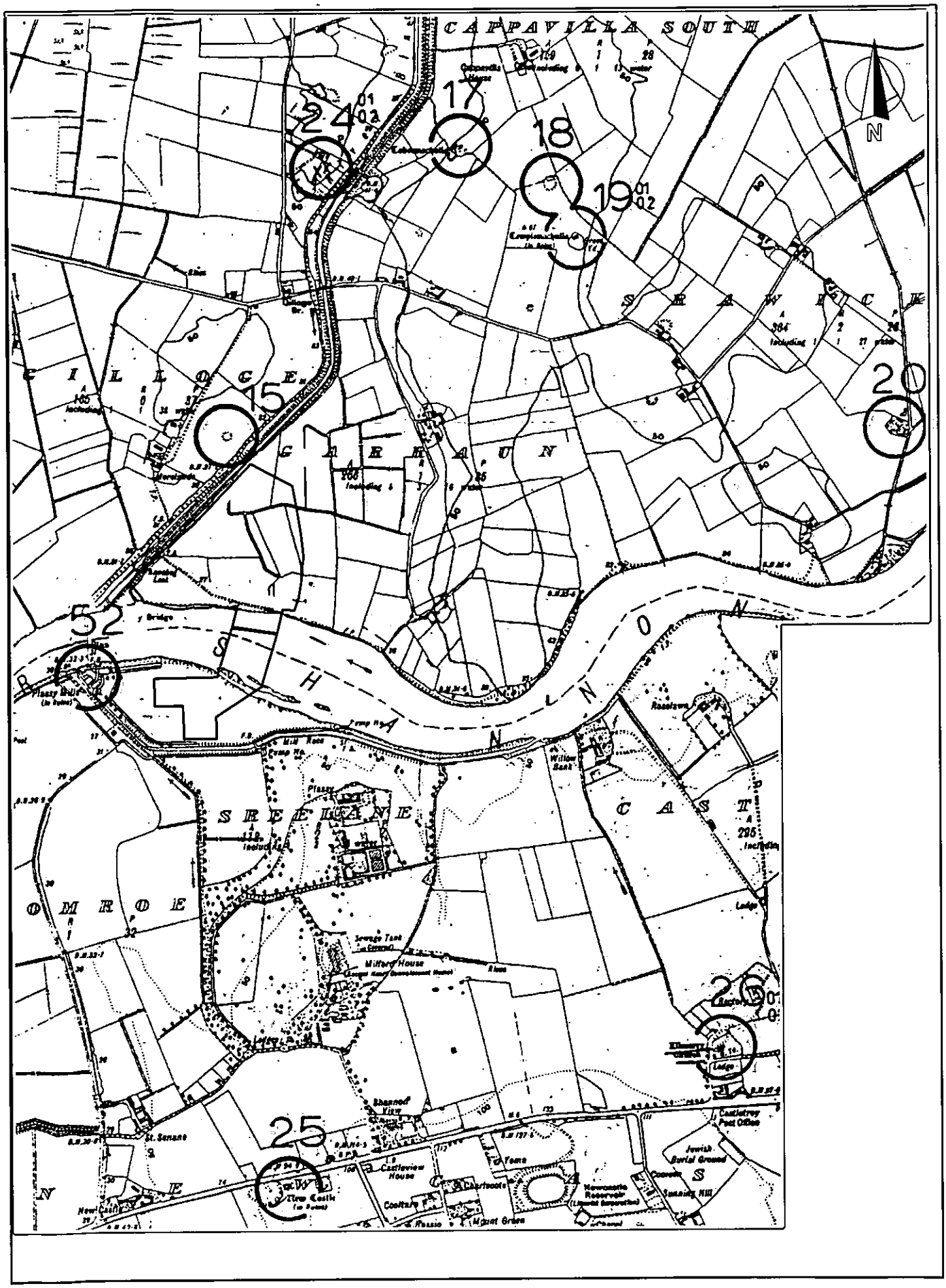
Habitat Map

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 9.1



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Sites of Archaeological Interest

