
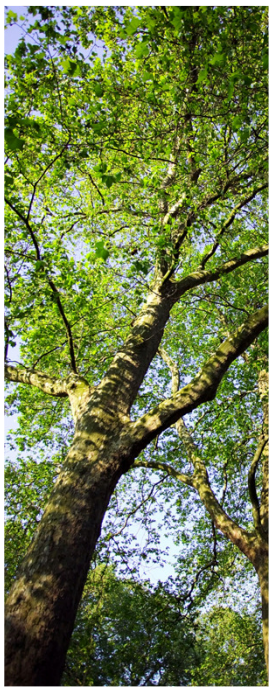


Ardersier Wastewater Treatment Works

Environmental Statement

March 2010

Scottish Water

SCOTTISH WATER

Mott MacDonald

Ardersier Wastewater Treatment Works

Environmental Statement

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Scottish Water

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Executive Summary

Scottish Water proposes to construct a new wastewater treatment works (WwTW) at the site of the existing WwTW at Ardersier. The Highland Council have advised that the proposed development must be assessed under the EIA (Scotland) Regulations 1999.

The Environmental Statement is comprised of 3 Volumes;

- Volume 1 – Non-technical Summary;
- Volume 2 – Part A – Proposal Description and Background;
- Volume 2 – Part B – Environmental Impact Assessment; and
- Volume 3 – Technical Appendices used to inform the EIA.

The EIA concludes that most of environmental impacts identified throughout the assessment will have a residual minor or negligible impact.

The key environmental issues identified are as follows;

- Site Layout:

The footprint of the site includes space set aside for potential increase in capacity at some later date.

- Contamination

A medium residual risk of environmental effects from ammoniacal nitrogen has been noted. Ammoniacal nitrogen contamination was found to be present in leachates (two sampling points) and groundwater (two sampling points) across the site. Concentrations detected in the leachates ranged from <0.05mg/l to 0.08mg/l while the groundwater concentrations ranged from 0.05mg/l to 0.76mg/l, all of which exceeded the Environmental Quality Standards for marine waters of 0.021mg/l.

As the WwTW is considered a likely source of this contamination, further testing is required for the material underlying the existing WwTW. This testing could be completed during demolition/decommissioning of the WwTW and would contribute to investigation of the possible source of elevated ammoniacal nitrogen concentrations.

- Landscape and Visual Impact

There is a trade-off between high building elevations and limitations on the depth of excavation. Excavation depth is restricted by the water table in this coastal location, along with requirements to minimise energy requirements for pumping and minimise flooding risk.

Bunding and planting are recommended to mitigate for visual intrusion from buildings.

The visual setting of the National Monuments in the surrounding area is not compromised by the proposed development.

- Water Quality and Marine Ecology

The new WwTW includes tertiary treatment in the form of disinfection of effluent, thereby improving discharge quality.

Water quality local to the outfall, where effluent currently discharged has secondary treatment, will have moderately significant improvement. The wider Moray Firth is expected to undergo negligible change.

Residual issues of minor impact include disturbance of marine mammals through transfer of noise emissions underwater, although it should be noted that the proposed development is approximately 50 m from Mean High Water Springs and over 500 m from Mean Low Water Springs. There is also a minor residual impact on the dingy skipper butterfly in Ardersier Common. Recommended mitigation measures are detailed in the relevant technical chapter.

- Odour Emissions

Abatement measures for odour control have been identified and recommended for implementation.

With these abatement measures, all sensitive receptors are exposed to less than 5 OU_E/m^3 during normal operations, therefore no odour nuisance is expected.

- Construction Traffic

The preferred route for construction traffic is through Ardersier. Alternative routes considered were found to be unsuitable for construction vehicles.

The number of vehicles at peak construction time may necessitate reinforcement or supplementation of existing traffic calming measures through Ardersier village, along with planning conditions to restrict the timing of vehicular movements.

Part A: Description of the Development

Part A includes discussion of the background to the scheme, including description of the EIA process, the need for the development, the purpose and key objectives of the EIA, the approach taken in completing the EIA, details of the existing site and works, details of the proposed works and legislative context.

Assessment of environmental impacts arising from the construction and operation of the proposed development are reported in Part B of this volume.

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1. The Environmental Impact Assessment

1.1 Introduction

Recent growth and committed future development within the A96 Corridor area of Inverness has resulted in a need for increased wastewater treatment in the catchment area comprising Ardersier Village, Tornagrain Hamlet, Fort George and Inverness Airport. This catchment is currently served by Ardersier wastewater treatment works (WwTW).

As a solution to meet projected increase in demand, Scottish Water (SW) intends to construct a new WwTW with increased capacity for treatment at the site of the existing WwTW at Ardersier. This will enable development in the A96 catchment to continue without impediment caused by infrastructure constraints.

There is a requirement for Scottish Water to lodge a planning application for the proposed new wastewater treatment works under the Town and Country Planning (Scotland) Act 1997. This Environmental Statement (ES) has been prepared in support of the planning application.

The ES represents the culmination of an Environmental Impact Assessment carried out by Scottish Water Solutions and Mott MacDonald, involving specialist studies, data gathering, and consultation with statutory and non-statutory consultees.

The ES has been developed to present a description of the proposed scheme for the WwTW and to identify potential environmental impacts and their mitigation.

Ardersier WwTW and its catchment area are within the A96 Corridor section of Inverness City-Region. See Figure 1.1 for a Location Map.

Figure 1.1: Location Map – Ardersier Wastewater Treatment Works

1.2 The EIA Process

The requirement to undertake an Environmental Impact Assessment (EIA) and prepare an Environmental Statement (ES) is established by European Directive 85/337/European Economic Community (EEC) (as amended by Council Directive 97/11/European Commission (EC) and 2003/35/EC) on the assessment of the effects of certain public and private projects on the environment (The EIA Directive).

In Scotland, the EIA (Scotland) Regulations 1999 transpose the EIA directive as amended into Scottish Law. The regulations apply to projects which require planning permission in response to an application under Part III of The Town and Country Planning (Scotland) Act 1997.

Under the EIA regulations, a screening opinion may be requested from the relevant planning authority in advance of the planning application to determine whether the scheme is an EIA development, and if deemed to be so an ES is required to be submitted in support of any planning application.

A screening opinion was requested of The Highland Council (THC) Planning Department who deemed that the proposed scheme should be subject to an EIA under the regulations. Further details of screening, scoping and consultation can be found in Chapter 5.

The purpose of the EIA is to systematically investigate the likely impact of the scheme on the biological, physical and human environment, as well as on welfare and current and future use of the environment. It helps to ensure that the importance of predicted effects, and the scope for reducing the negative and maximising the positive are properly understood by the public, the statutory and non-statutory consultees, and the local authority before it is determined whether the development proposals which the ES accompanies should be given planning permission.

The EIA and ES are an integral part of the scheme design, construction and operational phases. The EIA is used as a means of informing the decision making process throughout the design of the scheme so that potentially significant negative environmental impacts can be alleviated and positive impacts optimised. This can be achieved where practicable by incorporating measures to avoid, reduce, remedy or offset any predicted adverse effects.

There is no statutory prescribed format for an ES, but the EIA regulations have certain requirements as to the information that should be included. The ES must contain the information specified in Part II of Schedule 4 of the Regulations. The Regulations also require the inclusion of relevant information in Part I of Schedule 4 as is reasonable, to assess the effects of the project, and which the applicant would be able to provide in light of the scoping and taking account of current knowledge and assessment methods.

The format of this ES has been set out so as to clearly show that it covers each of the requirements of Part I and II of Schedule 4 of the Regulations. Part I of Schedule 4 specifies the following information:

- "Description of the development, with particular reference to:
  - A description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases
  - A description of the main characteristics of the production processes, for instance, nature and quantity of the materials used
  - An estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc.) resulting from the operation of the development

- An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for his choice, taking into account the environmental effects

- A description of the aspects of the environment likely to be significantly affected by the development, including in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the inter-relationship between the above factors

- A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, beneficial and adverse effects of the development resulting from:
  - the existence of the development
  - the use of natural resources
  - the emission of pollutants, the creation of nuisances and the elimination of waste
  - description by the applicant or appellant of the forecasting methods used to assess the effects on the environment

- A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment

- A non-technical summary of the information provided under paragraphs 1 to 5 of this part

- An indication of any difficulties (technical deficiencies or lack of know how) encountered by the applicant or appellant in compiling the required information."

Part II of Schedule 4 of the Regulations specifies the following information:

- "A description of the development comprising information on the site, design and size of the development

- A description of the measures envisaged in order to avoid, reduce and, if possible, eliminate significant adverse effects

- The data required to identify and assess the main effects, which the development is likely to have on the environment

- A non-technical summary of the information provided under the above information."

1.3 Purpose and Structure of the EIA

1.3.1 Limitations in Compiling the ES

The information provided in the ES is based on an outline design for development of the wastewater treatment works and current knowledge regarding the ground conditions and the location of utility services.

1.3.2 ES Assessment Team and Structure

The team of consultants involved in the ES and the structure of the EIA are presented in Table 1.1 below. This team was selected for their specialist technical services and expertise in their field. Overall management of the ES process, consultancy team and production of the ES was performed by Mott MacDonald on behalf of Scottish Water.

The Environmental Statement is presented in three volumes:

- Volume 1: Non-technical Summary
- Volume 2: Environmental Statement
    - Part A: Description of the Development
    - Part B: Environmental Elements Affected
- Volume 3: Technical Appendices

Table 1.1: ES Assessment Team and Volume Structure

Chapter	Author	Description
Part A: Description of the Development		
Chapter 1: Introductory Statement	Mott MacDonald	This section provides an introduction to the scheme including the assessment team and introduces EIA processes.
Chapter 2: Planning Framework	Tim Muir, Planning. Scottish Water Shared Services	This section sets the scheme within the legislative and planning policy context, including but not limited to the Highland Structure Plan, Local Plan, National Planning Policy Guidance and Scottish Planning Policies.
Chapter 3: Need for the Development	Mott MacDonald	This section describes the water treatment works in the context of recent and proposed development in the catchment area. An outline of the history of the scheme, previous studies and key objectives of the proposed scheme is presented.
Chapter 4: The Proposed Scheme	Mott MacDonald	This section includes a general description of the study area and the proposed scheme components. It provides details of the overall scheme layout and permanent access arrangements. This section also outlines a general summary of construction activities and construction plant.

Chapter	Author	Description
Chapter 5: EIA Approach	Mott MacDonald	This section provides details of the general approach and methods used for the EIA. It includes description of the screening and scoping process, identifying the consultees contacted, their responses to the proposed scheme and the subjects representing the focus for the EIA..
Chapter 6: Consideration of Alternative Schemes	Mott MacDonald	This section describes the alternative options which were assessed and provides a description as to why these were discounted as viable schemes.
Part B: Environmental Elements Affected		
Chapter 7: Geology, Soils and Contaminated Land	Mott MacDonald	This section contains a brief description of the chapter content and a description of the methodology used to collect the baseline information and undertake the impact assessment. This is followed by a description of the predicted impacts in relation to geology, soils and contamination. Mitigation measures are proposed and residual and cumulative impacts are assessed.
Chapter 8: Landscape and Visual	Clare Pond, Landscape Architect, Scottish Water Shared Services	Structure as per chapter 7.
Chapter 9: Hydrology and Water Quality	Mott MacDonald	Structure as per chapter 7.
Chapter 10: Ecology and Nature Conservation	Mott MacDonald	Structure as per chapter 7.
Chapter 11: Air Emissions	Mott MacDonald	Structure as per chapter 7.
Chapter 12: Noise and Vibration Emissions	Mott MacDonald	Structure as per chapter 7.
Chapter 13: Access and Traffic	Mott MacDonald	Structure as per chapter 7.
Chapter 14: Cultural Heritage and Archaeology	Mott MacDonald	Structure as per chapter 7.
Chapter 15: Socioeconomics, Tourism and Land Use	Mott MacDonald	This section considers the baseline socio-economic, tourism and land use conditions then assesses impacts of the proposed development on the features of importance identified.
Chapter 16: Cumulative Effects	Mott MacDonald	This section considers the cumulative effects of the development for all environmental aspects in combination with other proposed or existing developments in the local area.
Chapter 17: Summary of Environmental Effects	Mott MacDonald	This chapter provides a brief summary of the findings from chapters 7 to 16 and includes an Environmental Impacts table highlighting the identified impacts, sensitivity / value, magnitude without mitigation, proposed mitigation, significance with mitigation, positive or adverse impact and duration of impact.

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2. Planning Framework

2.1 Introduction

A comprehensive review was undertaken to determine the relevant planning legislation and policy applicable to the proposed development at the Ardersier WwTW. This review of policy and plans that potentially influence the proposed development was based upon two levels of guidance.

At the national level, the proposed development has been assessed against National Planning Policy Guidelines (NPPGs), and Scottish Planning Policies (SPPs) in terms of national planning guidance. At the local level, the proposed development has been assessed against the relevant Development Plan, including the Highland Structure Plan, the Inverness Local Plan and the A96 Growth Corridor Framework.

2.2 National Legislation and Policies

The following legislative requirements have been taken into account when carrying out this assessment:

- Town and Country Planning Act 1997
- Planning etc. (Scotland) Act 2006
- Environmental Impact Assessment (Scotland) Regulations 1999
- Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009
- Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2008
- Reservoirs Act 1975
- Wildlife and Countryside Act 1981
- Protection of Badgers Act 1992
- Environmental Protection Act 1990
- Control of Pollution Act 1974
- Ancient Monuments and Archaeological areas Act 1979
- Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1979
- The Birds Directive 79/409/EEC
- The Habitats Directive 92/43/EEC
- Water Service (Scotland) Act 2005
- Waste Management Licensing Regulations 1994

2.2.1 Environmental Impact (Scotland) Regulations 1999

An Environmental Impact Assessment (EIA) is a process which identifies the environmental effects, both positive and negative, of development proposals. It aims to prevent, reduce and offset any adverse impacts. The statutory requirement for EIA is set out in the 1985 European Council Directive (No. 85/337/EEC). This was amended in 1997 by Council Directive 97/11/EC.

The Environmental Impact Assessment (Scotland) Regulations 1999 transpose the EIA Directive as amended into Scottish planning law. The Regulations set out the statutory procedures, list the types of project to which they apply, specify the information to be contained in an environmental statement, list the consultation bodies and provide criteria for deciding whether projects are likely to have significant environmental effects.

The statutory requirement for EIA applies to the types of projects described in Schedules 1 and 2 of the Regulations. EIA is always required for a Schedule 1 project which by virtue of its nature or scale is always likely to have significant environmental effects. Development of a type listed in Schedule 2 of the Regulations requires EIA if it meets one of the relevant criteria/exceeds one of the relevant thresholds listed in the second column of the table in Schedule 2 or is located wholly or in part in a 'sensitive area' as defined in regulation 2(1). For the overwhelming majority of development projects however, normal planning powers are perfectly adequate to gain environmental information and EIA is not required (PAN 58, Scottish Executive).

The proposed development at Ardersier WwTW has been assessed by Highland Council to constitute EIA development, as it is deemed to qualify as a Schedule 2 development under the Regulations and is likely to have significant effects on the environment by virtue of its size and location in close proximity to areas of special designation. The reasons for Council's decision were contained in their Screening Opinion, issued on 29th January 2009, namely:-

"The development is for an extension of the existing Wastewater Treatment Works at Ardersier where the extent of development will exceed 1,000 square metres. The development therefore comes within Schedule 2, 11(c) of the above Regulations. By reason of its nature, scale and in particular its location adjacent to a Special Area of Conservation, Marine Special Area of Conservation, Moray Firth Special Protection Area, SSSI (Ardersier glacial deposits) and proximity to Fort George Scheduled Ancient Monument and within a Sensitive Coastal Zone and Landscape in respect of Visual Impact the development is likely to have a significant effect on the environment."

For all Schedule 2 developments, the relevant planning authority must make its own formal determination of whether or not an Environmental Impact Assessment is required in conjunction with a variety of consultees. In making this determination, the planning authority must take into account the relevant "selection criteria" in Schedule 3 of the Regulations.

2.2.2 Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009

The Planning etc. (Scotland) Act 2006 introduced the hierarchy of developments for planning in primary legislation. The use of the hierarchy ensures that applications are dealt with in an appropriate way to their scale and complexity, allowing decisions to be taken at the most appropriate level. Part 3 Section 5 of the 2006 Act inserts a new section 26A into the Town and Country Planning (Scotland) Act 1997 which defines the three categories in the hierarchy of development to which all developments are allocated, namely:-

- National development;
- Major development; and
- Local development.

The Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009 apply to all developments across Scotland, and to all land and waters covered by the Planning Acts. The hierarchy allows a proportionate approach to be used for dealing with planning applications depending on which of the three categories a development falls within. The procedure for making and handling planning applications vary between the three categories. Procedural matters including the making and handling of different categories of development are contained in the Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2008.

Section 26A(2) of the Planning etc. (Scotland) Act gives Scottish Ministers powers to make regulations to describe classes of development other than national developments and assign each class to either “major developments” or “local developments”. The Act prescribes that it is Scottish Ministers who are to describe classes of major and local development. There is no scope for local interpretation of what constitutes a major development or local development either by planning authorities, by applicants or by other stakeholders in the planning system.

Regulation 2(1) of the Hierarchy Regulations states that classes of development belong to the “major development” category where any applicable threshold or criterion in Schedule 1 of the regulations is met or exceeded in relation to that class of development. The Schedule of major Developments in the Hierarchy Regulations sets out nine ‘classes’ of major developments, each with a description and relevant threshold or criteria. References to ‘classes’ in the Hierarchy Regulations refer to classes in the Schedule to those regulations.

The proposed development at Ardersier WwTW is considered to be a “major development” by virtue that it falls within the threshold or criterion related to Waste Management Facilities, as listed in Schedule 1 of the Hierarchy Regulations, in that the capacity of the proposed facility will exceed 25,000 tonnes per annum.

2.2.3 Habitats Regulations

In 1992 the European Community adopted Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna (EC Habitats Directive). In the UK the Directive has been transposed into national laws by means of the Conservation (Natural Habitats, & c.) Regulations 1994 (as amended). These are known as 'the Habitats Regulations'.

The habitats and species listed in the annexes of the Directive are to be protected by means of a network of sites. Each Member State is required to prepare and propose a national list of sites for evaluation and once adopted, these are designated by Member States as Special Areas of Conservation (SACs), and along with Special Protection Areas (SPAs) classified under the EC Birds Directive, form a network of protected areas known as Natura 2000.

The Habitats Directive introduces for the first time for protected areas, the precautionary principle; that is that projects can only be permitted having ascertained no significant adverse effect on the integrity of the site. Projects may still be permitted if there are no alternatives, and there are imperative reasons of overriding public interest. In such cases compensation measures will be necessary to ensure the overall integrity of network of sites.

The Habitats Regulations require that where a competent authority concludes that a development proposal is likely to have a significant effect on a Natura 2000 site; it must undertake an appropriate assessment of the implications for the conservation interests for which the area has been designated. The assessment is required whether or not the proposal is subject to a full EIA. If an EIA is carried out for a project affecting a Natura 2000 site, the environmental statement should address the impact of the proposal on the conservation interest of the site in question. The environmental statement will help the Planning Authority to make its assessment of whether a proposal is likely to have a detrimental effect on the conservation interest and therefore whether they may grant planning permission for the proposal.

2.2.4 Water Services (Scotland) Act 2005

The Scottish Parliament has introduced legislation to regulate odour releases from Wastewater Treatment Works (WwTW). The Water Services (Scotland) Act 2005 gives Ministers the power to introduce a code of proactice for assessing, controlling and minimising sewerage nuisance from the public sewerage system. The code of practice came into force on 22nd April 2006 and since then all operators of WwTW must comply.

The code of practice sets in place a set of standards which are management-based controls to ensure that a WwTW is operating as efficiently as possible with respect to odour release. In order to comply with the code they must ensure that the site operates efficiently and that an Odour Management Plan is in place.

2.2.5 Waste Management Licensing Regulations 1994

If material is imported to a site to be used in site bunding, as in the case of the site bunding that is to be incorporated in the proposed development, then this material is likely to be considered as waste. If the planning authority consider this imported material as waste then it will be necessary for Scottish Water to ensure that this material is compliant with the Waste Management Licensing Regulations 1994. An exemption may be available.

2.2.6 National Planning Policy Guideline 14 (Natural Heritage)

This document states that for any given development proposal, the more environmentally sensitive the location, the more likely it is that environmental effects will be significant and will warrant assessment. Where a project listed in Annex II of the Directive is likely to have significant effects on the special character of a protected area or site an environmental assessment must be carried out. The views of SNH should be sought and taken into account where the planning authority is uncertain about the significance of the likely effects of a project on the natural heritage.

Environmental statements prepared under the Regulations must contain information on any likely significant effects on flora, fauna and the landscape, and the interaction between them. SNH is a statutory consultee for environmental statements prepared under the Regulations.

2.2.7 Planning Advice Note 58 (Environmental Impact Assessment)

This document states that The Town and Country Planning (Scotland) Act 1997 and the General Development Procedure Order 1992 provide planning authorities with wide ranging duties and powers to collect and evaluate various types of information from consultees and the applicant before determining any planning application. This may involve consultation and discussion as appropriate with statutory bodies (such as the Scottish Environment Protection Agency and Scottish Natural Heritage), amenity bodies, community councils, the public generally and other council departments or services.

PAN 58 further states that the planning system therefore provides a means for assessing the environmental effects of all applications and the absence of a formal EIA does not mean that environmental issues are not being considered nor appropriate mitigation measures put in place. In the vast majority of cases, the normal powers and duties are sufficient for the planning authority to gather the information it needs, but when an EIA is required, they are supplemented by the procedures set out in the Environmental Impact Assessment (Scotland) Regulations 1999.

2.2.8 Planning Advice Note 81 (Community Engagement)

This document suggests ways to help improve community engagement. It seeks to raise awareness of planning in Scotland and to demonstrate how the reforms will provide more and better opportunities for people to get involved. This should in turn result in more widespread trust and confidence in the planning system. The aspiration goes beyond planning authorities and developers publishing their plans, or submitting planning applications, and waiting for a reaction. It is instead about promoting a more inclusive and participatory system. To achieve this, everyone interested in the future development of their neighbourhood, village, town or city should understand the importance of the planning process, how to get involved at the earliest possible opportunity and feel confident that engaging in the process has been meaningful.

The PAN sets out advice and information to help ensure that everyone, no matter what their age, gender, or cultural background, can participate in ways that suit them in the planning decisions that affect their environments. The document includes the standards for community involvement which should be adhered to, including:-

- Involvement
- Support
- Planning
- Methods
- Working together
- Sharing information
- Working with others

- Improvement
- Feedback
- Monitoring and evaluation

It is beneficial to take into consideration all of the comments made by members of the public before a planning application is submitted to ensure that the proposed development meets the aspirations of the community and / or can be adjusted to address concerns over certain aspects of the development. Details of community engagement, the responses received, and how Scottish Water has responded to them will be provided to the Highland Council with the planning application in the form of a Community Engagement Statement.

2.3 Development Plan Designations and Planning Policies

Section 25 of the Town and Country Planning (Scotland) Act 1997 requires planning applications to be determined in accordance with the development plan unless material considerations indicate otherwise. The following Development Plan documents contain policies that are relevant in the assessment of the proposed development at the Ardersier WwTW:-

- Highland Structure Plan 2001
- Inverness local plan (2006)
- A96 Growth Corridor Framework (Supplementary Planning Guidance 2007)

2.3.1 The Highland Structure Plan

The Highland Council Structure Plan (Approved March 2001) provides the strategic overview of the plan area and sets out the general development framework. The plan highlights the importance of a satisfactory infrastructure system to serve economic development within the local authority boundaries, through its sustainable objectives:

"Adequate provision for water and waste management infrastructure is crucial not only to exploit business opportunities but to retain and enhance the high quality environment, in itself an important economic resource".

The importance of waste management facilities to serve new housing and business development is highlighted within the Strategic Issues section of the plan. Adequate provision for waste management infrastructure is crucial not only to exploit business opportunities but to retain and enhance the high quality environment, in itself an important economic resource. The guidance states that The Highland Council will work with Scottish Water with regard to meeting the infrastructure needs of Highland communities.

The Structure Plan also highlights the legislative environmental obligation that Scottish Water must comply with under the Urban Wastewater Treatment Regulations (Scotland).

The Structure Plan identifies general strategic policies that have been developed from the sustainability objectives and the strategic themes. The Plan highlights that development will be assessed against each strategic policy. The strategic policies relevant to the Appeal Application are:-

- Policy G1 – Conformity with Strategy
- Policy G2 – Design for Sustainability
- Policy G3 – Impact Assessments
- Policy G6 – Conservation and Promotion of the Highland Heritage
- Policy L3 Areas of Great Landscape Value
- Policy L4 – Landscape Character
- Policy N1 – Nature Conservation
- Policy W11 – Sewerage

It should be noted that the structure plan does not identify any land designations at the proposed site.

2.3.1.1 Policy G1 – Conformity with Strategy

The Council will support developments, having regard to the Plan's sustainable objectives, which promote and enhance the social, economic and environmental wellbeing of the people of Highland.

Proposed developments will be assessed on the extent to which they:

- are compatible with service provision (water and sewerage, drainage, roads, schools, electricity);
- are accessible by public transport, cycling and walking as well as car;
- maximum energy efficiency in terms of location, layout and design, including utilisation of renewable sources of energy;
- are affected by significant risk from natural hazards, including flooding, coastal erosion, land instability and radon gas, unless adequate measures are incorporated, or the development is of a temporary nature;
- are affected by safeguard zones where there is a significant risk of disturbance and hazard from industrial installations, including noise, dust smells, electro-magnetism, radioactivity and subsidence;
- make use of brownfield sites, existing buildings and recycled materials;
- impact on individual and community residential amenity;
- impact on non-renewable resources such as mineral deposits of potential commercial value, prime quality or locally important agricultural land, or approved routes for road and rail links."

Local Plans will identify the following areas in respect of sewerage constraints:

- poorly drained areas for septic tanks and soakaways; and

- a safeguard area around wastewater treatment plants and other associated structures, as advised by the North of Scotland Water Authority."

Although this policy is relevant to the proposal it places an emphasis on the role of local plans rather than provide guidance on specific projects.

2.3.1.2 Policy G2 – Design for Sustainability

Policy G2 (Design for Sustainability) states that developments will be assessed on the extent to which they, amongst other things, are compatible with service provision; contribute to the social and economic development of the community and impact on resources such as habitats, species, landscape and freshwater systems.

2.3.1.3 Policy G3 – Impact Assessments

This policy sets out that when environmental and/or socio-economic impacts of a proposed development are likely to be significant by virtue, size or location, the Council will require the preparation by developers of appropriate impact assessments.

2.3.1.4 Proposal L3 – Areas of Great Landscape Value

This proposal sets out that the local plans will identify Areas of Great Landscape Value (AGLV). This proposed site sits inside the Inner Moray Firth AGLV and therefore due care and attention should be paid to the way in which this proposal fits into the landscape.

2.3.1.5 Policy L4 – Landscape Character

Policy L4 (Landscape Character) seeks to maintain and enhance present landscape character, Policy N1 (Nature Conservation) seeks to ensure that new developments minimise their impact on the nature conservation resource and enhance it wherever possible and Policy G6 (Conservation and Promotion of the Highland Heritage) states that the Council will seek to conserve and promote all sites and areas of Highland identified as being of a high quality in terms of nature conservation, landscape, archaeological or built environment.

2.3.1.6 Policy N1 – Nature Conservation

This policy requires developments to minimise their impact on the nature conservation resource and enhance it where possible. This is relevant due to the proximity of this development to the Inner Moray Firth SAC and the Ardersier Glacial Deposits SSSI.

2.3.1.7 Policy W11 (Sewerage)

This policy sets out that local plans will identify areas around waste water treatment works for safeguarding of development.

2.3.2 Inverness Local Plan (Adopted 2006)

The site of the proposed expansion to the wastewater treatment works lies outwith the settlement boundary of Ardersier. While there are no specific allocations for the site the Local Plan identifies the proposed site and its surrounds as a Background Policy 4 feature. Background Policy 4 states,

"The Council will not approve development unless there is an over-riding social, economic, public health or safety reason, or for benefits of primary importance to the environment."

As the existing use of the site is the reason for the area being identified as a Background Policy 4 feature and this proposal is for expansion of its use, the policy will be considered but would not be a restriction on the development of this site. The site is also located within a Background Policy 2 feature due to its location within the Inner Moray Firth AGLV. Background Policy 2 states,

"The Council will permit development unless this would be likely to have a significantly adverse effect on, or be significantly adversely affected by, the features for which the area has been designated. Where it is concluded that any such adverse effects are likely to arise, development will only be permitted where it is considered that these would be outweighed by social or economic benefits."

2.3.3 A96 Growth Corridor Framework (Adopted as Supplementary Planning Guidance 2007)

The A96 Growth Corridor Framework sets out the potential for major expansion in the area between Inverness and Nairn known as the A96 Corridor. This document was supported by a number of infrastructure studies which included the 'A96 Corridor Wastewater Development Option Study' commissioned by Scottish Water and produced by Biwater.

This study identified the need for additional treatment works in the A96 Corridor. A redeveloped WwTW facility at Ardersier was identified as an option in this study. This option was identified to take additional load onto the waste water network from development in the "central area" of the A96 development which would include developments in the Dalcross area including the Inverness Airport Business Park and Tornagrain.

This infrastructure study has also identified that sludge thickening facilities will be used to reduce the transportation of thickened liquid sludge to Allanfearn WwTW for treatment. The Environmental Statement for the proposed development at Ardersier WwTW has given careful consideration as to the route of these movements to Allanfearn WwTW and acknowledges that due to the increase in treatment capacity, there will be an increase in traffic movement to and from the site over time as development progresses.

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3. Need for the Development

3.1 Growth of the Highlands

The Inverness City–Region is one of the fastest growing areas in Scotland. Over the last 30 years, the population grew by almost 32,000 and just over 20,000 houses were built.

The National Planning Framework for Scotland (2004) promotes the Inverness City-Region as one of the key development areas in Scotland over the next 20 years. The Framework identifies specifically the A96 corridor as the main area for growth in the Inner Moray Firth. The A96 corridor covers all of the land between Inverness and the border with Moray and south to the B9006.

In addition, both the Highland Structure Plan and the Inverness Local Plan identify the A96 corridor as the preferred location for long-term development.

The A96 Corridor Framework was published on 19th December 2007. The framework established a 30 - 40 year development plan within the A96 corridor. The Highland Council encouraged developers to recognise the opportunities and to work with the Council and the local communities, using the framework plan as a guide. Developers and landowners have been working proactively as they follow the requirements of the A96 Corridor Framework.

3.2 Scottish Water's Statutory Responsibility

Scottish Water is required by the Sewerage (Scotland) Act 1968 (as amended) section 1(1) to provide such public sewers as may be necessary for effectually draining its area of domestic sewage, surface water and trade effluent and to make such provision by means of wastewater treatment works or otherwise, as may be necessary for effectually dealing with the content of its sewers. The provision of such sewers and treatment processes should be practicable at a reasonable cost.

Scottish Water has a statutory obligation to ensure infrastructure is provided to drain and treat the domestic sewage originating from the proposed developments along the A96 corridor. An overview of the A96 corridor developments is provided on The Highland Council's website:

http://www.highland.gov.uk/yourcouncil/news/newsreleases/2007/December/2007-12-19-03.htm

3.3 Design Threshold of the Proposed Scheme

Plans for long-term development of the A96 corridor to 2041 will require significant upgrade of infrastructure to support the projected increase in population equivalent (PE) for the Inverness and Nairn catchment area.

In order to balance its statutory responsibility to provide infrastructure for development with capital investment constraints imposed by the Water Industry Commission for Scotland (WICS), Scottish Water has taken a phased approach to meeting increased demand in the A96 corridor.

At present, the pace of development beyond 2014 has been determined by Scottish Water to be too uncertain to justify investment.

Consequently, proposed expansion of the wastewater treatment works at Ardersier has been designed to meet population equivalents to 2014 in Phase 1, leaving space for future expansion in the footprint of the works.

3.4 Existing Infrastructure Constraints

Three wastewater treatment works (WwTW) are in the vicinity of the A96 corridor. These are, Nairn, Allanfearn and Ardersier WwTW.

3.4.1 Nairn WwTW

Nairn WwTW has capacity for limited further development. The WwTW is adjacent to Nairn East and Central Bathing Beaches. Treating significant additional flow at this works will place additional risk on Bathing Beach compliance from combined sewer overflows. Furthermore, the existing works is constrained for substantial expansion, as it has poor access (through a holiday camp) and adjacent land is constrained by existing recreational and holiday businesses.

3.4.2 Allanfearn WwTW

Allanfearn WwTW is a Public Finance Initiative works owned and operated by United Utilities and is therefore not a Scottish Water Asset. The Allanfearn WwTW is contracted to accept wastewater from a defined catchment around Inverness. Development within the A96 corridor is beyond the PFI catchment and so not eligible for inclusion. In addition, the ‘spare’ treatment capacity at Allanfearn is required to serve development demand within Inverness.

3.4.3 Adersier WwTW

The WwTW at Ardersier accepts sewage from Ardersier village, Fort George, Tornagrain and Inverness Airport. To treat the increasing load from phased development along the A96 corridor, the works needs to be upgraded and expanded. Expansion to the works is not constrained however, by land availability or development as Scottish Water owns the land adjacent to the existing works. Recently, works have been completed to allow transport of sewage from the Whiteness area to the WwTW.

4. Description of the Development

4.1 Introduction

Scottish Water (SW) plans to construct a new Wastewater Treatment Works (WwTW) on the site of the existing Ardersier WwTW and adjacent land owned by SW. The new works will accommodate increased wastewater requirements relating to committed development at Whiteness Head and Inverness Airport Business Park.

This chapter provides a description of the site and the existing WwTW and also outlines the proposed scheme and construction methodology.

4.2 The site and surrounding area

The site of the proposed development is the area around and including the existing WwTW, located 2km northwest of the town of Ardersier on the shores of the Moray Firth to the east of Inverness. A map of the area is provided in Figure 1.1. The current land uses within the footprint of the proposed scheme are the existing WwTW and open scrubland.

Environmental designations surrounding the site are discussed in detail in Chapter 10 (Ecology and Nature Conservation). An overview of the location of these designated sites, and other features of environmental interest, is shown in Figures 4.1 and 4.2.

The site is owned and operated by Scottish Water. The proposed development will utilise land adjacent to the existing facilities and also areas of scrubland which currently surround the works and provide visual screening. An outline plan of the existing WwTW is shown in Figure 4.3.

4.3 The Existing WwTW

4.3.1 Operation and Process of the existing works

The existing Wastewater Treatment Works at Ardersier provide secondary treatment for a population equivalent (PE) of 1,915. This is projected to increase to a PE of 8,831 by 2014 through a combination of commercial, industrial and residential expansion.

The WwTW currently discharges into the Outer Moray Firth to the north of Fort George (Figure 1.1).

4.3.1.1 Inputs to existing works

Ardersier WwTW currently receives domestic waste from the settlement of Ardersier, the army barracks at Fort George, commercial and industrial waste from Inverness Airport Business Park and the existing settlement of Tornagrain. Figure 4.4 is a schematic of the Ardersier village drainage area.

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Figure 4.1: Environmental Constraints Map A

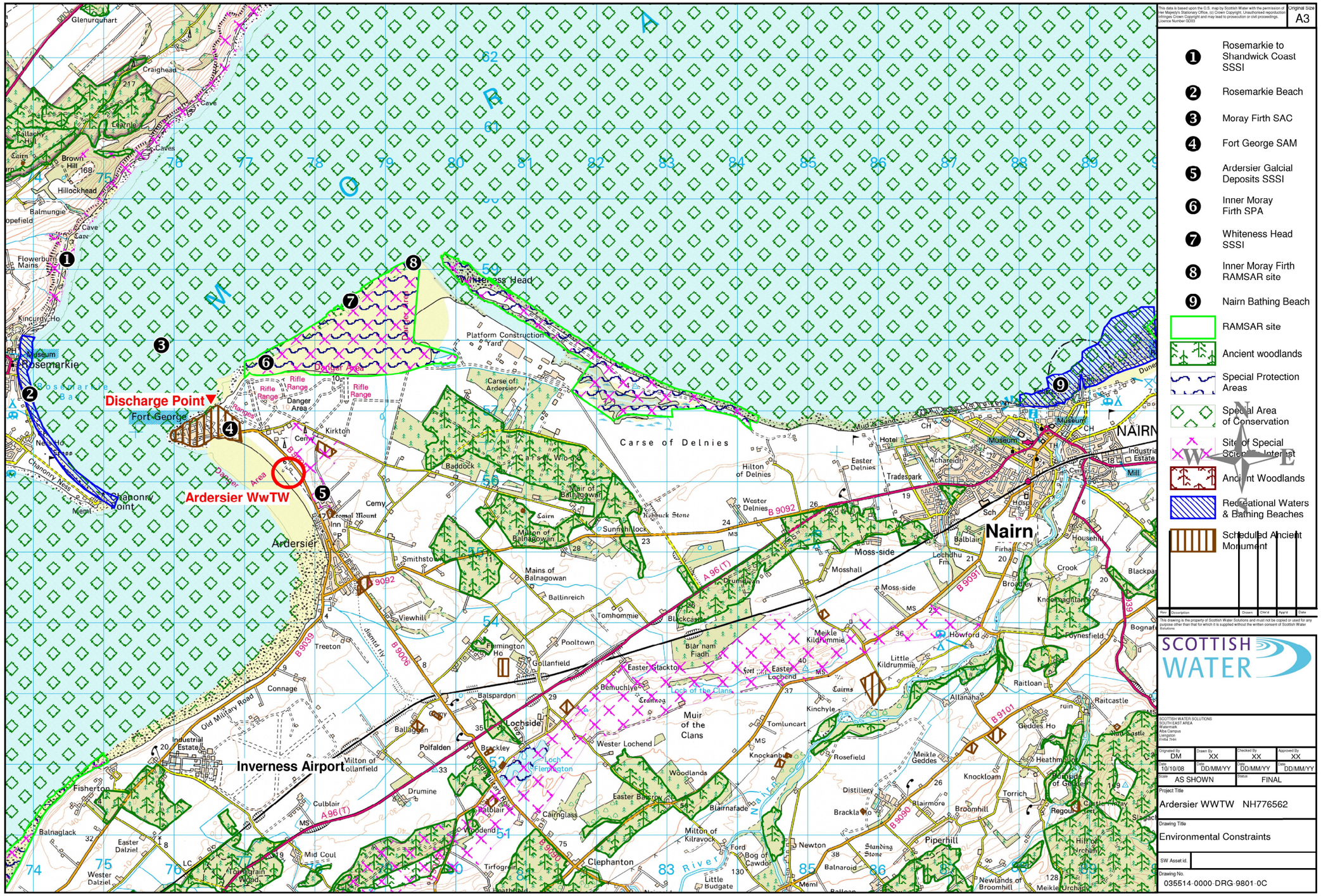

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Figure 4.2: Environmental Constraints Map B

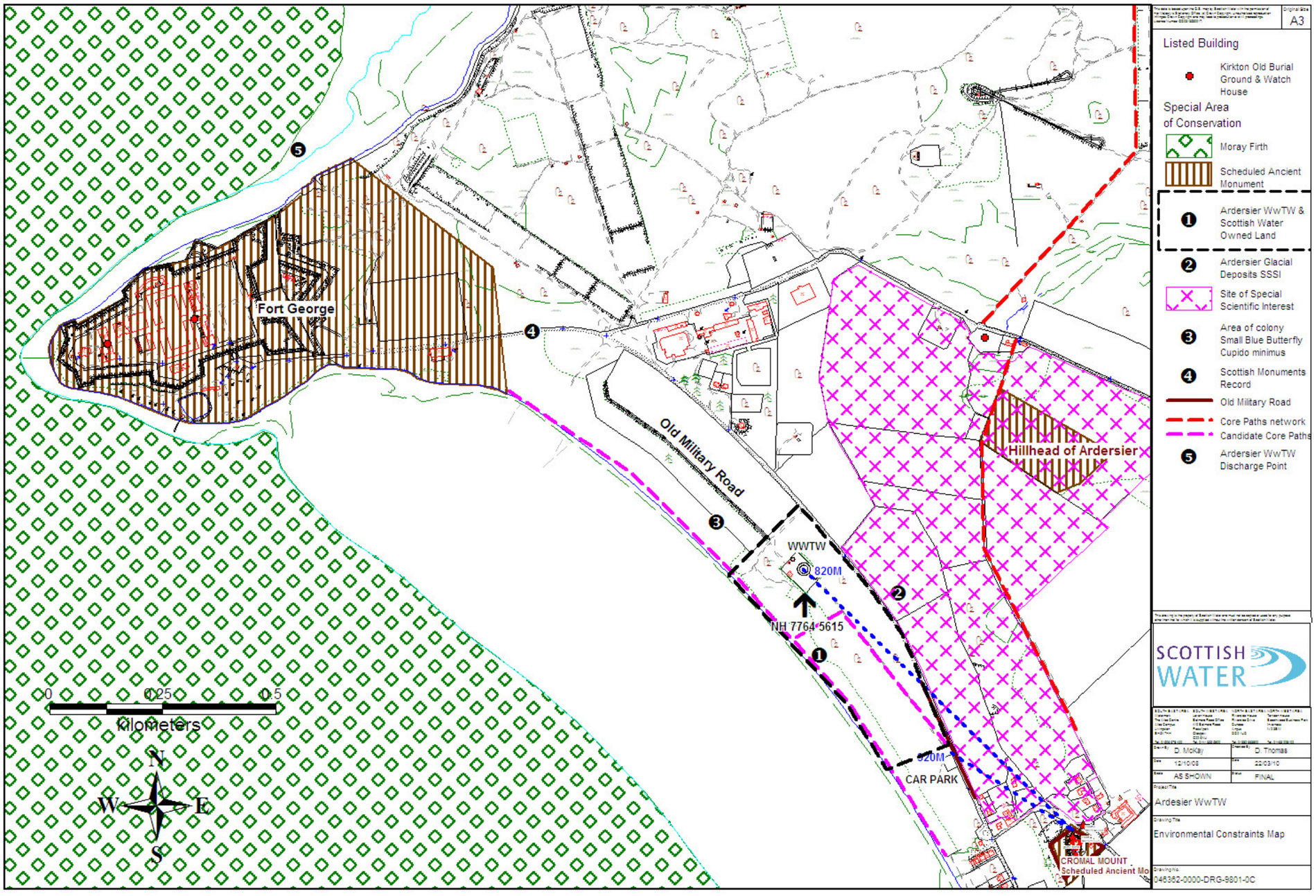

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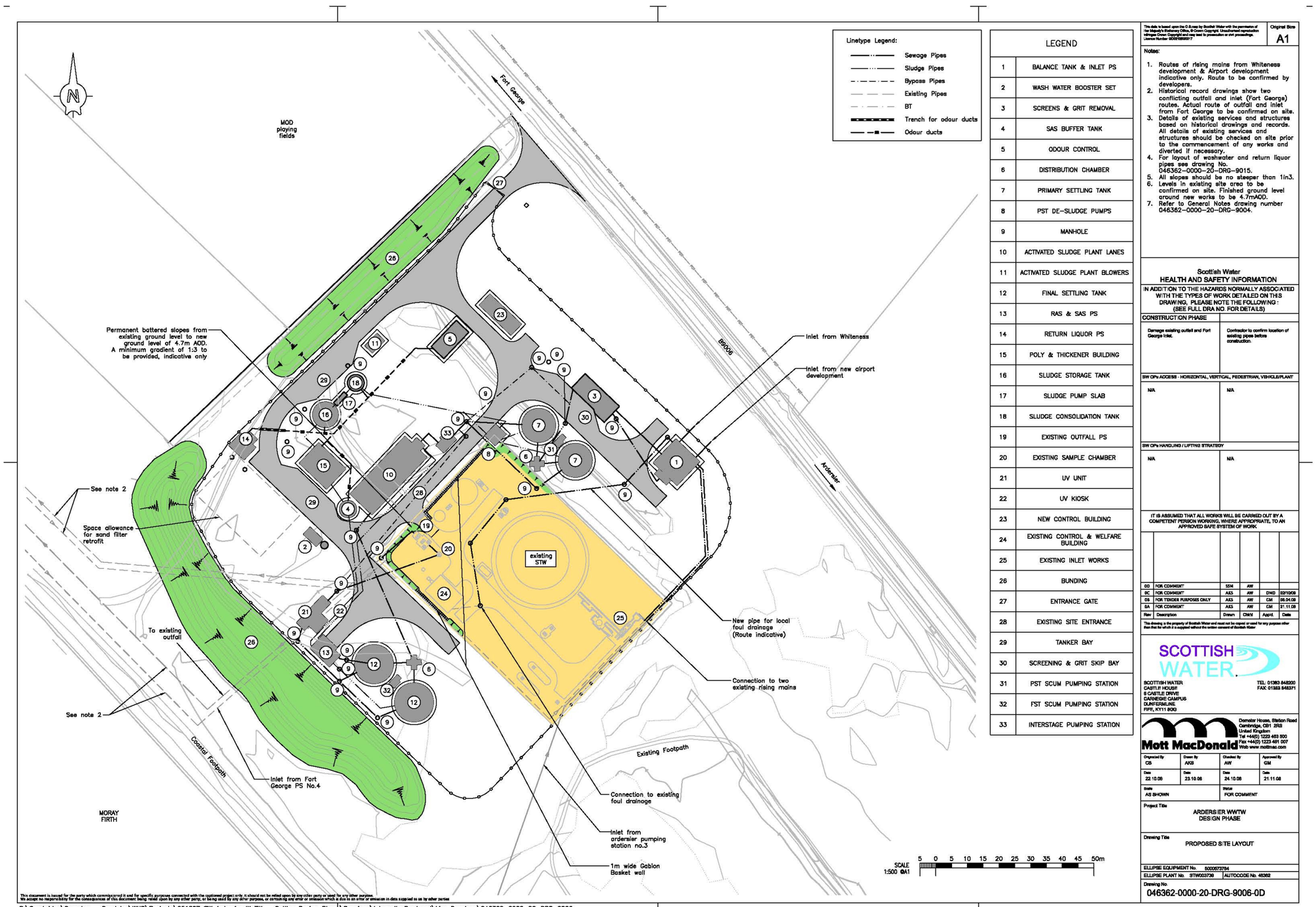
Figure 4.3: Site Layout Plan for Proposed Development



LEGEND	
1	BALANCE TANK & INLET PS
2	WASH WATER BOOSTER SET
3	SCREENS & GRIT REMOVAL
4	SAS BUFFER TANK
5	ODOUR CONTROL
6	DISTRIBUTION CHAMBER
7	PRIMARY SETTLING TANK
8	PST DE-SLUDGE PUMPS
9	MANHOLE
10	ACTIVATED SLUDGE PLANT LANES
11	ACTIVATED SLUDGE PLANT BLOWERS
12	FINAL SETTLING TANK
13	RAS & SAS PS
14	RETURN LIQUOR PS
15	POLY & THICKENER BUILDING
16	SLUDGE STORAGE TANK
17	SLUDGE PUMP SLAB
18	SLUDGE CONSOLIDATION TANK
19	EXISTING OUTFALL PS
20	EXISTING SAMPLE CHAMBER
21	UV UNIT
22	UV KIOSK
23	NEW CONTROL BUILDING
24	EXISTING CONTROL & WELFARE BUILDING
25	EXISTING INLET WORKS
26	BUNDING
27	ENTRANCE GATE
28	EXISTING SITE ENTRANCE
29	TANKER BAY
30	SCREENING & GRIT SKIP BAY
31	PST SCUM PUMPING STATION
32	FST SCUM PUMPING STATION
33	INTERSTAGE PUMPING STATION

Original Size A1

Notes:

1. Routes of rising mains from Whiteness development & Airport development indicative only. Route to be confirmed by developers.
2. Historical record drawings show two conflicting outfall and inlet (Fort George) routes. Actual route of outfall and inlet from Fort George to be confirmed on site.
3. Details of existing services and structures based on historical drawings and records. All details of existing services and structures should be checked on site prior to the commencement of any works and diverted if necessary.
4. For layout of washwater and return liquor pipes see drawing No. 046362-0000-20-DRG-9015.
5. All slopes should be no steeper than 1in3.
6. Levels in existing site area to be confirmed on site. Finished ground level around new works to be 4.7mAOD.
7. Refer to General Notes drawing number 046362-0000-20-DRG-9004.

Scottish Water
HEALTH AND SAFETY INFORMATION

IN ADDITION TO THE HAZARDS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING: (SEE FULL DRA NO. FOR DETAILS)

CONSTRUCTION PHASE	
Damage existing outfall and Fort George Inlet.	Contractor to confirm location of existing pipes before construction.

SW OPs ACCESS - HORIZONTAL, VERTICAL, PEDESTRIAN, VEHICLE/PLANT	
N/A	N/A

SW OPs HANDLING / LIFTING STRATEGY

N/A	N/A

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT PERSON WORKING, WHERE APPROPRIATE, TO AN APPROVED SAFE SYSTEM OF WORK

Rev	Description	Drawn	Chkd	Appd.	Date
0D	FOR COMMENT	SSM	AW		
0C	FOR COMMENT	AKS	AW	DMD	22/10/08
0B	FOR TENDER PURPOSES ONLY	AKS	AW	GM	06.04.09
0A	FOR COMMENT	AKS	AW	GM	21.11.08

SCOTTISH WATER
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6 CASTLE DRIVE
CARNEGIE CAMPUS
DUNFERMLINE
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Originated By	Drawn By	Checked By	Approved By
CB	AKS	AW	GM
Date 22.10.08	Date 23.10.08	Date 24.10.08	Date 21.11.08

Scale: AS SHOWN
Status: FOR COMMENT

Project Title: ARDERSIER WWTW DESIGN PHASE

Drawing Title: PROPOSED SITE LAYOUT

ELLIPSE EQUIPMENT No. 5000572784
ELLIPSE PLANT No. STW0003736 AUTOCODE No. 46362

Drawing No: 046362-0000-20-DRG-9006-0D

P:\Cambridge\Demeter – Daedalus\WUD\Projects\251807 SW Ardersier WwTW – Outline Design Phase\Drawings\Internally Produced\Live Drawings\046362-0000-20-DRG-9006

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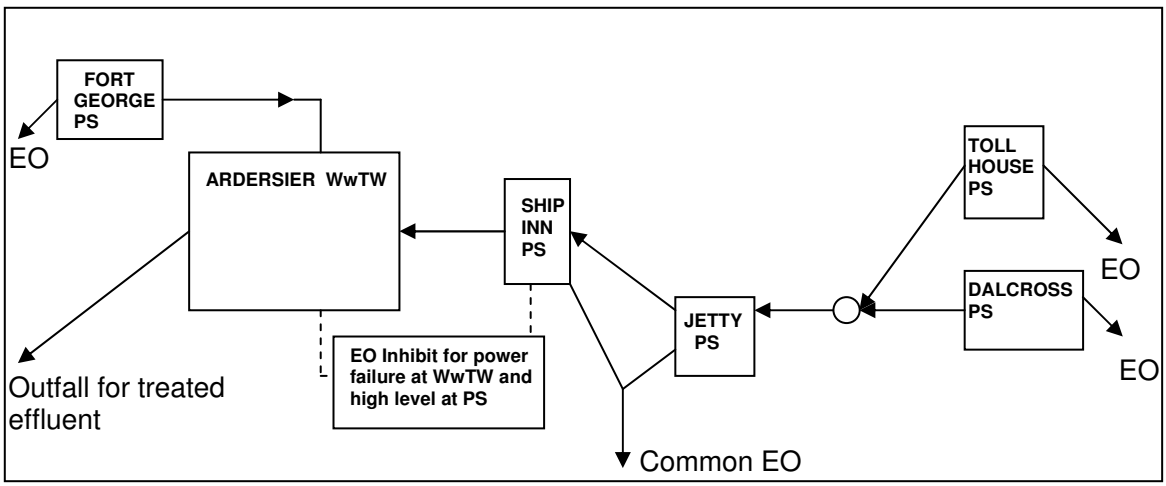
Figure 4.4: Schematic of Ardersier Village Drainage Area



Where the following abbreviations have been used:

- EO – Emergency Outfall
- PS – Pumping Station
- WwTW – Wastewater Treatment Works

Wastewater from the Inverness Airport Business Park and the Dalcross area is pumped via the Dalcross Pumping Station (PS) through the Jetty PS to the Ship Inn PS before reaching the inlet chamber at the WwTW. Wastewater from the Toll House area drains to the Toll House PS, which also feeds into the Jetty PS. A pumping station at Fort George pumps directly to the WwTW.

The Jetty PS receives both foul and surface water from Toll House PS and Dalcross PS as well as flows from approximately 62% of the village of Ardersier. Flows up to a maximum of 25 l/s are passed forward to the Ship Inn PS. All flows in excess of this figure are screened and spill to an EO (emergency outfall) which is shared with the Ship Inn PS.

The Ship Inn PS receives foul and surface water flows from the Jetty PS as well as flows from the remaining 38% of Ardersier. Flows up to a maximum of 34.5 l/s are passed forward to Ardersier WwTW. All flows in excess of this figure are screened and spill to the shared outfall.

The current estimate of PE is 1,915[1], with the discharge consent limit of 3,000.

[1] A Level 2 Headroom Assessment of the current works (Entec, Document Number 5000061980-WW-ASS-33885001, March 2007) estimated the current load to the works as equivalent to 1,851 PE based on telemetry data for July 2006. Using demographic information available for the catchment, the current load figure has been revised and estimated as 1,915 PE (Mott MacDonald, Ardersier WwTW Feasibility Study for A96 Development – Process Selection, April 2008).

4.3.1.2 Treatment process of existing works

Effluent entering Ardersier WwTW currently receives primary screening and grit removal, secondary activated sludge treatment in the form of a compact ditch, and final settlement.

The treated effluent flows to the outlet pumping station then discharges to the sea, to the north of Fort George in the Outer Moray Firth (NGR NH 7650 5710). The pipeline diameter is 280 mm, with the gravity section towards the outfall 250 mm in diameter and an end of pipe cast iron tidal flap.

Sludge from the settlement tank is moved to a storage tank for export and treatment off-site at the Allanfearn WwTW. Primary screen grits are transported to landfill.

During periods of high flows, the overspill at the WwTW is diverted to an overflow tank from where it is returned for treatment when flows reduce.

4.3.1.3 Discharge and Consent Limits

The operation of the existing WwTW is regulated by SEPA in accordance with the Controlled Activities (Water) (Scotland) Regulations, 2004 (CAR), through licence CAR/L/1001681.

The licence places a limit on the amount of wastewater to be treated by the WwTW and places constraints on the quality of the final effluent discharged to the Moray Firth.

The existing WwTW may treat a maximum of 3,000 PE and final effluent is required to contain less than 50 milligrams per litre of biochemical oxygen demand (BOD) and less than 100 milligrams per litre of suspended solids (SS). The pH of treated sewage should be between 6.0 and 8.0.

4.3.1.4 Compliance

Effluent monitoring results show that the existing WwTW operates within the licensed parameters. Concentrations in excess of the standard occurred on a single occasion since 2001.

4.4 The Proposed Development

This section provides a description of the proposed scheme, including information on the design and layout of the scheme, the methods and programme of construction, and the environmental protection measures through which the environmental aspects of the project will be controlled. This information provides the basis against which predicted environmental impacts of the scheme are identified and assessed.

4.4.1 Description of the proposed WwTW

Scottish Water intends to build a new WwTW using the site of the existing WwTW at Ardersier. The new WwTW is designed to treat wastewater from industrial, commercial and residential sources up to a maximum capacity equivalent to a population of 8,900. An outline plan of the proposed WwTW is shown in Figure 4.3.

The new WwTW will make use of the existing WwTW infrastructure, including pipework conveying wastewater from the existing network and discharge pipelines. The new works has been designed to utilise land around the existing WwTW, with some use of surrounding scrubland and minimal encroachment onto

land currently used for public amenity. Final effluent will be discharged through the existing outfall into the Moray Firth to the north of Fort George.

The existing WwTW will be decommissioned once the new WwTW is operational.

4.4.1.1 Inputs to the proposed WwTW

Committed development within the A96 corridor includes housing development at Whiteness Head and expansion of the Inverness Business Park. A pumping station has been constructed at Whiteness Head to convey foul water only. It is envisaged that a new pumping station will also be constructed to convey foul water from the Inverness Airport Business Park. Surface water from the expanded Business Park and from the Whiteness Head development will not be treated by the proposed new WwTW at Ardersier.

