At this planning stage, final details are not available on the works on the channel crossing at Carrigaloe. The possible options include open cut and tunnelling. In either case, it can be assumed that there will be shore-based works, which will generate noise. In the case of the open cut option there would also be noise emitted from the works on floating platforms in the channel. An additional consideration is the question of tidal restrictions, which may require works to be carried out outside the normal daytime construction periods on occasions. Noise emissions form these works will be subject to the construction noise limits set out in section 3.1.1.

3.2.4 VIBRATION

In carrying out this assessment, it is assumed that there will be no blasting carried out.

Taking account of the nature of the likely excavation works for the sewerage pipes, such as excavation and rock breaking, it is expected that the resulting vibration levels at nearby properties will be comfortably within the vibration limits for protection against cosmetic damage (set out in Table 10), and in terms of nuisance, are likely to be imperceptible.

3.2.5 CONSTRUCTION TRAFFIC

At this planning stage, precise details are not available on construction traffic volumes. Additional traffic noise can however be expected on haul routes to the treatment plant site, and along the sewer pipeline routes.

Based on a nominal assumption of 10 vehicles per hour travelling to/from the work sites, the additional traffic noise generated at a house at 10m from the road is expected to be approximately 55 dB(A). This is a relatively low level of traffic noise, and would have only a slight impact.

3.3 OPERATIONAL PHASE NOISE IMPACT

3.3.1 NOISE PROPAGATION MODEL

A computer noise propagation model was developed for the proposed waste water treatment plant. The model is based on the calculation procedures of ISO 9613. For noise modelling purposes the overall continuous plant and process noise emissions from the new plant are assumed to be limited at source and/or screened, such that the resulting noise level at a reference distance of 20m from the plant boundary is at the proposed design noise criterion of 45 dB(A). For additional work activities and vehicles operating within the site during daytime, the overall noise emissions are assumed to be limited to the daytime noise criterion of 55 dB(A) at 20m from the boundary.

3.3.2 NOISE EMISSIONS FROM WWTP

The calculated operational noise levels, and noise impact assessment for the daytime and nighttime periods, are presented in Table 14. The calculated noise levels for the operational WWTP are illustrated as a noise map in Figures 6 and 7 for nighttime and daytime operation respectively.

Daytime Noise Impact

For daytime operation of the WWTP, including daytime work activities and vehicle movements within the site, the projected additional noise levels due to the WWTP are in the range 34 dB(A) to 45 dB(A) at the noise sensitive locations considered. These additional noise levels are all comfortably below the EPA daytime noise limit of 55 dB(A).

At the nearest lands zoned residential to the east of the site, the ambient noise level is calculated to increase by 2 dB. This increase is not likely to be perceptible. The daytime activity noise and vehicle movement noise within the site is calculated to exceed the background noise by 4 dB. The noise may therefore be just audible, but is unlikely to be clearly distinguishable from the existing distant traffic noise. The component of continuous noise from the plant and processes at the WWTP (excluding vehicles and daytime works activities) would be in the range 27 to 35dB(A) and would be inaudible. The noise impact at this location is considered to be negligible.

At the other noise sensitive locations, the additional noise from the WWTP, including daytime work activities and vehicle movements within the site, would not result in any change in the existing total ambient noise at the nearest noise sensitive locations, and would be lower than the existing background noise levels. There would be no adverse noise impact at these locations.

At the existing houses to the east, north, south and west, the calculated additional WWTP noise will be 8 to 14 dB lower than the existing steady background noise level, and will be inaudible.

In the sports field to the north east of the site, the daytime noise level is expected to be in the range 40 to 45 dB(A), and will have no noise impact on the amenity of this area.

Nighttime Noise Impact

For nighttime operations, noise emissions from the WWTP are the same as modelled for daytime conditions, and the calculated noise levels at the noise sensitive locations are in the range 24 to 35 dB(A).

These additional noise levels are all in comfortable compliance with the EPA nighttime noise limit of 45 dB(A).

The additional noise at the noise sensitive locations would result in an increase of at most 1 dB in nighttime noise level at the nearest noise sensitive location, which is the land zoned residential 140m to the east. At this location, the WWTP noise would exceed the existing steady background noise by 5 dB, and consequently the noise would be audible at a low level outdoors. Allowing for an attenuation of approximately 15 dB through a partially opened window, the resulting indoor noise level would be 20 dB(A). This is comfortably within the BS 8233 guidelines, and represents an extremely low noise level which is unlikely to be noticeable indoors. The adverse noise impact at this location is considered to be negligible.

At the existing houses to the east, north, south and west, the projected WWTP noise is very low, and in the range 24 to 30 dB(A). The WWTP noise would be between 6 and 11 dB lower than the existing background noise, and would not be audible outdoors or indoors. There would be no adverse noise impact at these houses.

House Locations	Projected WWTP Plant Noise Level L_{Aeq} dB(A)	Existing Noise L_{Aeq} dB(A)	Projected Total Future Noise L_{Aeq} dB(A)	Projected Change, dB (Sound emergence)	Within EPA Limits (55/45 dB(A) day/night)	Comparison with mean background noise [1] L_{A90}	Likely Audibility	Overall Adverse Noise Impact
Daytime								
Lands to east (zoned residential)	**45**	47	49	+2	yes	+ 4 dB	Daytime activities possibly audible at low level outdoors, inaudible indoors	Negligible
Houses to east	**40**	55	55	0	yes	-8 dB	Inaudible outdoors and indoors	None
Houses to north	**39**	62	62	0	yes	-14 dB		
Houses to south	**34**	55	55	0	yes	-8 dB		
Houses to west	**37**	54	54	0	yes	-9 dB		
Nighttime								
Lands to east (zoned residential)	**35**	38	40	+2	yes	+5 dB	Audible at low level outdoors, not noticeable indoors	Negligible
Houses to east	**30**	50	50	0	yes	-10 dB	Inaudible outdoors and indoors	None
Houses to north	**29**	49	49	0	yes	-6 dB		
Houses to south	**24**	48	48	0	yes	-7 dB		
Houses to west	**27**	46	46	0	yes	-11 dB		

Table 14. Predicted noise levels from proposed WWTP, and noise impact assessment

[1] **difference between projected WWTP noise, and the background noise at the assessment location, as given in Table 3**

3.3.3 GROUND VIBRATION DUE TO WWTP

From visits to other waste water treatment plants (including Limerick, Ennis, Kilkenny, Athy, Greystones), it has been found that there is no perceptible ground vibration beyond the site boundaries associated with the operating equipment. At the proposed WWTP site, the nearest sensitive location is 140m to the east. There is unlikely to be any significant potential for audible ground-borne vibration over this distance.

3.3.4 NOISE AND VIBRATION EMISSIONS FROM PUMPING STATIONS

As the pumps and equipment in the major pumping stations will be enclosed within buildings, or located below ground level at the minor pumping stations, the noise sources will be effectively enclosed. In principle any desired degree of sound attenuation can be achieved.

Nighttime background noise levels at the sites of the proposed pumping stations ranged from 32 to 47 dB(A) L_{A90}. A reasonable criterion would be to ensure a noise level of less than 35 dB(A) at the nearest houses, as it was proposed for the noise sensitive locations near the WWTP site itself. For noise sensitive locations closest to the pumping stations at Monkstown and West Beach Cobh, this would correspond to a design noise criterion of 45 dB(A) at 5m from the pumping stations.

Given the proximity of nearby residences to the pumping station at Monkstown and West Beach Cobh, it is prudent to consider the potential for generation of ground-borne vibration, in the audio frequency range, which could potentially give rise to a low pitched audible sound inside the nearby residences.

Such ground-borne hums could be generated by motors, pumps and any other equipment which is in mechanical contact with the ground near a building. Audible ground-borne vibration is readily prevented through incorporation of suitable vibration isolators in the equipment mountings.

Measurements at the existing Church Street pumping station in Carrigaline found that ground vibration levels at 1m from the wall of the pumping station were extremely low, and there was negligible potential for transmission of audible ground-borne vibration to nearby residences. The measured vibration level is presented in Figure 8.

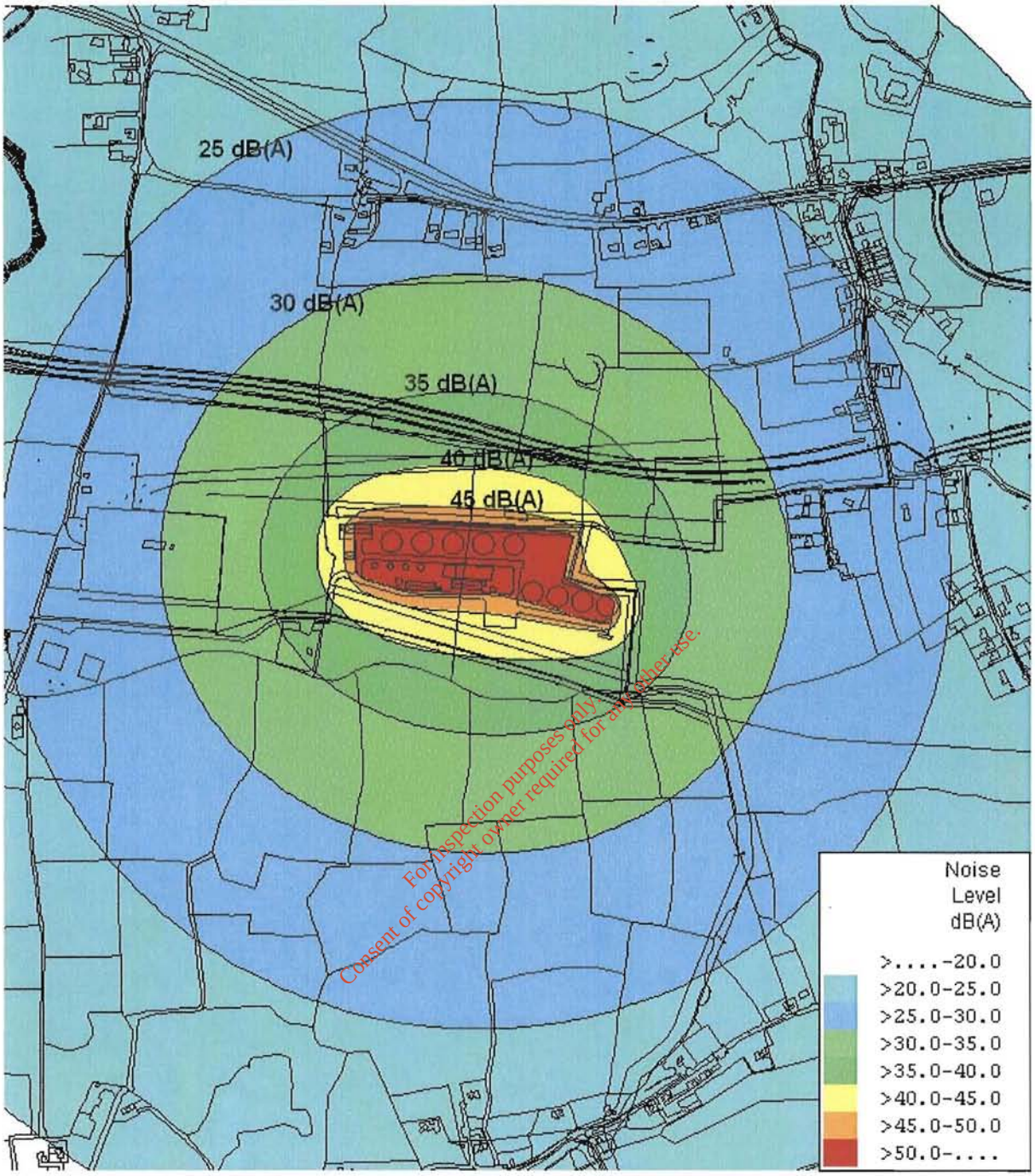

Figure 6. Calculated nighttime noise levels due to the operating WWTP. This noise map was generated using an ISO 9613 noise propagation model, based on a nighttime design noise criterion of 45 dB(A) at 20m from the WWTP boundary. This noise map represents the continuous plant and process noise emissions from the operating WWTP.