Student Village, River Shannon Bridge and Access Road EIS

Job No: D2387/11

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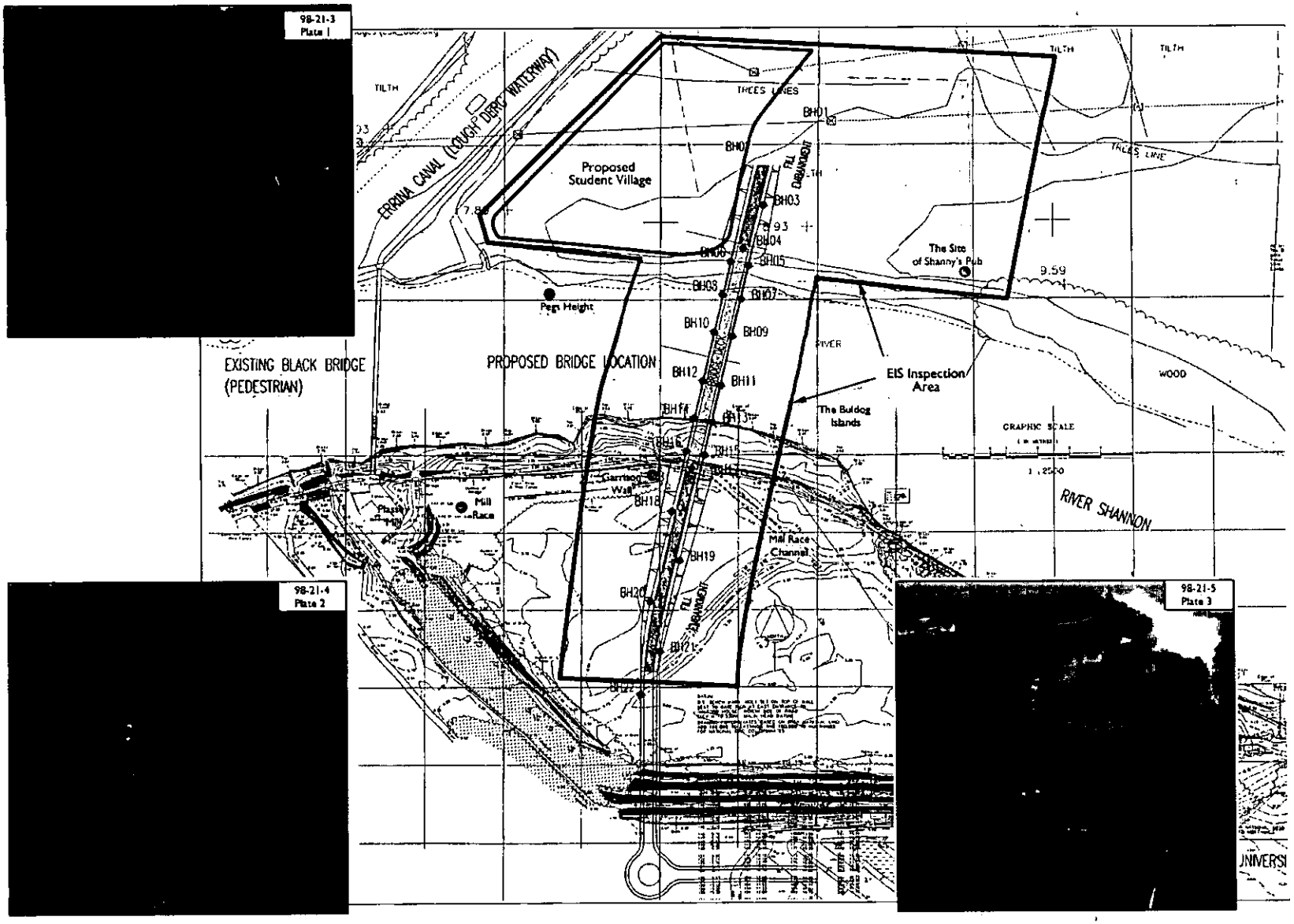