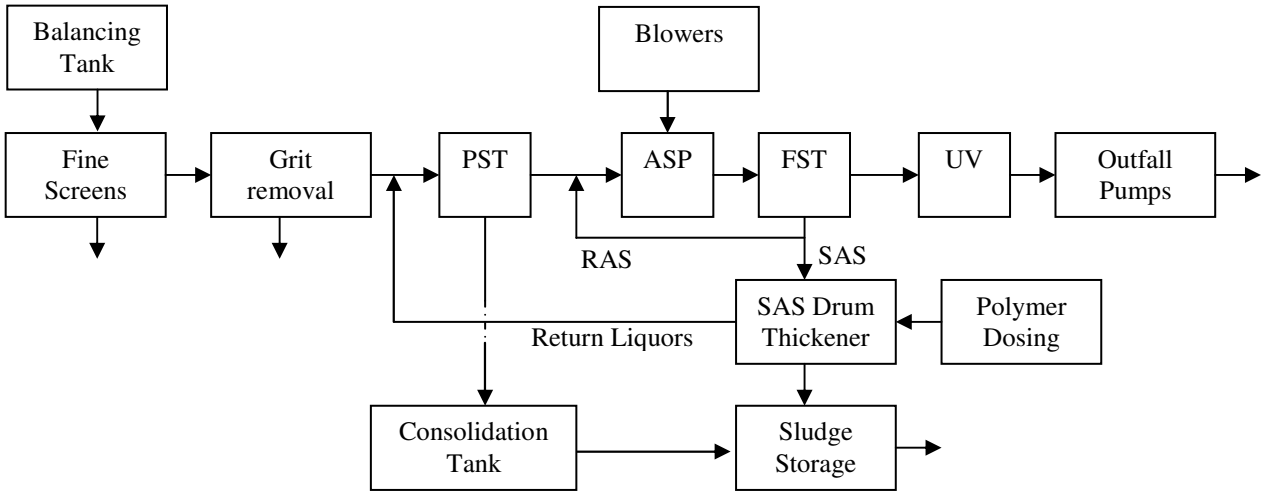
The new developments around Ardersier will flow directly to the new WwTW. The current flow from the airport comes into the Ardersier network and will continue to do so. Future flows from new development at the Inverness Airport Business Park will go directly to the new WwTW.

4.4.1.2 Treatment process of the proposed WwTW

The proposed WwTW will consist of primary screening and settlement followed by secondary activated sludge (ASP) assisted degradation. Bacteriological control of the final effluent will be achieved through tertiary disinfection by ultraviolet (UV) irradiation.

The process flow diagram for the new WwTW is shown in Figure 4.5 and a description of the proposed process follows. The proposed site layout is shown on Figure 4.3

Figure 4.5: Process flow diagram for new WwTW



Where the following abbreviations have been used:

- PST – Primary Settlement Tank
- ASP – Activated Sludge Plant
- FST – Final Settlement Tank
- UV – Ultraviolet disinfection unit
- RAS – Returned Activated Sludge
- SAS – Surplus Activated Sludge

Flow entering the WwTW is pumped to a balancing and storm tank and then passed on for fine screening and grit removal.

The full flow to treatment passes to 2 radial flow primary settlement tanks (PST) equipped with half bridge scrapers. Return liquors from sludge thickening are returned up-stream of the PSTs. The PSTs are desludged automatically by actuated valves and positive displacement pump.

Secondary treatment is provided by a non-nitrifying activated sludge plant (ASP) with a twin treatment stream. Aeration is by fine bubble diffused air supplied by blowers. The aeration lane is preceded by a selector zone.

The biomass is separated from the secondary effluent in 2 final settlement tanks (FST) each equipped with half bridge scrapers. Return activated sludge (RAS) will be returned at a constant rate to the selector zone by submersible centrifugal pumps. In order to control the mixed liquor suspended solids, surplus activated sludge (SAS) will be removed by actuated valves to a sump and pumped by a submersible centrifugal pump to the SAS drum thickener.

Disinfection of the tertiary effluent will be by UV lamps. The UV system will be of variable output to accommodate low flows. The lamps will be cleaned by an automatic mechanical cleaning system.

Treated effluent will be collected in a sump and pumped out through the existing outfall by submersible pumps.

Primary sludge will be thickened to 5% dry solids in a consolidation tank with decant and drain facilities. The thickened primary sludge will then be transferred to the sludge storage tank. This sludge will be removed by road tanker for further treatment at Allanfearn WwTW.

4.4.1.3 Control of inflows and emergency outfalls

Flows into the WwTW are controlled through the combined balance and storm tank. The design volume and operating philosophy of the balance tank have been established to accommodate flows from each of the terminal pumping stations with provision for storm water storage so that spills from the existing network emergency outfalls are reduced. There is no emergency overflow at the existing treatment works and none is planned for the proposed new WwTW.

A full description of the operation of the combined storm and balance tank, design volumes and control philosophy have been submitted to SEPA with the Controlled Activities Regulations licence application, which is being progressed simultaneously with the planning application. A summary of the position is presented here.

The combined balance and storm tank volume is made up of a Lower Balancing Volume, a Storm Storage Volume and an Upper Balancing Volume.

The Lower Balancing Volume is sized to accept flows from all four terminal pumping stations – the existing Ship Inn and Fort George pumping stations, the newly built Whiteness Head pumping station and a proposed new pumping station at the Inverness Airport Business Park.

The Storm Storage Volume provides storage for the combined foul and surface systems within the existing Ardersier catchment. The storm volume has been calculated using three methods for estimating storm volumes set out in Scottish Water design specifications. The largest of the three calculated storm volumes has been adopted. This has resulted in an increase of roughly one third in storage volume provided compared to the existing works. No additional storm water input will derive from the proposed development since all new inputs to the WwTW are foul only.

The Upper Balancing Volume is designed to accommodate continued inflows of foul water from the new pumping stations at Whiteness Head and Inverness Airport Business Park during times when the storm volume capacity is fully utilised.

When the level in the combined balance and storm tank exceeds the Lower Balance Volume and reaches the control band then the inlet pumps will gradually ramp up so that they discharge at Full Flow to Treatment (FFT) when the level reaches the allocated middle Storm Storage Volume.

When the level in the balance tank rises above the allocated Storm Storage Volume then the Ship Inn and Fort George terminal pumping stations will be inhibited and storm flows will be discharged via their terminal pump station overflows, replicating the existing situation. The works inlet pumps will continue to operate at FFT until the level then falls back into the Storm Storage Volume, at which point the inhibit to the Ship Inn and Fort George terminal pump stations shall be removed.

Should the level exceed the upper limit of the Upper Balancing Volume then the new foul-only pumping stations at Whiteness Head and Inverness Airport developments will be inhibited. This inhibit will be removed once the level has fallen back below an appropriate dead band.

Further details of the controls for inflows are presented in Scottish Water's Ardersier WwTW Process Control Philosophy document included as Technical Appendix A in Volume 3 of this Environmental Statement and in the CAR licence application.

This Environmental Statement does not consider network issues and emergency discharges. The proposed expansion of the WwTW capacity is required to serve foul water only from new residential, commercial and industrial developments. Foul water from these developments will be conducted to the WwTW through new pipelines which are separate from the existing network. There will be no change to the flows in the existing network nor will the operation of its infrastructure change. Being for foul water only, the new inlet systems to the WwTW will not be affected by storm flows.

4.4.2 Decommissioning of existing and proposed WwTW

When the new treatment works has been completed it will be commissioned by diverting flows from the existing works. Once the new treatment works is fully commissioned the existing works will be decommissioned and cleaned.

At this time it is not proposed to demolish and remove the existing works. Instead, items of mechanical and electrical equipment will be removed but the main structures and tanks retained. The control and welfare building is to be retained for continued use.

The details, including decommissioning methods and programme, have not yet been determined therefore do not form part of the Environmental Assessment. Once a decommissioning plan has been produced it is recommended that environmental impacts are considered further.

Similarly, the proposed WwTW will require to be decommissioned in the future and it will be necessary to evaluate the environmental impacts of that activity when a decommissioning plan is being prepared. The ability to decommission the works safely has been considered as part of the design, as required by the Construction (Design and Management) Regulations 2007.

4.5 Construction Methodology

This section describes the construction works associated with the project. Some elements of the construction methodology will be finalised by the contractor on site once the ground conditions for the individual items of plant have been determined. However the following description is indicative of the construction activities that would be expected. In addition, the contractor will be required to carry out environmental risk assessments on site for each work activity.

4.5.1 Works Phasing

Construction will include the following phases:

- Preconstruction site setup
- Road improvements
- Preparation works including service diversions and new service installations
- Civil engineering works construction
- Mechanical and electrical plant installation
- Commissioning
- Landscaping and ancillaries
- Demobilisation

4.5.2 Pre-construction Works

4.5.2.1 Improvement of access junction

The existing junction of the site access road and the B9008 will require to be widened and improved, to allow safer access and egress for articulated vehicles. This will involve the installation of temporary traffic management measures. The existing drainage for the road will remain operational during and after construction in order to avoid flooding or subsidence.

4.5.2.2 Vegetation Clearance

Parts of the scrubland around the existing WwTW will be cleared where necessary to allow access for ground investigation and to make land available for new plant and associated landscaping. This will include the removal of gorse and some trees. The existing bund and planting at the south east side of the site will not be removed, as this provides existing screening towards Ardersier.

4.5.2.3 Ground Investigation and Contaminated Land

Preliminary site investigation work has been undertaken. More comprehensive ground investigation will be required prior to construction.

The geo-environmental desk study completed by Mott MacDonald identifies modern and historic sources of contamination and potential engineering constraints. A contamination risk assessment for the area covered by the proposed scheme has been prepared. This represents a Phase 1 qualitative analysis of risk of encountering land affected by contamination.

Assessment of the risk of contamination and risk of impact on geological features is included in Chapter 7 (Geology, Soils and Contamination). The desk study and initial site investigation found that part of the site is made ground which is likely to have been deposited at the site between 1965 and 1987 when the area was used as a refuse tip. Soil and groundwater samples were collected and analysed at several boreholes around the site and gas monitoring was carried out in 2008 and 2010.

4.5.2.4 Preparation Works

The preparation works will include any required service diversions and extension of existing service installations to the site. Temporary service connections for electricity, telecom, water and wastewater will be required for the site compound. The exact location of all services is not yet known but the most likely place for service diversion is at the B9008 road junction improvement. The location of all affected services will be confirmed with the service providers and also by hand digging of trial pits.

The access road into the existing WwTW will be realigned to provide a surfaced 6m wide access road to the site although It is likely to remain unsurfaced until towards the end of the contract.

Chapter 10 of this report contains a detailed assessment of the impact of construction and operational traffic.

4.5.3 Construction Works

4.5.3.1 Site Preparation

The site compound is likely to be located adjacent to the exiting WwTW. It will be secured with temporary fencing and is likely to include site cabins and a storage area. Storage of all plant, equipment and substances will be within secure locked containers or defined areas. Fuel tanks will be bunded to 110% of the capacity of the tank.

Spoil will be prevented from entering the Moray Firth during construction by bunding with suitably battered slopes. No plant or machinery will enter any waterways, and good practice for preventing pollution of any watercourses will be followed. A cut–off drain will be constructed around the site in order to reduce the volume of water coming into contact with the site.

4.5.3.2 Ground Preparation

Existing topsoil will be removed and stockpiled with its seed layer. Where possible it will be used for surfacing of landscaping and bunding as part of the reinstatement works. If unsuitable for reuse then waste material will be disposed of in a licensed waste site.

Ground will be then be excavated to foundation level using wheeled or tracked excavators and dump trucks to remove the spoil from site. Spoil will be stored for re-use where it is suitable, or disposed off at a licensed waste site when not required. Any contaminated ground will be taken to a nearby licensed waste deposit. Given the ground conditions it is expected that sheet piling will be used to support the deeper excavations as opposed to open cut excavations. This will reduce the volume of earthworks required but will cause more noise. Use of acoustically-treated hydraulic piling will be recommended.

4.5.3.3 Construction and commissioning

Some of the units such as the final settlement tank will be constructed below ground level in order to maintain the hydraulic grade line through the works. Construction will generally start with the lowest items and work upwards. Foundations will be reinforced concrete plinths, constructed by erecting pre-bent reinforcement steel, then placing wooden formwork to form the correct shape and pouring ready mix batch concrete. When the concrete has cured the formwork moulds will be stripped and reused.

Concrete will be brought to site by concrete lorry from a nearby concrete plant. For the larger foundations such as the final settlement tanks this will require in the region of 10 loads of concrete coming to the site within a 2-3 hour period.

The majority of the tanks, chambers and kiosks will be constructed using pre-formed steel or pre-cast concrete which will be brought to site in sections and assembled in-situ. Pipework and cable ducts will be laid in trenches and backfilled.

Construction of the structures will be followed by installation of the mechanical and electrical plant, all of which will be manufactured off-site, and installed in sections. A mobile crane may be required for installation of the larger units.

Commissioning of the works will involve swabbing pipework, running test flows through each item of plant, measuring flows and power usage and water quality sampling in accordance with Scottish Water's

commissioning specifications. The activated sludge treatment is a biological process which requires some time following start up before a stable operating process is established. During this stabilisation period the final effluent from the new WwTW may not be of sufficient standard for discharge to the Moray Firth. There are a number of options for addressing this, including pumping of the final effluent to the intake of the existing WwTW for further treatment.

A detailed programme for construction and commissioning has not yet been confirmed but it will take account of any requirements of the planning application and residual environmental risks as described in Part B of this document.

4.5.3.4 Construction waste

Construction waste will be minimised following current best practice guidelines. Active and special wastes will be segregated and disposed of to landfill. Inactive waste will be reused on site or recycled where possible. A detailed assessment of waste is not within the scope of this report, and will be considered further by the contractor prior to start of work on site.

As noted above some low risk contaminated land has been identified within the site. This ground will be left undisturbed as much as possible, but where excavation is required, the ground will be either be replaced in the same location if appropriate or removed under safe conditions to an suitable landfill site. In order to avoid further contamination, good environmental practice will be followed to avoid spillages and use of environmentally hazardous materials will be minimised where possible.

See Chapter 7 for further details regarding contaminated land.

4.5.3.5 Landscaping and finishing works

Following on from construction, finishing works will involve construction of bunds and planting in accordance with the landscape management plan, as well as putting a final surface on the access road, and removing the site compound.

A considerable volume of soil will require to be imported in order to complete the earth bunding and planting around the site.

Chapter 8 of this report contains a detailed assessment of landscaping and finishing works.

4.5.3.6 Night Lighting

Night lighting will be required during construction if night working is required, for example on large concrete pours or long commissioning processes.

Chapter 8 of this report contains a detailed assessment of the impact of night lighting.

4.5.3.7 Community relations

The contractor will consult with neighbours well in advance of construction commencing to reduce disruption to a minimum. A Scottish Water community support team will be established to deal with day to day issues that arise and create newsletters and communications to advise the community on progress of the works.

4.5.4 Materials and Finishes

The materials and finishes for the WwTW have yet to be confirmed. Above ground structures will be finished in colours which will blend in to the landscape as much as possible, probably in shades of brown or green. The above ground structures are likely to be constructed of steel or blockwork with steel roofs and below ground structures will mainly be concrete.

4.5.5 Operation and Maintenance

Generally the works will run automatically with no permanent operator present. Control information for the works will be recorded and sent by telemetry to the local Scottish Water control office. The WwTW will be visited regularly by operators to perform tasks such as backwashing or water sampling, which is likely to require 2 -3 visits per week. Maintenance will be carried out as detailed in the Operation and Maintenance manual for the works.

4.5.6 Sustainability

The proposed development has been designed to optimise use of existing resources and reduce land take and impact on previously unaffected natural environment. The choice of location for the development has in part been made so as to make use of the existing sewer network infrastructure feeding into the existing WwTW. The development will be phased so as to meet demand from development only when it occurs, reducing the footprint of the scheme.

Scottish Water owns the plot of land between the B9006 and the shore from the junction of the WwTW access road to the car park approximately 700m closer to Ardersier village. The exsiting WwTW occupies an area at the northwest end of the plot while much of the rest of the plot is used as amenity ground, known as the Ardersier Common.

The surrounding land is of agriculture, sports fields, a strip of conifer forest and the coastline.

The proposed development is sited around the existing WwTW to minimise any additional land take. The layout of process units and infrastructure has been designed so that there is potential to accommodate the construction of increased treatment capacity identified in the A96 Plan if and when this is required.

The layout has been designed to avoid areas of habitat which has been colonised by the Dingy Skipper, a local Biodiversity Action Plan species. The layout has also been designed to avoid the need to build on established rough pathways through the Ardersier Common which pass close to the site of the existing WwTW.

The proposed landscaping plan has been designed to establish screening of the proposed development and also lay the foundations for screening any potential future expansion of the WwTW within the site.

Excavated material will be re-used on site with the possible exception of any higher risk contaminated land encountered. It will be necessary to import material to complete the bunding and screening areas around the site. Imported material will be sourced as locally as practicable to match the existing soil type and will ideally come from another site where there is a surplus.

The scheme has been designed to take account of the natural topography of the land, utilising gravity and minimising pumping where possible. Only one interstage pump station is required between the primary

settlement tanks and the aeration tank. This is required in order to an avoid extremely deep excavation for the final settlement tank, which in sandy soil close to the sea would be dangerous and require extensive pumping during construction and possibly also during operation.

Ultraviolet disinfection has been selected as the tertiary treatment process, which has the advantage over chlorination that it does not require additional chemicals and leaves no residue in the treated effluent.

Operating wastes will be generated as screening, grit, surplus activated sludge and final effluent. Screening and grit will be disposed of to landfill, sludge will be transported for treatment off-site at Alanfearn WwTW and final effluent will be discharged to the outer Moray Firth in accordance with a licence under the Water Environment (Controlled Activities) (Scotland) Regulations which is currently being determined by SEPA.

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5. EIA Approach

5.1 Introduction

This chapter discusses the general approach and methods used to prepare the Environmental Statement. The provision of information through the EIA process has involved the compilation, evaluation and presentation of the potential environmental effects of the proposed scheme.

5.2 General Approach

The EIA has been completed in accordance with the requirements of European Directive 85/337/EEC (as amended by Council Directive 97/11/EC and 2003/35/EC) on the assessment of the effects of certain public and private projects on the environment (The EIA Directive). In Scotland, the Environmental Impact Assessment (Scotland) Regulations 1999 transpose the EIA directive (and amendments) into Scottish Law. The Regulations, in combination with expert professional judgement and methodological guidance from government agencies and professional bodies, provide a framework within which potential effects are assessed and their likely levels of significance determined.

5.3 Screening

EIAs are mandatory for all Schedule 1 developments and for those Schedule 2 projects which are likely to have significant environmental effects. The Environmental Impact Assessment (Scotland) Regulations 1999 stipulate that for Schedule 2 developments it is a requirement for the local authority to provide a screening opinion to determine whether an Environmental Impact Assessment (EIA) is required.

A request was made to the Area Planning and Building Standards Manager at The Highland Council for screening opinion, to determine whether or not the proposed development constitutes a Schedule 2 EIA development.

A response was received from the Highland Council on 29 January 2009, stating that in accordance with the Environmental Impact Assessment (Scotland) Regulations 1999, the proposed extension to the wastewater treatment plant and associated works at Ardersier does constitute an EIA Development. The reasons given for the decision are as follows:

“The development is for an extension of the existing Waste water Treatment Works at Ardersier where the extent of development will exceed 1000 square metres. The development therefore comes within Schedule 2, 11(c) of the above Regulations. By reason of its nature, scale and in particular its location adjacent to a Special Area of Conservation, Marine Special Area of Conservation, Moray Firth Special Protection Area, SSSI (Ardersier glacial deposits) and proximity to Fort George Scheduled Ancient Monument and within a Sensitive Coastal Zone and Landscape in respect of Visual Impact the development is likely to have significant effect upon the environment.”

As a result of the screening and scoping activities described above, carried out in consultation with THC Planning Department, the critical issues which required further investigation were identified as:

- Geology and soils (Ardersier Glacial Deposits SSSI)
- Ecology and Nature Conservation (The Moray Firth SAC and SPA and their qualifying features) primarily, but not exclusively, in relation to changes to water quality

- Landscape and Visual (Visual setting of Fort George Scheduled Ancient Monument)
- Cultural Heritage (as Landscape and Visual)

For each of these issues, impacts would have to be determined and the magnitude of these impacts described. For each impact identification of mitigation measures would be required with a description of residual impact from the project being summarised.

As part of the Pre-Application Advice Service for Proposed Major Developments, a meeting between Scottish Water's planner and representatives of The Highland Council was held in December 2009. Following this meeting, a Pre-Application Advice Pack was issued by the Highland Council Planning Department on 18 January 2010. The Advice Pack summarises key issues relating to the development that should be addressed, either within the Environmental Statement or in separate documents appended to the planning application.

The Pre-Application Advice Pack for Ardersier WwTW (10/00043/PREAPP) states that the proposed development is broadly supported, and that the following pieces of work should be carried out and submitted with any planning application:

- Community Engagement Statement;
- Landscape Maintenance/Management Plan;
- Visual and Landscape Impact Assessment;
- Sustainable Drainage System Plan;
- Landscape Plan;
- Design and Access Statement;
- Transport Assessment, to include – Assessment of Construction Traffic, Operational Traffic Management Plan and Structural and geometric assessment of unclassified roads;
- Phasing Plan;
- Detailed Lighting Scheme; and
- Schematic showing core paths affected by development and proposed mitigation.

Reference is made in the Pre-Application Advice Pack to a Scoping Opinion to be issued by The Highland Council. The Scoping Opinion has not yet been issued to Scottish Water by the Highland Council.

The Pre-Application Advice Pack also provides comments received by the Highland Council Planning Department from SEPA and SNH.

Both agencies identified the issue of final effluent quality, particularly in relation to the interest features of the Moray Firth SAC.

In addition the following issues were raised for consideration within the ES:

- Requirements for sustainable urban drainage systems (SUDS)
- Consideration of identified land contamination
- Two features of local biodiversity interest

5.4 Scoping

A scoping opinion was issued by The Highland Council on 11 March 2010 and is included as Technical Appendix B.2 in Volume 3 of the ES. The scoping opinion was used to inform structure and content of the Environmental Statement.

Principal considerations identified by THC as aspects of the environment likely to be significantly affected by the development are as follows;

- Land Use
- Population
- Community Assets
- Nature Conservation Sites
- Habitats/Biodiversity
- Plants/Trees/Forestry
- Birds and Animals
- Soil
- Peat
- Water
- Fish and other Aquatic Interests
- Water Abstraction
- Air Quality/Noise
- Climatic Factors, and
- Cultural Heritage.

For each of these issues, impacts must be determined and the magnitude of these impacts described. For each impact, identification of mitigation measures is required as well as a description of residual impact from the project.

5.5 Consultation

The key issues and concerns relating to the proposed development from all groups consulted are captured in Table 5.1 below. Consultation responses are discussed in greater detail within each technical chapter of the Environmental Impact Assessment.

Table 5.1: Consultee Responses

Organisation	Key Issues
SNH	Moray Firth Special Area of Conservation Dolphins Intertidal sandbanks Badgers Ardersier Common as good butterfly habitat Dingy skipper butterfly
SEPA	Bacteriological limits of discharge

Organisation	Key Issues
	Discharge to Dolphin Hotspot Proximity of outfall discharge to Nairn Bathing Beach Drainage Flood Risk Contaminated Land
THC: Planning	Fit with A96 Corridor Development Plan
THC: Archaeology	General Wade Military Road Visual Setting of Fort George and Cromal Mount
THC: Ranger Service	Butterfly Habitat, Ardersier Common
THC: Roads Department	Construction and operational traffic access proposals
Ardersier Community Council	Vehicles through Ardersier Village (construction and operation) Odour Visual Impact Access for watersports Impact of effluent on ecological features of the Moray Firth Water quality

Consultation with the Highland Council was initially undertaken to discuss the need for the new WwTW and to determine how the immediate need for increased capacity should be considered within the context of further planned growth along the A96 corridor.

Consultation was also undertaken with statutory and other key non-statutory consultees at each stage of development of the design for a new WwTW to identify key issues relating to the proposed development, including the following organisations;

- Scottish Natural Heritage
- Scottish Environment Protection Agency
- The Highland Council – Planning, Archaeology and Roads Departments and Ranger Service
- Ardersier Community Council

A workshop for statutory consultees was held in August 2007 to evaluate the merits and constraints associated with a short list of locations for a new WwTW. This is discussed further in Chapter 6 – Consideration of Alternatives.

A programme of community consultation has been carried out from project inception, see Table 5.2.

Table 5.2: Community Consultation

Date	Consultation Type
January 2008	Scottish Water (SW) attended Ardersier Community Council (ACC) Meeting
February 2008	SW sent update letter to ACC
March 2008	SW attended ACC Meeting
September 2008	SW attended ward forum meeting
September 2008	SW sent a letter regarding topographical survey to ACC
October 2008	SW held a public display

Date	Consultation Type
January 2009	SW sent update letter to ACC
October 2009	SW attended ACC Meeting
November 2009	SW updated ACC on the status and progress of the proposed development
January 2010	SW attended ACC Meeting
January 2010	SW held a public display

Following initial consultation Scottish Water received a diverse range of comments and questions from the local community. In order to answer some of the most frequently stated concerns Scottish Water produced a document titled 'Ardersier Wastewater Treatment Works; Making it clear'. This document was sent to Ardersier Community Council and made available at the January 2010 public display. An extract from the document is reproduced below. Community representative queries are marked in black and Scottish Water responses in blue.

Another load of waste

It is the stated intention of Highland Regional Councils' Planning Department and the expectation of Scottish Water that the main treatment of waste water (sewage) from the developments planned along the A96 corridor over the coming years will be at the treatment plant currently situated adjacent to Fort George.

The current site at Ardersier would be the most suitable site

The treatment at this site is not final with the remaining solid residue required to be transported by road tanker to the present site at Allanfearn before finally going on to land fill in the south. When it is extended and developed, accommodating dwellings at Whiteness, according to Scottish Water, will increase the tanker movements from the current two to three per week to one a day (i.e. two tanker movements daily).

Scottish Water are fully treating the sewage on site and as a result of this biological treatment a by product is the sludge (as at every wastewater treatment works), there is no treatment of the sludge on site, this is removed to Allanfearn which is the area sludge treatment centre and once treated is given to local farmers for spreading on their land, it does not go to landfill.

The increase in tanker movement would be from the current 2-3 times a week to once a day

The full development at Whiteness is of 1950 dwellings, a hotel, marina and accompanying activities. The golf complex at Castle Stuart with chalets and hotel, the industrial park at Inverness Airport, the suggested development at Tornagrain for up to 20,000 people, the Delnies development including Hotel Golf course and 300 houses, the replacement of the current treatment works at Cawdor and Croy, with others, are all envisaged as developments which the Fort George facility will be extended to accommodate.

The wastewater from both the Inverness Airport Industrial Estate and Tornagrain currently go to the Ardersier WWTW for treatment and will continue to do so if there is development in these areas. The current Cawdor and Croy facilities will continue to serve the communities that they do at the moment and would continue to do so if these communities were to be developed.

Clearly under the current system this implies that an enormous number of tanker movements will be generated, and without any other provision, are expected to pass through Ardersier. The current survey which suggests the Fort George sight as the most favourable option does so without any reference to the impact of the effect of this additional heavy traffic on Ardersier village, nor includes any financial consideration for the cost of an alternative route avoiding the village.

The increase in tanker movement is as above

None of the above developments would be envisaged with sewage tankers passing through them, there is therefore no reason to see this as acceptable for Ardersier.

There is currently tanker movement at both Croy and Cawdor to remove sludge and transport to Allanfearn.

A comments book was provided by Scottish Water at a public display held in January 2010 to seek further comments from attendants. A record of the comments received is provided at the end of this chapter in Figure 5.1.

5.6 Baseline Studies

Information relating to the existing (baseline) condition was collated by consulting with appropriate government agencies, professional bodies and interested parties and interrogation of historic data. Where required, field surveys were undertaken to establish baseline conditions.

Details of consultees, data sources and any field surveys undertaken are provided within the technical chapters alongside a description of the baseline condition for that environmental component.

5.7 Evaluation of Impacts

The potential impacts of the WwTW development have been considered in relation to the construction of the works and its operation and maintenance post construction.

The magnitude of impact arising from the construction and maintenance of the works is dependant upon the sensitivity of the environmental components and baseline condition. Criteria for determining component value and impact magnitude are provided within each technical chapter.

The significance of impact varies according to the environmental component and its existing environmental status. Generally speaking, impact significance is assessed by considering the scale of impact, temporally and spatially and the potential for that impact to be reversed against component sensitivity. The nature of impact will vary. It may be direct or indirect, secondary, cumulative, short medium or long-term, and result in positive or negative effect. Only those impacts considered to have a moderate or major effect on each environmental component are significant.

Methodology used to inform assessment is summarised in Table 5.3 below.

Table 5.3: Summary of EIA Methodology

Environmental Component	Desk Study Informed By;	Further Consultation	Survey Requirements / Specialist Work
Geology, hydrology, soil and contaminated land	■ Consultation ■ Collection and collation of all available data (e.g. water quality etc.)	■ SEPA ■ Scottish Water ■ The Highland Council	Contamination testing of soil and groundwater as part of a geotechnical site investigation.
Water Quality	■ Consultation ■ Collection and collation of all available data (e.g. water quality etc.)	■ Scottish Water	Assessment of process efficiencies
Ecology and nature conservation	■ Consultation ■ Data collected at feasibility stage ■ Collection and collation of available data (species	■ SEPA ■ SNH ■ The Highland Council Ranger Service	Walkover survey for protected species and butterfly habitat.

Environmental Component	Desk Study Informed By;	Further Consultation	Survey Requirements / Specialist Work
	present, habitats etc.)		
Air and noise emissions	■ Traffic and Transportation specialist work ■ Establishment of construction traffic, plant and activity details ■ Establishment of odour control measures	■ The Highland Council	Specialist noise and odour modelling, survey work and desk study to assess traffic impact.
Landscape and visual	■ Consultation ■ Data collected from site visit	■ The Highland Council	Establish landscape baseline. Establish visual baseline through the study of visual receptors. Effects of the proposed development on landscape and townscape identified. Effects of the proposed developments on the visual amenity of the area assessed.
Archaeology and heritage	■ Consultation ■ Landscape and Visual specialist work (Sensitive Coastal Zone and Landscape)	■ The Highland Council Archaeology Unit ■ Historic Scotland	None.
Traffic and transportation	■ Consultation	■ The Highland Council	Additional work to identify the effect of the proposed scheme on traffic in the area.

5.8 Mitigation Measures

If impact evaluation identifies the likelihood of significant environmental effect, mitigation measures are considered to minimise and wherever possible avoid detrimental impact. Although only impacts considered adversely significant require mitigation, measures may also be required to address lesser effects in special circumstances. For example, where an ecological resource with particular legal protection is at risk of harm.

5.9 Evaluation of Residual Impacts

Final evaluation of impact significance involves the re-assessment of impact scale and magnitude against the sensitivity of the environmental component after considering the benefits expected from proposed mitigations.

Figure 5.1: Public Display 2010 – Visitor Comments Book:

Name	Address	Comment
DANIELLE MCINTOSH	INVERNESS AIRPORT.	
Mandy WITTS	ARDERSIER COMMUNITY COUNCIL	Good to meet Cheryl Cole & Posh!! Very informative meeting, Concerns of the residents being taken into account.
ELLIS MACNABBIE	INVERNESS AIRPORT	LOOKING TO SEE HOW THIS IMPACTS ON THE EXISTING AIRPORT.
Abertatten	ARDERSIER RESIDENT	GOOD INFORMATION VERY HELPFUL STAFF
JONATHAN BALL	ARDERSIER RESIDENT	CONCERNS RE VISUAL IMPACT, SEWER, IMPACT ON ROADS NOT REALLY FEATURED HOWEVER INFORMATIVE PRESENTATION.
John Orr HC Countryside Ranger	Inverness Castle IV2 7QR.	Some concerns over - Southern corner of proposed site development area. Good butterfly habitat.
		Good if it could be left undeveloped. Other unresolved issue access from road.
J Davidge	ARDERSIER COMUNITY COUNCIL	a lot of concerns to be sorted out later

Name	Address	Comment
NIGEL FRASER NESS DISTRICT FISHERY BOARD	SPLITT & PARKER OLD COURIER BUILDING 9-11 BANK LANE INVERNESS	We have great concerns about the lack of hydrological survey's of the water movement within the firth. Any discharge within the inner firth will be most strongly opposed.
Lord Burton	Dochgarroch Lodge Dochfour Inverness	More thought is needed on where the discharge point will be and the impact this will have on all species within the firth.
SHANE SPENCE	20 HIGH ST ARDERSIER (ARDCO DIRECTOR)	There will be a tension between this project and ARDCO intent to develop the water front as an asset. This may include developing the area for water sports etc. Hopefully will be a
JEAN HAY	OIRTHIR, HILLHEAD ARDERSIER.	Need to know much more about the smell. Will it be as bad as Alturlie.
FRANCIS HAY	AS ABOVE	
DONNA MARTIN (chairperson ARDCO)	8 Station Drive ARDERSIER.	Pleased to get a chance to forge the beging of a relationship between ARDCO & SW. We would still like to explore the issues of Bathing waters & will initiate this soon.
MARTIN / ROSEMARIE & EWEN SHARP	37 STUART ST. ARDERSIER 01667461191	Fine in principle, it must be hidden by trees, completely odour free. Ardersier is an up & coming community which needs to be protected & enhanced. Please help the community to this end. Thanks. (Martin)

Name	Address	Comment
JAMES MACRAE	75 GLENSHIEL PLACE INVERNESS IV2 4PU	Access to Middle of bay for Watersports. Jamesmac@kitepowered.co.uk
Matthew Russell.	27 Moray park Crescent, Culloden IV2 7RL	Access to the middle of the bay. - Safe flat area (eg grassed) for setting up/Launching/ Landing Kites/watercraft etc

6. Consideration of Alternatives

The Highland Council's Development Strategy includes proposals for significant development along the A96 corridor from Tornagrain to Nairn including Inverness Airport, Ardersier and Whiteness and Scottish Water is committed to providing essential services for these developments. The overall plan includes some committed development and many other proposed or aspirational developments for construction in the future.

Scottish Water's plans for provision of wastewater treatment have been directed by the need to provide immediately for committed developments while maintaining sufficient flexibility to accommodate future demands when and where these occur.

Options have been considered in respect of both short term and longer term needs.

In the short term, an increase in sewage treatment capacity is anticipated from a mix of residential, commercial and industrial sources up to a population equivalent (PE) of roughly 7,000. In the longer term, provision may be required for up to 60,000 PE.

6.1 Do Nothing Option

An assessment of SW assets was undertaken to determine whether the increased wastewater loads from committed development to 2011 could be accommodated within existing infrastructure. The majority of Inverness wastewater is treated at the Allanfearn WwTW, while that emanating from the Nairn area is treated at Nairn WwTW, and the wastewater from the airport, Whiteness and Ardersier are currently treated at Ardersier WwTW.

Allanfearn WwTW is operated under a PFI contract and any spare capacity has been allocated in growth in Inverness. Nairn WwTW is currently operating close to design capacity and would not have the potential to absorb the currently identified growth. Ardersier WwTW currently treats a PE of about 1,915, with a discharge consent limit of 3,000PE.

The capacity of the existing wastewater infrastructure is therefore not sufficient to cope with the short term or long term demands of this development, and expansion will be required.

6.2 Alternative Options

6.2.1 Expansion of existing assets

The site of the Allanfearn WwTW is space constrained by the Moray Firth, the Inverness-Aberdeen railway and the Allanfearn Barrows, a scheduled ancient monument. Further expansion of this sight is not deemed feasible and as noted above Allanfearn has been allocated to treat Inverness wastewater.

Expansion of the Nairn WwTW was considered to be a non-viable option due to its distance from the committed development growth areas and also due to the proximity of its discharge outfall to Nairn Beach, a designated Bathing Water.

Expansion of the Ardersier WwTW by extending the capacity of each of the existing process units was considered a reasonable option for short-listing.

6.2.2 Sites for a new WwTW

A short list of potential sites for a new WwTW was drawn up from an assessment of the local region and land-use.

Consultation was undertaken with key stakeholders (SEPA, SNH and The Highland Council Planning and Archaeology units) to determine what the main constraining issues would be for each site and the short list of options was refined accordingly.

The shortlisted sites for further discussion were as follows:

Option 1: Blackcastle / Drumdivan Quarry

Option 2: Existing Ardersier WwTW or immediate vicinity

Option 3: Inverness Airport Industrial Estate or Fisherton Area

Option 4: Delnies Area – west of Nairn and north of the B9092 road

Option 5: Existing Ardersier WwTW or immediate vicinity with outfall locations for options 1 and 4

An overall layout drawing capturing all options is presented in Figure 6.1. Possible outfall locations were identified for each option.

6.2.3 Key Issues for Scheme Selection

The environmental constraints for each of the short-listed locations were determined through a desk-top exercise and formed the basis for site selection. The key stakeholder issues raised during initial consultations are presented in Table 6.1 below.

Table 6.1: Initial stakeholder concerns

Issue	Key Stakeholder Concerns
Ecology	Moray Firth Special Area of Conservation • Dolphins • Intertidal Sandbanks Special Protection Areas • Bird species Sites of Special Scientific Interest • Whiteness Head (geomorphology, salt marsh)
Archaeology	Proximity to Ancient Monuments
Consents and Licensing	Likely bacteriological limits • Discharge to dolphin hotspots • Proximity of outfall discharge to Nairn Bathing Beach
Planning	Fit with A96 Corridor development plans Nearby communities perception of a new WwTW Wayleaves and permissions for pipelines
Defence Estates	Potential impact on Defence Estates Firing Ranges if a new outfall were required

Source: Stakeholder Workshop Meeting Record (August 2007)

A Stakeholder Workshop was conducted in August 2007, including representatives from Scottish Water, SNH, SEPA, The Highland Council and Mott MacDonald to assess the merits and concerns relating to the short listed locations for a new WwTW. Full details of the outcomes of this workshop are recorded in the Stakeholder Workshop Meeting Record (August 2007) and Addendum to Stakeholder Workshop Meeting Record (December 2007) which are included in the Technical Appendices to this report.

Each option was reviewed in turn and participants were given the opportunity to make known any potential issues they perceived with any option. Table 6.2 lists the issues noted for each option.

Table 6.2: Key issues pertaining to specific options

:Option	Key Issues
Option 1 Blackcastle/Drumdivan Quarry	Route of A96 upgrading may conflict with site Changing geomorphology may affect outfalls at some point Potential impact on dolphin hotspot and Nairn Bathing Beach
Option 2 Existing Ardersier WwTW or surrounding area	Proximity to village and potential objections Disinfection of effluent to recreational standard is likely due to proximity to dolphin hotspot Amenity areas next to site Outfall is susceptible to changing quality discharge standards
Option 3 Inverness Airport Industrial Estate	Proximity to commercial development Advantage of not having to pump industrial effluent
Option 4 Delnies Area	Proximity to future housing Potential impact on dolphin hotspot and Nairn Bathing Beach
Option 5 Existing Ardersier WwTW/immediate vicinity with outfall locations as per options 1 and 4 or at eastern boundary of the MoD firing range	High energy use through pumping all effluent Possible pathogen regrowth due to length of outfall Changing geomorphology may affect outfalls Potential impact on dolphin hotspot and Nairn Bathing Beach

Source: Stakeholder Workshop Meeting Record (August 2007)

6.2.4 Preferred Scheme Selection

Success criteria for the project were captured and ranked in importance. The success criteria were applied to each option in order to produce a total score and to determine the preferred options. The criteria were applied in respect of providing short term and longer term solutions separately. The scored criteria matrices are shown in Table 6.3 for short term solutions and Table 6.4 for longer term solutions. The highest scoring option for the short term was option 2 – existing Ardersier WwTW or immediate vicinity. The two long term options which score highest were option 2 - existing Ardersier WwTW or vicinity and option 4 – Delnies Area. The closeness of the result shows there remains little to choose between the high scoring options. However, on the basis that option 2 - existing Ardersier WwTW or vicinity scores highest for both the short and long term horizons it was selected as the overall preferred option.

Based on the assessment of success criteria and weightings, a risk assessment was undertaken for both the preferred short term and long term options. The risk assessment involved determination of the key likely risks to delivery for each option and the potential consequences and mitigation measures for these risks. The risk assessment found that community and stakeholder issues, as well as planning issues, are likely to be the biggest risk to cost and programme, with the main mitigation measure identified as consultation. The full risk assessment results are included in the Stakeholder Workshop Meeting Record and Addendum in Technical Appendix C and Technical Appendix D.

The option of constructing a new WwTW at the site of the existing Ardersier WwTW was considered to be preferential to the extension of the existing process units as this would allow flexibility of design to optimise the treatment and result in improved final effluent quality.

6.3 Summary

The consideration of alternatives showed that construction of a new WwTW on the site of the existing Ardersier WwTW is the preferred option to meet future demand in the A96 growth corridor area in the short and long term.

Table 6.3: Option scoring results for meeting increased treatment capacity in the short term

Success Criterion	Weighting	Options									
		1		2		3		4		5	
		Blackcastle or Drumdivan Quarry		Existing Ardersier WwTW or immediate vicinity		Inverness Airport Industrial Estate		Delnies Area		Existing Ardersier WwTW/vicinity with outfalls as per options 1 & 4	
		Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Ease of acquiring planning consent including environmental impact	5	4	20	4	20	4	20	4	20	3	15
Cost of Project	3.5	3	10.5	4	14	3	10.5	3	10.5	3	10.5
Ease of land acquisition	4.5	3	13.5	5	22.5	4	18	3	13.5	4	18
Community /Stakeholder acceptance	4	4	16	2	8	3	12	4	16	2	8
Licenses Granted (Dolphin issues) - SEPA/FEPA	5	3	15	3	15	3	15	3	15	3	15
Ability to meet short term needs	4	2	8	3	12	2	8	2	8	2	8
Total Score		83		91.5		83.5		83		74.5	
Preferred Option	**Existing Ardersier WwTW or immediate vicinity**										

Table 6.4: Option scoring results for meeting increased treatment capacity in the longer term

Success Criterion	Weighting	Options									
		1		2		3		4		5	
		Blackcastle or Drumdivan Quarry		Existing Ardersier WwTW or immediate vicinity		Inverness Airport Industrial Estate		Delnies Area		Existing Ardersier WwTW or immediate vicinity with outfalls as per options 1 & 4	
		Rating	Score	Rating	Score	Rating	Score	Rating	Score	Rating	Score
Ease of acquiring planning consent including environmental impact	5	4	20	4	20	3	15	4	20	4	20
Cost of Project	3.5	4	14	5	17.5	4	14	4	14	4	14
Ease of land acquisition	4.5	4	18	5	22.5	4	18	4	18	5	22.5
Community /Stakeholder acceptance	4	3	12	3	12	2	8	4	16	3	12
Licenses Granted (Dolphin issues) - SEPA/FEPA	5	3	15	3	15	3	15	3	15	3	15
Ability to meet long term needs	4	4	16	3	12	3	12	4	16	3	12
Total Score		95		99		82		99		95.5	
Preferred Option	**Existing Ardersier WwTW or immediate vicinity / Delnies Area**										

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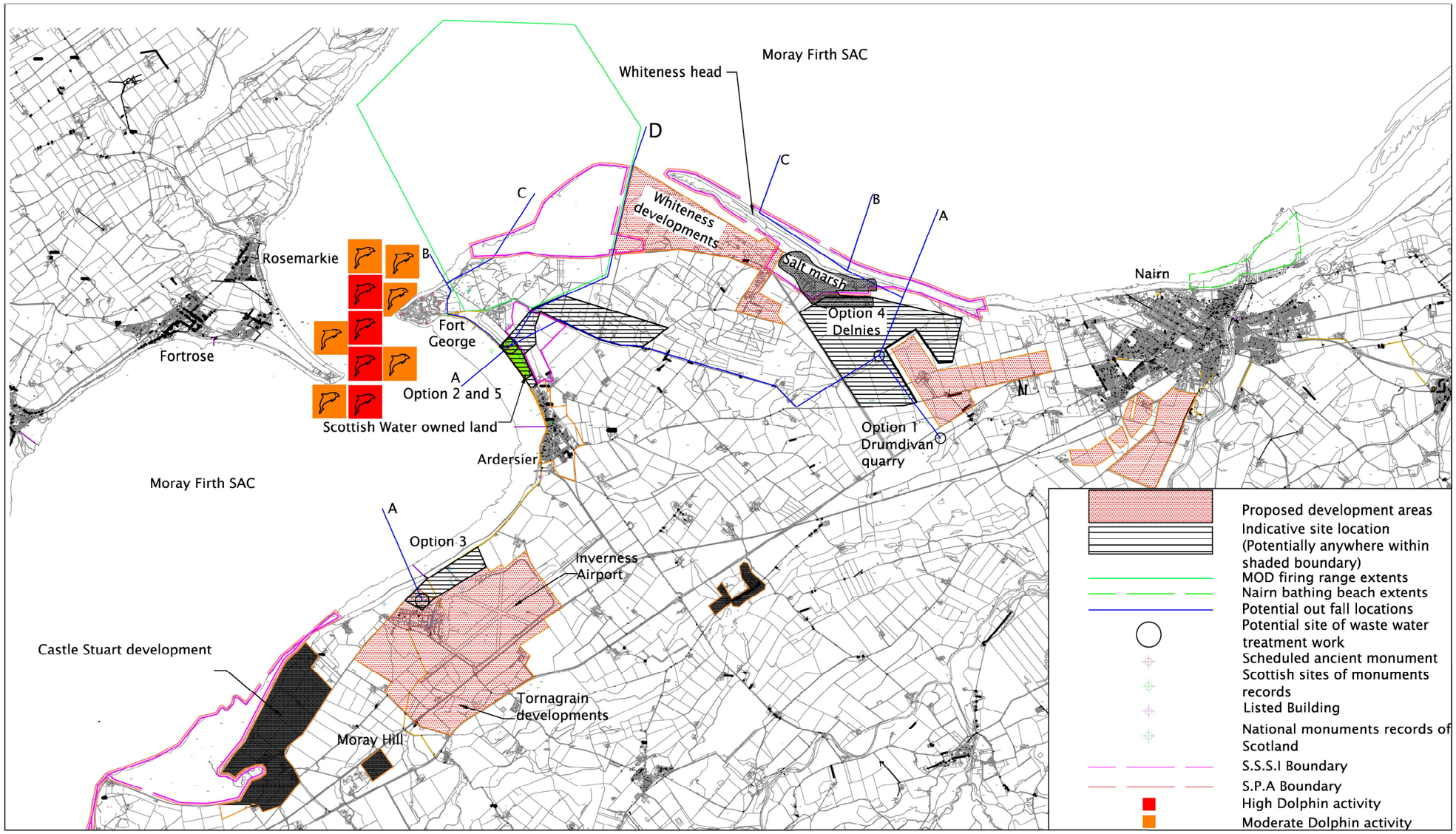
Figure 6.1: Options for location of a new WwTW, including possible discharge locations.



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Client: SCOTTISH WATER

Rev	Date	Drawn	Description	Ch'k'd	App'd
P1	1/8/07	JB	Preliminary issue	DM	SGR
P2	28/8/07	JB	Preliminary issue	DM	SGR

Title: Ardersier and surrounding area
Potential wastewater treatment sites
Location map

Drawn	JB
Checked	DM
Approved	SGR
Scale at A3	N.T.S
Drawing No.	238270/INV/007
Rev	P2
Status	PRE

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Part B: Environmental Elements Affected

This section builds on the background and scheme proposal set out in Part A.

An assessment is made of the magnitude and severity of the environmental impact resulting from the development proposed in Part A.

The impact is assessed relative to the baseline environmental conditions.

Recommendations for mitigation are recommended where required and the residual impacts are identified.

Assessment of environmental impact is determined under eight distinct specialist fields.

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7. Geology, Soils and Contamination

7.1 Introduction

This chapter provides an assessment of impacts of the proposed development on aspects of geology and soils and of impacts from the disturbance of contamination as informed by Technical Appendix E.

The assessment is undertaken with due consideration of relevant legislation and comprises description of baseline data, identification of hazards and evaluation of risk. Mitigation measures are identified to avoid or reduce the risks and an assessment of the residual risk is presented.

7.2 Legislative Framework

The primary regulatory regime under which contaminated land is managed in the UK is the Environmental Protection Act 1990 (as amended) Part IIA: Contaminated Land (Contaminated Land (Scotland) Regulations 2000) (ref 5). Under this Act, contaminated land is defined as 'any land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

- Significant harm is being caused or there is significant possibility of significant harm being caused
- Significant pollution of the water environment is being caused or there is a significant possibility of such pollution being caused."

Harm is defined by following criteria:

- Be harmful to a receptor listed in Table A of the statutory guidance (including human beings, certain ecological systems or living organisms, crops, livestock and certain buildings)
- Be within the description of harm specified for each receptor in the same table

In order to determine whether there is a possibility for significant harm, the following factors should be taken into account:

- Nature and degree of harm
- Susceptibility of the receptors.
- Timescale within which the harm may occur.

The Scottish Executive approach to contaminated land is outlined in PAN 33.

7.3 Assessment Methodology

The following Contaminated Land Risk Assessment methodology is based on CIRIA C552 (2001) Contaminated Land Risk Assessment – A Guide to Good Practice, in order to quantify potential risk via risk estimation and risk evaluation, which can be adopted at the Phase I stage. This will then determine an overall risk category which can be used to identify likely actions. This methodology uses qualitative descriptors and therefore is a qualitative approach.

The methodology requires the classification of:

- the magnitude of the consequence (severity) of a risk occurring, and
- the magnitude of the probability (likelihood) of a risk occurring.

The potential consequences of contamination risks occurring at this site are classified in accordance with Table 7.1 below, which is adapted from the CIRIA guidance.

Table 7.1: Classification of Consequence

Classification	Definition of Consequence
Severe	Short-term (acute) risks to human health
	Short-term risk of pollution of sensitive water resource or ecosystem
	Catastrophic damage to crops/buildings/property/infrastructure, including off-site soils
Medium	Medium/long-term (chronic) risks to human health
	Medium/long-term risk of pollution of sensitive water resource or ecosystem
	Significant damage to crops/buildings/property/infrastructure (on or off-site)
	Contamination of off-site soils
Mild	Easily preventable, permanent health effects on humans
	Pollution of non-sensitive water resources
	Localised damage to crops/buildings/property/infrastructure (on or off-site)
Minor	Easily preventable, non-permanent health effects on humans, or no effects
	Minor, low-level and localised contamination of on-site soils
	Easily repairable damage to crops/buildings/property/infrastructure

The probability of contamination risks occurring at this site will be classified in accordance with Table 7.2 below which is also adapted from the CIRIA guidance. Note that for each category, it is assumed that a pollution linkage exists. Where a pollution linkage does not exist, the likelihood is zero, as is the risk.

Table 7.2: Classification of Probability

Classification	Definition of Probability
High Likelihood	Circumstances are such that an event appears very likely in the short-term or almost inevitable in the long-term; or there is already evidence that such an event has occurred
Likely	Circumstances are such that such an event is not inevitable, but is possible in the short-term and is likely over the long-term
Low Likelihood	Circumstances are such that it is by no means certain that an event would occur even over a longer period, and it is less likely in the short-term
Unlikely	Circumstances are such that it is improbable that an event would occur even in the very long-term

For each possible pollution linkage (source-pathway-receptor) identified, the potential risk can be evaluated, as presented in Table 7.3. Based upon this, CIRIA C552 presents definitions of the risk categories, together with the investigatory and remedial actions that are likely to be necessary in each case, as in Table 7.4. These risk categories apply to each pollutant linkage, not simply to each hazard or receptor.

Table 7.3: Overall Contamination Risk Matrix

Probability	**Consequence**			
	Severe	Medium	Mild	Minor
High Likelihood	Very high risk	High risk	Moderate risk	Low risk
Likely	High risk	Moderate risk	Moderate risk	Low risk
Low Likelihood	Moderate risk	Moderate risk	Low risk	Low risk
Unlikely	Low risk	Low risk	Very low risk	Very low risk

Table 7.4: Definition of Risk Categories and Likely Action Required

Risk Category	**Definition and likely actions required**
Very high	Severe harm to a defined receptor is very likely, or has already occurred
	The risk is likely to result in a substantial liability
	Urgent investigation (if not already undertaken) is likely to be required
	Urgent remediation is likely to be required
High	Harm to a defined receptor is likely
	The risk, if realised, may result in a substantial liability
	Urgent investigation (if not already undertaken) is likely to be required
	Remediation is likely to be required in the long term, possibly sooner
Moderate	Harm to a defined receptor is possible, but severe harm is unlikely
	Investigation is likely to be required to clarify the level of potential liability and risk
	Some remediation may be required in the longer term
Low	Harm to a defined receptor is possible, but is likely to be mild at worst
	Liabilities could theoretically arise, but are unlikely
	Further investigation is not required at this stage
	Remediation is unlikely to be required
Very low	Harm to a defined receptor is unlikely, and would be minor at worst
	No liabilities are likely to arise
	Further investigation is not required at this stage
	Remediation is very unlikely to be required

7.4 Baseline Conditions

7.4.1 Geology Desk Study

Historical information from borehole investigations for the Highland Regional Council Water and Sewerage Department in April 1993 suggests that land for the proposed extension of Ardersier wastewater treatment works has been used historically for tipping. Part of the existing works has been constructed on made ground and the nature and extent of made ground at the site will require to be established prior to extending the WwTW.

Information from the following sources was reviewed to identify the nature of the ground conditions and consider any potential risks posed to the development:

- Published geological mapping and other data;
- Envirocheck Report supplied by Landmark Information Group;
- Geoenvironmental ground investigation results for October 2008
- Laboratory results for soil, leachate, groundwater chemical analysis & gas monitoring data

The published British Geological Survey 1:50,000 scale geological map Sheet 84W, Fortrose 1 was reviewed to determine the published geological conditions for the vicinity of the site:

Table 7.5: Expected Site Geology

Superficial Deposits		Solid Bedrock
Geological Unit	Description	Geological Unit
Raised Shoreface and Beach Deposits	Medium sand and well-rounded shingle	Upper Old Red Sandstone

A site investigation was previously carried out in the vicinity of the site in 1993, consisting of six boreholes to 8m depth. The results from the 1993 geotechnical investigation suggest the presence of 'Made Ground' in four out of the six boreholes and comprised of loose to medium-dense dirty brown sand with cinders, ashes, general household refuse and builder's rubble.

The Ardersier Glacial Deposits SSSI is located immediately opposite the proposed WwTW.

7.4.2 Hydrogeology Desk Study

To enable the Scottish Environment Protection Agency (SEPA) to undertake the Water Framework Directive characterisation, new tools have been developed. These tools include new aquifer and vulnerability classifications in the form of maps. The classifications have been developed as a means of addressing the vulnerability of groundwater to contaminant sources and are to be used together in the source-pathway-receptor risk assessment framework for groundwater in Scotland.

The Bedrock Aquifer map available from the SEPA website indicates that the area around the site is that of intergranular and fractured flow with high productivity. The Envirocheck Report (Appendix B of Technical Appendix E in Volume 3 of the Environmental Statement) indicates that the groundwater beneath the site comprises a major or highly permeable aquifer. This indicates that the formations underlying the site have

a known or probable presence of significant fracturing and have a high permeability. The Groundwater Vulnerability of the site is classed by SEPA as Class 4d and hence vulnerable to those pollutants not readily adsorbed or transformed. The soils in the vicinity of the WwTW and the surrounding area are of high leaching potential, with little ability to attenuate diffuse source pollutants and through which non-absorbed diffuse source pollutants and liquid discharges will percolate rapidly.

7.4.3 Site Investigation

7.4.3.1 Fieldwork Methodology

The initial site investigation was carried out on the Ardersier WwTW site between the 7th and 11th October 2008 and involved the excavation of 12 Trial Pits using a four wheeled 3CX JCB. The trial pits were excavated to a depth of approximately 3.50m with the exception of TP06, TP07, TP08, TP09 and TP11 which were excavated to approximately 3.00m depth. Four boreholes were also advanced using a cable percussion drilling rig. BH01 and BH02 were installed to a depth of 10.00m, BH03 was only installed to 8.60m and BH04 was to a depth of 9.45m. BH01 and BH04 were installed as gas and groundwater monitoring wells with a 50mm diameter standpipe to the greatest depth achieved. Data loggers were installed in the standpipes to recover data regarding tidal fluctuations of the groundwater level. The data was collected every 5 minutes for the duration of 6 complete tidal cycles.