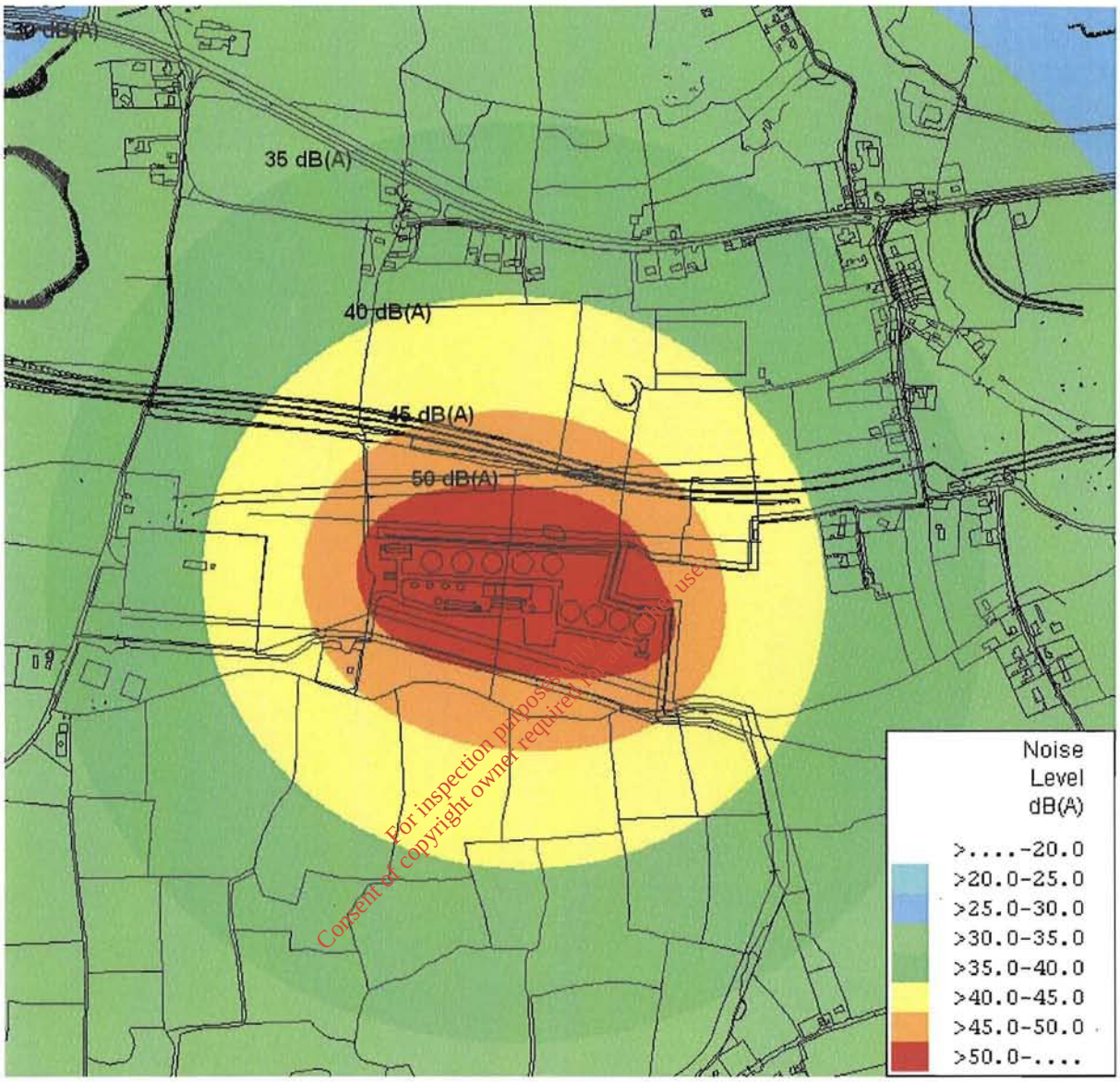

Figure 7. Calculated noise levels due to operating WWTP, during daytime. This noise map was generated using an ISO 9613 noise propagation model, based on a design noise criterion of 55 dB(A) at 20m from the WWTP boundary during daytime. This noise map represents the continuous plant and process noise emissions from the operating WWTP, and includes daytime work activities and traffic on site.

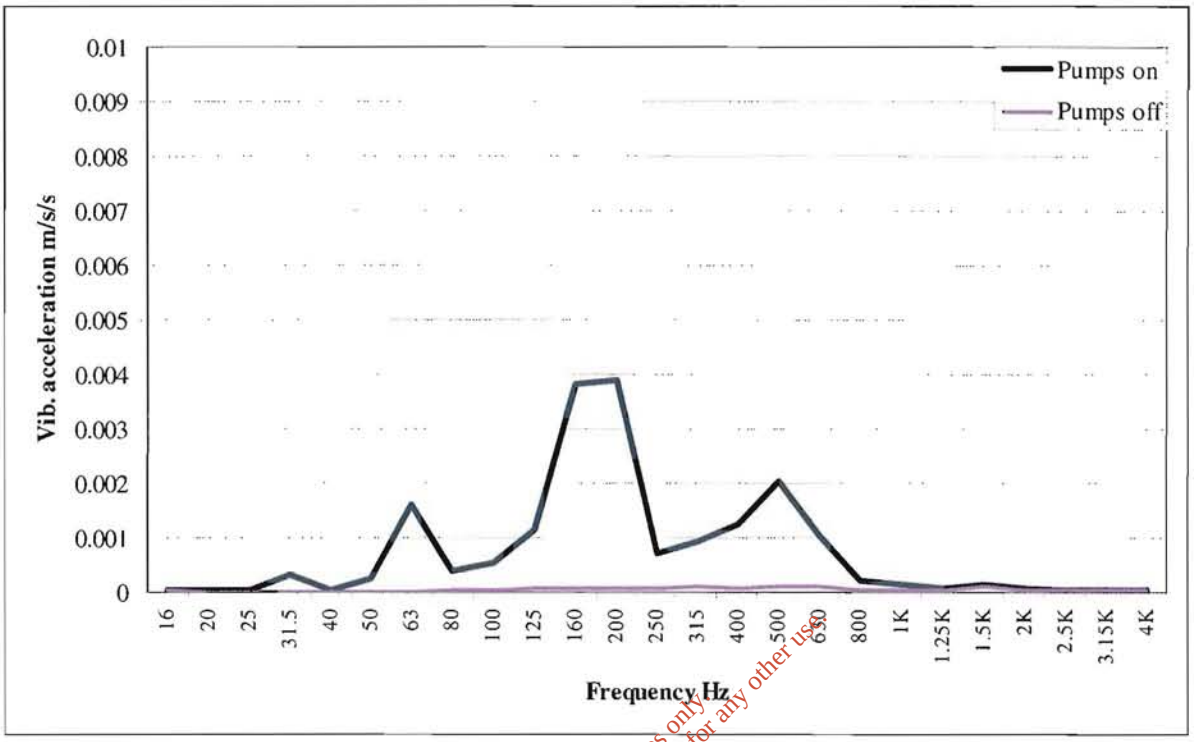

Figure 8. Measured ground vibration level at 1m from existing Church Street pumping station in Carrigaline, which demonstrate very low ground vibration levels, with no potential for transmission of audible sound beyond the immediate vicinity of the station

3.3.5 IMPACT OF OPERATIONAL PHASE TRAFFIC

Detailed operational traffic forecasts were not available at time of preparation of this report. However the estimates of likely site traffic are relatively low, at approximately 10 heavy vehicle movements per day along Cogan's Road to the site, and light staff traffic, which will have negligible impact.

The calculated traffic noise level due to the heavy vehicle movements is 40 dB(A) L_{Aeq} at a distance of 20m from the road. The existing measured traffic noise level was 54 dB(A) L_{Aeq} . The additional traffic noise would not add detectibly to the average traffic noise level.

The noise generated by vehicles moving within the site is calculated to result in a noise level of less than 50 dB(A) at 20m from the site boundary, and will be comfortably within the proposed daytime noise criterion of 55 dB(A) at 20m from the site boundary.

4 MITIGATION

4.1 NOISE MITIGATION DURING CONSTRUCTION PHASE

During the construction phase of the actual WWTP, the potential noise impact during daytime is slight, and no special mitigation measures are likely to be required.

During construction of the pumping stations and during excavation works for the sewer lines, there is potential for exceedence of the standard construction noise criterion of 70 dB(A) on occasions. In accordance with best practice, the noise issues at the sites should be managed in accordance with the recommendations in BS 5228, which should be incorporated into the construction environmental management plan.

- General guidelines for limiting the disturbance which may be applicable for these works are outlined below:

- Limit noisy construction works to 07.00 to 19.00 weekdays with Saturday working from 08.00 – 13.00 hours (relatively quiet construction activities could be carried out outside these hours, subject to strict controls).

- Essential nighttime works, should be subject to a noise limit of 45 dB(A), and carefully assessed and controlled to minimise impact

- Utilise solid timber site hoardings where required to screen sensitive properties.

- Use modern, silenced and well-maintained equipment conforming to applicable EU directives.

- Shut down equipment when not in use, where practicable.

- Site semi-static equipment such as generators, mixers, and compressors as far away as possible from sensitive locations and ensure that the orientation is the optimum for low noise.

- Ensure that all workers are given training with respect to minimising noise and disturbance.

- Noise exposure aspects within the worksites will be managed in accordance with the requirements of Safety, Health and Welfare at Work (General Application) Regulations 2007, SI 299 of 2007.

4.2 NOISE MITIGATION FOR OPERATIONAL PHASE

The assessment of noise impact during the operational phase of the development was based on a nighttime design noise criterion of 45 dB(A) at 20m from the northern, eastern and southern boundaries of the WWTP, and a design criterion of 45 dB(A) at 5m from the pumping stations.

In addition, for the WWTP site, a daytime design noise criterion of less than 55 dB(A) at 20m from the boundary is proposed to ensure negligible noise impact due to daytime work activities and vehicles operating within the site. These design noise criteria represent the specific noise emissions from continuous plant and processes, excluding residual noise from other sources such as traffic.

The achievement of these noise criteria will depend on the appropriate noise specifications and noise controls being incorporated into the detailed acoustic design of the plant. The principal mitigation measures required for the development therefore concern selection of equipment, sound containment, acoustic attenuators, and noise screening, in order to achieve the required design noise criteria.

Any mechanical equipment (such as motors) at the pumping stations, which is considered capable of transmitting significant ground borne vibration in the audio frequency range, should be adequately vibration isolated to ensure that they do not give rise to audible sound at the nearest houses.

Achieving the design criteria will be the responsibility of the developer's design team. The predicted noise levels, as outlined in this report are considered to be readily technically achievable using standard technology and noise control methods. The contractor will be required to demonstrate in advance of construction, using an appropriate methodology, that the design noise criteria will be achieved.

The design noise criteria referred to above, are for engineering design purposes only, and should not be confused with any noise conditions which may be set by the relevant authorities, which would typically be 55 dB(A) during daytime, and 45 dB(A) during nighttime at noise sensitive locations (as opposed to boundaries).

5 RESIDUAL NOISE IMPACT

The WWTP development with associated pumping stations is expected to have a negligible residual noise impact at the nearest houses during daytime and nighttime operations. Noise will be comfortably within the EPA limits at all houses.

6 NON TECHNICAL SUMMARY

The environmental noise impact of the proposed Cork Lower Harbour Drainage Scheme and Waste Water Treatment Plant has been assessed both during the construction phase, and during the operational phase.

The existing daytime noise environment in the vicinity of the proposed WWTP site was found to be relatively quiet, with a mean ambient noise level in the range 44 to 47 dB(A) L_{Aeq}, and with steady underlying background noise levels of 39 to 41 dB(A) L_{A90}. The noise environment is determined by distant traffic noise, agricultural machinery, with a contribution from aircraft noise.

At nighttime the mean ambient noise level was in the range 36 to 43 dB(A) L_{Aeq} with a steady underlying background noise component of 30 to 39 dB(A) L_{A90}.

The future realignment of the N28 will alter the noise environment at the site of the WWTP. The calculated future ambient noise level at the northern boundary is 52 dB(A) during daytime, and 39 dB(A) at nighttime. The realignment of the road is not expected to alter the steady underlying component of background noise at the WWTP site, as this is due to distant noise sources.

At the sites of the proposed major pumping stations at Rafeen, Monkstown, West Beach Cobh, and Carrigaloe, the noise environment was determined mainly by local traffic.

During the construction phase of the proposed WWTP the resulting noise levels at the nearest existing houses to the east and north is 51 dB(A). This is a very low noise level, and is comfortably within the standard construction noise criterion of 70 dB(A). The noise impact will be negligible.

During construction of the major pumping stations at Rafeen, Monkstown, West Beach Cobh, and Carrigaloe, the construction noise levels are expected to range from 57 to 70 dB(A) at the nearest houses. The highest noise levels will be experienced at the houses closest to the Monkstown and West Beach sites. Subject to appropriate mitigation, it is expected that the NRA 70 dB(A) criterion will be achievable at these locations, and that the resulting adverse impact will be slight.