ARUP
Consulting Engineers

Archaeological EIS Field Inspection Area

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

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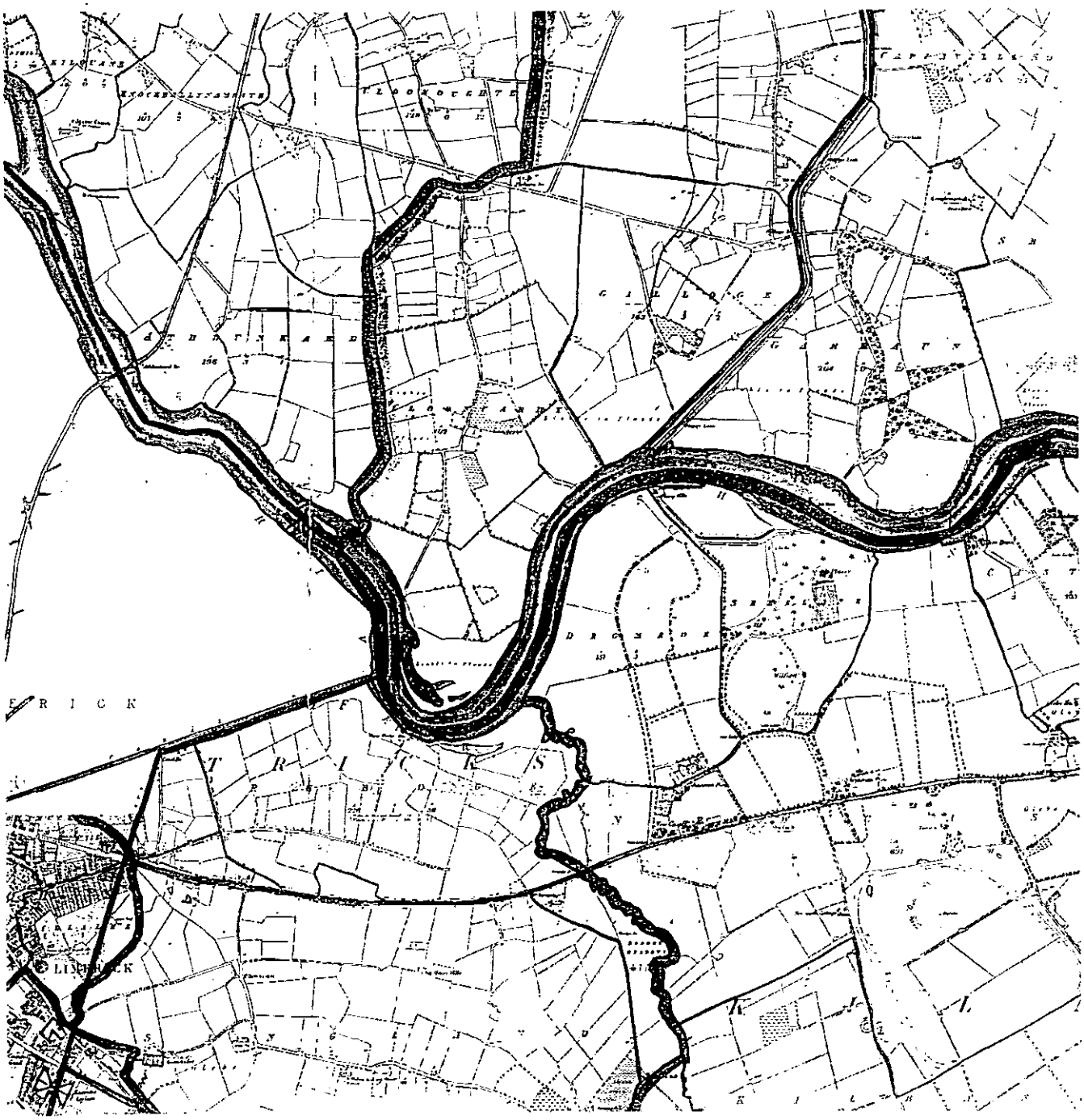