Representative soil samples were collected from the boreholes and trial pits; 0.50mbgl and every 0.50mbgl and/or change of strata thereafter, to a depth of approximately 3.00 within trial pits and approximately 10.00m within the boreholes. To be fully representative of the site conditions the samples were collected, transported, stored and tested with utmost care and consideration. All samples for chemical analysis were taken in accordance with BS10175:2001. All samples were stored for transportation to UKAS accredited laboratories in pre-cooled cool boxes.

One round of gas monitoring was carried out on 22nd October 2008 from BH01 and BH04. Repeat gas monitoring was carried out on six further occasions; three between 14th February and 27th February 2009 and on another three between 22nd January 2010 and 9th February 2010.

One groundwater sample was collected from BH01 and BH04 during the 2009 site visit, followed by collection of one further sample per borehole during site visits on 9th February and the 15th February 2010.

See Figure 7.1 for trial pit and borehole locations.

7.4.3.2 Laboratory Testing

Geotechnical Laboratory testing included:

- Particle Size Distribution (PSD) by sieve and sedimentation;
- Chloride, Sulphate, Magnesium and pH content of soil and groundwater;

Ten soil samples were collected and analysed for the parameters listed in Table 7.6 for the purposes of contamination testing. In addition, five laboratory leachate samples were also analysed.

Table 7.6: Contamination Testing

Medium	No. of samples	Analysis	Detection Limit
Soil	10	arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, sulphur, vanadium, zinc, sulphide, cyanide (free & total), thiocyanate	1mg/kg
		sulphate (acid soluble)	0.01%
		pH	0.01pH units
		Phenols (by HPLC)	0.01mg/kg
		PAH (speciated in half, screen in half) and TPH (by EZ Flash in half, TPHCWG criteria in half)	1mg/kg
		Asbestos (depends on the ground)	0.1%
Leachate	5	arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, sulphur, vanadium, zinc, nitrate, iron and magnesium	10µg/l
		sulphide, sulphate, cyanide (free & total), thiocyanate, ammoniacal nitrogen	0.05mg/l
		pH	0.01pH units
		Phenols, PAH TPH (by GCMS)	0.01 µg/l
Groundwater	6	arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, mercury, nickel, selenium, sulphur, vanadium, zinc, nitrate, iron and magnesium	10µg/l
		sulphide, sulphate, cyanide (free & total), thiocyanate, ammoniacal nitrogen	0.05mg/l
		pH	0.01pH units
		Phenols, PAH TPH (by GCMS)	0.01 µg/l

7.5 Identification of Environmental Effects

7.5.1 Geology

No part of the proposed work is within the Ardersier Glacial Deposits SSSI, and there is no mechanism by which the construction activities could impact on the geology for which the site is designated.

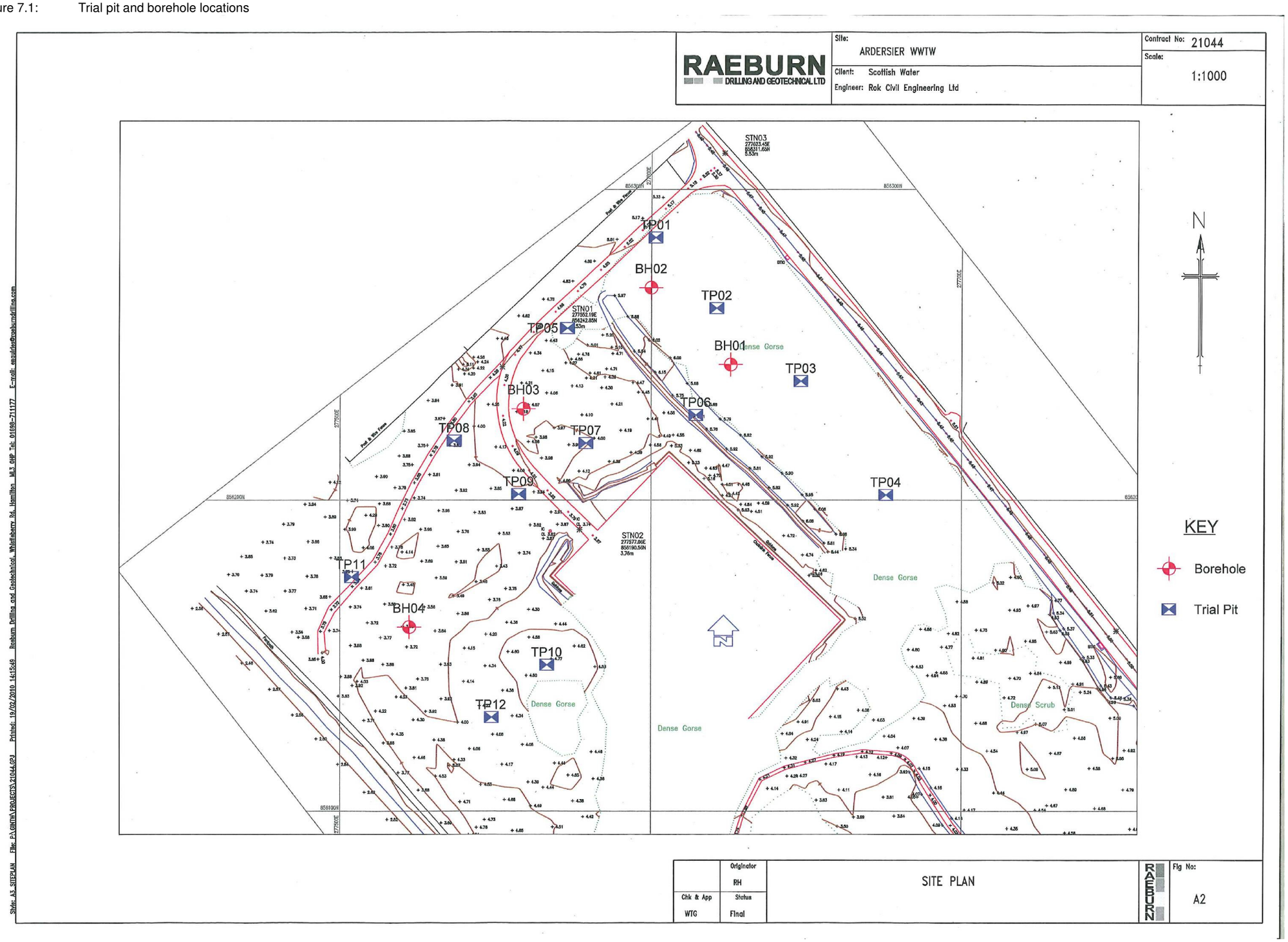
Earthworks will result in the permanent destruction of a small area of sand and shingle.

The material affected is of low environmental value. The area is highly localised and the environmental impact of the proposed development on geology is consequently considered to be insignificant.

7.5.2 Soil and Contamination

The presence of Made Ground, predominantly across the southern half of the site, has been considered a main source of contamination. The made ground was found to comprise of sand and gravel with brick, metal, plastic, ash and glass and is likely to have been deposited at the site between 1965 and 1987 when the area was labelled as a refuse tip on OS maps. Following the Contaminated Land Investigation however, it is also possible that the WwTW could be a potential source of contamination for the groundwater.

Figure 7.1: Trial pit and borehole locations



7.5.2.1 Receptors: Construction Workers and Operators

The main source of contamination associated with the site was linked to the presence of made ground predominantly across the southern half of the site. The made ground was found to comprise of sand and gravel with brick, metal, plastic, ash and glass and is likely to have been deposited at the site between 1965 and 1987 when the area was labelled as a refuse tip on OS maps.

Due to the presence of Made Ground underlying part of the site and the current land-use, chemical analysis of soil samples collected from the site was undertaken to assess risks to human health from direct contact with the soil. All parameters were found at levels below the relevant threshold criteria for a commercial/industrial scenario with the exception of one slightly elevated concentration of lead. However, when assessed statistically the US95 was found to be below the relevant threshold value (SGV). It is therefore considered that there is a low risk to human health from site soils.

Asbestos screen testing undertaken on all samples did not reveal the presence of asbestos at any of the locations.

Due to the presence of made ground and former tipping activities at the site the potential risk from gas was assessed and gas monitoring was carried out at the site from BH01 and BH04 at times of varying atmospheric pressure (995 – 1025mBar). No methane gas was detected at either location on the initial monitoring visit or on six repeat visits. Carbon dioxide was detected at low levels (0.5%) at BH01 which is consistent with the absence of made ground as described in the borehole log. At BH04, carbon dioxide was initially recorded at 7.7 % with a flow rate of 1.5 l/hr where approx. 1.5m of made ground was recorded at this location. Further gas monitoring visits failed to replicate this high concentration of carbon dioxide, it is therefore not considered a typical maximum value. In accordance with CIRIA C665, 2007, a gas screening value of 0.12l/hr was generated which characterises the site as 'Characteristic Situation 2' and classifies the risk as low.

7.5.2.2 Receptors: Controlled Waters

Laboratory leachate testing was undertaken on five samples and for the majority of contaminants, revealed no exceedences of the relevant threshold criteria (EQS/UK DWS) indicating that that the majority of soil bound contaminants are not readily leachable into the underlying groundwater. Benzo(a)pyrene and ammoniacal nitrogen however showed slight exceedances. This demonstrated that benzo(a)pyrene has the potential to leach from soils, at an isolated location (TP06), into groundwater and may pose a risk to the water environment. It is considered that as TP06 is situated on a bund, the made ground is therefore not reflective of ground conditions across the site as a whole. This was further demonstrated by groundwater analysis which indicated that benzo(a)pyrene was not present in groundwater samples collected from the initial groundwater sampling round. Ammoniacal nitrogen was detected in soil leachates from TP06 and TP10 and groundwater samples from BH01 and BH04, however the concentration in the leachates was lower than in the groundwater.

Groundwater depths taken during three rounds of monitoring were used to enable the direction of groundwater flow to be assessed. However, the results show that the majority of groundwater on the site is perched on top of the clay strata and for this reason it is not possible to clearly define the direction of flow.

Chemical analysis was initially undertaken on groundwater samples collected from both installed boreholes (BH01 and BH04) on site during a repeat site visit in February 2009. The majority of parameters tested in

the groundwater were below the relevant assessment criteria with the exception of ammoniacal nitrogen and copper detected at both boreholes. Elevated TPH was only detected in BH01. To enable the risk to controlled waters to be assessed fully, the results from the four additional groundwater samples (February 2010) were analysed. Copper and ammoniacal nitrogen concentrations remained in excess of the EQS values in both boreholes. The high TPH concentration was not replicated, however TPH (Aromatic C12 – C16) was detected at 15µg/l in the final round. Concentrations of zinc have increased at both locations and now exceed the EQS for marine waters.

As the concentrations of copper and zinc detected in the groundwater on site are slight exceedances, it is not considered that they pose a risk to controlled waters and the environment. The isolated elevated TPH concentration in BH01 is considered to be a one-off occurrence which has not been repeated in subsequent monitoring rounds. The concentration of TPH band (Aromatic C12-C16) detected in BH01 does not exist at a concentration which would pose a risk to controlled waters. However, it is considered that the concentrations of ammoniacal nitrogen detected in groundwater samples from BH01 and BH04 would pose a risk to controlled waters although as groundwater beneath the site is largely perched, no on-going environmental risk has been identified. It is still unclear whether this represents an off-site source or if this contamination is as a result of the WwTW on site.

7.5.2.3 Receptors: Construction Materials

Levels of sulphates in site soils were generally low, thus minimising risks to buried concrete. Soil pH ranged from 6.9 to 8.5 with only one sample outside the normal range (below 6 and above 9) with a slightly acidic pH of 5.7. Leachate testing revealed one slightly alkaline sample. Soils and leachates outside the normal pH range can pose a risk to buried construction materials which come into direct contact with site soils.

Several contaminants including arsenic, lead, mercury, pH and TPH were identified at levels exceeding WRAS threshold values which would be considered to pose a risk to the integrity of any water supply pipelines laid as part of the proposed development. This could lead to the permeation and accelerated deterioration of the pipe material through chemical reactions between the pipe and contaminants in the ground in which it is laid.

7.5.2.4 Waste Classification

The List of Waste (England) Regulations 2005 (which implements the European Waste Catalogue (EWC2002)) provides a comprehensive list of wastes that may or may not be hazardous.

The McArdle-Atkins CAT-WASTESOIL model has been used to provide an initial, rapid classification of granular material which has the potential to become a waste. The model deals specifically with EWC section 17 ‘Construction and Demolition Wastes (including excavated soil from contaminated sites)’ and refers to EWC code 17 05 03 "soil and stones containing dangerous substances".

Classification depends on the chemical composition of the waste and the concentrations of the identified compounds. All individual compounds have associated ‘risk phrases’, reflecting their physicochemical and toxicological properties. Risk phrases range from R1 to R68 and have been obtained from the Approved Supply List (Eighth Edition). Each risk phrase defines a specific risk and is linked with the hazard properties H1 to H14.

The results detail the individual risk phrase and hazard property for each compound that has a concentration above the hazard class threshold.

From the EA Guidance Document HWR08 Version 3.1 (June 2007), 'How to find out if waste oil and wastes that contain oil are hazardous', excavated materials will be considered to be classed as hazardous waste (Hazard Class H7, carcinogenic):

- where the total petrol range organics (PRO, C_6 to C_{10}) is 0.1% w/w (1000 mg/kg – category 2 carcinogen); or
- the diesel range organics (DRO, C_{10} to C_{25}) is 1% w/w (10000 mg/kg – category 3 carcinogen) or more;

Unknown lubricating/other oil (shown by analysis not to be fuel) in the waste will be assumed to be a category 2 carcinogen (limit 1000mg/kg) unless it can be demonstrated that it does not possess carcinogenic properties.

Using the McArdle-Atkins CAT-WASTESOIL model, three samples were classed as hazardous (hazard property H14 - ecotoxic) due to elevated concentrations of zinc and copper in the soil from TP11 (0.20m, 1.20m) and BH04 (0.30m). The risk phrases exceeded for H14 comprise R50 and R53, 'very toxic to aquatic organisms, may cause long term adverse effects in the aquatic environment'. These exceedances were located in the south-west of the site, in close proximity to the coast and the Moray Firth. If material from these locations (TP11 and BH04) are to be excavated for disposal to landfill, they should therefore be disposed of as hazardous waste. The remainder of materials tested were not classed as hazardous and would be accepted by a non-hazardous landfill.

7.6 Assessment of Significant Environmental Effects

A summary of key environmental elements at risk of being affected by sources of contamination is provided below. The significance of these potential effects is highlighted along with recommendations for mitigation in Table 7.7 at the end of this Chapter.

- Construction and maintenance workers
  - No contaminants were identified which exceeded the relevant commercial/industrial land-use scenario. The risk to construction and maintenance workers is therefore considered to be low.
  - In accordance with CIRIA C665, 2007, the site has been classified as 'Characteristic Situation 2' representing a Low Risk from gas generation.
- Controlled waters
  - Presence of slightly elevated benzo(a)pyrene in leachate from TP06 (bund).
  - High concentrations of zinc and copper in the soil from TP11 and BH04 pose a risk to the aquatic environment.
  - Elevated concentrations of ammoniacal nitrogen in groundwater samples from BH01 and BH04.
- Construction materials

- Acidic soil and alkaline leachate conditions were identified which have the potential to impact buried construction materials.

- Levels of contaminants were identified which may pose a risk to buried water supply pipes laid as part future phases of proposed development.

The overall environmental risk associated with geology, soils and groundwater is therefore classed as Medium.

The probability is low but the severity is medium. It will have a localised but long-term impact.

7.7 Mitigation

7.7.1 Human Health

Hardstanding and buildings proposed across the site, along with suitable subsoil and topsoil layers in landscaped areas will help prevent any contaminant pathways existing between site soils and final end users. Soils are therefore primarily a risk to construction workers.

Risks to construction workers however will be primarily mitigated through the provision and utilisation of suitable Personal Protective Equipment (PPE) and the implementation of best practice health and safety measures across the site in accordance with the Health and Safety at Work Act 1974 and all relevant regulations including the Construction (Design and Management) Regulations 2007.

No asbestos was identified in screens on any soil samples taken during the Ground Investigation and therefore no mitigation measures are required.

7.7.2 Controlled Waters

Although the initial elevated concentration of TPH in BH01 was not replicated, the exceedances of ammoniacal nitrogen detected in the further groundwater sampling results do pose a risk to controlled waters. To date, it has not been possible to test the WwTW itself as it is an active works and therefore the source of this contamination has remained unclear. It is recommended that during demolition and decommission of the existing works that further investigation into the underlying materials is carried out and material exceeding the relevant threshold values be taken off site.

It is understood that there is the possibility for infiltration drainage to be introduced in the southwest corner of the site, in close proximity to TP11 and BH04. Infiltration drainage would not be considered suitable at this location with the continued presence of ecotoxic materials. Although leachate testing showed the contaminants within the soils to have low mobility in this area, the promotion of infiltration at this particular location would encourage leachate formation which is not advisable in ecotoxic soils. Therefore, for infiltration drainage to be suitable, these materials would require removal and validation testing of the area prior to construction of an infiltration drainage system. If any of this material is to be disposed of off-site, then it will be classed as hazardous waste and will require Waste Acceptance Criteria testing to determine its suitability for landfill. If the materials are to be re-used across the site, they would only be suitable for use beneath hardstanding and above the groundwater table given the presence of elevated ecotoxic contaminants.

It is also understood that sections of the existing bund will be excavated during construction of the proposed development. If this is the case, then the material from TP06 (0.2m) is suitable to be re-used on the site, however only at locations which will be beneath hardstanding and above the groundwater table so as not to encourage leaching of benzo(a)pyrene into the water environment.

7.7.3 Construction Materials

Given the presence of localised alkaline and acidic conditions across the site, consideration of the most appropriate construction materials to be used on site should be undertaken as part of the detailed design process to protect against risks from site soils to buried structures.

Several contaminants were identified across the site at levels considered to pose a risk to the integrity of water supply pipelines. It is understood that potable water supply pipes are to be installed on site, it is therefore recommended that trenches should be excavated and backfilled with clean fill prior to the pipes being laid to prevent contact with site soils. Consultation should also be undertaken with Scottish Water regarding suitable pipe materials and any site specific measures which may be required.

7.7.4 Ground Gases

The gas monitoring results from the 2008 Ground Investigation and subsequent monitoring rounds were analysed in accordance with CIRIA C665 to assess the risks to buildings. This assessment indicates that the site is classed as 'Characteristic Situation 2', which requires the following typical scope of protective measures:

- Reinforced concrete cast in situ floor slab (suspended, non-suspended or raft) with at least 1200g DPM2;
- Beam and block of pre cast concrete slab and minimum 2000 g DPM / reinforced gas membrane;
- Possibly underfloor venting or pressurisation in combination with (a) and (b) depending on use; and
- All joints and penetrations sealed.

7.7.5 Waste Classification

Three samples in the south-west of the site contained levels of copper and zinc at levels sufficient to define them as hazardous due to hazard property H14 (ecotoxicity). If material from this area is to be excavated for disposal to landfill, it should therefore be disposed of as hazardous waste. The proposed development will involve varying degrees of excavation in the location of TP11 and BH04. If any of this material is to be disposed of off-site, then it will be classed as hazardous waste and will require Waste Acceptance Criteria testing to determine its suitability for landfill. If these materials are to be re-used across the site, they would only be suitable for use beneath hardstanding and above the groundwater table given the presence of elevated ecotoxic contaminants.

If the total contract value of the works exceeds £300,000, a Site Waste Management Plan will be required under the current legislation.

For any construction materials to be imported to the site, there will be a requirement for contamination testing to ensure that risks are not posed to sensitive receptors. Testing for imported materials should comprise laboratory analysis at a rate of 1 sample per 1000m^3 if it is from a Greenfield or quarried source,

or 1 sample per 250m^3 for material which has previously been used or reprocessed. Materials must comply with the requirements of the limits detailed in this report.

7.8 Residual Effects

Following completion of the mitigation measures provided above, it is considered that the potential risks associated with geology and soils would be reduced to acceptable levels. Further investigation will be required on the material underlying the WwTW during demolition/decommissioning to confirm the risks associated with groundwater (ammoniacal nitrogen) and their possible source.

7.9 Summary of Environmental Effects

Table 7.7: Geology, Soils and Groundwater Risk Assessment Summary

Hazard	Receptor	Pathway	Impact	Mitigation	Residual Risk
Contamination of bedrock aquifer from spills associated with process failures eg pumps	Not used for abstraction as at sea level and would be likely to be subject to salination	Highly permeable, therefore fast penetration	Medium	Containment, emergency operation plan, drainage plan	Low /insignificant impact
Sludge handling / transport	Groundwater	Damage caused by leakage of controlled substances (sewage sludge)	Medium	Containment, emergency operation plan, drainage plan	Low /insignificant impact
Isolated elevated TPH concentration in groundwater at BH01	Groundwater Sea life (depending on connectivity)	Mobilisation of contaminated groundwater during excavation	High	Further groundwater testing undertaken and initial concentration not replicated.	Low
Ammoniacal Nitrogen Contamination in leachates and groundwater across site	Groundwater Sea life (depending on connectivity)	Mobilisation of contaminated land during excavation, migration into groundwater	Medium	Further investigation required on material underlying WwTW during demolition/decommissioning to confirm elevated Ammoniacal Nitrogen concentrations and their possible source.	Medium (Residual risk will be assessed)
Isolated high CO_2 level in BH04 during initial gas monitoring round	Confined spaces/ buildings	Gas migration through strata/conduits	Low, CIRIA 'Characteristi c Situation 2'	Gas protection measures include suitable slab construction, gas membrane and sealing of all joints and penetrations.	Low
Hazardous (ecotoxic) soils at TP11 and BH04 (high concentrations of zinc and copper)	Groundwater Sea life (depending on connectivity)	Mobilisation of contaminated land during excavation, migration into groundwater	Moderate	Re-use under hardstanding and above GW table. Infiltration drainage to be located away from the source of contamination.	Low
Contaminated leachate at TP06 (benzo(a)pyrene)	Groundwater Sea life (depending on connectivity)	Mobilisation of contaminated land during excavation, migration into groundwater	Moderate/ Low	Re-use under hardstanding and above GW table. Infiltration drainage to be located away from the source of contamination.	Low
Corrosion of construction materials	Groundwater	Damage caused by leakage of controlled materials (sewage sludge) from plant due to corrosion of materials	Low	Consideration of most suitable materials to be used in development at detailed design stage.	Very Low
Contamination of drinking water pipelines	Construction materials (water supply pipelines)	Direct contact with pipeline materials	Low	Trenches should be excavated and backfilled with clean fill prior to pipes being laid to prevent contact with site soils	Low /insignificant impact

8. Landscape and Visual Impact and Lighting

8.1 Introduction

This section highlights the major findings of the landscape and visual and lighting impact assessment presented in Technical Appendix F in Volume 3 of the Environmental Statement.

8.1.1 Scheme Description

The overall study area for the assessment covers the inner Moray Firth. The visibility assessment extends from the spine of the Black Isle to the A96 corridor and from the Kessock Bridge to Whiteness Head.

In order to establish the degree to which a landscape character type or area can accommodate change without unacceptable adverse effects on its character, it is necessary to thoroughly understand the landscape context within which the change is to occur and the nature of the proposed change.

The existing WwTW scheme is made up of 23 key structures: -

- SAS buffer tank;
- Aeration plant lanes;
- Poly and thickener building;
- Sludge storage tank;
- Sludge consolidation tank;
- Inlet screens and grit removal;
- Odour control unit;
- Distribution chamber (2no.);
- Final settlement tanks (FST) (2no.);
- Ultraviolet (UV) kiosk;
- New control kiosk;
- FST scum pumping station (PS);
- Balance/storm tank and inlet PS;
- Wash water booster set;
- Primary Settlement Tank (PST) (2no.);

- PST De-sludge pumps;
- Aeration plant blowers;
- Sludge transfer pump;
- PST Scum PS;
- Interstage PS;
- Return Activated Sludge (RAS) & Surplus Activated Sludge (SAS) PS;
- Return liquor PS; and
- UV unit.

The new WwTW will make use of the existing WwTW infrastructure, including pipework conveying wastewater from the existing network and discharge pipelines. The new works has been designed to utilise land around the existing WwTW, with some use of surrounding scrubland and minimal encroachment onto land currently used for public amenity.

The existing WwTW will be decommissioned once the new WwTW is operational. The proposed WwTW will consist of primary screening and settlement followed by secondary aeration plant lanes assisted degradation. Bacteriological control of the final effluent will be achieved through tertiary disinfection by ultraviolet (UV) irradiation.

Within the constraints of providing an appropriate level of treatment, low elevation processes have been selected wherever possible. However, for the works to operate efficiently a certain hydraulic head has to be maintained and this determines the height of many of the individual structures within the site.

The engineering proposals for the WwTW are essentially a series of chambers, tanks, screens, pumping stations, units, kiosks and buildings. The proposed ground level will be raised on average 0.3m from the existing height which varies from 3.8m to 5.00m AOD. There are a total of 26 new structures of varying size.

The proposed structures have been divided into four height categories. These are as follows: -

- 0 to 0.15m (which represents 11% of the number of structures);
- 0.15m to 1m (which represents 34%);
- 1m to 3.25m (which represents 34%);
- 3.25m to 5.9m (which represents 22%);

With regards to considering the structures in terms of volume size, the four largest structures are concentrated within the taller height category.

8.2 Legislative Framework

There is no specific legislation relating to the aspects of visual impact and amenity considered in this ES. The relevant local policy is the Inverness Local Plan which outlines The Highland Council's vision and strategies to steer development for the Inverness area.

8.3 Assessment Methodology

8.3.1 Baseline Methods

The methodology adopted is as set out in:

- Scottish Natural Heritage (SNH) Environmental Assessment Handbook 'Guidance on the Environmental Impact Assessment Process',
- Appendix 1:Landscape and Visual Impact Assessment March 2005 (prepared for SNH by David Tyldesley and Associates).
- 'Guidelines for Landscape and Visual Impact Assessment 2nd Edition', a Spons 2002 publication for The Landscape Institute.

8.3.2 Method of Assessment of the Landscape

The different aspects of the landscape considered are as follows:

- Elements – prominent or eye-catching individual elements that make up the landscape e.g. hills, valleys, woods, trees, hedges, ponds, buildings or roads etc.
- Characteristics – Elements that make a particular contribution to the landscape e.g. tranquillity.
- Character – The distinct pattern of elements that repeatedly occurs in a particular type of landscape, and how this is perceived e.g. geology, landform, soils, vegetation, landuse and human settlement. It creates the particular sense of place of different areas of the landscape.

This assessment effectively seeks to identify the sensitivity of the landscape and its capacity to accommodate a proposed development without adverse effects on its character.

8.3.3 Method of Assessment of the Lighting

Artificial lighting in this area will be studied to see if they exist for all or some of the following reasons: -

- safety of movement;
- security of property;
- extension of working practices;
- extension of sporting and leisure activities;

- advertising of commercial enterprises;
- "bringing on" horticultural and farming produce; and
- enhancing the amenity value of important buildings and settlements.

The times of likely artificial lighting hours will be assessed.

The appropriate environmental zone or category that the exterior lighting within development area shall be selected. These zones will be, for example, intrinsically dark landscapes, low district brightness areas, medium district brightness areas, or high district brightness areas.

8.4 Baseline Conditions

8.4.1 Landscape

8.4.1.1 Landscape Context and Designations

The development is sited on the southern shore of the Moray Firth close to Fort George. The Firth is a valued area which is reflected in the various designations around the proposed development site covering cultural heritage (structures of historic interest) and ecological designations. Other important aspects to be aware of include points of interest and access, such as the Core Path (and Candidate Core Path) Network. There are actually no landscape designations.

8.4.1.2 Landscape Character

In order to broadly assess and categorises the landscape character of the study area, reference has been made to the Inner Moray Firth Landscape Character Assessment, Review No 90. The site of the WwTW is located on the junction of the ‘Enclosed Firth’ and the ‘Intensive Farming’ landscape character area.

8.4.1.3 Local Landscape Descriptions

- The WwTW is just inland from the shoreline. The key landscape elements are:
- The inner firth
- The shoreline - beach and intertidal zone
- Shrub and scrub of Ardersier Common
- Playing fields
- Evergreen plantations
- Grazing fields
- Distant views of Black Isle

Topography/landform - The existing and proposed WwTW are within very low lying ground with little topographic variation. To the east /south east the land rises to a low escarpment.

Due to the surrounding vegetation and the low structures of the existing WwTW site, the proposed site can be difficult to pin point from distant views. The neighbouring structures; the MOD radio mast, the 'Macleod organics' organic farm domed agricultural building, grain silos and white lorry trailer all help locate the proposed site when viewing.

Historical elements/single point features include - Fort George, Cromal Mount, Hillhead of Ardersier, Kirkton Old Burial Ground and Watch House, and The Old Military Road to Fort George.

Landuse and landcover - The primary landuse in the immediate surrounding area is that of recreation - the playing fields, Ardersier Common and the coastal waterfront walks. The fields to the north and east are grazed and military uses dominate the landscape to the north. To the south is the settlement of Ardersier.

Lighting – The existing lighting is designed to only be switched on manually, for whenever there is a breakdown and repairs need to take place during the dark hours. This is anticipated to be a very occasional. The beam angles are approximately at 45 degrees angled down into the site and away from the road and Ardersier residents. General maintenance visits are carried out 3 times a week during daylight hours.

The principle behind the proposed lighting scheme is to provide lighting as needed to carry out tasks within the works and some low level general site lighting. An average luminance is proposed such that safe movement to and medium light demanding tasks at and around the main plant area is facilitated. All these are likely to be PIR sensor activated. Some of the existing lighting is to remain.

Over the four seasons the average light hours will vary from as little as 8 hours a day in autumn/winter and as much as 16 hours in the spring/summer.

The areas and type of lighting to be checked are selected properties, the extension of working practices, sporting facilities, commercial enterprises and horticultural or farming business.

The roads are likely to have lighting to increase the safety of movement of vehicular or pedestrian traffic. Street lighting is found within Ardersier town, up to the edge of residential area and along the stretch between the town, past the site and to the MOD buildings. There are lights at the existing WwTW and a few at the entrance to the residential houses 1&2 The Commons. Lighting is concentrated at the MOD buildings, the road linking these and Fort George, and around Fort George itself. This might well be expected considering the nature of the landuse here.

The appropriate environment zone category that the scheme sits within is Category E2: Low district brightness area, typical for rural, small village or relatively dark urban locations.

8.4.1.4 Landscape Quality and Condition

Using the suggested criteria contained within the Guidelines for Landscape and Visual Impact Assessment Second Edition published by Spon Press 2002, the landscape quality of the entire study area is good –

there is a lack of any specific landscape designation, however the enclosed firth is attractive and Chanonry Point is a key location for dolphin watching.

The local landscape around the WwTW is not particularly special and is dominated by recreational, military and relatively low quality agricultural land use. The landscape structure of site surroundings is not strong so a scoring of Poor was allocated.

8.4.1.5 Landscape Value

On a local landscape scale - the WwTW site is within a recreational/ agricultural setting. The value of the local landscape was considered to be poor. The site is visible from a number of sensitive receptors but the visibility is restricted by existing vegetation within and adjoining the site.

Due to the proximity to Fort George however, the area has a landscape value higher than would be allocated locally. It was suggested therefore that the landscape for the study area and site surroundings has a Medium value.

8.4.2 Visual Impact

An assessment of the visual influence of the proposed development on the surrounding landscape was undertaken. The process involved identifying the principal representative viewpoints from which the development would be visible, and highlighting the potential sensitive receptors of the visual effects. The assessment assumed no mitigation.

The finer details of the viewpoints and the assessment of the impact of the development upon them are discussed within Technical Appendix F.

8.4.3 Description of Visual Envelope

Figure 4 Local Landscape Context (Technical Appendix F) indicates views into the site and elements that might interfere with lines of sight. The visual envelope of the Site is relatively local, being comparatively very tight to the site's eastern boundary and much more distant on all other boundaries. The higher ground of the ridge to the site's east, which hosts the Core Path network linking the group of houses by Hillhead Farm to the north of Ardersier with the Kirkton Old Burial Ground and Watch House, forms the visual boundary. The linked high points running parallel with the coastline opposite mirrors this visual boundary, although it is more distant. The fact the Site is on the coastline of the Moral Firth lends itself to open views to the north, south and west. There are distant views towards the Site from Chanonry Point 2.6km away. However the precise location of the Site cannot be defined by the naked eye from this viewpoint.

The established vegetation of gorse around the existing WwTW site and Ardersier Common to the south, together with the strip of woodland to the north actually restricts the envelope due to their close proximity, elevation and height.

The visual envelope of the development outlines the area of land within which there is a view of any part of the proposed development. Therefore all changes in visual impact must occur within these areas.

8.5 Identification of Environmental Effects

8.5.1 Landscape

8.5.1.1 Landscape Receptors

The term 'receptor' is used in landscape & visual assessments to mean an element or assemblage of elements that will be directly or indirectly affected by the proposed development. Landscape receptors include elements of the physical landscape that may be directly affected by the development such as topographic, geological and drainage features, woodland, tree and hedgerow cover, land use, field boundaries and artefacts.

The landscape is relatively robust much of its character comes from landform or lack of it and the nearby seascape, and large scale land uses –all unaffected by the relatively small scale proposals. However the following are the key local landscape receptors:

- The enclosed inner moray firth
- The shoreline
- The flat "intensive" farmland

8.5.1.2 Capacity to Absorb Change

The capacity of the local landscape to absorb change is significant, particularly for the small scale and low lying development proposed as the landscape is made up of a patchwork of different components woodland agriculture , common land and military uses all dominated by the seascape of the firth.

8.5.1.3 Landscape Experience

The inner Moray Firth landscape is an attractive example of east coast highland coastal landscape. The landscape experience is dominated by the landform and the sea. The scale of the landscape is large and the landscape is experienced at this large scale – small individual elements are less significant. The landscape experience will not be affected by a small scale development.

8.5.2 Visual Impact

8.5.2.1 Visual Receptors

Visual receptors may include residents, visitors, the public or the community. Table 8.3 summarises the visual impacts from various view points looking towards the WwTW. Figure 8.1 shows the location of the viewpoints in relation to the WwTW. A detailed description of the view point and screening factors is presented in Technical Appendix F along with photographs.

8.5.2.2 Construction Phase

During the construction period there will be significant visually intrusive activity onsite such as movements of large machinery and temporary earthworks. It is likely that plant, machinery and the temporary

compounds required to house welfare and storage for materials will be visible from various view points around the site and visible from a greater number of receptors.

During all these construction areas there will be a temporary adverse impact in the existing views resulting from the presence of construction plant and associated excavation activities. However, this is considered to be short lived lasting a matter of 18 months for the works. Once construction activities have ceased the site will be restored and there will only be the visual impacts as identified in the view point section.

8.6 Assessment of Significant Environmental Effects

8.6.1 Landscape Character

8.6.1.1 Project Description

The key elements of the development that could impact on the landscape are:

- The taller structures of the WwTW are the auger element of the screens and grit removal, SAS storage tank, aeration plant lanes, poly and thickener building, sludge storage tank and sludge consolidation tank;
- The loss of existing vegetation;
- Bunding associated with the new works.

8.6.1.2 Sensitivity of Landscape Receptors

The surrounding landscape on a wider scale is not of exceptional quality or of national importance. It is a large scale, landscape defined by the land forms and relationship to the sea.

The broad scale landscape receptors are not sensitive to a development of this relatively small scale which is tiny in comparison with the scale of the landscape.

The significance or sensitivity of the landscape receptors are as follows:

Identified Landscape Receptors	Sensitivity
The enclosed inner Moray Firth	Low
The shoreline	Medium
The flat “intensive” farmland	Low

8.6.1.3 Magnitude of Change/Impact

The landscapes here are within the study area and are **not** highly sensitive to small scale interventions such as proposed with this development.

Landscape magnitude is based, amongst other things, on the extent of change to the landscape resource, the duration, scale and nature of the change and the impact of the change on the character of the landscape and its tolerance for accommodating change.

The magnitude of landscape change on each landscape receptor caused by the construction of WwTW is set out below.

Identified Landscape Receptors	Magnitude
The enclosed inner Moray Firth	Low
The shoreline	Medium
The flat “intensive” farmland	Low

8.6.1.4 Significance/Identification of Landscape Impacts

Combining the two sets of analysis above, a simple matrix of significance is compiled as following:

Identified Landscape Receptors	Sensitivity	Magnitude	Significance of impact
The enclosed inner Moray Firth	Low	Low	Low
The shoreline	Medium	Medium	Medium
The flat “intensive” farmland	Low	Low	Low

The only significant landscape impact identified by this process is on the local landscape feature of the shoreline adjoining the WwTW.

8.6.2 Visual Impact

8.6.2.1 Sensitivity of Visual Receptors

Many potential visual receptors have been disregarded as potential receptors since they are so far from the site that a view is not possible with the naked eye, or not possible due to natural or man-made elements that completely screen the view.

Those receptors that have the likely hood of a view onto the site include the following:

High Sensitivity

- Occupiers of residential properties, including tourist hotels;
- Users of Viewpoints.

Medium Sensitivity

- Sporting or recreational (active and passive) facilities not related to the enjoyment of the natural heritage;
- Users of public roads;
- Users of undesignated/locally marked recreation routes;
- Users of open spaces and recreation areas.

Low Sensitivity

- People at their place of work.

8.6.2.2 Magnitude of Potential Impact

The landscape impact magnitude is based on the extent of change to the landscape resource, the duration, scale and nature of the change and the impact of the change on the character of the landscape and its tolerance for accommodating change.

Following is Table 8.1 to illustrate the classifications for this scheme.

Table 8.1: Classification of Impact Magnitude on Visual Receptors

Impact Magnitude	Significance of Impact
Majority of viewers affected, major change in view, where the scheme would cause a significant deterioration (or improvement) in the existing view.	Major negative or positive impact
Many/some viewers affected, moderate change in view where the scheme would cause a noticeable deterioration (or improvement) in the existing view.	Moderate negative or positive impact
Few viewers affected, minor changes in view where the scheme would cause a barely perceptible deterioration (or improvement) in the existing view.	Minor negative or positive impact
No discernable deterioration or improvement in the existing view.	Negligible

8.6.2.3 Significance/Identification of Visual Impacts

Combining the two sets of analysis from above, a simple matrix of significance is compiled as shown in Table 8.2.

Table 8.2: Significance of Visual Impact

		Value/Sensitivity		
		High	Medium	Low
Magnitude	Major negative	Major Adverse	Moderate Adverse	Minor Adverse
	Moderate negative	Major Adverse	Moderate Adverse	Minor Adverse

		Value/Sensitivity		
		High	**Medium**	**Low**
	Minor negative	Moderate Adverse	Minor Adverse	No Significant Effect
	Negligible	No Significant Effect	No Significant Effect	No Significant Effect
	Minor positive	Minor Beneficial	Minor Beneficial	No Significant Effect
	Moderate positive	Moderate Beneficial	Moderate Beneficial	Minor Beneficial
	Major positive	Major Beneficial	Moderate Beneficial	Minor Beneficial

8.6.2.4 Summary of Significant Impacts

The following summarise the landscape and visual impacts respectively, with the visual table only showing viewpoints of notable impact.

Landscape Character Impacts

Identified Landscape Receptors	Sensitivity	Magnitude	Significance of impact
The enclosed inner Moray Firth	Low	Low	Low
The shoreline	Medium	Medium	Medium
The flat “intensive” farmland	Low	Low	Low

Summary of Visual Impacts

Table 8.3: Summary of visual impacts

Viewpoint	Significance of visual impact	Sensitivity of visual receptor	Magnitude of visual receptor
Viewpoint 1 - View from group of elevated houses looking northwest	No significant effect	High	Negligible
	Minor adverse	Medium	Minor negative
2 - View from elevated house looking northwest	No significant effect	High	Negligible
3 - View from houses beside B9006 road looking northwest	No significant effect	High & Medium	Negligible
4 - View from two B&B houses looking northwest	Moderate adverse	High	Minor negative

Viewpoint	Significance of visual impact	Sensitivity of visual receptor	Magnitude of visual receptor
5 - View from Core Path Network between Hillhead Farm and the cemetery looking northwest	No significant effect	Medium & Low	Negligible
6 - View from Core Path Network between Hillhead Farm and the cemetery looking west	Minor adverse	Medium	Minor negative
	No significant effect	Low	Minor negative
7 - View from Core Path Network between Hillhead Farm and the cemetery looking west	Minor adverse	Medium	Minor negative
	No significant effect	Low	Minor negative
8 - View from grounds outside Fort George (SAM) looking southeast	No significant effect	High	Negligible
9 - View from Hillhead of Ardersier (SAM) looking west	Moderate adverse	High	Minor negative
	No significant effect	Low	Minor negative
10a - View from Watch House (Listed Building) looking southwest	No significant effect	High	Negligible
10b - View from Kirkton Old Burial Ground looking southwest	Moderate adverse	High	Minor negative
11 – View from Cromal Mount (SAM) looking north-west	Moderate adverse	High	Minor negative
12 – View from picnic spots on Ardersier Common looking north	No significant effect	High, Medium & Low	Negligible
13 - View from Chanonry Point beach Viewpoint looking east	No significant effect	High	Negligible
14 - View from MOD Rugby and Football Pitches looking south	Moderate adverse	Medium	Moderate negative
15 - View from B9006 (Old Military Road) road just north of Ardersier Common looking northwest	No significant effect	Medium	Negligible
16 - View from B9006 (Old Military Road) beside Army Training centre looking south	Minor adverse	Medium	Minor negative
17 - View from B9006 (Old Military Road) beside driveway to 1&2 The Commons residence looking south	Moderate adverse	Medium	Moderate negative
18 - View from a Candidate Core Path entrance into Ardersier Common, looking northwest	No significant effect	Medium & Low	Negligible
19 – View from a Candidate Core Path within Ardersier Common looking northwest	No significant effect	Medium & Low	Negligible
20 – View from a Candidate Core Path within Ardersier Common looking northwest	No significant effect	Medium & Low	Negligible
21 - View from Candidate Core Path beside band of mixed woodland looking southeast	Moderate adverse	Medium	Moderate negative
22 - View from Candidate Core Path beside band of mixed woodland looking southeast	Moderate adverse	Medium	Moderate negative
23 - View from Candidate Core Path immediately adjacent to the site looking	Moderate adverse	Medium	Moderate negative

Viewpoint	Significance of visual impact	Sensitivity of visual receptor	Magnitude of visual receptor
east			

Source: Ardersier WwTW Development LVIA, Scottish Water

Figure 8.1: Viewpoints Locations (source Ardersier WwTW Development LVIA, Scottish Water)

Lighting

The proposed artificial lighting scheme is in line with the lighting at the existing works. Both respect the environmental zone category (E2) that the WwTW scheme sits within. There is no infringement, on a dark hours lumination degree, of this low district brightness area.

Construction Phase

During the construction period there will be significant visually intrusive activity onsite. It is likely that plant, machinery and the temporary compounds required to house welfare and storage for materials will be visible from various view points around the site.

During all these construction areas there will be a temporary adverse impact in the existing views resulting from the presence of construction plant and associated excavation activities. However this is considered to be short lived lasting a matter of 18 months for the works. Once construction activities have ceased the site will be restored and there only will be the visual impacts as identified in the view point section.

8.7 Mitigation

8.7.1 Waste Water Treatment Works

Site Selection - Locating the extended WwTW immediately adjacent to the existing works utilises the existing vegetation of shrub and tree species as well as the lie of the land to provide instant screening from all angles within the study area, and a backdrop to the buildings for the views from the west.

Site Layout/Landform - The minimum size in height, width and breadth have been proposed for the control and welfare building and treatment works structures, area of access road and height of fencing and light columns. These have been arranged in as compact a layout as feasible.

Additionally the absolute minimum of existing vegetation and earth bunding has been removed for the construction of the site.

Earth Bunding and Planting - In general, the only situations where there is likely to be any unwanted open, or filtered views into the development is where the recipient is in close proximity (users of the Candidate Core Path and users of the MOD playing fields and the B9006 (Old Military Road) adjacent to these playing fields) or at an elevated viewpoint (residents and visitors to the B&B's, visitors to Hillhead of Ardersier (SAM) or users of the Core Paths near this SAM). The significance of the visual impact has been increased due to the higher sensitivity of the recipient (occupiers of residential properties or visitors).

Various detailed discussions have taken place with the Highland Council landscape architect and Ardersier Common ranger, with their various comments being taken on board.

To mitigate the visual impact, the construction of low earth bunds, to the northwest and west of the site is recommended. This will screen the visually busiest elements of the development including the security fencing, access road, signage etc, as well as the lower section of the built structures.

The bunds are to be profiled such that finished lines are to be sympathetic with the natural contours of the surrounding landscape and the line of the toe of the bund is to be varied to allow the slope angle to change and be less rigid and engineered.

To minimise the footprint of the bunds, the works side of the bund is to be 1:2 and grass seeded. The outward facing slopes are to be planted, therefore must at least be 1:4. The bund parallel with the coast at times is 1:10.

Trees and shrubs are planted on the outer slopes. There is a small percentage of tree species, which will reach up to 8-10+ metres high. The majority of the mitigation planting will be species of which reflect those that have successfully grown in the landscape surrounding the site. All proposed planting is designed such that it connects with the existing vegetation, both physically thus creating a habitat link, and visually by species choice thus the eyeline can travel across the vegetated horizontal line smoothly and unhindered.

8.7.2 Lighting

Through good design, light pollution and visual intrusion of the light structures has been minimised such that there in no requirement to mitigate through landscape works. Also due to the landscape mitigation

designed to screen the visual intrusion created by the WwTW structures, there is the benefit where the lighting columns etc are additionally screened from view.

8.7.3 Mitigation of Buildings and Structures

The following aspects of the building colour and materials will be considered at the detailed design stage of the works.

Colour - Traditional earth colours such as reds, browns and ochres as well as black and white fit well within the landscape. As a general rule for rural buildings use darker colours. Light colours usually make objects appear larger and more conspicuous. Suitable roof colours include Dark, blackish green; shades of grey, especially warm ones; khaki and olive greens. Blue greens and yellow greens should be avoided.

Materials - Preserve “Local distinctiveness” by assessing the character and locality of the surrounding buildings. By the use of sympathetic materials and well thought out detailing, buildings can be more successfully integrated into their setting. The impact of a large structure can be reduced by dividing it into broad horizontal or vertical bands of colour or material, such as plinth in brickwork or rendered blockwork, space boarding above, stained or treated to a dark colour, and a dark coloured roof.

Detailing should be used boldly by considering shadows, wide barge boards and the design of gutters and downpipes. Roofs can be broken up by stepped pitches and ridges. AVOID: Light, reflective surfaces unless always seen against the sky.

8.7.4 Construction Phase

Through careful consideration, temporary visual intrusions can/should be kept to a minimum i.e.

- Locate contractors’ site compound behind a natural rise, or adjacent to existing vegetation screen.
- Position units one behind the other.
- Keep the heights of structures to a minimum, such as the number of units on top of one another.
- Keep car parking behind structures.
- Phase works in sections rather than string out along whole length of landscape.
- Minimise traffic to/from site.
- Restrict working times.
- Possibly select a different access route to site.
- ‘Make good’ any unavoidable damage. i.e. re levelling, seeding and/or planting disturbed ground.

8.7.5 In General

The qualities of the Moray Firth, with its strong slopes and firths allowing views to be gained across and out of the character types, is characteristic of this landscape. This intervisibility and the recognised importance of long distance views, is a reminder that in considering any proposals it is imperative that we take a step back and see the landscape type in its broader context. This WwTW development must respond to this broader context as well as to the character of the immediate area as otherwise there is concern that there will be cumulative effects of piecemeal developments which may jeopardise the very qualities of the landscape that is aimed at to be retained.

With appropriate mitigation through landscape bunding and planting as previously described, any adverse effects of the development on the viewpoints can be minimised.

There are key short distant views into the site, and distant views out of the site. The most adverse impacts on visual receptors arise when the viewpoints look across or down to the site when there is no visual screening or filtering between the recipient and the development.

There is the opportunity to enhance the quality of the site by increasing its biodiversity value. Where appropriate, new planting will provide a significantly larger area of native tree and shrub species. An appropriate broader species mix of trees and shrubs and wildflower and grass seeding would improve the diversity, and thus the landscape value of the site.

8.8 Residual Effects

The effects identified in Section 8.5 are assessed in terms of their effect and the potential significance. Provided the proposed mitigation measures are implemented, the proposed development will have a negligible residual impact.

8.9 Summary of Environmental Effects

Table 8.4: Landscape and Visual Amenity Risk Assessment Summary

Hazard	Receptor	Pathway	Impact	Mitigation	Residual Impact
Deterioration in the existing view	residents, visitors, the public and the community	Visual	Medium impact Local (regional) Long term	Screening and planting, use of natural colours	low impact Local (regional) Long term

It is clear from the assessment that the majority of the landscape and visual impact prior to mitigation, would be of no significance for the landscape impact with 54% of the viewpoints having no significant effect of the proposed works. 14% would have minor adverse effect. Up to nine viewpoints, or 32%, would have a moderate adverse effect.

The viewpoints of greatest visual impact are such since they have the higher sensitivity of visual receptor, and/or are closer in proximity to the works or are from an elevated position where the view into the works is more open, thus the magnitude impact greater.

Following the successful implementation of screen planting, the impact magnitude will be reduced, and respectively the significance of the visual impact.

The impact of the proposed WwTW as a whole is relevant in the local context but is considered to have only a slight relevance on the landscape character of the broader landscape.

It can be concluded that, in the majority, the proposed development would have an impact of low significance on the overall character of the landscape where the proposed scheme would maintain the existing landscape quality.

9. Hydrology and Water Quality

9.1 Introduction

This chapter provides an assessment of the impact on surface water and groundwater relative to the baseline conditions. The assessment was undertaken through desk study and consultation.

Both surface and groundwater are important and valuable resources not only as sources of drinking water, but also as a vital source for other economic activities such as agriculture, industry, fisheries, amenity, and recreation. Additionally, many surface and groundwater features also support habitats and species of national and international importance. The protection of these features in terms of water quality and quantity is the central point of European legislation, the Water Framework Directive, which is transposed into Scottish Law through the Water Environment and Water Services (Scotland) Act 2003. The legislation requires an integrated catchment management approach with the main target to achieve “good ecological status” of water bodies by 2015.

The construction of the proposed development may have an impact on the local drainage system. This aspect is also considered within this chapter.

9.2 Legislative Framework

The following legislation and policy guidance has formed the basis of the assessment methodology used to determine risk of impact from the proposed works on water quality and hydrology;

- Urban Waste Water Treatment Directive (91/271/EEC)
- Water Environment and Water Services Act 2003 (The Water Framework Directive as enacted in Scotland)
- Water Environment (Controlled Activities) (Scotland) Regulations 2004
- The European Union Habitats Directive (92/43/EEC)

9.3 Assessment Methodology

9.3.1 Hydrology assessment method

The hydrological impacts of the development have been addressed through assessment of the risk of flooding of the site and consideration of neighbouring flooding being exacerbated on account of construction of the site.

The baseline conditions in the given area were identified through consultation with SEPA and by desk-based review of relevant documents and technical materials.

The coastal flood level is established and ground below this level is assessed to be at risk of flooding. Mitigation is proposed where construction is anticipated in areas identified as at risk.

9.3.2 Groundwater quality assessment method

The baseline groundwater quality conditions in the given area were identified through consultation with SEPA and Scottish Water, by desk-based review of relevant documents and technical materials including records of historical land use and through subsequent ground investigation as detailed in Chapter 7.

Assessment of impacts to groundwater from the construction and operation of the proposed development are based on the identification of sources and pathways for contamination.

Protection measures have been designed into the proposed scheme for drainage in accordance with published guidance documents and following consultation with SEPA.

9.3.3 Surface water quality assessment method

There are no watercourses or bodies of standing freshwater in the vicinity of the proposed development. Assessment of surface water focuses on impacts to coastal and marine waters of the Moray Firth.

The baseline water quality conditions in the given area were identified through consultation with SEPA and Scottish Water, by desk-based review of relevant documents and technical materials and through reference to current discharge standards from the existing WwTW.

Assessments of impact are made for construction activities and on the basis of the estimated increase in effluent flows and quality for the new WwTW. Receptors are identified and their sensitivity assessed. Criteria are set for evaluating the magnitude of impacts and the significance of impacts are based on a combination of receptor sensitivity and impact magnitude. Tables setting out the criteria categorisation are provided within the water quality assessment section.

9.3.4 Water quality assessment method

9.3.4.1 Sensitivity

The sensitivity of receiving waters has been evaluated in accordance with Table 9.1 on the basis of the degree of protection afforded to it and on its existing ecological status and with reference to the water quality status evaluation criteria.

Table 9.1: Criteria for Determining the Sensitivity of Coastal/Tansitional Receiving Water

Value	Criteria	Examples
Very High	High quality and rarity, national, international or, in some cases, regional scale and limited potential for substitution	Waterbodies set within or containing internationally protected sites (SPA, SAC, RAMSAR site). Waters designated under the Bathing Waters Directive. Waters designated for shellfish growing/production. Water quality not significantly anthropogenically affected.
High	High quality and rarity, local or regional scale and limited potential for substitution. Medium quality and rarity, regional or national scale and limited potential for substitution.	Waterbodies set within nationally protected sites (SSSI). Waterbodies with connectivity to waters of Very High sensitivity. Waterbodies of High Ecological Status

Value	Criteria	Examples
Medium	Medium quality and rarity, local scale and limited potential for substitution. Low quality and rarity, regional or national scale and limited potential for substitution.	Waterbodies remote from nationally or internationally designated areas. Waterbodies of Good Ecological Status
Low	Low quality and rarity, local scale and limited potential for substitution	Waterbodies of Moderate or lower Ecological Status

9.3.4.2 Magnitude of impact

The magnitude of the effect of effluent changes on the water quality of the Moray Firth has been determined using typical criteria as set out in Table 9.2 below.

The classification of magnitude has taken account of the following:
- the scale of the change in the concentrations and loads for key indicator parameters to the Moray Firth,
- the geographical extent over which the impact is effective,
- the duration of the impact.

The magnitude of all impacts, both beneficial as well as adverse, are noted.

Table 9.2: Criteria for evaluating the magnitude of impact on water quality

Magnitude of impact	Description of change
Major	Major shift away from the baseline conditions, fundamental change to water quality condition either by a relatively high amount for a long-term period or by a very high amount for an episode such that watercourse ecology is greatly changed from the baseline situation. Equivalent to a change of two levels of waterbody ecological status for classification under WFD (2006/60/EC).
Moderate	A moderate shift from the baseline conditions that may be long-term or temporary. Results in a change in the ecological status of the watercourse.
Minor	Minor shift away from the baseline conditions. Changes in water quality are likely to be relatively small, or be of a minor temporary nature such that watercourse ecology is slightly affected. Equivalent to minor but measurable change within a class.
Negligible	Very slight change from the baseline conditions such that no discernible effect upon the watercourse ecology results. No change in classification.

9.4 Baseline Conditions

9.4.1 Scope of assessment

The scope of the assessment was established through consultation with SEPA, SNH and the Highland Council planning department.

Building on the tenet of earlier consultation SEPA indicated, in a letter dated 21 January 2010, that as a minimum, this ES should include:

- A description of any works which will have an impact on the water environment, including assessment of the impacts on water quality, quantity and morphology and to minimise these impacts at the planning stage
- A list of sensitive receptors within the water environment and the potential impact the proposed activities will have on them.
- Details of the technologies and techniques that will be used in carrying out the works.
- SEPA have recommended that, in addition, the following aspects are considered;
- How the water environment will be protected during times that collection and treatment systems are hydraulically loaded, with mitigation measures identified.
- Estimation of frequency of storm overflow discharges from both new and existing parts of the sewerage network.
- Demonstration that the proposed pumping arrangement/flow philosophy is best practice and will not result in more frequent or larger spills from storm overflows than currently licensed.
- Consideration of how the water environment will be protected during emergency discharges, including identification of all existing emergency overflow points on the new and existing collection systems, with assessment of how the new flow philosophy will influence the operation of these. Where more frequent or larger spills from emergency overflows than currently licensed are predicted, remedial action planned to minimise the effect on spill frequency and magnitude should be detailed.
- Consideration of how the new works will be commissioned so as to minimise the need to discharge poor quality effluents to the Moray Firth. If the two works will be run simultaneously during commissioning, it would be advisable to consider how impact on the operation of the existing works will be minimised.