The proposed scheme will involve extensive excavation works for laying new sewer lines. When these works are in progress adjacent to houses along the routes, noise may exceed the 70 dB(A) National Roads Authority construction noise criterion for short periods. In general however, construction noise levels at houses along the sewer routes will be typically less than 65 dB(A), with minimal impact.

When the treatment plant is operational, and provided it is designed to the specified noise criteria, noise emissions are calculated to result in a nighttime noise level of 30 dB(A) L_{Aeq} , and a daytime noise level of 40 dB(A) L_{Aeq} at the nearest existing houses to the east, with no adverse noise impact. At the lands zoned residential, 140m to the east of the site, the expected noise level is 35 dB(A) at nighttime, and 45 dB(A) during daytime. The resulting noise impact is considered to be negligible.

Airborne noise emission from the pumping stations will be negligible. However, where a pumping station is located close to a residence, there is a small risk of structure borne vibration being transmitted into the residence, and being audible indoors. This can be avoided through incorporation of suitable vibration isolation as appropriate.

Summary of Main Mitigation Measures for This Project

- The Waste Water Treatment Plant should be designed such that the operational noise level due to the continuously operating WWTP plant and processes at a distance of 20m from the plant boundaries is less than 45 dB(A) L_{Aeq}.

  This criterion excludes daytime work activities and daytime vehicle movements within the site. The appropriate criterion for these daytime work activities and vehicle movements is a noise level of less than 55 dB(A) at a distance of 20m from the boundaries

- The pumping stations should be designed such that the operational noise level at a distance of 5m from the stations is less than 45 dB(A) L_{Aeq}

- Any equipment at the pumping stations capable of transmitting audible ground borne vibration to nearby houses should be adequately vibration isolated

- A daytime construction noise limit of 70 dB(A) is considered appropriate for this project. Construction noise aspects should be managed in accordance with BS 5228 "Noise and vibration control on construction and open sites".

References

ISO 1996 "Description and Measurement of Environmental Noise"

ISO 9613 "Attenuation of sound during propagation outdoors"

BS 5228 "Noise and Vibration Control on Construction and Open Sites".

BS 4142, "Rating Industrial Noise Affecting Mixed Residential and Industrial Areas".

U.K. Design Manual for Roads and Bridges / Calculation of Road Traffic Noise

BS 8233 "Sound insulation and noise reduction for buildings – A code of practice".

National Road Authority "Guidelines for Treatment of Noise and Vibration in National roads Schemes"

World Health Organisation: "Guidelines for Community Noise"

APPENDIX A - TERMINOLOGY

dB(A) a logarithmic noise scale (decibel). The "A" indicates that a frequency weighting has been applied to take account of the variation in the sensitivity of the human ear as a function of frequency.

L_{Aeq} the average noise level during the measurement period, which includes all noise events. The L_{Aeq} value has been found to correlate well with human tolerance of noise, and is the value normally used in setting and monitoring industrial noise limits.

L_{A90} the noise level exceeded for 90% of the time. It is generally taken as being representative of the steady background noise at a location. It tends to exclude short events such as cars passing, dogs barking, aircraft flyovers etc.

L_{A50} the noise level exceeded for 50% of the time.

L_{A10} the noise level exceeded for 10% of the time. It is a measure of the higher noise levels present in the ambient noise. The L_{A10} parameter is generally used to describe traffic noise.

L_{WA} the total sound power emitted by a source (in dB re 1 picoWatt)

Free-field

Noise measurements made away from reflecting surfaces (apart from the ground) are termed free-field measurements. Measurements at the façade of a building are typically 3 dB higher, due to reflection from the façade. All data in this report are free-field

Total Noise Level

The total noise level due to all noise sources (also called ambient noise).

Specific Noise Level

A component of the ambient noise that can be attributed to a specific source, e.g. industrial source

Residual Noise Level

The component of the total noise that exists in the absence of the specific noise

Sound Emergence

The increase in the total noise due to the addition of a specific noise source

Background Noise

The steady underlying component of the measured noise (normally measured using the L_{A90} parameter)

Appendix 7A

Cultural Heritage Report

Mott MacDonald

Impact Assessment
on the
Potential Archaeology & Architectural Heritage
for the
Cork Lower Harbour Drainage Scheme

Including underwater and intertidal dimension by ADCO Ltd

Planning Ref.: PRE-PLANNING
ÆGIS Ref: 62-37
NGR (*centred*): 176575/065449

by
T. Collins MA MIAI and A. Hayes MA MIAI
of
ÆGIS ARCHAEOLOGY LIMITED
32 Nicholas Street, King's Island, Limerick
Tel.: 061-634 375 info@aegisarc.com

Client:
Mott MacDonald Pettit,
5 Eastgate Avenue, Eastgate,
Little Island, Co. Cork

2007

COPIES OF THIS REPORT HAVE BEEN PRESENTED TO:

CLIENT:	Mott MacDonald Pettit 5 Eastgate Avenue Eastgate Co. Cork
STATUTORY BODIES:	N/A
LOCAL AUTHORITY:	N/A

PLEASE NOTE...

That the archaeological recommendations, mitigation proposals and suggested methodology followed in this report are similar to those used on previous similar projects approved by the Archaeological Planning and Licencing Unit National Monuments Section (formerly Dúchas), Dun Sceine, Harcourt Lane, Dublin 2. The National Monuments Acts 1930-2004, The Planning and Development Act 2002 and the most recent EPA guidelines were consulted. Guidelines and Plans issued from time-to-time by the statutory bodies have been consulted. This study also follows the NRA Guidelines for the Assessment of Archaeological Heritage Impacts of National Road Schemes and Guidelines for the Assessment of Architectural Heritage Impacts of National Road Schemes (NRA n.d.; NRA n..d.a). These are listed in the reference section of this report.

Every effort has been taken in the preparation and submission of this report to provide as complete an assessment as possible within the terms of the brief and all statements and opinions are offered in good faith. However, ÆGIS cannot accept responsibility for errors of fact or opinion resulting from the data supplied by any third party, for any loss or other consequences arising from decisions made or actions taken on the basis of facts and opinions expressed in this report, (and any supplementary information), howsoever such facts and opinions may have been derived, or as the result of unknown and undiscovered sites or artefacts.

ÆGIS acknowledges the information supplied from the Archaeological Survey of Ireland Files, maintained by the National Monuments Section (formerly Dúchas), and information supplied by the client. The National Monuments Acts 1930-2004 is the current legislation in relation to archaeological projects.

This report is based on a template formulated by ÆGIS. All technical information, mapping and aerial photos were supplied by Mott MacDonald Pettit.

COPYRIGHT NOTE

Contents

I. List of Figures, Plates and Tables

TABLES:

II. Glossary of Terms Used

ASI	Archaeological Survey of Ireland, a division of the DoEHLG
Barony, Parish, Townland	These terms refer to land divisions in Ireland. The barony is the largest land division in a county, which is formed from a number of parishes. These parishes are in turn made up of several townlands, which are the smallest land division in the country. The origins of these divisions are believed to be in the Early Medieval/Christian period (AD500-AD1000), or may date earlier in the Iron Age (500BC-AD500).
CCC	Cork County Council
CH	Cultural Heritage Feature Number
CLH	Cork Lower Harbour
CTC	Cobh Town Council
DoEHLG	Department of Environment, Heritage and Local Government
E	East
EPA	Environmental Protection Agency
First Edition	This relates to editions of the OS 6 inch maps for each county. The first edition map completed for the area dates to the early 1840s and this is referred to in the text as the "First Edition".
Inventory	Published archaeological inventory for County Cork.
KM	Kilometre
M	Metres, all dimensions are given in metres or part of a metre, unless otherwise stated
MMP	Mott MacDonald Pettit (lead consultants to the project)
N	North
n.d.	No Date (of publication or of unpublished report)
NGR	National Grid Reference
NIAH	National Inventory of Architectural Heritage
NMI	National Museum of Ireland
NMS	National Monuments Section. Regulatory body within the DoEHLG with responsibility for archaeological heritage
NRA	National Roads Authority
OS	Ordnance Survey
OSI	Ordnance Survey of Ireland
Pers. Comm.	Personal Communication
PO	Preservation Order
PS	Protected Structure
Refs	References
RMP	Record of Monuments and Places. An update of the older SMR, (sites and monuments record), on which all known archaeological sites are marked and listed in an accompanying list. The sites marked afford legal protection under the National Monuments Acts 1930-2004. The record is based on the 6-inch map series for the country and is recorded on a county basis. Each archaeological monument on the RMP has a unique code known as the RMP number (see below)
RMP Number CO-	This code is the number of the site on the RMP constraint map. It begins with the county code, here CO for Cork, the 6-inch sheet number, followed by the number of the archaeological monument on that sheet.
RPS	Record of Protected Structures
S	South
Sheet	This relates to the 6-inch map for each county, which is divided into sheets.
SMR	Sites and Monuments Record. The precursor of the RMP, the SMR now commonly relates to the archive paper files of known archaeological monuments maintained by the Archaeological Survey of Ireland (ASI). These files are arranged according to RMP number.
TB	Townland Boundary
W	West

WWTP Waste Water Treatment Plant

ZAP Zone of archaeological potential. This refers to the area indicated around a recorded archaeological monument on the RMP constraint map. This zone is for indication purposes only and is usually circular in shape or more irregular depending on nature of the archaeological monument is it indicating.

1. Introduction to the Study Area

1.1 Scope of Study (figs 1 & 2)

A full description of the proposed development project was supplied by the lead consultants Mott MacDonald Pettit.

This report details the archaeological and architectural cultural heritage assessment of the proposed upgrade of the existing waste water system and the provision of a waste water treatment plant (WWTP) and sludge treatment centre of the Cork Lower Harbour and environs, as detailed in the preceding paragraphs. The report is a pre-planning assessment report and fulfils the criteria of an impact assessment and follows the most recent EPA guidelines on the compilation of an EIS (2002). NRA guidelines have also been used in this regard (n.d.; n.d.a). The objective of any cultural heritage (architecture and archaeology) assessment study includes the identification of all recorded archaeological monuments within the study area including the legal status, if any, of these features (NRA n.d., 16). For architectural heritage the study is to identify structures and features of known architectural merit. This study collates information from readily available sources that will be used to inform the later stages of the planning process (NRA, n.d.a, 13). For both archaeological and architectural heritage at assessment stage data collection is based on a desk study to identify all features and structures of known architectural merit and all known and recorded archaeological monuments, from *published sources* (NRA n.d., 16; NRA n.d.a, 13). Fieldwork is also undertaken. In the case of this study, the historical integrity of some of the locations in the study area, is also very important and must be considered. Cobh town being a particular case in point. The entire town's entity being perhaps greater than the sum of its parts, due to its location and its rich maritime history associated with voyages of the *Titanic* and the *Sirius*.

The report details the recorded and potential archaeological and cultural heritage features within the study area and in its vicinity and discusses the proposed impact of the development on that archaeology and/or cultural heritage.

The following brief has been fulfilled by this report:

- The identification of all recorded archaeological monuments within the pipeline areas and pumping stations, including the legal status, if any, of these monuments;
- The identification of structures and features of architectural merit within the study area based on published sources;
- A report on the archaeological walkover inspection of the proposed pipeline and waste water treatment lands;
- A general account of the historical and archaeological background of the study area, including examination of RMP maps, SMR files and the topographical files, as well as a concise summary of the historical background of the study area;
- The predicted impact(s) (if any) of the proposed development on the known and potential archaeology and architecture is discussed;
- Suggested mitigation procedures for addressing those predicted impacts (if any).

No intrusive archaeological investigations (test-trenching or excavation) have been undertaken at this stage. Suggested further archaeological (and/or cultural heritage) mitigation is stated at end of the report.

1.2 Definition of Archaeological & Architectural Heritage

The archaeological heritage may be defined as

> a finite non-renewable physical and material resource. Archaeology is the study of past human societies through their material remains and artefactual assemblages. The study of archaeological remains increases our understanding and knowledge of the structure and culture of the past and ancient societies that are not recorded by any other means (NRA n.d., 8).

Every archaeological monument is unique and contains valuable information on the individual site as well as evidence for a wider cultural framework. As a group, archaeological monuments can contribute information on cultural evolution and important changes over time, while providing insights into communications, trade, and growth of past human societies (*ibid.*).

Architectural heritage is defined by the Architectural Heritage (National Inventory) and Historic Monuments Act 1999 as all

> structures and buildings together with their settings and attendant grounds, fixtures and fittings... groups of such structures and buildings and sites, which are of architectural, historic, archaeological, artistic, cultural, scientific, social or technical interest (NRA n.d.a, 7).