ARUP
Consulting Engineers

Ordnance Survey First Edition

Job No: D2387/11

Student Village, River Shannon Bridge and Access Road EIS

Figure No: Figure 14.3

APPENDICES

APPENDIX A

SPECIALIST SUB-CONSULTANTS

Aero Maps Ireland; Aerial Photography

AWN Consulting; Air Quality and Noise

Brady Shipman Martin; Landscape and Visual Effects

Digitech 3-D; Photomontages

ESB International; Flood Study

Margaret Gowen & Company Limited; Archaeology

Natural Environmental Consultants; Flora & Fauna

APPENDIX B

Macroinvertebrates Collected from the River Shannon at Plassey

	SAMPLING STATION 1 (S1)	SAMPLING STATION 2 (S2)
Baetis rhodani	3	2
Baetis other	2	2
Ephemerella ignita	13	65
Caenis sp.		10
Ecdyonurus venosus	1	5
Cased Caddis		
Limnephilidae	6	6
Uncased Caddis		
Wormaldia	3	
Psychomyidae		5
Hydropsychidae	43	1
Diptera larvae		
Chironomidae	5	84
Ceratopogonidae		1
Simulium sp.	17	6
Dicranata	1	
Beetle larvae		
Elmis sp	30	3
Haliplus ruficollis		8
Limnius sp	4	
Beetle adults		
Elmis sp	11	3
Dytiscus sp	1	
Crustaceans		
Ascellus aquaticus		2
Gammarus duebeni	13	50
Molluscs		
Bithynia	16	
Planorbidae	1	
Lymnaea	11	2
Ancylidae	1	
Sphaeridia sp.		6
Oligochaetae		50
Hirudinea		
Glossiphonia heteroclita	1	
Hemiptera		
Aphelocheirus montandoni	2	2
No. Taxa	21	20
Total Abundance	185	334
Simpson's Diversity Index	5.73	6.81
Berger-Parker Diversity Index	4.30	3.98
EPA Q Value	**Q 3 - 4**	**Q 3 - 4**

APPENDIX C

Archaeological Sites and Stray Finds

Archaeological sites are generally classified for the purpose of impact assessment in such a way that their importance in the archaeological record is suggested (see Table B). An *Area of Interest* is suggested for each site. This is a zone of archaeological potential around the known extant remains in which related archaeological features are likely to occur.

The SMR sheets, which are relevant to the proposed development, are sheet 5 and sheet 63 for County Limerick and County Clare respectively. The numbers used to identify the sites are those of the Sites and Monuments Record. The sites are numbered according to the O.S. 6-inch sheet on which they are located, so that Site No. 017 on O.S. 6-inch sheet 008 is listed as 017:008 (Figure 14.2).

There are no recorded monuments within the area of the proposed development, the closest site being SMR 063:015 found *c.*50m from the perimeter of the study area. Known archaeological sites within a 1km radius of the proposed development site are described below.

In some cases no additional information or descriptions are available from the Sites and Monuments Records. This usually indicates that the Archaeological Survey of Ireland has not yet surveyed the site. The Inventory for County Limerick has not yet been published.

County Limerick

SMR No.	005:024	**Townland**	Reboge
Site Type	Earthwork	**NGR**	Not given
Classification	C	**Area of Interest**	30m

Distance Over 1km southeast of the proposed student village

Description The site is not marked on the first edition Ordinance Survey map; it is however hachured on the 1903 edition. In the third edition it is unmarked. No further details were held on file.

SMR No. 005:025 **Townland** Newcastle
Site Type Tower House **NGR** 16124/15734
Classification C **Area of Interest** 20m
Distance Over 1km south of the proposed student village
Description This site is marked on the first and second editions and as 'Newcastle In Ruins' on the 1938 edition. Situated on a prominent high ridge to the east of the city, it is a large sixteenth/seventeenth-century rectangular building, 18.65m by 9.8m, of four floors with a wall walk above. It is built of limestone rubble with dressed quoins but the west end is missing where the outcrop, on which the quarry stands, has been quarried away. The east wall has a single gable while the north and south walls will have three gables each with a large chimney.