In addition, joint statements by SEPA and SNH have specified their desire that the quality of the discharge should meet Recreational (formerly Bathing) Water Standards, adopting the precautionary principle to mitigate for impact on any sensitive receptors (in this case the qualifying feature of the Moray Firth SAC, bottlenose dolphins).

With the proposed WwTW process, as is described in this chapter, the proposed development will provide significant improvement to the bacteriological water quality of the Moray Firth.

This Environmental Statement does not consider network issues and emergency discharges. The proposed expansion of the WwTW capacity is required to serve foul water only from new residential, commercial and industrial developments constructed with SuDS arrangements. Foul arisings from these developments will be conducted to the WwTW through new pipelines which are separate from the existing network. There will be no change to the flows in the existing network nor will the operation of its infrastructure change. Being for foul water only, the new inlet systems to the WwTW will not be affected by storms. As there is no change to the current network system, no impact to the environment relative to the baseline conditions is expected in this regard.

Details of the controls for inflows are presented in Scottish Water's Ardersier WwTW Process Control Philosophy document included as Technical Appendix A in Volume 3 of this Environmental Statement and in the CAR licence application.

Any issues with the existing network will be considered separately by Scottish Water and SEPA through the appropriate regulatory processes. The scope of this chapter of the EIA is to consider the impacts from construction and from changes in chemical composition and flow volumes of the effluent from the new Ardersier WwTW as compared to the baseline of the existing WwTW.

9.4.2 Sensitive receptors

Sensitive receptors associated with potential for impact on the aquatic or marine environment are identified below in Table 9.3.

Table 9.3: Receptors sensitive to impact on hydrology and water quality

Sensitive receptor	Protecting Legislation	Nature of risk of impact
Bottlenose dolphins (*Tursiops truncatus*)	Qualifying feature of the Moray Firth SAC (European Habitats Directive 92/43/EEC)	Marine – Water Quality
Watersports enthusiasts (kite surfing)	Bathing Waters Directive Water Environment (Controlled Activities) (Scotland) Regulations 2004	Marine – Water Quality
Beach users (Rosemarkie and Nairn Bathing Waters)	Bathing Waters Directive	Marine – Water Quality

9.4.3 Flood risk

A desk-based scoping assessment for risk of coastal flooding was completed in June 2008. The development is located adjacent to, but not within, the indicative 0.5% annual exceedance probability (AEP) coastal floodplain, as shown on the Indicative River & Coastal Flood Map produced by SEPA.

An extreme water level for the site was calculated using the methodology outlined in "Estimates of extreme sea conditions – spatial analysis for the UK coast" Dixon & Tawn (1997).

- A level of 2.96m OD was calculated for the 1-year return period water level at Fort George, the nearest tide gauge record.
- The 0.4% AEP (1 in 250 year return period) still water level was calculated at 3.87m OD.
- Predicted sea level rise from the UKCIP02 and IPCC 4th Assessment studies were considered. The increase by the 2050's is expected to be about 0.15m, but could be up to 0.36m. An allowance of 0.23m has therefore been included for future sea level rise over the design life of the scheme.
- A nominal freeboard allowance of 0.6m has also been included to give a final level of 4.7m OD.

It is proposed to raise the general ground level of the site to 4.7m OD to mitigate flood risk.

The level of 4.7m AOD was confirmed as appropriate by SEPA on 4 July 2008. SEPA would not object the undertaking of groundworks to elevate the site, as the area to be raised is outwith the functional floodplain.

9.4.4 Drainage

SEPA has advised that all surface water for the development is to be dealt with via SuDS, with the exception of areas considered to be at high risk of sewage spillage. Best practice should be followed in incorporating SuDS into the scheme design. Drainage from high risk areas will be transferred to the WwTW inlet.

The ground investigation indicates sand and gravel underlying the site and therefore suitable for infiltration drainage as a means of source control.

9.4.5 Hydrology of the Catchment

The only water body in the vicinity of the development site is the Moray Firth. The site is located on the shore of the Inverness or Inner Moray Firth, southeast of the Chanonry narrows. The final effluent from the existing treatment works is discharged into the Outer Moray Firth to the north of Fort George, via an outfall pipe at National Grid Reference NH 7650 5710.

As discussed in Chapter 7.4.2, the ground beneath the site is highly permeable, and there are no watercourses marked on OS 1:25k maps. Rainfall within the catchment is likely to infiltrate into the underlying perched groundwater. However it should be noted the catchment area is small, less than 0.25km².

The proposed development is not expected to have any impact on hydrological flows within the catchment. Therefore no hydrological studies have been completed as part of this assessment.

No culverting of watercourses or abstraction is required as part of the proposed development.

9.4.6 Groundwater

There is likely to be a limited flow of groundwater from the higher ground to the east of the site towards the firth. Groundwater depths taken during three rounds of monitoring were used to enable the direction of groundwater flow to be assessed. However, the results show that the majority of groundwater on the site would appear to be perched on top of the clay strata and for this reason it is not possible to clearly define the direction of flow.

An isolated elevated concentration of Benzo(a)pyrene was detected in the soil leachate from the existing bund, however this is not considered to be representative of the site as a whole. As part of the groundwater sampling, elevated levels of Copper, Zinc and TPH band (Aromatic C12-C16) in the groundwater were detected in boreholes BH04 and BH01. The concentrations of these contaminants detected are not considered to exist at concentrations which would pose a risk to the environment. However, elevated levels of ammoniacal nitrogen were detected in groundwater and leachate samples from a number of locations around the site. Chapter 7 contains details of investigation into contamination risk, including results of groundwater sampling.

9.4.7 Water Quality

SEPA has classified the transitional waters (SEPA Waterbody ID 200440) and the coastal waters (ID 200171) of the Moray Firth as High status with high confidence. This includes the specific classification of water quality as High status.

9.4.7.1 Licence conditions

The discharge is licensed under the Water Environment (Controlled Activities) (Scotland) Regulations, 2005 (CAR) through licence number CAR/L/1001681.

The discharge quality and flow conditions attached to the CAR licence are based on a design Population Equivalent of 3000. Discharge quality standards stated in the licence are that any instantaneous sample of treated sewage shall:

a. Contain no more than 50 milligrams per litre of biochemical oxygen demand (except where exceptions for exceeding this apply, in which case condition b) shall be met)

b. Contain no more than 100 milligrams per litre of biochemical oxygen demand

c. Contain no more than 100 milligrams per litre of suspended solids

d. Have a pH within the range of 6.0 to 8.0

9.4.7.2 Licence compliance

Samples of effluent are collected and analysed by SEPA roughly every three months to demonstrate compliance with the licence conditions. Results for samples taken between 2001 and 2007 have been obtained which demonstrate that the existing works operates effectively. The results, with the exception of those for a single sample showed:

- biochemical oxygen demand (BOD) concentrations between 1 mg/l and 10 mg/l (mean 3.0 mg/l)
- suspended solids (SS) concentrations between 3 mg/l and 40 mg/l (mean 12.2 mg/l)
- pH between 6 and 8 (non-dimensional units) (mean 7.2).

A single sample of final effluent taken on 19 August 2004 gave high results for BOD and SS, considerably in excess of the consent limits. Results from this sample have been excluded from the mean values quoted above.

9.4.7.3 Bacteriological water quality

In addition to the water quality parameters regulated by the CAR licence, it is pertinent to consider the bacteriological quality of the effluent and its receiving water on account of the presence of designated Bathing Waters and of the presence of bottlenose dolphins.

There are potentially a large range of human pathogens in sewage. An indication of the concentration of all pathogens is generally provided by measures of total coliforms, faecal coliforms, faecal streptococci or by measurement of the species *Escherichia coli*.

Baseline data for the bacterial water quality of the Moray Firth is available from monitoring of the designated Bathing Waters at Rosemarkie (<3km from the Ardersier WwTW discharge), at Nairn (Central) and at Nairn (East). The two Nairn beaches are more than 6km from the Ardersier effluent discharge.

Figures published by SEPA for Rosemarkie Beach show that all samples taken since its designation pass the Mandatory Recreational Water standards for total coliforms (<10,000 Colonies/100ml), faecal coliforms (<2,000 Colonies/100ml). Data for 2009 show that 75% of samples also passed the aspirational Guideline quality standards for total coliforms (<500 Colonies/100ml), faecal coliforms (<100 Colonies/100ml) and faecal streptococci (<100 Colonies/100ml).

Data from 2009 for both of the Nairn beaches show at least 75% of samples pass the Guideline standard. However, records over the past 20 years show some samples failing the Mandatory standard. This has been linked to a combination of discharges from Nairn WwTW and runoff from agricultural land along the River Nairn.

The water at all three designated beaches is influenced by discharges from WwTWs. In the case of Nairn the discharge is located off-shore of the East beach; at Rosemarkie the outfall is approximately 1.5 km SSE of the beach.

Bacteria entering the Firth through either direct discharges or from rivers decay through action of sunlight and due to saline intolerance. Concentrations are also reduced through dispersal.

A dispersion study for the Rosemarkie discharge was undertaken by Anderson Marine Surveys for Scottish Water in 2005. The study predicted that the Mandatory standard for Recreational Waters would be achieved within 70m of the outfall for secondary treated effluent. Guideline water standards would be met within 0.75 – 2km of the outfall.

The existing Ardersier WwTW, located on the opposite side of the Moray Firth, treats a similar size population to the Rosemarkie WwTW and currently provides secondary treatment. Dispersion modelling has not been undertaken for Ardersier and there is no data available on the quality of water in the Moray Firth around the outfall from the Ardersier WwTW. The dispersion study report for Rosemarkie noted the dependence of the results on several factors including the depth of the discharge, the flow of the effluent and the tidal currents around the zone of influence.

Whereas the discharge and dispersion conditions are not identical for Rosemarkie and Ardersier, the conclusions from the Rosemarkie study may provide an illustrative indication of the influence of the Ardersier WwTW discharge on the baseline bacterial water quality.

9.4.7.4 Bacteriological load estimation

An estimate of the bacterial load from the existing Ardersier WwTW was undertaken using the following method:

1. A typical faecal coliform concentration of crude sewage was determined from literature. In this case a value of 3.0 x 10^7 faecal coliform units (FCU) per 100ml was used[2].

2. Typical reduction factors (expressed as logarithm) of faecal coliforms for the various process units at the existing Ardersier WwTW were used to gauge the reduction through the WwTW.

3. The reduction factors were used to determine the faecal coliform concentration in the final effluent stream.

4. Average flows for the existing PE were sourced and then used to determine the faecal coliform load from the WwTW by multiplication of flows by the final effluent concentration established in step 3.

The results of the load estimation are presented in Table 9.4 below.

Table 9.4: Estimated bacteriological load of existing WwTW at Ardersier

	Faecal Coliform Concentration in Crude Sewage (FCU/100ml)	Log Faecal Coliform Reduction in WwTW	Faecal Coliform Concentration in Final Effluent (FCU/100ml)	Average Flow (m^3/day)	Faecal Coliform Load in Final Effluent (FCU/day)
Existing WwTW (1,851 PE)	3.0 x 10^7	1.6	8.3 x 10^5	650	5.4 x 10^{12}
Existing WwTW (3,000 PE)	3.0 x 10^7	1.6	8.3 x 10^5	735	6.1 x 10^{12}

Source: 1: Reviews of Virus and Bacterial Removals in Waterwater Treatment Systems. Derrick Gould, South West Water
2: Wastewater Engineering; Treatment, Disposal and Reuse. Metcalfe and Eddy, 3rd Edition, 1991

Records show that the position of the outfall does not reach MLWS, therefore the initial dilution of effluent does not achieve 1:50 dilutions.

9.5 Identification of Environmental Effects

9.5.1 Flood risk

The current ground level on the site rises from is 3.5m OD on the seaward side to 4.7m OD closer to the B9006. A final ground level for the new wastewater treatment site of 4.7m OD or greater is proposed. Raising ground levels on a coastal site will not adversely affect flood risk elsewhere.

9.5.2 Drainage

The drainage system for the WwTW was designed to minimise the potential for impacts from surface water contamination on groundwater quality. The design is in accordance with advice provided by SEPA in a letter dated the 8 December 2008 and prior consultation.

[2] Reviews of Virus and Bacterial Removals in Waterwater Treatment Systems. Derrick Gould, South West Water

9.5.2.1 Low Risk Areas

For low risk roads and parking bays, two treatment trains are proposed. The low risk roads and parking bays will have a cross-fall that directs surface water towards flush kerbs, over a gently sloping vegetative strip (1st treatment train) and into an infiltration trench.

In some instances, it was not possible to provide a minimum 6m wide vegetative strip as recommended in the CIRIA 697 SUDS manual. In these cases, surface water will be collected either by kerb drains or directly from the verge and conveyed by dry swales (lined to prevent infiltration) to the infiltration trenches.

The percolation of surface water through the infiltration trenches and subsequent infiltration in to the ground provides the 2nd treatment train.

Infiltration trenches have been located a minimum distance of 5m from foundations. The base of any trench will be 1m or more above the highest seasonal groundwater table level.

Percolation tests carried out were inconclusive due to the very high infiltration rates in the test pits which could not be easily measured, therefore an infiltration coefficient of 500 mm/hr was assumed to design the infiltration trenches for the 1:30 yr storm in accordance with CIRIA Report 156.

9.5.2.2 High Risk Areas

The two tanker loading bays and the area planned for screen and grit removal were classed as high risk areas due to the risk of sewage spillage. These areas are numbered 29 and 30 respectively on the site layout drawing.

The road cross-fall and solid kerbs in the high risk areas will direct surface water to road gullies. Sealed pipes from the gullies will return the surface water to the head of the works for treatment.

9.5.3 Water Quality: Construction Stage

Potential impacts on the water quality are likely to be of most significance during the construction period. The significance of the potential impact will be closely dependent on the specific method used to carry out the construction works. The conditions of work will be addressed in the Contractor's EMP and Method Statements. According to the estimated impacts, appropriate environmental protection measures will be employed during the construction phase to eliminate the significance of potential impacts

Potential effects on the surface and groundwater bodies during the construction phase can be summarised as follows:

Table 9.5: Potential Impacts of the Construction Phase

Issues	Source of Impact	Potential Impact
Surface water quality	Soil stripping and excavation, removal and storage, change in land cover, site surface water runoff, movement of traffic and plants, accident spillage of chemicals, fuels, oils, concrete and other building materials, inappropriate storage of material, release of contaminated soil	■ Change in quality, chemical / organic/ microbial pollution. Increase in sediment and suspended solids runoff to the sea ■ Release of contaminated soil and

Issues	Source of Impact	Potential Impact
		consequently contamination of groundwater bodies and the sea. ■ Solid waste from the construction site
Surface Water Quality: Surface water hydrology / hydraulics / channel morphology / sediments	Soil excavation, removal and storage,	■ Uncontrolled sediment erosion and contaminated silty runoff; ■ Increase in the build-up of sediment deposit along the shoreline; ■ Interception of existing drainage pathways
Groundwater Quantity: Groundwater Hydraulics	Excavation and dewatering	■ Change in flow and/or direction, change in water table level.
Groundwater quality	Construction below the water table Storage of construction material Pumping Disturbance of contaminated land	■ The risk of releasing pollutants (chemical, organic, microbial) into the groundwater reservoirs, possibility of saline water intrusion due to temporary pumping.
Local Drainage system	Excavation and foundation work	■ Interruption of the surface runoff patterns ■ Physical impact of the foundation work on the drainage system network

9.5.4 Water Quality: Operational Stage

The proposed WwTW has been designed to treat sewage from a larger population, up to 8,831 PE. The potential for impact on surface water quality is considered in terms of the impact of the final effluent on water quality in the Moray Firth.

The sizing of the individual process units and the residence times of material in the processes will result in greater degradation of organic material and increased settlement of solids. In addition, ultra violet disinfection will be provided as tertiary treatment to further reduce the bacterial load of the final effluent.

9.5.4.1 Biological Oxygen Demand and Suspended Solids

The concentration of both biological oxygen demand and suspended solids in the final effluent is therefore expected to be lower than in the effluent from the existing WwTW. The CAR licence for the WwTW is consequently anticipated to be amended to stipulate tighter quality standard conditions for BOD and SS.

Although the concentration of BOD and SS in the final effluent will decrease compared to the existing effluent, the population equivalent being treated will increase from the current level of 1,915 to the design capacity of the new WwTW (8,831 PE).

Consequently, although there will be an immediate drop in the total load of BOD and SS from the WwTW to the Moray Firth, the load will increase over time, and at some point will exceed the load from the existing WwTW.

It should be noted that any future further expansion of Ardersier WwTW will include a review and possible extension of the WwTW outfall.

9.5.4.2 Bacterial water quality

In order to determine the net change in bacterial discharge to the Moray Firth the load estimation method used for the existing WwTW (see Section 9.4.7.4) was repeated for the new WwTW process.

The estimation incorporated the following input assumptions:

- the faecal load in crude sewage was unchanged from the figure used previously,
- the faecal coliform reduction through the works up to the UV disinfection process was estimated to increase slightly on account of the improved treatment,
- an additional faecal coliform reduction factor was applied for the UV process,
- the average daily flow was increased according to estimates made in the design of the new WwTW.

The efficiency of the UV disinfection unit is a key factor in estimating the bacterial load of the Moray Firth.

The UV unit is the final treatment at the works before the effluent is pumped to the discharge. The efficiency of the UV unit in killing bacteria is primarily dependant on the clarity of the effluent arising from the final settlement tank, upstream in the WwTW. Suspended solids in the effluent stream passing through the UV unit cause shadowing and thereby reduces the performance of the unit.

The UV plant manufacturer quotes a bacterial kill rate of four log factors for final effluents with suspended solids concentrations below 15 mg/l. Suspended solids concentration is not the only factor influencing UV disinfection efficiency and a straightforward empirical correlation is not available.

Final effluent samples from the existing WwTW were found to have suspended solids concentrations ranging 3 – 40 mg/l with a mean value of 12.2 mg/l. On this basis, the UV efficiency for average suspended solids concentrations would be expected to produce the four log unit reduction in faecal coliform concentration, as per the manufacturer's figures. The new WwTW is designed to produce a final effluent with lower suspended solids concentrations than the existing works, increasing the likelihood of reaching the higher end of the UV efficiency.

Due to the range of UV efficiencies anticipated from a variable effluent, bacterial loads to the Moray Firth have been estimated based on two values for UV efficiency to represent the optimal and worst cases to be expected.

The results of the bacterial load estimation are shown in Table 9.6.

Table 9.6: Bacteriological load of existing and new WwTW

Table Heading Left	Faecal Coliform Concentration in Crude Sewage (FCU/100ml)	Log Faecal Coliform Reduction in WwTW prior to the UV unit	Log Faecal Coliform Reduction in UV unit	Faecal Coliform Concentration in Final Effluent (FCU/100ml)	Average Flow (m^3/day)	Faecal Coliform Load in Final Effluent (FCU/day)
Existing WwTW (1,851 PE)	3.0×10^7	1.6	n/a	8.3×10^5	650	5.4×10^{12}
New WwTW (without UV)	3.0×10^7	1.8	n/a	4.8×10^5	1781	8.5×10^{12}
New WwTW (upper value)	3.0×10^7	1.8	2	4.8×10^3	1781	8.5×10^{10}
New WwTW (lower value)	3.0×10^7	1.8	4	48	1781	8.5×10^8

Source: 1: Reviews of Virus and Bacterial Removals in Wastewater Treatment Systems. Derrick Gould, South West Water
2: Wastewater Engineering; Treatment, Disposal and Reuse. Metcalfe and Eddy, 3rd Edition, 1991

Without UV the load to the Moray Firth is estimated to increase relative to the existing load due to the higher effluent flows resulting from treating a larger PE.

The introduction of the UV disinfection process has a major impact on the bacterial load discharged from the WwTW to the Moray Firth, producing a reduction of between 50 – 10,000 fold compared to the existing WwTW depending on the kill factor applied. As indicated above, this range is likely to be dependant on the suspended solids concentration in the effluent.

The proposed UV arrangement is consistent with those in use at Allanfearn, Nairn and a number of other WwTW in the area discharging to the SAC and shellfish waters.

Primary receptor – Moray Firth

The bacterial load estimation indicates that the existing WwTW has an impact on the bacterial water quality of the Moray Firth in the immediate vicinity of the discharge outfall. The geographical extent over which the impact applies is not known although the Rosemarkie dispersal study may suggest that the impact extends to a distance of around 2km.

Secondary receptors

Key receptors affected by water quality are users of the designated Bathing Waters and the marine ecology of the Moray Firth.

Impacts on marine ecology are considered in Chapter 10 of the Environmental Statement.

Any impact on water quality at Rosemarkie or Nairn Bathing Water beaches would be a cumulative effect in tandem with the other treatment works discharging into the Moray Firth. No failures of the Mandatory standard have been recorded at Rosemarkie Beach – the closest of the designated bathing waters to the Ardersier outfall. Failures at the Nairn beaches are thought to be linked to historical issues with Nairn WwTW and with agricultural run-off and are unlikely to be due to impacts from Ardersier WwTW.

Impact of the existing WwTW on all three designated Bathing Waters is therefore considered to be negligible.

9.6 Assessment of Significant Environmental Effects

9.6.1 Flood Risk

SEPA has approved the proposals outlined in Section 9.5.1 and the design of the proposed development meets the required standards.

Risk of environmental impact from flooding as a result of the proposed scheme is therefore considered to be negligible.

9.6.2 Drainage

The potential for impact of surface water drainage on groundwater quality is considered to be low with the adoption of the proposed drainage plan, as described in Section 9.5.2.

9.6.3 Water Quality

9.6.3.1 Construction Stage

It is expected that general impact from construction on the Moray Firth and on groundwater will be low, provided best practice for construction is followed by the contractor.

9.6.3.2 Operational Stage

The impact assessment is based on consideration of the scale of the change, the sensitivity of the receiving waters, the extent over which the impact is expected to have influence and the timescale over which the impact would act.

Biological Oxygen Demand and Suspended Solids

The impact of the new WwTW on the physico-chemical water quality of the Moray Firth, as indicated by BOD and SS, is likely to be a small deterioration at the outfall by the time the WwTW is operating at full capacity. The impact will be localised and the significance is considered to be negligible.

Bacterial water quality

The final effluent from the proposed Ardersier WwTW discharges to the Moray Firth SAC, a site of international importance for the qualifying species (bottlenose dolphin) and habitat (submerged sandbanks) under the Habitats Directive. The bottlenose dolphin population represents the northern extremity of its extent, making this site particularly rare. This species is considered to be sensitive to water quality. The Moray Firth is also designated as a SPA, a Ramsar site and contains several constituent SSSIs. Further consideration of impacts on the features of these sites is provided in Chapter 10.

The sensitivity of the receiving waters is consequently considered to be Very High.

The longevity of the impact of the proposed development on water quality of the Moray Firth has been categorised as long term. The proposed development has been designed to accommodate committed development and predicted growth up to 2014. Further growth beyond 2014 could be accommodated by expansion of the WwTW. The current downturn in the global economy has resulted in reduced growth forecasts for the Inverness area and future expansion of the WwTW may not be required for a number of years beyond 2014. Any future expansion would be subject of separate planning applications during which the impacts of expansion on water quality would be addressed.

For the purposes of the current planning application the change in water quality is anticipated to be long term.

Scale of change

The bacterial load to the Moray Firth is predicted to decrease by a factor of between 50 and 10,000 as a result of the proposed development, with the higher end of this range anticipated for the majority of the time.

The concentration of suspended solids and BOD is predicted to decrease as a result of the proposed development. The total loading of suspended solids and BOD to the Moray Firth is predicted to decrease initially and then increase as more developments are connected to the WwTW. By the time the WwTW reaches its capacity there may be an increase to around 2 – 3 times the existing load.

The Moray Firth is separated into its transitional waters and its coastal waters for categorisation and classification by SEPA. Both waterbodies are currently classified as High Ecological Status, including High status for water quality criteria. The improved effluent water quality from the proposed development is therefore unable to result in a change of status.

Extent of impact

Once discharged, the effluent undergoes initial dilution as the effluent rises to the water surface and dispersal through the mixing action of currents and tides. Furthermore, the bacterial components of the effluent decay as a result of irradiation by the sun and from saline intolerance.

The change in effluent quality will be most significant at the point of discharge but the extent over which the impact on water quality will be noticeable in the wider Moray Firth is not known. The dispersion study for the Rosemarkie WwTW discharge suggests that the extent would be limited to a radius of 2 km from the outfall. This is the upper end of the range by which the Guideline bathing water standard would be met from a discharge at the Rosemarkie outfall assuming secondary treatment with no disinfection. Although, the dispersion dynamics may be different for the Ardersier discharge, it will receive tertiary treatment and the 2 km is realistically likely to be highly conservative.

By area this is a relatively minor proportion of the Moray Firth. However, it is noted that the outfall is close to the Chanonry Narrows which is a site known to be frequently visited by bottlenose dolphins. The magnitude of impact has consequently been determined separately for the local impact and the impact on the wider Moray Firth.

The magnitude of the impact on water quality is therefore categorised as:

- Local: Positive – Moderate
- Wider Moray Firth: Negligible

Significance of impacts

The impact of the development on each water feature has been allocated a level of significance in accordance with the criteria shown in Table 9.7.

Table 9.7: Criteria for estimating the significance of potential impacts on the water environment

Magnitude	Low Sensitivity	Medium Sensitivity	High Sensitivity	Very High Sensitivity
Negligible	Insignificant	Insignificant	Insignificant	Low Significance
Minor	Insignificant	Insignificant	Low Significance	Significant
Moderate	Insignificant	Low Significance	Significant	Highly Significant
Major	Low Significance	Significant	Highly Significant	Very Significant

The significance of the impact on local water quality and on the water quality of the wider Moray Firth have been determined from this table.

- Local: Positive – Highly Significant
- Wider Moray Firth: Positive – Low Significance

9.7 Mitigation

9.7.1 Flood risk

Ground level of the new works will be at or above 4.7m OD. No further flood alleviation is required.

9.7.2 Drainage

SEPA has responded positively to earlier draft proposals to drain the high risk areas (tanker loading area and skip area used for collecting inlet screenings) to the foul sewer. SEPA are also satisfied for the remaining low risk areas (roads, hardstandings and roof drainage) to drain to some form of infiltration drainage. Subsequent to this correspondence the proposed layout of the WwTW process units has been amended. The approach to drainage design was maintained in the revised layout. Although no confirmation has been received from SEPA it is anticipated that the revised plans are appropriate.

No further mitigation is required.

9.7.3 Water Quality: Construction Stage

To mitigate for risk of contamination of water during construction, all construction activities should be planned with due regard to the relevant PPGs, particularly PPG 5 (SEPA Pollution Prevention Guidelines: Work and maintenance in or near water, 2007) and CIRIA report number C532 (Control of water pollution

from construction sites: Guidance for consultants and contractors). In practice this will mean that all site water is settled prior to discharge and all temporary fuel and chemical stores are bunded and fenced.

There is a risk that during construction contaminants such as silt, concrete or fuel oil could contaminate the groundwater. To reduce this risk, all construction activities should be planned with due regard to the guidance documents listed above.

As discussed in Chapter 7, it is recommended that if any material from the vicinity of TP11 and BH04 is to be disposed of off-site, it will be classed as hazardous waste and will require Waste Acceptance Criteria testing to determine its suitability for landfill. If the materials are to be re-used across the site however, they would only be suitable for use beneath hardstanding and above the groundwater table given the presence of elevated ecotoxic contaminants. Material excavated from the existing bund (TP06) is also only suitable for re-use in this way.

9.7.4 Surface Water

Further mitigation measures for the improvement of effluent quality are not expected to have a significant bearing on the result of the impacts assessment.

SNH has advised that the effluent quality should meet recreational water standards at the end of pipe to minimise impacts to bottlenose dolphins. Estimates for the proposed Ardersier WwTW made in this chapter suggest that the new WwTW is likely to meet the Mandatory recreational water bacterial standard for Faecal Coliforms. However, achievement of the bacteriological standard is exceptionally difficult to guarantee.

9.8 Residual Effects

With the implementation of the mitigation measures described in the previous section, residual negative impacts on surface waters are predicted to be insignificant.

The risk of sediments reaching the Moray Firth due to surface runoff from the construction site cannot be fully eliminated. However the risk is considered to be low due to the distance between the site and the edge of the water. The risk will be reduced to insignificant level by the incorporation of appropriate pollution control measures and implementation of ‘good practice’ in construction sites.

9.9 Summary of Environmental Effects

Table 9.8: Hydrology and Water Quality Impact Assessment Summary

Hazard	Receptor	Pathway	Impact	Mitigation	Residual Impact
Risk of flooding of site causing pollution incidents	Local waterways	Flood water or poorly designed drainage	Medium impact Local (regional) Long term	Raise ground above 4.7m OD. Incorporate the appropriate level of SuDS in design.	Insignificant
Damage to property of infrastructure from flood displacement	Local buildings	Flood water	Medium impact Local (regional)	Raise ground above 4.7m OD	Insignificant

Hazard	Receptor	Pathway	Impact	Mitigation	Residual Impact
			Long term		
Mobilisation of silt and/or spills of oils or concrete washings etc	Groundwater Inner Moray Firth	Dissipation or run-off of contaminants	Low impact Local Long term	Adopt standard best practice construction measures	Low significance
Risk of mobilisation of contaminants in soils	Groundwater and sea	Disturbance of contamination	Low to Medium impact Local (regional) Long term	Validation testing of material excavated from identified areas	Low significance
Risk of deterioration of water quality in the discharge receiving waters	Moray Firth	Effluent discharge	Medium Impact Local (regional) Long term	Tertiary treatment of effluent	Highly significant local improvement Low significance regional improvement

10. Ecology and Nature Conservation

10.1 Introduction

This section describes the methodology and results of the assessment undertaken to inform the ES about the potential effects of the Waste water Treatment Works on the ecology and nature conservation features occurring within the Zone of Influence (ZoI) of the development.

This chapter contains baseline condition assessments of the ecological features at risk of impact from the proposed scheme, and outlines mitigation measures necessary to reduce the potential impact of the development on designated sites, habitats and protected and notable species (the ecological features).

The objectives of the assessment are to:

- Identify designated sites and habitats within and adjacent to the area of proposed works;
- Undertake ecological surveys for habitats and protected and notable species which may be on, near and/or adjacent to the site and assess their ecological importance, and;
- Assess the potential impact of the proposed development on the ecological features and provide mitigation and compensation measures.

10.2 Legislative Framework

10.2.1 European Legislation and International Conventions

The construction and operational activities for the development should comply with international, European and UK legislation. The following EC Directives and international conventions are relevant to the ecological assessment:

- Bern Convention on the Conservation of European Wildlife and Natural Habitats (1979)
- Convention on Biological Diversity 1992
- EC Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive 1992) as amended (92/43/EEC)
- EC Directive on the Conservation of Wild Birds (Birds Directive 1979) as amended (79/409/EEC)
- Ramsar Convention on Wetlands 1971

10.2.2 National Legislation

Linked to the EU Birds and Habitats Directives, the Important Bird Area (IBA) Programme of BirdLife International aims to identify, monitor and protect a global network of IBAs for the conservation of the world's birds and other biodiversity.

IBAs are sites particularly important for bird conservation because they regularly hold significant population of one or more globally or regionally threatened, endemic or congregatory bird species or highly representative bird assemblages[3]. In the European Union IBAs have been widely used as reference for the designation of Natura 2000 sites under the EU Birds Directive.

A key piece of UK legislation is the Wildlife and Countryside Act (WCA) 1981 (as amended) which consolidates and amends existing national legislation to implement the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and Council Directive 79/409/EEC on the Conservation of Wild Birds (Birds Directive) in Great Britain. Within Scotland, the WCA 1981 is amended by the Nature Conservation (Scotland) Act 2004. Thus, it is now an offence to recklessly carry out actions such as killing, injuring or taking any wild animal listed on Schedule 5 of the WCA 1981.

The Conservation (Natural Habitats, & c.) (Scotland) Regulations 1994 and amendments transpose the Habitats Directive into national law. The Regulations provide for the designation and protection of 'European sites', and the protection of European Protected Species (EPS), such as great crested newts (*Triturus cristatus*) and otters (*Lutra lutra*). Under these Regulations, it is an offence to deliberately or recklessly harass, capture, injure or kill a EPS, obstruct or deny access to a place, structure or site used for breeding or resting or disturb in such a way so as to affect ability to survive, reproduce, rear or care for young.

Other relevant pieces of UK legislation include:

- Hedgerow Regulations 1997
- The Protection of Badgers Act 1992
- The Wild Mammals (Protection) Act 1996

Legislation and policies specific to individual species are provided in Table 10.1

Table 10.1: Legislation and policies specific to individual species

Species	Legal Protection
Marine mammals	Habitats Directive (Annex II: bottlenose dolphin, harbour porpoise, grey seal, harbour seal, Annex IV: all cetaceans, Annex V: all Phocidae not mentioned on Annex IV), Water Framework Directive, Bern Convention (Annex II: harbour porpoise, common dolphin, bottlenose dolphin, and Annex III: all species not on Annex II and includes grey seal and harbour seal) Conservation (Natural Habitats, & c.) (Scotland) Regulations 1994 (and amendments), UKBAP (bottlenose dolphin), LBAP (grey seal, harbour seal, porpoise and bottlenose dolphin)
Badgers (*Meles meles*)	Bern Convention (Annex III) Nature Conservation Act (Scotland) 2004, Protection of Badgers Act 1992, UKBAP and LBAP species
Bats (all species)	Habitats Directive (Annex IV all species), Bern Convention (Annex II: all species excluding common pipistrelle, Annex III: common pipistrelle), Conservation (Natural Habitats, & c.) Regulations 1994 and amendments, UKBAP (all pipistrelles) and LBAP (Daubenton's, Natterer's, brown long-eared and common and soprano pipistrelles).
Birds	Birds Directive (Annex I), Bern Convention (Annex All breeding birds are protected by the WCA 1981, Schedule I species are afforded additional protection from the WCA 1981 and Annex I

[3] http://www.birdlife.org/eu/EU_policy/Birds_Habitats_Directives/index.html

Species	Legal Protection
	species are afforded protection from the Birds Directive.
Otter (*Lutra lutra*)	Habitats Directive (Annex II and IV), Bern Convention (Annex II), protected by Conservation (Natural Habitats, & c.) Regulations 1994 and amendments, UKBAP and LBAP species
Red squirrel (*Sciurus vulgaris*)	Bern Convention (Annex III), Wildlife and Countryside Act 1981 (as amended), UKBAP and LBAP species
Water vole (*Arvicola terrestris*)	Partially protected under Wildlife and Countryside Act 1981 (as amended), UKBAP and LBAP species
Reptiles	Bern Convention (Annex III: all species not mentioned on Annex II), WCA 1981 (Schedule 5: adder, common lizard and slow worm (in respect of section 9(5) only), LBAP (adder, common lizard and slow worm)
Great crested newt (*Triturus cristatus*)	Habitats Directive (Annex II and IV), Bern Convention (Annex II), Conservation (Natural Habitats, & c.) Regulations 1994 and amendments, UKBAP and LBAP
Fish	Habitats Directive (Annex II: brook, sea and river lamprey, Atlantic salmon, Annex V: river lamprey and Atlantic salmon), Bern Convention (Annex III: Atlantic salmon), Freshwater Fisheries Directive, Water Framework Directive, Conservation (Natural Habitats, & c.) Regulations 1994 as amended, UKBAP and LBAP (Atlantic salmon, sea/brown trout, eel and lamprey are UKBAP and LBAP species)

10.2.3 National Policy and Guidance

Additional policies and guidance provide guidelines on ecology and nature conservation assessments. Those relevant to this study include but are not limited to:

- NPPG 14: Natural Heritage
- PAN 60: Planning for Natural Heritage
- Scottish Biodiversity List
- Towards a strategy for Scotland's Biodiversity: Biodiversity Matters
- UK Biodiversity Action Plan (BAP)

PAN 60 provides guidance on *Planning for Natural Heritage* and sets out the national approach to good practice in planning to ensure the protection of Scotland's biodiversity and natural heritage. PAN 60 clearly states that a development should be sustainable, encourage enhancement and have minimal impact on biodiversity.

The UK BAP is the UK Government's response to the Convention on Biological Diversity (CBD), signed in 1992. This represents a description of the UK's biological resources and includes 1150 species and 65 habitats, listed as priorities for conservation action.

10.2.4 Local Policy and Biodiversity Action Plans

Key local policies with influence on ecology and nature conservation assessments are:

- Highland Structure Plan

- Inverness Local Development Plan

In 2004 the Highland Council produced a Local Biodiversity Action Plan (LBAP) for Inverness and Nairn, which outlines biodiversity objectives to be achieved between 2009 and 2014.

10.3 Assessment Methodology

10.3.1 General approach

The assessment of impact on ecology and nature conservation features was undertaken in a series of stages;

- A baseline desk study
- Consultation with statutory consultees and a stakeholder workshop
- A habitat and protected species survey

For the purposes of the ecological impact assessment (EcIA), potential impacts from the proposed development are separated into two categories;

- Impacts during the construction phase including pre-construction works and site preparation, on environmental features surrounding the existing WwTW.
- Impacts during the operational phase, from the discharge into the Moray Firth.

The construction and operation of flood defence structures can have impacts on ecological features beyond the confines of the site itself. All ecological features which occur within the ZoI and which have the potential to be affected by the proposed development during its lifespan should be investigated (IEEM, 2006).

The ZoI is defined as:

- The areas directly within the land take for the proposed development and access
- The areas which will be temporarily affected during construction
- The areas where there is risk of impact on water quality from the WwTW discharge
- The areas where there is a risk of pollution and noise disturbance during construction or operation

10.3.2 Desk-based Study

A desk study was undertaken to identify potential ecological issues relating to the proposed works at Ardersier.

As part of the assessment process, an environmental constraints map was produced to represent the key environmental areas surrounding the Ardersier WwTW site (see Figures 4.2 and 4.3). In addition, a map

showing environmental features of note in the area of the proposed works was produced by SNH (see Figure 10.1).

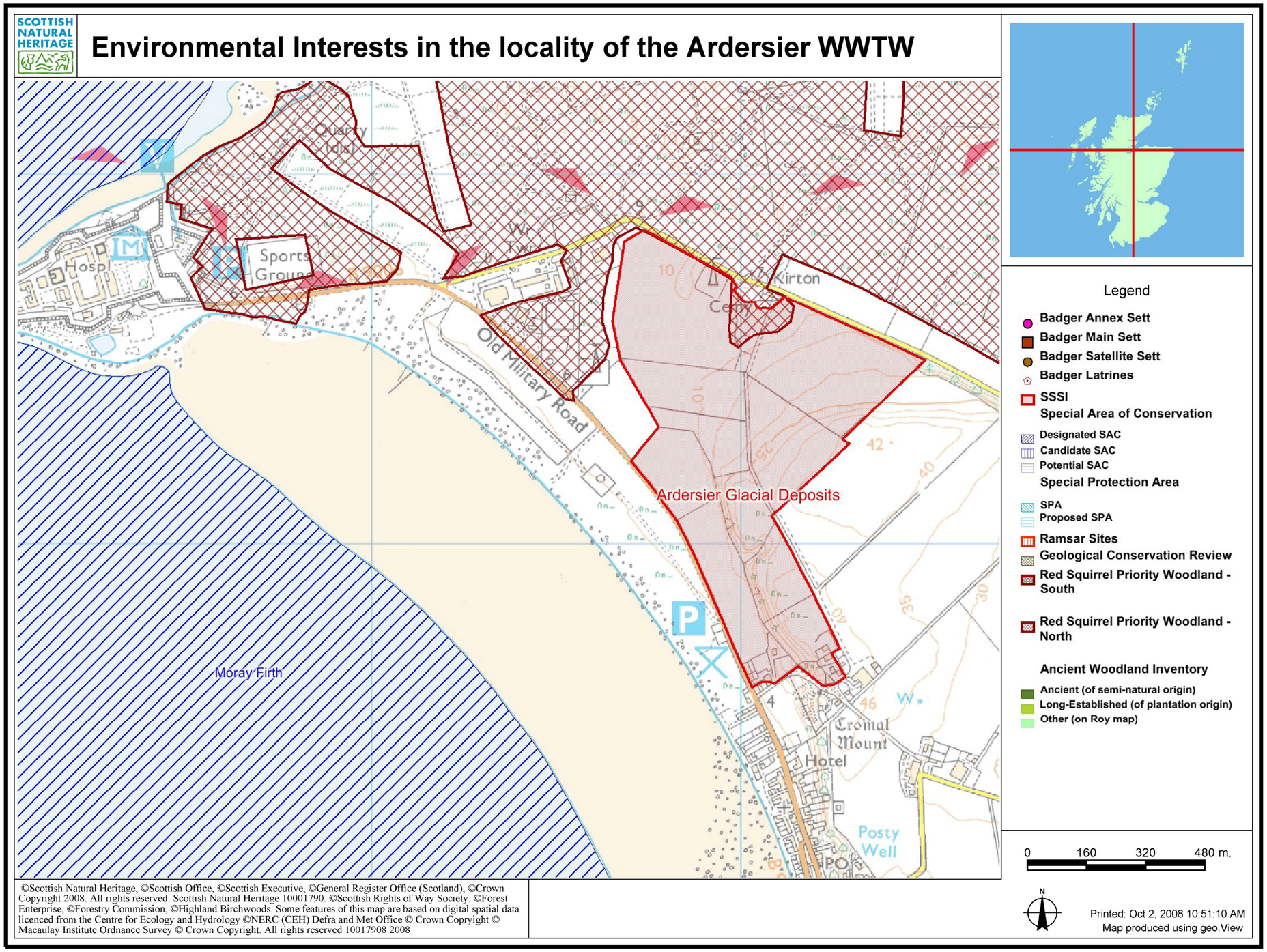
A review of data records of protected and notable species and their habitats occurring within 3 km of the edge of the proposed works was undertaken, identifying all designated sites in the vicinity of the proposed works. Information was obtained by searching available publications, reports and online databases (Multi Agency Geographic Information for the Countryside (MAGIC), 2008; National Biodiversity Network (NBN), 2008; Scottish Natural Heritage, (SNH) 2008; and Joint Nature Conservancy Council (JNCC), 2008).

10.3.3 Habitat and Protected Species Survey

Methods for surveys undertaken for the following are provided in Technical Appendix G within Volume 3 of the Environmental Statement, along with their results:

- Habitats and Botanical Species
- Badgers
- Bats
- Otters

Figure 10.1: SNH Environmental Constraints Map



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10.3.4 Assessing Conservation Value and Impact

The method used for this assessment is described below. It combines a modified approach to the online Transport Analysis Guidance (WebTAG) assessments (applicable in a wider context than transportation schemes) and IEEM guidance (IEEM, 2006). The criteria for evaluating ecological resources and describing impacts to resources is based on WebTAG.

IEEM (2006) guidelines suggest setting a threshold level of importance for ecological resources, based on a geographical frame of reference, above which any impacts are considered to be significant, and below which they are considered not significant. For example impacts could be considered significant if they affect internationally designated sites (of very high value), but would not be significant for a habitat of less than local (negligible) value for nature conservation. The IEEM guidance relies on professional judgment for determining conservation importance/value. An outline of the significance thresholds for this assessment is given in Table 10.7.

Ecological features identified during surveys and regarded as being of conservation importance and/or sensitive to the impacts of the development are referred to as Valued Ecological Resources (VERs).

The conservation importance of each VER is assessed by defining conservation value at different levels of importance (Table 10.1). For instance, a specific habitat or species at a site may not be important at the international level, but could be of high importance at the regional level.

In addition to the conservation importance, it is necessary to assess the conservation status of the VER by considering long-term trends in population health. The conservation status of habitats and designated sites is based on favourable or unfavourable condition and the integrity of the site (Table 10.2).

Table 10.2: Criteria for Determining the Conservation Value and Level of Importance of Ecological Resources

Conservation value	Criteria	Level of importance	Criteria
Very high	High importance and rarity and limited potential for substitution.	International	Internationally designated sites (SPAs, SACs, Ramsar Sites). Significant populations of species and habitats of international importance, notably qualifying interest features of designated sites. Habitat and species listed in EC Habitats Directive.
High	High importance & rarity, or with limited potential for substitution	National	Nationally designated sites (SSSIs, National Nature Reserve (NNR)). Nationally important habitats of good condition and/or significant species population of national importance. Regionally important habitats and/or species with limited potential for substitution. Significant species population.
Medium	High or medium importance and rarity, and limited potential for substitution	Regional	Locally designated sites (Local Nature Reserve (LNR), Sites of Nature Conservation Importance (SNCI)). Regionally important habitats and/or species with potential for substitution. BAP priority habitats and species other than those of national importance.
Low	Low or medium importance and	Local	Undesignated sites of some local

Conservation value	Criteria	Level of importance	Criteria
	rarity.		biodiversity and earth heritage interest. Local species of importance (often listed in LBAPs).
Negligible	Very low importance and rarity.	-	Other habitats or species populations with little biodiversity value and earth heritage interest

Table 10.3: Criteria for Determining the Conservation Status & Integrity

Conservation status	Description
Favourable - species	When the population is maintaining itself on a long-term basis as a viable component of its natural habitat, the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and there is and will probably continue to be a sufficiently large habitat to maintain its population on a long-term basis.
Favourable - habitat	When its natural range and area it covers within that range are stable or increasing, and the species structure and function which are necessary for its long-term maintenance exist and likely to continue to exist for the foreseeable future, and the conservation status of its typical species is favourable.
Integrity of a site	The integrity of a site is the coherence of its ecological structure and function, across its whole area that enables it to sustain the habitat, complex of habitat and/or the levels of population of the species for which it was classified.

The likelihood that a change/activity will occur as predicted and also the degree of confidence in the assessment of the impact on ecological structure and function is scored accordion to the criteria below;

- Certain/near-Certain: probability estimated at 95% chance or higher
- Probable: probability estimated above 50% but below 95%
- Unlikely: probability estimated above 5% but less than 50%
- Extremely Unlikely: probability estimated at less than 5%

Following identification of conservation importance, the magnitude (Table 10.4), duration, scale and persistence of the impact on the VER are evaluated (Table 10.5).

Table 10.4: Criteria for Determining the Magnitude of Impact on Ecological Resources

Magnitude	Criteria
Major negative/positive	The proposal would affect the integrity of the site, habitat or species population, in terms of the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, the complex of habitats and/or the population levels of species of interest.
Intermediate negative/positive	The site's integrity will not be affected, but the effect on the site is likely to be significant in terms of its ecological objectives. However if, in the light of full information, it cannot be clearly demonstrated that the proposal will not have an effect on integrity, then the impact should be assessed as major.
Minor negative/positive	Some minor impact is evident with changes in the habitat or species population, but the changes are not deemed as being significant.
Negligible	The habitats or species on the site is being affected or changed, but there is no observable impact in either direction.
No impact (neutral)	The site, habitat or species is either outside the zone of influence, or if inside the zone of influence is not in anyway altered by the development. Ecological resources with no impact are unlikely to be reported in an EcIA.

When describing changes/activities and impacts on ecosystem structure and function, reference should be made to the following parameters;

- Positive or negative
- Magnitude
- Extent
- Duration
- Reversibility
- Timing and frequency

Table 10.5: Criteria for Determining the Characterisation of Impacts

Characterisation	Description
Duration of impact	Short-term: 12 months to 5 years Medium-term: 5 to 10 years Long-term: 10+ years
Scale & Persistence	Localised: Damage or loss of a habitat or species which may be reversible or irreversible and having an impact on less than 5% of the local species population or 5% habitat. Reversible: Temporary damage or loss of a habitat or species in the short, medium or long-term. Irreversible: Permanent damage or loss of a habitat or species Timing: Is the impact during a critical stage of the species life-cycle?

Pre-mitigation appraisal considers the magnitude and characterisation of the impact alongside conservation importance (Table 10.6). The impact significance is determined and a level of confidence ascribed (Table 10.7)

Table 10.6: Overall Appraisal Category for Impacts on Ecological Resources

	Conservation importance				
Magnitude of impacts	Very High	High	Medium	Low	Negligible
Major negative	Very large adverse	Very large to large adverse	Moderate adverse	Moderate to slight adverse	Negligible
Intermediate negative	Large adverse	Moderate to large adverse	Moderate adverse	Slight adverse	Negligible
Minor negative	Moderate to slight adverse	Slight adverse	Slight adverse	Slight adverse	Negligible
Neutral	Negligible	Negligible	Negligible	Negligible	Neutral

Table 10.7: Significance of Impacts on Ecological Resources

	Conservation importance				
Magnitude of impacts	Very High	High	Medium	Low	Negligible
Major negative	**Significant**	**Significant**	**Significant**	**Significant**	Not significant
Intermediate negative	**Significant**	**Significant**	**Significant**	Not significant	Not significant
Minor negative	Not significant	Not significant	Not significant	Not significant	Not significant
Neutral	Not significant	Not significant	Not significant	Not significant	Not significant

Final appraisal involves re-assessment to consider planned mitigations and enhancement measures to identify residual impact and significance.

10.4 Baseline Conditions

10.4.1 Consultation

Local biodiversity information was obtained from the following statutory consultees:

- The Highland Council (Ranger Service)
- SNH
- SEPA
- Paul Thompson (Aberdeen University, bottlenose dolphin specialist)

Consultation with SEPA and SNH was conducted jointly to consider all issues of concern to both organisations concertedly.

Initial consultation was carried out at the scoping stage, where a number of different locations for the new WwTW were considered (see Table 6.1).

The results of the consultation are summarised in Table 10.8 below.

Table 10.8: Ecological Issues Identified from Optioneering Consultation

VER	Mechanism of Impact	Conservation Authority	Ecological Issue	Action Required
Bottlenose dolphin	Changes to water quality in the Moray Firth	SNH Paul Thompson	Dolphin activity or 'hotspots' in the Moray Firth are not currently defined. Impact on the dolphin population is the key issue to be addressed.	Investigate further as part of the ES.
Seals	Physical disturbance from construction	SNH	Risk of impact if physical disturbance from construction would impact on the integrity of the Dornoch Firth SAC, particularly during the common seal breeding season.	No further investigation required. Construction of the proposed development will not impact on the Dornoch Firth SAC, which is over 27 km from Ardersier WwTW.
Birds	Physical disturbance from construction	SNH	Any disturbance of the intertidal habitat of birds or nesting sites of terns at Whiteness would require detailed assessment.	No further investigation required. Construction of the proposed development will not impact on the Whiteness area, which is over 1 km from Ardersier WwTW.
Sandbanks	Physical disturbance from construction. Changes to water quality in the Moray Firth.	SNH	Assessment of the impact on the integrity of the sandanks required. Disturbance to the Riff Bank should be avoided.	Investigate further as part of the ES.

On the key issue of bottlenose dolphins the following points were noted in particular:

- SNH published guidance (version 01/09/05) entitled "SNH advice on water quality in areas frequently used by bottle nosed dolphins *Tursiops truncatus* in the Moray Firth Special Area of Conservation" advises that, "sensitive areas for bottle nose dolphins meet EC Bathing water standards".

- SNH advised that if a discharge was near to or within an area frequently used by dolphins then year round Bathing Water (later amended to Recreational Water) bacteriological standards would be required by the time the effluent reaches the area frequented by dolphins. This advice applies to the existing discharge location from Ardersier WwTW.

- SNH indicated that if Scottish Water proposed to deviate from the "recreational standard" cited in guidance for water quality in the Moray Firth SAC, a robust case would need to be presented, showing the such a deviation would not impact on the integrity of the SAC.

Consultation was repeated following selection of the existing WwTW site at Ardersier as the preferred location for new WwTW.

The latest results from consultation are recorded as statements from SNH and SEPA in the Pre-Application Advice Pack (included as Technical Appendix B in Volume 3 of the Environmental Statement) issued by The Highland Council to Scottish Water on 18 January 2010. Additional consultation regarding impact on butterflies was carried out with The Highland Council Ranger Service.

In their statement in the Pre-Application Advice Pack, SNH also note potential for impact on two features of local biodiversity interest; the dingy skipper butterfly and badgers. SNH indicate appropriate action to mitigate for impact on these features.

Key issues to be addressed within the ES are summarised in Table 10.9 below.

Table 10.9: Ecological Issues Identified for Ardersier WwTW through Consultation with SNH

VER	Mechanism of Impact	Ecological Issue	SNH Mitigation Recommended by SNH
Bottlenose dolphin	Changes to water quality in the Moray Firth	Water quality is a key factor in meeting the conservation objectives of the Moray Firth SAC.	Discharge meets recreation water standards year-round.
Badger	Physical disturbance from construction	No signs of badgers were found during a survey in 2008, however it is possible that badgers could be present at this site.	Site walkover prior to commencement of development to confirm whether or not badgers are still absent from the development area and whether any mitigation is required.
Dingy skipper butterfly	Physical disturbance from construction	Areas of coastal grassland and gorse in the vicinity of the WwTW are important for the dingy skipper and clearance of gorse as part of the proposed development has potential for adverse impact on this species.	The footprint for expansion of the works should avoid the location of known colonies of dingy skipper. Glad areas should be left free from compaction by contractors' vehicles.

Risk of impact on the qualifying features of Ardersier Glacial Deposits SSSI and Whiteness Head SSSI was also raised. Risk of impact is, however, considered to be negligible, as the proposed development does not include construction or access within the boundary of either of these sites. Risk of impact on these sites will not be considered further within this ES.

The proposed development is sufficiently distant from the Inner Moray Firth SPA and Ramsar Site, Whiteness Head SSSI and Moray Basin Firths and Bays IBA that risk of impact on the designated bird species through construction noise is considered to be negligible.

10.4.2 Site Description

10.4.2.1 The treatment plant

The proposed development is located at site of the existing WwTW at Ardersier (NH 7761 5616). Figures 4.2, 4.3 and 10.1 show the wider area including environmental constraints and location of the outfall. All temporary construction works will take place within the boundary of the works depicted by the Red Line in the planning drawings.

The site is constrained by a road (B9006) on the northeast, the sea (Moray Firth) to the southwest, MoD Playing Fields and a strip of conifer plantation to the northwest and Ardersier Common to the southeast.

The footprint for construction of the new works includes developed land occupied by the existing WwTW and extends into scrubland surrounding the existing WwTW.

The bund bordering the existing WwTW has been planted with conifer and birch species, and is colonised by gorse-dominated scrub.

The substrate of the existing works and environs is a combination of colonised shingle dunes and made ground of unknown source (for further information on geology and ground investigation see Chapter 7).

See Technical Appendix F (Landscape and Visual Impact Assessment, Figure 12: Landscape Mitigation Plan) for indication of where vegetation around the existing WwTW will be left in place as part of the proposed development.

Vehicular access to the site is gained through an existing junction from the B9006, to a road leading to the WwTW.

10.4.2.2 Discharge from the treatment plant

Treated effluent from the existing WwTW is discharged to the north of Fort George in the Outer Moray Firth (NH 7650 5710). It is proposed that the new WwTW utilises the existing outfall, therefore there will be no ecological impacts from construction associated with the outfall.

The location of the outfall in the Moray Firth is included in the ZoI of the proposed scheme due to the potential for water quality to impact on ecological features, as a result of discharge from the treatment works.

10.4.3 Nature Conservation Sites

The following environmental designations were found to be present within a 3 km radius of the existing WwTW, summarised Table 10.10. Site citations are provided by JNCC (2008) and SNH (2008).

Table 10.10: Designated Sites for Environmental Features: Proximity to Ardersier WwTW

Name of Environmental Designation	Distance from Ardersier WwTW (NH 776 561)	Conservation Status	Probability of Impact from proposed development
Moray Firth SAC	0.6 km	Very High (International)	Probable
Inner Moray Firth SPA and Ramsar Site	1.4 km	Very High (International)	Extremely Unlikely
Whiteness Head SSSI	1.4 km	Very High (International)	Extremely Unlikely
Ardersier Glacial Deposits SSSI	0.11 km	High (National)	Extremely Unlikely
Moray Basin Firths and Bays Important Bird Area	0.14 km	Very High (International)	Extremely Unlikely

Source: http://www.magic.gov.uk/website/magic/

10.4.3.1 Moray Firth SAC

The Moray Firth Special Area of Conservation SAC lies approximately 0.6 km to the west of the area of proposed development. This site is designated due to the only known resident population of bottlenose dolphin (*Tursiops truncatus*) in the North Sea and subtidal sandbank habitats which support worms, crustaceans, molluscs, echinoderms and fish (sandbanks which are slightly covered by seawater all the time). These sandbank areas provide an important nursery habitat for fish and feeding grounds for seabirds.