It is important to note that not all archaeological or architectural heritage is known or recorded at present and "new" sites are constantly being identified, by a variety of methods.

1.3 Protection of Heritage: The Legislative Frameworks

The current relevant legislation in relation to the protection of the archaeological and architectural heritage is detailed below, (there is some overlap in the legislation at present, and this accounts for the repetition in the list below, from NRA n.d., 9; n.d.a 8, with additions):

Level of Legislation	Archaeological Heritage Legislation	Architectural Heritage Legislation
National	National Monument Act 1930 amended 1954, 1987, 1994, 2004 Road Act 1993 National Cultural Institutions Act 1997 The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous) Provisions Act 1999 *Framework and Principles for the Protection of the Archaeological Heritage* (Dept of Arts, Heritage, Gaeltacht and the Islands 1999) Local Government (Planning and Development) Act 2000 *Advice notes on current practice (in the preparation of environmental impact statements* (EPA 2003) *Guidelines on the information to be contained in Environmental Impact Statements* (EPA 2002) *Environmental Impact Assessment of National Road Schemes – A Practical Guide* (NRA 2005) *Code of Practice between the NRA and the Department of Arts, Heritage, Gaeltacht and the Islands* (2000)	National Monument Act 1930 amended 1954, 1987, 1994, 2004 Heritage Act 1995 The Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous) Provisions Act 1999 Local Government (Planning and Development) Act 2000 *Architectural Heritage Protection Guidelines for Planning Authorities* (DoEHLG 2004) Action on Architecture 2002-2005 Government Policy on Architecture *Advice notes on current practice (in the preparation of environmental impact statements* (EPA 2003) *Guidelines on the information to be contained in Environmental Impact Statements* (EPA 2002) *Code of Practice between the NRA and the Department of Arts, Heritage, Gaeltacht and the Islands* (2000) *NIAH Handbook* (National Inventory of Architectural Heritage DoEHLG June 2006)
European	European Convention on the Protection of the Archaeological Heritage ratified by the ROI 1997 ("The Valetta Convention") Council of Europe Convention on the Protection of the Architectural Heritage of Europe ratified by the ROI 1997 ("The Granada Convention")	Council of Europe Convention on the Protection of the Architectural Heritage of Europe ratified by the ROI 1997 ("The Granada Convention") European Council Directive on Environmental Impact assessment (85/337/EEC) 1985 and amending directive (97/11/EC) 1997 Charter for the Conservation and Restoration of Monuments and Sites (Venice 1964)
International	International Council on Monuments and Sites (ICOMOS) advisory body to UNESCO concerning the protection of sites and recommendation of World Heritage sites ratified by the ROI 1992	Convention for the Protection of World Cultural and National Heritage (1972)

Table 1. Relevant legislation in relation to the protection of the archaeological and architectural heritage

Using the above legislative framework, there are a number of methods can be applied to secure the protection of archaeological/architectural monuments. These include National Monument designation (ownership and guardianship by the State including local authorities), the Register of Historic Monuments, The Record of Monuments and Places (RMP), the placing of Preservation Orders and temporary Preservation Orders on endangered archaeological

monuments. The government department with responsibility for the archaeological heritage is the Department of the Environment, Heritage and Local Government and its Minister. Protected Structure legislation is currently in place to protect the architectural heritage of the country. The work of the NIAH (National inventory of architectural heritage) informs the compilation of lists of Protected Structures by local authorities. The NIAH's work is ongoing. The NIAH has yet to undertake fieldwork in the study area, though this is scheduled for later in 2007 (W. Cummins NIAH pers. comm.).

National monuments may be acquired by the Minister by agreement or by compulsory purchase order. The State or the local authority may assume the guardianship of any national monument (apart from dwellings). The owners of national monuments may also appoint the Minister or local authority as guardian of that monument, should they be in agreement. Once in the ownership or guardianship of the State, the site cannot be interfered with without the written consent of the Minister. At the time of writing there are no National Monuments being directly impacted by the proposed development.

The **Register of Historic Monuments** was enacted under the 1987 amendment to the National Monuments Act. It required that the Minister established and maintained a Register of Historic Monuments and archaeological areas, which once on the register, would be afforded statutory protection under the 1987 Act. Two months notice in writing is required to be provided to the Minister, prior to any works being undertaken on or in the vicinity of a registered monument. With the establishment of the RMPs (under the 1994 amendment Act) the Register became somewhat redundant. At the time of writing, there were no Registered Monuments being directly impacted by the proposed development.

The **Record of Monuments and Places** (RMP) was established under the 1994 amendment to the Act. It was the duty of the Minister to establish and maintain such a record where the Minister believes such monuments may exist. The record comprises a list of monuments and places and a constraint map indicating the location of such monuments and places. The RMP is maintained on a county basis. Sites on the RMP all received statutory protection under the National Monuments Act 1994. (The current protective legislation at the time of writing is the National Monuments Act 1930-2004.) The **black line or circle** on the RMPs (figure 4.6) indicates the zone of archaeological potential (ZAP) either around an individual archaeological site (usually a circle) or around a town or archaeological complex (usually an irregular shape). This line provides a protective zone of archaeological potential, which is a zone that is protected under The National Monuments (amendment) Acts 1930-2004 legislation.

According to section 12 of the National Monuments Acts 1930-2004, where "the owner or occupier (other than the Minister for Environment and Local Government) of a monument or place included in the Record, or any other person, proposes to carry out, or cause or permit the carrying out of any work at or in relation to such a monument or place, he or she shall give notice in writing to the Minister for the Environment and local Government to carry out work and shall not, except in the case of urgent necessity and with the consent of the Minister, commence the work until two months after giving the notice". The **Sites and Monuments Record (SMR)** was the precursor to the RMP and now commonly refers to the paper archive housed in the Archaeological Survey of Ireland, which details pertinent information on each individual archaeological monument.

In the event that archaeological sites are deemed to be in immediate danger of destruction or damage a **Preservation Order** can be issued under the provisions of the 1930 (principal) National Monuments Act. These Orders make any interference with the site illegal. Under the 1954 Act, Temporary Preservation Orders can also be issued, while having the same function as a Preservation Order, have a time limit of six months, after which the case must be reviewed. Again, work on or in the vicinity of archaeological monuments under temporary or full Preservation Orders require Ministerial written consent. At the time of writing, it appeared that there were no Preservation Orders on archaeological monuments being directly impacted by the proposed development.

There are also a number of methods in which the architectural heritage may be protected. The Heritage Council was established by **The Heritage Act 1995**. Its main objective seeks to promote the interest in, knowledge and protection of all Irish heritage, which includes the archaeological and architectural resource. The 1995 Act, protects all heritage buildings owned by local authorities from damage or destruction. The **Architectural Heritage Act 1999** requires the Minister to establish a survey in order to identify record and evaluate the architectural heritage of the State. The body established to undertake this work is known as the **NIAH**, National Inventory of Architectural Heritage, which is undertaking the survey at present. The NIAH has not yet undertaken the inventory for this area of Cork and there are no structures included in the survey for the study area at the time of writing. Inclusion of structures on this inventory does not provide statutory protection; however, local authorities are encouraged to use the NIAH surveys as a baseline in creating their **Record of Protected Structures** (RPS). The RPS is an obligation of local authorities under the Local Government (Planning and Development) Act 2000. This record should list structures of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest. The Record of Protected Structures for County Cork is included in the Cork County Development Plan 2003, (Cork

County Council). Cobh town also has a Development Plan (Cobh Town Council 2005), which lists all the Protected Structures in the town. Cobh is also important on a wider level due to its historical importance, particularly its maritime history.

"Cultural heritage" is the loose collective term applied to both archaeological and architectural heritage (Buttimer *et al* 2000). However, as a rule of thumb the archaeological resource covers sites and monuments from the prehistoric to the post medieval period, while the architectural resource includes standing structures and sites dating from the post-medieval to the modern period.

2. Method of Study

The following resources and methods of establishing the archaeological and architectural status of the study area were used. This follows the NRA and EPA guidelines on both archaeological and architectural consultation to gather baseline information (NRA n.d. 16; NRA n.d.a 13). Information on the proposed development was provided by the lead consultant, MMP:

- The proposed pipeline routes (green field and existing), waste water treatment (WWTP) site, major pump station sites and archaeological and cultural heritage sites in the vicinity of the proposed development were examined and inspected by two qualified archaeologists;
- A comprehensive review of published archaeological and cultural heritage work undertaken in the vicinity of the study area was undertaken by the writers (including Excavations Bulletins, searched on the online research database www.excavations.ie compiled to 2003 at the time of writing);
- The National Museum topographical files were consulted;
- The Record of Monuments and Places (RMP) constraint maps and list were consulted;
- The published archaeological inventory for the study area was consulted (*Archaeological Inventory of County Cork- Volume II: East and South Cork* Power 1994). This is an important resource for the archaeological heritage of Co. Cork;
- Cork County Development Plan 2003 (Cork County Council), Cobh Town Development Plan (Cobh Town Council 2005) and applicable local area plans were consulted for the locations of possible Protected Structures in the vicinity of the proposed development;
- The National Inventory for Architectural Heritage (NIAH) was consulted. The NIAH has not yet undertaken the inventory for this area of Cork, but are beginning fieldwork presently;
- A wide range of local historical and archaeological records relevant to the study area were consulted, including the OS First Edition six-inch map (*c.*1840);
- Suitable aerial photos, analysed for archaeological purposes were used in the study. These were supplied by MMP;
- Access was permitted for the proposed WWTP site and this was inspected by the writers;
- Where the proposed pipeline corresponded with roadway or public areas these were visited and/or a windscreen survey was undertaken by the writers;
- The assessment of the intertidal and underwater locations of the proposed development site (marked in blue on the accompanying mapping) was undertaken by ADCO Limited.

2.1 Limitations to the Study

A number of difficulties in relation to the study were encountered during the assessment process. It is important that these limitations are acknowledged. The mitigation section of this report suggests suitable mitigation to alleviate some of these limitations. They are as follows:

- Due to the scale of proposed development and the fact that much of it is linear pipeline along both existing roadways and green field sites, only those known (recorded) archaeological sites whose zone of archaeological potential (ZAP) is predicted to be directly impacted by the route of the pipe have been included in the assessment.
- It was not known at the time of assessment what side of the roadway the pipelines may take and if the pipes are going to be placed in existing culverts or new service trenches.
- Aerial photography for the proposed development study area is in the form of orthophotos. While these are adequate for a number of purposes, sometimes they are not clear enough to identify the smaller possible archaeological sites. Suitable mitigation has been suggested to accommodate this limitation.
- Access was not permitted to portion of the proposed pipelines, in the green field areas, which are through private lands. Aerial photos were used as a substitute and the areas were viewed from the roadsides or gateways.
- The intertidal and underwater assessment required an archaeological licence, which was not received from the relevant bodies until September 2007 (This licence was applied for in May 2007). This delayed this part of the cultural heritage assessment significantly. This work was undertaken in September 2007.
- The minor pumping station locations are marked as triangles on the accompanying mapping and the general locations of these features were assessed. Aerial photos were used at these locations.
- As the fieldwork for the assessment was carried out in the summer season, vegetation growth may have obscured some features of archaeological or cultural heritage interest.

2.2 Assessment Dates

All desk based research, file consultation and aerial photo analysis was undertaken prior to fieldwork. The assessment fieldwork was carried out on the following dates:

- Aegis field inspection was undertaken on 27th June, 10th July and the 16th September 2007.
- ADCO underwater assessment was undertaken on 25th and 26th September 2007.

3. Existing Environment

The study area is located in the Cork lower harbour area in and around Passage West, Monkstown, Raffeen/Strawhall, Carrigaline, Ringaskiddy and Cobh, Co. Cork (figs 1 & 2). The study area incorporates thirty townlands (see table 1). The collection system and WWTP impacts the Zones of Archaeological Potential (ZAPs) for twenty recorded monuments (RMP) in the study area. The archaeological walkover was undertaken by two qualified and experienced archaeologists (figs 1- 3).