SMR No. 005:026/01-02 **Townland** Newcastle
Site Type Church & Graveyard **NGR** 6231/15764
Classification C **Area of Interest** 10m
Distance Over 1km south of the proposed student village
Description The church is not marked on the first, second or third editions of the Ordnance Survey; however, the graveyard is marked on all editions. The church and graveyard is Church of Ireland.

SMR No. 005:052 **Townland** Shreelane
Site Type Watermill **NGR** Not given
Classification C **Area of Interest** Undefined
Distance *c.*200m southwest of the proposed student village
Description Marked '*Plassey mills*' on the 1841 Ordnance Survey map, '*Plassey mills (Corn)*' on the 1903 edition and '*Plassey Mill (in Ruins)*'on the third edition.

County Clare

SMR No. 063:015 **Townland** Gilloge
Site Type Enclosure **NGR** Not Available
Classification D **Area of Interest** 10m
Distance *c.*50m west of the proposed area, across the canal

SMR No. 063:017 **Townland** Cappavialla South
Site Type Holy Well **NGR** 16174/15988
Classification D **Area Of Interest** 10m
Distance *c.*200m north of the proposed student village
Description Marked on the first edition and named '*Tobermochulla*' on the 1938 edition. The well is dedicated to the patron of the church. The well has been loosing its character for sanctity, due to its being eclipsed by the more sacred fountain of Saint Senan.

SMR No. 063:018 **Townland** Garraun (Tulla Lwr)
Site Type Enclosure **NGR** 16195/15977
Classification C/D **Area of Interest** 30m
Distance *c.*580m north-northwest of the proposed student village
Description Marked on the first edition and shown as partially hachured in the 1938 edition.

SMR No. 063:019/01–2 **Townland** Garraun (Tulla Lwr)
Site Type Church & Graveyard **NGR** 16205/15966
Classification C **Area of Interest** 20m
Distance *c.*550m north-northwest of the proposed student village
Description Marked in the first edition and named 'Tempochulla' on the 1938 edition. Described as a late fifteenth-century ruin '28 feet of the south wall and 18 feet of the north remain; the south window is of the late fifteenth century, with a champfered angular head cut out of one block. The founder, probably St. Mochulla of Tulla'. The graveyard is also marked on the first edition, and shown as a 'Graveyard' on the 1938 edition.

SMR No. 063:020 **Townland** Srawickeen
Site Type Enclosure **NGR** 16285/15915
Classification C/D **Area of Interest** 30m
Distance Over1km east of the proposed development
Description It is marked on the first edition, and hachured on the 1938 edition.

SMR No. 063:024/01 **Townland** Derryfadda
063:024/02
Site Type Potential site, Enclosure Poss **NGR** 16135/15893
Classification G **Area of Interest** 30m
Distance Over 1km west of the proposed development
Description 063:024/01 was not marked on the first or third editions of the O.S. maps, but described as a possible ring barrow identified from aerial photographs. 063:024/02 was also not marked, but is said to be very well designed and possibly bivallate. 01 is located immediately northeast of 02.

The following stray finds are recorded by the National Museum of Ireland:

Townland Sreelane
County Limerick
Find(s) Two Roman Coins
Gallic Usurper
Acquisition Found with a metal detector and donated to Limerick Museum
Description The Roman coins were possibly contemporary forgeries from an unofficial mint, marked on both with *Antoniaini of Tetricus c. 270.*