Due to its European designation, the site has been assessed as being of **Very High (International)** conservation value.

Habitats Regulations Assessment

The discharge of the proposed development has potential for direct impact on the Moray Firth SAC.

Consequently, the proposed development must be assessed separately to this Environmental Statement, under the Habitats Regulations (92/43/EEC). This assessment, carried out by a Competent Authority, will determine risk of impact on the qualifying features of the Moray Firth SAC.

The Habitats Regulations Assessment (HRA) will be carried out following submission of the planning application, and will determine the need for Appropriate Assessment.

10.4.3.2 Inner Moray Firth SPA and Ramsar Site

Intertidal areas of the Inner Moray Firth, which incorporate the Longman and Castle Stuart Bay; Beauly Firth; Munlochy Bay; and Whiteness Head SSSI, are designated as a SPA under the EC Birds Directive (79/409/EEC). The Inner Moray Firth SPA and Ramsar sites are designated for Bar-tailed godwit (*Limosa lapponica*), common tern (*Sterna hirundo*), cormorant (*Phalacrocorax carbo*), curlew (*Numenius arquata*), goldeneye (*Bucephala clangula*), greylag goose (*Anser anser*), osprey (*Pandion haliaetus*), oystercatcher (*Haematopus ostralegus*), red-breasted merganser (*Mergus serrator*) and common redshank (*Tringa totanus*). In addition, the SPA is designated as an assemblage wetland of international importance, regularly supporting at least 20,000 individual waterfowl and the Ramsar site due to the presence of intertidal flats with eelgrass *Zostera* beds, saltmarsh, sand and shingle spit.

The Inner Moray Firth SPA and Ramsar Site lie approximately 1.4 km to the north of Ardersier WwTW. It is considered that these designated areas fall sufficiently far away from the proposed development to be impacted by noise from construction or traffic, given the scale of the proposed works. The impact of the works on protected bird species from changes to water quality associated with the discharge from the proposed development is given due consideration in Section 10.6.6.

Due to its European designation, the site has been assessed as being of **Very High (International)** conservation value.

10.4.3.3 Whiteness Head SSSI

This site has been designated for bar-tailed godwit (*Limosa lapponica*), coastal geomorphology (sand and shingle spit enclosing an accreting intertidal system), knot (*Calidris canutus*), mudflat, saltmarsh, sand dune and shingle.

Whiteness Head is one of the best examples of an active shingle spit in Scotland. The spit is unstable at its northern tip, becoming more stable inland.

The site is also an integral component of the Inner Moray Firth SPA, supporting important waterfowl assemblages.

The site is noted to be an important feeding and roosting area for bar-tailed godwit and wintering knot and for its littoral habitats (sand, shingle and saltmarsh vegetation). Other features of interest for this site include two breeding species of tern (common and arctic) as well as distinctive and diverse fauna and flora. A number of uncommon lichen species have been recorded at the site.

Whiteness Head SSSI lies approximately 1.4 km to the north of the area of the proposed works. It is considered that this designated area falls sufficiently far away to be impacted given the scale of the proposed works. The impact of the discharge from the works on protected bird species which frequent these sites is given due consideration in Section 10.6.6.

This site alone would be assessed as being of High (National) conservation value, however due to its importance as part of the network forming the Inner Moray Firth SPA and Ramsar Site, classification is elevated to **Very High (International)** conservation value.

10.4.3.4 Ardersier Glacial Deposits SSSI

This site has been designated for geological features and contains distinctive and diverse flora and fauna, including uncommon lichen species. The boundary of this SSSI is coincident with the road running parallel to the boundary of land owned by SW around the existing WwTW.

Due to its national designation, this site has been assessed as being of **High (National)** conservation value.

10.4.3.5 Moray Basin Firths and Bays Important Bird Area

A complex area of coastline and estuary, including Loch Fleet, Dornoch Firth, Loch Eye, Cromarty Firth, Beauly Firth and Moray Firth (South shore including Burghead and Spey Bay), stretching from Helmsdale south to Spey Bay.

As an environmental designation of European importance, this site has been assessed as being of **Very High (International)** conservation value.

10.5 Identification of Environmental Effects

10.5.1 Habitats and Biodiversity

Through desk-based study and consultation, two habitats of importance with potential for impact from the proposed development were identified, see Table 10.11 below.

Table 10.11: Habitats with potential for impact from the proposed development

VER	Conservation Status	Location in relation to the proposed development	Nature of Impact
Ardersier Common	Low (Local)	Less than 0.1 km to the southeast of Ardersier WwTW	Physical disturbance from construction activity
Moray Firth SAC	Very High (International)	The existing and proposed WwTW both discharge directly into this designated area	Changes to water quality
Sandbanks: qualifying feature of the Moray Firth SAC	High (National)	Discharge from the WwTW could have an impact on sandbank features	Changes to water quality

10.5.1.1 Ardersier Common: Butterfly Habitat

Ardersier Common to the southeast of the existing WwTW is a combination of semi-natural mixed woodland and improved grassland. This site is owned by Scottish Water but maintained by The Highland Council Ranger Service to promote biodiversity, particularly in support of local butterfly populations. Management activities include removal of gorse (*Ulex* sp.).

As an undesignated site of local biodiversity interest. Ardersier Common has been assessed as having a **Low (Local)** conservation designation.

Ardersier Common stretches along an area of stabilised coastal shingle ridges, with shingle strandline vegetation along the coastal edge. A pronounced bare shingle ridge, variable in width, dips down inland to a wetter area of shingle slack vegetation, some open but mostly wooded.

Inland is a hummocky terrain of ancient shingle ridges supporting vegetation dominated by scrub and tussocky mesotrophic grassland with a scattered mosaic of short-sward mesotrophic grassland areas.

The open wet slack areas and the short mesotrophic grass areas are where bird's-foot trefoil (*Lotus corniculatus*), food plant for the dingy skipper butterfly is most abundant.

These areas are critically kept open by trampling and rabbits and are sheltered from wind by the surrounding scrub and many form south-facing glades.

This open short sward vegetation hosting the bird's-foot trefoil food plant for the dingy skipper covers a small percentage of the site as a whole.

Figure 10.2 shows the location of vegetation types in relation to habitat for these species of butterfly as determined from a vegetation survey of Ardersier Common and in relation to the existing WwTW. Results

of the vegetation survey are provided as Technical Appendix G within Volume 3 of the Environmental Statement.

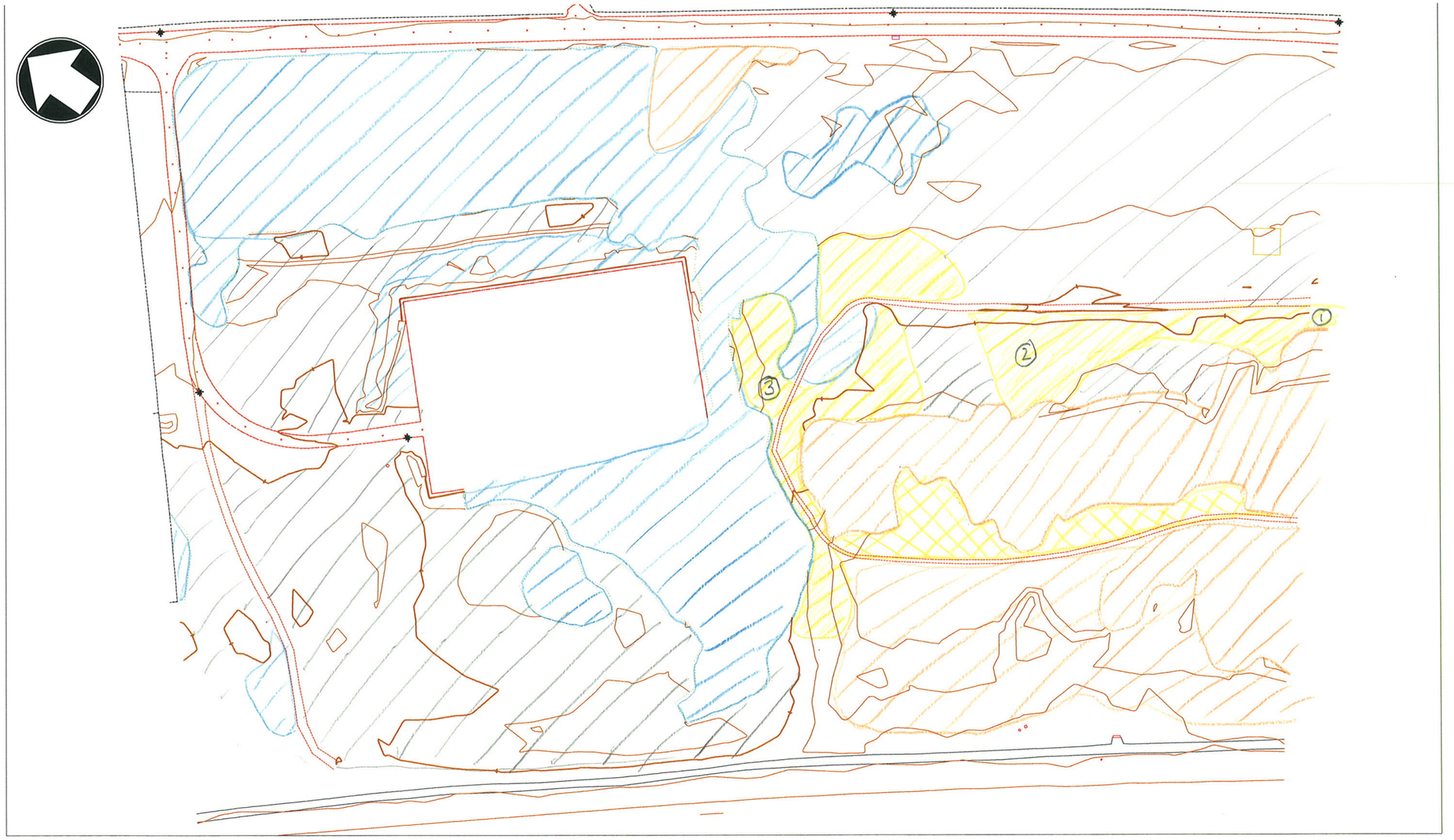
The effects on the habitat of the dingy skipper butterfly (including its food plant Bird's-foot trefoil (*Lotus corniculatus*)) is considered further under the heading 'dingy skipper butterfly'.

10.5.1.2 Plants, Trees and Forestry

The bund bordering the existing WwTW has been planted with conifer and birch species, and is colonised by gorse-dominated scrub.

Trees within the ZoI of the proposed development are considered to have **negligible** conservation value, of very low importance and rarity.

Figure 10.2: Habitat Map from Site Survey



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- Woodland
- Gorse
- Willow/Reed/Bramble Scrub
- Short grassland - good butterfly habitat
- Salix dune - slack community - also good butterfly habitat

Development Site
Ardersier WWTW
Inverness-shire
Enviromental Survey of Site

Surveyors KSW/EG

251866/007

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10.5.1.3 Sandbanks within the Moray Firth SAC

An unpublished report commissioned by SNH 'Sublittoral Biotope Mapping of the Moray Firth SAC' was used to inform the assessment of baseline conditions for the sandbanks habitat (Envision Mapping (2006) Sublittoral Biotope Mapping of the Moray Firth SAC (unpublished report to SNH).

The sandbanks feature of the Moray Firth SAC comprises an extensive area of sand waves underwater. Due to the size of the SAC, there is considerable variability of physical conditions within the site, with a gradual transition from the more estuarine and sheltered conditions at the mouths of the Firths to the open sea of the Moray Firth.

Although designated as a Grade C[4] example of this type of feature, the extent and substrate type of the sandbanks in the Moray Firth add to their uniqueness and therefore environmental significance.

The sandbanks feature is classified as 'favourable, maintained' by SNH after Site Condition Monitoring, last assessed on 12/08/04.

Sewage effluent (whether treated or untreated) has the potential to cause deterioration of sandbank habitats and communities in the following ways:

- Siltation of sandbanks, blanketing invertebrates
- Changes to nutrient load through the effects of pollution and / or nutrient enrichment, with subsequent changes to community structure

Measured concentrations of suspended solids in the discharge from the existing WwTW are reported to be in the range of 3 – 40 mg/l, with a mean value of 12 mg/l (see Chapter 9). The end of pipe discharge rises to the surface but, given the location of the outfall relative to MLWS, is expected to achieve only moderate initial dilution. Although dispersion studies have not been undertaken, given the tidal flows through Chanonry Narrows, dispersion is likely to be rapid.

It should be noted that the sediment around the Ardersier outfall is of hard ground with sand waves, cobble and mixed sediment so it is not expected that the sediment is of the nature where fine solids will settle and accumulate over time. Therefore, whereas some siltation may be expected in the immediate vicinity of the outfall this is likely to be limited in extent and is unlikely to cause significant impact to sandbank features.

The extent of nutrient input is likely to be similarly limited in extent. The level of input is unlikely to give rise to a sustained effect given the anticipated dispersion.

The 2006 Envision Mapping report constructs an indication of the sea bed substrate and topography from a combination of sediment samples and side scan and swath images. It is possible to extract details of the type and nature of the sandbank feature (which is present throughout the whole Moray Firth SAC) from this report, in the particular zone of influence within a 3 km radius of the outfall from Ardersier WwTW.

4 Examples of the feature which are of at least national importance (i.e. usually above the threshold for SSSI/ASSI notification on terrestrial sites) but not significantly above this. These features are not the primary reason for SACs being selected. (JNCC, 2010)

The survey methodology employed a combination of techniques including particle size analysis (PSA) of samples and digitised data from side scan and swath images to characterise the ecology of the sea bed for many locations throughout the Moray Firth.

Survey results show hard ground with varying sizes of sand waves close to the outfall, within a 2 km radius. The seabed continues to be moderately hard ground through the Chanonry Narrows to the south and west but becomes softer to the north and east towards open water.

Distribution of PSA samples classified to the Folk system (Folk, 1954) show cobble and mixed sediment around the outfall, with a transition to silty medium fine sand, shelly gravely sand then shell through the Channonry Narrows. In the opposite direction from the outfall, adjacent to the Whiteness Head SSSI and towards the open water of the Moray Firth, there is a transition to medium fine sand.

Substrate just outside the Inverness Firth at Fort George is sandy and dominated by clams. In stable areas of the open coast, shallow sandy sediments support populations of bivalves, with sea potatoes, razor shells and the sabellid polychaete found at depth. Moving towards the open Firth, off Whiteness, substrate is recorded as fine unstable sands exposed to wave action, containing sparse animal communities dominated by bivalves. Through the Chanonry Narrows to the south and west of the Ardersier outfall, pockets of coarse sediment occur in fast currents and associated biotopes are characterised by communities containing polychaete worms.

The distribution of biotope groups predicted using interpretation of acoustic data using the samples for ground truthing largely reflects the same patterns seen from the biotope samples, but with increased incidence of SS.SBR.SMus.Mod.Mx in a small patch immediately at the outfall and a large band on the opposite side of the channel from the outfall. There is, in addition, the biotope of SS.SMX.CMx immediately surrounding the outfall and continuing through the Chanonry Narrows. SS.SMU is also present at the northern and southern points of the Chanonry Narrows.

In the Moray Firth, the sediment category SS.SMU was used where no other distinguishing feature (except for common starfish, swimming crabs, shore crabs and hermit crabs) suggested an alternative biotope. This sediment occasionally supported sea squirts (*Ascidiella aspersa*) in deeper water.

As a general trend, the distribution of sediments in shallow water appears to be linked to bathymetry, with a close correlation between increased depth and decreasing grain size, with the exception of fine sand accumulating in the area seaward of the inner Firths.

From this, there would not appear to be evidence to suggest the presence of eelgrass or maerl beds close to the Ardersier outfall, so the typology of the sandbank feature within the zone of influence of the WwTW is most likely to be either of the “gravelly and clean sands” or “muddy sands” types.

The part of the Moray Firth SAC close to the Ardersier outfall, although within the boundary of Priority Area 5 designated within the SNH commissioned Biotope Report, is not of the highest conservation value. Biotopes identified in the potential zone of influence are seen to be characterised by common species.

This feature is therefore considered to have conservation status of **High (National Importance)**.

10.5.1.4 Peat

No areas of peat are present within the ZoI of the proposed development, and therefore environmental effects relating to peat do not need to be considered further.

10.5.2 Protected and Notable Species

10.5.2.1 Birds and Animals

A desk-based search of the NBN species record database (NH75) did not identify records for any protected species in the immediate vicinity of Ardersier WwTW, although some species including the badger only have records of accuracy within a 10 km square.

Through consultation, badgers and the protected dingy skipper butterfly were noted to be potentially at risk of impact from the proposed development.

Although no records of otters or bats were found, these species were included as targets for survey due to potential suitability of habitat.

Protected and notable species or groups considered to be at risk of impact from the proposed development are listed below, and summarised in Table 10.12.

Table 10.12: Protected and notable species with potential for impact from the proposed development

VER	Conservation Status	Nature of Impact
Bottlenose dolphin	Very High (International)	Potential impacts from changes to water quality in the Moray Firth
Marine mammals and fish	High (National)	Underwater noise from construction
Protected bird species	High (National)	Potential impacts from changes to water quality in the Moray Firth
Badger	Medium (Regional)	Physical disturbance from construction activity, loss of habitat
Otter	Medium (Regional)	Physical disturbance from construction activity
Bats	Medium (Regional)	Physical disturbance from construction activity, loss of habitat
Dingy skipper butterfly	Medium (Regional)	Physical disturbance from construction activity, loss of habitat
Breeding birds	Medium (Regional)	Physical disturbance from construction activity, loss of habitat

Bottlenose dolphin

The Moray Firth dolphin population is at the extreme northern end of its natural range and therefore subject to stress factors absent from other bottlenose dolphin populations such as low temperatures. Due to its small size and relative isolation, and because dolphins live for a long time and reproduce slowly, this population is considered to be particularly vulnerable to both natural and human influences changing the quality of its environment.

The Moray Firth SAC is one of only two SACs in the UK (along with Cardigan Bay in Wales) designated as a Grade A/B[5], examples of the interest feature of *Tursiops truncatus*. Furthermore, the Moray Firth supports the only known resident population of bottlenose dolphins in the North Sea.

[5] A: Outstanding examples of the feature in a European Context

B: Excellent examples of the feature, significantly above the threshold for SSSI/ASSI notification but of somewhat lower value than

The Moray Firth population of *T. truncatus* is estimated at around 130 individuals [Wilson et al. 1999]. Reports of sightings of these dolphins occur all year round, and although the dolphins range widely throughout the Moray Firth, they are known to favour particular areas, which are known as dolphin 'hot spots'.

A population model developed in 1999 to predict future changes in population size predicted a population decline at a rate of 5-6 % per annum. 2004 annual abundance surveys suggest that dolphin numbers have remained higher than predicted from this model, but also that use of the SAC by the dolphins has reduced.

As a result, SNH have classified the bottlenose dolphin feature of the Moray Firth SAC to be of 'unfavourable, recovering' status with continuing research underway to closely monitor any changes in this population. The status of the Moray Firth bottlenose population is based on a downward trend in observed numbers during the 1990s, followed by a subsequent small increase and possible stabilisation in observations between 2000 and 2004.

Sewage effluent entering UK coastal waters (whether treated or untreated) can consist of domestic, industrial, agricultural and fish farm wastes. Waste from these sources contributes an input of organic and inorganic compounds, marine litter and harmless but also some infectious micro-organisms into the marine environment.

Sewage effluent has the potential to affect bottlenose dolphin populations principally through increased risk of disease. Several studies have suggested that marine mammals may be susceptible to infection via human or livestock pathogens transferred through direct transfer from sewage or agricultural effluents, leading to deformities and other health problems, dependent on the type of pathogen.

Other possible mechanisms of impact may be through long-term ingestion of persistent chemicals discharge with the effluent or through the changes to prey fish species resulting from indirect effects of increased or decreased nutrient loadings.

Secondary treatment of sewage reduces a high proportion of the Biochemical Oxygen Demand (BOD) and suspended solids loading, but some bacteria, fungi and viruses remain present in even secondary treated sewage. UV disinfection, as proposed for the Ardersier WwTW is designed to kill the vast majority of bacteria.

In the UK, research has been conducted on inorganic and organic pollutant contamination of cetaceans, but not cetacean contamination by sewage-borne pathogens.

The persistence of all the pathogens in sea water with the potential to transfer to cetaceans is not known, but it is considered that the daily exposure to pathogens of cetaceans in coastal waters close to urban centres is likely to be several orders of magnitude higher than levels considered unsafe for humans due to ingestion of large quantities of seawater[6].

In order for a pathogen to infect a cetacean, a site of entry is required. This could be through mucous membranes, the respiratory tract, lesions and lacerations or the gastrointestinal tract. In many cases these

grade A sites (JNCC 2010)

[6] Parsons, Clark, Ross, Simmonds. The Conservation of British Cetaceans: A review of the threats and protection afforded to whales, dolphins and porpoises in UK waters.

pathogens are opportunistic and animals may be more susceptible to them when they are already stressed or sick for other reasons[6]. Therefore dolphin populations in waters close to urban populations could be considered to be at higher risk of pathogen infection, due to the other pressures associated with pollutants and other waste from urban environments.

Due to the status of this species as the primary feature for designation of the Moray Firth SAC, it is considered to be of **Very High (International)** conservation value.

Fish and other aquatic interests

No surface waterways are present within the ZoI of the scheme, therefore the environmental effects on aquatic species are restricted to indirect effects from groundwater. Environmental effects on groundwater are considered in Chapter 7. Aquatic species are not considered further within this ES, as impact on these species is considered to be negligible.

Marine mammals and fish

A number of marine mammals including whales, dolphins, porpoises and seals and migratory fish species including salmon and sea trout are known to occur in the Moray Firth. The bottlenose dolphin, harbour seal and Atlantic salmon are of European importance. Additionally, the bottlenose dolphin is protected under the WCA 1981 and listed on the UKBAP and LBAP. Grey seal, harbour seal and porpoise are also LBAP species.

The edge of the Moray Firth SAC is 0.6 km from the proposed development, and it is possible that noise from construction could be transmitted underwater to have an adverse impact on these protected marine species.

Given the limited distribution of these species and suitable habitat within the wider area they are considered to be of **High (National Importance)** conservation value.

Protected and notable bird species of the Inner Moray Firth SPA and Ramsar Site and Whiteness Head SSSI

Sites of European and National significance, including the Inner Moray Firth Special Protection Area (SPA) and Ramsar Site and Whiteness Head SSSI, are within 2km of the existing WwTW.

There is therefore potential for impact on the qualifying features of these sites (bird species including;

bar-tailed godwit (*Limosa lapponica*), common tern (*Sterna hirundo*), cormorant (*Phalacrocorax carbo*), curlew (*Numenius arquata*), goldeneye (*Bucephala clangula*), goosander (*Mergus merganser*), greylag goose (*Anser anser*), osprey (*Pandion haliaetus*), oystercatcher (*Haematopus ostralegus*), red-breasted merganser (*Mergus serrator*), redshank (*Tringa totanus*), scaup (*Aythya marila*), teal (*Anas crecca*), waterfowl assemblage, wigeon (*Anas penelope*) and knot (Calidris canutus),

where birds have moved outside the boundaries of the designations for feeding or nesting.

Risk of negative impact on bird species during the construction phase primarily arises from clearance of vegetation during the breeding season or, loss of habitat and food sources the winter months. The

proposed development is considered to be sufficiently distant from the protected sites that impact from construction will be negligible.

There is also risk of negative impact on bird species assemblages in the Moray Firth due to changes in water quality with consequent changes to marine ecology.

Discharge from Ardersier WwTW is approximately 6.6 m to seaward of Mean Low Water Springs. There is a small amount of initial dilution as discharge rises to the surface. Discharge is then subject to often rapid lateral dispersal due to tidal currents, since the point of discharge is close to the Chanonry Narrows. Nevertheless, some deposition of sediment in close proximity to the source of discharge is likely.

For this assessment, the bird species protected under the legislation are grouped into three broad types; piscivores, littoral zone feeders and species capable of feeding directly on organic matter in the effluent.

Although the outfall discharges into the Outer Moray Firth, sections of the Inner Moray Firth SPA and Ramsar Site lie within 1 km of the point of discharge from Ardersier WwTW. The Inner Moray Firth designations are therefore considered to be at greater risk of impacts from the WwTW than the other SPA and Ramsar sites assessed due to the proximity of the outfall.

There is potential for impact on birds through the following mechanisms:

- Direct impact through contaminants from sewage. Risk of this is inversely proportional to the level of treatment of the effluent, and effluent is currently secondary treated at this site. It is not thought that contaminants exist in treated sewage from Ardersier WwTW in sufficient quantities to have an impact on local bird species.

- Direct impact of birds feeding directly on the organic matter in raw sewage. Although this may have benefit in terms of increased food supply, there is also the possibility of negative effects on individuals from direct exposure to contaminants in the organic matter, as well as negative effects on the overall bird assemblage as changes to natural nutrient levels may confer a competitive advantage to certain species that may not be of greatest conservation interest.

- Indirect impacts through increased abundance of detritivores. Although this may benefit some species, the benefit cannot be quantified and the effects on the entire assemblage all bird species of nutrient enrichment are unknown, therefore it is advisable that levels of treatment are maximised in order to attain as close to natural levels of organic matter in the aquatic environment as possible.

- Indirect impact through contamination of prey (piscivores). It is possible that organic enrichment from sewage can alter the invertebrate composition within a zone of influence and therefore indirectly influence the fish species feeding on these invertebrates. Any toxic substances, damaging compounds or harmful pathogens associated with the effluent could be transferred to birds via prey fish species.

- Alterations to the composition of fish species and their abundance in the Moray Firth due to changes in the natural nutrient load. There are no known impacts on fish populations from secondary treated sewage effluent.

- Indirect impact on littoral zone feeders through siltation of the shoreline, by reducing extent or quality of feeding ground. In northerly winds, there is the potential for discharge to be blown back onshore. Siltation loading in secondary treated effluent is considered to be low and any deposited silt is likely to be remobilised by subsequent tidal action.

- Indirect impact through alterations to natural nutrient load, with resultant changes to invertebrate and algal populations.

Some studies in Britain have identified links between organic enrichment from sewage and excessive development of the alga *Enteromorpha*, which can blanket the mud creating anaerobic conditions unsuitable for underlying invertebrates or making prey invertebrates inaccessible to the birds. Other studies have found an entirely different overall effect, that organic sewage inputs increase invertebrate prey abundance and therefore localised abundance of certain species of bird that feed on them.

The effects of enrichment leading to depressed bird numbers have not been noted to exist in the Moray Firth by any of the Conservation Authorities, and the assumption is made that this impact does not require further consideration.

It is not possible to comment on the complexities of the ecological composition of the invertebrates at these sites in the Moray Firth without detailed studies, but it is not considered that the rates of dispersal and quantities of nutrients released with the Ardersier discharge are sufficient to have indirect impacts on any of the designated bird species feeding in the littoral zone through alteration of the composition of invertebrate and algal communities.

The Conservation Value of these Schedule I and Annex I species is considered to be **High (National Importance)** in the ZoI.

Badgers

Badger activity has been recorded within a 10 km grid square of the proposed works (NBN, 2008). Although badger activity has not been recorded within the footprint for construction of the proposed development, badgers are known to be active within the A96 corridor and risk of impact on local badger populations could be anticipated.

Risk of failure to observe signs of badger activity is identified in the following survey constraints:

- Survey took place immediately following a period of wet weather. This is a sub-optimal time for survey due to danger of animal signs being washed away.

- Autumn is a sub-optimal time for badger survey due to the risk of heavy vegetation growth covering sett entrances. Spring is the best time of year for looking for evidence of badger activity, as badgers are most active at this time of year, marking territory.

- The most likely location for a sett entrance is the dense gorse area close to the road, which is not possible to access.

During the walkover survey carried out in September 2008, no field signs were found that would indicate presence of badgers. Some pathways through vegetation were observed but in the absence of other supporting signs, these cannot be attributed to badgers and could be made by rabbits or dogs, signs of which were both abundant at this site. Deer and dog prints were observed in muddy areas, but no badger prints.

During the site visit and walkover, general site character and ground type was noted and the following observations made:

- Ground type is predominantly colonised ancient shingle dunes, colonised with a very thin or absent soil layer. This ground type is unlikely to support a resident badger population due to the difficulty of digging sett tunnels in a shingle substrate and scarcity of the badger's main food (earthworms), as a consequence of the ground type.

- The most likely location for any badger sett would be in the thick band of gorse between the WwTW and the road (see Figure 10.2). This area of gorse is very close to the road and will be left in place as part of the proposed scheme (see Appendix F: Landscape and Visual Impact Assessment for further details).

- Human disturbance of the site is high, as a footpath runs through the middle of the land owned by Scottish Water. The path through Ardersier Common runs close to the WwTW. These footpaths are used frequently for dog walking.

Outside the boundary of the proposed works, badger setts could be present within the conifer plantation, within the dense gorse or within parts of the Ardersier Common. No evidence of a sett entrance within 30m of the footprint for construction of the scheme was found.

The very nature of the dense gorse precluded complete survey of these areas of the site. The site stretches along an area of stabilised coastal shingle ridges and slacks and is unsuitable for supporting setts. Indeed, while rabbit activity was evident from droppings and from their evident influence on the vegetation, no rabbit burrows were observed. Equally, were there to be setts within the plantation area, the potential for tunnelling to a subsidiary entrance within the gorse is limited by the shingle substrate.

Badgers are protected by the Bern Convention (Annex III) Nature Conservation Act (Scotland) 2004, Protection of Badgers Act 1992 and are a UKBAP and LBAP species. Badgers are therefore considered to have **Medium (Regional Importance)** conservation value.

Otters

Otter activity has been recorded within a 10 km grid square of the proposed works, but not within 1 km (NBN, 2008).

Otters have been recorded within 10km of the site, however records are located on the opposite side of the Moray Firth, around the Rosemarkie area. No signs of otters were noted during the site visit.

It is difficult to prove absence and not finding animals during survey is not a guarantee that they are not present, as animals are shy and generally nocturnal.

Otters are protected at a European level and are also a UKBAP and LBAP species. Otters are considered to be of **Medium (Regional Importance)** conservation value.

Bats

Bat activity has not been recorded within a 1 km grid square of the proposed works (NBN, 2008), nor has bat activity within the footprint of the scheme been highlighted during consultation with Conservation Authorities.

Although bat activity has not been noted within the footprint for construction of the proposed development, risk of impact on bat populations could be anticipated, therefore a walkover survey of the site was undertaken in January 2010 to assess bat roost potential of the trees within the footprint of the scheme.

The Bat Conservation Trust's 'Bat Surveys: Good Practice Guidelines' (2007) was used to inform classification of bat roost potential.

Trees considered to have potential for use as bat roots generally exhibit some of the following qualities;

diameter of 200mm or greater, covering of ivy, dense epicormic growth, mature or over mature, gnarled, creviced or flaking bark, knot holes or other hollows/cavities, bird or bat boxes.

See Figures Figure 10.3 and Figure 10.4 for photographs showing typical tree and vegetation type for the bund around the existing WwTW.

The only trees within the footprint for construction of the scheme are around the boundary of the existing WwTW. It is likely that these trees were planted to provide visual screening for the original WwTW development.

Figure 10.3: Vegetation along the bund on the west side of the existing WwTW, with surrounding scrub

Figure 10.4: Trees around the existing WwTW

Trees around the existing WwTW are mainly conifers, with some birch species, and are generally immature and scrub-like. Typical height is 3m, with diameter 50cm.

No signs of bats or droppings were noted during the survey and no trees meeting the description of high potential to provide bat roosts or field signs of bats were found within the footprint of the scheme.

The characteristics of the trees present in the scrub bordering the WwTW are such that they are determined to have low to negligible bat roost potential.

Bats are considered to be of **Medium (Regional Importance**) conservation value.

Dingy skipper butterfly

This species, known to be present and recorded during annual butterfly monitoring surveys for Ardersier Common, is a UK BAP priority species and is therefore considered to be of **Medium (Regional Importance**) conservation value.

Breeding birds

All breeding birds are protected by national law, whilst some species are afforded additional international protection. With gorse-dominated scrub abundant at the site, the area provides a number of potential suitable breeding bird habitats. The bird nesting season is considered to be from March to July inclusive for construction works, during which time clearance activities should not take place[7].

[7] CIRIA C587 (2004)

However, suitable habitat is abundant in the wider area and the conservation value of breeding birds is considered to be **Medium (Regional Importance)** in the ZoI.

10.6 Assessment of Significant Environmental Effects

Risk of environmental impact during the construction phase is limited to activities of vegetation clearance and disturbance during construction of the new works, in close proximity to the existing WwTW. The footprint for construction of the scheme is as outlined in Figure 4.3.

Some vegetation and trees around the existing WwTW will be removed as part of the proposed works. This loss of biodiversity will be offset by planting around the new scheme, as detailed in Chapter 8 and Appendix F. Furthermore, where possible, vegetation will be left in place in areas within the footprint of the scheme set aside for future development.

Risk of impact on ecological features from generic construction activities such as pollution of waterways, noise and dust is expected to be minimised through following best practice construction methods.

Water quality issues relating to the proposed scheme are investigated in Chapter 9.The existing WwTW at Ardersier is estimated to treat domestic and industrial treated sewage for a Population Equivalent of 1,851[8]. The bacteriological load of the current discharge is estimated at 5.37 x 10^{12} FCU/day in final effluent. The discharge contains an array of organic and mineral material, generally determined in aggregate through concentration of BOD and suspended solids.

The new WwTW design introduces UV disinfection of the effluent, with bacteriological load of the new works estimated at between 8.5 x 10^{10} to 8.5 x 10^{8} FCU/day in final effluent, dependent on the efficiency of the UV disinfection unit. This represents a significant reduction of bacterial load in the final effluent for the proposed works.

Each of the species and habitats identified as having potential for impact from the proposed development are considered in turn below. Table 10.13 summarises the impacts on habitats, and Table 10.14 on notable species not associated with either of these two habitats.

10.6.1 Habitats and Biodiversity

Table 10.13: Assessment of impacts – Habitats and their qualifying features

VER	Conservation Status	Nature of Impact	Characterisation of Impact	Overall Appraisal	Significance of Impact
Moray Firth SAC	Very High	Change of water quality	Minor positive Probable Long-term Localised Reversible	Moderate to slight positive	Not Significant
Sandbanks	High	Change of water quality	Minor positive Probable Long-term	Slight positive	Not Significant

[8] Estimates of PE and bacteriological load taken from Mott MacDonald Report "Comparison of Faecal Coliform Loads Discharge to Moray Firth from Ardersier WwTW (January 2010)". See Volume 3: Technical Appendices for full report.

			Localised Reversible		
Ardersier Common	Low	Physical disturbance from construction	Minor negative Probable Short-term Localised Irreversible	Slight adverse	Not Significant
Plants, Trees and Forestry	Negligible	Removal of trees and scrub around the existing WwTW	Minor negative Certain Short-term Localised Irreversible	Negligible	Not Significant

10.6.1.1 Moray Firth SAC

The Moray Firth SAC has been classified as having **Very High** conservation value, and is at risk of direct impact from the proposed works due to the location of the outfall, with effluent from both the existing and proposed WwTW at Ardersier discharged directly into the designated site.

The qualifying features of the Moray Firth SAC are bottlenose dolphins and sandbanks.

Potential for negative impact on these two features is from deterioration of water quality (noise impact on marine mammals will be considered separately) within the Moray Firth. Impact from effluent discharged from Ardersier WwTW would be **long-term** and **localised** around the dispersal zone of the outfall.

10.6.1.2 Sandbanks which are slightly covered by sea water all the time

No physical disruption of the sandbanks is associated with the proposed works, therefore consideration of impact on this designated feature of the Moray Firth SAC is constrained to water quality of the discharge.

Improvements to water quality associated with the new WwTW further reduce any risk of impact to sandbank features, through reduction of sediment and bacteriological load being discharged into the Moray Firth. It is therefore considered **probable** that the proposed development will have a **minor positive** impact on this ecological feature.

To determine the level of impact on the Moray Firth SAC, the effects on its component qualifying features must be considered. Effects on the SAC are therefore considered to be **probable minor positive** and **reversible**, because any future change in water quality could result in loss of the minor positive effect.

10.6.1.3 Ardersier Common

The effects on Ardersier Common are considered as a combination of effects its notable species; breeding birds, badgers and dingy skipper butterfly.

The overall appraisal is therefore recorded as slight adverse, not significant, due to the predicted effect on the dingy skipper butterfly as a worst case.

10.6.1.4 Plants, Trees and Forestry

The proposed gorse and small scale tree removal is illustrated by the grey hatched outlines in Figure 12 of the Landscape and Visual Impact Assessment (Technical Appendix F).

It is considered **certain** that there will be a short-term and irreversible **minor negative** impact on this resource of negligible conservation value. The overall effect is negligible, and not significant.

Although impact on plants, trees and forestry has been assessed as not significant, recommendations for mitigation measures for trees and habitat biodiversity.

10.6.2 Birds and Animals

10.6.2.1 Bottlenose dolphins

Bottlenose dolphins have been classified as having **Very High** conservation status.

While the effects of bioaccumulation of harmful compounds are of significant concern, it should be noted that the Moray Firth is a populated area with a full range of human activities, including some minor industrial activities. Therefore dolphin populations in the Firth will be exposed to a variety of potential stresses outwith the scope of this assessment. Many waste water related bioaccumulating contaminants are primarily associated with particulate matter, having very low solubilities, and are mainly removed by settlement in the WwTW. The contribution of the Ardersier discharge to the input of contaminants to the Moray Firth is expected to be minor and is not likely to significantly effect the dolphin feature of the SAC.

There is some evidence to suggest that reduction in organic matter as effluent treatment improves may reduce local populations of the prey species (for example gadid fish) which feed off organic matter in the effluent and therefore are present in increased abundance in the immediate vicinity of sewage outfalls. On the other hand prey feeding in such locations may be exposed to elevated doses of contaminants. Dolphins attracted to prey in this vicinity may benefit from increased ease of feeding but may consequently also be exposed to elevated intake of contaminants. The overall effect may be circumneutral.

The impact of this development, as detailed in Chapter 9, will result in a net improvement of water quality and reduced bacteriological load, through inclusion of a UV disinfection step in processing of the effluent.

In conclusion, it considered **probable** that by improving water quality in comparison to current discharge of effluent to the Moray Firth, there will be an overall **minor positive** effect on the Moray Firth bottlenose dolphin population through reduced exposure to contaminants.

10.6.2.2 Marine mammals and fish

There is potential for some marine species in the Moray Firth to be affected by noise and vibration from construction works, in particular from pile driving activity. See Section 12.6.5 (Noise and Vibration) for consideration of underwater noise impact on marine mammals and salmon, sea trout and mackerel.

It is considered **probable** that there will be a **minor negative** effect during construction in the form of underwater noise disturbance for marine mammals and fish. This effect would be **short-term**, **localised** and **irreversible**.

The following mitigation measures should be employed so as to reduce impact from noise during construction;

- Mitigation measures at source such as buffer blocks and reduced hammer drop heights should be used to lessen potential effects; and,
- Where practical, piling should be avoided when dolphins are calving in summer, as mother and calf are likely to be vulnerable to noise.

10.6.2.3 Protected bird species

The proposed development introduces an additional level of treatment of effluent in comparison to the existing discharge, producing a cleaner discharge. Impact from effluent discharged from Ardersier WwTW would be **long-term** and **localised** around the dispersal zone of the outfall.

Risk of impact of the operational phase of the proposed development on bird populations in the Moray Firth is therefore considered to **probably** be **negligible**.

The concentrations of organic matter discharged in secondary treated effluent are not considered to be sufficient to be the primary component of the diet of resident or migratory bird species in the vicinity of the outfall, therefore any improvement to the quality of the discharged effluent should not lead to a localised loss of bird species.

10.6.2.4 Badgers

The findings of the desk study and walkover survey described in Section 10.5.4 are such that clearance activities and construction of the proposed development is considered to **probably** have a **negligible** impact on local badger populations. Any impacts would be during the construction phase and would be **short-term**, **localised** and **irreversible**.

To mitigate for the possibility of badgers being present at the site, a walkover survey will be carried out prior to construction.

10.6.2.5 Otters

With an absence of freshwater pools, visible holts or resting up areas at the site and high levels of human disturbance, in particular dog walkers, risk of impact on otters from proposed development is considered to **probably** be **negligible**. Any impacts would be during the construction phase and would be **short-term**, **localised** and **irreversible**.

No necessary mitigation measures have been identified.

10.6.2.6 Bats

No bat roosts within the footprint for construction of the scheme have been identified and trees that may need to be removed as part of the scheme (bordering the existing WwTW) are considered to have low bat roost potential. Any impacts would be during the construction phase and would be **short-term**, **localised** and **irreversible**.

Some vegetation, scrub and tree scrub will be left in place with introduction of new trees as part of the planting regime proposed for the new works.

It is therefore considered **probable** that risk of impact to bat populations is **negligible**, with no further work or mitigation required.

10.6.2.7 Dingy Skipper Butterfly

Prior to vegetation clearance for ground investigation works in October 2008, SNH advised that impact on butterflies should be fully investigated prior to any construction works including clearance of gorse for site investigation works.

Restriction of vehicular movement to avoid exposing areas of good butterfly habitat to compaction by contractors' vehicles was considered to be appropriate mitigation by SNH prior to vegetation clearance works.

See Section 10.5 for baseline information, including a review of suitability of habitat for the dingy skipper butterfly in the environs of Ardersier WwTW.

Without giving any consideration to sensitive design to minimise impact or mitigation, it is considered **probable** that vehicular movements and vegetation clearance activities would have a **major negative** impact on the butterfly species of Ardersier Common. This impact would be **long-term**, **localised** and **irreversible**.

However, in designing the layout of the proposed development, local biodiversity interests have been taken into account. The layout of the works has been designed to avoid areas of good butterfly habitat (see Figures 4.4 and 10.2) and vehicular access for the construction phase will be restricted to the existing access from the B9006 road, with construction vehicles avoiding Ardersier Common to the east of the existing WwTW completely.

The bund around the existing WwTW will be left in place along the eastern side and in the southeast corner, to further reduce potential for impact on areas of good butterfly habitat.

With these mitigation measures in place, it is considered **probable** that construction of the proposed works will have a **minor negative** impact on the dingy skipper butterfly. This impact will be **short-term**, **localised** and **irreversible**, during the construction phase.

10.6.2.8 Breeding birds

Risk of negative impact on bird species during the construction phase primarily arises from clearance of good nesting habitat (scrub vegetation) and impact from noise during the breeding season.

To mitigate for this impact, clearance works should take place outwith the breeding bird season.

If this mitigation is followed, it is **probable** that the construction of the proposed works will have a **negligible** impact on breeding birds. This impact will be **short-term**, **localised** and **irreversible**, during the construction phase.

Existing scrub vegetation around the site will be left in places, and new scrub will be established over time.

Taking into account its component features, it is therefore considered **probable** that the proposed works will have a minor negative impact on the Ardersier Common habitat. This impact will be **short-term**, **localised** and **irreversible**, and restricted to the duration of the construction phase.

Table 10.14: Assessment of impacts – Protected and notable species

VER	Conservation Status	Nature of Impact	Characterisation of Impact	Overall Appraisal	Significance of Impact
Bottlenose dolphin	Very High	Change of water quality	Minor positive Probable Long-term Localised Reversible	Moderate to slight positive	Not Significant
Marine mammals and fish	Medium	Underwater noise	Minor negative Probable Short-term Localised Irreversible	Slight adverse	Not Significant
Protected bird species	High	Adverse impact from changes to water quality in the Moray Firth	Negligible Probable Long-term Localised Reversible	Negligible	Not Significant
Badger	Medium	Physical disturbance from construction	Negligible Probable Short-term Localised Irreversible	Negligible	Not Significant
Otter	Medium	Physical disturbance from construction	Negligible Probable Short-term Localised Irreversible	Negligible	Not Significant
Bats	Medium	Physical disturbance from construction	Negligible Probable Short-term Localised Irreversible	Negligible	Not Significant
Dingy skipper butterfly	Medium	Loss of habitat Physical disturbance from construction	Minor negative Probable Short-term Localised	Slight adverse	Not Significant

			Irreversible		
Breeding birds	Medium	Loss of habitat Physical disturbance from construction	Negligible Probable Short-term Localised Irreversible	Negligible	Not Significant

10.7 Mitigation

Mitigations measures have been discussed against each Valued Ecological Resource in Section 10.6. Measures identified and required to reduce potential for impact are summarised below.

10.7.1 Plants, Trees and Forestry

The proposed planting scheme for the development is detailed in Figure 12 of the Landscape and Visual Impact Assessment (Technical Appendix F)

The selected choice of plant and grass species contribute towards the designed local biodiversity of the Common and the design of the planting is to be such that it blends in with the existing planting characters of the evergreen woodland strip, and the deciduous trees and shrubs of Ardersier Common.

The detailed planting will be designed such that the species choice links and blends in with the high percentage of evergreen trees at the north-west corner of the site where the woodland strip is, closer to the Fort George end of the site. This concentration of evergreen trees would then feather out into a mix of trees and shrubs of a more deciduous character that is fitting with the vegetation in Ardersier Common. Tree species could include Scots Pine, Rowan and Silver Birch, and shrub species could include Common Gorse, Willow, Hawthorn, Blackthorn and Sea Buckthorn. Other species that are successful in coastal regions, such as Corsican Pine, Monterey Pine etc, will be considered and discussed as further options with the Highland Council.

As tried and tested successfully on the Common, the planting into the existing ground where there is to be no bund, such as along the eastern boundary, will be cell grown plants notch planted direct into the existing ground. There shall be no imported growing medium. However, it would be anticipated that there will be a high failure rate so the planting numbers will be selected accordingly. For Silver Birch species, the larger stock size of up to 1m height could be considered to provide an earlier screening effect.

There is a high population of rabbits in the area, thus the planting areas would have to be protected appropriately with either individual shelters or rabbit proof fencing. Since there would be many numbers of cell grown plants, the choice may pull towards rabbit-proof fencing.

During construction works, BS 5837 (2005) shall be complied with, whereby existing trees on and adjacent to the development site, shall be protected.

10.7.2 Underwater noise impact on marine mammals and fish

The potential for impact is associated with the construction activity of pile driving. The form of pile driving used will be dependent on the type of substrate encountered.

Any use of machinery for pile driving will be minimised where possible and, where options are available, the method reducing generation of noise and vibration emissions should be selected.

Mitigation measures at source such as buffer blocks and reduced hammer drop heights should be used to lessen potential effects and where practical, piling should be avoided when dolphins are calving in summer, as mother and calf are likely to be vulnerable to noise.

10.7.3 Badgers

A walkover survey to provide an updated assessment of badger activity in the environs of Ardersier WwTW must be completed prior to construction.

A recommendation for vegetation clearance activities is that any dense vegetation is cleared slowly, checking regularly for signs of badger or bird activity. If any badgers, holes in the ground which could possibly be sett entrances, or nesting birds are encountered during the course of clearance activity, work should stop immediately and the appropriate environmental representative should be contacted.

10.7.4 Dingy skipper butterfly

The layout and design of the proposed works and planting for visual screening have been designed to minimise impact on resident butterfly populations in Ardersier Common.

Vehicular access must be taken from the existing road at the entrance to the WwTW. It is recommended that appropriate access routes, mobile plant operational areas and operational methods should be agreed with vehicle operators prior to clearance or construction works.

When working in the Dingy Skipper butterfly habitat areas, in order to minimise disruption to the ground, work is to be carried out from boards and/or temporary footways. It is the plant Bird's-foot Trefoil on which the butterflies eggs and larvae are principally found, which is to avoid being disturbed. The planting in this southern corner is to take place over two years to further minimise disturbance for the butterflies in any one year.

The inner faces of the 1:2 sloped bunds have the opportunity of being seeded with a wildflower and wild grass mix that will benefit the biodiversity of the surrounding area. Through discussions with the Ardersier Common ranger, kidney vetch shall be included as a food source for the Small Blue Butterfly.

It is recommended that vegetation clearance activities take place outwith the summer months when the dingy skipper is most active, to minimise risk of impact on this species.

10.7.5 Breeding birds

Construction activities to clear vegetation should be carried out outwith the breeding bird season to avoid impact on nesting birds.

It is recommended that clearance activities take place between August and February inclusive.

10.8 Residual Effects

Two slight adverse impacts have been noted:

- Impact on the dingy skipper butterfly through construction activities, and
- Impact on marine mammals and fish through construction activities, transmitted as underwater noise.

Impact on butterflies has been reduced as much as possible in design of the scheme, however there will be an inevitable minor residual impact from noise and dust during construction due the proximity of the site to Ardersier Common.

Mitigation for transmission of underwater noise has already been considered, however there is likely to be a minor residual impact on marine mammals and fish. It should be noted that this impact would be temporary and low in magnitude.

A separate assessment under the Habitats Regulations (92/43/EEC) must be completed, to determine risk of impact on the qualifying features of the Moray Firth SAC. This will take place after submission of the planning application and will be co-ordinated by the competent authority. As part of the HRA (Habitats Regulations Assessment), the competent authority will make a decision on the need for Appropriate Assessment.

10.9 Summary of Environmental Effects

No **significant** effects associated with the proposed development have been identified.

Some action to mitigation for impact on the dingy skipper butterfly, badgers, breeding birds and marine mammals and fish is required and detailed in Section 10.7.

The effect of the proposed development on the Moray Firth SAC and its component features of bottlenose dolphin and sandbanks is determined to be, overall, slightly positive.

Ecological impacts will be minimised if vegetation clearance activities are carried out during the months of August to February inclusive.

11. Air Emissions

11.1 Introduction

This chapter provides an air quality assessment of the proposed extension to Ardersier WwTW. The proposed development has the potential to affect air quality in the area by changing traffic flows on the local road network and generating dust during the construction phase. In addition, the proposed development has the potential to affect air quality during the operational phase through nuisance relating to odour levels.

This assessment of air quality includes the following key elements:

- Review of current air quality legislation relevant to this assessment
- Assessment of impact from odour
- A qualitative assessment of construction phase dust effect
- A quantitative screening assessment of construction phase traffic emissions
- A proposed list of mitigation measures to control air pollution during construction
- Consideration of residual effects and cumulative effects

11.2 Legislative Framework

11.2.1 Odour

Debate still exists as to what odour concentration constitutes an odour nuisance. Practical experience of UK wastewater treatment plant installations have shown that exposures of up to 5 OU_E/m^3, expressed as a 98 percentile of one hourly average odour concentrations do not generally cause odour nuisance (UKWIR, 2001). In general, once exposure exceeds 5 to 10 OU_E/m^3 at the 98^{th} percentile, then there is an increasing risk of annoyance or justified complaints.

New guidance as published in the Scottish Executive's Code of Practice on Assessment and Control of Odour Nuisance from Wastewater Treatment Works (Scottish Executive, 2005) states that: "there are a number of sources of benchmark values including the current Environment Agency Guidance value of 1.5 OU_E/m^3 as a 98th percentile of hourly averages for more unpleasant odours". The H4 Draft Guidance (Environment Agency, 2002) referred to by the Code of Practice recommends a maximum atmospheric odour concentration of 1.5 OU_E/m^3 at the site boundary for highly offensive processes. Highly offensive processes by definition cover wastewater treatment operations and any processes involving putrescible waste. The new guideline value, expressed as the 98 percentile of one hourly average odour concentrations, is applicable at all sensitive receptors around the site.

The Environment Agency's (H4: Horizontal Odour Guidance Parts 1 & 2) guidance is still currently a draft consultation document, with no statutory powers. Whether an odour is considered offensive or not has been discussed in detail in Appendix 2 of the H4 document. The document attempts to define the concept of a concentration that may constitute "no reasonable cause for annoyance. The Agency accepts that these guidelines can be modified upwards or downwards, for site specific circumstances and are undergoing revision.

The Scottish Executive's Code of Practice itself states that:

- The use of boundary odour limits as absolute control values is not recommended due to the difficulty in effective ambient measurement and also the uncertain relationship between odour concentration and nuisance; and

- It must be stressed that the modelling output relates to odour intensity and not odour nuisance and therefore care must be taken in the practical application of this data.

The Code of Practice identifies that: "the selection of an appropriate benchmark value would be for the operator to justify based upon the characteristics of the odour and the locality". Given the above, it would seem that there is still debate as to what ambient odour concentration constitutes an odour nuisance. For the purposes of this assessment therefore, odour concentrations above 5 OU_E/m^3 are taken as the basis for the prediction of an odour nuisance.

11.2.2 Dust from Construction Activities

Relevant policies include the UK Air Quality Strategy (AQS) 2007, whose production is a requirement of the Environment Act 1995. The AQS establishes the framework for air quality improvements. Measures agreed at the national and international level are the foundations on which the strategy is based. The first Air Quality Strategy was adopted in 1997 and was replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland published in January 2000. The 2000 Strategy has subsequently been replaced by the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 (DEFRA, Scottish Excecutive, Welsh Assembly Government and Department of the Environment Northern Ireland, 2008).

In addition, the Environment Act 1995 requires that the Environment Agency and the Scottish Environment Protection Agency (SEPA) have regard to the Air Quality Strategy in exercising their pollution control functions, particularly under the Environmental Protection Act 1990 and under the Pollution Prevention and Control Regulations 2000 (PPC) and the Pollution Prevention and Control (Scotland) Regulations 2000. Local Authorities are also required to work towards the Strategy's objectives prescribed in the Air Quality (Scotland) Regulations 2000 and the Air Quality (Scotland) Amendment Regulations 2002.

The air quality objectives included in the 2007 AQS are a statement of policy intentions or policy targets. As such, there is no legal requirement to meet these objectives except in as far as these mirror any equivalent legally binding limit values in EU legislation and relevant Scottish regulations.

For the purposes of this assessment, the UK 2007 AQS objectives are considered the most appropriate. The objectives for nitrogen dioxide (NO_2) and particulate matter less than 10 microns (10^{-6}m) aerodynamic diameter (PM_{10}), which are considered to be the only pollutants of concern within the study area and addressed in the AQS, are presented in Table 11.1

Table 11.1: Relevant Air Quality Objectives

Pollutant	Averaging Period	Air Quality Objective	Where applicable (a)
Nitrogen Dioxide (NO_2)	Hourly mean	200 µg/m^3 (b)	All locations where the annual mean and 24 and 8-hour mean objectives apply. Kerbside sites (e.g. pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully

Pollutant	Averaging Period	Air Quality Objective	Where applicable (a)
			enclosed, where the public might reasonably be expected to spend 1-hour or more. Any outdoor locations to which the public might reasonably expected to spend 1-hour or longer.
	Annual mean	40 µg/m^3	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, libraries etc.
Particles (PM_{10})	Daily mean	50 µg/m^3 [(c)]	All locations where the annual mean objective would apply. Gardens of residential properties.
	Annual mean	40 µg/m3	All locations where members of the public might be regularly exposed. Building facades of residential properties, schools, hospitals, libraries etc.
		18 µg/m^3[(d)]	

[(a)] Criteria are applicable only at locations where persons may be exposed over the averaging period

[(b)] Not to be exceeded more than 18 times per year. Expressed as the 99.79th percentile for calendar year.

[(c)] Not to be exceeded more than 35 times per year. Expressed as the 90.41st percentile for the calendar year.

[(d)] To be achieved by 2010

11.3 Assessment Methodology

11.3.1 Odour

The AERMOD atmospheric dispersion model version 5.9.0 was used to estimate dispersion of odours emitted from the wastewater treatment works. This is the standard model recommended by the US EPA for odour dispersion and similar studies. The modelling procedure was as follows:

- An OS map showing the proposed site location was used as a base map for AERMOD modelling;
- The location and arrangement of the proposed treatment units and buildings were input and shown on the base map;
- Certified pre-processed meteorological data was imported into AERMOD;
- Pre-processed terrain data was imported into AERMOD;
- All potential odour sources were identified and emission rates calculated using standard equations developed by the Water Research Centre (WRc, 1995). The results of this mathematical modelling were entered into AERMOD;
- Odour dispersion was simulated with 'building downwash' actuated. Actuation of building downwash ensures that the effects of buildings and other structures on plume dispersion and ambient air odour concentrations are taken into account;
- Several runs were undertaken to assess options; and

The output files were processed to give graphical representations of potential atmospheric odour concentration in the form of isopleth maps. These concentrations were then compared with odour concentration guidelines as identified in Section 11.2.