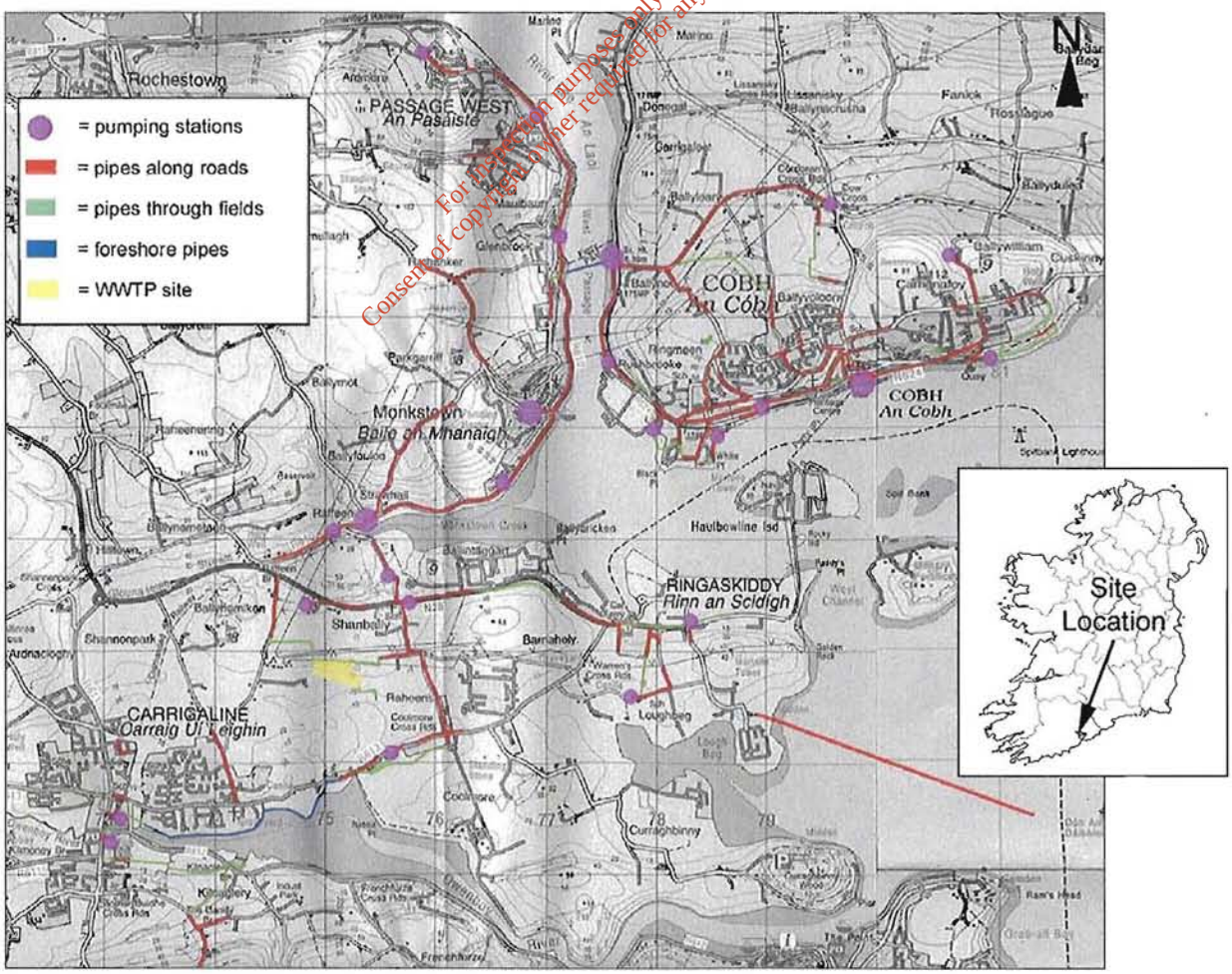

Figure 1. Discovery Series map Nos 81, 87 showing collection system & WWTP locations (OSI 1997)

3.1 The Proposed Development (fig. 2)

The Cork Lower Harbour Main Drainage Scheme involves upgrading the existing sewerage system of Cork Lower harbour and environs together with the provision of a wastewater treatment plant and sludge treatment centre (see section 1.1 of this report for detail).

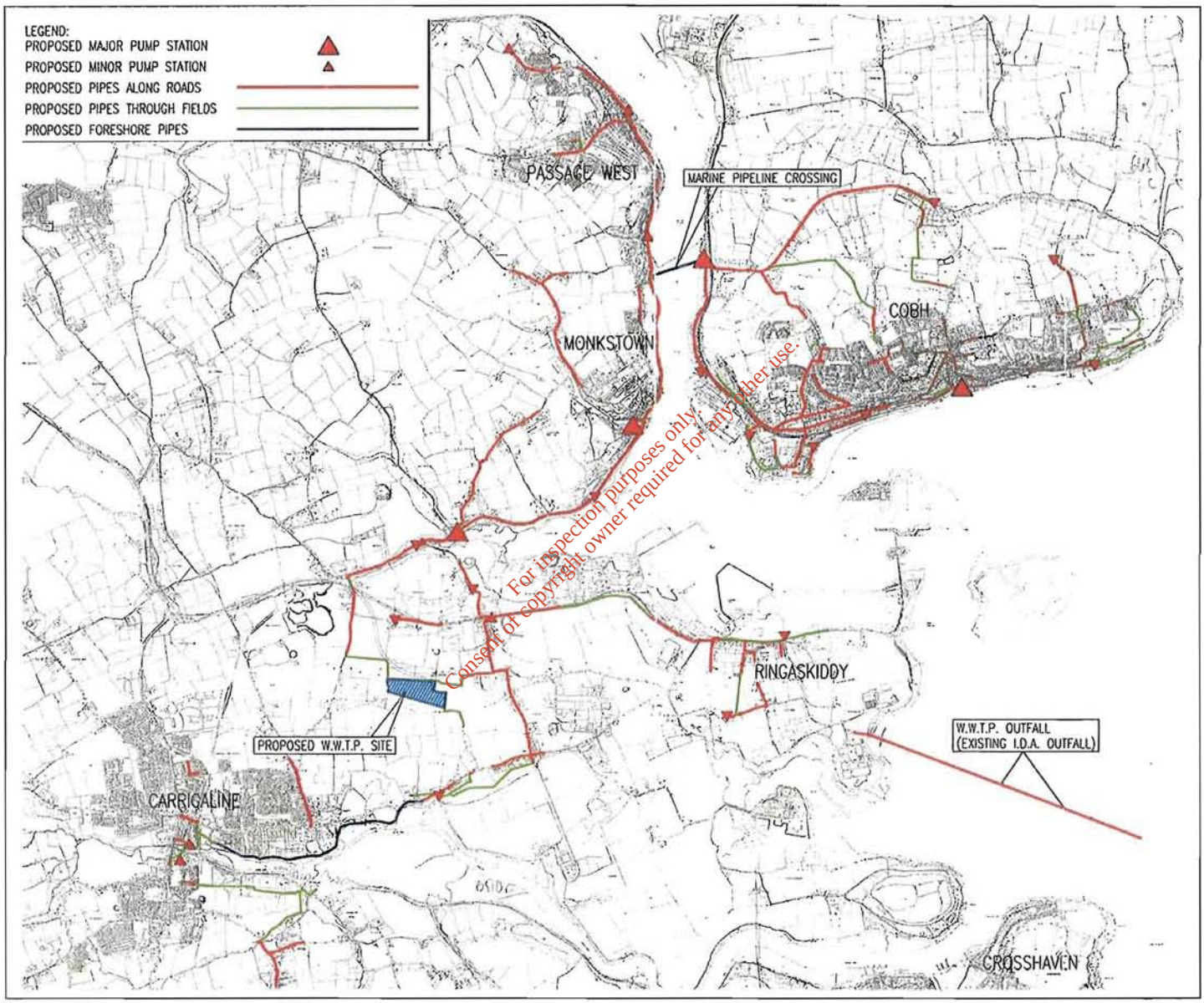

Figure 2. Collection system, pumping station locations and WWTP location (supplied by client)

3.2 The Archaeological Inspection (fig.3)

The proposed collection system pipeline routes comprise a mixture of green-field, roadways intertidal and underwater areas. It is proposed that some of the pipeline will follow existing trenches and pipes, while others will be completely new. (These are not yet specified at time of writing. This information will be available at detailed design stage.) As the area of the study is extensive, for ease of description the area haves been divided into sections around the principal centres that the scheme will ultimately serve. They are as follows:

- Passage West, Monkstown, Raffeen/Strawhill (map detail no. 1)
- Carrigaline (map detail no. 2)
- Shanbally (WWTP) (map detail no. 3)
- Ringaskiddy (map detail no. 4)
- Cobh and environs (map detail no. 5)

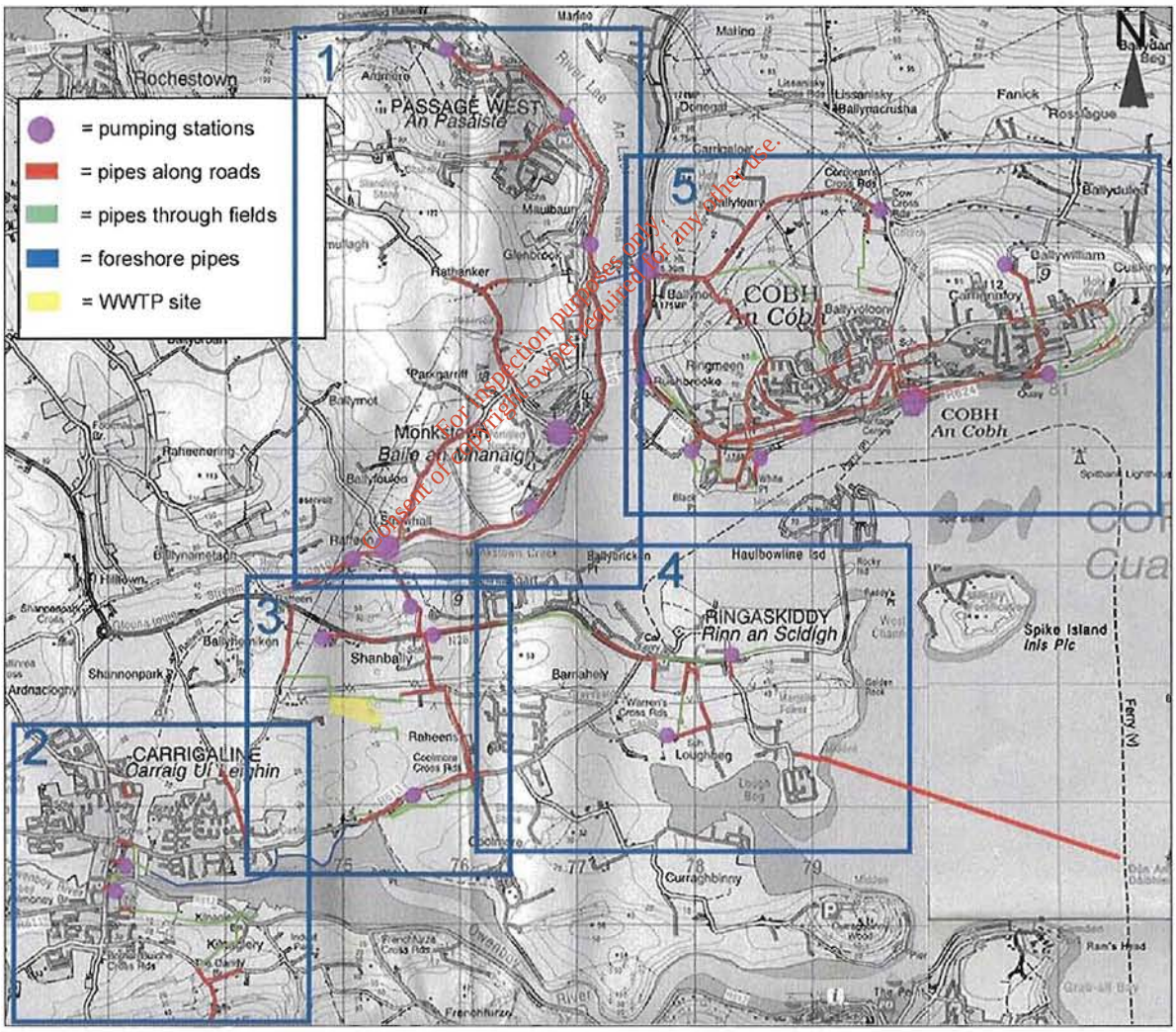

Figure 3. Master map showing section description areas (Discovery Series map with additions)

The topography of the study area as shown above is varied. This area is also known as Cork Lower Harbour Area. The location is the estuary of the River Lee. Cork Harbour is one of the most extensive natural harbours in Ireland. Cork Harbour is a Special Protection Area (CCC 2005, Carrigaline Electoral Area Local Area Plan, section 7.2.8., 21). A description of this landscape and topography can be summarised as follows (synopsis by CCC):