Archaeological and General Historical Background

Limerick City and Environs

The town of Limerick was founded by the Vikings in the early tenth century and formed one of the five major Viking coastal towns; the other urban centres were at Dublin, Cork, Waterford and Wexford (Edwards 1990). The establishment of a permanent centre at Limerick represented a general shift from an emphasis on continual raiding of the Shannon basin to a more permanent nucleated settlement. A base or fortification was established as early as AD 845 on Lough Ree (Edwards 1990). However, it was during the following century that the Norse king, Tamar, set up a base at Limerick on the easily defended island (later to become known as 'Kings Island') formed by the Abbey River. The historical sources suggest that, as with other major Viking towns in the tenth century, the Viking settlement at Limerick was based on a pre-existing settlement centre in the form of a sixth-century church (perhaps a monastery) dedicated to St. Munchin (O'Rahilly 1995). Although the location of this early ecclesiastical centre is not known for certain, it was probably close to the modern day St. Munchin's, north of Thomond Bridge, with the *longphort*, or Viking naval base, situated further south. Initially, the Limerick Vikings, or Hiberno-Scandinavians, functioned as a separate kingdom from Dublin; however, after a defeat at Lough Ree in 937, they became subject to Dublin rule.

Dublin's dominance of Limerick was short-lived, however, and by 967, the city was under the control of the Ua Briain, a powerful Gaelic dynasty that controlled Limerick for the next 230 years. In 1101, Muircheartach Ua Briain moved his palace from Kincora in Killaloe to the centre of Limerick, where he reputedly built a dwelling on the *thingmote*, or assembly mound of the Vikings (Bradley; O'Rahilly 1995). The Ua Briain remained in control of Limerick until the coming of the Anglo-Normans (Otway-Ruthven 1980, 154).

Indeed, Limerick was one of the last towns to fall to the Anglo-Normans, who invaded Ireland in 1169. The city did accept a constable of Henry II as early as 1171, and in 1172, Domhnall Mor Ua Briain submitted to Henry II, leading to the establishment of a garrison at Limerick by Raymond le Gros (O'Rahilly 1995). However, the town was then entrusted to Domhnall, who promptly burnt it, and as a result, the Anglo-Normans did not begin to gain control of Limerick until after Domhnall's death in 1194.

Limerick developed as a walled Anglo-Norman town in much the same way as Dublin. Both were reserved to the crown and formed part of the vast demesne lands of the king. Like Dublin, Limerick received various charters and privileges and a strong stone castle was built to defend the town. In addition, various religious orders were established within and around the town. By the early-fourteenth century, the southern suburb, on the other side of the Abbey River, had developed as a separate entity known as Irishtown, which was presumably where the Gaelic people lived. This area was walled, or partially walled, as early as 1310 (O'Rahilly 1995).

The modern boundary of County Limerick in its present form does not have any basis in history. It may perhaps be defined as oldest 'Thomond' or North Munster, but by about AD 380, Thomond had been extended far to the north of the Shannon by the conquests of the warlike kings of Munster, Lugad Meann and his son, Conall Eachluath. The area under study lies mostly within the barony of Clanwilliam. It has no single historical predecessor; a part of it formed the tribe land of the Tuath Luimneach. O'Huidhrin described it, in 1420, as the *'Smoothest of plains in the grassy territory of Ui g conaig, a bright watered plain of the noblest aspect, by the meadowy side of Craobh-Cumhráidhe'* (Westropp 1906). It was called Clanwilliam, after the Burkes, in 1466.

Plassey

Following his contribution to the conquest of India, Robert Clive, an English military adventurer, was awarded the Irish title *Baron of Plassey, County Clare, Ireland,* for his victory in the decisive battle of Plassey, Calcutta, in 1757, resulting in the establishment of the Indian Empire. To be eligible for his title he was obliged to buy an estate in Ireland, so he secured a disjointed Irish estate in County Clare and County Limerick that consisted of several thousand acres and the townlands of Annaghbeg, Dromore, Gurrane, Rivers and Shravokee. This area became known collectively as Plassey (Hannon 1979; Spellissy 1998).