It should be noted that the dispersion modelling was conducted using the elevated terrain algorithm in AERMOD, which allows the effect of the surrounding terrain to be accounted for in the predicted atmospheric odour concentrations.

11.3.2 Dust from Construction Activities

Construction activities have the potential to lead to the generation and liberation of dust. Dust is a generic term used to describe a wide range of particulate materials that are generated from the disintegration of solids.

The size of dust particles is generally in the range 1 - 75 micrometres (µm) compared to PM_{10} which describes the fraction below 10 micrometres and is one of the local air quality pollutants regulated by the legislation discussed above. Dust can be generated through the use of construction materials particularly where demolition and excavation works are being undertaken and where large movements of materials occur.

Construction dust can be liberated by natural winds or through the movement of materials by vehicles and site plant. Implementation of adequate mitigation measures to control dust will reduce the likelihood of nuisances.

Currently there are no UK or Scottish statutory standards or limits appropriate for the assessment of deposited dust and its tendency for causing nuisance exist.

Construction dust has the potential to cause a statutory nuisance but this is defined by a subjective assessment by Environmental Health professionals. Although no numerical dust nuisance criteria have been formally adopted in the UK, guidance states that most non-toxic dusts will begin to be perceived as a nuisance when deposition reaches 200 mg/m^2/day. However, this does not consider the nature of the dust and a range of criteria from 133 to 350 mg/m^2/day is found in the literature (Greater London Authority, 2006).

The main potential effect of any dust emissions from the construction sites would be nuisance and loss of amenity due to soiling of surfaces, particularly windows, cars and laundry. By convention, therefore, the assessment of construction dust is normally confined to an evaluation of the likelihood that emissions may give rise to some perceptible nuisance, and therefore risk of dust effects. It is normally possible, by appropriate control, to ensure that dust deposition does not give rise to nuisance effects.

A Best Practice Guide (BPG) on the control of dust and emissions from construction and demolition has been produced by the Mayor of London, (Greater London Authority, 2006) in association with the Air Pollution Planning and the Local Environment (APPLE) working group, comprising participants from the Greater London Authority and the Association of London.

The BPG is designed to inform the planning process within London boroughs and assist developers in understanding the methods to control dust and emissions from construction and demolition activities. Although the BPG has been specifically produced for London, it represents the latest approach in

assessing potential construction phase effects on air quality and is therefore considered relevant to this assessment.

The BPG favours a qualitative risk style approach for assessing potential effects and provides the criteria presented in Table 11.2 for assigning a level of risk for dust effects. Mitigation measures are identified commensurate with the level of risk identified.

Table 11.2: London BPG Risk Assessment Criteria

Low risk sites
Development of up to 1,000 square metres of land
Development of one property and up to a maximum of ten properties
Potential for emissions and dust to have an infrequent impact on sensitive receptors
Medium risk sites
Development of between 1,000 and 15,000 square metres of land
Development of between ten to 150 properties
Potential for emissions and dust to have an intermittent or likely impact on sensitive receptors
High risk sites
Development of over 15,000 square metres of land
Development of over 150 properties
Potential for emissions and dust to have significant impact on sensitive receptors

These key factors are also addressed in the Buildings Research Establishment (BRE) guidance in Control of dust for construction and demolition activities (BRE Environment, 2003) and therefore both methodologies have been drawn upon for the purposes of this assessment.

The first stage of the assessment has included identification of key construction activities with the potential to generate dust and combustion related atmospheric emissions. Where possible, the scheduling of the construction works has been considered to provide a temporal and spatial element to the assessment. The locations of key receptors have been identified in Figure 11.1.

The results of the assessment have been used to determine the level of dust mitigation required in order to minimise or avoid the effects of dust nuisance.

11.3.3 Construction Vehicle Emissions

The Design Manual for Roads and Bridges (DMRB) screening method has been used to assess the potential impacts of proposed construction traffic routes to the WwTW site.

11.4 Baseline Conditions

11.4.1 Meterological Conditions

Atmospheric dispersion modelling requires hourly averaged values for wind speed and direction, cloud cover, height of the mixing layer and other parameters. Certified pre-processed meteorological data was obtained from Atmospheric Dispersion Modelling (ADM) Ltd for the years 2005, 2006, and 2007. Wind rose plots showing the prevailing wind direction for 2005, 2006 and 2007, respectively can be found in the Odour Dispersion Study provided as Technical Appendix H in Volume 3 of the Environmental Statement.

Most of the hourly meteorological parameters were obtained from the meteorological station at Inverness, the station closest to the proposed site. However, for all three years, missing cloud cover was taken from the station at Kinloss.

Meteorological data were chosen to be the most representative for the proposed location of the new wastewater treatment works. Actual weather conditions at the site may differ owing to the distance between the site and the station as well as differences in topography and ground roughness.

11.4.2 Sensitive Receptors

Twelve sensitive receptors near the wastewater treatment works have been identified, as presented in Figure 11.1:

1.Ministry of Defence (MOD) Playing Fields;

5. Coastal footpath past the site;

6. Ardersier Common;

7. Hillhead;

8. Fort George;

9. Outlying Fort George Site;

10.Outlying properties;

11.Outlying properties;

12.Outlying settlement of Ardersier;

13.Outlying settlement of Ardersier;

14.Outlying properties;

15.Outlying Fort George Site;

11.5 Identification of Environmental Effects

11.5.1 Odour

An odour dispersion study was commissioned by Scottish Water in 2008, and revised with an updated design layout in January 2010.

It is proposed that discharges from the settlements within the catchment are transferred to the upgraded works by an expanded collection system comprising pumping stations and rising mains. Each settlement will be served by an individual pumping station. The two pump stations for the Ardersier/Inverness Airport Development are to be located south of the site, while the Fort George and Whiteness pumping stations will be located to the North and North-east of the site, respectively.

It has been assumed for the purposes of this study that all gravity mains will be designed to British Standards and will therefore have low septicity. In addition, Nutriox dosing to the collection system will be undertaken to suppress the generation of septic conditions in the rising mains serving the collection system.

The upgraded works, serving an equivalent population (PE) of 8831, will comprise the following main process units:

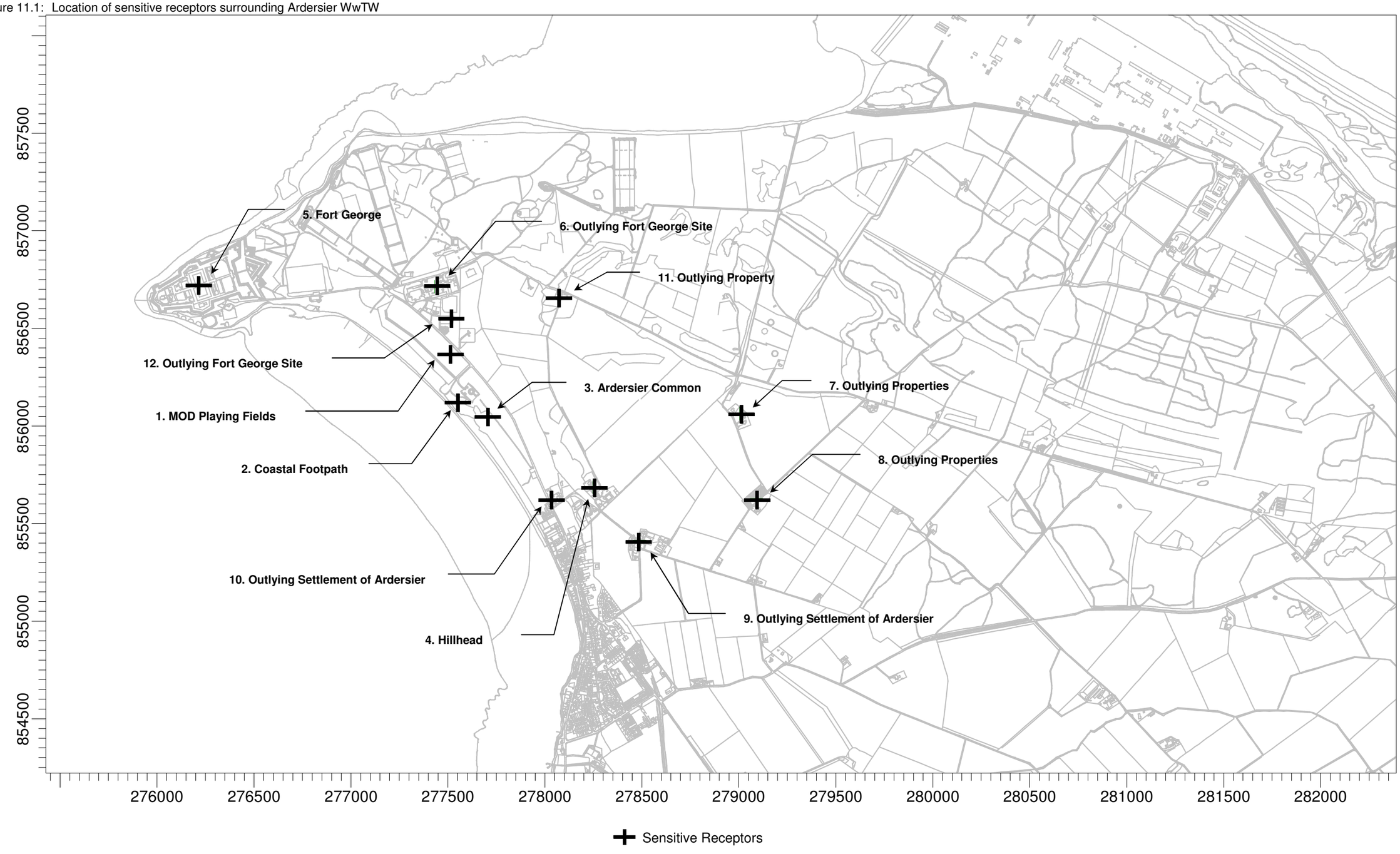
- 1 Nr inlet Balance Tank;
- 1 Nr Inlet Screens and Grit Removal;
- 2 Nr Primary Settlement Tanks;
- 1 Nr Interstage Pumping Station
- 2 Nr Activated Sludge Tanks;
- 2 Nr Final Settlement Tanks;
- 1 Nr SAS Buffer Tank;
- 1 Nr Mechanical Thickener (e.g. drum thickener);
- 1 Nr Sludge Consolidation Tank;
- 1 Nr Sludge Storage Tank;
- 1 Nr Return Liquors Pumping Station;
- 2 Nr Distribution Chambers;
- 1 Nr UV Plant;
- 1 Nr Washwater Pumping Station; and
- 1 Nr Final Effluent Pumping Station.

Tertiary treatment in the form of UV disinfection will be provided.

It is intended that the works will be located 50 to 60 metres west of the B9006 highway, between Ardersier and Fort George. A plant layout is provided in Figure 4.3.

The odour dispersal study aims to determine likely odour emissions from the works and the subsequent impact of such emissions beyond the site boundary. It should be noted that this report will focus on emissions as a result of normal operation of the works. While it does report on the effect of the tanker loading during desludging activities, it does not take into account odour generated as a result of other one-off or short term incidences.

Figure 11.1: Location of sensitive receptors surrounding Ardersier WwTW



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A summary of the predicted odour emissions from the plant is given in Table 11.3 for normal operations, both with and without odour abatement.

The greatest single source of odour at the works is the sludge storage tank, with a theoretical odour emission of 16 381 OU_E/s, approximately 40% of odour emitted from the site prior to odour control. Following abatement this is reduced to 7% of emissions.

During normal operations, other significant sources of odour are the return liquor pump station accounting for 21% of emissions (8 749 OU_E /s) and the sludge consolidation tank responsible for 11% of emissions (4 367 OU_E/s). Odour control of these two units sees their total contribution decreased to 5% of emissions. The proposed odour control strategy achieves a significant reduction (71% decrease) in odour emissions from the site.

The balance tank (including bellmouths), activated sludge aeration tanks and primary settlement tanks in combination contribute another 17% of emissions. The emissions from these sources are not odour controlled and therefore their contribution to the total residual emissions rises to 59%.

Table 11.3: Summary of theoretical odour emissions during normal operations prior to, and following, odour abatement.

Source	Prior to Abatement		With Abatement Strategy	
	Emission Rate (OU_E/s)	% of Total Odour Emissions	Emission Rate (OU_E/s)	% of Total Odour Emissions
Sludge Storage Tank	16 381	40.1	819	6.8
Return Liquors Pump Station	8 749	21.4	438	3.6
Sludge Consolidation Tank	4 367	10.7	218	1.8
Balance Tank & Bellmouths	3 292	8.1	3 292	27.4
Activated Sludge Aeration Tanks	2 124	5.2	2 124	17.7
Primary Settlement Tanks	1 678	4.1	1 678	14.0
Other emissions direct to atmosphere	4 213	10.3	3 435	28.6
Total	**40 803**	**100**	**12 004**	**100**

The theoretical odour emissions during desludging activities are presented in Table 11.4. A major source of emissions prior to abatement in this scenario is the tanker loading operations. The odour emanates from the displaced air released from the sludge tanker during loading. The actual odour emissions will depend on the previous tanker load and its odour potential. An average value has been selected for the purposes of this modelling. This modelling has also assumed that only one tanker loading point is in use at any point in time.

The largest source of odour emissions during desludging operations remains the sludge storage tank (31% of emissions prior to abatement). Tanker loading operations (which have been assumed to be odour controlled) contribute 24% of theoretical odour emissions prior to abatement and 5% following odour control. The proposed odour control strategy achieves a 76 % reduction in emissions from the site during desludging operations.

Of the residual abated emissions during desludging operations, the largest contributor is the balance tank (and associated bellmouth) at 26% of total residual odour emissions from the site. The activated sludge aeration tanks and primary settlement tanks contribute another 17% and 13% of emissions, respectively.

Although tanker loading activities will not occur on a daily basis, and are expected to last for less than an hour, they will occur periodically and given its impact on emissions, it is important to ensure efficient odour control of these emissions by the installation of appropriate odour control equipment and through good housekeeping by the tanker drivers.

Table 11.4: Summary of theoretical odour emissions during desludging activities prior to, and following, odour abatement

Source	Prior to Abatement		Following Abatement	
	Emission Rate (OU_E/s)	% of Total Odour Emissions	Emission Rate (OU_E/s)	% of Total Odour Emissions
Sludge Storage Tank	16 381	30.7	819	6.5
Tanker Loading Operations	12 530	23.5	627	5.0
Return Liquors Pump Station	8 749	16.4	438	3.5
Sludge Consolidation Tank	4 367	8.2	218	1.7
Balance Tank & Bellmouths	3 292	6.2	3 292	26.1
Activated Sludge Aeration Tanks	2 124	4.0	2 124	16.8
Primary Settlement Tanks	1 678	3.1	1 678	13.3
Other emissions direct to atmosphere	4 212	7.9	3 434	27.2
Total	**53 333**	**100**	**12 630**	**100**

The extraction rates for treatment in the odour control unit for each relevant process unit are listed in Table 11.5. For the tanks, ventilation rates have been derived based on 120% of the maximum fill rate. The mechanical thickener and the Poly & Thickener building are designed to 30 and 4 air changes per hour, respectively.

It should be noted that the current ventilation rates are based on both the maximum fill rates and tank dimensions as currently available at the outline design stage. This information is for tender purposes only and may change during the subsequent detailed design stage. It is therefore critical that both the ventilation rates and the odour modelling be updated at the next stage.

Table 11.5: Summary of predicted extraction volumes to be treated by Odour Control Unit

Source	Ventilation Rate Basis	Volume of Air Requiring Treatment in OCU (m^3/h)
SAS Storage Tank	120% of max fill rate	10.2
Mechanical Thickener	30 air changes per hour	135.0
Poly & Thickening Building	4 air changes per hour	2 041.6
Sludge Consolidation Tank	120% of max fill rate	13.1
Sludge Storage Tank	120% of max fill rate	29.7
Return Liquors Pump Station	120% of max fill rate	155.8
Total		**2385.3**

This study has assumed that process units which are covered but not ventilated will result in a 40% reduction in odour emissions from the unit. An investigation of the alternative methods to model process units which are provided with covers, but with no extraction of foul air was undertaken in the previous report (Mott MacDonald 2009). There was shown to be little difference between the two alternative assumptions: a) a 40% reduction in emissions at the process unit or b) transfer of all emissions to the next uncovered downstream unit. For simplicity of implementation, option a) (a 40% reduction in emissions) was therefore selected for all subsequent modelling.

11.5.2 Dust from Construction Activities

The list below summarises the main construction activities that will take place that have the potential to cause dust nuisance:

- Demolition and site clearance
- Earthworks
- Handling and disposal of spoil
- Wind-blow from stockpiles of particulate material
- Concrete batching (small scale)
- Cutting or drilling activities
- Movement of vehicles on site
- Handling of loose construction materials

The level and distribution of construction dust emissions will vary according to factors such as the type of dust, duration and location of dust-generating activity, weather conditions and the effectiveness of dust suppression measures.

Table 11.6 lists the activities due to take place as part of the scheme. The activities most associated with dust raising are groundworks and where large quantities of spoil or other materials are stored.

Table 11.6: Potential Dust Raising Activities

Activity	Description	Potential Dust-Raising Activities	Potential Dust Nuisance Risk
Site clearance and ground works	Clearance of vegetation Preparatory excavation or levelling works Excavated material will be considered for use on-site	Earthmoving Excavation Transport of materials Wind Resuspension of dust on unsurfaced roads	High
Construction of flood barrier and infrastructure	Construction of new plant Excavation for foundations	Transport of materials Storage of materials Preparation of materials (cutting etc.) Resuspension of dust on unsurfaced roads Wind	Low-Medium
Handling and removal of spoil	Storage of excavated materials and removal from site by road	Earthworks Storage of materials Wind	Medium

The existing WwTW will be left in place for this phase of the development, therefore no demolition activities will take place.

11.5.2.1 Sensitive Receptors

The area around the proposed scheme is quiet with some transient receptors such as local residents using the core paths network or the MoD playing fields and vehicular use of the B9006 highway, as well as animals in farmland adjacent to the WwTW site.

The location of the construction activities will take place within approximately 25 to 100 m of these receptors.

11.5.3 Construction Vehicle Emissions

Exhaust emission from construction traffic have the potential to impact upon surrounding sensitive residential receptors, especially if the diversion routes are proposed to direct additional HGVs though the streets of Ardersier.

The consideration of Heavy Goods Vehicles (HGV) movements within this assessment is important as they produce emissions an order of magnitude greater than Light Goods Vehicles (LGVs), such as cars and vans. A small increase in HGV numbers, especially within a rural location, can result in a significant impact on surrounding sensitive residential receptors, especially within Ardersier where a number of these receptors are located close to the proposed routes.

The detailed construction programme is unknown at this stage of the study; however, it is assumed that the work will continue for 18 months. It is envisaged that within this timeframe, an additional four HGV movements per day will result from proposed deliveries and removal of materials to and from the WwTW

site. As well as this, it is assumed that approximately 24 LGV movements per day will be generated from site worker traffic (see Chapter 13 Access and Traffic for more details).

Table 11.7 and Table 11.8 summarise the traffic data used within this assessment and consider both proposed diversion routes. The closest residential receptor for each road link has been used to predict the Annual Mean pollutant concentrations. The two main pollutants of concern are to be nitrogen dioxide (NO_2) and particulate matter (PM_{10}) with reference to vehicle emissions and will be considered within this assessment. Current Annual Mean Human Health Objectives for NO_2 and PM_{10} are 40µg m^{-3} and 18µg m^{-3} respectively.

Table 11.7: Estimated traffic in individual roads (Do-nothing traffic data)

Link	Road name	Annual Average Daily Traffic AADT (24-Hour) (number)	Total HDVs (number)	% HDVs (%)	Average Speeds (KPH)
1	A 96 (Newton to Golanfield, Whiteness Junction)	12542	1568	12.5	96
2	B9039 (A96 to Ardersier junction with B9092)	1252	100	8.0	96
3	B9092 (between B9030 and B9006)	778	62	8.0	96
4	B9006 (within Ardersier B9092 Cromal Mount - East Side)	1252	100	8.0	48
5	B9039 (within Ardersier B9092 Cromal Mount - West Side)	1252	100	8.0	48
6	B9006 (North of Adersier to Wastewater site)	1252	100	8.0	96
7	Unclassified Road through MOD facility	83	0	0	96

Table 11.8: Estimated traffic in individual roads (Do-something traffic data)

Link	Road name	AADT (24-Hour) (number)	Total HDVs (number)	% HDVs (%)	Average Speeds (KPH)
1	A 96 (Newton to Golanfield, Whiteness Junction)	12570	1572	12.5	96
2	B9039 (A96 to Ardersier junction with B9092)	1280	104	8.2	96
3	B9092 (between B9030 and B9006)	799	66	8.3	96
4	B9006 (within Ardersier B9092 Cromal Mount - East Side)	1280	104	8.2	48
5	B9039 (within Ardersier B9092 Cromal Mount - West Side)	1280	104	8.2	48
6	B9006 (North of Adersier to Wastewater site)	1280	104	8.2	96
7	Unclassified Road through MOD facility	114	4	4	96

The UK Air Quality Archive (UKAQA) provides estimates for NO_X, NO_2 and PM_{10} concentrations across the UK at a resolution of 1km^2 for the years 2006 to 2020. An adjustment to avoid double counting of roads,

removes the road contribution in a specific grid reference. Corrected background pollutant concentrations for the study area have therefore been used within this assessment.

11.6 Assessment of Significant Environmental Effects

11.6.1 Atmospheric Odour Concentration

Figure 11.2 to Figure 11.5 are isopleth maps depicting the predicted 98 percentile odour contours for the combination of odour sources and calculated emission rates during normal operations for all three years of meteorological data (2005, 2006 and 2007) incorporating the current proposed odour control strategy.

There was some variation in odour dispersion across the three years, but for all years the isopleths maps indicate that, 98% of the time, the maximum atmospheric concentration expected at all twelve sensitive receptors should not exceed 5 OU_E/m^3 during normal operations and should therefore not produce an odour nuisance.

Odour concentrations at three of the receptors (numbers 1, 2 and 11 - MOD playing fields, coastal footpath and an outlying property) are expected to lie between 1.5 and 5 OU_E/m^3. The expected odour concentrations at these three receptors varied slightly by year. The results are summarised in Table 11.9.

The predicted odour concentrations for receptor 1 varied between 1.2 and 2.1 OU_E/m^3 over the years 2005 to 2007. Similarly, the concentrations at receptor 2 varied from 2.0 to 4.1 OU_E/m^3 over the three years. The values for receptor 2 are at a nominal position along the coastal footpath. If one considers the entire stretch of the footpath then predicted atmospheric odour concentrations could range from 0 to 8 OU_E/m^3 for the years 2006 and 2007 during normal operations. The year 2005 shows a reduced atmospheric odour concentration for the coastal footpath, ranging from 1.5 to 5.1 OU_E/m^3.

Sensitive receptor 11, the outlying property to the north east of the Ardersier site, could be expected to experience ambient odour concentrations of between 2.6 and 3.1 OU_E/m^3 during normal operations for the years 2005 to 2007.

Table 11.9: Summary of predicted odour concentrations for receptors 1 and 2 during normal operations for years 2005 to 2007, and 2006 during desludging activities

Receptor No	Odour Concentrations (98 percentile values)			
	2005	2006	2007	2006 Desludging Activities
1 (MOD Playing Fields)	2.1 OU_E/m^3	1.5 OU_E/m^3	1.2 OU_E/m^3	1.8 OU_E/m^3
2 (Coastal Footpath)	2.0 OU_E/m^3	3.7 OU_E/m^3	4.1 OU_E/m^3	3.7 OU_E/m^3
11 (Outlying Property)	2.0 OU_E/m^3	3.1 OU_E/m^3	2.6 OU_E/m^3	3.3 OU_E/m^3

Short sections of the nearby B9006 highway, close to the works, may also be subject to atmospheric odour concentrations of between 25 and 50 OU_E/m^3 98ile. The difference in odour concentrations seem to stem from the differing meteorological conditions for each year, which result in more or less elongated odour isopleths.

The worst case was assumed to be the year with the largest extent of the 1.5 OU_E/m^3 limit. In this case, it was determined to be 2006. This meteorological data was then used to model the effect of desludging operations.

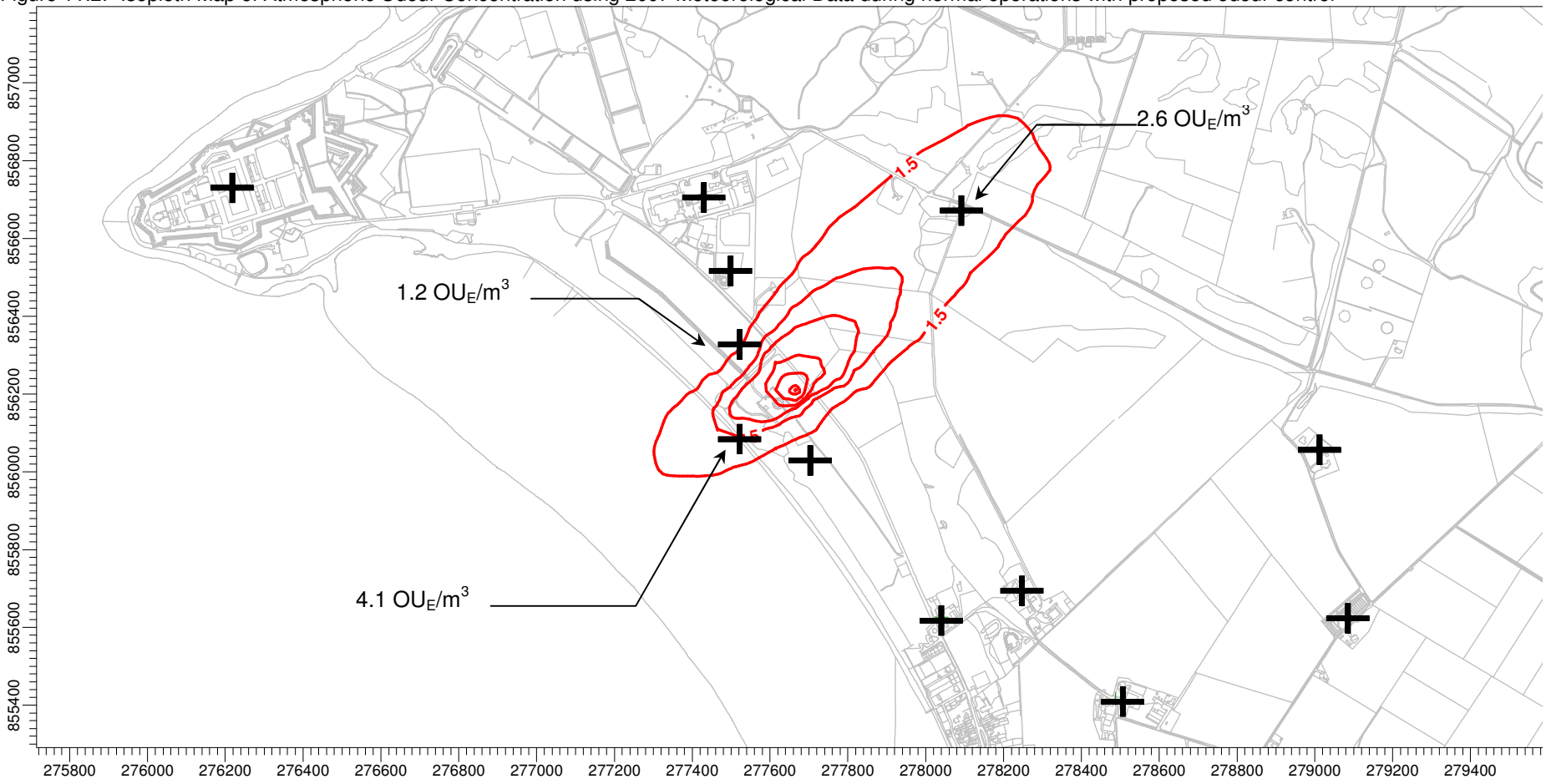
Figure 11.5 shows the isopleth map generated as a result of modelling tanker loading activities using the 2006 meteorological data. . During these operations all twelve sensitive receptors should experience maximum atmospheric odour concentrations of less than 5 OU_E/m^3 98ile and are therefore not expected to produce an odour nuisance during tanker loading activities in the worst case year.

As was found for normal operating activities, three receptors are likely to be subject to atmospheric odour concentrations of between 1.5 and 5 OU_E/m^3 during desludging activities (1.8, 3.7 and 3.3 OU_E/m^3 respectively for receptors Nr 1, 2 and 11). Considering the entire length of the coastal footpath, the predicted odour concentration could range from 0 to 8 OU_E/m^3.

Atmospheric odour concentrations of up to 50 OU_E/m^3 98ile could be experienced on short stretches of the B9006 highway. It should be noted, however, that these receptors are transitory and not residential and will therefore only be subject to intermittent nuisance.

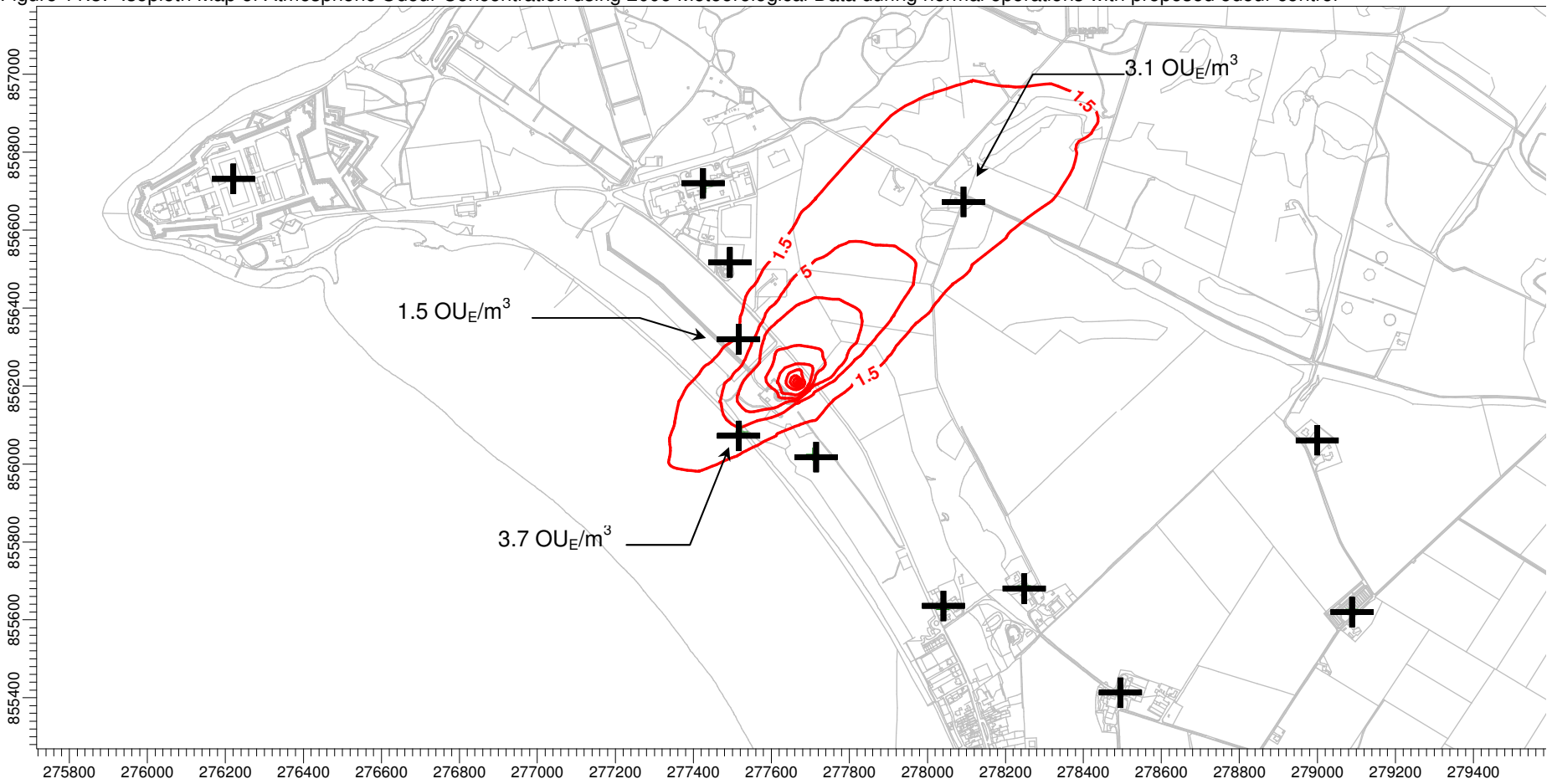
It can be seen, therefore, that desludging activities produce a minimal increase on the predicted odour concentrations from the site, with the assumed odour control strategy in place. Although tanker loading activities will not occur on a daily basis, and are expected to last less than an hour, they will occur periodically. It is therefore critical that odour control for the tanker loading is provided, is well maintained and that good housekeeping be adhered to by the tanker drivers.

Figure 11.2: Isopleth Map of Atmospheric Odour Concentration using 2007 Meteorological Data during normal operations with proposed odour control



Odour contours represented are: 1.5, 5, 10, 25, 50, 100 and 150 OU_E/m^3.

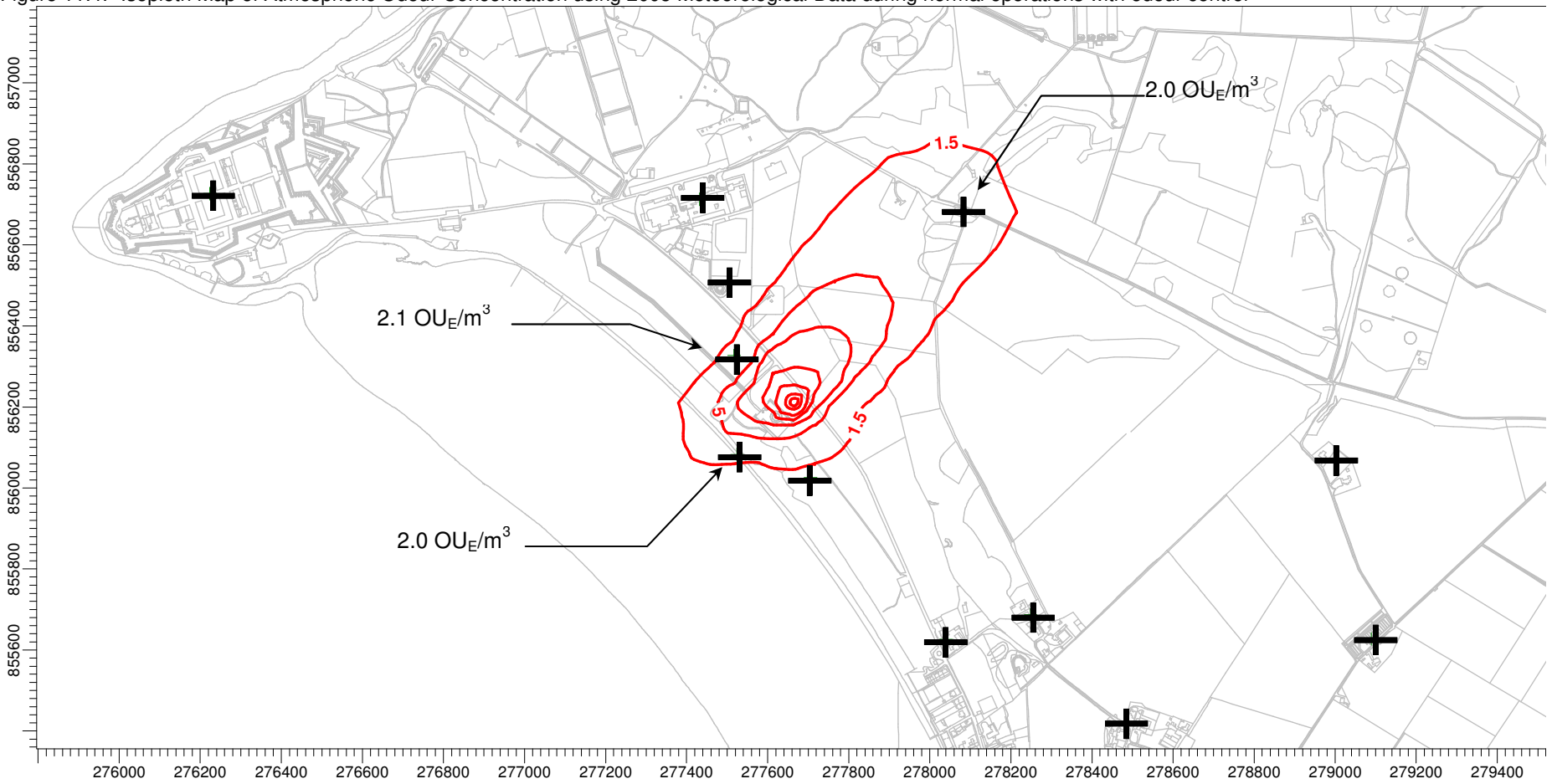
Figure 11.3: Isopleth Map of Atmospheric Odour Concentration using 2006 Meteorological Data during normal operations with proposed odour control



Sensitive Receptors

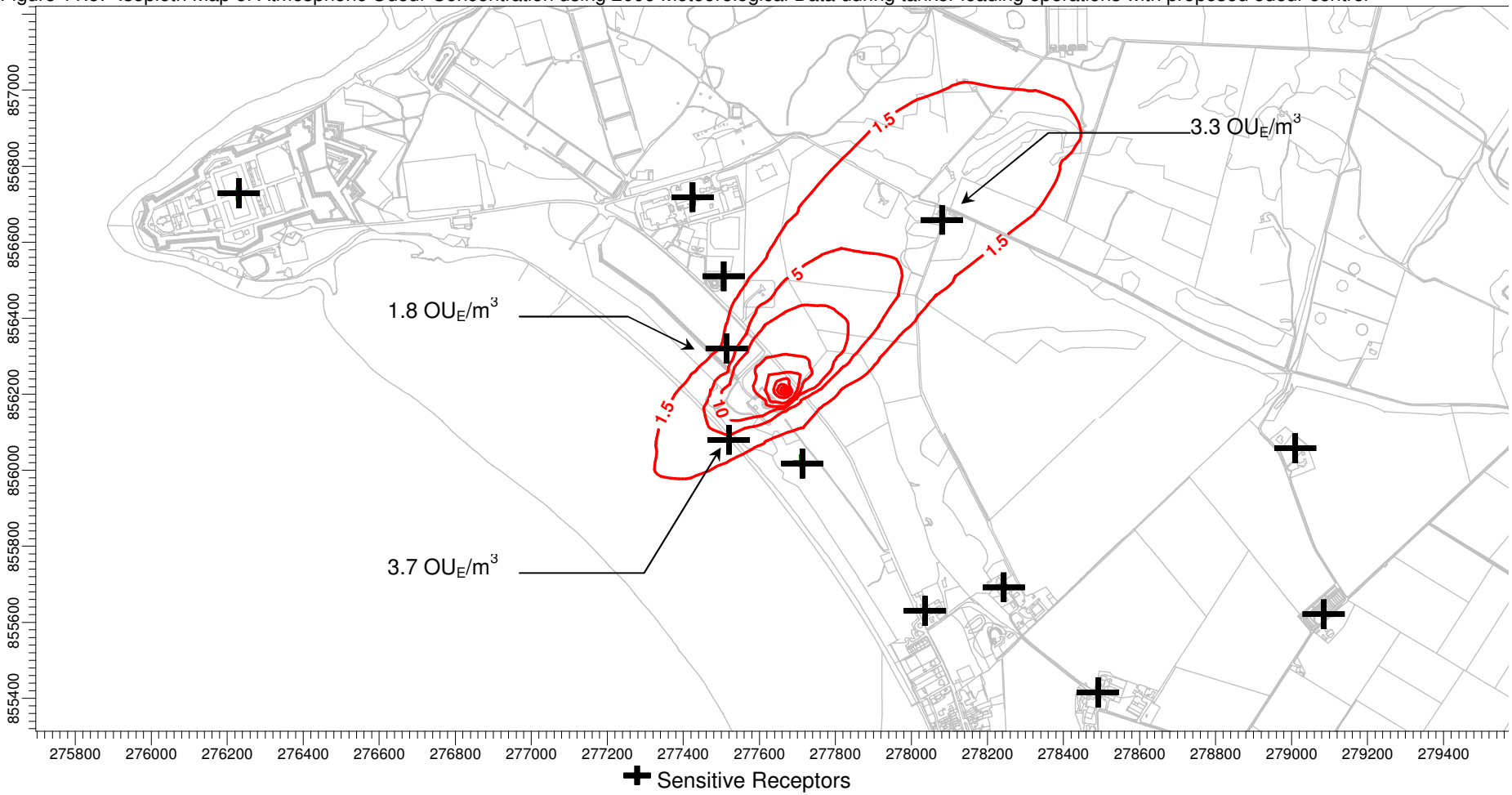
Odour contours represented are: 1.5, 5, 10, 25, 50, 100, 150, 200 and 250 OU_E/m^3.

Figure 11.4: Isopleth Map of Atmospheric Odour Concentration using 2005 Meteorological Data during normal operations with odour control



Odour contours represented are: 1.5, 5, 10, 25, 50, 100 and 150 OU_E/m^3.

Figure 11.5: Isopleth Map of Atmospheric Odour Concentration using 2006 Meteorological Data during tanker loading operations with proposed odour control



Odour contours represented are: 1.5, 5, 10, 25, 50, 100, 150, 200 and 250OU_E/m^3.

11.6.2 Dust from Construction Activities

11.6.2.1 Risk of Dust Emissions

Given the scale of the proposed development the low risk site category for control of dust and emissions from construction and demolition can be applied.

Routine dust control measures would normally ensure that the risk of long-term effects is insignificant but short-term events may occur, for example, due to technical failure or exceptional weather conditions. Following these stages, the overall dust nuisance has been determined, and mitigation measures, consistent with those provided in the London BPG, identified.

11.6.2.2 Nuisance Potential

Based on the dust raising potentials described in Table 11.10, the overall dust nuisance risk has been assessed based on the types of activities due to take place on the sites, the location of sensitive receptors, and the expected frequency of the nuisance. The latter is based on the intensity of the works that takes place on each site. Although the overall construction period is expected to take place for 18 months, this does not mean the works are continuous throughout the entire period. Construction activities will be scheduled to stop at weekends.

With the above considered, the overall risk of dust nuisance at each site is summarised in Table 11.10.

Table 11.10: Overall Dust Nuisance Potential

Dust Raising Potential	Distance to Sensitive Receptors	Frequency of Potential Nuisance	BGP Risk Level	Nuisance Risk
Medium	25 – 100 m	Medium	Low	Low - Medium

Works could pose a risk of dust nuisance if not properly mitigated due mostly to the nature of the activities taking place over the period of construction, however nuisance risk is classified as low - medium.

11.6.3 Construction Vehicle Emissions

Table 11.11 and Table 11.12 summarise the results for predicted changes in NO_2 and PM_{10} concentrations respectively during the construction phase.

Table 11.11: NO_2 Predicted Annual Mean Concentration and Predicted Changes

Receptor Link	Receptor Description	OS Grid Coordinates		NO_2 Annual Mean Concentration µg m^{-3}		Percentage Change
		X	Y	Do-Minimum	Do-Something	
1	Residential Property at Mid Coul (off A96)	277599	850941	9.02	9.04	0.2
2	Residential Property at Connage (Off B9039)	277419	853281	3.70	3.74	1.0
3*	Residential Property at Smithstown (Off B9092)	279189	854796	2.58	2.59	0.5
4	Station Drive (Closest property to Station Drive) (Off B9006 within Ardersier)	278449	854861	3.23	3.27	1.1

Receptor Link	Receptor Description	OS Grid Coordinates		NO_2 Annual Mean Concentration µg m^{-3}		Percentage Change
		X	Y	Do-Minimum	Do-Something	
5	Stuart Street (opposite West End Drive) (Off B9039 within Ardersier)	278154	854716	3.26	3.30	1.2
6	Chromal Terrace (Closest Property to High Street) (Off B9006 north of Ardersier)	278024	855531	2.99	3.03	1.3
7**	Residential Property at Baddock (Off Unclassified Road through MOD land)	279714	856136	2.00	2.04	2.2

Note: * Indicates that receptor is only relevant to diversion route 5. ** Indicates that receptor is only relevant to diversion route 6

Table 11.12: PM_{10} Predicted Annual Mean Concentration and Predicted Changes

Receptor Link	Receptor Description	OS Grid Coordinates		PM_{10} Annual Mean Concentration µg m^{-3}		Percentage Change
		X	Y	Do-Minimum	Do-Something	
1	Residential Property at Mid Coul (off A96)	277599	850941	8.93	8.94	0.1
2	Residential Property at Connage (Off B9039)	277419	853281	7.64	7.65	0.1
3*	Residential Property at Smithstown (Off B9092)	279189	854796	7.28	7.28	0.0
4	Station Drive (Closest property to Station Drive) (Off B9006 within Ardersier)	278449	854861	7.83	7.84	0.1
5	Stuart Street (opposite West End Drive) (Off B9039 within Ardersier)	278154	854716	7.84	7.85	0.1
6	Chromal Terrace (Closest Property to High Street) (Off B9006 north of Ardersier)	278024	855531	7.45	7.45	0.1
7**	Residential Property at Balldock (Off Unclassified Road through MOD land)	279714	856136	7.07	7.08	0.1

Note: * Indicates that receptor is only relevant to diversion route 5. ** Indicates that receptor is only relevant to diversion route 6

NO_2 and PM_{10} concentrations at representative receptors along both of the proposed diversion routes are predicted to be extremely small and well below the UK and Scotland air quality objectives set for human health. Given these extremely small changes in predicted NO_2 and PM_{10} concentrations as well as the temporary nature of the HGV movements within the Study Area during the construction period, no predicted significant impacts would result to the surrounding sensitive receptors as a result of increased HGV movements.

11.7 Mitigation

11.7.1 Proposed Odour Control Strategy

The current odour control strategy on-site constitutes capturing and treating odorous air from the following units/processes:

- SAS Buffer Tank;
- Mechanical Thickener;
- Poly & Thickening Building;
- Sludge Consolidation Tank;
- Sludge Storage Tank;
- Tanker Loading Operations; and
- Return Liquors Pump Station.

All units other than the tanker will be enclosed and vented to a central odour control unit. The tanker, however, will not be enclosed or ventilated, but odour abatement could be provided either by venting the off gases to a localised carbon adsorption unit, or as tanker loading operations are periodic to a portable unit (e.g. SC Protect System), or a carbon filter fitted directly to the tanker. The later is probably the least appropriate.

The current odour control strategy is shown to be effective at reducing the theoretical odour emissions from the works by approximately 71% during normal and 76% during tanker loading operations. For these estimates, the odour control equipment installed at the works has been assumed to remove 95% of the odour extracted for treatment, as required by the Scottish Executive's Code of Practice on Assessment and Control of Odour Nuisance from Wastewater Treatment Works, 2005. In practice, removals of odour may be higher.

The single largest source of odour at the proposed works is from the sludge storage tank. Emissions from this tank are odour controlled and reduce to approximately 7% of abated emissions. Tanker loading operations are the second largest source of odour emissions. Odour control of the tanker loading operations is incorporated into the design and has been assumed for this modelling. The efficacy of odour control for this operation, however, is reliant on adherence to good housekeeping procedures and strict use of the odour control device during loading operations by tanker drivers.

In addition to the current odour control strategy, it is recommended that an Odour Management Plan incorporating good housekeeping is implemented for the entire site. This should incorporate the following points (Scottish Executive's Code of Practice on Assessment and Control of Odour Nuisance from Wastewater Treatment Works, 2005; UK WIR, 2006):

- The site should be maintained in a clean condition. Any spills should be cleaned promptly;
- Skips of grit and screenings should be removed swiftly once full;

- Particular attention should be paid to site drainage;
- Good maintenance of process units and operation under optimal conditions to prevent the development of septicity. Septicity may lead to the generation of hydrogen sulphide, a major cause of odours at wastewater treatment works; and
- Prevention of solids build-up in tanks, particularly primary tanks. These should be regularly cleaned and desludged. Particular attention should also be paid to any storm holding capacity at the site.

It should be noted that all estimations in this report are theoretical and based on Mott Macdonald's experience of other wastewater treatment works. Actual odour emissions and subsequent achievable odour removal efficiencies may differ.

11.7.2 Dust from Construction Activities

Dust control measures are well developed and are capable of eliminating or reducing emissions to a level such that nuisance is unlikely to occur. The key activities in mitigating dust nuisance are: firstly, to prevent dust from being released (by using techniques that minimise the production of dust); secondly, to prevent the liberation of this dust as far as practicable through dampening and cleaning techniques; and thirdly, to enclose the construction area or protect sensitive receptors.

The mitigation measures will minimise the amount of dust generated primarily through the use of water control to dampen the dust and prevent it from being suspended and transported by the wind. Similarly, they recommend that materials be kept covered for the same reasons.

The GLA and Mayor of London's guidance "The Control of Dust and Emissions from Construction and Demolition – Best Practice Guidance" (Greater London Authority, 2006) has been used to inform the selection of mitigation measures for the construction of the proposed flood defences. These measures are presented below:

11.7.2.1 Site Planning

- Erect solid barriers to site boundary;
- No bonfires;
- Plan site layout – machinery and dust causing activities should be located away from sensitive receptors;
- All site personnel to be fully trained;
- Trained and responsible manager on site during working times to maintain logbook and carryout site inspections;
- Hard surface site haul roads;

11.7.2.2 Site Activities

- Minimise dust generating activities;

- Use water as dust suppressant where applicable;
- Cover, seed or fence stockpiles to prevent wind whipping;
- Re-vegetate earthworks and exposed areas;
- If applicable, ensure concrete crusher or concrete batcher has permit to operate;
- Minimise drop heights from conveyors, loading shovels, hoppers and other handling equipment.

11.7.3 Construction Vehicle Emissions

- All vehicles to switch of engines – no idling vehicles;
- Effective vehicle cleaning and specific fixed wheel washing on leaving site and damping down of haul routes;
- All loads entering and leaving site to be covered;
- No site runoff of water or mud;
- On- road vehicles to comply to set emission standards;
- Minimise movements of construction traffic around the site;
- Hard surfacing and effective cleaning of haul routes and appropriate speed limit around site.

11.8 Residual Effects

11.8.1 Odour

Debate still exists as to what odour concentration constitutes an odour nuisance. Practical experience of UK wastewater treatment plant installations have shown that exposures of up to 5 OU_E/m^3, expressed as a 98 percentile of one hourly average odour concentrations do not generally cause odour nuisance (UKWIR, 2001). Results indicate that maximum atmospheric odour concentrations at all twelve identified sensitive receptors should not exceed 5 OU_E/m^3 98ile during normal operations and desludging activities, and should therefore not produce an odour nuisance. Consequently, no further mitigation measures are required for odour in the operational phase.

11.8.2 Dust from Construction Activities

Use of best practice techniques during construction and mitigation measures outlined in Section 11.7.2 are expected to reduce environmental effects from air quality during construction to an acceptable level, with minimal residual effects.

It is expected that there will be a minor residual risk of impact on the dingy skipper butterfly as discussed in Section 10.8, however this can be mitigated to some degree by carrying out vegetation clearance outwith the summer months (August to February inclusive).

11.8.3 Construction Traffic

The site manager, or other delegate, should liaise with the local community in order to determine whether the mitigation measures employed are sufficient to avoid any construction dust nuisance. By incorporating a grievance mechanism for the community the site manager can be made aware of any issues that may arise involving nuisance and effect appropriate measures to minimise the risk of any future nuisance from occurring.

11.9 Summary of Environmental Effects

Theoretical odour emissions from the proposed Ardersier wastewater treatment works have been estimated and used in a standard atmospheric dispersion model (AERMOD) to determine the 98 percentile atmospheric odour concentrations in the proximity of the works using meteorological data for the three-year period from 2005 to 2007.

Results indicate that maximum atmospheric odour concentrations at all twelve identified sensitive receptors should not exceed 5 OU_E/m^3 98ile during normal operations and desludging activities, and should therefore not produce an odour nuisance.

The coastal footpath may be subject to odour concentrations of between 2 and 4 OU_E/m^3 98% of the time during normal operations, depending on which year is considered. During tanker loading operations, this receptor may be subject to odour concentrations of 3.7 OU_E/m^3. Considering the entire length of the coastal footpath, the predicted odour concentration could range from 0 to 8 OU_E/m^3 98ile during both normal activities and desludging operations.

The MOD playing fields could experience atmospheric odour concentrations of between 1.2 and 2.1 OU_E/m^3 98ile during normal operations and desludging activities. The outlying property to the north-east of the site could experience odour concentrations of between 2.0 and 3.3 OU_E/m^3 98ile during normal operations and desludging activities. The B9006 highway may also experience odour concentrations of between 25 and 50 OU_E/m^3 98ile, both during normal and tanker loading operations.

It should be noted that the coastal footpath, MOD Playing Fields and the B9006 highway are transitory receptors (i.e. not permanent residencies) and will therefore only be subject to intermittent nuisance.

Although tanker loading will not occur on a daily basis, and is expected to last less than an hour, it will occur periodically. It is therefore critical that efficient odour control is provided on-site for tanker connections, that it is well maintained, and that good housekeeping practices are adhered to by the tanker drivers.

Environmental effects from construction vehicle emissions are expected to be low, with dust emissions from construction work at low-medium level of impact, further reduced by mitigation of good practice during construction.

Table 11.13: Summary of risk of air quality impacts

Hazard	Receptor	Impact	Level of Impact
Exposure to odour concentrations between 2.0 and 3.3 OU_E/m^3 98%ile during normal operations and desludging activities	Permanent receptor: outlying property at cemetery	Certain Local Long term	Minor
Exposure to odour concentrations between 0 and 8 OU_E/m^3 98%ile during normal operations and desludging operations	Transitory receptor: coastal footpath	Certain Local Long term	Minor
Exposure to odour concentrations between 1.2 and 2.1 OU_E/m^3 98%ile during normal operations and desludging activities	Transitory receptor: MoD playing fields	Certain Local Long term	Minor
Exposure to odour concentrations between 25 and 50 OU_E/m^3 98%ile during normal operations and tanker loading operations	Transitory receptor: B9006 road	Certain Local Long term	Moderate
Dust emissions from Construction Work	Transitory receptors; coastal footpath, playing fields and B9006. Permanent receptor, farm animals.	Certain Local Short term	Low-Medium
Construction Vehicle Emissions	Receptors listed in Tables 11.11 and 11.12	Certain Local Short term	Low

12. Noise and Vibration Emissions

12.1 Introduction

Noise effects will arise through a number of sources during operation of the proposed extension to the WwTW, potentially generating noise levels that are in excess of prevailing conditions and affecting noise sensitive receptors outside of the site.

Baseline noise monitoring has been undertaken in the immediate vicinity of the site and forms the point of reference against which modelled emissions are to be evaluated. Predicted effects have been determined on the basis of recognised protocols and assessed in the context of appropriate legislation and guidance.

The objectives of the assessment are to:

- Establish baseline conditions at the nearest noise sensitive receptors;
- Determine the potential operational noise effects of the proposed WwTW extension;
- Provide general guidance on construction and decommissioning noise effects arising as a result of the proposed WwTW extension; and,
- Develop, as necessary, mitigation and control measures to minimise adverse effects.

Although the outline design of the proposed WwTW is complete, revisions to the detailed design are ongoing. Consequently, in order to undertake an assessment of the potential operational noise effects, it has been necessary to make a number of assumptions.

12.2 Legislative Framework

The Scottish Government offers guidance and strategy in relation to the potential noise effects from new development. This guidance is detailed in the documents specified below:

- Circular 10/1999: Planning and Noise; and,
- Planning Advice Note 56 (PAN 56): Planning and Noise.

Circular 10/1999 states:

> "…the planning system has a role to play in preventing and minimising the impact of noise through its influence over the location and design of new developments. It should aim to do this without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business."

A structure for managing environmental noise and development is outlined in PAN 56. The guidance states that a noise impact assessment will assist planning authorities where developments could raise significant noise issues. The need for balancing the benefits of development with environmental noise effects is detailed in PAN 56:

> "Noise can have a significant impact upon our health, quality of life and the environment generally. This advice note demonstrates the role of the planning system in preventing

> and limiting the adverse effects of noise without prejudicing investment in enterprise, development and transport."