> The topography and landscape components in this area, primarily the River Lee as well as the vast open and natural harbour, have provided the opportunity for human settlement and the development of a city. The River Lee and many smaller rivers make their way to the harbour by cutting through carboniferous limestone or mudstone between east-west ridges of sandstone. The Lee forms a broad alluvial flood plain, which has provided an ideal location for settlement and growth into a large urban centre. Most of the smaller rivers form shallow mudflat estuaries where they meet the sea. In terms of landform, the harbour is dominated by Great Island. A narrow harbour mouth is established by two steeply rising rocky knolls of green sandstone and mudstone which are, in turn, articulated by the old military fortifications which crown their summits.
> Shelter has been afforded by the steep but shallow valley sides and the broad and safe natural harbour. The city was originally structured by the River Lee, which still etches its way through the core urban mass. Along the northestern side of the harbour, flanking the Lee prior to her entry into the harbour, the valley steps up along the steep surrounding banks to form a terraced streetscape and villa landscape. The city gradually breaks open to form an urban and periurban sprawl. It spreads out across the flat alluvial flood plain through suburbs and, further, to identifiable satellite communities [such as those in the study area] to eventually merge with the rural hinterland.
> While the harbour limits expansion eastwards, the river valley provides the line of expansion westwards channelled by the valley sides to the north and south. The harbour at the broad topographic scale includes large islands, which, along with much of the harbour shore, comprise landscape of rural farmland character falling gently to the sea. It comprises a mosaic of fertile fields of mixed use on brown podzols. These fields are defined by broadleaf hedgerows as well as swaths of broadleaf woodland.
> The city profile is dominated by church spires and tall offices, most notably the County Hall west of the centre, while silos, high factory blocks and chimney stacks are scattered beyond the city core and extend into the rural environs. Attractive historical terraced houses rise up against the steep slopes of the Lee valley immediately north of the harbour (flanking the N25), interspersed among individual houses set in a landscape well endowed with vegetation. South of this road modern industrial and business parks spread out in an orderly fashion across a plane, extending towards the harbour. Two noteworthy features of development are the passenger ferry port located where the city meets the harbour and the airport inland to the south. Other significant areas are Ringaskiddy and Little Island to the south of the city on the western side of the harbour, supporting industrial development. On higher ground along the valley and city

periphery an occasional telecommunication mast or water storage tower punctuates the skyline. Extending from the city the docks in particular contribute to the cultural and commercial character and give testimony to the city's relationship to the sea and mercantile history. In profile they are identified by tall skeletal cranes hovering across the skyline and large ships. Further eastwards and to the south marinas catering for smaller boats and boating activity as well as occasional industrial sites link the docks to the broader harbour.

On Great Island the town of Cobh opens southwards towards the harbour. It rises from the shore up the steep incline on which it has grown, almost forming a terraced structure. Its historical development cultural complexity are visible in the resulting tightly packed layering of architectural form, comprising religious, commercial and residential buildings. At the southern extremity of the harbour, the steep and narrow mouth is articulated by Carlisle Fort on the east (built *c.*1798) and Camden Fort on the west side (an example of a bastion fort begun in the late 16th century), otherwise known by their pre-colonial names as Meaghar and Davis respectively.

Notwithstanding the rural character around much of the greater harbour area, the tell-tale signs of urban intensity are evident everywhere through the prevalence of infrastructure such as roads, bridges and electricity power lines and the frequency of urban clusters. Overall, the city and harbour comprise a balance of intensely urban form, rural character and seascape. The course of the River Lee creates a linear structure along which the older city core is strung and a spatial release west-wards between the northern and southern containing valley sides. The broader harbour also provides some spatial release while creating a sense of containment or focus to which the surrounding landscape falls and refers. In the less built up but heavily wooded areas a sense of spatial confinement and forward visual focus is experienced as one travels many of the roads due to the densely spaced tall broadleaves in roadside hedgerows. This creates a temporary tunnelled darkness, relatively speaking, which eventually gives way to openness and light. A steep and wooded precipice on the southern side of the N22 heading towards Ballincollig combines with tall mature trees on the northern side to create such an effect. In contrast, certain roads along the sea shore, such as an estuary like Poolnabibe or a channel like Passage West, involve spatial containment on one side and openness on the other. A visual connection is created between these and the land masses on opposite sides of the water through a natural sense of curiosity that is the experience of a desire to explore and understand distant landscapes.

3.2.1 Passage West, Monkstown, Raffeen/Strawhill (fig. 4; plates 3.1-3.7; 3.42-3.44)

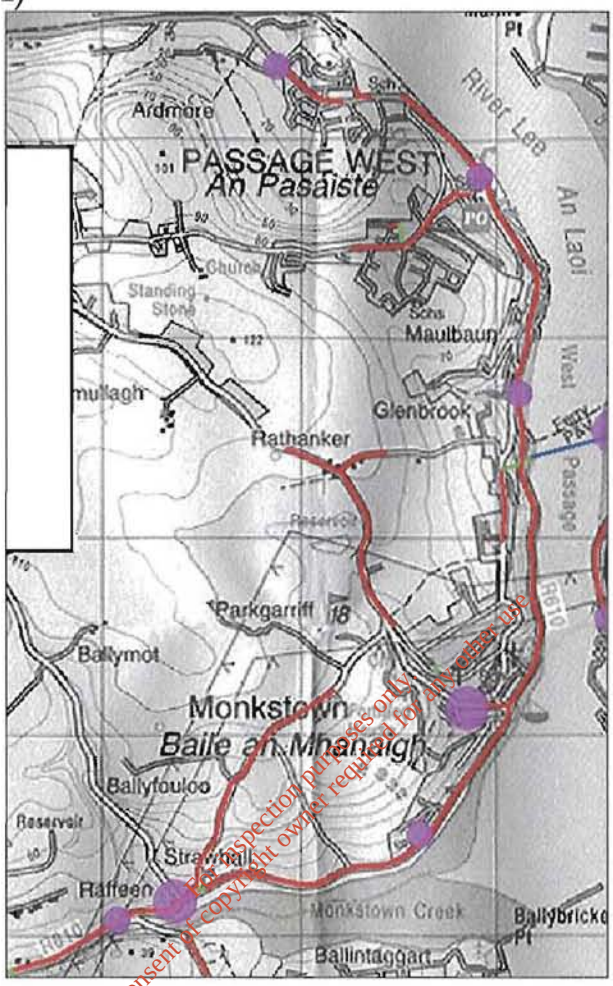

Figure 4. Location of pipeline routes within the Passage West, Monkstown, Raffeen/Strawhill (detail map no. 1)

Pipeline Routes along Existing Roads

The pipeline in the Passage West, Monkstown, Raffeen/Strawhill area follows along the R610 directly from the north of Passage West, through the itself village and onto Monkstown, along Monkstown Creek to the Raffeen bridge/Strawhill area at south. From this main pipeline along the R610, are a further four lines of pipe proposed, which diverge from the main proposed line along the R610. These four lines are proposed to travel along existing roadways generally to the west of the R610 line. The most northerly travels eastwards and uphill from the R610 in Passage West. This is along an existing roadway through a primarily residential area. The second line is a very short stretch, which runs parallel to the R610 near the Ferry Terminal in the townland of Monkstown. This proposed line is to be connected, to the main R610 pipeline via a short green field pipeline route (see below). The third line is to the northeast of Monkstown village itself and travels uphill to the northwest towards the

townland of Rathanker, along Glen Road. This line is separate from the remainder of the proposed lines in this area (new pipe will link up with existing pipes in this area). The line to Rathanker commences along the road to the north northwest of three recorded monuments (RMPs), CO-087-027--- (td Monkstown Castlefarm; classified as an abbey); CO-087-028--- (td Monkstown Castlefarm; classified as a fortified house) and CO-087-029--- (td Monkstown Castlefarm; classified as a church and graveyard). The proposed pipeline is not intended to impact on their ZAPs, so they are not designated CHs in this report. They are included here for information only. They are not visible from the road where the pipeline commences. At a "Y-shaped" junction in Rathanker, the proposed pipeline diverges for a distance of approximately 250m respectively.

The fourth extension from the main line along the R610 travels from Raffeen/Strawhill in the south in a northeasterly direction. This line is proposed to follow an existing roadway in Ballyfouloo townland. This road continues to run along the townland boundary between Ballyfouloo and Monkstown Castlefarm townlands.

Pipeline Routes through "Green Field" Areas

There are five very short stretches of proposed pipeline in this area which are "proposed pipes through fields", or green field locations. The first is in Passage West, on the divergent route off the R610. The second is to the west of the Ferry Terminal which is at present a steep slope, so that it might connect the second proposed line which runs along a road (see above). The third green field area is a very short stretch required in the middle of Monkstown, which appeared at the time of inspection to be situated in a residential area. Nothing of an archaeological nature was noted during the field inspection. The fourth green field location is a very short stretch immediately to the east of the major pumping station location (see below). The fifth is a very short stretch at the Raffeen/Strawhill pumping station (see below). These are extremely short stretches and they will serve to aid in the connection of pipes along the roadways. These locations (and all others) were viewed from the closest roadways and if not visible were examined from the orthophotography. Nothing of an archaeological nature was noted in these locations.

Pumping Stations (figs 5 & 6)

There are two types of pumping stations proposed for this project: minor pumping stations and major pumping stations. The minor pumping stations were considered part of the overall piping route, when this was visited. There are five minor pumping stations required for this area of the project. They are situated in the townlands (from north) of Pembroke (2); Lackroe;

Monkstown (Castle Farm); Raffeen. Two major pumping stations are proposed for this area, one at Monkstown and the other at Strawhill (Ballyfouloo td). Both are proposed to be located adjacent to existing roadways.

Monkstown Pumping Station

The proposed major pumping station at Monkstown is to be located in the southeast corner of the public Park on Glen Road and is to be connected to the pipeline route running along Glen Road, via a sewer pipeline. The proposed location is at present a surface carpark, which services the public park, which lies to the north. There is a residential house that overlooks this area. It is a good example of a fine residential structure in Monkstown, from which the pumping station would be visible. The pumping station might be screened from view with suitable screening to alleviate this predicted visual impact (see section 5). Nothing of an archaeological nature was noted during the inspection of this location.

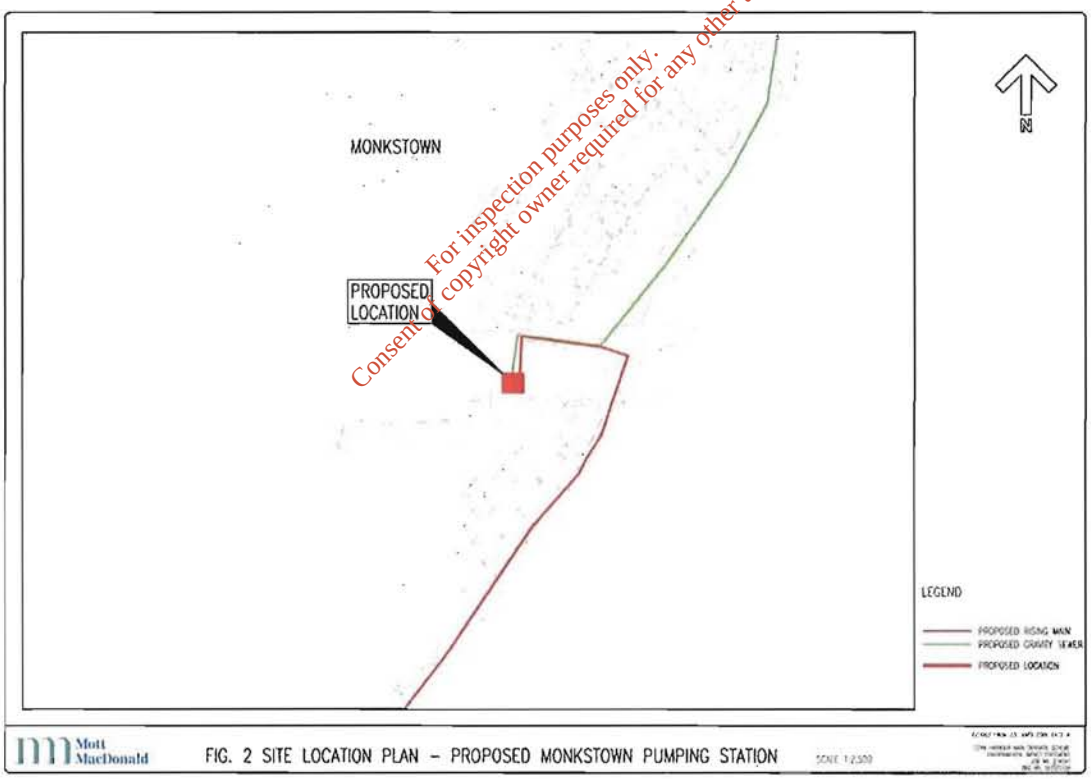

Figure 5. Location of Monkstown Pumping Station

Raffeen/Strawhall Pumping Station

The proposed major pumping station at Raffeen/Strawhill is to be located in the townland of Ballyfouloo, on the southern side of the R610 road in an area of ground reclaimed from the tidal area of Monkstown Creek. Nothing of an archaeological nature was noted during the inspection. CH23 a railway embankment and concrete and steel bridge, associated with the Great southern railway and lies approximately 30m to the southeast of the proposed location of the pumping station (see section 5).