Clive purchased the Ballykilty Estate (now the lands of the University of Limerick) from Thomas MacMahon, and renamed it Plassey after his famous Indian victory. Plassey House still stands today, a two-storey Victorian Italiante building built for the Russell family in 1863. It is said that it retains some of the features of the original house known as Ballykilty Manor, owned by the Maunsell family. The Maunsells created a sylvan landscape; they planted the estate with beech and chestnut trees, harnessed the river to create a waterfall, and built a mill in the 1820s (SMR 005:052) at the western boundary of the estate, the millrace of which ran through the demesne. Subsequently, the Russell family as mentioned above, constructed a new house and improved the closed Maunsell Mill by adding a turbine. Plassey Demesne had many conscientious owners who maintained and developed the estate i.e. the Campbell, Harvey, Bailey, and Keating families. However, in the 1960s an institution acquired the Plassey estate and felled a considerable number of trees which were, at the very least, 150 years old. The current owners of the land retained and maintain the surviving trees (Hannon 1979; Spellissy 1998; Bence-Jones 1978).

The Shannon Navigation Company constructed what was known as Black Bridge, connecting the lands of Plassey on either side of the river in the late 1830s. It was reconstructed in 1949. Formerly, a horse-ferry transported people to and fro; this ferry was protected from the strong river currents by a buttressed bulwark otherwise known as the Garrison Wall. It also protected the ferry-operator's house (no longer extant) on the Clare side of the estate (Spellissy 1998).

Hannon (1979) portrays Plassey as a 'Mecca for fishermen, boatmen, artists, nature-lovers, picnickers and riverside strollers'. Two Shanny sisters (the daughters of a fisherman) established Shanny's Pub, located on the Clare side of the River, and just a few yards downstream from Black Bridge (Figure 14.2). The pub stood for one hundred years and was very much a part of the delights of Plassey (Hannon 1979; Spellissy 1998).

Shannon Estuary

An important feature within the study area is the River Shannon. Both the Limerick and Clare County Councils in their respective development plans (1999) have assigned the Shannon Estuary as a *Special Protection Area* and *Natural Heritage Area.*

The archaeological potential within an estuarine environment has been amply demonstrated by the work of the Discovery Programme (O'Sullivan 1993, 1996) and of others working in estuarine and inter-tidal zones. The archaeological survey on Irish inter-tidal zones began in 1992 in the Shannon and Fergus estuaries and involved systematic field walking and recording of a range of wooden structures on the estuaries' muds, along with some submerged pine forests and a dug-out boat. These field surveys "confirmed that a landscape previously untapped by Irish archaeology lies waiting to been explored" (Archaeology Ireland 7:2 1993, 18). This research was undertaken as part of the Discovery Programme and has shown that the frontier between freshwater and the open sea "is one of the most bountiful natural environments in Ireland" (Archaeology Ireland 9:1 1995, 8) with survey work on the upper Shannon estuary leading to the discovery of important archaeological deposits.

Even one season of research was enough to confirm that "archaeological material survives on the mudflats and saltmarshes of the Shannon, and clearly further discoveries are inevitable" (Discovery Programme, Report 1, 1993, 67). Such important archaeological remains are enough to show that, while ignored formerly, the Shannon Estuary is an area of intense archaeological interest capable of producing evidence relating to the archaeological development of the wider area.

Cartographic evidence

Henry Peltram's Map Of Limerick
This 1787 sparse representation shows Milford House located south of the original Ballykilty (Plassey) House. This house was the home George Maunsell of Milford, a Limerick Banker. The horse-ferry would have been in use at this time to carry people across the Shannon.

Ordnance Survey first edition, 1842
This early map edition hints at the former grandeur of Plassey House, gardens and mill. A gate lodge with its own gardens stands at the entrance gate and a tree-lined avenue leads to the house. Ornate gardens to the rear of the house can be clearly made out. Plassey mill and millrace is located to the northwest. Black Bridge crossing the Shannon is marked as *Metal Br.* The Clare side of the river consists of irregularly shaped large fields and it states that they are in an area *liable to floods.* Plassey Lock is clearly indicated (Figure 14.3).