According to PAN 56, the noise impact assessment should seek to:

> "Measure or predict and describe noise levels (including traffic noise) to be generated by the proposed development; or that the proposed development is to be subjected to criteria for assessing the impact of noise on its surroundings and outline measures available to reduce noise impact to acceptable levels"

In addition to Scottish Government guidance, specific direction in relation to noise is also detailed in:

- The Control of Pollution Act, 1974 (CoPA);
- The Environmental Protection Act, 1990 (EPA);
- British Standard 7445 (BS 7445): Description and measurement of environmental noise. Guide to quantities and procedures;
- ISO 9613: Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation;
- British Standard 5228 (BS 5228): Code of Practice for Noise and Vibration Control on construction and open sites; and,
- British Standard 4142 (BS 4142): Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas.
- Department of Environment's Advisory Leaflet 72 (DoE AL 72)

The CoPA may be used to control noise via imposing or negotiating operating conditions on the development site whilst under Part III of the EPA, a Local Authority has a duty to investigate a complaint of noise from vehicles, machinery or equipment, as amended by the Noise and Statutory Nuisance Act 1993. An abatement notice may be served by the Local Authority if an environmental health officer is satisfied that a statutory nuisance has occurred.

Baseline measurements in this assessment have been made in compliance with BS 7445 and the ISO 9613 algorithm has been used to model operational noise emissions from the proposed extension to the WwTW. The potential operational effects have been determined in accordance with the principles of BS 4142, the most widely used guidance for industrial noise assessment in the United Kingdom.

Although DoE AL 72 is no longer in print, the document remains the most commonly cited reference in construction noise assessments in the UK. As such, the recommendations of DoE AL 72 are followed in this report.

12.3 Assessment Methodology

12.3.1 Operational Noise

The guidance of BS 4142 provides a means of forecasting whether noise emissions from an industrial facility are likely to provoke complaints from the occupiers of an adjacent dwelling. It applies a relative noise limit based on the permitted increase in noise with respect to background noise level, and includes an adjustment for the character of the noise, where tonal, impact or intermittent components to the noise are penalised.

The Standard compares the measured or predicted noise from a source, as received at a noise sensitive receptor (eg a house), with the background noise level at the same position minus the industrial noise source. This is represented by subtracting the percentile exceedance level of the residual noise (L_{90}) from the rating level (the received noise plus the 5 dB character adjustment) if appropriate. The Standard offers the following direction:

- If the received contribution, corrected for its character, is more than 10dB below the measured background noise level, then this is a positive indication that complaints are unlikely;
- If the received contribution, corrected for its character, is more than 5dB in excess of the pre-existing background noise level then the likelihood of provoking complaints is marginal; and
- If the received contribution, corrected for its character, is more than 10dB in excess of the pre-existing background noise level, the indication is that complaints are likely to be provoked.

The noise parameters used in the criteria are total 'A' weighted levels and these can be applied during day time or night-time, the latter being the most sensitive time of day.

Noise limits in planning conditions are usually established on the guidance of BS 4142.

Significance Criteria

The effect of change in noise level is a function of the degree to which predicted emissions are at variance with baseline conditions. The significance criteria for operational noise effects of the proposed extension to the WwTW have been derived based on the guidance of BS 4142 and the Institute of Acoustics (IoA)/Institute of Environmental Management and Assessment (IEMA) guidance on the Assessment of Environmental Noise, as outlined below:

- **Major:** A change in excess of 5dB(A). Up to or more than a doubling/halving of noise level;
- **Moderate:** A change in the range of 3 to <5dB(A). A noticeable change in noise level;
- **Minor:** A change in the range of 0.1 to <3dB(A). Barely perceptible change in noise level; and,
- **None:** A change in noise level of <0.1dB(A). No change in environmental conditions.

Acoustic modelling of the operational phase is assessed against the above significance criteria in order to determine the effects of the planned site extension on adjacent noise sensitive receptors.

12.3.2 Construction Noise

A range of factors determine the acceptability of construction site noise in addition to the actual noise levels produced by plant items. These include the location of work positions, hours of work, baseline conditions, noise screening, the nature of work being carried out, and the attitude of the receptor and site operator.

It is generally accepted by local authorities that due to the temporary nature of construction noise, it warrants less stringent controls on noise emissions than that of a permanent operational development. Strict noise control measures can also be difficult to impose due to the transient nature of the works and may also hinder site progress.

The type of equipment used at the proposed extension site will vary in sound power level, with heavy plant items such piling rigs, trucks and excavators being the most significant sources of noise. Such equipment typically have more low frequency noise content (20Hz to 200Hz) to their emissions, meaning that noise is generally not attenuated as effectively by atmospheric effects and ground absorption. This has the effect of low frequency noise being more audible at greater distances.

Significance Criteria

Fixed limits do not apply to construction site noise in the UK. Although BS 5228 specifies a noise and vibration prediction methodology, it does not recommend a method determining the level of potential disturbance arising from the received noise levels. In this instance, it has been necessary to develop a significance criterion based on the guidance of the Department of Environment's Advisory Leaflet 72 (DoE AL 72).

DoE AL 72 recommends that the daytime noise levels outside the nearest occupied room in a noise sensitive property should not exceed the following levels over a normal working day:

- 75 dB(A) in urban areas near to main roads in heavy industrial areas; or,
- 70 dB(A) in rural, suburban and urban areas away from main road traffic and industrial noise.

The DoE AL 72 guidance is normally taken to represent the values above which moderate to major effects can take place. It is recognised that prolonged exposure to construction noise at a level significantly above the DoE AL72 rural criterion of 70 dB(A) in a setting such as Ardersier is likely to result in disturbance to the occupiers of nearby properties or other sensitive receptors.

The practicality of any proposed construction noise effect criterion, in addition to the likely level of noise generated and the duration of exposure, should be considered when establishing a standard that is designed to protect the local environment.

Appropriate reference values for construction effects have been derived based on the recommendations of DoE AL72, in addition to other relevant guidance. The significance criterion used in the assessment of construction noise is presented in Table 12.1.

Table 12.1: Construction Noise Significance Criterion

Effect Significance	Description	Duration	Construction Noise at Receptor dB(A)
Major	A significant change in conditions	Months	60 - 65
		Weeks	65 - 70
		Days	> 70
Moderate	A material but non-significant change in conditions	Months	55 - 60
		Weeks	60 - 65
		Days	65 - 70
Minor	A perceptible but restricted change in conditions	Months	50 - 55
		Weeks	55 - 60
		Days	60 - 65
Negligible	A potentially perceptible but non-significant change in conditions	Months	< 50
		Weeks	< 55
		Days	< 60

The significance criterion detailed in Table 12.1 represents a balanced compromise between practical limitations and the necessity to maintain an acceptable local noise climate. The term 'negligible' has been used instead of 'none' as construction noise is unlikely to have no effect at 50dB(A) to 60dB(A) regardless of the duration of proposed work.

12.4 Baseline Conditions

The proposed extension site is to be developed on land immediately adjacent to the existing WwTW. The area in the immediate vicinity of the site may be described as rural in character and is generally used for agricultural pursuits. The local terrain is gently undulating with a mature tree population in places. The Moray Firth forms the western boundary of the proposed WwTW and the B9006 road is located immediately to the east of the site.

The nearest noise sensitive receptors are considered to be the Ministry of Defence (MoD) playing fields located approximately 25m to the north-west of the proposed WwTW site boundary and the coastal footpath some 50m to the west.

Although background noise levels in the area vary according to individual surroundings, the conditions at the nearest receptors are generally controlled by natural sources of noise such as that produced by the Moray Firth or meteorological effects. The baseline noise levels at the nearest receptor positions are therefore considered to be relatively tranquil in times of calm weather. Noise levels are however likely to increase during periods of inclement weather, owing to the exposed geographical nature of the location.

Road traffic noise from the B9006 contributes to the local noise climate to some extent throughout the course of a typical day although the road is considered to be lightly-trafficked. The level of road traffic noise reduces during evening and night-time periods. All other local roads are generally single track or private with a low volume of daily traffic movements.

12.4.1 Baseline Survey Locations

Short-term unattended monitoring of baseline conditions was undertaken in a free-field setting at locations considered to be representative the MoD playing fields and the coastal footpath. Measurements were made over an interval of two days, incorporating daytime and night-time periods.

The baseline measurements logged $L_{Aeq,\ 1\ hour}$ and $L_{A90,\ 1\ hour}$ indices using a 'fast' time weighting at all times of the day. A number of other environmental indices were recorded during the survey to further characterise the noise climate. The receptor information is summarised in Table 12.2

Table 12.2: Baseline Monitoring Locations

Receptor	Monitoring Location	Approximate Distance from Proposed WwTW Extension
NSR 1	MoD Playing Fields	25
NSR 2	Coastal Footpath	50

All noise monitoring was carried out between the 16th and 18th of December 2008. The baseline measurement positions and sensitive receptor locations are detailed in Figure 12.1

Figure 12.1: Baseline Measurement Positions / Sensitive Receptor Locations

The proposed extension to the existing WwTW will be developed on the land immediately to the north and east of the current plant boundary.

12.4.2 Baseline Survey Results

To be consistent with the overall conservative approach to assessing the effects of environmental noise from the proposed extension to the WwTW, it is appropriate to consider the minimum L_{A90} levels that were measured at each noise sensitive receptor location if a worst-case assessment is to be made. A summary of the acquired baseline environmental noise data at each of the receptors is detailed in Table 12.3.

Table 12.3: Baseline Monitoring Results

Receptor	Monitoring Location	Minimum $L_{A90, 1\ hour}$	Minimum $L_{Aeq, 1\ hour}$
NSR 1	MoD Playing Fields	36.8	39.8
NSR 2	Coastal Footpath	39.2	42.1

The baseline monitoring established that $L_{A90, 1\ hour}$ noise levels were in the range of 36.8dB(A) to 57.1dB(A) at NSR 1, the MoD playing fields, over the course of the measurement period. The measured $L_{A90, 1\ hour}$ noise levels ranged from 39.2dB(A) to 57.5dB(A) at NSR 2, the coastal footpath, during monitoring.

12.4.3 Instrumentation and Meteorological Effects

All measurement equipment complied with the relevant Type 1 requirements of IEC651 Specification for Sound Level Meters and IEC804 Specification for Integrating Averaging Sound Level Meters. The sound level meters were check calibrated shortly before commencing the survey and on completion, the instrumentation reading correctly on all occasions.

Noise monitoring was performed in calm weather conditions of standard temperature and pressure. A pre-polarised microphone was used throughout the survey, positioned 1.5 metres above ground level, and removed from vertical facades. The sound level meters were fitted with a wind shield at all times.

Baseline sound levels were measured in accordance with the principles of BS 7445 and BS 4142.

12.5 Identification of Environmental Effects

Noise from the proposed extension of the WwTW was modelled based on a normal operating scenario, assuming continuous daytime and night-time operation. A bespoke acoustic model was developed in order to calculate the hemispherical propagation of noise from dominant sources at different locations within the site. The predicted operational effects have been compared to baseline conditions that are understood to be representative of the quietest conditions at each noise sensitive receptor, therefore representing a conservative assessment.

12.5.1 Modelling of Operational Noise Effects

The predicted received noise levels at each noise sensitive receptor have been calculated through the use of advanced acoustic modelling software using the ISO 9613 algorithms. A digital 3D model of the proposed WwTW extension was developed allowing sound power levels and transmission loss characteristics to be assigned to each source of noise.

Plant items and buildings containing process equipment have been modelled as noise radiating area sources or point sources. Noise emissions from the proposed WwTW extension have not been calculated on the basis of full line of sight view at each sensitive receptor due to the presence of a planned vegetation bund.

It is assumed that modern, quieter technology will be used at site and that building structures will be of a design that affords good acoustic performance. It is also assumed that adequate noise control measures will be employed where necessary. Plant items exhibiting high levels of noise are assumed to be located in the best practicable positions in terms of noise attenuation and it is considered that equipment housed in buildings will operate with all doors in the closed position.

The proposed WwTW extension contains a range of low-height noise sources. Miscellaneous noise emissions associated with the weekly operation of the facility including vehicle movements are understood to be minimal and have therefore not been included in the model.

12.5.2 Discussion of Operational Noise Modelling Results

The assessment aims to determine the anticipated operational effects based on the calculated increase in received noise at each sensitive receptor. The comparisons between the maximum predicted operational noise (including the BS 4142 character correction) and the minimum $L_{A90,\ 1\ hour}$ noise levels are outlined in Table 12.4

Table 12.4: Summary of Effects

Receptor	Predicted WwTW Extension Contribution dB(A)	Addition of 5dB Character Correction dB(A)	Minimum Baseline $L_{A90,\ 1\ hour}$ dB(A)	Predicted Change dB(A)
NSR 1	34.7	39.7	36.8	+ 2.9
NSR 2	31.1	36.1	39.2	- 3.1

The predicted worst-case effect detailed in Table 12.4 indicates a maximum increase over minimum existing $L_{A90,\ 1\ hour}$ noise levels of 2.9dB(A) at NSR 1 following the addition of the BS 4142 +5dB character correction. The predicted effect of the proposed WwTW extension at NSR 2 is 3.1dB(A) below minimum existing conditions.

The predicted changes can be compared to the Institute of Acoustics (IoA)/Institute of Environmental Management and Assessment (IEMA) guidelines for noise impact assessment, as adapted in Table 12.5

Table 12.5: IoA/IEMA Effect Significance

Change in Noise Level dB(A)	Effect Significance	Subjective Response	NSR 1	NSR 2
< 0.1	No change	None	Minor	None
0.1 – <3.0	Barely perceptible	Minor		
3.0 – <5.0	Noticeable	Moderate		
> 5.0	Up to a doubling/halving in noise	Major		

It can be seen from Table 12.5 that the significance of the proposed WwTW extension is rated as minor at NSR 1 and none at NSR 2, respectively. Such an increase in noise level at NSR 1 is barely perceptible and any other receptor in the wider area is predicted to receive an effect of no significance. This indicates that the operational noise levels following the application of the +5dB character correction of BS 4142 are unlikely to provoke complaints.

12.6 Assessment of Significant Environmental Effects

12.6.1 Summary

The potential for adverse noise effects exist during the construction and decommissioning phases of the proposed extension to the WwTW.

The likelihood of construction or decommissioning activity causing disturbance is determined in a different manner to that of a permanent noise source, such as the operational works, due to its temporary nature.

Noise emissions during the construction and decommissioning phases will arise from a range of static and moving sources. Static sources of construction noise normally include construction plant temporarily positioned at specific locations, whilst moving sources typically comprise mobile construction plant and vehicles.

A full assessment of construction and decommissioning noise has not been carried out as a programme for such work remains in development. Construction and decommissioning traffic movements on public roads have also not been assessed. Predicted noise levels attributable to general site activity have, however, been compared with absolute noise limits beyond which it is generally accepted that construction noise is likely to provoke complaints, as outlined in Section 12.3.

12.6.2 Sources of Noise

The primary source of noise during construction and decommissioning activity will generally be large plant such as piling rigs, excavators, cranes, and dump trucks. Noise emissions from small construction plant such as generators and compressors typically have lower sound power levels and potential noise effects from such plant can be effectively controlled by way of positioning and screening.

The noise levels generated during construction and decommissioning activity depend on plant in use and operational mode, however, fixed plant sound power levels normally range from L_{WA} 100dB to L_{WA} 120dB whilst moving heavy vehicles typically produce noise levels of approximately L_{WA} 110dB. Idling plant and vehicles emit significantly reduced noise levels.

12.6.3 Necessary Assumptions

There are a number of unknowns at this stage, both in terms of the equipment and construction techniques to be used, therefore it has been necessary to make a variety of assumptions based on experience of similar projects. Consequently, worst case noise levels have been used in the assessment, i.e. selection of plant that will emit higher noise levels than may actually be the case. The assumptions allow for calculations to be performed in accordance with the guidance of BS 5228.

12.6.4 Airborne Noise

Noise levels generated during the construction phase of the project are likely to be higher than those produced during decommissioning due to the reduced need for impact activities throughout the latter phase. The effects of decommissioning noise have therefore not been assessed as a construction noise assessment is considered to represent a worst-case scenario.

The level of noise received during the construction phase will depend on the activity taking place and its distance from the noise sensitive receptor. An estimation of noise levels at a variety of distances from a selection of construction activities is detailed in Table 12.6. The activities specified are those that would normally be required for a WwTW.

Indicative noise levels have been calculated in accordance with BS 5228. The predicted effects are conservative in nature as it is assumed that construction plant items will be in use for 100% of a typical working day and that the site will not make use of acoustic screening during construction. The figures in bold in Table 12.6 denote exceedence of the recommended DoE AL 72 rural limit of 70 dB(A).

Table 12.6: Summary of Effects

Activity	Sound Power Level L_{WA} dB(A)	Distance from Receptor to Activity (m)			
		25	50	100	200
Upgrade access track	115	**79**	**72**	64	56
Construct site buildings	120	**84**	**77**	69	61
Construct hardstandings	115	**79**	**72**	64	56
Construct foundations	120	**84**	**77**	69	61
Cable/pipe laying	115	**79**	**72**	64	56
Equipment lifting	115	**79**	**72**	64	56
HGV movement on site tracks	108	**72**	65	57	49

As illustrated in Table 12.6, an effect above the recommended noise limit of 70 dB(A) is likely to be produced at a distance of 25m from all activities. At a distance of 50m from each construction activity, only the HGV movements on site tracks will be below 70dB(A). For distances of 100m and beyond, all activities generate a noise level below the recommended 70 dB(A) noise limit.

As is detailed in Section 12.3.2, the duration of the predicted effect is fundamental to the overall significance of each construction activity. Construction activities at the proposed extension site can be described as temporary and not fixed to any specific location, therefore noise effects should only be described as major if they take place at a specific location over an extended period of time or where noise levels in excess of 70 dB(A) occur for several consecutive days.

Although a major impact is predicted during most activities at 25m and 50m from the site, which represent the approximate position of the MoD playing fields and coastal footpath respectively, it is understood that the playing fields are not in daily use and the coastal footpath will only receive such noise levels at its nearest point to the site. The received noise levels will rapidly diminish as users of the playing fields and footpath pass beyond the nearest point to the WwTW. Furthermore, the assumed work positions at site are worst-case, meaning that it is very unlikely that construction activity will occur at the edge of the site throughout the course of the construction phase. As such, the general effect of construction works at NSR 1 and NSR 2 is assessed as being of moderate significance.

Mitigation measures such as barriers may reduce noise levels by as much as a further 10dB(A) at each receptor.

12.6.5 Underwater Noise

12.6.5.1 Context

Air and water are two different media and as such the transmission of sound differs in each. Water is approximately eight hundred times denser than air, meaning that sound in water appears louder and travels considerably further. It is therefore important to investigate the potential noise effects to marine life arising from any underwater noise generated by construction of the proposed extension to the WwTW.

In addition to the potential for causing behavioural changes in some fish or sea animals, underwater noise may, in extreme cases, result in physical injury. Research suggests physical trauma in marine mammals and fish generally occurs at peak impulse sound pressure levels in excess of 200dB (Richardson et al., 1995). A greater range of sound pressure levels exist at which behavioural changes take place, and these typically depend on sound type and amplitude.

12.6.5.2 Methodology

An assessment of the potential effects of noise on marine receptors in the vicinity of the proposed WwTW extension scheme has been made by means of a literature review.

A considerable level of research related to the underwater behaviour of noise and how it affects marine mammals and fish has been carried out to date. The potential effects of activities such as seismic surveys and drilling operations, as well as shipping movements, construction activities (e.g. piling) and various sonar operations have been investigated as part of previous research into underwater noise.

An evaluation of this information was carried out in order to establish whether noise characteristics of any of these activities are comparable to those that may occur as a result of the proposed extension to the WwTW and the effects thereof. Typical noise sensitivity characteristics of marine mammals and fish relevant to the project area were also examined as part of the literature review.

12.6.5.3 Ambient Noise Climate

The proposed scheme is to be sited close to shallow and relatively sheltered waters with some nearby industrial activity. Ambient sea noise around the UK is estimated to be around 85dB and shallow water noise levels are typically considered to be higher than deeper water.

Low frequency noise (below 10Hz), as produced by construction activity, occurs naturally in water bodies primarily as a result of surface wave pressure fluctuations. The level of noise depends on both wind speed and water currents, and this effect is greatest in shallow waters.

Distant anthropogenic noise from a variety of sources such as shipping generally dominates the ambient noise climate within the 10Hz to 100Hz range. The ambient noise climate largely depends on meteorological conditions at frequencies greater than 100Hz.

Piling is deemed to be the most likely activity to contribute to underwater noise during construction activities at site.

12.6.5.4 Acoustic Sensitivity of Receptors

Marine species display a wide variety in hearing, communication and echolocation capability characteristics and consequently have differing sensitivity thresholds.

The potential effects of noise on a given species depends on its frequency spectrum (Hz) and auditory range. A linear relationship exists between the level of excess above hearing threshold and the potential effect.

Four zones between the source and receiver have been developed by (Richardson et al, 1995) in order to assess the potential scale and likelihood of effects to marine receptors and to help manage adverse results effectively. The categories are defined as:

- Hearing Loss – location nearest the source where sound is capable of causing tissue damage and possibly result in temporary threshold shift (TSS) or permanent threshold shift (PTS);
- Masking – location within which noise is of a level capable of hindering sound detection (e.g. communication or echolocation). This location can be highly variable depending on the source and receptor;
- Responsiveness – location where the species demonstrates a behavioural or physiological reaction; and,
- Audibility – Location within which the species can detect sound.

One or more of these zones can help establish an appropriate safety range specific to an activity and fish or mammal. This also depends on the type of noise source, the species, its known habits and behaviour towards noise.

In the case of piling, the noise produced is dependent on several factors including the equipment used, water depth, and seabed composition (Nedwell et al., 2004).

The range of hearing in fish lies typically between 30Hz to 1,000Hz. There is evidence, however, that some fish have a hearing range of <20Hz, whilst others have a hearing range of >20,000Hz (Thomsen et al, 2006), therefore demonstrating a wide auditory range.

Like fish, marine mammals have a broad hearing range, typically between 20Hz to 200,000Hz, with hearing thresholds near 40-50dB re. 1µPa.

12.6.5.5 Mammal Response to Sound

Mammals may use sound for communication, echolocation and information purposes, and as such, man-made noise has the potential to mask or interrupt the workings of each system. It has been demonstrated that behavioural and physiological responses to noise in bottlenose dolphins (avoidance to investigation) can take place, repelling at relatively shallow depths and stimulating interest at deeper levels. The noise frequency characteristics of the bottlenose dolphin and other marine mammals are summarised in Table 12.7

Table 12.7: Typical Noise Frequency Characteristics of Marine Mammals

Species	Communication Frequency Range (Hz)	Echolocation Frequency Range (Hz)	Hearing Range (Hz)	Sensitivity Comment
Odontocetes (e.g. dolphins, porpoises, sperm whales, beaked whales)	Med – High 1,000 – 20,000 1,400 - 2,500	High 20,000 – 150,000 (250 – 220,000) 110,000 – 140,000	High Up to 150,000 100,000+	Generally low auditory sensitivity below 1,000 Hz. Peak sensitivity at higher frequencies. Some use low freq. calls for foraging and communication, e.g. harbour porpoise.
Mysticetes (e.g. larger whales such as the rorqual -minke, humpback, sei, fin, and blue whales)	Low – Med 12 – 18,000	No high frequency echolocation system	Low - Med 20 – 3,000	Best hearing range likely low frequency compared to Odontocetes. Zone of audibility can be limited by low frequency ambient noise.
Pinnipeds (e.g. Harbour Seal)	Low	No high frequency echolocation system	High < 70,000 (underwater) < 30,000 (land) Very wide range, best hearing at 8,000 – 16,000	Generally low auditory sensitivity below 1,000 Hz. Most have peak hearing sensitivity between 1,000 and 20,000 Hz.

Potential Effects on Mammals

The primary source of underwater noise resulting from the proposed scheme is that arising from piling activity. Behaviour responses in harbour porpoises has been recorded due to wind farm piling (Nedwell et al, 2004). The communication calls of some Odontocetes such as bottlenose dolphins is in the mid-frequency range of 1,400 - 2,500Hz, meaning there is potential for masking and disturbance effects at distances of up to 20km, however, a low impact is likely in the high frequency echolocation or hearing ranges.

Departure from the area for an extended duration would represent a major effect. Oil and gas exploration experience in the Moray Firth, however, suggests that the local mammal population have tolerated very high levels of noise in the past, mainly as a result of seismic surveys.

The hearing and communication range of mysticetes is believed to be low to mid-frequency, meaning that detection of generated sound is likely at distance. There is scope for behavioural responses such as startling where sudden pulses occur in close proximity to mysticetes. There is also the possibility of masking and responsiveness to noise over greater distances.

Pinnipeds such as the harbour seal demonstrate their most effective hearing in the range of 8,000-16,000Hz, with generally low sensitivity below 1,000Hz. They do, however, exhibit acute hearing at low frequencies. They have the potential to demonstrate possible behavioural and masking responses to noise at a distance (Thomsen et al, 2006). There remains the potential for physical and behavioural effects if the species is in close proximity to works and subject to sudden pulses. The area is not understood to be a haul out area for seals and venturing into the area of the proposed extension works is likely only to be transient.

The expected effects of construction of the proposed extension to the WwTW on the local sea mammal population are summarised in Table 12.8.

Table 12.8: Potential Effects of Construction Noise on Mammals

Description	Analysis
Magnitude of change	Low
Nature of change	Temporary
Significance of effects	Minor

With reference to the factors discussed above and owing to the noise and vibration attenuation that will be provided by the ground at site, an effect of minor significance is predicted for mammals in the Moray Firth.

12.6.5.6 Salmon, Sea Trout and Mackerel Response to Sound

Salmonids, sea trout and mackerel are generally less sensitive to sound as compared to other fish and sea mammals. The audibility bandwidth of such species is typically narrow and they do not demonstrate significant behavioural modifications to sound with the exception of infrasound. Fish detect sound through the use of two sensory sytems; the ear and the lateral line. The former sensory system detects signals at considerable distances whilst the range of the latter extends only to the immediate vicinity of the fish (Kalmijn, 1988; 1989).

There is evidence to suggest that migrating Atlantic salmon smolts do not habituate to infrasound sources as readily as adults even after several exposures, however, studies have concluded that it would be difficult to prevent smolts from migrating using infrasound and that its effects are relatively localised. The noise frequency characteristics of fish are summarised in Table 12.9.

Table 12.9: Typical Noise Frequency Characteristics of Fish

Species	Communication Call Frequency Range (Hz)	Hearing Range (Hz)	Sensitivity Comment
Fish	Low	Varied, but many 30 – 1,000 Some are <1 or >20,000	Diverse hearing range, many with high auditory sensitivity at low freq. Many anthropogenic noise sources predicted to be within frequency range of fish.

Potential Effects on Salmon, Sea Trout and Mackerel

The hearing and communication range of fish is generally below 1,000Hz, however, detection and masking may take place at distances of up to 80km in open water (Thomsen et al, 2006). There is evidence of mortality, hearing or tissue damage if subjected to impulsive high level noise in the immediate vicinity of fish.

There is potential for infrasound generated from piling and similar works to cause some modification to the behaviour of the local salmonid population, nonetheless, the effect of this will be localised and temporary due to rapid adult habituation.

With reference to the potential effect on smolt, such habituation does not appear to occur and although the effects are likely to be localised, it is considered unnecessary that low frequency noise arising from

construction activity at Ardersier WwTW is only generated outside the smolt run period of May to July as adult salmon and smolts are likely to use the other bank of the Moray Firth during any construction work.

Additionally, construction is likely to be carried out during daylight hours when the movement of adult salmon and smolts is at its lowest rate. The potential effects are summarised in Table 12.10

Table 12.10: Potential Effects of Construction Noise on Salmon and Sea Trout

Description	Analysis
Magnitude of change	Low
Nature of change	Temporary
Significance of effects	Minor

It can be seen that an effect of minor significance is predicted for Salmon and Sea Trout. Mackerel are expected to be outside the range at which high noise levels will be produced and are therefore not expected to have a significant effect on the population, as detailed in Table 12.11.

Table 12.11: Potential Effects of Construction Noise on Mackerel

Description	Analysis
Magnitude of change	Low
Nature of change	Temporary
Significance of effects	Minor

According to the previously discussed significance criteria, an effect of minor significance is predicted for Mackerel.

12.7 Mitigation

12.7.1 Operational Noise

The measures detailed below are considered to be proportionate and reasonable and include engineering, layout design and management techniques:

- Consideration should be given to noise emission levels at the detailed design stage, in addition to cost, when orientating and acquiring plant;
- Adequate control measures such as acoustic enclosures, silencers, acoustic louvers, encasing underground plant with appropriate materials, and vibration isolation systems should be employed where appropriate;
- Ancillary plant should be of low noise design and employ sound attenuation techniques such as insulation and low speed fans where required;
- Buildings should be treated with acoustic absorption materials capable of reducing noise across an appropriate range of frequencies, where necessary;
- Plant should be located in the best practicable positions in terms of noise attenuation. Any ventilation openings should be fitted with attenuators to control noise `break-out' if deemed to be required;

- Safety valve tests should only be carried out during daytime hours; and,
- All building doors should be kept closed (wherever practicable).

12.7.2 Construction Noise

12.7.2.1 Airborne Noise

Potential airborne noise effects can be controlled by implementing the following measures, wherever practical to do so:

- Construction activities should be undertaken in accordance with good practice as set out in BS5228. Noise monitoring should be carried out at representative intervals;
- General hours of working should be restricted to avoid sensitive periods of the day. Proposed working hours are recommended as 07.00 to 18.00 in summer and 07.30 to 17.00 (or as daylight allows) in winter, over a 5 day working week, with the option of a 6 day working week retained as/when needed. The proposed working hours on a Saturday are 08.00 to 13.00;
- Any requirements to work outside normal working hours should only occur through prior written agreement with The Highland Council;
- An appropriate piling method should be used for the proposed scheme, so as to minimise noise levels at source;
- Piling rigs and similar equipment should be screened from receptors, where necessary and practicable, and throttled down to a minimum when not in use;
- Plant with directional noise features should be positioned so as to minimise the potential for noise disturbance;
- Nearby receptors should be informed in advance of activities likely to generate high levels of noise. A site contact number for local residents should be provided;
- Material stockpiles and suitable work locations should be used so as to screen work locations and maximise the distance between work activities and receptors;
- Equipment should be maintained in good working order and fitted with appropriate noise control at all times (for example, silencers, mufflers and acoustic hoods); and,
- All site employees should be advised of the noise sensitive nature of the area and be informed to adopt the quietest work practices, where appropriate.

12.7.2.2 Underwater Noise

Potential underwater noise effects can be controlled by implementing the following measures, wherever practical to do so:

- Mitigation measures at source such as buffer blocks and reduced hammer drop heights should be used to lessen potential effects; and,

- Where practical, piling should be avoided when dolphins and seals are calving in summer, as mother and calf are likely to be vulnerable to noise.

12.8 Residual Effects

The operational noise attributable to the proposed plant at the nearest sensitive receptors is assessed as being of minor significance and will not create a noteworthy environmental effect provided that the mitigation measures of Section 12.7 are followed where relevant.

Construction noise should be managed in accordance with the principles of British Standard 5228 'Noise Control on Construction and Open Sites', and referenced in contractual documentation in order to ensure compliance. The need for appropriate control measures should be stated in the contract and work should be phased in such a way so as to reduce the potential for negative effects to a minimum, where possible.

The most significant source of noise during the construction phase is likely to be that arising from piling. The potential effects, however, depend the method of piling used and site ground conditions. A piling method that generates the lowest possible noise levels should be used for the proposed scheme where possible so as to minimise noise effects.

12.9 Summary of Environmental Effects

The potential impact of all phases of the proposed extension may be reduced through implementation of various mitigation measures as detailed in this report. Such measures will allow for potential noise effects to be controlled at source and through pro-active management measures, thereby limiting the overall effect of the proposed development to a minimum.

General guidance on construction noise effects has also been considered. The proposed site extension has the potential to cause disturbance to nearby sensitive receptors due to the levels of noise that may be generated through construction. It is likely that decommissioning will result in lower effects than that of construction, due to a reduced need for intensive activity. The construction phase is therefore envisaged as having the potential to result in the highest levels of noise.

Although a major impact is predicted during most construction activities at the MoD playing fields and coastal footpath respectively, the general effect of construction works is considered to be moderate due to the anticipated duration of the works, the limited use of the MoD playing fields and diminishing noise levels along the footpath as users walk beyond its nearest point to the WwTW. The use of silenced equipment and adequate attenuation such as barriers may reduce noise levels by as much as 10dB(A), thereby reducing the predicted effects further.

Piling operations are likely to be within the audible range of most marine receptors. It has been established that piling, particularly when marine receptors are in the immediate vicinity, has the potential to result in physical effects on some mammals and fish species. Detection of noise and associated masking and behavioural changes may occur at distance for some species.

Low frequency noise arising from piling can propagate large distances and remain audible in the absence of turbulent noise, meaning increased receptor sensitivity during calm conditions.

Ambient underwater noise conditions can influence both the propagation and detection capability of marine receptors. The proposed extension works is to be located near shallow waters, meaning increased low

frequency noise attenuation and typically higher ambient noise levels as compared with open water regions. As a result, the predicted effects of this report could potentially be considered worst case.

With respect to the factors discussed above and owing to the noise and vibration attenuation that will be provided by the ground at the construction site, it is predicted that an effect of minor significance will occur for mammals and fish in the Moray Firth.

On the basis of the points detailed above, it is expected that the proposed scheme could be completed with limited impact upon terrestrial and marine receptors.

13. Access and Traffic

13.1 Introduction

This chapter considers the traffic and transport effects associated with the Ardersier Wastewater Treatment Works (WwTW) extension project. It considers the traffic that will be generated during both the construction and operational phases and assesses the effects on, and measures to minimise disruption to, the local transport network. It should be noted that potential effects relating to traffic air quality and noise as a result of increased traffic during construction are discussed in Chapters 11 and 12 respectively.

Access to Ardersier WwTW site is off from public road (B9006) and the proposed operational and construction traffic routes are along public roads only. Therefore, effects of traffic on 'non public' roads are not considered as part of this assessment.

13.1.1 Study Area Description

The site of the proposed development is the area around and including the existing WwTW, located 2 km northwest of the town of Ardersier on the shores of the Moray Firth to the east of Inverness. A plan of the local area is provided in Figure 1.1. Full details of the proposed works are given in Chapter 4.

The study area for traffic and transport is effectively the public road network in the vicinity of the Ardersier WwTW and in and around Ardersier village, which will be used during construction and operation of the new treatment works.

13.1.1.1 Road network

The Ardersier WwTW has access off the B9006, approximately 2 km northwest of Ardersier village. . The site can be accessed from A96 through B9039, B9006 and B9092. Both B9039 and B9092 meet with B9006 at Ardersier, run through the village as B9006 and ends at Fort George. The site can also be accessed through unclassified road from B9092 near Sunnyhillock and passing by the MOD facility.

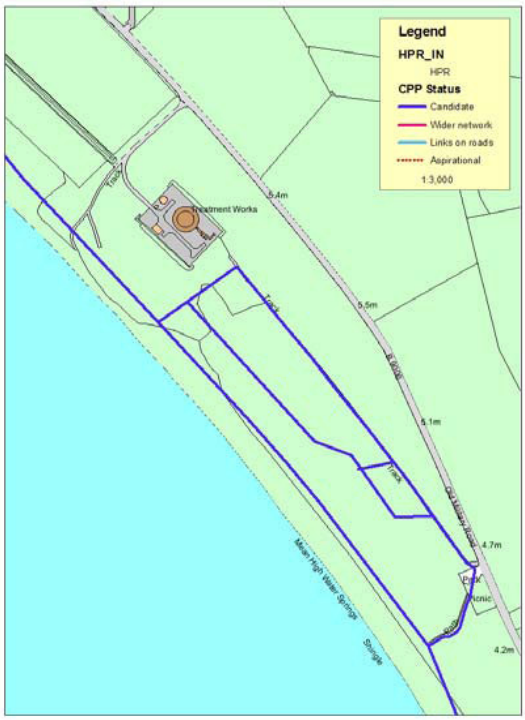
13.1.1.2 Public Transport

Ardersier village and the Fort George are connected by hourly bus services from Inverness. There are two bus stops in the village and another bus stop at Fort George. The nearest railway station from Ardersier is located in Nairn, approximately eight miles east of Ardersier. The Inverness International Airport is located approximately three miles south of the Ardersier village. Being the principal hub for air services in the Highlands and Islands, it has onward connections to various major cities in England and elsewhere in Europe.

13.1.1.3 Walking and Cycling

The site of the proposed works in Ardersier WwTW is located near to several core paths regularly used by local community and visitors. At present, a track down to foreshore through the site is used unofficially by watersports enthusiasts. Figure 13.1 shows the candidate core paths near the WwTW site.

Figure 13.1: Core paths near Ardersier WwTW site



Source: The Highland Council

13.1.2 Potential Effects

Potentially significant effects of traffic and transportation related to this project were identified on the basis of the strategic routeing work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance and standards of relevance to this topic area.

The provisional potentially significant effects remained under review as the EIA progressed, with account taken of the scoping responses and other additional consultation responses received as part of this process. On the basis of this, Table 13.1 presents the effects considered to be potentially significant and which are therefore assessed in full as part of the EIA. Other effects are not considered further.

Table 13.1: Potentially Significant Traffic and Transport Effects

Key Effects Considered in the Assessment	Key Effects Considered in the Scoping Assessment but not considered further
Effects associated with construction traffic movements comprising incoming and outgoing materials and personnel. Construction traffic movements can result in increased air pollution, noise and vibration, congestion and delay, loss of amenity and risk to safety to road users (including pedestrians and cyclists).	Operation and maintenance: effects of vehicles on existing traffic flows and the local road network
Effects associated with restrictions and alterations to the movement of general traffic, including pedestrian and cyclist, resulting from construction phase activity.	
Effects associated with restrictions and alterations to the movement of general traffic, including pedestrian and cyclist once the scheme is operational.	
Cumulative effects during construction with other developments on traffic flows and the local road network.	

13.2 Legislative Framework

The following guidance and policy advice has been used to inform the traffic and transport assessment:

- The Design Manual for Roads and Bridges, Volume 11, Environmental Assessment, 2008 (Highways Agency/Scottish Government).
- The Design Manual for Roads and Bridges, Volume 15, Economic Assessment of Road Schemes in Scotland, 2005 (Scottish Government).
- The Design Manual for Roads and Bridges, Volume 13, Economic Assessment of Road Schemes, 2002 (Highways Agency).
- Guidelines for the Environmental Assessment of Road Traffic, (IEMA Guidelines), 1993 Guidance Notes No. 1.
- Transport Assessment & Implementation: A Guide (Scottish Executive).
- Scottish Planning Policy: SPP 17 – Planning for Transport (Scottish Executive).
- Planning Advice Note: PAN 75 – Planning for Transport (Scottish Executive).
- Road Guidelines for New Developments 2001 (The Highland Council Roads and Transport Department)
- A96 Corridor Master Plan, final report, March 2007 (The Highland Council)
- A96 Corridor Master Plan, Strategic Environmental Assessment (SEA), January 2007 (The Highland Council)

13.3 Assessment Methodology

13.3.1 Overview

This assessment has been undertaken as a combination of desk-top study, field survey and consultation in line with current good practice and policy advice. Predicted volumes of construction and operational vehicle movements have been compared with baseline traffic flows, to identify if there are likely to be periods where the increase in traffic (or HGV traffic) as a result of construction (and operation) exceed standard thresholds. Potential effects arising as a result of the additional traffic have been identified and their significance assessed.

13.3.2 Sources of Data

Road Traffic Count Data in B9006 through Ardersier village provided by the Highland Council (THC) has been used in this assessment. The traffic count was undertaken in June 2008 and is considered representative of summer peak flow through the village. It is assumed that most visitors to Fort George come from Inverness following B9039 and therefore the traffic data in B9006 is also representative of traffic flow in B9039.

Traffic count data for the A96 trunk road during the period of January 2009 to January 2010 was supplied by Transport Scotland.

The data supplied by THC and Transport Scotland was not classified and does not define the proportion of HGV traffic.

A sample traffic count was undertaken by Mott MacDonald Ltd on the B9092 and the unclassified road through the MOD facility. The traffic was counted at junction between B9092 and unclassified road from A96. These counts were carried out on 16/02/2010 between the hours of 8:00 am to 9:00 am and 10:00 am to 11:00 am.

Site visits were undertaken by Mott MacDonald Ltd during January 2009 and further in January 2010, to undertake an assessment of transport access considering potential lorry traffic (tanker) and construction traffic routes to and from Ardersier WwTW. Digital videos and photographs of public route network were recorded to review the current traffic operation and identify potential constraints on the public road network in terms of HGV movement.

13.3.3 Consultation

13.3.3.1 Consultation with THC Roads Department

Mott MacDonald Ltd (on behalf of SW) met with THC Roads Department (21st December 2009) to discuss construction access route options relating to the proposed extension of the Ardersier WwTW. Mott MacDonald Ltd presented six possible construction access traffic routes to THC Roads Department. Of these six route options, THC Roads Department considered three routes as potentially viable routes and recommended further investigation to identify a preferred route for construction traffic. The summary of the construction route access assessment study is presented in Section 13.4.4.

THC Integrated Transport: Road Safety Department were contacted to source data on road traffic accidents for the road network recommended by THC Roads Department as possible construction traffic routes.

13.3.3.2 Consultation with Transport Scotland

Construction traffic access to Ardersier WwTW site is assumed to be linked to/from the A96 trunk road. The A96 is a trunk road administered by Transport Scotland (part of a system of strategic routes of national importance that cater for the through movement of long distance traffic) and can reasonably withstand the predicted construction traffic, therefore the effect on the A96 route sections to be used by both construction and operational traffic will be negligible and therefore the impact is considered not to be significant.

13.3.4 Significance Criteria

The Guidelines for the Environmental Assessment of Road Traffic (IEMA, Guidelines 1993) suggest that two broad rules can be used as a screening process to delimit the scale and extent of the assessment. These are:

Rule 1 - Include highway links where traffic flows would increase by more than 30% (or the number of HGVs would increase by more than 30%)

Rule 2 - Include any other specifically sensitive areas where traffic flows would increase by 10% or more. Where predicted increase in traffic flow is lower than these thresholds, the significance of the effects can be stated to be low and therefore insignificant and further detailed assessments are not warranted. *Note: In respect of Rule 2 above, all route sections have been classed as "sensitive" with exception of the A96 trunk road which generally operates within its respective capacity and as the main function of A-class roads is to facilitate regional distribution of traffic.*

The IEMA guidelines are intended for the assessment of the environmental impact of road traffic associated with major new developments (examples of major developments are listed in the guidelines, including power stations, coal mining operations and quarries; it is common and established practice that they are applied to energy related developments). These guidelines are defined as suitable to assess the short term construction phase of a development, indeed it is now common practice to do so.

Where the predicted increase in traffic volume, general traffic or HGV, is lower than these thresholds the significance of the effects can be stated to be negligible and therefore not significant meaning that further detailed assessments are not warranted.

A formal Transport Assessment (TA) has not been carried out for this development as TAs are not considered to be required for temporary construction works and the traffic movements associated with the operational phase will not be significant (i.e. notably less than 10% increase in traffic flows) and the development road access will not be located with 67m of a trunk road. This is consistent with current guidance from both the IHT (Institute of Highways and Transportation) and Transport Scotland. Furthermore THC did not request a formal TA during consultation meetings.

The transport routes that are to be used by the development have been clearly identified. Quantitative assessments have been undertaken to determine whether or not the effects are considered to be of significance. Professional judgement has then been used to interpret how the effects will manifest in practice. As a guide to inform the assessment, criteria for determining the significance of traffic related

effects has been adopted, with separate criteria for an increase in general traffic (all traffic; HGV+LGV) and HGV traffic defined. These are set out in Table 13.2 below.

Table 13.2: Significance Criteria

Significance Criteria	% Increase in traffic volume (&/or HGV volume)
Major	A fundamental change in the environment. ≥ 60%
Moderate	A material but non-fundamental change to the environment. Between ≥30% and <60% (10% to 60% for defined sensitive areas)
Minor	A detectable but non-material change to the environment. ≥10% and < 30% Between 10% to 30% (5% to 10% for defined sensitive areas
None	Under 10% (5% for defined sensitive areas)

Environmental effects judged to be **major** or **moderate** are considered to be 'significant effects' in accordance with the EIA Regulations.

13.4 Baseline Conditions

The road network included in this assessment was identified on the basis of likely construction traffic routes derived through assessment and stakeholder consultation.

13.4.1 Baseline Traffic Flows

13.4.1.1 Total Traffic Flows

Traffic count data received from THC and Transport Scotland were converted to AADT (Average Annual Daily Traffic) for 5 day, 16 hour flows based on methodology described in Chapter 9 of Highway Agency Design Manual for Roads and Bridges Volume 13. The method considers seasonal variation of data by applying a factor (M factor) calculated for each month of the year.

To convert two hour manual traffic count data to 16 hour flows (for B9092 and the unclassified road by the MOD facility), the percentage traffic in similar hours (08:00 to 09:00 and 10:00 to 11:00) to 16 hour traffic in A96 (during the same period of the year) was calculated. Then this 16 hour flow was converted to five day average AADT as described above. The estimated AADT in study area roads are shown in Table 13.3.

13.4.1.2 HGV Traffic Flows

The Transport Scotland website states that the proportion of HGV traffic on the A96 is approximately 12% in 2009.

The percentage of HGV movement obtained from the manual traffic count data in B9092 is approximately 8% of the total traffic. This figure has been assumed reasonable in all 'other roads in the study area (apart from the A96).

Table 13.3: Estimated AADTs in individual roads

AADTs	AADTs	Notes
A 96	12,552	Data obtained from Transport Scotland
B 9006	1252	Data obtained from THC
B 9039	1252	Assumed similar traffic flow as B 9006
B 9092	778	Manual traffic count
Unclassified road through MOD facility	83	Manual traffic count

13.4.2 Operation Phase: Traffic from Operation and Maintenance Works

At present, the existing facility generates two sludge tankers deliveries per week to Scottish Water (SW) Allanfearn site through the Ardersier village. The site is visited two to three times weekly by SW operatives typically in small vans or cars.

13.4.3 Road Traffic Accidents (RTAs)

Accident data has been provided by THC for the five year period between January, 2004 and December, 2009.

The study area comprises; the section of A96 from Airport Roundabout to junction for Whiteness Head, the section of B9039 between junction with Airport Road near Airport Business Park to Ardersier, section of B9092 from junction with A96 to junction with B9006 in Ardersier, section of B9006 from Ardersier to Fort George and the unclassified road from junction with B9006 near MOD facility to junction with B9092 near Sunnyhillock.

Analysis of this data indicates that there were 27 reported injury accidents within a five year period. Of these; 21 resulted in slight injury, four serious and two fatal. The main accident concentrations were as follows:

- Nine accidents were recorded on the B9039 corridor between the junction of Airport Road (near Industrial Estate) and the junction with the B9092. This included one fatal accident involving overtaking at a speed in excess of the local speed limit.

- 11 accidents were recorded on the A96 corridor between Mid Coul and Blackcastle. This included one fatal accident involving a pedestrian the road environment was not noted as a contributory factor.

13.4.4 Access Study

In order to assess the suitability of road access to site, a study was undertaken by Mott MacDonald Ltd during January 2010. This study of transportation issues comprised a systematic review of potential access routes; the review considered the following:

Access between the A96 trunk road and the public road site access point with respect to road geometry (horizontal and vertical alignment), including the consideration of alternative routes and the requirement for passing places;

Junction and site access (including visibility and junction radii), general road safety and potential obstructions (e.g. street furniture);

Three potential routes were considered and these routes are shown diagrammatically in Figure 13.2 The headline findings of the access review are:

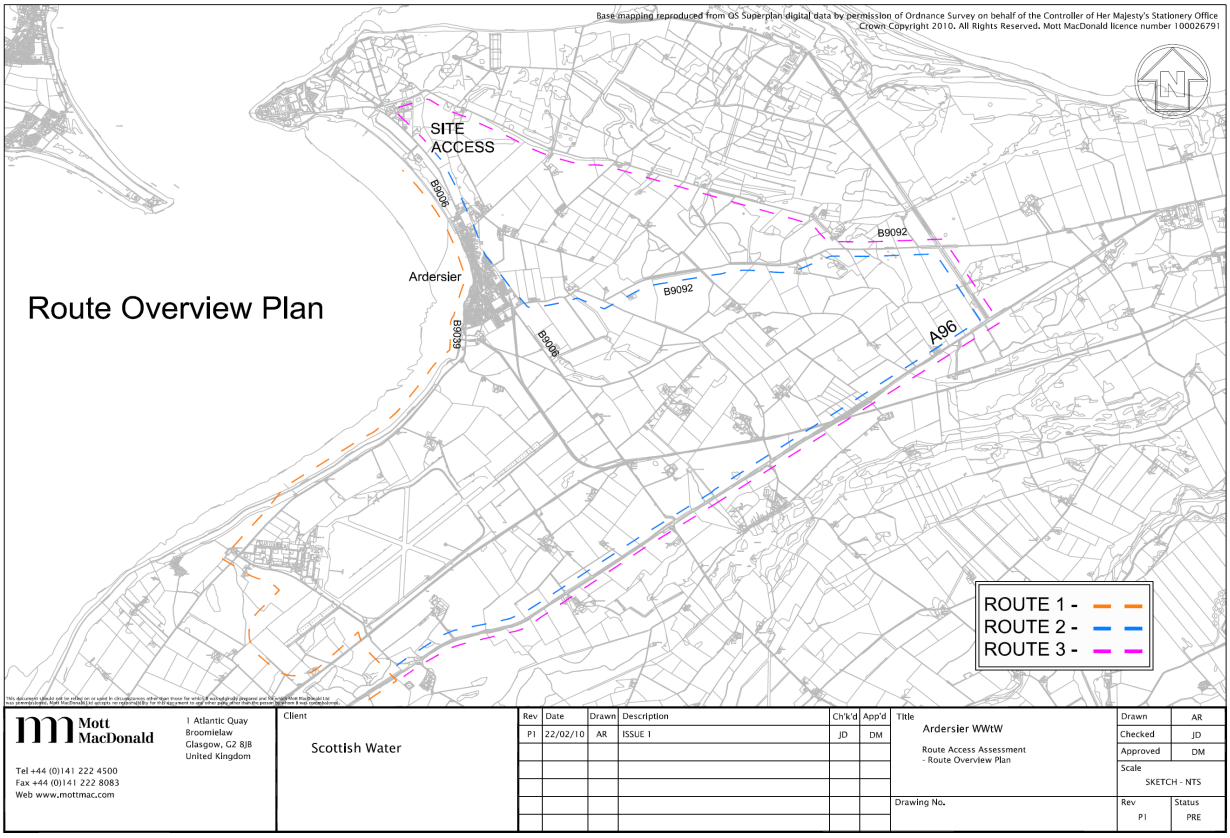
Route 1 exits the A96 at the Airport roundabout junction and follows north to meet the B9039. Then east towards Ardersier and via the B9006 north to site. This route predominantly follows existing B class (two-way) roads which are considered adequate to accommodate an increase in HGV traffic volumes. This route passes through the Ardersier village and would be likely to require associated traffic management measures to be agreed and adopted should it be considered as the 'preferred route' by THC Roads Department.

Route 2 exits A96 at Whiteness Head Junction following north to the junction with B9092. Then west on B9092 to junction with B9006 at Ardersier, then north to the site. This route predominantly follows existing B class (two-way) roads which are considered adequate to accommodate an increase in HGV traffic volumes. There could be some difficulties for HGVs exiting back onto the A96 at Whiteness junction. The A96 is a strategically important road link between Inverness and Aberdeen and is known to be experience heavy traffic flows at peak hours and often fast moving traffic outside of the peaks; it could hence prove difficult (and potentially dangerous) for larger slower vehicles to safely exit back onto the A96 westbound carriageway, as they will require to cross two traffic lanes. This route also passes through a section of Ardersier village.

Route 3 exits A96 at Whiteness Head Junction following north to the junction with B9092. then west on short section of B9092 (near Sunnyhillock), then onto the unclassified road via Baddock to B9006, then south to the site. This route has the same issue of potential difficulties for HGVs exiting back onto the A96 at Whiteness junction. In addition, the existing passing places on the single track unclassified road are not judged of sufficient capacity to accommodate two-way HGV movement. In order to make this section more suitable for HGV traffic then some improvement works to existing passing places would be beneficial.

The WwTW site access junction with B9006 and entrance would benefit from minor upgrade (increase in kerb radii, and movement of the entrance gate further from the B9006 with a parking lay-by) in order to reduce risk of obstruction, and of the likelihood of damage to adjacent areas of soft landscaping.

Figure 13.2: Route Overview Plan



The route access assessment study concludes that all three of the considered routes have potential for use by construction traffic, but Route 1 is the 'preferred route' for construction traffic access to Ardersier WwTW site.

The route options have been discussed in principle with THC Roads Department and may require further consideration prior to commencement of construction.

13.4.5 Planned Changes to the Road Network

THC has planned junction improvement work on B9039 at the airport turn off from airport road to B9039. A programme for commencement, of these works is as yet undefined.

13.4.6 Other Developments

Under the "A96 Growth Corridor Framework", THC has identified potential developments proposed largely from 2011 onwards, for a period stretching over next 30 years. The proposed development includes continued growth in Inverness Airport and a new Airport Business Park, new settlements in Tornagrain and Whiteness, and housing and business expansion in Nairn. However, considering the time scale of these proposed developments, it is unlikely that these developments will have any impact on the construction traffic movement for Ardersier WwTW.

13.5 Identification of Environmental Effects

13.5.1 Assessment Assumptions

- The detailed programme of the construction works is undefined at this stage. However, it has been assumed that the construction work will be completed within approximately 18 months period. The contactor's site office and temporary depot will be located at the WwTW site.
- All bulk materials will be delivered by fully laden (nominal 25T / 10m^3) HGVs to the construction site.
- Ready-mix concrete wagon will deliver a nominal 6m^3 of ready-mix concrete per trip.
- The quantities of construction were estimated using estimating proforma for the project. The calculation of HGV movement is based on calculated construction quantities and also includes allowances for all construction related activities.
- Water will be available by pipe supplies, and is therefore ignored in this assessment of traffic impacts.
- There will be no construction related parking in public areas (on- or off-street).
- The builder's plants will be delivered to site once and will remain on site throughout the construction period.
- There will be some light vehicle (LGV) movements everyday to and from the site for construction personnel, supervision staff, specialist trades, inspections, etc. it is assumed that four cars and two vans will come daily to site. These LGVs will leave and return to site during lunch and leave site at end of day's work.

13.5.2 Estimated Operational Traffic

As defined at scoping stage; the predicted traffic numbers associated with the operation phase are limited and infrequent, therefore their effect on the capacity of the roads is considered to be low and the magnitude of traffic increases judged to be negligible. On this basis, operational traffic associated with Ardersier WwTW is not considered to be significant and is not considered further within this chapter.