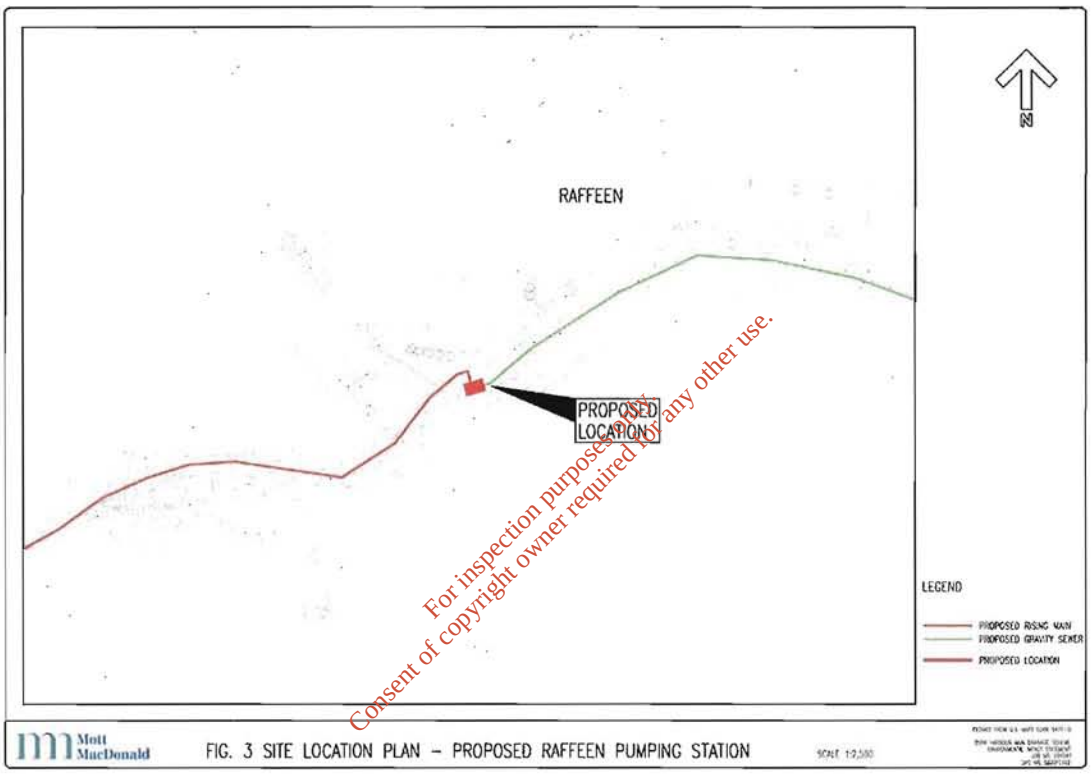

Figure 6. Location of Raffeen/Strawhill pumping station

Intertidal/Underwater Zone

The portion of pipeline marked in blue which traverses from Passage West on the right bank to the ferry terminal at Carrigaloe on the left bank of the estuary is being assessed by ADCO (see appendix section 10).

Cultural Heritage Features (Fig. 19)

No new unrecorded archaeological or cultural heritage features were noted during the inspection. From the desk based study and field inspection, there are five Cultural Heritage (CH) features located within this area. They are:

Cultural Heritage No. CH	Designation	Townland	Classification
1	RMP CO087-006---	Rathanker	Ringfort
16	RMP CO087-097---	Rathanker	Souterrain (possible)
3	RMP CO087-024---	Parkgarriff	Ringfort
4	RMP CO087-025---	Ballyfouloo	Holy Well
5	RMP CO087-026---	Monkstown (Castlefarm)	Lime Kiln
23	none	Ballyfouloo	Great Southern Railway Embankment

None of these sites is predicted to be directly impacted by the proposed project. Their ZAPs are predicted to be impacted. CH1 is a ringfort in the townland of Rathanker. This monument extant as a ringfort (inventory no. 4614). CH16 is a possible associated souterrain (inventory 5140). This could not be located during field inspection, but it can be suggested that it is partially within the ringfort enclosure. The proposed route of the pipeline terminates on the road to the east of the ZAP for this monument. CH3, also a ringfort (inventory no. 4973) is no longer extant and is obscured by modern buildings. The proposed pipeline route runs along the road to the southeast of the ZAP for this monument. CH4, a Holy Well (inventory 5186) could not be located on the ground at the time of inspection (it had been quite dry prior to the inspection and the well may have temporarily dried up). The proposed pipeline route runs through the ZAP for this monument. CH23 is a railway embankment for the Great Southern railway located to the SE of the proposed pumping station at Raffeen/Strawhill.

3.2.2 Carrigaline & Environs (fig. 7; plates 3.8-3.14; 3.16-3.23; 3.48-3.51)

The proposed pipeline route in the Carrigaline area will travel mainly through green field areas. However, the pipeline will follow along some roadways in the centre and east and south of Carrigaline. Carrigaline is at present a busy town in its own right, with many residential areas around its perimeter. It is built on the Owenboy River. The river estuary is designated as a conservation area (see section 6).

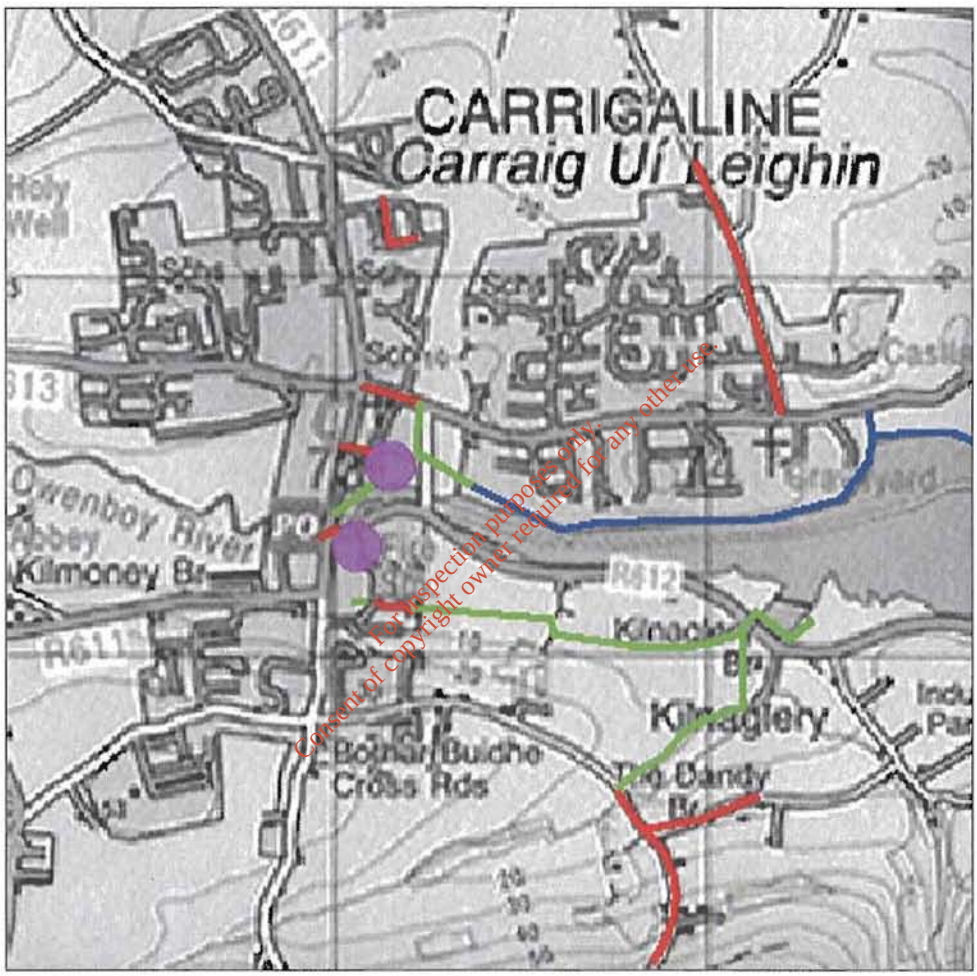

Figure 7. Location of pipeline routes within Carrigaline and its environs (map detail no. 2)

Pipeline Routes along Existing Roads

Seven stretches of pipeline are proposed to follow existing roadways in the centre and environs of Carrigaline town. Some are proposed to be quite short as figure 7 illustrates. The longest stretch is immediately north of Church Road and travels northward for a distance of approximately 750m. This is uphill and is an existing fairly substantial roadway. Nothing of note was recorded during the inspection at this location. Three further short stretches are proposed to the north of Carrigaline town centre and to the west of the main carriageway to

Cork City. These areas are all proposed for residential and built-up areas. There is another east - west running stretch in another residential area of Carrigaline, which is proposed to connect some green field stretches of pipeline.

The final stretch of pipeline proposed for existing roadways is around The Dandy Bridge (CH24). The proposed pipeline runs from north to south, with another line running perpendicular at a T-junction to the south of The Dandy Bridge. The route of the pipeline was inspected and nothing of an archaeological nature was noted. The bridge is designated a CH (see below).

Pipeline Routes through "Green Field" Areas

There are six stretches of pipeline proposed to traverse green field locations. These will form part of the route with the pipelines along the existing roadways described above. A new pipeline is proposed to run parallel to the carriageway to Cork City, along its western edge. This is currently a modern landscaped area along the western side of the road. Another new route diverges from the one just described, which heads in an eastern direction, crossing the carriageway and connecting to the intertidal route (marked in blue on mapping see intertidal zone section below). This green field area is public space near public buildings. Nothing of an archaeological nature could be determined.

There is a section of new pipe proposed for the centre of Carrigaline, which will run generally along the left bank of the Owenboy River. This river is open and runs through the town. This route was inspected where possible and nothing of a cultural heritage nature was noted.

The longest stretch of proposed new pipeline is proposed for the southeast of Carrigaline, and to the south of the Crosshaven road, the R612. This route traverses private lands, which were not accessible at the time of writing. From aerial photos, nothing of an archaeological nature could be ascertained. This stretch links with another which leads from The Dandy Bridge northeastwards to Kilnaglery, where the two pipelines converge to outfall at Kilnaglery Bridge. This bridge appears to be modern and nothing of antiquity could be noted at the time of inspection. Immediately to the north of this location is a Great Southern railway Embankment, which was designated CH25 (see below).

Pumping Stations

There are two types of pumping stations proposed for this project: minor pumping stations and major pumping stations. The minor pumping stations were considered part of the overall

piping route, when this was visited. There are no major pumping stations proposed for this location at the time of writing.

The Intertidal Zone

The proposed pipeline route to the east of Carrigaline town is proposed for the intertidal zone, which runs to the south of the road R613. The Owenboy estuary is designated a conservation area (see section 6). From a cultural heritage perspective, this area was assessed by ADCO (see appendix section 10).

Cultural Heritage Features (Figs 21 & 23)

The cultural heritage features impacted by the pipeline in this area are: CH6, CH7, CH17, CH19, CH24 and CH25. CH6 is a mill in the centre of Carrigaline town. It is also a Protected Structure. This mill is extant and has recently been renovated. CH7 is a church and graveyard. It is also a Protected Structure and extant. The pipeline route runs along the road which runs to the north of CH7. CH17 was a possible souterrain found during the construction of a house at this location. CH17 no longer extant. CH19 is the location of a possible *fulacht fiadh* (burnt mound). No surface trace visible. CH24 is The Dandy Bridge. This is extant and already has pipes running along its base. CH25 Kilnaglery Bridge, which appears modern and the Great Southern Railway embankment, which now forms part of a local amenity walk to Crosshaven.

3.2.3 Waste Water Treatment Plant (WWTP) (fig. 8; plates 3.15-3.23)

Figure 8. Location of pipeline routes and WWTP (in yellow) around Shanbally area (map detail no. 3)

This area incorporates the proposed waste water treatment plant (WWTP) at Shanbally and associated pipeline. Pipeline routes follow existing roads N28 and R613 as well as interconnecting roads in Raheens and Shanbally. The pipeline is to be laid from the existing roads at east and west.