Ordnance Survey Third Edition (Revised Current), 1938
The metal bridge is now marked *Plassey Bridge* and Plassey mill is described as being in ruins. Buildings and a yard have replaced the picturesque gardens of Plassey House, Milford House and its additions are the *Sacred Heart Convalescent Home.* On the Clare side of the river the field boundaries have changed considerably, having been subdivided to a number of smaller fields (Figure 14.1).

Table C: Archaeological Impact Classification Table

EPA Impacts	Impact Level	Criteria for EIS	Category	Status	Implications
Profound or significant, (negative effect only)	Severe	Reserved for adverse effects only. Applies where mitigation would be unlikely to remove such effects. The effects are generally but not exclusively associated with sites and features of international or national importance	A	National Monument	Sites must be avoided
Significant impact, (positive or negative)	Major	Important considerations at a national to regional level. If adverse, they have the capacity to become key components in the structuring of the project. Mitigation measures are unlikely to remove all effects upon the affected communities or interests	B	Nationally important site/ or very rare in the archaeological record	Sites must be avoided
	Moderate	Represents issues where mitigation measures and detailed design work may ameliorate/enhance some of the consequences upon affected interests. If adverse, they are important but not likely to be key decision makers on the EIS. The effects can be mitigated.	C	Extensive, well-preserved sites (ringforts, castles, churches, graveyards, burial mounds) not necessarily rare in the archaeological record	Sites should be avoided, if possible. All archaeological investigation work should take place pre-development well in advance of construction
			D	Sites similar to those in category C, but not as well preserved or extensive	Avoidance is recommended. If not an option, full archaeological excavation ensuring preservation by record would be required. Archaeological work should be conducted at the pre-development stage
			E	Historical Building Sites, post 1700AD and industrial buildings and/or structures.	Archaeological/architectural building survey. Sites are assessed by survey and photographic and historic record. To take place at the pre-construction and/or construction phase
			F	Low visibility sites/features, i.e., fulachta fiadh, souterrains/ lithic scatters	Archaeological investigation/excavation prior to the construction phase. If archaeological material is found, full excavation or avoidance can then be cited
	Minor	Not significant in the decision making process. Can be of relevance to the subsequent design of the project	G	Sites of sites, destroyed or delisted, marked on the OS, or known from documentary sources	Area needs to be archaeologically assessed in the field. Sometimes monitoring is required during the construction phase
	Unknown		UC	Sites of possible archaeological potential but of unquantified extent and significance	Trial excavations for a detailed assessment would be required and a full excavation may be recommended. To take place pre-construction
Neutral or slight Impact	Not significant	The forecasting framework cannot envisage any effect on the environment	N/A	N/A	An area of archaeological potential must be observed around all sites

National Monuments Legislation

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

In the 1987 Amendment of Section 2 of the Principal Act (1930), the definition of a national monument is specified as:

> any artificial or partly artificial building, structure or erection or group of such buildings, structures or erections,
>
> any artificial cave, stone or natural product, whether 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,
>
> any, or any part of any, prehistoric or ancient
>
> (i) tomb, grave or burial deposit, or
> (ii) ritual, industrial or habitation site,
>
> and
>
> any place comprising the remains or traces of any such building, structure or erection, any 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):

> It shall be unlawful...
>
> 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
>
> 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...

Under Amendment to Section 23 of the Principal Act (1930),

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

The latter is of relevance to any finds made during a watching brief.

In the 1994 Amendment of Section 12 of the Principal Act (1930), all the sites and 'places' recorded by the Sites and Monuments Record of the Office of Public Works are provided with a new status in law. This new status provides a level of protection to the listed sites that is equivalent to that accorded to 'registered' sites (Section 8(1), National Monuments Amendment Act 1954) as follows:

> 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.
>
> The Commissioners shall cause to be exhibited in a prescribed manner in each county the list and map or maps of the county drawn up and publish in a prescribed manner information about when and where the lists and maps may be consulted.
>
> In addition, when the owner or occupier (not being the Commissioners) of a monument or place which has been recorded, 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.