13.5.3 Estimated Construction Traffic Flow

A summary of estimated construction traffic generated by the proposed work is outlined below in Table 13.4

Table 13.4: Summary of construction traffic generated by project

Construction Activity/Item being transported	Type of vehicle	Details	Total vehicle movements
Ready-mix concrete	HGV	Delivery of ready-mix concrete	270 deliveries (540 movements)
Formwork for concrete	HGV	Delivery of formworks for concrete work	5 deliveries (10 movements)
Reinforcement bars	HGV	Delivery of reinforcement bars for RCC	41 deliveries (82 movements)
M & E equipment	HGV	Delivery of M & E equipment for several plants	13 deliveries (26 movements)
Building construction	HGV	Delivery of steel sections, cladding etc	5 deliveries (10 movements)
Fence, Posts and Gates	HGV	Delivery of fence, posts and gates	9 deliveries (18 movements)
Pipework	HGV	Delivery of pipes and pipework ancillaries	11 deliveries (22 movements)
Manholes and Chambers	HGV	Delivery of manhole rings, chambers and other ancillaries	7 deliveries (14 movements)
Site access roads	HGV	Imported material for sub-base, base course and wearing course	15 deliveries (30 movements)
Site roads, kerbs and paving	HGV	Delivery of bulk materials for site roads, tanker lay-bys, footpath, kerbs, etc	107 deliveries (214 movements)
Site clearance	HGV	Removal of gorge and other plants from site	4 deliveries (8 movements)
Construction site office	HGV	Delivery of portable cabins, temporary fencing, storage containers, skips, generators, fuel tanks	27 deliveries (54 movements)
Builder's Plants	HGV	Multi-purpose excavators, piling rigs, cranes, machineries for road works	10 deliveries (20 movements)
Pumps	HGV	Delivery of pumps and ancillaries	13 deliveries (26 movements)
Earthwork	HGV	Delivery of required fill material for ground level raising and bunding	111 deliveries (222 movements)
Sundry items	HGV	Delivery of polyethylene membranes, kiosks, cables, hand rails, access, platforms, bridge scrappers etc	157 deliveries (314 movements)
	HGV	**Total**	**805** deliveries (**1610** movements)
Trips by construction personnel, engineers, supervisors, visitors, inspectors, etc	LGV	Daily trips by construction workers, supervisors, site engineers, etc	**12 two-way trips (24 movements) per day**

Table 13.5 estimated vehicle movements by construction tasks over the scheduled 18 month period. The table shows that the construction works will generate an average of four HGV movements per day with a peak flow of seven movements per day over a two month period (months 11 to 12 inclusive).

The average number of LGV movements is assumed as 24 movements per day consistently throughout the project. Therefore, the average number of construction vehicle movements per day is estimated at 28 movements (over 18 months) with a peak flow of 31 movements over a two month period (months 11 to 12 inclusive).

Table 13.5: Estimated Vehicle Movements by Construction Task

MONTHS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Preliminary Activities *Site mobilisation*	26																	
Earthworks	31	40	40													40	40	31
Site Access Road		30																
Site Roads, kerbs and paving				40	50	40	40	24	20									
Ready-mix concrete delivery with ancillaries								100	100	112	112	112	100					
Building Construction											5	5						
Delivery of Pipes											11	11						
Delivery of Plant fuel	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Builders Plants		10																10
Delivery of Manholes rings and Chambers													14					
Delivery of M & E equipments														26				
Delivery of pumps														13	13			
Sundry Items D*elivery of polythene membranes, kiosks, cables, handrails, access platforms etc*			50	50	60	72	80											
Delivery of Fence, Post and Gates																18		
Total No. HGV only Movements per month	**59**	**82**	**92**	**92**	**112**	**114**	**122**	**126**	**122**	**114**	**130**	**130**	**116**	**41**	**15**	**60**	**42**	**43**
Site Personnel *LGV movements*	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480
Site Personnel *LGV movements per day*	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**
Total No. Traffic Movements per month (LGV+HGV)	539	562	572	572	592	594	602	606	602	594	610	610	596	521	495	540	522	523
Average No. movements per day (HGV+LGV)	**27**	**28**	**29**	**29**	**30**	**30**	**30**	**30**	**30**	**30**	**31**	**31**	**30**	**26**	**25**	**27**	**26**	**26**
Average No. HGV movements per day	**3**	**4**	**5**	**5**	**6**	**6**	**6**	**6**	**6**	**6**	**7**	**7**	**6**	**2**	**1**	**3**	**2**	**2**
											Peak	**Peak**						

13.6 Assessment of Significant Environmental Effects

13.6.1 Predicted Effects: Construction Traffic Flow Effects

The estimated construction traffic flow in Table 13.5 is compared with the baseline traffic flow figures presented in Table 13.3. The percentage increases in total volume of traffic and HGVs are presented in Table 13.4 and compared with Table 13.2 to determine the significance of environmental impact of increased traffic on individual roads.

When compared with Table 13.2, it can be seen that no significant effects are predicted on any of the roads included in Route 1 or Route 2, however should the construction traffic be routed via Route 3 then a **moderate** effect is predicted through an increase in general traffic on the unclassified road through the MOD facility.

It is assessed that the increase in general traffic volume resultant from construction can cause moderate (temporary) delay and congestion for general traffic on the unclassified road between the B9092 and site.

Table 13.6: Significance of environmental effect of increased traffic and HGV flows on individual roads

		ALL TRAFFIC			HGV TRAFFIC ONLY		
Road	**Access Route option**	**Average : % total traffic increase**	**PEAK % total traffic increase**	**Significance level**	**Average : % HGV traffic increase**	**PEAK % HGV traffic increase**	**Significance level**
A96	Routes 1,2 and 3	0.2	0.2	None	0.0	0.0	None
B9006 (Station Road)	Route 1 and Route2	2.3	2.5	None	0.2	0.4	None
B9039	Route 1	2.3	2.5	None	0.2	0.4	None
B9092	Route 2 and Route 3	3.7	4	None	0.3	0.6	None
Unclassified road	Route 3	34.3	37.3	**Moderate**	2	4	None

13.6.2 Predicted Effects on Pedestrians and Cyclists

The construction traffic volume increase estimated on roads through Ardersier village will be none and hence the effect of safety and amenity for pedestrians and cyclists will be insignificant.

In addition, the proposed routes of both construction traffic and the worksite boundary itself do not directly impinge on existing core paths adjacent the WwTW site.

13.6.3 Predicted Effects on Road Traffic Accidents

The data referred to in Section 13.4.3 has been examined, with due reference to the RoSPA guidance[9] and RCGB[10], in order to identify any clusters and trends in the pattern and location of personal injury accidents (PIAs) on the local road network.

Two small clusters of accidents were identified within corridors of both the A96 (11 PIAs) and a section of the B9039 (9 PIAs). These corridors have been compared with national accident rates for similar routes see Table 13.7 below.

[9] RoSPA (Royal Society for the Prevention of Accidents) Road Safety Engineering Manual (2008)

[10] Department for Transport Reported Road Casualties Great Britain: 2008 Annual Report

Table 13.7: Personal Injury Accident Rates

Location	Site average (accidents per 100 million vehicle km)	National average by road class [ ] (accidents per 100 million vehicle km)
A96 corridor between Mid Coul and Blackcastle.	6	21 [rural A Class]
B9039 corridor between the junction of Airport Road (near Industrial Estate) and the junction with the B9092.	112	46 [All roads]

This preliminary comparison assessment indicates a higher than average accident rate on the B9039 near Ardersier and a below average accident rate on the A96, however through consideration of the contributory factors stated there is no clear evidence that the nominal increase in traffic anticipated during the construction or operational periods of the proposed development will cause any consequential increase in road traffic accidents.

13.7 Mitigation

13.7.1 Modifications to Scheme Design

No modification to the scheme design is required for the proposed extension works in Ardersier WwTW site.

13.7.2 Traffic Management/Construction Code

Temporary effects relating to an increase in general construction traffic will be regulated through an agreed construction code with appropriate traffic management methods employed.

The measures would apply to all route sections, backed up by locally specific measures as appropriate, and may include timing and frequency of vehicles will be managed to minimise local disruption.

A Traffic Management Plan (TMP) outlining measures to enhance the efficient transportation of plant and materials to site, and minimising congestion and disruption which might affect general traffic and the emergency services, will be developed prior to construction starting. The TMP will include but not be limited to:

- a statement of which public roads are, and are not, to be used by construction traffic;
- a statement of which local towns and villages are to avoided and when;
- a commitment to monitor and ensure that damage to walkways, driveways, accesses, bridges, walls, verges and private property does not occur. Where accidental damage occurs, the contractor will promptly make good any damage;
- if appropriate, details of additional speed restrictions through sensitive areas;

- temporary signage to be installed at notified locations;
- proposed arrangement for ongoing liaison with stakeholders including the local community; and
- procedures to ensure pedestrian easement adjacent to worksites.

These measures will be agreed with THC, Transport Scotland TRNMD and the Police as appropriate.

13.7.3 Roads Improvement Works

Should Route 1 or Route2 be adopted as the 'preferred route', no road improvement works would be required. However, should the construction traffic route through the single track unclassified road by the MOD facility (Route 3) be taken forward as 'preferred route'; in order to make this section more suitable for HGV traffic then some improvement works to existing passing places would be beneficial. The infrastructure improvement works would generate HGV movements and road works which in themselves could be temporarily disruptive to road usage

13.8 Residual Effects

Table 13.8 summarises the predicted effects, their mitigation measures and any residual effects related to increase in traffic flows in the local road network due to construction traffic for Ardersier WwTW extension works, for all 3 possible access routes.

Table 13.8: Summary of Predicted Effects, Mitigation Measures and Residual Effects

Predicted Effect	Significance	Mitigation	Route Affected	Residual Effect
Increase in general (and/or HGV) traffic volumes cause delay and congestion on public roads ('A' and 'B' type roads)	None	Traffic Management / Construction Code	1, 2 and 3	None
Increase in general traffic volumes cause temporary disruption and delay to general traffic (unclassified road)	**Moderate (temporary)**	Infrastructure improvement Works	3	Minor (temporary)
Increase in HGV traffic volumes cause temporary disruption and delay to general traffic (unclassified road)	None	Infrastructure improvement Works	3	None
Road Safety (Road Traffic Accidents)	None	None required	1, 2 and 3	None
Movement of construction traffic could impact upon safety and amenity for pedestrians and cyclist (**for all possible Routes**)	None	Traffic Management / Construction Code	1, 2 and 3	None
Disruption to pedestrian and cycle routes (**for all possible Routes**)	None	Not required	1, 2 and 3	None

In accordance with the defined significance criteria, only effects of major or moderate are considered significant in terms of the EIA regulations, therefore the residual effects of the proposed development are assessed as at worse minor (temporary) and therefore not significant.

The mitigation measure of infrastructure improvement works will only be required if Route 3 is adopted, and therefore will not be required should Route 1 or Route 2 be adopted.

13.9 Summary of Environmental Effects

The predicted increase in all traffic and specifically HGV traffic volume on the A96 and other B class roads (affecting Routes 1, 2 and 3) associated with the construction and operational phases of the Ardersier WwTW is unlikely to result in a significant effect.

However, as mentioned in Section 13.6.1, if Route 3 is adopted as a construction traffic route the significance threshold will be exceeded on the unclassified road section; furthermore the implementation of infrastructure improvements could also be temporarily disruptive to road usage.

Table 13.9 summarises the predicted effects associated construction traffic on public roads. Mitigation measures of infrastructure improvement works are required **only** if Route 3 is adopted.

The route options have been discussed in principle with THC Roads Department and the final route adopted will be confirmed in consultation with THC Roads Department, prior to commencement of construction.

The route access assessment study concludes that all three of the considered routes have potential for use by construction traffic, however Route 1 is preferred by Scottish Water.

Table 13.9: Summary of predicted effects

Predicted Effect	Route Affected	Significance
Increase in general (and/or HGV) traffic volumes cause delay and congestion on public roads ('A' and 'B' type roads)	1, 2 and 3	None
Increase in general traffic volumes cause temporary disruption and delay to general traffic (unclassified road); **should route 3 be adopted**	**3**	**Moderate (temporary)**
Increase in HGV traffic volumes cause temporary disruption and delay to general traffic (unclassified road); **should route 3 be adopted**	3	None
Road Safety (Road Traffic Accidents)	1, 2 and 3	None
Movement of construction traffic could impact upon safety and amenity for pedestrians and cyclist	1, 2 and 3	None
Disruption to pedestrian and cycle routes	1, 2 and 3	None

14. Cultural Heritage and Archaeology

14.1 Introduction

This chapter presents the results and recommendations from an assessment of the possible impacts of the scheme on the cultural heritage and archaeology. It identifies and evaluates baseline data for archaeological sites, historic buildings and features of cultural heritage significance that might be impacted by the proposed development, and proposes mitigation strategies as necessary.

It considers three principal aspects:

- Historic and archaeological landscapes
- Sites, structures and artefacts which are of cultural, historical or archaeological interest
- Structures and buildings which are of architectural interest

The cultural heritage assessment included a baseline desk-based assessment, followed by an assessment of the direct and indirect impacts of the proposal in consultation with the Regional Archaeologist for The Highland Council. Where appropriate, measures to mitigate the impacts are also presented.

14.2 Legislative Framework

'Nationally important' archaeological sites are legally protected as Scheduled Monuments under the Ancient Monuments and Archaeological Areas Act 1979. Buildings of architectural or historic importance are listed under the Town and Country Planning (Scotland) Act 1997. These are divided into three classes: Grade A (National Importance) Grade B (Regional Importance) and Grade C (Local Importance). Where features are both scheduled and listed, scheduling takes precedence.

Sites, structures or artefacts can also be registered on the National Monuments Record of Scotland or the Scottish Sites and Monuments Record but this does not automatically provide any legal protection.

The key relevant international charter is the *Australia ICOMOS Charter for the Conservation of Places of Cultural Significance* 1999 (the Burra Charter). This has become a generally accepted international standard. It emphasises the need for a cautious approach to development of historic places, based on an assessment of their cultural significance. This is defined as 'aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. Places may have a range of values for different individuals or groups.' (Article 1.2)

Relevant UK policies include NPPG 5, NPPG 18 and PAN 42. Scottish policies relating to Cultural Heritage and Archaeology are set out in *The Stirling Charter* (2000) and *Passed to the Future: Historic Scotland's Policy for the Sustainable Management of the Historic Environment* (2002). These are informed by the frameworks previously mentioned.

The *Highland Structure Plan* published in 2001 follows National Planning Guidance in adopting the precautionary principle as regards archaeology and requiring that potential impacts be assessed and mitigated where possible. The relevant policies are as follows:

Policy BC 1: Preservation of Archaeological Sites

Archaeological sites affected by development proposals should be preserved, or, in exceptional circumstances where preservation is impossible, the sites will be recorded at developers' expense to professional standards. Provision will be made in Local Plans for the appropriate protection, preservation and enhancement of archaeological sites.

Policy BC 5: Listed Buildings and Conservation Areas

The Council will seek to preserve Highland's buildings and groups of buildings of historic or architectural interest, some of which may be at risk from neglect, by the identification in Local Plans of opportunities for their productive and appropriate use.

14.3 Assessment Methodology

The value of the cultural heritage resource was defined using the criteria in Table 14.1 where a four-tier classification system has been used.

Table 14.1: Importance of cultural heritage resource

Importance	Designation / Description
High	Resource with a high quality and rarity on a local scale and/ or a medium quality and rarity on a regional or national scale. Resource of high sensitivity to change
Medium	Resource with a medium quality and rarity on a local scale and/ or a low quality and rarity on a regional or national scale.
Low	Resource with a low quality and rarity on a local scale
Negligible	Resource of little or no interest

Designated sites such as Scheduled Ancient Monuments and Listed Buildings are all classified as nationally important and therefore of High importance.

The magnitude of the proposed development's impact on each individual site was assessed independently from the value of that site. The extent, frequency, duration, reversibility and probability of the impact were considered when determining the magnitude of the impact, which can be adverse or beneficial. Table 14.2 shows the categorisation of the magnitude of impacts.

Table 14.2: Criteria relating to magnitude of impact

Magnitude	Criteria
Major	Considerable impact of more than local significance, or in breach of legislation
Moderate	Limited impact which may however be significant in the context of the site
Minor	Slight, short term or localised impact.
Negligible	Impact does not affect the resource

The significance of the impact was then determined by reference to both the value of the site and the magnitude of the impact as shown in Table 14.3 below. These apply equally to adverse and beneficial impacts.

Table 14.3: Significance of the impact

Magnitude of impact	Importance of Resource			
	High	**Medium**	**Low**	**Negligible**
Major impact	Major significance	Moderate significance	Minor significance	Minor significance
Moderate impact	Moderate significance	Moderate significance	Minor significance	No significant effect
Minor impact	Minor significance	Minor significance	No significant effect	No significant effect
Negligible	Minor significance	No significant effect	No significant effect	No significant effect

14.4 Baseline Conditions

A desk-based assessment was carried for the study area in July 2007. Sources consulted included the National Monuments Record for Scotland (Royal Commission on the Ancient and Historical Monuments of Scotland, 2008) and the Scottish Water environmental database. An environmental constraints map was produced to identify key potential issues for environmental impact, including archaeology, surrounding the Ardersier WwTW site (Chapter 4, Figures 4.1 and 4.2). The following features were found to be close to the development site (refer to Figure 14.1 for locations):

Statutory Designated sites:

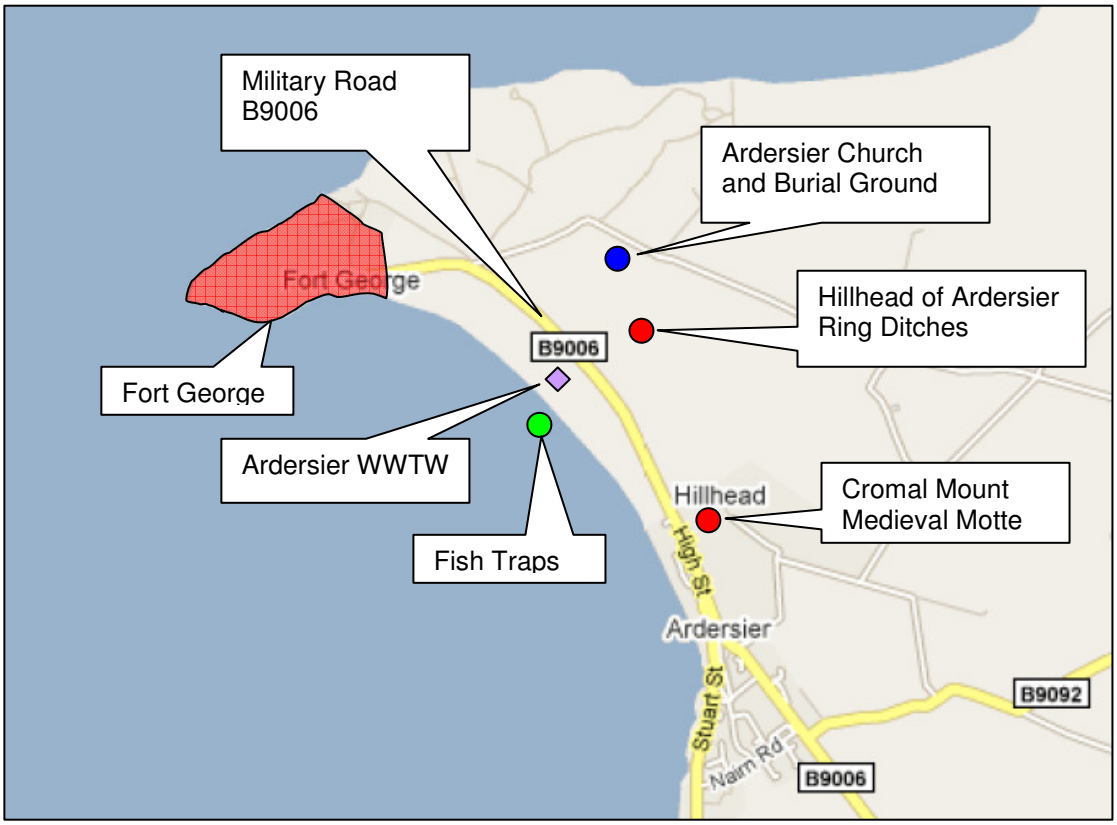
- Fort George (Scheduled Ancient Monument)
- Cromal Mount Medieval Motte, Ardersier (Scheduled Ancient Monument)
- Hillhead of Ardersier ring ditches (Scheduled Ancient Monument)
- Ardersier Church, Watch House and Old Burial Ground, Kirkton (B-Listed Building, and Scottish Sites and Monuments Record)

Non-designated sites

- Inverness to Fort George Military Road (National Monuments Record of Scotland Reference: NH75NE13)
- Ardersier Fish Traps (Scottish Sites and Monuments Record)

The Core Path network could also be considered as part of the cultural heritage of the area. The impact of the scheme on the Core Path has been discussed in Chapter 8: Landscape and Visual Amenity.

Figure 14.1: Archaeological Features Location Plan



14.4.1 Consultation with Highland Council and Historic Scotland

The Highland Council Archaeology Unit (THCAU) and Historic Scotland were consulted relating to potential for archaeological issues with all options assessed as part of the stakeholder workshop and in January 2010. Historic Scotland did not raise any particular concerns.

The scoping response for the EIA from The Highland Council Archaeology Unit indicated that the archaeological potential of the existing WwTW site is considered to be low. However they noted concerns regarding potential for environmental impact from the proposed development on the following features:

- Inverness to Fort George Military Road
- Cromal Mount Medieval Motte
- Fort George

The Highland Council Archaeology Unit have confirmed that a watching brief would not be required should construction works be carried out to widen the junction between the access track to the WwTW and the B9006.

14.5 Identification of Environmental Effects

14.5.1 Hazards, receptors and pathways for Operational Impacts

During operation of Ardersier WwTW the principal hazards to cultural heritage and archaeology will be deterioration of the existing view to or from the receptor, vibration damage to the receptor or noise impact at the receptor. The receptors are the archaeological features identified in section 14.2.3 above.

The pathways are visual sightlines, and airborne or ground-borne noise and vibration.

14.5.2 Hazards, Receptors and Pathways for Construction Impacts

During construction of Ardersier WwTW the principal hazards to cultural heritage and archaeology will be deterioration of the existing view to or from the receptor caused by construction activities, disturbance caused by site activities and vehicle movements in relation to the receptor, vibration damage to the receptor or noise impact at the receptor due to piling or other noisy site activities. The receptors are the archaeological features identified in section 14.2.3 above.

It should be noted that all construction impacts are temporary. The pathways are visual sightlines, and airborne or ground-borne noise and vibration.

14.6 Assessment of Significant Environmental Effects

14.6.1 Operation

14.6.1.1 Fort George

Fort George is an eighteenth-century garrison fortress which is still used as a working army base. It is a Scheduled Ancient Monument and is managed by Historic Scotland. It is located approximately 1.2km north west from the Ardersier WWTW site. The visual impact assessment (Chapter 8) has shown that there will be no significant impact visually from the development, and the noise assessment shows there is not likely to be a noise impact at that distance. The resource is of high importance but the operational impact is negligible therefore the operational impact is of *minor significance*.

14.6.1.2 Cromal Mount Medieval Motte

Cromal Mount is a 6m high sandy hillock with evidence of ramparts at the north end of Ardersier, believed to have been a medieval defensive motte. It is located approximately 1km south east of the scheme. The visual impact assessment (Chapter 8) considered three viewpoints close to the mount and found no significant impact. Similarly the noise assessment shows there is not likely to be a noise impact at that distance. As the mount is a Scheduled Ancient Monument it is of high importance but the operational impact is negligible therefore the impact is of *minor significance*.

14.6.1.3 Hillhead of Ardersier Ring Ditches

Hillhead of Ardersier comprises several ring ditches in a field which are thought to be the remains of prehistoric burial or settlement features. It is located approximately 500m to the north east of the Ardersier WwTW site on the other side of the B9006 and is a Scheduled Ancient Monument. The Landscape and Visual Impact Assessment (Chapter 8) notes that “It is anticipated that, for the visitors to Hillhead of

Ardersier and the people at their place of work, there would be an impact magnitude of minor negative impact where the scheme would cause a barely perceptible deterioration for few viewers in the existing view." The noise and vibration impact is considered to be negligible at this distance.

The site is of high cultural importance and the impact is minor, therefore the impact is of *minor significance*.

14.6.1.4 Ardersier Church, Watch House and Old Burial Ground, Kirkton

This site comprises a late eighteenth century square walled burial ground, an early nineteenth century rectangular watchhouse and the ruins of an eighteenth century church. The burial ground and watch house are a category B-listed structure. The Landscape and Visual Impact Assessment found that the WwTW site is barely visible from Ardersier Church, which is about 700m away from the WwTW site. Again there are not considered to be any adverse effects of noise and vibration at this distance.

The site is of high importance but the impact is of negligible magnitude therefore the overall impact is of *minor significance*.

14.6.1.5 Inverness to Fort George Military Road

The B9006 road, which provides the only road access to the WwTW, is on the route of the Inverness to Fort George Military Road, which was built in the eighteenth century to provide access to Fort George. The road splits in Ardersier and one branch continues south as far as Couper Angus. The military road is not legally protected and has been modernised but is listed in the National Monuments Record of Scotland and the Scottish Sites and Monuments Record. The road runs parallel to the WwTW site on its north east site and is less than 100m away at the closest point.

The Landscape and Visual Impact Assessment found that, with the planned screening, the development has a negligible to minor adverse impact visually for road users. There is likely to be a small increase in the background noise where the road comes close to the site, but as most road users will be in motor vehicles and the road itself has significant background noise, this is not considered to be a significant impact.

The traffic on the road will increase when the WwTW is operational, as there are likely to be increased operator visits and also increased articulated tanker deliveries. Chapter 13 covers the access and traffic impact assessment in detail. Whichever route the tankers use, it will be necessary to travel some distance on the B9006.

The military road is a monument of medium importance and the magnitude of the impacts on it are considered to be minor. The overall impact assessment is therefore of *minor significance*.

14.6.1.6 Ardersier Fish Traps

The Ardersier Fish Traps are recently discovered circular cockle and mussel beds which are occasionally visible between the low water and high water levels on Ardersier Beach. They are approximately 400m to the south west of the WwTW scheme, and are included in the Scottish Sites and Monuments Record.

It is unlikely that the operational activities of the WwTW will have any impact on the fish traps and therefore the impact on them is *negligible*.

14.6.2 Construction

14.6.2.1 Fort George

As Fort George is located approximately 1.2km north west from the Ardersier WwTW site, it is unlikely that there will be any significant visual impact during construction. There is likely to be a minor adverse impact from construction noise particularly during piling activities. Depending on the final route agreed for construction traffic, it is possible that there will be construction vehicles passing close to Fort George. The resource is of high importance but the operational impact is negligible therefore the operational impact is of *minor significance*.

14.6.2.2 Cromal Mount Medieval Motte

The visual impact of the WwTW at Cromal Mount is not likely to be greater during construction than during the operational period. As the Mount is located about 1km from the site, there will be some noise and vibration impact during construction but it is unlikely to be significant. The Mount is not a place of work or residence and so the magnitude of the impact is considered to be minor, therefore the operational impact is of *minor significance*.

14.6.2.3 Hillhead of Ardersier Ring Ditches

There is likely to be a slight deterioration in the visual amenity at the Ring Ditches during construction, and some noise and vibration impact, as it is located only 500m uphill from the site. However as this is short term again the magnitude of the impact is considered to be minor and so the operational impact is of *minor significance*.

14.6.2.4 Ardersier Church, Watch House and Old Burial Ground, Kirkton

The construction site is barely visible from Ardersier Church which is situated 700m from the site. As for the ring ditches there is likely to be some noise and vibration impact during some of the construction activities. Depending on the final route agreed for construction traffic, it is possible that there will be some disturbance from construction vehicles passing by the church. The site is of major significance but the magnitude of the impact is minor therefore the impact is of *minor significance*.

14.6.2.5 Inverness to Fort George Military Road

Construction traffic will require to use the military road for at least a short distance to access the site. The road runs adjacent to the site so there will be some visual impact during construction although bunding is likely to be one of the first activities on the site so the impact may be very short-term. There will be some noise impact during some of the construction activities but as most of the road users will be in a motor vehicle this impact is not expected to be significant.

It is also necessary to widen the mouth of the WwTW access road at its junction with the B9006. This will require a slight modification to the road structure but as it has already been considerably modernised this will have a minor, localised impact. For at least part of the construction period there are likely to be traffic management measures on the road such as temporary traffic lights in order to improve the safety for access and egress from the site.

The military road is a monument of medium importance and the magnitude of the impacts on it are considered to be minor. The overall impact assessment is therefore of *minor significance*.

14.6.2.6 Ardersier Fish Traps

The fish traps are located below the high water line on Ardersier Beach. They are not likely to be affected by construction activity unless there is any uncontrolled runoff from the site into the sea, which will only happen in an emergency situation. It is unlikely that the general construction activities of the WwTW will have any impact on the fish traps and therefore the impact on them is *negligible*.

14.7 Mitigation

14.7.1 Mitigation measures during operation

Fort George – potential for impact on visual setting. Ardersier WwTW is barely discernable from Fort George. Consideration of visual impact in Chapter 8 indicates that, with mitigation measures of screening and planting along with use of natural colours, impact of the proposed development on views from this feature is low.

Cromal Mount in Ardersier – potential for impact on visual setting. Historic Scotland has indicated that the setting of the mount should not be compromised. Chapter 8 has a further discussion of the potential for impact or mitigation for the setting of features of cultural and historic monuments. Chapter 8 concludes that visual impact from the proposed development on views from this archaeological feature will be minimal with mitigation. Visual impact will be minimised by using appropriate paint colours and screening where possible.

Hillhead of Ardersier Ring Ditches – it is anticipated that the completed scheme will be barely discernable from Hillhead and so the mitigation against visual impact will be the general measures described above.

Ardersier Church and Burial Ground – potential for impact on visual setting. Again the WwTW will be barely discernable from the Ardersier Church and therefore mitigation measures will be use of screening as described previously.

Military Road – potential for impact from operational traffic, and visual setting. The visual and noise impact from the road will be mitigated where possible using bunding and screening and appropriate colours. Mitigation of the effects of operational traffic is discussed fully in Chapter 13.

14.7.2 Mitigation Measures during construction

Fort George – potential for impact on visual setting and disturbance from construction traffic and activities. It is not expected that the visual impact of construction will be significant at Fort George, however bunding is likely to be an initial site activity which will help to mitigate any deterioration in the view. Noise impact will be reduced as far as possible by using best practise low noise piling techniques.

Cromal Mount – potential for impact on visual setting and disturbance from construction activities. As for Fort George, noise impact will be reduced where possible by selecting low noise ct construction methods, and natural planting at the south end of the site will be maintained to provide visual screening towards Ardersier.

Hillhead of Ardersier Ring Ditches – potential for impact on visual setting and disturbance from construction activities. Again noise and vibration during construction will be reduced where possible using best practise techniques. The visual impact is expected to be small during construction but will be reduced where possible by bunding.

Ardersier Church - potential for impact on visual setting and disturbance from construction traffic and activities. The visual impact at Ardersier Church will be minimal.

Military Road – potential for impact from junction widening and construction traffic. The Highland Council Regional Archaeologist has indicated through consultation activities that improvements to the site junction with the B9006 will not require a watching brief. Mitigation measures for construction traffic are discussed in Chapter 13.

Ardersier Fish Traps – potential for pollution impact from site activities – good environmental practise will be strictly followed on site in order to prevent any pollution. This is likely to include setting and treating any runoff, bunding of fuel or chemical tanks and having good emergency procedures and equipment in place to deal with unexpected situations.

14.8 Residual Effects

None of the nearby archaeological features have been identified to be at significant risk from the construction or operation of the WwTW.

There may be a minor adverse effect to views as newly planted screening around the site becomes established, however effects are not considered to be significant.

14.9 Summary of Environmental Effects

No significant environmental effects on archaeological features or cultural heritage from the proposed extension to Ardersier WwTW are anticipated.

15. Socioeconomics, Tourism and Land use

15.1 Introduction

This chapter addresses the potential socio-economic effects of the proposed development at Ardersier WwTW by considering the socio-economic baseline relevant to Ardersier and the wider A96 corridor area in relation to the potential impacts of the scheme.

This chapter presents baseline descriptions and assessment of effects, with identification of potential impacts and mitigating measures required. The following have been addressed;

- Changes and effects on population;
- Effect on employment e.g. location, availability and types of employment, job creation and employment increase;
- Effect on social wellbeing e.g. access to social networks, attachment to place, etc;
- Effect on social services e.g. access to level of provisions;
- Effect on standard of living;
- Changes and effects on the land use area;
- Effects on recreation and outdoor access, etc; and
- Changes and effects on tourist attractions and activities.

15.2 Legislative Context

There is no specific legislation applicable to socio-economic impacts, therefore this assessment is based on baseline conditions and previous EIAs and makes reference to information sources relevant to this chapter.

This assessment takes into account:

- The type of development project, including its nature, scale, location, duration etc;
- The type of outdoor access facility within the WwTW; and
- The nature of recreational activities and natural conservation areas that exist within the vicinity.

In undertaking this chapter of the ES, account has been taken of the relevant legislation and policies. Full details of these are provided in Chapter 2.

15.3 Assessment Methodology

The following methodologies and sources of information have been used for the purposes of this assessment:

- Detailed desk studies and a site visit to establish the baseline conditions of the site;
- Consultation with relevant statutory and non-statutory organisations;
- Description and evaluation of evaluation of relevant and updated legislation and guidance relevant to the development;
- Description of the potential effects of the proposed development and the effects these could have on tourism, recreation and the socio-economic environment;
- Evaluation of the significance of these effects by consideration of the sensitivity of the project, the potential magnitude of these effects; and
- Identification of possible measures to avoid and mitigate against any potential adverse effects resulting from this development.

The baseline conditions are separated into several sub categories which cover the socio-economic aspects specific to the proposed development. These sub-categories are set out as follows;

- Land Use
- Walking and Rights of Way
- Population
- Employment and Economy
- Community Assets
- Tourism and Recreation.

The proposed new WwTW at Ardersier will have a variety of effects on socio-economic factors. Due to the nature of assessing impacts, much of the methodology will be based on a qualitative basis. The proposed scheme will have a variety of direct and indirect effects on residents and visitors to Ardersier.

The projections will identify the positive and negative impacts of the proposed scheme. Mitigation and enhancement measures will be suggested where appropriate.

The criteria employed to assess the significance of effects on tourism, recreation and socio-economics at the site is in line with SNH guidance[11]. Significant effects are those that would lead to permanent or long-term effects on facilities provided under statutory powers, or where the WwTW will affect recreational resources that have more than local use or importance.

In terms of socio-economic factors, effects would be significant if the development during either construction or operation resulted in any fundamental or material changes in population, structure of the local community, local services or employment.

[11] Scottish Natural Heritage – A Handbook on Environmental Impact Assessment (Appendix 5 – Countryside Access Impact Assessment), January 2002

15.4 Baseline Conditions

15.4.1 Land Use

The proposed WwTW is located in a rural area to the north of Ardersier Village and to the south of Fort George. The development will make use of the existing WwTW infrastructure, including pipework conveying wastewater from the existing network and discharge pipelines. The new works has been designed to utilise land around the existing WwTW, with some use of surrounding scrubland and minimal encroachment onto amenity resources including the Candidate Coastal Paths Network and Ardersier Common.

Final effluent will be discharged through the existing outfall into the Moray Firth to the north of Fort George.

Land within the footprint for construction of the development is considered to have low conservation value.

The site of the proposed development is owned by Scottish Water.

15.4.2 Walking and Rights of Way

Paths near the existing WwTW have been identified by The Highland Council as part of a Candidate Core Paths Network, see Figure 13.1.

The landscape mitigation plan (see Technical Appendix F: Landscape and Visual Impact Assessment – Figure 12) has been formulated in consultation with The Highland Council so that planting minimises impact on both the habitat of the dingy skipper butterfly and on the Candidate Core Paths Network.

At present, a track down to foreshore through the site is used unofficially by watersports enthusiasts.

15.4.3 Population

Information on population in Ward no. 18 – Culloden and Ardersier is held by The Highland Council[12], with statistics supplied by the General Register of Scotland. Statistics are taken from the GRO (S) 2008 mid-year estimates.

Culloden and Ardersier is a mixed rural and urban Ward with an overall population density above the Highland average. The proportion of people in the 16 to 49 age group is the highest in Highland and the proportion in the 0 to 15 group is above the Highland average. The population total was stable between 2001 and 2004, although parts of Culloden are beginning to show a decline, and a higher than average decrease in the number of children has been compensated for by an increase in the numbers of the elderly.

Table 15.1: Total Population, Ward 18 Culloden and Ardersier

	Ward	Highland	Scotland
Total Population	11,029	219,400	5,168,500

Source: GRO(S) 2008 mid-year estimates

[12] http://www.highland.gov.uk/yourcouncil/yourward/ward18/ward-18-z-wardstats.htm

15.4.4 Employment and Economy

9% of workers in Culloden and Ardersier are self-employed, below the Highland average. The Ward has a high proportion of jobs in manufacturing and transport & communications, and a low dependency on the public sector.

Table 15.2: Number of People in Employment, Culloden and Ardersier

	Ward	Highland	Scotland
Number of People in Employment*	3,400	109,300	2,420,400

Source: Annual Business Inquiry 2008 - *Rounded to nearest 100 people

In 2001, approximately 75% of people in the Ward aged 16 to 74 were economically active; that is working, actively looking for work or full time students.

Table 15.3: Employment by Sector

Table Heading Left	Ward	Highland	Scotland
Percentage of people employed in:			
Agriculture & fishing	2.2	1.7	1.7
Energy & water	0.0	0.8	1.8
Manufacturing	12.2	8.0	8.7
Construction	4.0	6.7	5.9
Distribution, hotels and restaurants	10.9	25.6	22.2
Transport and communications	20.6	6.0	5.1
Banking, finance & insurance, etc.	18.1	14.9	19.1
Public admin., education & health	29.1	31.1	30.0
Other services	2.7	5.3	5.4

Source: f Annual Business Inquiry 2008

Table 15.3 shows that 'Public admin., education and health', 'Transport and communications', 'Banking, finance & insurance etc' and 'Distribution, hotels and restaurants' are the most significant industries of employment in the Culloden and Ardersier Ward.

These figures are broadly similar to the rest of the Highland Region and Scotland, but with significantly more employed in the transport and communications industry and less in distribution, hotels and restaurants.

15.4.5 Community Assets

No Community Assets of significance have been identified within the boundary of the proposed development.

15.4.6 Tourism and Recreation.

Statistics published by Visit Scotland show that Scottish tourism depends heavily on the country's landscape, with 92% of visitors stating that the scenery was important in their choice of Scotland as a holiday destination, with the natural environment being important to 89% of visitors[13].

The nearest tourist attractions and recreational places to the WwTW include:

15.4.6.1 Fort George

Fort George is an 18th-century garrison fortress which was built in the after math of the Battle of Culloden in 1746, and still serves as an important military base. It is a Scheduled Ancient Monument and is a site of interest for tourism in terms of its historical significance and as a venue for local events, primarily during the summer. Visitor numbers obtained from Historic Scotland indicate visitor numbers of 61,168 in 2009, with the majority of visitors in July and August. The main road to Fort George passes the WwTW site. Alternative routes are possible via unclassified roads.

15.4.6.2 Ardersier Common

Ardersier Common is an area of land adjacent to the existing WwTW, owned by Scottish Water and managed to promote biodiversity by The Highland Council Ranger Service. The ecological features of Ardersier Common, the impacts anticipated from the proposed development and recommendations for mitigation measures are considered in Chapter 10.

15.4.6.3 B&B's in the vicinity of Ardersier

The proposed development is within the Inner Moray Firth Area of Great Landscape Value. Predicted impacts on viewpoints affecting a variety of locations are considered in Chapter 8.

15.5 Assessment of Effects

15.5.1 Land Use

Site compounds and decommissioning of the existing WwTW would all take place within the boundary of the scheme (see Figure 4.3).

There is no obstruction or interference with public footpaths.

Construction will directly impact on the use of the site however the effects of construction activities have been assessed as short-term (18 months) and not of significant impact. See technical chapters for further details.

The land use will not change as the development represents an extension to an existing wastewater treatment works.

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15.5.2 Walking and Rights of Way

Vehicular access from the site on to the B9006 road will be required however impacts on traffic using the B9006 will be limited to temporary traffic management if necessary.

The unofficial access route to the Moray Firth will be removed as part of the proposed development, however there are other access routes to the Moray Firth along the coastline.

During construction and operation there will be no public access to the site within the boundary of the development. There will be no impact on public access and rights of way to the Core Paths Network as part of the proposed development during operation or construction, and the footpath close to the southern corner of the site will remain unaffected by the operation of the works.

Signage will be erected within the site to warn members of the public of the dangers of machinery and other operational features within the treatment works.

15.5.3 Population

The new WwTW will bring benefits for the local population by improving the following aspects:

- Capacity to meet the needs of potential population and industrial growth as identified in the A96 Masterplan;
- Improvement in water quality of the Moray Firth by improvement in level of treatment of sewage discharges, with benefit to marine ecology; and
- Cleaner shoreline waters for watersports.

The WwTW plays an important infrastructure role as a service area for the surrounding A96 area. With projected population increases in future years, it will also accommodate waste water from future developments within the A96 area within the footprint of the scheme, without a need for additional land take or construction impacts outside the boundary of the development.

This resolves the need for additional treatment works in the A96 corridor identified in the 'A96 Corridor Wastewater Development Option Study' commissioned by Scottish Water and produced by Biwater (2007) and supports the potential for major expansion in the A96 Corridor as set out in the A96 Growth Corridor Framework (The Highland Council, 2007).

The WwTW will support and improve an environment which will attract new investment and will retain economically active residents.

15.5.4 Employment and Economy

The development will result in the creation of a number of local jobs during the construction phase.

15.5.5 Tourism and Recreation

Due to the kind of development proposed and the distance between major tourist attractions in the area (Fort George) and the proposed development, no adverse effects on tourism are anticipated.

The long-term impact of the sludge tankers and skip lorries on recreational users of the B9006 has been assessed in Chapter 13 (access and traffic), as negligible impact due to the low number of HGVs accessing the WwTW.

A minor to moderate adverse effect on views from some locations was recorded as part of the Landscape and Visual Impact Assessment (see Table 8.3). The anticipated effect on viewpoints from the proposed development includes views from locations of interest to tourism and recreation, however these effects are reduced to low with mitigation measures of planting for screening and use of natural colours.

Recreational activities such as walks in Ardersier Common and along the Candidate Core Paths Network will not be affected by the proposed WwTW.

The proposal will result in an improvement in water quality on the shoreline of the Inner Moray Firth and is therefore considered to have a positive effect.

15.6 Mitigation

During construction appropriate notices will be posted around the site to ensure that the public are made aware of works and potential hazards associated with heavy plant and construction on site. During operation public access to the site will be prohibited.

Temporary adverse impacts of noise, dust and traffic during the construction phase can be adequately mitigated through appropriate working practices and traffic management. These measures are detailed in the relevant technical chapters.

Predicted odour emissions do not represent nuisance levels for any of the surrounding sensitive receptors, and will have negligible impact on tourism-related sites such as B&B's, Fort George and Ardersier Village.

Planting for visual screening (detailed in Chapter 8) will mitigate for impact on views.

15.7 Proposed Monitoring

There will be no monitoring for tourism, socio-economics and land use effects as they are temporary and of negligible impact.

15.8 Statement of Significance

No adverse effects are anticipated to tourism and recreation. No obstruction or interference with public footpaths or roads will occur as a consequence of the proposed development.

The proposed new WwTW is a key infrastructure improvement in support of The Highland Council's development plans for residential and industrial growth in the A96 Corridor area.

The proposed development is expected to have a minor positive impact on employment in the area during construction with associated positive effects on employment statistics in the wider A96 corridor area through provision of infrastructure to support local development plans.

Permanent impacts are limited to the footprint for construction at the site of the existing wastewater treatment works.

No mitigation measures other than implementation of appropriate site safety measures during construction and best practice for construction activities as referenced in the individual technical chapters are required. The effects of the proposed development on socio-economic activities are assessed as being of a minor significance.

16. Cumulative Impacts

High level consideration has been given to the cumulative effects of the development in combination with other developments in the local area.

Environmental elements for which in-combination effects from other developments or proposals are considered to have potential to exacerbate environmental effects of the proposed development considered in this EIA are highlighted below.

16.1 Geology and Contamination

The proposed development is not considered to have potential to exacerbate issues of contamination or geological impact in the area surrounding Ardersier WwTW.

16.2 Landscape and Visual Impact

The proposed development is not considered to have low local impact, with greater impact in the short term while planting for screening becomes established. Potential for the new WwTW to act in combination with other developments in the area to impact on views in the wider landscape area is low. Immediate land use of MoD playing fields,

16.3 Water Quality and Ecology

In addition to the final effluent discharge from Ardersier WwTW, the Moray Firth receives a series of both continuous and intermittent discharges from Scottish Water assets and other unrelated industries.

Continuous discharges to the Moray Firth within 15 km of the Ardersier outfall include final effluent from Allanfearn, Avoch, Fortrose, Cromarty, Alness, Invergordon and Nairn WwTWs.

Intermittent discharges include combined sewer outfalls from each of the combined sewer networks serving communities around the Firth.

The overall cumulative effect is not possible to quantify, however it should be noted that the level of sewage treatment in the Firth has improved markedly over the past 15 years. New treatment works with enhanced levels of treatment have been built at Allanfearn in 2000, at Nairn in 2001, at Fortrose, at Rosemarkie in 2006 and at Ardersier itself in 1995.

In its consultation on the proposed development SEPA has indicated that it would expect the intermittent discharges from the networks of the Ardersier WwTW catchment area to be included within the EIA.

All WwTW discharges within the Moray Firth SAC have the potential to increase the risk of infection to bottlenose dolphins to a minor degree, even if these do not discharge into frequently used areas. This is equally true of other point sources of pathogens, such as private septic tank discharges, and disperse sources such as run off from agricultural land (directly to coastal water or via riverine input).

Any impact on water quality at Rosemarkie or Nairn Bathing Water beaches would be a cumulative effect in tandem with the other treatment works discharging into the Moray Firth. No failures of the Mandatory standard have been recorded at Rosemarkie Beach – the closest of the designated bathing waters to the

Ardersier outfall. Failures at the Nairn beaches are thought to be linked to issues with Nairn WwTW and with agricultural run-off and are unlikely to be due to impacts from Ardersier WwTW.

It should be noted that bacteriological treatment is provided at Nairn WwTW (UV treatment), Allanfearn WwTW (UV treatment), Rosemarkie WwTW (Membrane Bioreactor - MBR) and Cromarty WwTW (MBR).

Scottish Water has excluded consideration of intermittent discharges from the scope of the EIA on the grounds that the existing networks will be unaffected by the development. There is currently no intermittent discharge from the WwTW itself nor will there be from the proposed new WwTW. All additional inflows to the proposed WwTW will be via new networks for foul waters only. Surface water drainage for new developments will be determined through their respective planning applications.

There is consequently no impact from the proposed development on water quality issues relating to intermittent discharges from the existing network.

From the results of the dispersion modelling for Fortrose and Rosemarkie WwTW there is potential for this discharge to augment the impact from Ardersier WwTW over a limited range.

16.4 Ecology

Fragmentation of habitat and reduction of biodiversity from planned development in the A96 corridor area is an important issue, however the risk of construction of a new WwTW forming a cumulative contribution to this effect is considered to be low. Proposed planting mitigation out lined in Chapter 8 will maintain and eventually enhance the habitat at the WwTW site.

16.5 Air Emissions

No planned projects in the local area with significant air quality effects are known.

16.6 Noise Emissions

No planned projects in the local area with significant noise effects are known.

16.7 Access and Traffic

There are no other committed developments (identified through consultation with The Highland Council) which might give rise to significant increases in local traffic volumes during the construction phase of Ardersier WwTW.

16.8 Cultural Heritage and Archaeology

There is no direct impact on archaeological features associated with the proposed development.

The proposed development is considered to have low impact on views affecting cultural heritage features in the area, with greater impact in the short term while planting for screening becomes established. Potential for the new WwTW to act in combination with other developments in the area to impact on views in the wider landscape area is low.

16.9 Socioeconomics, Tourism and Land Use

It is likely that the proposed new WwTW will have a cumulative effect with other plans and proposals within the A96 Corridor area to represent a net benefit to population and economy in the region.

17. Summary of Environmental Effects

A draft scheme of mitigation measures required to counteract the environmental effects of the proposed development has been compiled, and is included below.

Table 17.1: Draft Scheme of Mitigation

Environmental Category	Hazard	Impact	Mitigation	Residual Impact
Geology, Soils and Contamination	Contamination of bedrock aquifer from spills associated with process failures eg pumps	Medium	Containment, emergency operation plan, drainage plan	Low / insignificant
	Sludge handling / transport	Medium	Containment, emergency operation plan, drainage plan	Low / insignificant
	Isolated elevated TPH concentration in groundwater at BH01	High	Further groundwater testing undertaken and initial concentration not replicated.	Low
	Ammoniacal Nitrogen Contamination in leachates and groundwater across site	Medium	Further investigation required on material underlying WwTW during demolition / decommissioning to confirm elevated Ammoniacal Nitrogen concentrations and their possible source.	Medium (Residual risk will be assessed)
	Isolated high CO2 level in BH04 during initial gas monitoring round	Low, CIRIA 'Characteristic Situation 2'	Gas protection measures include suitable slab construction, gas membrane and sealing of all joints and penetrations.	Low
	Hazardous (ecotoxic) soils at TP11 and BH04 (high concentrations of zinc and copper)	Moderate	Re-use under hardstanding and above GW table. Infiltration drainage to be located away from the source of contamination.	Low
	Contaminated leachate at TP06 (benzo(a)pyrene)	Moderate / Low	Re-use under hardstanding and above GW table. Infiltration drainage to be located away from the source of contamination.	Low
	Corrosion of construction materials	Low	Consideration of most suitable materials to be used in development at detailed design stage.	Very Low
	Contamination of drinking water pipelines	Low	Trenches should be excavated and backfilled with clean fill prior to pipes being laid to prevent contact with site soils	Low / insignificant
Landscape and Visual Amenity	Deterioration in the existing view	Medium	Screening and planting, use of natural colours	Low
Hydrology and Water Quality	Risk of flooding of site causing pollution incidents	Medium	Raise ground above 4.7m OD. Incorporate the appropriate level of SuDS in design.	Insignificant
	Damage to property of infrastructure from flood displacement	Medium	Raise ground above 4.7m OD	Insignificant
	Mobilisation of silt and/or spills of oils or concrete washings	Low	Adopt standard best practice construction measures	Low

Environmental Category	Hazard	Impact	Mitigation	Residual Impact
	etc			
	Risk of mobilisation of contaminants in soils	Low to Medium	Validation testing of material excavated from identified areas	Low
	Risk of deterioration of water quality in the discharge receiving waters	Medium	Tertiary treatment of effluent	Highly significant local improvement Low significance regional improvement
Ecology and Nature Conservation	Moray Firth SAC	Moderate to slight positive	None required	Minor positive
	Bottlenose dolphin	Moderate to slight positive	None required	Minor positive
	Sandbanks	Slight positive	None required	Minor positive
	Ardersier Common	Moderate to slight negative	See mitigation measures listed below.	Minor negative
	Trees and Forestry	Negligible	Follow BS 5837 during construction.	Negligible
	Dingy skipper butterfly	Moderate to slight negative	Vegetation clearance August to February inclusive. Agreement with contractor regarding access and working arrangements prior to start on site. Planting to include kidney vetch. Planting in the southern corner to take place over 2 years.	Minor negative
	Breeding birds	Negligible	Vegetation clearance August to February inclusive	Negligible
	Badger	Negligible	Site survey prior to construction	Negligible
	Otter	Negligible	None required	Negligible
	Bats	Negligible	None required	Negligible
	Protected bird species	Negligible	None required	Negligible
	Marine mammals and fish	Moderate to slight negative	Avoid use of machinery for piling where possible, or use machinery with low noise emissions. Use buffer blocks and minimise hammer drop height.	Minor negative
Air Quality	Odour concentrations between 2.0 and 3.3 OU_E/m^3 98%ile at cemetery house	Low	None required	Low
	Odour concentrations between 0 and 8 OU_E/m^3 98%ile at Coastal Path	Low	None required	Low
	Odour concentrations between 1.2 and 2.1 OU_E/m^3 98%ile at MoD Playing Fields	Low	None required	Low

Environmental Category	Hazard	Impact	Mitigation	Residual Impact
	Odour concentrations between 25 and 50 OU_E/m^3 98%ile at B9006 road	Minor	None required	Minor
	Dust emissions from Construction Work	Low-Medium	Best practice for dust minimisation in construction to be used by contractor	Low
	Construction Vehicle Emissions	Low	None required	Low
Noise and Vibration	Operational Noise	Minor	Control of noise at source and through pro-active management measures	Minor
	Construction Noise	Moderate	Follow British Standard 5228 for construction. Additional silencing measures can be implemented if required.	Low to Moderate
	Piling activities	Slight adverse	Avoid use of machinery for piling where possible, or use machinery with low noise emissions. Use buffer blocks and minimise hammer drop height.	Minor
Access and Traffic	Increase in general (and/or HGV) traffic volumes cause delay and congestion on public roads ('A' and 'B' type roads); **All 3 Routes**	Negligible	Traffic Management / Construction Code	None
	Increase in general traffic volumes cause temporary disruption and delay to general traffic (unclassified road); **Route 3 only**	Moderate (temporary)	Infrastructure improvement Works	Minor (temporary)
	Increase in HGV traffic volumes cause temporary disruption and delay to general traffic (unclassified road); **Route 3 only**	Negligible	Infrastructure improvement Works	None
	Road Safety (Road Traffic Accidents); **All 3 Routes**	Negligible	None required	None
	Movement of construction traffic could impact upon safety and amenity for pedestrians and cyclist; **All 3 Routes**	Negligible	Traffic Management / Construction Code	None
	Disruption to pedestrian and cycle routes; **All 3 Routes**	Negligible	None required	None
Cultural Heritage and Archaeology	Direct impact on archaeological features (Fort George Military Road)	Low	Road has already been considerably modernised, and the effects of junction improvement works likely to be insignificant.	Negligible
	Indirect impact on visual setting of archaeological features (Fort George, Cromal Mount, Hillhead of Ardersier)	Medium	Screening and planting, use of natural colours	Low impact
Socioeconomic	Risk of hazards to members of the public during construction	Low	Implement site safety measures during construction	Low impact

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Glossary

AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
AEP	Annual Exceedance Probability
AOD	Above Ordinance Datum (Newlyn)
APPLE	Air Pollution Planning and the Local Environment
BAP	Biodiversity Action Plan
BCT	Bat Conservation Trust
BGS	British Geological Survey
BPG	Best Practice Guidance
BRE	Building Research Establishment
BTO	British Trust for Ornithology
CAR	Controlled Activities Regulations
CIRIA	Construction Industry Research and Information Centre
CLEA	Contaminated Land Exposure Assessment
CSO	Combined Sewer Overflow
dB / dBA	Decibel, equal to one tenth of a Bel
Defra	Department of Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges
DoE AL 72	Department of Environment Advisory Leaflet 72
EA	Environment Agency
EC	European Commission
EcIA	Ecological Impact Assessment
EEC	European Economic Community
EIA	Environmental Impact Assessment
EPS	European Protected Species
ES	Environmental Statement
FEPA	Food and Environment Protection Act
GES	Good Ecological Status
H	High
HVA	Habitat Viability Assessment
IEEM	Institute of Ecology and Environmental Management
JNCC	Joint Nature Conservancy Council
L	Low

LA90	The A-weighted level of noise exceeded for 90% of the measurement time. Normally taken as the background noise level
LAeq	A-weighted equivalent sound pressure level. A steady sound level that produces the same energy as the fluctuating sound level over the measured time interval
LAmax	Maximum A-weighted sound pressure level occurring over the measured time interval
LBAP	Local Biodiversity Action Plan
Leq	The equivalent sound pressure level
LNR	Local Nature Reserve
L90	The un-weighted level of noise exceeded for 90% of the measured time interval
M	Medium
MLWS	Mean Low Water Springs
MM	Mott MacDonald Limited
N	Neutral
NBN	National Biodiversity Network
NMRS	National Monuments Records of Scotland
NNR	National Nature Reserve
NPF	National Planning Framework
NPPG	National Planning Policy Guidance
PAN	Planning Advice Note
PPG	Planning Policy Guidance
PSD	Partical Size Distribution
RCAHMS	Royal Commission on the Ancient and Historical Monuments of Scotland
RICS	Royal Institute of Chartered Surveyors
RTA	Road Traffic Accident
SAC	Special Area of Conservation
SEPA	Scottish Environment Protection Agency
SEPA PPG	Scottish Environment Protection Agency Pollution Prevention Guidelines
SNCI	Site of National Conservation Importance
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPP	Scottish Planning Policy
SSSI	Site of Special Scientific Interest
SUDS	Sustainable Urban Drainage Systems
TA	Transport Assessment
TECS	Transport, Environment, and Community Services

THC	The Highland Council
UK	United Kingdom
VER	Valued Ecological Resources
VH	Very High
VL	Very Low
WAC	Waste Acceptance Criteria
WCA 1981	Wildlife and Countryside Act 1981
WebTAG	Web Transport Analysis Guidance
WEWS	Water Environment and Water Services
WFD	Water Framework Directive
WwTW	Waste Water Treatment Works
ZoI	Zone of Influence