Pipeline Routes along Existing Roads

The majority of the pipeline route in this area follows existing roads. The most northerly stretch continues from Raffeen/Strawhill pumping station, which follows the R610 to Raffeen Bridge. Another pipe route runs along a third class road southwards from Raffeen Bridge towards Carrigaline in the direction of the WWTP (and an existing ESB substation). A third short stretch is to be located immediately to the south of the R28 in a cluster of houses. The longest stretch runs from north along a road near a golf course to the south of Monkstown Creek, southwards to the junction with the R28 at Shanbally. The route continues southwards

across the R28 to Coolmore Cross Roads. There is a westwards branch off this main north-south line to service the WWTP (it follows the lane to the current sports field at this location).

At Coolmore Crossroads, the pipeline along the roads follows for a short distance to the east and south and follows to the west along the R613 towards Carrigaline.

Pipeline Routes through "Green Field" Areas

There are several sections of Greenfield pipeline proposed at this location. The majority are proposed to feed to the WWTP and three emanate from the northwest, northeast and southeast corners of the WWTP. These are proposed to follow existing field boundaries. Nothing of an archaeological nature was noted along the northwest stretch. The northeast section will impact on CH9 and CH10 (see below).

There is a short stretch of green field pipeline proposed to the east of Raffeen Bridge in order to connect two stretches of pipeline along the road. This is going through a wooded area.

The final stretch of green field pipeline runs generally parallel to the R613 from Coolmore Cross Roads towards Carrigaline. The route runs behind houses which front onto the R613 and so could not be walked at the time of writing. It would appear from viewing from the R613 that the route is through fields under both pasture and crops. A short stretch is located on the northern side of the R613 and was viewed from aerial photos. Nothing of an archaeological nature was noted from the aerial photos.

Pumping Stations and WWTP

The proposed treatment plant is to be located in a green field site on the slope of a hill overlooking the Owenboy River to the south.

The site incorporates two fields (labelled fields A and B for the purposes of description). Field A is the western field of the proposed location for the WWTP. It is bounded by mature hedgerows all around. The central portion of this field is proposed for the WWTP. The field slopes from a high at north to a low at south. High tension power lines cross the site from east to west (an esb substation lies to the southwest). The field at the time of inspection was under grass. Nothing of an archaeological or cultural heritage nature was found in this field. Field B is the eastern field of the proposed WWTP location. This field was also under pasture at the time of writing. Nothing of an archaeological or a cultural heritage nature was noted as being extant at the time of inspection. However immediately outside the boundary of field B are two

features: CH9 and CH10. These are recorded archaeological monuments RMPs. Both are enclosures and likely to be ringforts. CH9 is partially extant with its northern portion being maintained in the field boundary. CH10 was noted as a crop mark. Both these features are predicted to be impacted by the proposed WWTP and associated pipe work. The predicted negative impacts on these CH sites are detailed in section 5.

Cultural Heritage Features (Fig. 21)

This area incorporates three cultural heritage features, CH8, CH9 and CH10 in the townland of Shanbally. CH8 is a limekiln (inventory no. 6163) and an RMP. Access to this site was not permitted at the time of writing and it was densely overgrown so could not be viewed from the road. Its ZAP is predicted to be impacted rather than the limekiln itself. CH9 (inventory 5312) is an RMP and is classified an enclosure. It is likely to be a ringfort based on its morphology and location. CH10 is another RMP enclosure (inventory 6364) and manifested itself as a crop mark. No trace visible on ground at time of inspection. Both CH9 and CH10 are predicted to be impacted by the pipeline route. Impacts and mitigation suggested in section 5.

3.2.4 Ringaskiddy & Environs (fig. 9; plates 3.24-3.29)

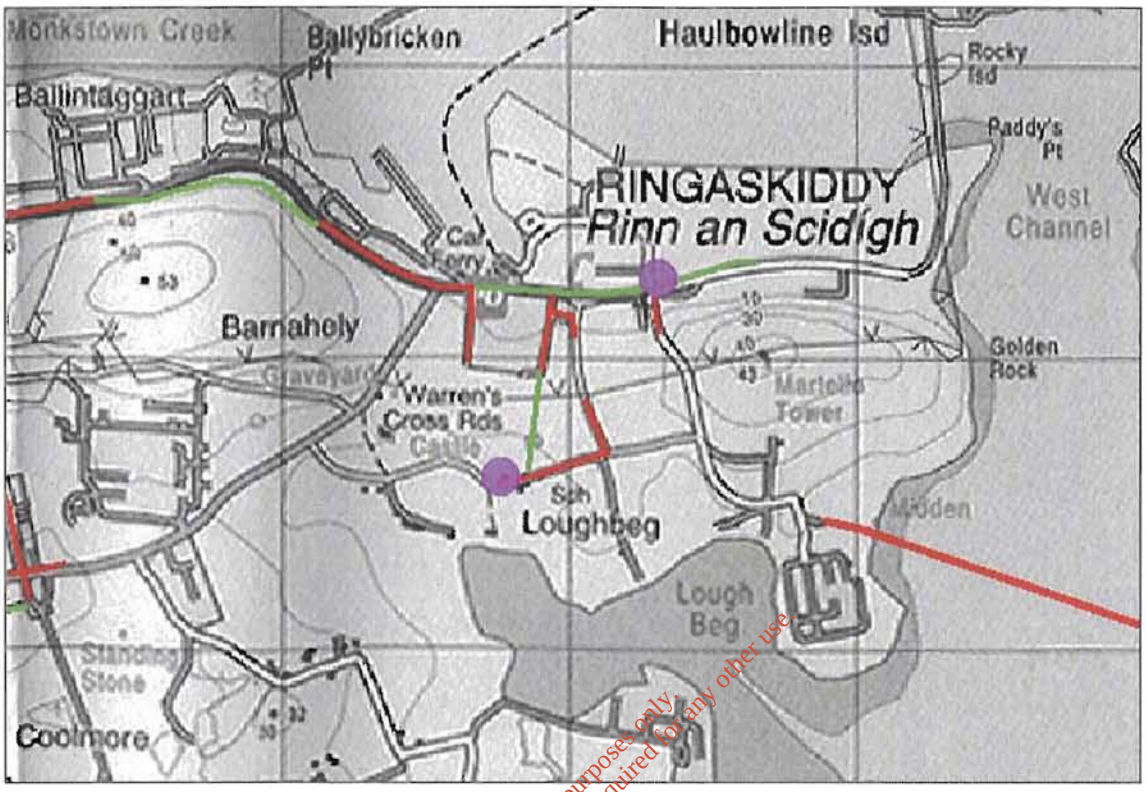

Figure 9. Location of pipeline routes within the Ringaskiddy area (map detail no. 4)

Pipeline Routes along Existing Roads

The pipeline at this location again comprises both green field and existing/roadway pipelines, but the majority is along existing routes. Where it deviates from the N28 the pipe is proposed to run along the grass verge of the roadway. In the Ringaskiddy area it follows along the N28 at north, firstly along the roadway (at western end from Shanbally) where it then diverges from the road into the grass verge on the southern side of the N28 before meeting up with the N28 again. After a distance of approximately 500m the proposed pipeline then again will follow the grass verge of the N28 until its terminus.

The pipeline route is to be located along smaller roads in the Loughbeg area at south of the N28. All these routes were accessed for archaeological or cultural heritage features. None was noted during the inspection.

The proposed outfall pipe at the eastern side of the area is to follow an existing IDA outfall (as marked on the mapping).

Pipeline Routes through "Green Field" Areas

Green field locations of the pipe foe the N28 in Ringaskiddy have been noted above in the existing routes, as it is proposed that the pipes will travel along the road verges (which are disturbed ground in any case). A short stretch of pipe is routed across fields to the west of a school. This stretch was not accessed at the time of writing but was seen on the aerial photos. The route follows existing field boundaries.

Pumping Stations

There are two types of pumping stations proposed for this project: minor pumping stations and major pumping stations. The minor pumping stations were considered part of the overall piping route, when this was visited. There are no proposals for a major pumping station at this location at the time of writing.

Cultural Heritage Features (Fig. 22)

There are four Cultural Heritage (CH) features located within this area, CH11 and 12, and new sites noted during the walkover inspection CH20 and CH21. CH11 is recorded in the RMP as a possible church, though the inventory does not include it. No trace found during the walkover inspection. Location marked on constraint illustrates as per RMP. CH12 is a shell midden (inventory 4271). This feature was noted during the walkover inspection. As there are no predicted works in this area, it is not predicted to be impacted at this time. There is an existing IDA outfall at this location. CH20 is a modern roadside memorial. It is predicted to be impacted. CH21 is a plaque dating to 1980. It may be impacted depending on which side of the road the pipeline route will be located.

3.2.5 Cobh & Environs (fig. 10; plates 3.30-3.41, 3.45-3.47)

Due to Cobh's historical importance for a number of reasons, including its unique maritime history, it has been allocated a CH number for the purposes of this study: CH26. It is suggested that the boundary for CH26 follow the limits of the Town Council as set out in its Development Plan (CTC 2005). Where specific features of note have been inspected within the zone for Cobh, these have been given additional CH numbers.

For the majority of the works proposed around Cobh, the pipeline is to be located along existing roadway. There are some notable green field areas too, however.

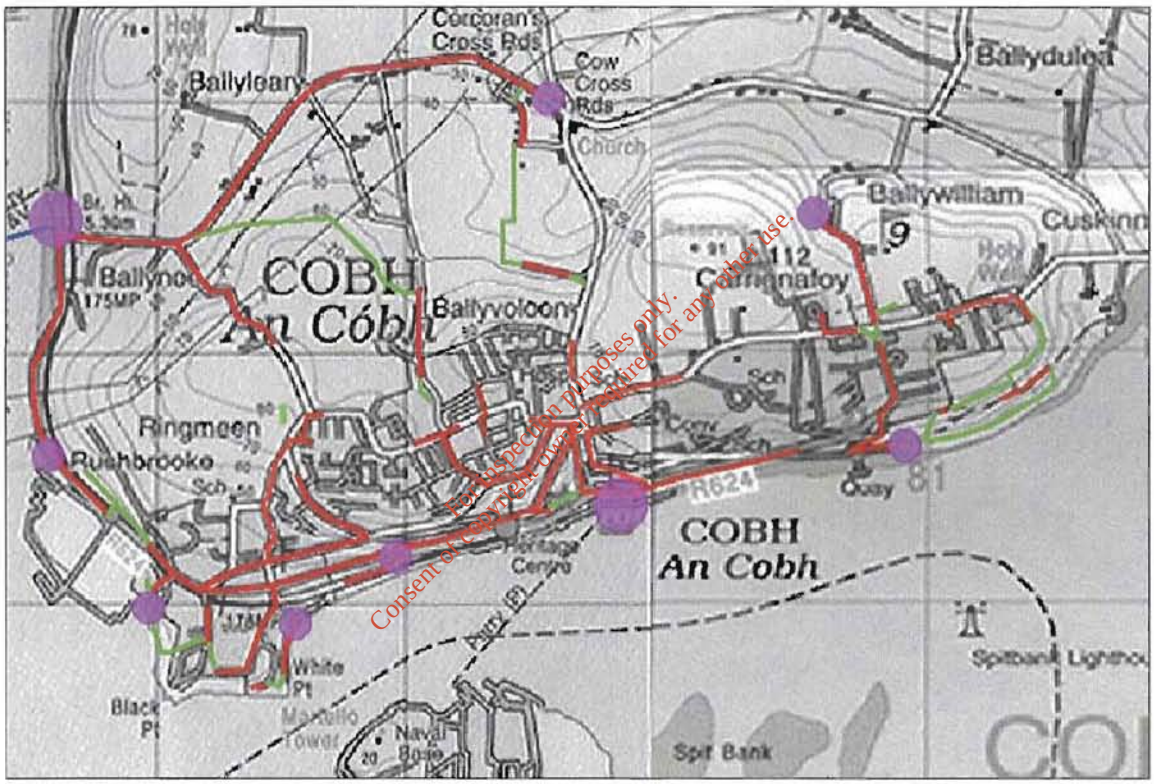

Figure 10. Location of pipeline routes around Cobh and its environs (map detail no. 5)

Pipeline Routes along Existing Roads

The pipeline proposed follows the R624 from Carrigaloe to the north (see pumping station below), through Rushbrooke, along the road at West Beach (the main street in Cobh), east Beach eastwards as far as Carrigafoy (the current harbour commissioners). This road is undulating as it clings to the steep sides of Cork harbour. There are several branches of pipeline from the main spine along West Beach.

A stretch follows Spy Hill and the Bishop's Road, another stretch follows Westbourne Place, and the road that the Heritage Centre and Garda station is located. Pipes are proposed for